REPUBLIC OF BULGARIA

UPDATED NATIONAL IMPLEMENTATION PLAN

FOR THE MANAGEMENT OF PERSISTENT ORGANIC POLLUTANTS(POPs)

IN THE REPUBLIC OF BULGARIA,

2012 ÷ 2020.

(U - N I P P O P M)

ADOPTED BY DECISION OF THE COUNCIL OF MINISTERS ON 5TH SEPTEMBER 2012

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MINISTRY OF ENVIRONMENT AND WATER

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EXECUTIVE SUMMARY

Persistent organic pollutants (POPs)[1] are organic substances which possess toxic properties, resist degradation in environment for a long period of time, bioaccumulate and are transported through air across international boundaries and deposited far from their place of release. They pose a potential threat to the environment and human health, and the initiation of global actions is necessary for elimination of their production, placing on the market, as well as the reduction of their releases in environment.

Bulgaria has signed the **Stockholm Convention** on POPs (SC) on 23rd May 2001. The Convention is ratified by law (promulgated in the State Gazette (SG), issue 89/12.10.2004), in force in the country as of 20 March 2005. A competent national authority on the implementation of the obligations of our country under the Stockholm Convention is the Ministry of Environment and Water (MEW).

Bulgaria as a member state of the European Union (EU) and a party to the Stockholm Convention has the obligation to fulfill its commitments related to the implementation of the convention.

The obligations on implementation of the convention are introduced into European law through Regulation (EC) No. 850/2004 on POPs. Pursuant to Article 7, paragraph 1, i. (c) of the Stockholm Convention and Article 8 (4) of Regulation (EC) No. 850/2004 on POPs our country is obliged to review and update its NIPPOPM after inclusion of new POPs in the Annexes to the Convention.

In national legislation the measures on implementation of Regulation (EC) No. 850/2004 on POPs are regulated by Article 1 (3) (e), Article 22 and Article 22f (1) and (2) of the Law on protection from the harmful effects of chemical substances and mixtures (LPHECSM), SG, issue 98/14.12.2010. Legal ground for adoption of U-NIPPOPM by an instrument of the Council of Ministers is paragraph 2 in conjunction with paragraph 1 of Article 22f of LPHECSM.

In this respect, by Order No. RD-1063/08.12.2010 of the Minister of environment and water, a National Coordinating Committee (NCC) has been established by representatives of the concerned institutions, professional organizations, the academic community and non-governmental organizations with the task to update, amend and supplement the «National implementation plan for the management of persistent organic pollutants (POPs) in the Republic of Bulgaria» of March 2006 (NIPPOPM). For the elaboration of individual parts of U-NIPPOPM there have been established 6 subsidiary working groups (AWG). The final version of U-NIPPOPM is finalized after conducting of extensive discussions and consultations with members of NCC and AWG.

The Annexes to the Stockholm Convention currently comprise 22 POP compounds.

The 12 initial POPs are: aldrin, dieldrin, DDT, endrin, chlordane, heptachlor, hexachlorbenzen (HCB), mirex, polychlorinated biphenyls (PCBs), toxaphene, polychlorinated dibenzo-r-toxins and dibenzofurans (PCDD/PCDF).

The 10 new POPs are: alpha and beta-hexachlorocyclohexane (alpha-HCH and beta-HCH), lindane, endosulfan, chlordekon, hexabromobiphenyl (HBB), tetra- and pentabromodiphenyl ether (tetra-BDE and penta-BDE), hexa- and heptabromodiphenyl (hexa-BDE and hepta-BDE), pentachlorobenzene (PeCB) and perfluoroctansulphonic acid and its derivatives (PFOS).

This document constitutes **Updated National Implementation Plan on Persistent Organic Pollutants (POPs) Management in Bulgaria, 2012 – 2020 (U-NIPPOPM)** which comprises subsequent measures and activities for the 12 initial POPs and such future measures for the 10 new POPs included in SC. U-NIPPOPM has been elaborated in the period from January 2011 to April 2012 and adopted by decision of NCC.

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[1] According to Annex D to the Stockholm Convention, a chemical substance is determined as persistent if its half-life in soils and sediments is greater than 180 days, in water – greater than 60 days; in bioaccumulative terms – if its bio-concentration factor (BCF) or its bio-accumulation factor (BAF) > 5000 or if the Octanol-Water Partition Coefficient (log Kow) is > 5; if it has a potential for long-range environmental transport – if its half-life in air is greater than 2 days; and if toxicity and ecotoxicity data show a potential to damage human health or the environment.

Strategic objective of U-NIPPOPM is reduction of the risk to human health and the environment due to the harmful effect of POPs, and its **main objective** is improvement of POPs management system, which will be achieved by way of a series of operational objectives.

U-NIPPOPM consists of an introduction, four main parts and 4 annexes thereto.

Part I. "Country baseline" contains general data about the country (geographical location, territory, relief, climate and natural resources, population as per the latest census of February 2011, political system and administrative & territorial division of the country). The economic profile per sectors and the basic economic indicators are updated as at 2010. The ecologic situation in the country is reflected in terms of the level of air pollution, surface and ground water contamination, soil contamination, as well as generated amounts of household and hazardous waste as at 2010.

Part II. "Institutional, policy and regulatory framework" describes in detail the policies on environment protection and sustainable development, signed and ratified international conventions; presents an overview of the current European and national legislation on POPs management, including in respect of the 10 new POPs until the end of 2011, other mechanisms and voluntary initiatives, administrative penalties and sanctions.

Part III. "Assessment of the POPs issue in Bulgaria" comprises a detailed evaluation of the status of the 12 initial POPs and the 10 new POPs – POP pesticides (15), industrial POP chemicals (PCB, HBB, PBDE, PFOS) and POP emissions [dioxins /furans (PCDD/PCDF), PCB, HCB, PeCB, PAH); existing programmes for monitoring, information & awareness raising, and educating the public; NGO activities; laboratory infrastructure; chemical management systems.

According to the available data, Bulgaria has never produced any POP pesticides, or industrial POP chemicals in the form of individual substances, or in mixtures, or in the form of plant protection products (PPP).

Bans and restrictions are introduced as regards the placing on the market and use, import and export of POPs substances in mixtures and products. The export of POPs is permitted solely for the purposes of environmentally sound disposal.

The status of available POPs is followed up, as the evaluation includes the new ones as well: lindane, alpha- and beta - HCH, PeCB, chlordecone and endosulfan. Availability of about 161 t (DDT and wheat treated with DDT, heptachlor and lindane). About 4.5 t of lindane are kept in 4 warehouses in good condition, and about 156.5 t in 91 BB-cubes, out of which 50 t of DDT and DDT-treated wheat, 6.5 t of heptachlor and 99.5 t of lindane. Subsequent activities are also envisaged in respect of the final disposal of these POPs pesticides abroad and external financing is provided through the Swiss Programme on export and disposal of obsolete pesticides out of the territory of Bulgaria. Till the end of 2010 there have been exported and disposed in Germany approximately 82.5 t of other obsolete pesticides "of unknown composition", which could have been contaminated with POPs as well. No samples of these obsolete pesticides were tested for content of POPs.

Evaluation of the condition of industrial POPs chemicals has been performed while taking into account the performance of the activities related to decommissioning and disposal abroad of inventoried transformers and capacitors containing PCB. Till the end of 2011 99% of these have been exported and disposed at incinerators in Germany, the Netherlands, Italy, France and other EU MSs due to the lack of hazardous waste disposal plant in the country. For the period 2007 – 2011 there have actually been exported and disposed 19,353 pcs. of equipment (transformers and capacitors) and waste containing PCB with a gross weight of 1,543 t.

In respect of the new industrial POPs chemicals (HBB, PBDE, PFOS) the results of a preliminary research on placing on the market and use (January – March 2012) have been reported and a preliminary evaluation has been performed as to the possible content of PBDE, PFOS in articles and waste of WEEE and ELVs. The performance of a detailed book inventory is envisaged for identification of these compounds in articles and waste for the purpose of determining the necessary subsequent measures and activities, especially as regards the option for recovery and/ or disposal abroad. As at the end of 2011, some 8,110 kg firefighting foam waste have been identified in the country, containing 6 % PFOS. Measures are taken for the announcement of a public procurement for their disposal out of the country.

The results from the monitoring of the initial POP pesticides and PCBs in the components of environment (soils, surface and ground water), as well as in raw materials, products, and foods of plant and animal origin, have been updated.

The data from the estimated inventories of POP emissions (PCDD/PCDF, PCB, HCB and PAH) have been updated as at 2009, as well as the potential opportunities for reduction of unintentionally generated POPs emissions; the existing programmes on monitoring, performed activities on raising the awareness and educating society, the NGO activities, the available accredited laboratories for testing of POPs in different matrixes, as well as the chemical management systems, are additionally described.

Part IV “Strategy and updated Action Plan (U-AP) for the implementation of NIPPOPM” describes the assumed national commitments on implementation of the Stockholm Convention as regards the 22 POPs, the set priorities of national significance (8 priorities, out of which 5 are of high priority), the principles and strategy on implementation of the set objectives and priorities, planned measures and activities within updated action plan (U-AP) and expected results.

Annex No.1 sets forth elaborated and approved U-AP in which the three specific action plans within NIPPOPM of March 2006 are unified within a single U-AP, comprising measures and activities for all 22 POPs: POPs pesticides, industrial POPs chemicals and POPs in emissions.

U-AP contains a number of subsequent measures and activities related to the 12 initial POPs and future activities in respect of the 10 new POPs, included in SC. As regards the 10 new POPs, the performance of detailed audits is envisaged for industrial POPs chemicals – PBDE and PFOS – in articles, products and EEE, placed on the market, as well as identification of their possible content in WEEE and ELV waste.

U-AP provides for a number of measures and activities for ensuring of conditions for effective application of the legislation in the field of POPs and for exercising control; disposal abroad of the available obsolete POPs, of other available equipment containing PCB and of the available firefighting foam containing PFOS; improvement of the laboratory infrastructure for testing and monitoring of the new POPs in the target matrixes and strengthening of administrative capacity; raising the awareness of the public as regards the effects of the new POPs on human health and environment and provision of publicly accessible information about the risks posed by POPs.

For implementation of the measures and activities set under U-AP, a time schedule for each year within the period 2012 – 2020 in Annex No. 2, as well as distribution of estimated costs and funding sources for implementation of the plan set forth in Annex No. 3.

The estimated costs for implementation of U-NIPPOPM (in BGN) are indicatively determined per years and are at the expense of the responsible ministries for the respective years, as the funds necessary for improvement of laboratory infrastructure for testing and monitoring of the new POPs in set target matrixes and administrative capacity strengthening will be provided for after the performance of a research into the needs for development of the national laboratory infrastructure. Along with that, the opportunities for provision of external funding sources within the relevant operations programmes of EU or other donorship programmes will be examined.

The estimated costs for implementation of all activities set out in U-NIPPOPM amount to BGN 14,364,000 for the period 2012 – 2020.

U-NIPPOPM cannot be implemented by the private sector alone; state control by the competent authorities is necessary as regards the observance of the bans and restrictions on placing on the market and use of the 22 POPs included in SC, as well as on the management of generated hazardous waste containing POPs.

U-NIPPOPM will regulate the measures and activities for protection of environment and human health from all 22 POPs by way of reduction or prevention of the harmful effect of POPs, the generation and management of hazardous waste containing POPs, as well as the recovery and/ or disposal of plastic waste containing POPs fire retardants.

LIST OF ABBREVIATIONS

States

BE	Belgium
BG	Bulgaria
CS	Czech Republic
DE	Germany
GB	Great Britain (England)
NL	the Netherlands
RO	Romania
TR	Turkey
US	United States of America

International organizations, conventions and laws

BSEF	Bromine Science and Environmental Forum
CLRTAP	Convention on Long-range Transboundary Air Pollution
ECHA	European Chemicals Agency
ECICS	European Customs Inventory of Chemical Substances
EMAS	European Eco-Management and Audit Scheme
EUROSTAT	Statistical Office of the European Union
EUROWATERNET	European Environment Agency's Monitoring and Information Network for Inland Water Resources
GEF	Global Environmental Fund
GHS	Globally Harmonised System
IARC	International Agency for Research on Cancer
IFCS	Intergovernmental Forum of Chemical Safety
IPPC	Integrated Pollution Prevention and Control
ISO	International Organization for Standardization
INFOCAP	Information Exchange Network on Capacity Building for the Sound Management of Chemicals
IUCLID	International Uniform Chemical Information Database
OECD	Organization for Economic Co-operation and Development
PEN	PCB Elimination Network
RASFF	Rapid Alert System for Food and Feed
SAICM	Strategic Approach to International Chemicals Management
SGP GEF	GEF Small Grant Programme
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNIDO	United Nations Industrial Development Organization
UNOPS	United Nations Office for Project Services
WHO	World Health Organization
BC	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
EEA	European Environmental Agency
EUROSTAT	Statistical Office of the European Union
EC	European Commission
CE	European Community
EPA	US Environmental Protection Agency
EU	European Union
ECHA	European Chemicals Agency
LPHECSM	Law on protection from the harmful effects of chemical substances and mixtures

PPA	Plants Protection Act
EPA	Environment Protection Act
WMA	Waste Management Act
CPPC	Complex Prevention and Pollution Control
UN	United Nations
UNOPS	United Nations Office for Project Services
SGP	Small Grants Programme of the Global Environmental Fund (GEF)
UNDP	United Nations Development Programme
WFD	Water Framework Directive 2000/60/EC
PIC	Prior Informed Consent Procedure in international trade
PIC	Prior Informed Consent Procedure in international trade
RC	Rotterdam Convention on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade
SC	Stockholm Convention on Persistent Organic Pollutants (POPs)

Ministries, state institutions and enterprises, governmental and non-governmental organizations

NPP	Nuclear Power Plant
CM	Customs Agency
AIC	Agro-industrial complex
BFSA	Bulgarian Food Safety Agency
BAS	Bulgarian Academy of Sciences
RBD	River Basin Directorates at MEW
BDZ	Bulgarian State Railways
BRIEEP	Balkan Research Institute of Ecology and Environmental Protection
SEEC	Supreme Expert Environmental Council
WPP	Water Power Plant
WS&S	Water Supply and Sewage
VBC	Veterinary Border Control.
GD LAA	General Directorate Laboratories and Analytical Activities at the EEA
GD SP	General Directorate “Security Police” at MoI
GD FSPP	General Directorate „Fire Safety and Protection of Population”
BIP	Border Inspection Post
BCP	Border Check Point
SAMTS	State Agency for Metrological and Technical Surveillance
SHC	State Health Control
SEWRC	State Energy and Water Regulatory Commission
APD	Air Protection Directorate, MEW
PAD	Preventive Activities Directorate, MEW
WMSPD	Waste Management and Soil Protection Directorate, MEW
EU MS	Member State of the European Union
ECB	Expert Committee on Biocides
EA BAS	Executive Agency “Bulgarian Accreditation Service”
EA GLI	Executive Agency General Labor Inspectorate
EAMA	Executive Agency Maritime Administration
EEA	Executive Environment Agency
EAEMDR	The Executive Agency for Exploration and Maintenance of the Danube River
TC	Traffic Control
TL	Testing Laboratory
MoI	Ministry of Interior
MoH	Ministry of Health
MoAF	Ministry of Agriculture and Food

MoEET	Ministry of Economy, Energy and Tourism
MoFA	Ministry of Foreign Affairs
MoD	Ministry of Defence
MoES	Ministry of Education and Science
MoEW	Ministry of Environment and Water
MoRDPW	Ministry of Regional Development and Public Works
CoM	Council of Ministers
MoTITC	Ministry of Transport, Information Technologies and Communications
MoLSP	Ministry of Labor and Social Policy
MoF	Ministry of Finance
NRA	National Revenue Agency
NVS	National Veterinary Service
NIMH	National Institute of Meteorology and Hydrology
NC	National coordinator under the Stockholm Convention
NCC	National Coordinating Committee
NGOs	Non-governmental Organizations
NRL	National Reference Laboratory
NSI	National Statistical Institute
NPPS	National Plant Protection Service
NCIPD	National Center of Infectious and Parasitic Diseases
NCPHA	National Center of Public Health and Analysis
RFSD's	Regional Food Safety Directorates
RDFSPP	Regional Directorates Fire Safety and Protection of Population
SWGS	Standing Working Group on Synergy
SWG	Subsidiary Working Groups
EMEPA	Enterprise for Management of Environmental Protection Activities
RHI	Regional Health Inspectorates
RIEW	Regional Inspectorates of Environment and Water
CPPP	Council on Plant Protection Products
AA	Agricultural Academy
TPP	Thermal Power Plant
CF	Co-operative Farm
CLVCE	Central Laboratory of Veterinary Control and Ecology
CLChTC	Central Laboratory for Chemical Testing and Control

Chemical substances, mixtures, products, articles

ABS	Acrylonitrile butadiene styrene
AMPA	Amino-methyl phosphonic acid
ATH	Alluminum hydroxide
BFR	Brominated fire retardands
c-DecaBDE	Commercial mixtures of nonaBDE and decaBDE
CMR	Carcinogenic, mutagenic or reproduction toxic substances
c-OctaBDE	Commercial mixtures of hexaBDE and heptaBDE
c-PentaBDE	Commercial mixtures of tetraBDE and pentaBDE
CRT	Cathode ray tube displays
DBB	Decabromodiphenyl
DBBT	Dibromobenzyltoluene
DCBT	Dichlorobenzyltoluene
DCDM	Monomethyl-dicholoro-diphenyl methane
DDT	1,1,1-trichloro-2,2-bis(4-chlorphenyl) ethane or Dichlorodiphenyltrichlorethane
DDT, DDE, DDD	Metabolites of DDT

decaBDE	Decabromodiphenyl ether
DEEP	Diethylethylphosphonate
DIOX	Polychlorinated dibenzo-p-dioxins
DMHP	Dimethyl hydrogen phosphite
DMPP	Dimethyl propil phosphonate
DPK	Diphenylcresylphosphate
EBP	1,2-bis(pentabromophenyl)ethane
EBTPI	Ethylene bistetrabromophtalimide
EPDM	Ethylene-propilene-diene terpolimer
ER	Epoxide rasins
EtFOSA	N-Ethyl perfluorooctane sulfonamide (sulfluramid)
EtFOSE	N-Ethyl perfluorooctane sulfonamidoethanol
EtFOSEA	N-Ethyl perfluorooctane sulfonamidoethyl acrylate
EtFOSEP	Di[N-ethyl perfluorooctane sulfonamidoethyl] phosphate
EVA	Acetate co-polymers of ethylene-vinil acetate
FC-98	Potassium perfluoroethyl cyclohexyl sulfonate
Fluorotenside-134	3-[[(Heptadecafluorooctyl)- sulfonyl]amino]-N,N,N-trimethyl-1-propanammonium iodide/perfluorooctyl sulfonyl quaternary ammonium iodide
FR	Fire retardants
GAP	Good agricultural practice: Good plant protetcion practice
GHS	Global harmonized system
HBCD	Hexabromocyclododecan
heptaBDE	Heptabromodyphenil ether
hexaBDE	Hexabromodyphenil ether
HIPS	High impact polystyrene
HpCDD	1,2,3,4,6,7,8 - Heptachlordibenzodioxin
HpCDD	1,2,3,7,8,9 - Hexachlordibenzodioxin
HpCDF	1,2,3,4,6,7,8 - Heptachlordibenzofuran
HpCDF	1,2,3,4,7,8,9 - Heptachlordibenzofuran
HxCDD	1,2,3,4,7,8 - Hexachlordibenzodioxin
HxCDD	1,2,3,6,7,8 - Hexachlordibenzodioxin
HxCDF	1,2,3,4,7,8 - Hexachlordibenzofuran
HxCDF	1,2,3,6,7,8 - Hexachlordibenzofuran
HxCDF	1,2,3,7,8,9 - Hexachlordibenzofuran
HxCDF	2,3,4,6,7,8 - Hexachlordibenzofuran
IPM	Integrated pets management
IVM	Integrated vegetation management
LDPE	Low density polyethylene
MeFOSA	N-Methyl perfluorooctane sulfonamide
MeFOSE	N-Methyl perfluorooctane sulfonamidoethanol
MeFOSEA	N-Methyl perfluorooctane sulfonamidoethyl acrylate
nonaBDE	Nonabromodyphenil ether
octaBDE	Octabromodyphenil ether
PBB	Polybrominated biphenyls
PBDE	Polybrominated diphenylethers
PCDD	Polychlorinated dibenzo-p-dioxins
PCDD/PCDF	Dioxins/Furans
PCDF	Polychlorinated dibenzofurans
PCN	Polychlorinated naphthalenes
PeCDD	1,2,3,7,8 - Pentachlordibenzodioxin
PeCDF	1,2,3,7,8 - Pentachlordibenzofuran
PeCDF	2,3,4,7,8 - Pentachlordibenzofuran

pentaBDE	Pentabromodyphenyl ether
PFAS	Perfluoroalkyl sulfonates
PFBS	Potassium perfluorobutane sulfonate
PFDS	Perfluorodecane sulfonate
PFHxS	Perfluorohexane sulphonic acid
PFOS	Perfluoroctan sulfonates
PFOS	Perfluoroctansulphonic acid and its derivatives
PFOS.Li	Lithium perfluoroctane sulfonate
PFOS.NH3	Ammonium perfluoroctane sulfonate
PFOS.K	Potassium perfluorooctane sulfonate
PFOSA	Perfluorooctane sulfonamide
PFOS-DEA	Diethanolammonium perfluoroctane sulfonate
PFOS-F	Perfluorooctane sulfonil fluoride
PFOSH	Perfluorooctane sulfonic acid
PNC	Phospho-nitrile chloride
POPs	Persistent organic pollutants
PS	Polystyrene
PUR	Rigid polyurethane foam
PVC	Polyvinyl chloride
RDP	Resorcinol bis(diphenylphosphate)
SCCP	Short chain chlorinated paraffins
SVHC	Substances of very high concern as regards human health and the environmnet
TBBPA	Tetrabromobisphenol A
TBPE	Bis(tribromophenoxy)ethane
TCBT	Tetrachlorobenzyltoluene
TCB	Trichlorobiphenyl
TCDD	2,3,7,8 - Tetrachlordibenzodioxin
TCDF	2,3,7,8 - Tetrachlordibenzofuran
TCDM	Monomethyl-tetrachlordiphenyl methane
TCPP	Tris-chloropropyl-phosphate
TDCPP	Tris-dichloropropyl phosphate
TeEt-PFOS	Tetraethylammonium sulfonate
tetraBDE	Tetrabromodiphenyl ether
UPE	Unsaturated (Thermoset) polyesters
USPE	Ultrasaturated thermoactive polyesters
vPvB	Persistent bioaccumulative and toxic substances
ZHS	Zinc hydroxystanate
ZS	Zinc stanate
AS	Active substances
AMS	Automatic measurement stations
APP	Ammonium polyphosphate
ATO	Antimony trioxide
BB-cube	Reinforced concrete contained, hermetically sealed, with a useful volume of 5 m^3
BFR	Brominated fire retardants
VMP	Veterinary medicinal products
DDT	1,1,1-trichloro-2,2-bis(4-chlorphenyl) ethane or dichlordiphenyltrichlorethane
AOS	Automatic optical stations
EEE	Electrical and electronic equipment
WEEE	Waste electrical and electronic equipment
ELV	End-of-life vehicles

ITC	Infromation and telecommunication equipment
VOC	Volatile organic compounds
VH	Vehicles
HBB	Hexabromobiphenyl
HCB	Hexachlorbenzene
HCBD	Hexachorobutadiene
HCH	Hexachlorocyclohexane
NMV	New motor vechiles
OBB	Octabromobiphenyl
WEEE	Waste of electrical and electronic equipment
SAS	Surface-active substances (surfactants)
PPP	Plant protection products
PA	Polyamide
PAH	Polycyclic aromatic carbohydrates
PBT	Persistent, bioaccummulating and toxic substances
PBTP	Polybutylene terephtalate
PeCB	Pentachlorbenzene
PP	Polypropilene
PCB	Polychlorinated biphenyls
PCP	Pentachlorphenol
PCT	Polychlorinated terphenyls
TEP	Triethylphosphate
TPP	Triphenylphosphate
TCP	Tricresyl phosphate
POPS	Persistent organic pollutants
UMV	Used motor vehicles

Parametres, norms, plans, programmes, etc.

BAF	Bioaccumulation factor
BCF	Bioconcentration factor
ELV	End-of-life vehicles
LOD/LOQ	Limit of detection/ Limit of quantitation
MRL	Maximum residue concentrations
NIP	National Implementation Plan
ppb	part per billion
ppm	part per million
TE	Toxic equivalent
TEF	Toxic equivalence factor
TEQ	Toxic equivalence
α-HCH	Alpha-hexachlorcyclohexane
β-HCH	Beta- hexachlorcyclohexane
γ-HCH	Gamma-hexachlorcyclohexane (lindane)
AOC	Absorbable organohalogenic compounds
U-NIPPOPM	Updated National Implementtaion Plan for Persistent Organic Pollutants Management
U-IP	Updated Implementation Plan
GDP	Gross domestic product
БДС	Bulgarian state standard
BAT	Best available techniques
BEP	Best ecological practices
BV	Borderline values
SG	State Gazette

DAD	Daily admissible doses
AOS	Automatic optical stations
ADC	Admissible degree of contamination
EF	Emission factor (coefficient)
SMNCP	Single multiannual national control plan
EN	Emission norms
EE	Ecological evaluation
MV	Mandatory value
IC	Intervention concentration
QL	Quantity limit
CPCP	Complex prevention and control of pollution
CP	Complex permit
MDL	Minimum detectable limit
MARC	Maximum admissible residue concentrations
MAC	Maximum admissible concentration
AEN	Admissible emission norms
NIP	National implementation plan
NPMCR	National programme for monitoring and control of pesticide residues and other harmful substances in and on food of plant and animal origin.
NPWMA	National programme for waste management activities, 2009 – 2013.
NIPPOPM	National implementation plan for persistent organic pollutants management
US	Undesrirable substance
NSWM	National system for water monitoring
NAAQMS	National ambient air quality monitoring system
NSEM	National system for environment monitoring
NSSM	National system for soil monitoring
WW	Wastewater
OBOC	Environmental impact assesment
SW	Surface water
GWB	Groundwater bodies
ACL	Admissible concentration limit
PIMGS	Permanent inter-ministerial group on synergy
PL	Pollution limit
PC	Preventive concentration
SGP	Small Grants Programme of the Global Ecological Fund (GEF)
SWG	Subsidiary Working Groups
EFHRP	Enterprises and/ or facilities with high risk potential
EFLRP	Enterprises and/ or facilities with low risk potential
BMP	Basin management plans
RBMP	River basin management plans
REMAAQ	Region for evaluation and management of the atmospheric air quality
EQS	Environmental quality standards
SWQS	Surface water quality standards
GWQS	Groundwater quality standards
AMEN	Average monthly emission norms

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INTRODUCTION

0.1. PERSISTENT ORGANIC POLLUTANTS (POPS)

In the last decades the use of chemical substances and the significance of chemical industry have significantly increased on a global scale. As a result, more and more toxic substances, including the so-called persistent organic pollutants (POPs), are released into the environment causing adverse effects on human health and the environment.

Persistent organic pollutants[1] are organic substances which:

a) possess toxic properties;
b) resist degradation in environment;
c) bioaccumulate (accumulate in biosphere);
d) have potential for long-range transboundary transport through air as well as a potential to deposit;
e) are very likely to cause considerable negative consequences to human health or the environment, near to or far from their sources of release.

POPs pose a potential threat to human health and the environment across the globe and the exposure to the impact of POPs may lead to serious health problems. Therefore, taking actions at international level is necessary for reduction and elimination of the production, use and release of these dangerous chemicals into the environment.

0.2. OBJECTIVES OF THE UPDATED NATIONAL IMPLEMENTATION PLAN FOR THE MANAGEMENT OF PERSISTENT ORGANIC POLLUTANTS (U-NIPPOPM)

Strategic goal : reduction of the risk to human health and the environment from the harmful impact of POPs.

Main objective: improvement of the POPs management system.

Operational objectives:
- ✓ ensure the implementation of European legislation for POPs management;
- ✓ strengthen the administrative capacity for enforcement and implementation of the Stockholm Convention;
- ✓ report the implementation of the measures and actions taken so far, related to 12 initial POPs;
- ✓ review and update the measures and actions as regards the 12 initial POPs;
- ✓ identify additional measures and future actions as regards the 10 new POPs;
- ✓ map out measures for prevention of placing on the market and use of the 10 new POPs;
- ✓ review and update the three existing specific action plans (APs) through the inclusion of additional measures as regards all 22 POPs;
- ✓ determine the necessary financial resources for implementation of the updated AP which includes future measures and actions;
- ✓ improve the laboratory infrastructure for analysis of the new POPs in the components of the environment, articles and waste, in products and food of plant and animal origin;
- ✓ enhance the coordination and cooperation for implementation of the Stockholm, Basel and Rotterdam Conventions;
- ✓ raise knowledge and awareness of Bulgarian industry and organizations as regards recovery and recycling of waste in respect of the 10 new POPs;
- ✓ raise the awareness of the population as regards the harmful effects of POPs on human health and the environment.

By submitting the updated NIPPOPM to the Secretariat of the Stockholm Convention and by its subsequent implementation, our country will fulfill its commitment for NIPPOPM updating, after the inclusion of the 10 new POPs in the annexes to the convention.

0.3. LEGAL GROUNDS, SCOPE AND METHODOLOGY FOR DEVELOPMENT OF UPDATED NIPPOPM

Bulgaria has signed the Stockholm Convention on 23 May 2001 at the Conference of Plenipotentiaries held in Stockholm, Sweden. The convention is ratified by law (promulgated in the State Gazette, issue 89/12.10.2004), and is effective for Bulgaria as of 20 March 2005.

The competent national body as regards the fulfillment of the obligations of our country under the Stockholm Convention is the Ministry of Environment and Water (MoEW).

0.3.1. Legal grounds

The legal grounds for review and updating of NIPPOPM are set out in Article7, i.1, letter c) of the Stockholm Convention and Article 8, i.4 of Regulation (EC) No. 850/2004 on persistent organic pollutants. After the entry into force on 26 August 2010 of the amendment to Annexes A, B and C to the Stockholm Convention for inclusion of nine new POPs, and the amendment to Annex A for inclusion of the pesticide endosulfan, Bulgaria is to update its NIPPOPM within a two-year term.

In national legislation the measures for implementation of Regulation (EC) 850/2004 on POPs are regulated under Article 1 (3) (e), Article 22 and Article 22f (1) and (2) of the Law on protection from the harmful effects of chemical substances and mixtures (LPHECSM), SG, issue 98/14.12.2010. The legal grounds for adoption of U-NIPPOPM by an instrument of the Council of Ministers are provided by Article 22f (2) in conjunction with (1) of LPHECSM.

0.3.2. Scope

This document comprises updating, amendment and supplement to NIPPOPM of March 2006 for the period 2012 – 2020, in accordance with the amendments to Annexes A, B and C, adopted at the fourth meeting of the Conference in May 2009 and the amendment to Annex A, adopted at the fifth meeting of the Conferences of the parties to the convention in April 2011 with the inclusion of 10 new POPs substances.

The updated NIPPOPM is a framework document introducing measures for management of 22 POPs included in the Annexes to the Convention and of the substances included in the Protocol on POPs. The document consists of four main parts: Part I: "Country baseline", Part II "Institutional policy and regulatory framewrok", Part III "Assessment of the POPs issue in Bulgaria" and Part IV "Strategy and updated Action plan (U-AP) for the implementation of U-NIPPOPM, 2012 – 2020".

The present updated NIPPOPM includes subsequent measures and activities in respect of the 12 initial POPs, such as safe storage and final disposal of identified POPS pesticides; final disposal of the remaining electrical equipment containing polychlorinated biphenyls (PCB) and reduction of POPs in emissions of unintentional production, released by industrial and anthropogenic sources. In addition, the document contains future measures and activities related to the management of the 10 new POPs.

The measures also include activities for control and monitoring of POPs in the components of the environment, materials and foods of plant and animal origin, provision of public access to the available information about POPs; transparency in the exchange of information in respect of POPs; raising the awareness and knowledge of the public and reporting the implementation of the envisaged measures.

In order to be ensured a high level of protection for human health and the environment and prevention of the harmful effect of persistent organic pollutants, close co-operation and coordinated efforts are necessary on the part of the authorities responsible for implementation of policies in the field of environment, healthcare, energy, industry, agriculture, and transport.

0.3.3. Methodology for development of updated NIPPOPM

With funds granted by the Global Environmental Fund (GEF) under Project GF/2732-02-4454 and with the assistance of the Executive Agency at the United Nations Environmental Programme

(UNEP) in March 2006 Bulgaria elaborated its first NIPPOPM, encompassing 12 POPs and submitted same to the Secretariat of the Stockholm Convention on 27 September 2006.

The Ministry of Environment and Water as a body responsible for fulfillment of the obligation of the country under the Stockholm Convention, after the entry into force of the amendments thereto on 26 August 2010, has initiated a procedure for review and updating of NIPPOPM. By Order No. RD-1063/08.12.2010 issued by the Minister of environment and water, a National Coordinating Committee (NCC) was established, including representatives of all concerned authorities, professional organizations, the academic community, and non-governmental organizations (NGOs). For the purpose of enhancing the work of NCC, Subsidiary Working Groups (SWG) were formed. The main task of NCC was to develop an updated NIPPOPM for the period 2012 – 2020. The draft of the updated NIPPOPM was developed and formulated with the active participation of the members of NCC and its SWGs, and the definitive version thereof was finalized after conducting extensive discussions and consultations with representatives of all concerned ministries, institutions and organizations.

On 14 June 2012 the draft U-NIPPOPM was approved by Decision of NCC, and on 5 September 2012 it was adopted by Decision of the Council of Ministers, transcript of Minutes No.33 of a session of the Council of Ministers held on 5 September 2012.

PART I:

1. COUNTRY BASELINE

1.1. GEOGRAPHY AND POPULATION

GEOGRAPHICAL LOCATION : Bulgaria is situated in Southeast Europe in the eastern part of the Balkan Peninsula and occupies 22% of its territory. To the east it borders on the Black Sea, to the south on Turkey and Greece, to the west on the Former Yugoslav Republic of Republic of Macedonia and Serbia, and to the north on the river Danube and Romania.

Figure 1: Map of Bulgaria per regions

TERRITORY: The territory of Bulgaria is 111,910 km2. The total length of Bulgarian frontier is 2,245 km, of which 1,181 km are land frontier, 686 km - riverside and 378 km - sea coastline. The average altitude of the country is 470 meters above sea level.

RELIEF: Extremely varied: predominantly mountainous, with plains in the northern and southeastern part of the country.

RIVERS, LAKES, FLORA AND FAUNA: In Bulgaria there are 526 rivers in all, having a length greater than 2.3 km. Major rivers are the Danube to the north, Struma and Maritza in the southern part. The longest river in Bulgaria is the Iskar with its length of 368 km. Lakes in Bulgaria are 400 in number, however, they are small in size. The only bigger lake is Srebarna, which has the status of UNESCO reserve due to its unique flora and fauna. Many dams have been built as well.

Bulgaria is one of the countries richest in thermal spas in Europe, ranking third after the Czech Republic and Spain in number of mineral springs. Their number is about 140, with over 700 mineral spas having various healing properties.

Plant species in Bulgaria exceed 12,350, and animal species are more than 15,000. Forests cover about 33 % of Bulgaria’s territory. In order to preserve this variety of plant and animal species, which are rare not only for Bulgaria, but globally as well, a great number of protected areas have been established – three national parks, eleven nature parks and 90 reserves, as well as a multitude of protected areas.

CLIMATE: The country is with a transitional climate between moderate continental and subtropical climate in its Mediterranean variant (in the southern parts of the country). The average annual temperature is 10.5^{0}C.

NATURAL RESOURCES: Mineral resources are varied – gold, boxit, copper ores, lead and zinc ores, coal, wood, mineral water, arable land. There is a variety of good-quality soils.

POPULATION[2]: According to the final data from the last census of the population, as at the date of 01.02.2011, the country has 7,364,570 inhabitants living in 255 towns and 5,047 villages. 3,777,999 (51.3%) out of them are women and 3,586,571 (48.7%) are men.

During the period 2001 - 2011 the population of the country has decreased by 564,331 with an average annual rate of decrease equaling 0.7%. Thirty-three per cent of the population of the country lives in the six towns with a population over 100,000 inhabitants (Plovdiv, Varna, Burgas, Ruse, Pleven and Stara Zagora).

The capital of the country is the city of Sofia, with a population of 1,204,685 inhabitants (or 17.5% of the country's population). The average population density is 69.6 persons/km^2.

The immigration abroad during the period 2001 – 2011 has accounted for reducing the population by 175,244 persons.

CITIZENSHIP: As at 01.02.2011 permanent residents in Bulgaria are 36,723 (0.5%) persons of foreign origin, as 8,444 out of them are EU citizens (23% of all foreigners).

OFFICIAL LANGUAGE: The official language in Bulgaria is Bulgarian, as it is the mother tongue of 85.2 % of the population.

RELIGIONS: Orthodox Christians – 76.0%; Muslims – 10.0%; Roman Catholics – 0.8 %; Protestant denominations – 1.1%; other religions – 0.2%, and atheists – 4.7 %; unspecified – 7.1%.

EDUCATIONAL STRUCTURE: 19.6% of the population have graduated higher education, 43.4% - secondary education; the share of illiterate individuals is 1.5% .

1.2. POLITICAL SYSTEM

Bulgaria is a Parliamentary Republic with a distinctly set division of powers – legislative, executive and judiciary. The basic law in Bulgaria is its Constitution adopted in the year 1991.

The President is the Head of State, commander in chief of the military forces and chairperson of the Consultative National Security Council. In his activity he is aided by a vice-president.

The Bulgarian one-chamber parliament, called "National Assembly" consists of 240 MPs and exercises the legislative power.

The main body of executive power is the Council of Ministers headed by a Prime-minister.

Justice in Bulgaria is administered by: regional, district courts of justice, appellate, administrative and military courts of justice, Supreme Administrative Court and Supreme Court of Cassation.

1.3. ADMINISTRATIVE & TERRITORIAL STRUCTURE

The political & geographical structure of the country is formed by three main types of territorial units: municipalities, regions and planning regions.

There are 264 municipalities on the territory of the country formed by the settlements included in their composition, along with the adjoining land territories. Bulgarian municipalities are administrative & territorial units, where local self-governance is carried out, and each municipality is governed by a mayor elected by direct elections once in every four years.

The country is divided into 28 regions, which are administrative&territorial units implementing the regional and central government policy locally, as well as monitoring the compliance between the

[2] *NSI, Final data from the population census of 22 July 2011.*

national and local interests. Each region is governed by a regional governor, appointed by the Council of Ministers.

The country's territory is divided into 6 planning regions: North West (regions of Vidin, Vratsa, Lovech, Montana, Pleven), North Central (regions of Veliko Tarnovo, Gabrovo, Razgrad, Ruse, Silistra), North East (regions of Varna, Dobrich, Targovishte, Shumen), South West (regions of Blagoevgrad, Kyustendil, Pernik, Sofia-city and Sofia-region), South Central (regions of Kardzhali, Pazardzhik, Plovdiv, Smolyan, Haskovo) and South East (regions of Burgas, Sliven, Stara Zagora, Yambol).

Source: MoRDPW, General Directorate "Regional Development Programming", Sofia 2007 .

1.4. Economic Profile per Sectors

Bulgaria is a country with functioning market economy, with private ownership being predominant in economy.

1.4.1. Basic economic indicators

PRODUCTION

In April 2011 the calendar adjusted index of industrial production has increased by 9.4% as compared to April 2010. An increase is accounted also in the production and distribution of electric and heating energy and gas - by 18.6%, in extraction industry - by 15.9%, and in processing industry - by 5.1%.

According to preliminary operating data the gross domestic product (GDP) in the first quarter of the year 2011 amounts to BGN 15,903 million as per current prices, with some BGN 2,120.9 per capita.

INVESTMENTS

The average loading of industrial capacities in April 2011 is estimated at 70.1%.

The gross fixed capital formation during the first quarter of the year 2011 relative to the same period of the previous year as per the seasonally adjusted data grows in real terms by 1.6%. The relative share of this category in the gross domestic product (GDP) is 19.6%.

LABOUR MARKET

During the first quarter of the year 2011 the total number of employed individuals at the age of 15 and older is 2,890.7 K, and their relative share of the population of the same age is 44.7%. The unemployed during the first quarter of 2011 are 395.5 K, and the unemployment rate equals 12.0%. In March 2011 the average salary is BGN 689, which is by 3.9% more as compared to the preceding month. Relative to March 2010, the growth is by 8.3%.

Source : NSI, data as at 01.07.2011.

1.4.2. Economic indicators per sectors

In the year 2010 the gross domestic product (GDP) reached a nominal value volume of BGN 70,474.3 million. The gross added value (GAV) in the year 2010, achieved by the subjects of national economy, amounts to BGN 60,645.7 million. The actual value volume of the indicator is by 0.2% higher as compared to the one reached in 2009.

The industrial sector generates 31.2% of added value in economy, which is by 0.5 per cent points higher as compared to the year 2009.

The service sector generates 63.5% of the total added value, and the agrarian sector reaches 5.3% of the added value.

The individual consumption of the population forms 69.1% of GDP. The international trade balance of goods and services is negative.

Source: NSI , Key indicators for Bulgaria, 2011, Date of updating: 01.07.2011.

1.4.3. Economic indicators per economic planning regions

The contribution of the planning regions to the country's GDP is uneven. The biggest growth carrier is the South-West planning region, which exceeds the average growth rate for the country. The main factor for the high GDP level in the region is the capital city of Sofia, in which a significant part of the national economy is concentrated.

1.5. ENVIRONMENTAL OVERVIEW

The environmental situation in the country reflects both the general economic situation and the technological structure of production. It also depends on the measures (legislative, financial and others) which the public and the state undertake for protection of environment.

The thermal power plants and the enterprises in the iron &steel and the non-ferrous metals industries continue to be the major polluters of environmental components in Bulgaria.

1.5.1. Environmental pollution

ATMOSPHERIC AIR POLLUTION

There is a sustainable trend of decrease in atmospheric air pollution by industrial sectors in Bulgaria (mainly due to the decrease in production growth). For 33 regions municipal programmes are prepared for decrease in the levels of atmospheric air pollution and reaching the relevant norms, as the mayors are responsible for the implementation thereof. These programmes are comprehensive and encompass all possible sources of harmful substances in atmospheric air – transport, organized fixed point sources and unorganized sources.

The sources of emissions of harmful substances in atmospheric air are distributed into eleven groups, as one of these is POPs (PAH, DIOX, PCB and HCB) and certain specific pollutants.

Most generally, the emissions of POPs manifest a lasting trend of decrease during the last decade.

Source: National Report on the State of the Environment, EEA, 2009.

SURFACE WATER CONTAMINATION

The use of water resources and their protection from contamination is not only a matter of ecology, but also an essential factor for sustainable economic growth, especially in the conditions of water shortage and more frequent draught periods.

Based on the information collected under the National Environment Monitoring Scheme (NSEM) in the period 1990 – 2010 the trend of water quality improvement, as observed in recent years, is preserved, and yet certain water bodies are still at risk. In respect of them in the River Basin Management Plans (RBMP) published in 2010, a number of programmes with measures are envisaged for achievement of the targets set out under Framewrok Directive 2000/60/EC on water – reaching of good ecological state till the year 2015.

The analysis of surface water quality per basin management regions in the year 2010 shows a trend of preserving the good water quality in respect of the main indicators.

No excessive water contaminations have been registered above the admissible concentration limits for surface water (ACL) as regards PCB and POPs pesticides.

A potential threat for surface water is posed by the incorrect use and storage of pesticides and fertilizers, which can easily escape into surface and ground water, creating contamination hazard for large regions.

In the next few years Bulgaria will introduce a radical change in the field of water through the implementation of effective programmes with measures for improvement of water quality, control and monitoring.

Source: National Report on the State of the Environment, EEA, 2010.

GROUND WATER CONTAMINATION

The assessments of ground water quality in the year 2009 are performed in accordance with the requirements of the European Framework Directive on Water per river basin regions and per ground water bodies (GWB). The results from the performed analyses are compared to the ground water quality standards (QS) according to Ordinance No. 1 of 10.10.2007, as amended, SG, issue 2 of 8 January 2010 on the exploration, use and protection of ground water.

Statistical processing of the monitoring data for a 15-year period (1995 – 2009) was completed. Any ground water bodies in which there has been established median excess of values through the years are determined as risky, and in respect of these, trends of change have been identified. For the greater part of GWB no distinctly manifested trends have been observed. Nitrates are the main pollutants of ground water in the country. More significant excesses of the quality standard for manganese are established in porous water in Quaternary deposits in some of the lowlands near the Danube, in Quaternary deposits on the terraces of certain rivers and also in the Neogene layer of Sofia valley, Haskovo valley, and the region of Pazardzhik and Plovdiv, etc. In all these cases no clear trend in manganese concentrations has been detected.

In 2009 a lack of excessive content of pesticides in ground water was established for the entire country and one-off excessive values relative to the quality standards for separate heavy metals.

Source: National Report on the Status of Environment, EEA, 2009.

SOIL CONTAMINATION

The main sources of soil contamination are industry, improper use of PPP, contaminated water for irrigation, transport, and other activities.

The supervision and control on the status of lands and soils are performed by the National Environment Monitoring System (NEMS).

The assessment of the status of soils is performed within the National Soil Monitoring System, within which research is carried out through monitoring of a number of indicators, including of POPs.

The monitoring carried out within the period 2005 - 2010 shows that soils in the country have good ecological status in terms of contamination with heavy metals, metaloides and POPs. The measured contents of POPs in 2010 are several times lower than the maximum admissible concentrations (MAC) in 97% of the tested samples, as PCB is below the detection limit and in 98.9% of the samples PAH is below MAC.

The use of PPP, including as regards the order for approval of new products does not constitute a source of lasting soil contamination.

In relation to the existence of warehouses with obsolete and banned pesticides, the nearby soils are additionally examined where contamination of adjoining areas is expected. From the samples tested in the year 2009 for content of POPs pesticides, over 85% of the measured contents were either below MAC or below the preventive concentrations (PC).

Source: EEA, 2011 г.

1.5.2. Waste generation

In 2010 the total amount of generated waste is 15,241 kt. (including 645 kt of hazardous, 3 091 kt of household and 11 944 kt of production waste). The decrease is about 2,430 kt as compared to 2009.

HOUSEHOLD WASTE

During the last 10 years the amount of household waste generated in the country has been decreasing. Generated household waste in the year 2010 equals 3,091 kt. Since 1999 the average amounts of household waste generated per capita in Bulgaria are lower than those in the EU-27. The average accumulation norm for household waste for EU-27 for the year 2010 is 513 kg/year/capita, whereas for Bulgaria it is 410 kg/year/capita.

The share of the population covered by the schemes for organized waste collection and transportation of household waste is continuously growing. The targets for reuse, recovery and recycling of vehicle waste, lead-acid batteries and accumulators unfit for use, as well as the targets for collection of waste electrical and electronic equipment generated by households and the WEEE recycling targets have been fulfilled. The targets for waste oils recovery have also been met.

HAZARDOUS WASTE

In 2010, 645 kt of hazardous waste are generated in Bulgaria, which comprises 4.2 % of the total generated waste.

Source: National Report on the Status of Environment, 2010.

PART II:

2. INSTITUTIONAL, POLICY AND REGULATORY FRAMEWORK

2.1. Policies on Environment Protection and Sustainable Development

Being aware of its important role for the public development of Bulgaria, MoEW strives after ensuring sustainable and healthy environment, based on active co-operation, partnership, and dialogue with the European Union (EU) institutions and with the United Nations Organization (UN), with governments of other countries, state institutions, local governance bodies, non-governmental organizations (NGOs), scientific organizations, educational establishments, etc., by performing the following main activities:

- Formulation and management of national policy on protection of the environment;
- Determination of the conditions and measures for protection, restoration and use of the components of the environment, through preparation and implementation of statutory regulations, strategic documents and issuance of permits;
- Adoption of decisions on ecologic assessment (EA) of plans and programmes and programmes for environment impact assessments (EIA) of investment proposals for construction, activities and technologies, or their amendments or extensions, upon the performance of which, considerable impacts on environment are possible;
- Co-ordination of the absorption of resources for the environment, granted under EU funds and by other financial sources;
- Co-ordination on issues of EU and international co-operation in the field of environment;
- Raising ecological awareness and culture and provision of information about the environment to the public;
- Methodic and controlling functions in respect of the implementation of the requirements concerning environment protection;
- Provision of administrative services to citizens and the business.

2.2. Role and Responsibilities of Ministries, Agencies and Other State Institutions in POPs Management

A number of state institutions, having the relevant competence, as per their delegated powers and obligations under the applicable statutory regulations in the country, are involved in the management of chemicals, including POPs (Figure 2).

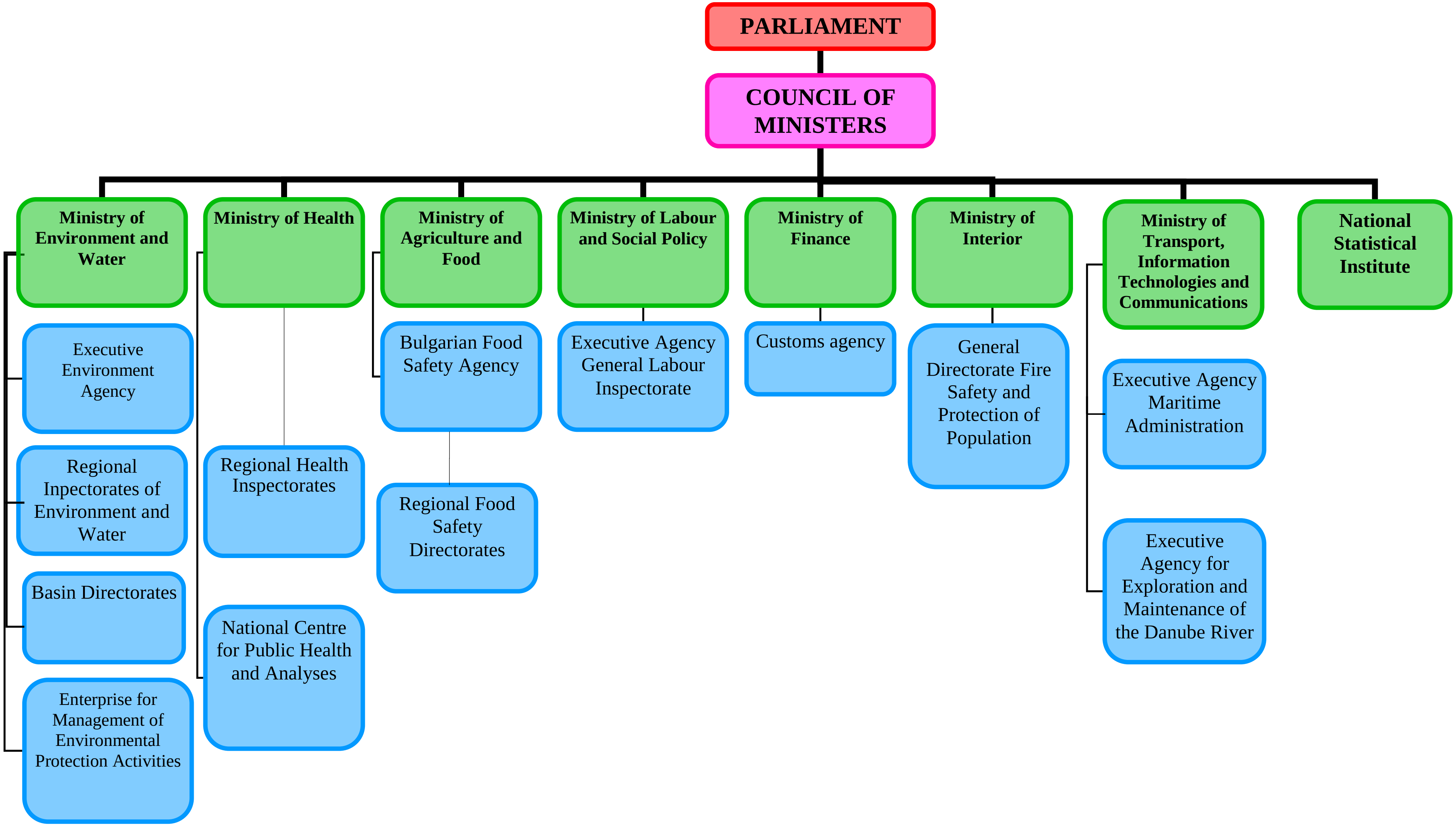


Figure 2: State institutions responsible for POPs management

The responsibilities, functions, obligations and rights of the separate institutions are determined by the relevant statutory regulations.

- **MINISTRY OF ENVIRONMENT AND WATER (MOEW):**

MoEW is a competent body in respect of the implementation of the European and national legislations in the field of management of chemical substances, both on their own and in mixtures, a part of which are POPs, as the prior informed consent procedure in international trade with certain chemical substances and pesticides, the ban on import and export and the prevention of large emergencies involving hazardous substances and restriction of their consequences.

MoEW exercises control on the import and export of hazardous waste, as well as on the activities of their management, including on the implementation of the requirements for treatment and transportation of production and hazardous waste.

MoEW is responsible for the implementation of the three conventions concerning the management of hazardous chemicals and waste – the Stockholm, Rotterdam and Basel Conventions. They encompass key elements of POPs management and provide an international framework regulating the environmentally sound management of hazardous chemicals and waste. The main objective of the three conventions is the protection of human health and the environment from the harmful impacts of hazardous chemical substances and waste, including POPs throughout their life cycle starting with their production and ending with their disposal.

Through the **Executive Environment Agency (EEA), the sixteen Regional Inspectorates of Environment and Water (RIEW)** and the four River Basin Directorates **(**RBD**)**, MoEW implements its activity at a national and regional level.

EEA, through its **15 Regional laboratories** conducts monitoring of the components and factors of environment, including POPs on the territory of the entire country.

Enterprise for Management of Environmental Protection Activities (EMEPA), established in 2002, finances ecological projects and activities within the national and municipal strategies and programmes on environment. EMEPA provides funds in the form of grants, interest-free, and low-interest credits.

- **MINISTRY OF HEALTH (MOH):**

MoH exercises control over the implementation of the European and national legislations in the field of the management of chemical substances on their own and in mixtures as regards the classification, labeling, and packaging of substances, mixtures, biocides, and detergents. MoH prohibits the placement on the market of chemical substances and mixtures, dangerous to human health, and orders their destruction or processing and use for other purposes. MoH manages, coordinates, and controls the activity of the **Regional Health Inspectorates (RHI) and the National Centre of Public Health and Analyses (NCPHA)**.

- **MINISTRY OF AGRICULTURE AND FOOD (MOAF):**

MoAF, through the **Bulgarian Food Safety Agency (BFSA)** performs the controlling, diagnostic, scientific research and arrangement functions under the Plant Protection Act (PPA) and is a competent food control authority. BFSA sets the requirements regarding PPPs and fertilizers, the regime of testing, permitting and control of production, repackaging, storage, placement on the market and the use thereof with the aim of protecting human and animal health and the environment.

- **MINISTRY OF LABOR AND SOCIAL POLICY (MoLSP):**

MoLSP develops, coordinates and conducts a state policy in the field of provision of healthy and safe occupational conditions. Through **Executive Agency General Labour Inspectorate (EA GLI)** it exercises integrated control on compliance with the legislation and on performance of the obligations for provision of healthy and safe labour conditions in all sectors and activities, irrespective of the form of ownership.

❖ **MINISTRY OF TRANSPORT, INFORMATION TECHNOLOGIES AND COMMUNICATIONS (MOTITC):**

The transportation of hazardous chemical substances and mixtures is regulated by **MoTITC,** the competence of which includes also determining the LAC of harmful substances and emissions from vehicles and control on the implementation thereof.

Executive Agency Maritime Administration (EAMA) at the Ministry of Transport, Information Technologies and Communications, exercises control on and organizes the protection of marine environment and of the Danube River from any pollution caused by ships.

Executive Agency for Exploration and Maintenance of the Danube River (EAEMDR) at **MoTITC** participates in the work of international organizations related to the infrastructure, ecology, and other problems, concerning the Danube River, and the European inland water courses. In addition, its activity includes obligations related to the removal of pollution caused by ships (oil, oil products and other contaminants);

❖ **MINISTRY OF FINANCE (MOF):**

MoF through the Customs Agency (CA) exercises customs supervision and control on the import, export and transit of goods from and to third countries, the collection of import duties, counteracts customs, currency, excise duty related offences, offences of the EU legislation of the European Union, which assigns control tasks to the customs authorities in the European Union (EU) by way of risk management.

CA, within the working units at the European Commission (EC) participates in the maintenance of the public European Customs Inventory of Chemical Substances (ECICS), which serves as a guide for classification of chemicals by codes under the Combined Nomenclature of EC, providing information about the clear and correct identification of chemicals and their names in the EU languages.

❖ **MINISTRY OF INTERIOR (MOI):**

MoI, through General Directorate Fire Safety and Protection of Population **(GDFSPP)** carries out preventive, firefighting and rescue activity, state fire safety and preventive control, permitting and controlling activity of products for fire extinguishing, operational protection in cases of floods, or search and rescue operations, chemical, biological and radiation protection in the event of any incidents, or emergencies related to hazardous substances.

❖ **NATIONAL STATISTICAL INSTITUTE (NSI):**

The mission of **NSI** is the effective provision of high-quality statistical information about economy, demography, the social sphere, and ecology. It provides statistical information about emissions in atmospheric air, production and household waste, industrial and domestic wastewater, treated wastewater, costs and investments on protection of the environment.

2.3. INTERNATIONAL TREATIES AND OBLIGATIONS

Bulgaria has ratified and signed most international conventions and agreements in the field of environment and is a fully authorised member of the European Environment Agency (EEA).

The multi-partite conventions and agreements in the field of environment, to which Bulgaria is a party, are specified in Table No. 1.

Table 1: International conventions concerning POPs

No.	International agreements	Bulgarian legislation
1	**Stocholm Convention on Persistent Organic Pollutants (SC)** (signed by R.Bulgaria on 23.05.2001 in Stockholm, ratified by the National Assembly by Law on 30.09.2004, SG, issue 89/2004, in force as of 20.03.2005)	**Law on protection from the harmful effects of chemical substances and mixtures (LPHECSM)** in force as of 05.02.2002, promulgated in SG 10/04.02.2000, last amended, SG 98/14.12. 2010, in force as of 01.01.2011).
2	**Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade**, (ratified with a law, SG 55/2000, SG 33/23.04.2004, effective 24.02.2004)	**Law on protection from the harmful effects of chemical substances and mixtures (LPHECSM)** in force as of 05.02.2002, promulgated in SG 10/04.02.2000, last amended, SG 98/14.12. 2010, in force as of 01.01.2011).
3	**Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal**, (ratified with a law, SG 8/26.01.1996, effective 16.05.1996)	**Waste Management Act (WMA)** (promulgated in SG 86/30.09.2003, amended SG 33/26.04.2011, last amendment, SG 99/16.12.2011, in force as of 01.01.2012); **New Waste Management Act** (promulgated in SG 53 of 13.07.2012, in force as of 13.07.2012)
4	**Convention on the Cooperation for Protection and Sustainable Use of the Danube,** ratified with a Law, SG 30/02.04.1999, effective 6.04.1999, amended SG 53/28.05.2002	**Water Act** (in force as of 28.01.2000, promulgated in SG 67/27.07.1999, amended, SG 98/14.12.2010, amended, SG 80/14.10.2011, last amended SG 45/15.06.2012, in force as of 1.09.2012)
5	**Geneva Convention on Long-Range Transboundary Air Pollution,** (ratified with a law, SG 16/1981, effective 16.03.1983)	**Clean Ambient Air Act** (in force as of 29.06.1996, promulgated in SG 45/28.05.1996, last amended SG 42/03.06.2011, amended SG 32 of 24.04.2012, SG 38/18.05.2012, SG 53/13.07.2012, last amended, SG 54/17.07.2012)
6	**Persistent Organic Pollutants Protocol under the Geneva Convention on Long-Range Transboundary Air Pollution of 1979,** (signed by Bulgaria 24.06.1998, ratified with a law on 12.04.2001, SG 42/2001, promulgated SG 102/2003, effective since 23.10.2003.	**Clean Ambient Air Act** (in force as of 29.06.1996, promulgated in SG 45/28.05.1996, last amended SG 42/03.06.2011, amended SG 32 of 24.04.2012, SG 38/18.05.2012, SG 53/13.07.2012, last amended, SG 54/17.07.2012)
7	**The Convention on the Transboundary Impacts of Industrial Accidents** (signed by Bulgaria on 18. 03. 1992 in Helsinki, Finland, ratified, SG 28/1995, effective as of 12.05.1995)	**Environment Protection Act (EPA)** (promulgated SG 91/25.09.2002, amended and supplemented, SG 42/03.06. 2011, amended SG 32/24.04.2012, amended, SG 38/18.05.2012, in force as of 1.07.2012, amended and supplemented, SG 53/13.07.2012, effective as of 13.07.2012)
8	**Convention for the Protection of the Black Sea from Pollution** (ratified with a law, SG 99/1992, effective 15.01.1994)	**Water Act** (in force as of 28.01.2000, promulgated in SG 67/27.07.1999, amended, SG 98/14.12.2010, amended, SG 80/14.10.2011, last amended SG 45/15.06.2012, in force as of 1.09.2012)
9	**Convention for the prevention of marine pollution by dumping of waste and other matter of 1972** (ratified with a law, SG 100/13.12.2005, promulgated SG 22/ 14.03.2006, effective as of 24.02.2006)	**Water Act** (in force as of 28.01.2000, promulgated in SG 67/27.07.1999, amended, SG 98/14.12.2010, amended, SG 80/14.10.2011, last amended SG 45/15.06.2012, in force as of 1.09.2012) **Ordinance on marine environment protection** (promulgated in SG 94/30.11.2010 г., в сила от 30.11.2010 г.)
10	**The Convention on the environmental impact assessment (EIA) in the Transboundary Context** (signed by Bulgaria on 25. 02. 1991 in Espo, Finland, ratified, SG 28/1995, effective as of 10. 09. 1997, amn. SG 89/1999, **Protocol on strategic environmental assessment,** signed by Bulgaria on 21.05.2003 in Kiev, Ukraine)	**Environment Protection Act (EPA)** (promulgated SG 91/25.09.2002 ,amended and supplemented, SG 42/03.06. 2011, amended SG 32/24.04.2012, amended, SG 38/18.05.2012, in force as of 1.07.2012, amended and supplemented, SG 53/13.07.2012, effective as of 13.07.2012)

No.	International agreements	Bulgarian legislation
11	**United Nations Framework Convention on Climate Change** (adopted in June 1992, ratified by Bulgaria on 16.03.1995. In 2002 Bulgaria ratified also the Kyoto Protocol, whereby it joined the efforts of global community to resolve the problem of climate change.) and the Kyoto Protocol.	**Environment Protection Act (EPA)** (promulgated SG 91/25.09.2002.,amended and supplemented, SG 42/03.06. 2011, amended SG 32/24.04.2012, amended, SG 38/18.05.2012, in force as of 1.07.2012, amended and supplemented, SG 53/13.07.2012, effective as of 13.07.2012)

❖ STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS

The Stockholm Convention (SC) demands the initiation of global actions in respect of the 22 POPs substances, grouped in three categories: 15 pesticides, 7 industrial chemicals and 4 by-products formed and released unintentionally by anthropogenic sources, as some POPs are both pesticides and industrial chemicals. To the 12 initial POPs, at the fourth and fifth meetings of the Conferences of the Parties in May 2009 and in April 2011, a total of ten new POPs were included.

The strategic objective of the Stockholm Convention is the protection of human health and the environment from POPs.

The Stockholm Convention has five essential aims:

Aim No. 1: Eliminate dangerous POPs, starting with the 22 listed in the Convention

Aim No. 2: Support the transition to safer alternatives

Aim No. 3: Target additional POPs for action

Aim No. 4: Clean-up old stockpiles and equipment containing POPs

Aim No. 5: Work together for a POPs-free future

The 20 intentionally produced POPs substances, currently listed in Annex A and B of SC are subject to a ban on production and use, except where there are generic or specific exemptions. .The generic exemptions allow laboratory-scale research, use as a reference standard and unintentional trace contaminants in products and articles. Articles in use containing POPs are also subject to an exemption provided that Parties submit information on the uses and the national plan for waste management for such articles to the Secretariat of the Stockholm Convention.

Import and export of the intentionally produced POPs is severely restricted by the Stockholm Convention. After all substance specific exemptions have ceased, import and export is allowed only for the purpose of environmentally sound landfilling/disposal under restricted conditions.

Total releases of unintentionally produced by-products from anthropogenic sources listed in Annex C are subject to continuous reduction with, as objective, the ultimate elimination where feasible. The Stockholm Convention also foresees identification and safe management of stockpiles containing or consisting of POPs. Waste containing, consisting of or contaminated with POPs should be disposed of in such a way that the POP content is destroyed or irreversibly transformed so that it does not exhibit POPs characteristics. Disposal operations that may lead to recovery, recycling, processing, direct re-use or alternative use of POPs are explicitly forbidden. With regard to shipment of such wastes, relevant international rules, standards and guidelines, such as the Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, are to be taken into account.

The main tool for this is the National Action Plan (NIP) which should cover the source inventories and release estimates as well as plans for release reductions. The most stringent control provision with regard to by-products is that Parties shall promote and, in accordance with their National action plans (NAP), require the use of best available techniques (BAT) for new sources within their major source categories identified in Part II of Annex C of the Stockholm Convention.

In addition to control measures, the Stockholm Convention includes several general obligations in relation to the exchange of information; awareness and public access to information on POPs; appropriate research and monitoring activities and reporting to the Conference of the Parties.

❖ Ptorocol on POPs as part of the Convention on Long-range Transboundary Air Pollution (CLRTAP)

Bulgaria signed the Protocol on POPs on 24.06.1998 and ratified it by law passed by the National Assembly on 12.04.2001, in force for the country as of 23.10.2003. It includes 16 substances, comprising 11 pesticides, 2 industrial chemicals and 3 by-products/pollutants. The ultimate objective of this protocol is to eliminate the intentional production discharges ; emissions and losses of POPs. The POPs protocol bans the production and use of certain chemical substances (aldrin, chlordane, chlordecone, dieldrin, endrin, hexabrombiphenyl, mirex and toxaphene). Others are scheduled for elimination (DDT, HCH, including lindane and PCB). The Protocol includes provisions for environmentally sound treatment and disposal of waste from such products. It also obliges the parties to reduce their emission of dioxins, furans, PAH and HCB below their level in 1990 (or an alternative year between 1985 and 1995). For the incineration of municipal , hazardous and medical waste, it lays down specific limit values.

On 18 December 2009, Parties to the Protocol on POPs adopted decisions to amend the Protocol to include 7 new substances: hexachlorbutadiene (HCBD), octabromodiphenyl ether (octaBDE), PeCB, pentabromodiphenyl ether (pentaBDE), perfluorooctane sulphonates (PFOS), polychlorinated naphthalenes (PCN) and short-chain chlorinated paraffins(SCCP). Furthermore, the Parties revised obligations for DDT, heptachlor, hexachlorobenzene and PCBs as well as emission limit values (ELVs) from waste incineration. These amendments have not yet entered into force for the Parties that adopted them.

❖ Rotterdam Convention (RC) on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade

The Rotterdam Convention is adopted on 10.09.1998 and is effective for Bulgaria as of 24.02.2004.

The Convention is applied in respect of prohibited or strictly limited chemical substances and severely hazardous pesticide formulations. It obligates the parties to the Convention to notify the Secretariat on the definitive regulatory actions taken in respect of banned or severely restricted chemicals in order to inform the other parties through the PIC procedure.

The PIC procedure is a mechanism through which the parties to the Convention adopt informed decision on import of the chemicals included in Annex III, as to whether they provide or not, and under what conditions, their consent to receive future supplies of these chemicals, as well as to verify whether the exporting parties observe these decisions.

Annex III to the convention includes 43 chemical substances, which are also object of the PIC procedure, comprising 28 pesticides, 4 severely hazardous pesticide formulations and 11 industrial chemicals.

Subject of prior informed consent procedure upon export are ten POPs pesticides – aldrin, DDT, dieldrin, endosulfan, HCH (mixed isomers), chlordane, heptachlor, HCB, lindane and toxaphene and one industrial chemical – PCB.

❖ Basel Convention (BC) on the Control of Transboundary Movement of Hazardous Wastes and their Disposal,

The Basel Convention was signed on 22.03.1989 in Basel, Switzerland, and is in force for Bulgaria as of 16.05.1996.

The Basel Convention is an international mechanism for control of transboundary movement and management of hazardous wastes and their disposal.

The parties to the convention must take appropriate measures for the purpose of ensuring the minimization of hazardous and other waste generation and their transboundary movement, as well as the availability of appropriate waste disposal equipment.

2.4. DESCRIPTION OF THE EXISTING LEGISLATION IN RESPECT OF POPS

2.4.1. Harmonization of the National with the European legislation on POPs

Harmonization of the specific national legislation in the field of POPs management with that of the European Union[3] is presented in Table No. 2.

Table 2: European and national legislation on POPs management

No.	European legislation	Bulgarian legislation	Responsible institutions
	Legal basis for POPs management		
1.	Regulation (EC) No/ 850/2004 of the European Parliament and of the Council of 29 April 2004 on persistent organic pollutants and amending Directive 79/117/EEC AMENDMENTS: Commission Regulation (EU) No. 519/2012 of 19 June 2012 amending Regulation (EC) No/ 850/2004 of the European Parliament and of the Council on POPs as regards Annex I; Commission Regulation (EU) No. 757/2010 of 24 August 2010 amending Regulation (EC) No. 850/2004 of the European Parliament and of the Council on persistent organic pollutants as regards Annexes I and III; Commission Regulation (EU) No. 756/2010 of 24 August 2010 amending Annexes IV and V to Regulation (EC) No. 850/2004 of the European Parliament and of the Council on persistent organic pollutants ; Regulation (EC) No. 304/2009 amending Annexes IV and V to Regulation (EC) No. 850/2004; Regulation (EC) No. 1195/2006 amending Annex V to Regulation (EC) No. 850/2004; Regulation (EC) No. 172/2007 of the Council of 16 February 2007 amending Annex V to Regulation (EC) No. 850/2004 of the European Parliament and of the Council on persistent organic pollutants; Commission Regulation (EC) No. 323/2007 of 26 March 2007 amending Annex V to Regulation (EC) No. 850/2004 of the European Parliament and of the Council on persistent organic pollutants and amending Directive 79/117/EEC)	Law on protection from the harmful effects of chemical substances and mixtures (LPHECSM) in force as of 05.02.2002, promulgated in SG 10/04.02.2000, last amended, SG 98/14.12. 2010, in force as of 01.01.2011).	MoEW
	Legal basis for waste management		
1	Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Council Directive 91/689/EEC of 12 December 1991 on hazardous waste and 2006/12/EC of the European Parliament and of the Council от 5 април 2006 on waste (repealing Directive 75/442/EEC on waste) have been repealed as of 12 December 2010)	Waste Management Act (promulgated, SG 53 of 13.07.2012, effective as of 13.07.2012	MoEW
		Ordinance on the requirements for treatment and transportation of production and hazardous waste, adopted by Decree of the Council of Ministers No.53 of 19.03.1999, promulgated, SG 29/1999.	MoEW, MoH

[3] All Regulations are directly applicable for Bulgaria.

No.	European legislation	Bulgarian legislation	Responsible institutions
		Ordinance No. 3 of 1 April 2004 on classification of waste, promulgated, SG 44 of 25 May 2004, as amended and supplemented, SG 23 of 20.03.2012 .	MoEW, MoH
2	Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste and its amendments (amended by Commission Regulation (EC) No 1379/2007; Commission Regulation (EC) No 669/2008 of 15 July 2008; Commission Regulation (EC) No 308/2009 of 15 April 2009; Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009); Commission Regulation (EC) No 967/2009 of 15 October 2009 amending Regulation (EC) No 1418/2007 concerning the export for recovery of certain waste to certain non-OECD countries	Law on Ratification of the the Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal Convention, promulgated, SG 8 of 26.01.1996.	MoEW
3	Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste 2003/33/EC: Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC	Ordinance No. 8 of 24 August 2004 on the conditions and requirements concerning the construction and operation of landfills and other facilities and plants for waste recovery and disposal, promulgated, SG 83/24.09.2004, as amended, SG 87/30.10.2007, last amended, SG 27/01.04.2011.	MoEW
4	Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directive 2002/95/EC) Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directive 2011/65/EC)	Ordinance on the requirements for placement on the market of electrical and electronic equipment and treatment and transportation of waste electrical and electronic equipment, effective as of 01.07.2006, promulgated, SG 36/02.05.2006, as amended, SG 5/20.01.2009, last amended, SG 29/08.04.2011. The introduction of the requirements of Directive 2011/65/EC in Bulgarian legislation is forthcoming through the Law on amending and supplementing (LAS) of LPHECSM. The law will be enacted as of 3 January 2013. The conditions and order for placement on the market of electrical and electronic equipment in relation to the restrictions for use of hazardous substances в EEC will be determined by ordinance of the Council of Ministers. The Council of Ministers adopts the ordinance within a three-month term as of the SG promulgation date of LAS of LPHECSM.	MoEW MoEW State Agency for Metrological and Technical Surveillance (SAMTS)
5	Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE) Directive 2003/108/EC of the European Parliament and of the Council of 8 December 2003 amending Directive 2002/96/EC on waste electrical and electronic equipment (WEEE)	Ordinance on the requirements for placement on the market of electrical and electronic equipment and treatment and transportation of waste electrical and electronic equipment, effective as of 01.07.2006, promulgated SG 36/02.05.2006, as amended SG 5/20.01.2009, last amended SG 29/08.04.2011.	MoEW
6	Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles (ELV Directive 2000/53/EC)	Ordinance on the requirements for treatment of waste vehicles, effective as of 01.01.2005, promulgated SG 104/26.11.2004, last amended SG 45/16.06.2009, last amended SG	MoEW

No.	European legislation	Bulgarian legislation	Responsible institutions
		29/08.04.2011.	
7	Council Directive 96/59/EC of 16 September 1996 on the disposal of polychlorinated biphenyls and polychlorinated terphenyls (PCB/PCT)	Ordinance on the requirements and order for inventory of equipment, containing polychlorinated biphenyls, its marking and cleaning, as well as for the treatment and transportation of waste containing polychlorinated biphenyls, promulgated SG 24/ 21.03.2006, supplemented SG 53/ 10.06.2008, last amended SG 29/ 08.04.2011.	MoEW
8	Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste	Ordinance No. 6 of 28 July 2004 on the conditions and requirements for construction and operation of waste incineration plants and waste co-incineration plants, SG 78/07.09.2004, as amended, SG 98/05.11.2004.	MoEW
9	Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives	Ordinance on the requirements for treatment and transportation of waste oils and waste oil products, promulgated, SG 90/11.11.2005, effective as of 01.01.2006, last amended SG 29/08.04.2011.	MoEW
10	Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC Directive 2008/103/EC of the European Parliament and of the Council of 19 November 2008 amending Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators as regards placing batteries and accumulators on the market	Ordinance on the requirements for placement on the market of batteries and accumulators and on treatment and transportation of waste batteries and accumulators, effective as of 01.01.2006, adopted by Decree of the Council of Ministers No. 144 of 05.07.2005, promulgated SG 58/15.07.2005, last amended SG 5/ 20.01.2009, last amended SG 29/ 08.04.2011.	MoEW
Legal basis for management of chemicals, PPP, biocides and detergents			
1	Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (CLP) (OJ, L 353/1 of 31 December 2008)	Law on protection from the harmful effects of chemical substances and mixtures (LPHECSM) in force as of 05.02.2002, promulgated in SG 10/04.02.2000, last amended, SG 98/14.12. 2010, in force as of 01.01.2011).	MoEW, MoH, MoAF
		Ordinance on the order and method for classification, packaging and labeling of chemical substances and mixtures, SG 68/31.08.2010, applicable until 31.05.2015.	MoH, MoEW, RHI and RIEW
		Ordinance on the order and method for storage hazardous chemical substances and mixtures, promulgated SG 43/07.06. 2011г.	MoEW
2	Regulation (EO) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC	Law on protection from the harmful effects of chemical substances and mixtures (LPHECSM) in force as of 05.02.2002, promulgated in SG 10/04.02.2000, last amended, SG 98/14.12. 2010, in force as of 01.01.2011).	MoEW, MoH, MoAF
		Ordinance on the order and method for restricting the production, use, or placement on the market of certain dangerous chemical substances, mixtures and articles, as listed in Annex XVII to Regulation (EC) No. 1907/2006 (REACH), promulgated SG 1/03.01.2012.	MoEW, RIEW
3	Regulation (EO) No. 689/2008 of the European Parliament and of the Council of 17 June 2008 concerning the export and import of dangerous	Law on protection from the harmful effects of chemical substances and mixtures (LPHECSM) in force as of 05.02.2002, promulgated in SG	MoEW, MoH, MoAF

No.	European legislation	Bulgarian legislation	Responsible institutions
	chemicals (OJ, L 204/1 of 31 July 2008)	10/04.02.2000, last amended, SG 98/14.12. 2010, in force as of 01.01.2011).	
4	Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products, applicable as of 1 September 2013. Commission Regulation (EC) No 1451/2007 of 4 December 2007 on the second phase of the 10-year work programme referred to in Article 16(2) of Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market (OJ, L 325/3 of 11 December 2007) Commission Regulation (EC) No 1896/2000 of 7 September 2000 on the first phase of the programme referred to in Article 16(2) of Directive 98/8/EC of the European Parliament and of the Council on biocidal products Directive 98/8/EC of the European Parliament and of the Council of 16 February 1998 concerning the placing of biocidal products on the market(OJ, L 1235 of 24 April 1998)	Law on protection from the harmful effects of chemical substances and mixtures (LPHECSM) in force as of 05.02.2002, promulgated in SG 10/04.02.2000, last amended, SG 98/14.12. 2010, in force as of 01.01.2011). Ordinance on the conditions and order for placement of biocicdes on the market, promulgate d SG 4/15.01.2008, as amended, SG 51 of 3.06.2008) effective as of 01.01.2008.	MoEW, MoH, MoAF
5.	Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC, effective as of 14 June, 2011 Commission Implementing Regulation (EU) No 540/2011 of 25 May 2011 implementing Regulation (EC) No 1107/2009 of the European Parliament and of the Council as regards the list of approved active substances, effective as of 14 June, 2011. Commission Regulation (EU) No 544/2011 of 10 June 2011 implementing Regulation (EC) No 1107/2009 of the European Parliament and of the Council as regards the data requirements for active substances, effective as of 14 June, 2011. Commission Regulation (EU) No 545/2011 of 10 June 2011 implementing Regulation (EC) No 1107/2009 of the European Parliament and of the Council as regards the data requirements for plant protection products, effective as of 14 June, 2011. Commission Regulation (EU) No 546/2011 of 10 June 2011 implementing Regulation (EC) No 1107/2009 of the European Parliament and of the Council as regards uniform principles for evaluation and authorisation of plant protection products,	Plant Protection Act, promulgated SG 91/10.10.1997, last amended and supplemented, SG 8/25.01.2011, SG 28/05.04.2011.	MoAF , BFSA
		Ordinance on permission of plant protection products, effective as of 01.09.2006, promulgated SG 81/06.10.2006.	MoAF , BFSA
		Ordinance No. 104 of 22.08.2006 on control concerning the placing on the market and use of plant protection products, promulgated SG 101/15.12.2006, as amended, SG 45/16.06.2006, SG 7/21.01.2011.	MoAF , BFSA
		Ordinance on the requirements as regards the warehouse base, transportation and storage of plant protection products, promulgated SG 101/15.12.2006, as amended and supplemented, SG 45/16.06.2009, SG 7/21.01.2011.	MoAF , BFSA

No.	European legislation	Bulgarian legislation	Responsible institutions
	effective as of 14 June, 2011.		
6	Commission Regulation (EU) No 547/2011 of 8 June 2011 implementing Regulation (EC) No 1107/2009 of the European Parliament and of the Council as regards labelling requirements for plant protection products.	Ordinance on the conditions and order for labeling of plant protection products, promulgated SG 54/13.06.2003, last amended SG 17/24.02.2006.	MoAF , BFSA
7	Directive 2009/128/EC establishing a framework for Community action to achieve the sustainable use of pesticides.	The introduction of the requirements under Directive 2009/128/EC in Bulgarian legislation in forthcoming through new Plant protection act, which to date is in the final phase of its elaboration.	MoAF , BFSA
8	Regulation (EO) No. 648/2004 on detergents Commission Regulation (EC) No 907/2006 of 20 June 2006 amending Regulation (EC) No 648/2004 of the European Parliament and of the Council on detergents, in order to adapt Annexes III and VII thereto of 25 June 2009 amending Regulation (EC) No. 648/2004 of the European Parliament and of the Council on detergents, in order to adapt Annexes V and VI thereto (derogation in respect of surfactants) Regulation (EC) No 1336/2008 of the European Parliament and of the Council of 16 December 2008 amending Regulation (EC) No 648/2004 in order to adapt it to Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures	Law on protection from the harmful effects of chemical substances and mixtures (LPHECSM) in force as of 05.02.2002, promulgated in SG 10/04.02.2000, last amended, SG 98/14.12. 2010, in force as of 01.01.2011).	MoEW
Legal basis in other fields			
1	Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1)	Water Act (effective as of 28.01.2000, promulgated SG 67/27.07.1999, as amended SG 98/14.12.2010, amended SG 80/14.10.2011, last amended SG 45/15.06.2012, effective as of 1.09.2012)	MoEW, MoAF , MoEET, MoTITC, MoD
2	Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council	Water Act (effective as of 28.01.2000, promulgated, SG 67/27.07.1999, as amended SG 98/14.12.2010, as amended SG 80/14.10.2011, last amended SG 45/15.06.2012, effective as of 1.09.2012)	MoEW, EEA, MoH, MoRDPW, MAF , MoEET, MoTITC, MoD
		Ordinance No. 1 of 11 April 2011 on water monitoring, promulgated, SG 34/29.04.2011.	MoEW, EEA,
		Ordinance on environmental quality standards for priority substances and certain other pollutants, SG 88 of 9.11.2010, effective as of 09.11.2010	MoEW, EEA, RBD
		Ordinance No. 9/2001 on the quality of water intended for drinking and domestic purposes, promulgated SG 30/28.03.2001, as amended SG 87/30.10. 2007, as amended, SG 1/4.01. 2011)	MoEW, EEA

No.	European legislation	Bulgarian legislation	Responsible institutions
3	Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control	Environment Protection Act (EPA) (promulgated SG 91/25.09.2002, amended and supplemented, SG 42/03.06. 2011, amended SG 32/24.04.2012, amended, SG 38/18.05.2012, in force as of 1.07.2012, amended and supplemented, SG 53/13.07.2012, effective as of 13.07.2012) Environment Protection Act (EPA) (promulgated SG 91/25.09.2002, amended and supplemented SG 42/03.06. 2011, as amended SG 32/24.04.2012, as amended, SG 38/18.05.2012, effective as of 1.07.2012, as amended and supplemented, SG 53/13.07.2012, effective as of 13.07.2012) Ordinance on the conditions and order for issuance of complex permits, (promulgated, SG 80 of 09.10.2009)	MoEW, EEA
4	Regulation (EC) No 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC;	Environment Protection Act (EPA) (promulgated SG 91/25.09.2002, amended and supplemented SG 42/03.06. 2011, as amended SG 32/24.04.2012, as amended, SG 38/18.05.2012, effective as of 1.07.2012, as amended and supplemented, SG 53/13.07.2012, effective as of 13.07.2012)	MoEW, RIEW, EEA, RBD, regional governors and municipality mayors
5	Regulation (EC) No 396/2005 of the European Parliament and of the Council of 23 February 2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origin and amending Council Directive 91/414/EEC	Food Act (promulgated, SG 90/15.10.1999, as amended SG 8/25.01.2011, last amended SG 54/17.07.2012 г.)	MoAF , BFSA
6	Commission Regulation (EU) No 915/2010 of 12 October 2010 concerning a coordinated multiannual control programme of the Union for 2011, 2012 and 2013 to ensure compliance with maximum levels of and to assess the consumer exposure to pesticide residues in and on food of plant and animal origin Commission Implementing Regulation (EU) No 1274/2011 of 7 December 2011 concerning a coordinated multiannual control programme of the Union for 2012, 2013 and 2014 to ensure compliance with maximum residue levels of pesticides and to assess the consumer exposure to pesticide residues in and on food of plant and animal origin.	National programme for monitoring of residues of pesticides and other harmful substances in and on food of plant and animal origin.	MoAF , BFSA

2.4.2. Description of Key European and National legislation on POPs management

❖ **Regulation (EC) No. 850/2004 on persistent organic pollutants (POPS), (OJ, L 158/30.04.2004), effective for Bulgaria as of 01.01.2007.**

The Regulation introduces a ban, stage-by-stage termination, or limitation of the production, placement on the market, and use of the POPs substances, which are the subject of the Stockholm Convention on their own, in preparations, or as a constituent part of any articles; requirements regarding the management of obsolete stockpiles and waste which contain, or which have been contaminated with POPs, as well as measures for reduction of the unintentionally generated POPs emissions. The member states are obliged to perform an inventory of the POPs emissions, to elaborate national implementation plans and to update these upon inclusion of any new POPs, as well as to exercise monitoring and exchange of information.

The general and specific exceptions are brought down to a minimum. The owners of stockpiles exceeding 50 kg of some of the listed POPs, the use of which is permitted, shall manage these in a manner ensuring safety, efficacy, and environmental protection. The member states control the use and management of notified stockpiles. All other obsolete amounts of POPs, the use of which is prohibited, shall be managed as hazardous waste. Any disposal or recovery activities which may lead to recycling, recovery or reuse of the substances listed in Annex IV are prohibited. Annex V specifies the maximum admissible concentrations (MAC) of the wastes listed in Annex IV and the permitted operations for permanent storage.

The Regulation contains requirements for annual reporting on the production and placement of POPs on the market, as well as on the import and export of waste containing POPs. The three-year reporting demands the submission of information about the obsolete stockpiles, emissions and POPs levels in the components of the environment, and requirements to the EU member states as regards the introduction of administrative penalties and sanctions in the event of noncompliance with the Regulation.

❖ **Environment Protection Act (EPA), (promulgated SG 91/25.09.2002, as amended SG 42/03.06.2011, last amendment and supplement SG 53/13.07.2012, in force as of 13.07.2012).**

The law regulates the public relations associated with the protection of environment and human health; the protection and use of the components of the environment; the control and management of any factors being detrimental thereto, the exercise of control over the status of the environment and the pollution sources; the prevention and restriction of pollution; the establishment and functioning of a National Environment Monitoring System; the strategies, programmes and plans for environment protection.

By way of the special laws and regulations thereto – on ambient air, water, soils, waste, chemicals and mixtures, regulating is provided for the rights and obligations of the state and municipal authorities, individuals and legal entities, for implementation of preventive and other activities, which have the purpose of ensuring a better quality of the environment and reducing the risks for the environment and people.

❖ **Law on protection from the harmful effects of chemical substances and mixtures (LPHECSM) in force as of 05.02.2002, promulgated in SG 10/04.02.2000, last amended, SG 98/14.12. 2010).**

This law regulates the rights and obligations of individuals and legal entities, who produce, place on the market, use, store and export chemicals on their own, in mixtures, or in articles for the purpose of protecting human health and protecting the environment, as well as the powers of the state authorities exercising control over the production, placement on the market, use, storage, and export of chemicals on their own, in mixtures, or in articles.
The law regulates the measures for implementation of:

♦ Regulation (EC) No. 850/2004 of the European Parliament and of the Council of 29 April 2004 on persistent organic pollutants;

♦ Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006 the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH);

♦ Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, (CLP);

♦ Regulation (EC) No. 648/2004 of the European Parliament and of the Council of 31 March 2004 on detergents;

♦ Regulation (EC) No. 689/2008 of the European Parliament and of the Council of 17 June 2008 concerning the export and import of dangerous chemicals;

♦ Commission Regulation (EC) No 1451/2007 of 4 December 2007 on the second phase of the 10-year work programme referred to in Article 16(2) of Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market

❖ **Clean Ambient Air Act (in force as of 29.06.1996, as amended SG 42/03.06.2011, as amended SG 32 of 24.04.2012, SG 38/18.05.2012, SG 53/13.07.2012, last amended SG 54/17.07.2012).**

With a view to ensuring ambient air quality (AAQ) compliant with the set standards, the law introduces norms for admissible concentrations of harmful substances, released in the atmosphere from fixed sources – dioxins and furans.

❖ **Water Act (in force as of 28.01.2000, promulgated SG 67 of 27 July 1999, as amended SG 35/03.05. 2011, as amended SG 80/14.10.2011, last amended 45/15.06.2012, in force as of 1.09.2012)**

The law has the objective to ensure integrated water management to the best interest of society and protection of the population's health, as well as to create conditions for provision of a sufficient and good quality surface and ground water for sustainable and well-balanced water use, as well as to ensure the reduction of water contamination; protection of surface and ground water and the Black Sea water; reduction of discharges, emissions and releases of priority substances.

The Ordinance on environmental quality standards for priority substances and certain other pollutants, (effective as of 09.11.2010, promulgated SG 88/09.11.2010) to the Water Act sets forth a list of priority substances and introduces environmental quality standards for: aldrin, endrin, DDT, endosulfan, HCH, PAH, PeCB, HCH.

Ordinance No. 6 of 9 November 2000 on emission norms for the admissible content of harmful and dangerous substances in wastewater discharged in water sites, (promulgated, SG 97 of 28 November 2000, as amended SG 24 of 23 March 2004) to the Water Act specifies sets forth emission norms for the following POPs: HCH, DDT, pentachlorphenol (PCP), aldrin, endrin, dieldrin, HCB and HCBD.

❖ **Ordinance No.1 of 10.10.2007 on exploration, use and protection of ground water, issued by the minister of environment and water, the minister of regional development and public works, the minister of health and the minister of economy and energy, promulgated SG 87 of 30.102007, effective as of 30.10.2007, as amended and supplemented, SG 2 of 8.01.2010, SG 15 of 21.02.2012, effective as of 21.02.2012.**

❖ **Waste Management Act (WMA), (promulgated SG 53 of 13.07.2012, effective as of 13.07.2012)**

The law regulates the environmentally sound management of waste as an aggregate of rights and obligations, decisions and activities, related to the generation and treatment thereof, as well as the forms of control over such activities. Thereby are determined the requirements to products which in the process of their production or after their end use, form dangerous or ordinary waste, as waste management is carried out for the purpose of prevention, reduction or limitation of their harmful effect on human health and the environment. The requirements laid down under the law as regards the management of waste containing POPs are introduced into national legislation through the following ordinances: Ordinance No. 3 on waste classification; Ordinance on the requirements for the order and method of inventorying equipment containing polychlorinated biphenyls, its marking and cleaning, as well as the treatment and transportation of waste containing PCB.

❖ **Soils Act (promulgated SG 89/06.11.2007, amended SG 98/14.12.2010, effective 1.01.2011, last amended SG 92/22.11.2011).**

This law regulates the public relations associated with the protection of soils from damaging, as well as their sustainable use and long-term restoration as an environmental component.

Ordinance No. 3 of 1.08.2008 on the norms for admissible content of harmful substances in soils (promulgated SG 71 of 12.08.2008, effective 12.08.2008) determines the norms for limit concentrations (LC), maximum admissible concentrations (MAC) and intervention concentrations (IC) of persistent organic pollutants and oil products in soils (specified as a total content in mg/kg dry soil). Annex 2 to the Ordinance includes norms for POPs pesticides, polycyclic aromatic carbohydrates (sum of 16 PAH compounds), polychlorinated biphenyls (PCB sum and 6 PCB congeners).

❖ **Plant Protection Act (promulgated SG 91/10.10.1997, amended SG 96/28.11.2006, last amended SG 28/05.04.2011)**

The Plant Protection Act regulates the requirements concerning the placement on the market and the use of PPP, fertilizers, soil improvers, biologically active substances and food substrates.

❖ **Food Act (promulgated SG 90/15.10.1999, as amended SG 8/25.01.2011, last amended SG 54/17.07.2012)**

❖ This law regulates the requirements in respect of foods, the measures and conditions for provision of their safety, packaging and labeling; the requirements as regards all stages in the production, processing, distribution and trade in food; the rights and obligations of the entities producing or carrying out trade in food and the rules for exercising statutory control. **Forage Law (promulgated SG 55/07.07.2006, last amended SG 8/25.01.2011).**

The law regulates the requirements in respect of food and feed, the measures and conditions for ensuring their safety, packaging, labeling; the requirements to all stages in the production, processing, storage, transportation, distribution and use of fodders; the rights and obligations of operators in the fodder sector.

The legislation of the European Union, relating to POPs in the field of raw materials and products of plant origin upon harvesting, on plants and plant products intended for production of food and feed and on foods of plant and animal origin intended for human consumption.

✓ Regulation (EC) No. 396/2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origin and amending Council Directive 91/414/EEC;

✓ Commission Regulation (EC) No. 1213/2008 of 5 December 2008 concerning a coordinated multiannual Community control programme for 2009, 2010 and 2011 to ensure compliance with maximum levels of and to assess the consumer exposure to pesticide residues in and on food of plant and animal origin;

✓ Commission Regulation (EU) No 915/2010 of 12 October 2010 concerning a coordinated multiannual control programme of the Union for 2011, 2012 and 2013 to ensure compliance with maximum levels of and to assess the consumer exposure to pesticide residues in and on food of plant and animal origin;

✓ Commission Implementing Regulation (EU) No. 1274/2011 of 7 December 2011 concerning a coordinated multiannual control programme of the Union for 2012, 2013 and 2014 to ensure compliance with maximum residue levels of pesticides and to assess the consumer exposure to pesticide residues in and on food of plant and animal origin

✓ Commission Regulation (EC) No. 669/2009 of 24 July 2009 of the European Parliament and of the Council concerning the implementation of Regulation (EC) No. 882/2004 of the European Parliament and of the Council as regards increased level of official controls on imports of certain feed and food of non-animal origin and amending Decision No. 2006/504/EC.

is transponed in national legislation through:

✓ Ordinance No. 31 of 29 December 2003 on maximum residue levels of pesticides in food (promulgated SG 14/24.02.2004, last amended SG 29/18.03.2009);

✓ Ordinance No. 119 of 21.12.2006 on control measures of certain substances and residues thereof in live animals, raw materials and food of animal origin intended for human consumption.

❖ **Health Act (promulgated SG 70/10.08. 2004, amended SG 45/14.06.2011, amended SG 60/05.08.2011, amended 38/18.05.2012, effective as of 1.07.2012, amended and supplemented, SG 40 /29.05.2012, last amended SG 54/17.07.2012)**

This law regulates the public relations associated with protecting the health of citizens. MoH, through RHIs, exercises control over the chemical substances and mixtures in the cases determined under LPHECSM.

❖ **Law on healthy and safe working conditions (promulgated SG 124/23.12.1997, amended SG 98/14.12. 2010, effective as of 01.01.2011, amended SG 60/05.08.2011, effective as of 5.08.2011, last amended SG 7 of 24.01.2012)**

This law regulates the rights and obligations of the state, employers, employees in the field of occupational health and safety.

2.5. Key Approaches and Administrative Procedures for Enforcement OF POPs Legislation

2.5.1. Administrative capacity strengthening

A key approach to the improvement of the professional qualification and administrative capacity is the participation of MoEW in technical assistance projects related to the management of chemical substances on their own, in mixtures and articles; waste management; monitoring of the environment components:

♦ Project: BG/2007/IB/EN/05 «Strengthening the administrative capacity for practical implementation of legislation in the fields of electrical and electronic equipment, batteries, and accumulators at national and regional level in Bulgaria» (2009). Partnership: Twinning contract between the Austrian Federal Environment Agency, the Federal Ministry of Environment, nature protection and nuclear safety – Germany, the Ministry of environment, energy and climate changes – Greece, and MoEW.

♦ Twinning project BG 2007/IB/EN/02 - Transboundary shipment of wastes"Strengthening of the administrative capacity with the aim to ensure the efficient enforcement of the EU acquis communautaire in the sphere of waste management". The project is implemented by the Environment Agency – Austria and MoEW, Bulgaria.

♦ Regional project "Determination of trends regarding POPs concentrations in ambient air in Bulgaria following the method of passive sampling of air by stationary device equipped with a polyurethane filter (PAS_CEECs)" – Phase II, 2007, financed by the Czech Government.

♦ Twinning project BG 06 IB EN 01 "Strengthening of surface water monitoring network". The project is implemented by the Italian National Healthcare Institute and EEA. Its aim is to strengthen the activities of surveillance, operating and research monitoring of the surface water monitoring network in respect of priority substances, and the efficient implementation of the EU Water Framework Directive 2000/60/EC.

♦ Project DVU 440/2008: "Safety and nutrition value of Black Sea products", 2007 – 2012, Medical University, Department of Chemistry, city of Varna, financed by the Ministry of Education and Science (MoES).

2.5.2. Key approaches and administrative procedures for POPs management

The existing key approaches and administrative procedures for management of chemical substances, including POPs, include classification, registration, permits, sanctions and control of industrial chemicals and pesticides, as well as assessment of the risk to people and the environment (Table No. 3).

Table 3: Administrative procedures for control and management of POPs chemicals

(Annexes A and B to the Stockholm Convention)

Administrative procedure	Import	Production	Storage	Transport	Distribution	Use	Disposal
Classification, packaging and labeling	x	x	x	x	x	x	x
Registration of active substances and products	x	x	x		x	x	
Permits	x			x	x	x	x
Control	x	x	x	x	x	x	x
Sanctions	x	x	x	x	x	x	x
Information for the workers/ the public	x	x	x			x	x

(X- *Adequately regulated in the legislation*)

The administrative procedures for control and management of POPs waste include classification, registration, permits, licensing and inspecting. Data about hazardous waste on the territory of the country are collected only within the system of EEA through information cards documenting the name, amount, properties, movement, storage and disposal of waste from enterprises the activity of which is related to generation and/ or treatment of hazardous waste. The national classification of waste is consistent with the European one and the data can be compared (Table No. 4).

Table 4: Administrative procedures for control and management of waste containing POPs

Administrative procedure	Import	Collection	Temporary storage	Transport	Trade/ use	Recovery	Disposal
Classification	x	x	x	x	x	x	x
Registration		x	x	x			x
Permits	x	x	x	x		x	x
License if trade in waste from steel and iron and non-ferrous metals					x		x
Control	x	x	x	x	x	x	x
Information for the workers/ the public			x			x	x

(X- *Adequately regulated in the legislation*)

2.5.3. Voluntary initiatives

In relation to the implementation of procedures for environment impact assessment (EIA) and especially for issuance of complex permits, the companies also develop programmes on attaining compliance with the norms of the European Union, which also determine the time periods for such compliance attainment. **The voluntary initiatives "Responsibility and Care" and "Stewardship Products"** implemented through the Bulgarian Chamber of Chemical Industry in certain producer companies also contribute to reducing the pollution of environment by chemicals, reducing the risks of emergencies, and the creation of safer occupational conditions. The initiative "Stewardship Products" marks the onset of the producers' voluntary responsibility throughout the life cycle of chemical substances and mixtures.

Environment Management and Audit Scheme (EMAS) is a voluntary instrument for environment management. EMAS aims at improving the state of the environment and enhances the rational use of resources and pollution minimizing. EMAS is introduced by Regulation (EC) No. 1221/2009.

Another voluntary initiative is the **European Ecolabel Scheme** established in 1992. The aim of the scheme is to encourage the manufacturing of products with a reduced environment impact and to facilitate consumers in recognizing such products. The scheme logo is a guarantee to the consumer that a product meets high ecologic requirements. Regulation (EC) No 66/2010 of the European Parliament and of the Council of 25 November 2009 on the EU Ecolabel determines the rules on establishment and implementation of the voluntary ecolabeling scheme.

2.5.4. Administrative penalties and imposing sanctions

Bulgaria has introduced rules on imposing administrative penalties and sanctions in its national legislation, in compliance with the requirements of Article 3, 5 and 7 of Regulation (EC) No. 850/2004, most of which are included in the national legislation in respect of chemicals and waste management, protecting the clean ambient air, water, plants; the placement on the market of chemical substances and mixtures, plant protection products and biocides, and the issuance of complex permits (IPPC).

- ✓ Environment Protection Act;
- ✓ Law on protection from the harmful effects of chemical substances and mixtures;
- ✓ Clean Ambient Air Act;
- ✓ Water Act;
- ✓ Waste Management Act;
- ✓ Plant Protection Act .

The competent authorities as regards the exercising of control on implementation of the national legislation on POPs and the imposing of administrative penalties are MoEW, EEA and RIEW, MoAF and BFSA, MoH and RHI, which, in the cases of any established violations in the fulfillment of the requirements pursuant to the POPs Regulation impose administrative penalties and fines in the course of regular inspections, or inspections initiated following a signal.

PART III:

3. ASSESSMENT OF THE POPS ISSUE IN BULGARIA

The Stockholm Convention obliges the parties to take measures for elimination of the 22 POPs substances, grouped in three categories: 15 pesticides, 7 industrial chemicals and 4 by-products, generated and released unintentionally by anthropogenic sources, as certain POPs are both pesticides and industrial chemicals. The intentionally produced 20 POPs substances, included in Annexes A and C to the Stockholm Convention are the object of a ban on production, use, import and export, save in the cases when general and specific exceptions are admitted. After the expiry of the period of effect of the specific exceptions, the import and export is permitted only for the purposes of environmentally sound disposal under particular conditions.

The general releases of unintentionally generated by-products listed in Annex C [dioxins (PCDD), furans(PCDF), polychlorinated biphenyls (PCB), pentachlorbenzen (PeCB) and hexaclorbenzene (HCB)] are the object of lasting reduction, and where possible, complete elimination.

The Stockholm Convention includes special requirements regarding the evaluation of the existing chemical substances as regards their POPs characteristics for the parties, implementing regulatory evaluation schemes and the implementation of measures for preventing the development, production, and placement on the market of new chemical substances, possessing POPs characteristics .

The Stockholm Convention also provides for the implementation of measures for identification and management of waste which contain, or have been contaminated with POPs, by managing and disposing same in an ecologically sound manner. The operations on disposal, which could lead to regeneration or reuse of POPs, are absolutely prohibited. Upon transportation of such waste, the requirements of international and European law on hazardous waste carriage are complied with (Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal and Regulation (EC) No. 1013/2006 on shipments of waste).

Apart from the control measures, the Stockholm Convention sets forth several general obligations as well. Each party is obliged to develop, update upon inclusion of new POPS, and implement a National Implementation Plan on Persistent Organic Pollutants Management (NIPPOPM); to carry out an exchange of information; to raise the awareness of the population and to ensure public access to the available information about POPs. The parties, depending on their capabilities, carry out scientific research and conduct POPs monitoring in co-operation, including as regards the POPs substitution alternatives and the inclusion of new POPs. In addition, each party periodically reports to the Conference of the Parties on the measures which same has undertaken on implementing the Stockholm Convention and on the efficiency of such measures for attaining the objectives of the convention.

The evaluation of the status in Bulgaria comprises POPs substances, included in the Stockholm Convention, the progress achieved since 2006 to date, as regards the measures taken in terms of bans on and restrictions for import, export, production, placement on the market, reduction and restriction of generated waste containing POPs and reduction and restriction of the POPs emissions from unintentional production, as well as the planned future measures and activities by the year 2020.

Table No. 5 contains the list of the new POPs included in the Stockholm Convention.

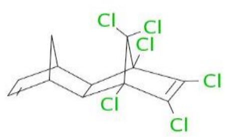
Table 5: List of the new POPs substances included in the Stockholm Convention

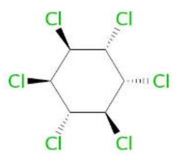
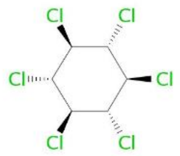
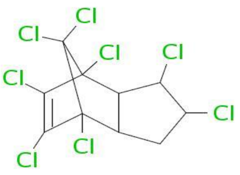
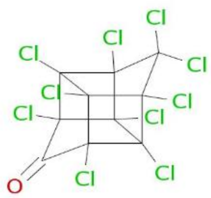
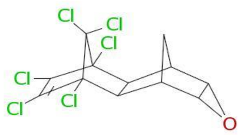
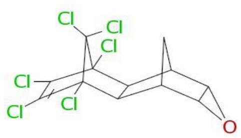
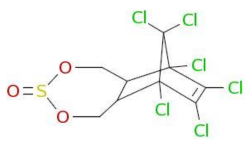
No	Name of substance	Substance abbreviation	CAS No.	Ban on the production and use in the EU/Bulgaria (BG)
1.	Alpha hexachlorcyclohexan	α-HCH	319-84-6	There is no production and use in EU/ BG
2.	Beta xhexachlorcyclohexan	β-HCH	319-85-7	There is no production and use in EU/ BG
3.	Lindane	γ-HCH	58-89-9	There is no production and use in EU/ BG, ban 01/01/2006 г.
4.	Chlordecone		143-50-0	There is no production and use in EU/ BG
5.	Endosulfan		115-29-7 959-98-8 33213-65-9	There is no production and use in EU/ BG, ban 05/12/2005 г.
6.	Tetrabromdiphenyl ether	TetraBDE	40088-47-9 and other TetraBDE congeners, available in C-PentaBDE products	EU – not produced since 2004 BG: ban – 26.08.2010
	Pentabromdiphenyl ether	PentaBDE	32534-81-9 and other PentaBDE congeners, available in C-PentaBDE products	EC-not produced since 2004 BG: ban – 26.08.2010
8.	Hexabromodiphenyl ether	HexaBDE	68631-49-2 and 207122-15-4 and other HexaBDE congeners, available in C-OctaBDE products	EC-not produced since 2004 BG: ban – 26.08.2010
	Heptabromdiphenyl ether	HeptaBDE	446255-22-7 and 207122-16-5 and other HeptaBDE congeners, available in C-OctaBDE products	EC-not produced since 2004 BG: ban – 26.08.2010
9.	Perfluorooctane sulphonate and its derivatives (PFOS) $C_8F_{17}SO_2X$ (X=OH, Metallic salt (O-M+), halide, amide, and other derivatives, including polymers)	PFOS	1763-23-1 (PFOS); 307-35-7 (PFOSF) and other: 2795-39-3, 29457-72-5, 29081-56-9, 70225-14-8, 56773-42-3, 251099-16-8	Included in Annex B to the Stockholm Convention in May 2009 with a number of exemptions for use. Ban – 26.08.2010
10.	Pentachlorbenzene	PeCB	608-93-5	There is no production and use Included in Annexes A and B to the Stockholm Convention in May 2009 Ban – 25.08.2010

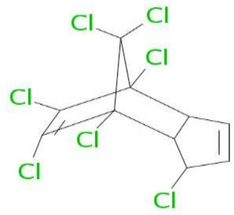
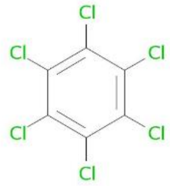
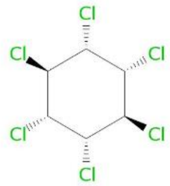
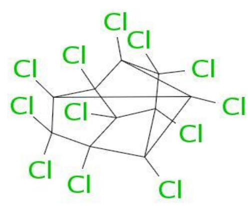
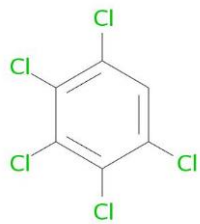
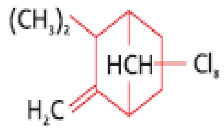
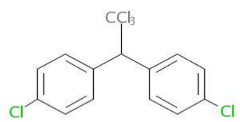
3.1. POPS PESTICIDES

The group of POPs pesticides listed in Annexes A and B to the Stockholm Convention includes 15 POPs substances, as the production of 12 of these is absolutely prohibited, and the production of 3 of these is severely restricted, as specified for each party in the Register of Specific Exemptions (Table No. 6).

Table 6: POPS pesticides, listed in Annex A and B to the Stockholm Convention

No.	POPs pesticides	CAS No.	EC No.	Structural formula	Annex	Acceptable production purpose or specific use
1)	Aldrin	309-00-2	206-215-8		A	Production: none Use: none

No.	POPs pesticides	CAS No.	EC No.	Structural formula	Annex	Acceptable production purpose or specific use
2)	Alpha hexachlorcyclohexane (α-HCH)	319-84-6	206-270-8		A	Production: none Use: none
3)	Beta hexachlorcyclohexane (β-HCH)	319-85-7	206-271-3		A	Production: none Use: none
4)	Chlordane	57-74-9	200-349-0		A	Production: none Use: none
5)	Chlordecone	143-50-0	205-601-3		A	Production: none Use: none
6)	Dieldrin	60-57-1	200-484-5		A	Production: none Use: none
7)	Endrin	72-20-8	200-775-7		A	Production: none Use: none
8)	Endosulfan	115-29-7 959-98-8 33213-65-9	204-079-4		A	Production: as permitted for the parties entered in the Specific Exemption Register Use: for a complex of agricultural crops and pests, in compliance with Part VI of this Annex.

No.	POPs pesticides	CAS No.	EC No.	Structural formula	Annex	Acceptable production purpose or specific use
9)	Heptachlor	76-44-8	200-962-3		A	Production: none Use: none
10)	Hexachlorbenzene (HCB)	118-74-1	204-273-9		A	Production: none Use: none
11)	Lindane (γ-HCH)	58-89-9	200-401-2		A	Production: none Use: as a pharmaceutical preparation for local administration in public healthcare for treatment of scabies and lice.
12)	Mirex	2385-85-5	219-196-6		A	Production: none Use: none
13)	Pentachlorbenzene (PeCB)	608-93-5	210-172-0		A	Production: none Use: none
14)	Toxaphene	8001-35-2	232-283-3		A	Production: none Use: none
15)	Dichlordiphenyltrichloroethane (DDT)	50-29-3	200-024-3		B	Production: for control of pathogens in compliance with part II of this Annex; Use: as biocides against mosquitos, spreading diseases such as malaria;

3.1.1. Properties and characteristics of POPs pesticides

Most POPs pesticides resists degradation in environment and have a half-life period of 4 to 15 years, they possess a high bio-accumulation and bioconcentration potential through the food-chain in biota. They are prone to long-range transport and are highly toxic to water ecosystems, as they can cause lasting harmful impacts to wild animals and people in contaminated areas. (Table No. 7).

Table 7:Properties, characteristics and exposure to POPs pesticides[4]

<table>
<tr><th>POPs pesticide</th><th colspan="2">POPs characteristics and exposure</th></tr>
<tr><td>Aldrin</td><td colspan="2">Chemical name:
1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-1,4:5,8-dimethanonaphthalene
CAS No.: 309-00-2; EC No. 206-215-8;
Molecular formula: $C_{12}H_8Cl_6$; Molecular mass: 364.92
Outer appearance: white crystalline odourless substance when pure, technical aldrin is light to dark-brown hard substance with a mild chemical odour.
Properties[5]: Melting point: 104^o C (pure substance), 49-60^o C(technical); boiling point: 145^o C at 2 mm Hg; Henry's constant: 4.96 x 10^{-4} atm m^3/mol at 25^o C; log K_{OC}: 2.61 ÷ 4.69; log K_{OW}: 5.17-7.4; water solubility: 17-180 μg/L at 25^o C; vapour pressure: 2.31 x 10^{-5} mm Hg at 20^o C.
Due to its resistance (DT50soil = 5 years in soils) and hydrophobicity, aldrin is prone to bioconcentration, mainly as metabolites' residues.
Exposure and harmful effects: aldrin is toxic to people. It causes headache, faintness, nausea, ailment , and vomiting. The exposure of humans to aldrin occurs upon consumption of dairy products and meat. The International Agency for Cancer Research (IARC) classifies aldrin in Group 3 – not classified as carcinogenic to humans.</td></tr>
<tr><td rowspan="6">Alpha hexachlorocyclohexane (α-HCH)
Beta hexachlorocyclohexane (β-HCH)</td><td colspan="2">Molecular formula α-HCH and β-HCH: $C_6H_6Cl_6$; Molecular mass: 290.83
Outer appearance α-HCH and β-HCH: hard crystalline substance with a phosgene odour.</td></tr>
<tr><td>alpha-HCH[6]</td><td>beta-HCH[7]</td></tr>
<tr><td>Chemical name
alpha hexachlorocyclohexane (alpha-HCH)
1,2,3,4,5,6-hexachlorocyclohexane, alpha isomer
CAS No.: 319-84-6; EC No. 206-270-8;</td><td>Chemical name:
beta hexachlorocyclohexane
beta-1,2,3,4,5,6-Hexachlorocyclohexane, beta isomer;
CAS No.: 319-85-7; EC No. 206-271-3;</td></tr>
<tr><td>Properties: melting point: 159^o C at 760 mm Hg; boiling point: 288^o C; Henry's constant: 6.9 n 10^{-6} atm m^3/mol at 25^o C; log Kow: 3.8; log Koc: 3.57; water solubility: 10 ppm at 28^o C; steam pressure: 4.5 x 10^{-5} mm Hg at 25^o C.</td><td>Properties: melting point: 314^o C at 760 mm Hg; boiling point: 60 °C at 0.5 mmHg; Henry's constant: 4.5 x 10^{-7} atm m^3/mol at 25^o C; log Kow: 3.78 at 25^o C; log Koc: 3.57 at 25^o C; water solubility: 5 ppm; steam pressure: 3.6 x 10^{-7} mm Hg at 20^o C.</td></tr>
<tr><td colspan="2">Alpha-HCH is resistant to abiotic processes such as photolysis and hydrolysis, its microbial degradation is very slow. It has a potential (log Kow=3.8) for bioaccummulation and bioconcentration in living organisms.</td></tr>
<tr><td colspan="2">Exposure and harmful effects:
The exposure of poulatoin to α-HCH and β-HCH occurs upon consumption of contaminated plants and animal products. Mother's milk transfers α-HCH and β-HCH to babies. Neurophysiological and neuropsychological disorders and gastrointestinal problems as observed in workers exposed to tehnical grades of HCH with complaints of face and limb Paresthesia, headache and vertigo, vomiting, trembling, stiffening, blurred vision, insomnia, memory loss, and sexual disturbances. The inhalation of HCH (mixed isomers) may lead to nose and throat inflammation. IARC classifies α-HCH and β-HCH HCH as possibly carcinogenic to humans (Group 2B).</td></tr>
</table>

4 http://www.POPstoolkit.com/about/chemical/
5 UNEP-POPs_Asses_IPCS_Ritter[1]
6 UNEP-POPs_NPOPs_GUID_Start up Guidance 9 POPs[1]
7 UNEP-POPs_NPOPs_GUID_Start up Guidance 9 POPs[1]

POPs pesticide	POPs characteristics and exposure
Chlordane	Chemical name[2]: 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene CAS No.:57-74-9; EC No. 200-349-0 Molecular formula: $C_{10}H_6Cl_8$; Molecular mass: 409.78 Outer appearance: colourless to yellowish-brown viscose liquid with an acute odour resembling that of chlorine. Properties: melting point: <25^o C; boiling point: 165^o C at 2 mm Hg; Henry's constant: 4.8 x 10^{-5} atm m^3/mol at 25^o C; log K_{OC}: 4.58-5.57; log K_{OW}: 6.00; water solubility: 56 ppb at 25^o C; vapour pressure: 1 x 10^{-6} mm Hg at 20^o C. Chlordane is semi-volatile and may come into atmospheric air. It easily connects to sediments in water ecosystem and accumulates in mass tissue of water organisms as a result of its log K_{OW} = 6.00. It is resistant in soil (DT50soil = 2 - 4 years). Exposure and harmful effects: People can be exposed to chlordane mainly via air. Only slight indispositions, headache and weakness are observed. Chlordane is classified by IARC as possibly carcinogenic to humans (Group 2B).
Chlordecone	Chemical name : 1,1a,3,3a,4,5,5,5a,5b,6-decachloro-octahydro-1,3,4-metheno-2H-cyclobuta[cd]pentalen-2-one CAS No.: 143-50-0; EC No. 205-601-3; Molecular formula: $C_{10}Cl_{10}O$; Mollecular mass: 490.64; Outer appearance: Chlordecone is chemically similar to mirex. It is a light-grey hard crystalline substance. Properties: melting point: 350^o C (degradable); boiling point: no data available; Henry's constant: 2.53 x 10^{-3} atm m^3/mol at 20^o C[8]; vapour pressure: 3.0 – 4.0 x 10^{-5} Pa at 25^o C[9]; log K_{OC}: 3.38-3.41[5]; log K_{OW}: 4.50 – 6.00; water solubility: 2.7-3.0 mg/L at 25^o C;. Chlordecone is strongly resistant in the environment, it degrades very slowly, as it mostly connects to the soil and sediment particles. Chlordecone has a high potential for bioconcentration in the food chain and a potential for a long-range transboundary transport. Exposure and harmful effects: Chlordecone is easily absorbed in the body and accumulates upon continuous exposure. Based on experiments with animals it has been established that it damages the nervous, immume, reproductive, and musculoskeletal systems and the liver. IARC classifies it as possibly carcinogenic to humans (Group 2B).
Dieldrin	Chemical name[2]: 3,4,5,6,9,9-Hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-2,7:3,6-dimetanonapth[2,3-b]oxirene CAS No. 60-57-1; EC No. 200-484-5; Molecular formula: $C_{12}H_8Cl_6O$; Molecular mass: 380.91 Outer appearance: dieldrin is a stereo-isomer of endrin. The pure substance is in the form of white crystals, the technical grade of dieldrin is in the form of light brown flakes with or without a mild typical odour. Properties: melting point: 175 – 176^o C; boiling point: degradable; Henry's constant: 5.8 x 10^{-5} atm·m^3/mol at 25^o C; log K_{OC}: 4.08-4.55; log K_{OW}: 3.692-6.2; water solubility: 140 µg/L at 20^o C; vapour pressure: 1.78 x 10^{-7} mm Hg at 20^o C. Dieldrin is highly resistant and accumulates in the food chain (DT50soil = 5 years). Due to its resistance and hydrophobicity dieldrin possesses the ability to bioconentrate (BCF=12,500 ÷ 13,300). Exposure and harmful effects: dieldrin is highly toxic to land mammals and aquatic organisms and may cause liver damage, as well as a damage to the nervous and immune systems in humans. The consumption of contaminated food is the main route of exposure of the population. IARC classifies dieldrin on Group 3 – not classified as carcinogenic to humans.

8 Howard, 1991, Quoted from US ATSDR, 1995.

9 Kilzer, l et. al., 1979.

POPs pesticide	POPs characteristics and exposure
Endrin	Chemical name[2]: 3,4,5,6,9,9,-Hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-2,7:3,6-dimethanonaphth[2,3-b]oxirene CAS No. 72-20-8; EC No. 200-775-7; Molecular formula: $C_{12}H_8Cl_6O$; Molecular mass: 380.92 Outer appearance: white crystalline substance without odour in its pure form, technical grades of endrin are light brown with a slight specific odour. Properties: melting point: 200^o C; boiling point: 245^o C (degradable); Henry's constant: 5.0 x 10^{-7} atm·m^3/molecular; log K_{OW}: 3.209-5.339; water solubility: 220-260 µg/L at 25^o C; vapour pressure: 7 x 10^{-7} mm Hg at 25^o C. Endrin easily becomes the subject of animal metabolism and does not accumulate in fatty tissues to the same extent as the other compounds having similar strgucture, but it is strongly resistant in soil (DT50soil = 12 years) Exposure and harmful effects: Endrin is highly toxic to fish. The main route of exposure of population is via food, even though the levels of endrin are low and safe according to the World Health Organization (WHO). IARC classifies dieldrin in Group 3 – not classified as carcinogenic to humans.
Endosulfan	Chemical name: 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9ahexahydro-6,9-methano -2,4,3-benzodioxathiepin-3-oxide. CAS No. 115-29-7; 959-98-8; 33213-65-9;EC No. 204-079-4 ; Molecular formula: $C_9H_6Cl_6O_3S$; Molecular mass: 406.93; Outer appearance: cream-coloured to brown hard substance in the form of crystals or flakes with an odour similar to turpentine. It exists in two isomers – alpha and beta-endosulfan, both being biologically active. Technicl grade endosulfan is a brown crystalline substance containing α- and β-isoemrs in ratio 70:30 Properties: Melting point: 106 °C; boiling point: 449.7°C at 760 mmHg; Henry's constant: 1.94 x 10^{-3} atm·m^3/mol; log K_{OW}: 4.65 for α- and 4.34 for β-endosulfan (GFEA-U, 2007) water solubility: 0.33 mg/L at 25^o C; vapour pressure: 1.3 × 10^{-3} Pa at 25°C. Endosulfan is resistant in atmospheric air, water and sediment. Endosulfan is moderately resistant in aerobic soils and degrades within 50-200 days, unlike combined toxic waste (endosulfan+endosulfan sulphate), which degrade for a period from 9 months to 6 years. In anaerobic soils degradation takes a considerably longer period. Endosulfan bioaccummulates in the tissues of aquatic organisms and has a long-range transport potential. Exposure and harmful effects: Endosulfan is toxic to humans and causes harmful effects to aquatic and land organisms. IARC classifies endosulfan as possibly carcinogenic to humans (Group 2B). It damages the estrogene and endocrine sustems, the male reproductive function in humans and animals.
Heptachlor	Chemical name[2]: 1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methanol-1H-indene. CAS No. 76-44-8; EC No. 200-962-3 ; Molecular formula: $C_{10}H_5Cl_7$; molecular mass: 373.32. Outer appearance: white to light brown wax-like substance or crystalline substance with a camphor odour. Properties: Melting point: 95-96^o C (pure substance), 46-74^o C (technical grade); boiling point: 135-145^o C at 1-1.5 mm Hg, degradable upon 760 mm Hg; Henry's constant; 2.3 x 10 $^{-3}$ atm·mm^3/mol; log K_{OC}: 4.38; log K_{OW}: 4.40-5.5; water solubility: 180 ppb at 25 C; vapour pressure: 3 x 10^{-4} mm Hg at 20^o C. heptachlor is resistant in soils (DT50soil = up to 2 years). It possesses a high potential for bioconcentration. The chemical properties of heptachlor (low water solubility, high stability and semi-volatility) favour its long-range transport. Exposure and harmful effects: There are no reported accidental or fatal heptachlor intoxications in humans. Symptoms in animals include trembling and convulsions. Food is the major route of exposure for humans, traces thereof are found in the blood of US and Australian cattle. IARC conlcludes that while in humans there is no sufficient evidence of carcinogenicity of heptachlor, sufficient evidence exsist from experiments with test animals and classifies heptachlor as possibly carcinogenic to humans (Group 2B).

POPs pesticide	POPs characteristics and exposure
Hexachlorbenzene (HCB)	Chemical name[2]:hexachlorobenzene CAS No. 118-74-1; EC No. 204-273-9; Molecular formula: C_6Cl_6; Molecular mass: 284.78; Outer appearance: white monolicnic crystals or crystalline hard substance. Properties: Melting point: 227-230^o C; boiling point: 323-326^o C (sublimates); Henry's constant: 7.1 x 10^{-3} atm m^3/mol at 20^o C; log K_{OC}: 2.56-4.54; log K_{OW}: 3.03-6.42; water solubility: 40 µg/L at 20^o C; vapour pressure: 1.089 x 10^{-5} mm Hg at 20^o C. HCB is rather volatile, which is why it comes into atmospheric air. It is strongly resistant to degradation in aerobic and anaerobic soils (DT50soil = from 2.7 to 22.9 years), possesses high lipophylity (log K_{OW} = 3.03-6.42) and accumulates in the fatty tissues of living organisms. Exposure and harmful effects: A remarkable case of HCB impact on humans includes incidents related to the intake of seeds treated with HCB in Eastern Turkey between 1954 and 1959. The patients who have swallowed treated seeds have complained of various symptoms, such as skin erhythema, hyperpigmentation, excessive hair growth, stomachaches, physical weakness, porphyria, and loss of strength. Approximately 3,000 – 4,000 individuals have developed porphyria and disorders in blood cells biosynthesis. Mortality rate reaches 14%. Mothers who have swallowed treated seeds have transmistted HCB to their children through the placenta and breastfeeding. The children born by such mothers have developed "pembe yara" or pink ulcers, as reported mortality rate reaches 95%. Examination of 32 individuals 20 years after the incident shows that people still cannot be healed from skin porphyria due to the high resistance of HCB. A study of occupational health shows development of skin porphyria in workers after exposure to HCB for a period ranging between 1 and 4 years. Exposure to HCB in several tests with monkeys shows that it causes degenerative alterations of surface epithel tissue, suppression of progesterone formation, cerebral cortex atrophy, decrease in lymphocytes count, ovarian and kidney alterations, comparable to porphyria tarda. IARC classifies HCB as probably carcinogenic to humans (Group 2B).
Lindane (γ-HCH)	Chemical name[10]: gamma, 1,2,3,4,5,6-hexaclorocyclohexane, γ-HCH isomer CAS No. 58-89-9; EC No. 200-401-2; Molecular formula: $C_6H_6Cl_6$; Molecular mass: 290.83; Outer appearance: hard crystalline substance. Lindane is the trivial name of gamma isomer 1,2,3,4,5,6-hexachlorocyclohexane (HCH). The technical grade HCH comprises a mixture of 5 isomers (alpha, beta, gamma, delta and epsilon). Properties: Melting point: 112.5o C; boiling point: 323.4^o C 760 at mm Hg; Henry's constant: 3.5 x 10^{-6} atm m3/mol at 25^o C; vapour pressure: 4.2 x 10-5 mm Hg at 20^o C; BCF: 10÷2600 in fish; log K_{OW}: 3.5; water solubility: 8.35 mg/L at 25^o C, pH 5. Lindane is resistant in the environment (DT50soil = 2 years; DT50water=30÷300 days; DT50sed=50 days; DT50air=2.3÷13 days), it easily bioaccummulates in the food chain and accumulates in living organisms. It is stable when exposed to light, hight temperatures and acids, and hydrolyses upon high pH. Lindane is degraded very slowly by microbes, it is more soluble and water and more volatile as compared to the other chloroorganic pesticides, which explains its availability in all components of environment. Exposure and harmful effects: There are available proofs of the toxic effects (immunotoxic, reproductive and behavioural) in laboratory animals and aquatic organisms. Lindane is moderately to severely toxic to rats, field mice, and fish. People can be exposed to lindane through consumption of contaminated food (fish, meat, dairy products) accummulating in fatty tissue and mother's milk. The exposure of humans to high lindane concentrations may cause skin irritations and itching, vertigo, headaches, diarrhea, nausea, and vomiting, and even spasms and death.(CEC, 2005). After severe exposure or chronic inhalation of aerosols of lindane there have been observed respiratory, cardiovascular, hematologic, liver and endocrine effects in humans. IARC classifies lindane as probably carcinogenic to humans (Group 2B).

[10] UNEP_POPs_NPOPs_GUID_Start up guidance for the 9 new POPs, December 2010

POPs pesticide	POPs characteristics and exposure
Mirex	Chemical name[2] 1,1a,2,2,3,3a,4,5,5a,5b,6-dodecachloroacta-hydro-1,3,4-metheno-1H-cyclobuta[cd]pentalene CAS No. 2385-85-5; EC No. 219-196-6; Molecular formula: $C_{10}Cl_{12}$; Molecular mass: 545.5 Outer appearance: white crystalline hard odourless substance Properties: Melting point: 485^{o} C; vapour pressure: 3 x 10^{-7} mm Hg at 25^{o} C. Mirex is highly resistant in environment, especially in soil (DT50soil = up to 10 years) and accumulates in the food chain. It is toxic to certain species of plants, fish and crustacean. Chemical properties of mirex favour its long-range transport, as mirex is detected in Arctic fresh water and land animals. Exposure and harmful effects: The main route of exposure for humans is via food, especially the consumption of meat, fish and game. Direct exposure to mirex does not harm humans, but tests with laboratory animals do prove harmful effects. The short-term effects include body weight loss, liver enlargement, and morphological alterations of liver cells. IARC classifies mirex as probably carcinogenic to humans (Group 2B).
Pentachlorbenzene (PeCB)	Chemical name: Pentachlorobenzene 1,2,3,4,5-pentachlorobenzene; CAS No. 608-93-5; EC No. 210-172-0; Molecular formula: C_6HCl_5; Molecular mass: 250.32; Outer appearance: white or colourless crystals with a specific odour; Properties[11]: Melting point: 86^{o} C; boiling point: 277 °C; water solubility: 0.68 mg/L at 20 °C; vapour pressure: 2.2 Pa at 25 °C. PeCB is highly resistant in soils and sediments, surface water (DT50water = 194 ÷ 1250 days) and athmospheric air (DT50air >2 days, 277 days). It possesses high potential for bioaccummulation (log Kow = 4.8 ÷ 5.18) in fish and mammals and for long-range transport. Exposure and harmful effects: PeCB is moderately toxic to humans, but it is highly toxic to aquatic organisms. It is absorbed in human body through inhalation or intake of contaminated food or water. It damages the liver and kidneys. IARC is of the opinion that there is no evidence of PeCB carcinogenity and does not classify it as such.
Toxaphene	Chemical name[2]: Toxaphene CAS No. 8001-35-2; EC No. 232-283-3; Molecular formula: $C_{10}H_{10}Cl_8$; Molecular mass: 413.82 Outer appearance: yellow wax-like hard substance with odour similar to chlorine/ turpentine. Properties: Melting point: 65-90^{o} C; boiling point: >120^{o} C (degradable); Henry's constant: 6.3 x 10^{-2} atm·m^3/mol; log K_{OC}: 3.18 (calculated); log K_{OW}: 3.23-5.50; water solubility: 550 µg/L at 20^{o} C; vapour pressure: 0.2-0.4 mm Hg at 25^{o} C. Toxaphene is highly resistant in soils (DT50soil = up to 12 years). It accumulates in aquatic organisms and has a potential for long-range transport via air. Exposure and harmful effects: People can be exposed to toxaphene via food or inhalation of aerosols. It is highly toxic to fish. Upon experiments with test animals show there have been observed damages of kidneys, thyroid gland and liver. Even though toxicity to people upon direct exposure is not high, IARC classifies toxaphene as probably carcinogenic to humans (Group 2B).

11 http://en.wikipedia.org/wiki/Pentachlorobenzene

POPs pesticide	POPs characteristics and exposure
Dichlordiphenyl-trichlorethane (DDT/DDT)	Chemical name[2]: 1,1'-(2,2,2-Trichloroethylidene)bis(4-chlorobenzene) CAS No. 50-29-3; EC No. 200-024-3; Molecular formula: $C_{14}H_9Cl_5$; Molecular mass: 354.49. Outer appearance: DDT is a colourless crystalline or white odourless powder substance. Properties[2]: Melting point: 108.5^o C; boiling point: 185^o C at 0.05 mm Hg (degradable); Henry's constant: 1.29 x 10^{-5} atm·m^3/mol at 23^o C; log K_{OC}: 5.146-6.26; log K_{OW}: 4.89-6.914; water solubility:1.2-5.5 µg/L at 25^o C. DDT is practically insoluble in water, but it dissolutes in most organic solvents. It is semi-volatile and may enter into the atmosphere. The presence of DDT and its decomposition products DDD and DDE in the environment is of global scale and can be detected even in the Arctic. DDT is highly resistant in soils (DT50soil = 10 -15 years) and can enter into atmospheric air where it decomposes within 2 days. DDT is a lipophylic substance and easily accumulates in fatty tissues of living organisms, where it bioconcentrates. The levels of DDT in animals and fish may be higher than those in the environment, because it accumulates in fat cells and its decomposition takes a very long period. Exposure and harmful effects: People are exposed to residues of DDT, DDE and DDD mainly through the consumption of contaminated food. During tests with volunteers who have swallowed DDT for a period of 21 months there have been observed increased rate of mortality caused by cerebral and vascular diseases. People who have accidentally swallowed high levels of DDT become irritable, have tremblings and faint. The short-term effects of DDT on humans are limited, but the long-term exposure may lead to immune system damage, harming the function of the thyroid and suprarenal gland. DDT is still found in mother's milk, which poses a serious threat for the health of breastfed infants. DDT, DDE, and DDD are classified by IARC as possibly carcinogenic to humans (Group 2B) .

3.1.2. Historical production and use of POPs pesticides

Table No. 8 sets forth general historical data about the global production and use of POPs pesticides in the past and the available alternatives for their substitution.

Table 8: Global production and use of POPs pesticides and substitution alternatives

POPs pesticide	Global production and use and alternatives for substitution of POPs pesticides
Aldrin	Production: Aldrin is produced on industrial scale from 1950 to 1990. To date it is not produced anywhere in the world. Main producers: 1948 -1974: J Hyman & Co., Denver, CO, САЩ 1954 -1990: Shell Chemical Corporation; Pernis; The Netherlands Trademarks: Aldrec; Aldrex; Altox; Aldrex 30, Aldrite, Aldrosol, Altox, ; Drinox; Octalene; Toxadrin; Seedrin; ENT 15949 (compound 118). Use: Aldrin is extensively used as a soil insecticide against termites, grasshoppers, corn weevils (Tanymecus dilaticollis), ground beetles, wireworms, wheat weevils and other pests affecting corn and potatoes and for protection of wooden structures from termites. Alternatives: A multitude of environmentally sound alternatives for aldrin substitution exists. In EU the chemical alternatives[12] to aldrin include piretroide, organophosphorous and N-Methyl carbamate insecticides, such as: cyfluthrin, cypermethrin, deltamethrin, chlorpyrifos, malathion, methomyl, pirimiphos - methyl;

[12] Beyond POPs, Evaluation of the UNEP Chemical Substitutes of the POPs Pesticides Regarding Their Human and Environmental Toxicity, Appendix 2 - Chemical Substitutes Of the Nine POPs Pesticides, PAN Germany, Hamburg, April 2001

POPs pesticide	Global production and use and alternatives for substitution of POPs pesticides
	Non-chemical alternatives: in combating termites aldrin may be substituted by natural repellents, physical barriers, a number of useful parasites and predators, and biological pathogenes. The alternatives to aldrin as an insecticide in agriculture include the use of beneficial insects, crop rotation, planting crops near beneficial plants, and mechanical cultivation.
Alpha hexachlorocyclohexane (α-HCH) Beta hexachlorocyclohexane (β-HCH)	Production: Alpha- and beta-HCH are not intentionally produced and are not offered on the market. They are formed as by-products of technical HCH in the production of lindane (per each ton of lindane produced, from to 6 to 10 tones of alpha- or beta-HCH are produced),(IHPA, 2006). Use: none Alternatives: Since no intentional use of α-HCH and β-HCH exists, there is no need to identify any alternatives.
Chlordane	Production: Chlordane is produced from 1948 to 1988. Main producers: Velsicol Chemical Corporation, USA Trademarks: Chlordan, Velsicol-1068, Velsicol 168; M-410; Octachlor, Aspon, Belt, Chloriandin, Chlorkil, Chlordane, Corodan, Chlortox; Cortilan-neu, Dowchlor, HCS 3260, ; Gold Crest C-100; Gold Crest C-50; Kilex; Kypchlor, M140, Niran, Octachlor, Octaterr, Ortho-Klor, Synklor, Tat chlor 4, Topichlor, Toxichlor; Termi-Ded; Topiclor 20; Prentox; and Penticklor. Use: used intensively as a biocide for combating cockroaches, ants, termites, spiders, ticks, asps, and other domestic pests, and also as a broad-range insecticide for treatment of a number of agricultural crops. Alternatives: In EU the chemical alternatives[2] to chlordane include piretroide, organophosphoric and N-Methyl carbamate insecticides, such as: alpha-methrin, alpha- and beta-cypermethrin, cyfluthrin, cypermethrin, cyromazine, deltamethrin, permethrin, chlorpyrifos, fenitrothion, malathion, phosmet, pirimiphos-methyl; Non-chemical alternatives include: use of beneficial insects, crop rotation, planting near beneficial plants and mechanical cultivation.
Chlordecone	Production[13]: Chlordecone is produced from 1951 to 1976 by Allied Chemical Company, USA, mainly under the trademarks Kepone and GC-1189. Technically thinned Chlordecone (80% active substance), known with the trademark Kelevan, is exported in great amounts to Europe, mostly to Germany, to Asia, Latin America and Africa. In France chlordecone is produced under the trademark Curlone from 1981 to 1993, and in Brazil – up to 1990. Main producers: Allied Chemical Company, USA Trademarks: Kepone, GC-1189, Kelevan, ENT 16391; Curlone, Merex Use: Used as insecticide for cultures, such as tobacco, ornamental plants, bananas, citrus fruits and as a fungicide for apples and potatoes. It is also used as a biocide against ants, cockroaches and other domestic pests. Alternatives: There are effective alternatives for substitution of the use of chlordecone. Chemical alternatives in EU as chlordecone substitutes include piretroide, organophosphorous and N-Methyl carbamate insecticides such as: ethoprophos, oxamyl, cyfluthrin, imidacloprid, terbuphos, and as a biocide: azadirachtin, bifenthrin, cypermethrin, cyfluthrin, deltamethrin, esfenvalerate, imidacloprid, lamda-cyhalothrin, malathion, piperonyl butoxide, pyrethrins, pyriproxyfen, etc. Non-chemical alternatives include: the use of beneficial microorganisms, (Bacillus thuringiensis); crop rotation, placement of nets, use of baits, such as pheromones.
Dieldrin	Production: Dieldrin is produced for the first time in 1948 by J. Hyman & Co, Denver, USA. Its production is terminated in 1987.

13 Draft Risk Management Evaluation for Chlordecone, May 2007, Ad hoc working group on chlordecone

POPs pesticide	Global production and use and alternatives for substitution of POPs pesticides
	Trademarks: Alvit, Quintox, Diedrex, Dieldrite, Panaram D-31, Illoxal, Dielmoth, Dorytox, Insectlack, Kombi-Alberta, Moth Snub D, Red Shield, SD 3417, Termitox, ENT 16225 (compound 497); Use: used till the beginning of 1970s as insecticide for treatment of seeds; for leaf treatment of cereal crops, fruit-trees and ornamental plants. It is also used for termite control in buildings, against domestic insects, and mosquitoes and for treatment of wood and wool against moths. In veterinarian medicine it is used as a disinfection solution for decontamination of sheep. Alternatives: There are effective alternatives for substitution of dieldrin in its use as insecticide. Chemical alternatives for substitution of dieldrin in EU include piretroide, organophosphorous and N-Methyl carbamate insecticides, such as: chlorpyrifos, cyfluthrin, cypermethrin, delthamethrin, ethyl-aziphos, ethyl-pirimiphos, malathion, methomyl, trichlorfon, pirimiphos - methyl; Non-chemical alternatives include: use of beneficial insects, crop rotation, planting of beneficial plants nearby and mechanical cultivation.
Endrin	Production: Endrin has been produced up to the year 1986 in the USA. Trademarks: Mendrin, Compound 269, Nendrin, Endrex, Hexadrin, NCI-COO157, ENT 17251 OMS 197, Isodrin Epoxide. Use: used as insecticide for field crops, such as cotton, corn, sugar cane, rice, grain crops, ornamental plants, and as rodenticide for control of field mice and voles around fruit trees. Alternatives: there are sufficient alternatives for substitution of endrin used as insecticide. Chemical alternatives for substitution of endrin in EU include piretroide, organophosphorous, and N-Methyl carbamate insecticides, such as: deltamethrin, pyrethrins, chlorpyrifos, dimethoate, malathion, methomyl; Non-chemical alternatives include: use of beneficial insects, crop rotation, planting of beneficial plants nearby, and mechanical cultivation.
Endosulfan	Production: the production of endosulfan starts in the early 1950s, in India and China it is still produced, and in Europe and the USA it has been terminated in 2006/2007.[Germany 2010]. Main producers: Diachem SPA, Albano, PAC S.R.L, Bergamo, SCAM, Modena, Italy; HELM AG, Hamburg and Hoechst SCHERING AGREVO GmBH(now Bayer CropScience), Frankfurt/Main, Germany; FBC Limited, Cambridge, England ; Hinolustan Insecticides; Makhteshim – Agan, Israel; FMC Corporation, USA; Excel Industries, Ltd., Bombay, India; Trademarks:[14]: Beosit; Chlortiepin; Cyclodan; Devisulphan;Endocel; Endosol; Hildan; Insectophene; Malix; Rasayansulfan; Thifor; Thimul; Thiodan; Thionex; Thiosulfan; Tiovel., Endosan, Farmoz, Endosulfan, Callisulfan. Use: Endosulfan is an insecticide, used for control of various pests affecting agricultural crops, against the tsetse fly and ectoparasites in sheep, as well as wood preservative. As a broad-spectrum insecticide, endosulfan is currently used for control of a multitude of insects affecting different crops. The largest consumers of endosulfan (Argentina, Australia, Brazil, China, India, Mexico, Pakistan, and the USA) use of a total of about 15,000 t a year. Its use in the EU MSs, including in the Republic of Bulgaria, is prohibited. Alternatives[15]: in many countries there are existing chemical and non-chemical alternatives to endosulfan. Chemical alternatives[16] for substitution of endosulfan in the EU include piretroide, organophosphorous and N-Methyl carbamate insecticides, such as: Abamectin, Acetamiprid, Buprofezin, Chlorpyrifos, Clofentezine, Cypermethrin, Cyromazin,

[14] Endosulfan Draft Risk Management Evaluation, UNEP/POPS/POPRC.6/9, 15 July 2010.

[15] Endosulfan, Draft Risk Management Evaluation, Supporting Document-1, Annex III– Results from the screening Risk Assessment of Chemical Alternatives compared to Endosulfan, April 2010.

[16] AS included in Annex I of Directive 91/414

POPs pesticide	Global production and use and alternatives for substitution of POPs pesticides
	Deltamethrin, Diflubenzuron, Dimethoate, Enamectin benzoate, Flubendiamide, Flucythrinate, Indoxacarb, Imidacloprid, Lambda cyhalothrin, Mancozeb, Malathion, Methomyl, Methoxyfenozide, Novaluron, Oxamyl, Permethrin, Phosmet, Pirimicarb, Pymetrozine, Pyrethrin/Piperonyl butoxidef, Pyridaben, Spirodiclofen, Spirosad, Spirotetramat, Sulphur, Tebufenozide, Thiacloprid, Zeta cypennethrin; Non-chemical alternatives include: biological control systems, agro-ecological practices, such as integrated pest management (IPM), organic agriculture, and other specific agricultural practices.
Heptachlor	Production: industrial production starts in 1953 in the USA for application as insecticide in agriculture and lasts till the year 1974. (EPA 1986a). Trademarks: Aahepta, Agroceres, Baskalor, Drinox, Drinox H-34, Heptachlorane, Heptagran, Heptagranox, Heptamak, Heptamul, Heptasol, Heptox, Soleptax, Rhodiachlor, Veliscol 104, Veliscol heptachlor. Main producers: Velsicol Chemical Corp., USA Use: initially, heptachlor has been used to combat soil insects and termites, but its broader use for combating cotton pests, grasshoppers and malaria mosquitoes. Alternatives: there are existing chemical and non-chemical alternatives to heptachlor. Chemical alternatives for substitution of heptachlor in the EU include piretroide, organophosphorous and N-Methyl carbamate insecticides, such as: abamectin, acetamiprid, bifenthrin, chlorpyriphos, cyfluthrin, deltamethrin, ethyl-pyrimiphos, ethoprophos; for malaria control: alpha-cypermethrin, cyfluthrin, deltamethrin, etofenprox, lambda-cyhalothrin, malathion, pirimiphos-methyl. Non-chemical alternatives include: biological control systems, agro-ecological practices, such as integrated pest management (IPM), organic agriculture, and other specific agricultural practices..
Hexachlorbenzene (HCB)	Production: HCB is produced for the first time in the year 1945. Trademarks: AntiCarie; Ceku C. B. Amaticin, Anticarie, Bunt-cure, Bunt-no-more, Co-op hexa, Granox, No bunt, Sanocide, Smut-go, Sniecotox. Main producers: Bayer AG, Leverkusen, Germany; Dow Deutschland INC., Werk Stade; Wacker-Chemie GmbH, Burghausen, Germany Use: as a fungicide combating grain crops mildew and seed treatment. Alternatives: in many countries there are existing chemical and non-chemical alternatives to HCB. Chemical alternatives for substitution of HCB include carboxamide and benzimidiazole fungicides, such as: carboxin, fuberidazole. Non-chemical alternatives include: agro-ecological practices, such as integrated pest management (IPM)
Lindane (γ-HCH)	Production: the technical grade of HCH and lindane are produced in Europe, the USA, Russia, Brazil, and Japan during the period from 1950 to 1990. In the 1990s of the last century the production of lindane has marked an abrupt drop and currently it is produced in India only. Trademarks: Agrocide, Aparasin, Arbitex, BBH, Ben-hex, Bentox, Celanex, Chloresene, Dvoran, Dol, Entomoxan, Exagamma, Forlin, Gallogama, Gamaphex, Gammalin, Gammex, Gammexane, Hexa, Hexachloran, Hexaverm, Hexicide, Isotos, Kwell, Lendine, Lentox, Linafor, Lindafor, Lindagam, Lindatox, Lintox, Lorexane, Nexit, Nocochloran, Novigam, Omnitox, Quellada, Silvanol, Tri-6, Vitron. Main producers in Europe: AgrEvo Prode Tech, Marseille, France; Diachem SPA, Albano S.Alessandro, Italy; Helm AG, Hamburg, Germany; Rhone Poulenc Agrochimie, Lyon, France; Use: broad-spectrum insecticide for treatment of seeds and soils, for leaf sprinkling, for wood treatment and for combating ectoparasites in veterinary and human

POPs pesticide	Global production and use and alternatives for substitution of POPs pesticides
	medicine. Alternatives: there are various existing chemical and non-chemical alternatives to lindane. In the EU chemical alternatives for substitution of lindane[17] include piretroide, organophosphorous and N-Methyl carbamate insecticides used for: – treatment of seeds: Clothianidin, Imidacloprid, Thiamethoxam; – leaf sprinkling: Alpha-Cypermethrin, Beta-Cyfluthrin, Clothianidin, Deltamethrin, Imidacloprid, Lambda-Cyhalothrin, Pyrethrin, Thiamethoxam; – veterinary purposes: Abamectin, Cyfluthrin, Cypermethrin, Eprinomectin, Evermectin, Fipronil, Lambdacyhalothrin, Malathion, Phosmet, Pyrethrin; – human medicine (lice and scabies): Malathion , Pyrethrin, Pyrethrum; – wood protection: Clothianidin, Cypermethrin, Cyclopropanecarboxylic acid, Ethoprophos, Etofenprox and Thiamethoxam; Non-chemical alternatives to lindane include: crop rotation, biological control systems, agro-ecological practices, such as IPM, organic agriculture and other specific agricultural practices.
Mirex	Production: Mirex has been produced from 1955 to 1976 in the USA. Trademarks: GC 1283; Dechlorane; HRS1276; ENT 257 19; Ferriamicide, Use: insecticide for combating ants, coccidae and termites. It is also used as a fire retardant in plastic, rubber and electronic equipment. Alternatives:there are existing chemical and non-chemical alternatives to mirex. In the EU chemical alternatives for substitution of mirex include piretroide, organophosphorous insecticides, such as: Diflubenzuron, Deltamethrin, Chlorpyriphos. The non-chemical alternatives include: biological control systems, agro-ecological practices, such as IPM, organic agriculture and other specific agricultural practices.
Pentachlorbenzene (PeCB)	Production: it is not produced in Europe and North America. PeCB is an intermediary product in the production of the fungicide quintozene. Trademarks: Quintozene; Campbell Terraclor Soil Fungicide; Use: fungicide in agriculture; as an intermediary product in the production of quintozene; as flame retardant for PCB products, as dye carrier. Alternatives: there are existing effective and cheap alternatives to PeCB..
Toxaphene	Production: toxaphene called (camphechlor) is produced from 1949 to 1975 in the USA. Trademarks: Alltex; Alltox; Attac 4-2; Attac 4-4; Attac 6; Attac 6-3; Attac 8; Agricide Maggot Killer; Camphofene Huilex; Camphechlor; Camphochlor; Camphoclor; Chemphene M5055; Chloro-camphene; Clor chem T-590; Geniphene; Hercules 3956; Hercules Toxaphene; Huilex, Kamfochlor; Melipax; Motox; Octachlorocamphene; Penphene; Phenicide; Phenatox; Phenphane; Polychlorocamphene; Strobane-T; Strobane T-90; Synthetic 3956; Texadust; Toxakil; Toxon 63; Toxyphen; Vertac 90%. Use: as an insecticide for combatting pests affecting cotton, grain crops, fruit trees, walnuts, hazelnuts, peanuts, and vegetables. It is also used as a veterinary preparation for combating ticks and intestinal worms in cattle. Alternatives: there are existing chemical and non-chemical alternatives to toxaphene. In the EU chemical alternatives for substitution of toxaphene include piretroide, organophosphorous insecticides, such as: Deltamethrin, Demethoate, Chlorpyriphos, Metribyzin. Non-chemical alternatives include: biological control systems, agro-ecological practices, such as IPM, organic agriculture and other specific agricultural practices.
Dichlordiphenyltrichlorethane (DDT/DDT)	Production: DDT was synthesized for th first time in the year 1874, but its production has started as late as in the year 1939. It was successfully used during World War II for combating malaria and typhus amond soldiers and the civil population. In the USA it is produced by Ciba, Montrose Chemical Company,

[17] The 9 new POPs, Risk Management Evaluations 2005-2008 (POPRC1-POPRC4)

POPs pesticide	Global production and use and alternatives for substitution of POPs pesticides
	Pennwalt and Velsicol Chemical Corporation, as the peak of its production was reached in the year 1963. India, which is its largest consumer, is the only country that still produces DDT. Trademarks:Agritan, Anofex, Arkotine, Azotox, Bosan Supra, Bovidermol, Chlorophenothan, Chloropenothane, Clorophenotoxum, Citox, Clofenotane, Dedelo, Deoval, Detox, Detoxan, Dibovan, Dicophane, Didigam, Didimac, Dodat, Dykol, Estonate, Genitox, Gesafid, Gesapon, Gesarex, Gesarol, Guesapon, Gyron, Havero-extra, Ivotan, Ixodex, Kopsol, Mutoxin, Neocid, Parachlorocidum, Pentachlorin, Pentech, PPzeidan, Rudseam, Santobane, Zeidane, Zerdane. Main producers in Europe: Enichem Synthesis S.P.A., Milano, Italy Use: broadly used as an insecticide against harmful insects in a multitude of agricultural crops, among which the most important is cotton. It is still used in some countries for combating malaria and typhus, spead mainly via malaria-transmitting mosquitoes. In EU the chemical alternatives for substitution of DDT include piretroide, organophosphorous insecticides, such as: Alpha-cypermethrin, Bifenthrin, Cyfluthrin, Deltamethrin, Chlorpyriphos, Etofenprox, Esphenvalerate, Lambda-cyhalothrin, Malathion, Methomyl, Phosmet, Pyrimiphos-methyl, Sulphur. At present piretrines are the safest alternative for substitution of DDT in intergrated management of disease carrying insects (IVM), since these are biological products. Non-chemical alternatives include: biological control systems, agro-ecological practices, such as IPM, organic agriculture and other specific agricultural practices.

3.1.3. Institutional and legal framework for the management of POPs pesticides

3.1.3.1. Competent authorities and responsibilities

The Ministry of Agriculture and Food (MoAF) through the **Bulgarian Food Safety Agency (BFSA)** exercises controlling, diagnostic, scientific research, scientific application and regulatory functions under the Plant Protection Act.

BFSA exercises official control and determines the requirements as regards plant protection products (PPP) and fertilizers, testing regime, permission and control of their production, repackaging, storage, placement on the market, and their use, with the aim to protect human and animal health and the environment; BFSA controls materials and foods of plant and animal origin and feed for content of any pollutants, the compliance of the fresh fruit and vegetable quality with the standards of the European Union for placement on the market and it annually implements a National Programme for Monitoring of Pesticides Residues on Plant and Animal Origin Food and Feeds, etc.

The active substances (AS), intended for production of plant protection products (PPP) for the purpose of being placed on the market and used in Bulgaria, must be included or notified for inclusion in the list of AS approved for use in PPPs in the European Union(EU).

For permitting PPPs a **Council on Plant Protection Products (CPPP)** was established by Order of the Minister of agriculture and food, which comprises representatives of MoAF , BFSA, MoEW, MoH, National Center of Public Health and Analysis (NCPHA) and of scientific research institutes. CPPP adopts decisions and makes suggestions based on expert evaluations for permission of PPP, performed by valuers from BFSA, MoEW and MoH, as per the Plant Protection Act.

PPP are placed on the market and used after having been permitted by order of the executive director of BFSA. BFSA performs the expert evaluations of the physicochemical properties of AS and PPP, biological characteristics and residual substances from pesticides in and on food and feeds of plant or animal origin of PPP.

BFSA exercises control over the PPP placed on the market and on their use.

The Ministry of Health (MoH) manages the national system for analysis, evaluation and control of drinking water pollutants. MoH prohibits the placement on the market of chemical substances and mixtures, which are dangerous to human health, and orders their destruction or reprocessing and use for other purposes.

MoH carries out the expert assessments of the toxicological characteristics of AS and PPP in order to determine the risk to human health.

MoH determines the conditions and order for placement of biocides on the market. Biocides are placed on the market and used after a permission thereof has been issued bythe Minister of health.

In respect of permitting biocides, an **Expert Committee on Biocides(ECB)** was established by order of the Minister of Health, which consists of representatives of MoH, MoEW, NCPHA, and the National Center of Infectious and Parasitic Diseases (NCIPD). ECB performs assessments of the risk to humans and non-target organisms in the environment and of biological effectiveness based on the data contained therein.

The Ministry of Environment and Water (MoEW) exercises control and monitoring of the pollution of the components of environment (air, soils, surface and groundwater) with chemical pollutants, on the production, placement on the market, use, storage and export of chemical substances on their own, in mixtures and articles, the classification, labeling, and packaging of substances and mixtures, the application of procedure for prior informed consent in international trade with certain dangerous chemical substances and pesticides and regulates the placement of biocides on the market.

MoEW performs assessments of the risk to the environment and the non-target organisms related to the PPPs and biocides proposed for placement on the market.

3.1.3.2. Key legislation addressing POPs pesticides management

✓ **Stockholm convention on persistent organic pollutants(POPs), ratified by law, (promulgated SG 89 of 12.10.2004), effective for Bulgaria as of 20.03.2005.**

POPs pesticides included in the Stockholm Convention are subject to production and use bans, save in the cases in which general and specific exemptions are envisaged. The import and export of POPs pesticides is severely restricted and after the expiry of the specific exemption it is permitted solely for the purposes of environmentally sound disposal under restricted conditions. The Stockholm Convention also envisages the identification and safe management and environmentally sound disposal of accumulated waste from obsolete pesticides, containing or contaminated by POPs.

✓ **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, ratified by law (promulgated SG 8/26.01.1996), effective for Bulgaria as of 16.05.1996.**

The Basel Convention control transboundary movements and management of hazardous waste and their disposal. Subject to control are the following categories of waste with hazardous properties:

У 45 – organohallogen compounds, including, for example, POPs pesticides;
H11 – toxic substances (causing chronic diseases or delayed-action diseases): substances or waste, which, if inhaled, swallowed, or via skin penetration, may cause delayed or chronic impacts, including cancer.

H12 – ecotoxic substances: substances or waste, which, if released in the environment, pose or may pose an immediate or long-term threat to the environment as a result of bioaccumulation and/ or toxic impacts on biosystems.

✓ **Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and. Pesticides in International Trade(PIC), ratified by law (promulgated SG 55/2000, SG 33/23.04.2004), effective for Bulgaria as of 24.02.2004;**

To date the Rotterdam Convention includes 43 chemical substances, which are subject to the procedure of prior informed consent for export (PIC), including 28 pesticides, 4 especially dangerours pesticide formulations and 11 industrial chemicals. In future it is expected that other chemical substances will also be added to Annex III to the Convention.

The Rotterdam Convention imposes bans and severe restrictions to international trade with the following 10 especially dangerous POPs pesticides: aldrin, chlordane, DDT, dieldrin, endosulfan, HCH (mixture of isomers), lindane, heptachlor, hexaclorbenzene (HCB) and toxaphene, which are subject to the procecdure of prior informed consent (PIC) in international trade.

✓ **Protocol on persistent organic pollutants of 24 June 1998 to the Geneva Convention on Long-Range Transboundary Air Pollution** of **1979 (CLRTAP), (promulgated SG 102/21.11.2003) effective for Bulgaria as of 23.10.2003;**

The Protocol on POPs introduces bans (b) and severe restrictions (sr) on the production and use of certain POPs pesticides and demands the provision of conditions for their environmentally sound disposal and/ or management and the transboundary transport of such waste in compliance with the requirements of the Basel Convention: aldrin (b), chlordane (b), chlordecone (b), DDT(b), dieldrin (b), endrin (b), heptachlor (b), HCB (b), mirex (b), toxaphene (b), HCH (b), lindane (sr), PeCB (b). Only the use of lindane as insecticide is permitted for local application in healthcare and veterinary medicine till the year 2012.

✓ **Regulation (EC) No. 850/2004 of the European Parliament and of the Council of 29 April 2004 on persistent organic pollutants and amending Directive 79/117/EEC, (OJ, L 158/30.04.2004), effective for Bulgaria as of 01.01.2007;**

Regulation (EO) No. 850/2004 introduces bans on the production, placement on the market and use of the following POPs pesticides: aldrin, chlordane, chlordecone, DDT, dieldrin, endrin, heptachlor, HCB, mirex, toxaphene, HCH, lindane and PeCB. Waste containing any of the listed POPs pesticides in concentration equal or higher than 50 mg/kg are determined as hazardous waste, containing POPs.

✓ **Regulation (EC) No. 689/2008 of the European Parliament and of the Council of 17 June 2008 concerning the export and import of dangerous chemicals (OJ, L 204/31.07.2008), effective for Bulgaria as of 31.07.2008;**

Regulation (EC) No. 689/2008 implements on the territory of EU the Rotterdam Convention concerning the procedure of prior informed consent (PIC) in international trade with certain dangerous chemicals and pesticides. The Regulation bans the export of chemicals, determined as persistent organic pollutants under the Stockholm Convention, unless such export has the purpose of environmentally sound disposal.

The scope of the Regulation includes pesticides, that are subject to PIC procedure; which are banned or severely restricted within the EU; and pesticides, which are exported as far as their classification, packaging and labeling are concerned.

Annexes I, II and III list the following POPs pesticides which are subject to export notification (PIC procedure), bans (b) and severe restrictions (sr): aldrin (b-b); chlordane (b-b); chlordecone (b-b); DDT (b-b); dieldrin (b-b); endosulfan (b); HCH isomers (b-sr); lindane (b-sr); heptachlor (b-b); HCB (b-b); toxaphene (b-b);

✓ **Regulation (EC) 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), (OJ, L 396/29.05.2007), effective for Bulgaria as of 1 June 2007.**

Regulation (EC) 1907/2006 (REACH) introduces restrictions on the production, placement on the market and use of certain dangerous substances, mixtures and articles within the territory of the EU, as listed in Annex XVII.

✓ **Regulation (EC) No. 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC (OJ, L 309/24.11.2009), effective as of 14 June 2011.**

Regulation (EC) No. 1107/2009 establishes the rules on permission of PPPs in commercial form, as well as on their placement on the market, use and control within the Community. The Regulation is applied for PPPs consisting of, or containing active substances, antidotes, or synergists, and intended for various uses.

The Regulation introduces bans on placing on the market and use of PPPs, containing certain POPs (aldrin, DDT, dieldrin, chlordane, chlordecone, endrin, endosulfan, heptachlor, hexachlorbenzene, lindane, mirex, toxaphene).

✓ **Commission Implementing Regulation (EU) No. 540/2011 of 25 May 2011 implementing Regulation (EC) No. 1107/2009 of the European Parliament and of the Council as regards the list of approved active substances (OJ, L 153/11.06.2009), effective 14 June 2011.**

The active substances included in the annex to Regulation (EU) 540/2011, are deemed approved as per Regulation (EC) No. 1107/2009.

✓ **Commission Implementing Regulation (EU) No. 544/2011 of 10 June 2011 implementing Regulation (EC) No. 1107/2009 of the European Parliament and of the Council as regards the requirements in respect of the data of the active substances (OJ, L 155/11.06.2009), effective as of 14 June 2011.**

The Annex to Regulation (EU) No. 544/2011 introduces requirements in respect of the data for the purposes of the approval of active substances envisaged in Regulation (EC) No. 1107/2009.

✓ **Commission Implementing Regulation (EU) No. 545/2011 of 10 June 2011 implementing Regulation (EC) No. 1107/2009 of the European Parliament and of the Council in respect of the data about plant protection products (OJ of EU, L 153/11.06.2009), effective as of 14 June 2011.**

The Annex to Regulation (EU) No. 545/2011 introduces requirements in respect of the data about PPP , envisaged in Regulation (EC) No. 1107/2009.

✓ **Commission Implementing Regulation (EU) No. 546/2011 of 10 June 2011 implementing Regulation (EC) No. 1107/2009 of the European Parliament and of the Council as regards the uniform principles of evaluation and permission of plant protection products (OJ of EU, L 153/11.06.2009), effective as of 14 June 2011.**

The uniform principles of evaluation and permission of plant protection products envisaged under Regulation (EC) No. 1107/2009 are specified in the annect to this Regulation.

✓ **Regulation (EC) No. 547/2011 implementing Regulation (EC) No. 1107/2009 of the European Parliament and of the Council in respect of the requirements for labeling of plant protection products (OJ of EU, L 153/11.06.2009), effective as of 14 June 2011.**

The Regulation determines the specific requirements for labeling of PPP and the content of the label. Where appropriate, labeling contains standard phrases for special risks to human health, animal health, and the environment, as well as measures for limiting the risk for human health, and non-targeted organisms.

✓ **Directive 98/8/EC of the European Parliament and of the Council of 16 February 1998 concerning the placing of biocidal products on the markets (Official Journal of the European Union, L 123/24.04.1998)**

Directive 98/8/EC arranges the conditions for permitting and placing of biocidal products on the market, as well as the active substances in biocidal products, including the requirements for efficacy and safety in their use, as well as the rules for the mutual recognition of the permits within the Community; and the elaboration on a Community level of a list of the active substances which can be used in biocides with a low risk.

✓ **Directive 2009/128/EC establishing a framework for Community action to achieve the sustainable use of pesticides (OJ of EU, L 309/24.11.2009).**

The Directive establishes a framework to achieve sustainable use of pesticides through reduction of the risks and the impact of pesticides use on human health and the environment and for encouragement of employing an integrated pest management and alternative approaches or techniques, such as, for instance, non-chemical alternatives to pesticides. The Member States adopt national implementation plans which determine their objectives, measures and timelines to achieve sustainable use of pesticides.

✓ **Regulation (EC) No. 1881/2006 of 19 December 2006 setting maximum levels for certain contaminants in foodstuffs.(OJ of EU, L 364/ 20.12.2006), effective as of 01.01.2007.**

The foodstuffs listed in the Annex are not placed on the market when they contain a pollutant, including the POPs specified in the Annex, with a maximum admissible amount which exceeds the maximum admissible level determined in the Annex.

✓ **Regulation (EC) No. 396/2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origin and amending Council Directive 91/414/EEC, (OJ of EU, L 70/16.3.2005), effective as of 01.01.2007.**

Regulation (EC) No. 396/2005 establishes harmonized provisions of the Community as regards the maximum admissible residue levels of pesticides in and on food and feed of plant and animal origin. The Regulation is implemented in respect of products of plant and animal origin (or parts thereof), which are used in fresh or processed state and/ or as constitutent food and feed, in or on which there may be residual pesticide substances.

✓ **Commission Implementing Regulation (EU) No. 1274/2011 of 7 December 2011 concerning a coordinated multiannual control programme of the Union for 2012, 2013 and 2014 to ensure compliance with maximum residue levels of pesticides and to assess the consumer exposure to pesticide residues in and on food of plant and animal origin (OJ of EU, L 269/13.10.2010), effective as of 01.01.2012)**

Regulation (EU No. 1274/2011 repeals Regulation (EU) No. 915/2010 and specifies the combinations pesticide/ product which are subject to monitoring in and on foods of plant and animal origin for the period 2012, 2013 and 2014. The minimum number of samples per product per annum for Bulgaria is 12. In addition to the samples, in 2012 each member state collects and analyzes ten samples of processed cereal foods for children. The POPs pesticides included in Annex I are: Chlordane (a combination of cis- and trans-isomers of oxichlordane, expressed as chlordane); DDT [combination of p,p′-DDT, o,p′-DDT, p-p′-DDE and p,p′-DDD (TDE), expressed as DDT]; Dieldrin (combination of aldrin and dieldrin, expressed as dieldrin); Endosulfan (combination of alpha- and beta- isomers and of endosulfan sulphate, expressed as endosulfan); Endrin; HCB; Heptachlor (combination of heptachlor and heptachlor epoxide, expressed as heptachlor); HCH, alpha-isomer HCH; beta-isomer HCH; and gamma-isomer HCH (lindane);

✓ **Plant Protection Act, (promulgated SG 91 of 10.10.1997, as amended SG 96 of 28.11.2006, effective as of 1.01.2007, last amended and supplemented SG 28 of 5.04.2011)**

The Plant Protection Act regulates the requirements regarding PPPs and fertilizers, the regime of testing, permission and control of the production, repackaging, storage, placing on the market and use with the aim to protect human health and animals and in order to protect the environment; the control of PPP's compliance with the indicators, approved upon the permission thereof; the requirements concerning the storage of documentation of placed on the market and used amounts of PPPs and fertilizers; the control of pollutants in plant materials used in primary production of agricultural crops, intended for food or feeds, etc.

❖ Ordinance on the permission of plant protection products (PPP),(promulgated SG 81/ 06.10. 2006) effective as of 01.09.2006.

❖ Ordinance on the conditions and order of labeling plant protection products (PPP), (promulgated SG 54/13.06.2003, effective as of 01.01.2004, as amended SG 17/24.02. 2006);

❖ Ordinance No. 104 of 22.08.2006 on control on the offering on the market and use of plant protection products (promulgated SG 81/06.10.2006, effective as of 6.10.2006);

❖ Ordinance on the requirements as regards the warehouse base, transportation and storage of plant protection products, (promulgated SG 101/15.12.2006, as amended and supplemented SG 2/09.01.2009, as amended SG 45/16.06.2009, SG 7 of 21.01.2011)

✓ **Law on protection from the harmful effects of chemical substances and mixtures (LPHECSM), (promulgated SG 114 of 30.12. 2003, effective as of 31.01.2004, amended and supplemented SG 63 of 13.08.2010, last amendment SG 98 of 14.12.2010, effective as of 01.01.2011);**
The law sets forth measures for implementation of Regulation (EC) No. 850/2004 on Persistent Organic Ppollutants and the subsequent amendments thereto.

✓ **Ordinance on the order and method of restricting the production, use or placement on the market of certain hazardous chemical substances, mixtures and articles specified in Annex XVII to Regulation (EC) No. 1907/2006 (REACH) , (promulgated SG 1 of 3 January 2012)**

The ordinance determines measures for implementation of the restrictions on production, placement on the market and use of hazardous chemical substances on their own, in mixtures and articles as specified in Annex XVII to REACH Regulation (EC) No. 1907/2006.

✓ **Ordinance on the order and method of classification, packaging and labeling of chemical substances and mixtures, (promulgated SG 68/31.08.2010), effective as of 31.08.2010 to 31.05.2015.**

The ordinance determines the order and method of classifiying chemical substances and mixtures and the requirements concerning the packaging and labeling of hazardous chemical substances and mixtures; POPS pesticides are included in tables 3.1. and 3.2 of Annex No. VI to Regulation (EC) No. 1272/2008 (tables No. 9 and 10).

Table 9: Table 3.1 of Annex VI to Regulation (EC) No. 1272/2008

Index No.	International chemical identification	EC No	CAS No	Classification		Labeling		Specific limit concentrations M-coefficient
				Class code and hazard category	Hazard warning code	Pictogramme and signal phrase code	Hazard warning code	
602-048-00-3	Aldrin	206-215-8	309-00-2	Carc. 2 Acute Tox. 3 * Acute Tox. 3 * STOT RE 1 Aquatic Acute 1 Aquatic Chronic 1	H351 H311 H301 H372 ** H400 H410	GHS06 GHS08 GHS09 Dgr	H351 H311 H301 H372 ** H410	
602-049-00-9	Dieldrin	200-484-5	60-57-1	Carc. 2 Acute Tox. 1 Acute Tox. 3 * STOT RE 1 Aquatic Acute 1 Aquatic Chronic 1	H351 H311 H301 H372 ** H400 H410	GHS06 GHS08 GHS09 Dgr	H351 H311 H301 H372 ** H410	
602-050-00-4	Isodrin	207-366-2	465-73-6	Acute Tox. 2 * Acute Tox. 1 Acute Tox. 2 * Aquatic Acute 1 Aquatic Chronic 1	H330 H310 H300 H400 H410	GHS06 GHS09 Dgr	H330 H310 H300 H410	M=100
602-051-00-X	Endrin	200-775-7	72-20-8	Acute Tox. 2 * Acute Tox. 3 * Aquatic Acute 1 Aquatic Chronic 1	H300 H311 H400 H410	GHS06 GHS09 Dgr	H300 H311 H410	
602-052-00-5	Endosulfan	204-079-4	115-29-7	Acute Tox. 2 * Acute Tox. 2 * Acute Tox. 4 * Aquatic Acute 1 Aquatic Chronic 1	H330 H300 H312 H400 H410	GHS06 GHS09 Dgr	H330 H300 H312 H410	

Index No.	International chemical identification	EC No	CAS No	Classification		Labeling		Specific limit concentrations M-coefficient
				Class code and hazard category	Hazard warning code	Pictogramme and signal phrase code	Hazard warning code	
602-065-00-6	Hexachlorobenzene HCB	204-273-9	118-74-1	Carc. 1B STOT RE 1 Aquatic Acute 1 Aquatic Chronic 1	H350 H372 ** H400 H410	GHS08 GHS09 Dgr	H350 H372 ** H410	
602-074-00-5	Pentachlorobenzene PeCB	210-172-0	608-93-5	Flam. Sol. 1 Acute Tox. 4 * Aquatic Acute 1 Aquatic Chronic 1	H228 H302 H400 H410	GHS02 GHS07 GHS09 Dgr	H228 H302 H410	
602-077-00-1	Mirex	219-196-6	2385-85-5	Carc. 2 Repr. 2 Lact. Acute Tox. 4 * Acute Tox. 4 * Aquatic Acute 1 Aquatic Chronic 1	H351 H361fd H362 H312 H302 H400 H410	GHS08 GHS07 GHS09 Wng	H351 H361fd H362 H312 H302 H410	
602-043-00-6	Lindane	200-401-2	58-89-9	Acute Tox. 3 * Acute Tox. 4 * Acute Tox. 4 * STOT RE 2 * Lact. Aquatic Acute 1 Aquatic Chronic 1	H301 H332 H312 H373 ** H362 H400 H410	GHS06 GHS08 GHS09 Dgr	H301 H332 H312 H373 ** H362 H410	M=10
602-044-00-1	Toxaphene, Camphechlor	232-283-3	8001-35-2	Carc. 2 Acute Tox. 3 * Acute Tox. 4 * STOT SE 3 Skin Irrit. 2 Aquatic Acute 1 Aquatic Chronic 1	H351 H301 H312 H335 H315 H400 H410	GHS06 GHS08 GHS09 Dgr	H351 H301 H312 H335 H315 H410	
602-045-00-7	DDT/DDT; clofenotane ; dicophane	200-024-3	50-29-3	Carc. 2 Acute Tox. 3 * STOT RE 1 Aquatic Acute 1 Aquatic Chronic 1	H351 H301 H372 ** H400 H410	GHS06 GHS08 GHS09 Dgr	H351 H301 H372 ** H410	
602-046-00-2	Heptachlor	200-962-3	76-44-8	Carc. 2 Acute Tox. 3 * Acute Tox. 3 * STOT RE 2 * Aquatic Acute 1 Aquatic Chronic 1	H351 H311 H301 H373 ** H400 H410	GHS06 GHS08 GHS09 Dgr	H351 H311 H301 H373 ** H410	
602-063-00-5	Heptachlor epoxide	213-831-0	1024-57-3	Carc. 2 Acute Tox. 3 * STOT RE 2 * Aquatic Acute 1 Aquatic Chronic 1	H351 H301 H373 ** H400 H410	GHS06 GHS08 GHS09 Dgr	H351 H301 H373 ** H410	
602-047-00-8	Chlordane	200-349-0	57-74-9	Carc. 2 Acute Tox. 4 * Acute Tox. 4 * Aquatic Acute 1 Aquatic Chronic 1	H351 H312 H302 H400 H410	GHS08 GHS07 GHS09 Wng	H351 H312 H302 H410	
606-019-00-6	Chlordecone	205-601-3	143-50-0	Carc. 2 Acute Tox. 3 * Acute Tox. 3 * Aquatic Acute 1 Aquatic Chronic 1	H351 H311 H301 H400 H410	GHS06 GHS08 GHS09 Dgr	H351 H311 H301 H410	

Table 10: Table 3.2 of Annex No. VI to Regulation (EC) No. 1272/2008

Index No.	International chemical identification	EC No	CAS No	Classification	Labeling	Limit concentrations
602-048-00-3	Aldrin	206-215-8	309-00-2	T; R24/25-48/24/25 Carc. Cat. 3; R40 N; R50-53	T; N R: 24/25-40-48/24/25-50/53 S: (1/2-)22-36/37-45-60-61	
602-049-00-9	Dieldrin	200-484-5	60-57-1	T+; R27 T; R25-48/25 Carc. Cat. 3; R40 N; R50-53	T+; N R: 25-27-40-48/25-50/53 S: (1/2-)22-36/37-45-60-61	
602-050-00-4	Isodrin	207-366-2	465-73-6	T+; R26/27/28 N; R50-53	T+; N R: 26/27/28-50/53 S: (1/2-)13-28-36/37-45-60-61	C ≥ 0,25 %: N; R50-53 0,025 % ≤ C < 0,25 %: N; R51-53 0,0025 % ≤ C < 0,025 %: R52-53
602-051-00-X	Endrin	200-775-7	72-20-8	T+; R28 T; R24 N; R50-53	T+; N R: 24-28-50/53 S: (1/2-)22-36/37-45-60-61	
602-052-00-5	Endosulfan	204-079-4	115-29-7	T+; R26/28 Xn; R21 N; R50-53	T+; N R: 21-26/28-50/53 S: (1/2-)28-36/37-45-60-61-63	
602-065-00-6	Hexachlorobenzene/ HCB	204-273-9	118-74-1	Carc. Cat. 2; R45 T; R48/25 N; R50-53	T; N R: 45-48/25-50/53 S: 53-45-60-61	
602-074-00-5	Pentachlorobenzene/ PeCB	210-172-0	608-93-5	F; R11 Xn; R22 N; R50-53	F; Xn; N R: 11-22-50/53 S: (2-)41-46-50-60-61	
602-077-00-1	Mirex	219-196-6	2385-85-5	Carc. Cat. 3; R40 Repr. Cat. 3; R62-63 R64 Xn; R21/22 N; R50/53	Xn; N R: 21/22-40-50/53-62-63-64 S: (2-)13-36/37-46-60-61	
602-043-00-6	Lindane	200-401-2	58-89-9	T; R25 Xn; R20/21-48/22 R64 N; R50-53	T; N R: 20/21-25-48/22-64-50/53 S: (1/2-)36/37-45-60-61	C ≥ 2,5 %: N; R50-53 0,25 % ≤ C < 2,5 %: N; R51-53 0,025 % ≤ C < 0,25 %: R52-53
602-044-00-1	Toxaphene/, Camphechlor	232-283-3	8001-35-2	Carc. Cat. 3; R40 T; R25 Xn; R21 Xi; R37/38 N; R50-53	T; N R: 21-25-37/38-40-50/53 S: (1/2-)36/37-45-60-61	
602-045-00-7	DDT/DDT; clofenotane ; dicophane	200-024-3	50-29-3	T; R25-48/25 Carc. Cat. 3; R40 N; R50-53	T; N R: 25-40-48/25-50/53 S: (1/2-)22-36/37-45-60-61	
602-046-00-2	Heptachlor	200-962-3	76-44-8	T; R24/25 Carc. Cat. 3; R40 R33 N; R50-53	T; N R: 24/25-33-40-50/53 S: (1/2-)36/37-45-60-61	
602-063-00-5	Heptachlor epoxide	213-831-0	1024-57-3	T; R25 Carc. Cat. 3; R40 R33 N; R50-53	T; N R: 25-33-40-50/53 S: (1/2-)36/37-45-60-61	
602-047-00-8	Chlordane	200-349-0	57-74-9	Carc. Cat. 3; R40 Xn; R21/22 N; R50-53	Xn; N R: 21/22-40-50/53 S: (2-)36/37-60-61	
606-019-00-6	Chlordecone	205-601-3	143-50-0	Carc. Cat. 3; R40 T; R24/25 N; R50-53	T; N R: 24/25-40-50/53 S: (1/2-)22-36/37-45-60-61	

✓ **Ordinance No. 3 of 1.04.2004 on classification of waste (promulgated SG 44/25.05.2004), effective as of 25.05.2004, as amended and supplemented, SG 23 of 20.03.2012.**

The ordinance determines the conditions and order concerning the classification of hazardous waste per types and properties, including agrochemical waste. The classification codes of agrochemical waste as per Annex No. 1 are as follows:

– 02 01 08* agrochemical waste containing hazardous substances;

– 03 02 02* waste from conservation of wood containing halogenated organic wood conservants;

– 07 04 13* waste from the production, formulation, supply and use of organic plant protection mixtures (hard waste containing hazardous substances), mixtures for biocide conservation;

– 15 01 10* - packages containing residues of hazardous substances, or polluted with hazardous substances

Under Annex No. 2: codes of the properties, determining a waste as hazardous: H14 (dangerous to the environment).

✓ **Ordinance on the conditions and order of placement of biocides on the market, (promulgated SG 4/15.01.2008, as amended, SG 51 of 3.06.2008), effective as of 01.01.2008.**

The ordinance regulates the conditions and order of placement of biocides on the market. Biocides are placed on the market and used when a permit has been issued in thereof, or a registration certificate following the order provided for under LPHECSM;

✓ **Ordinance No. 3 of 1 August 2008 on the norms for admissible content of harmful substances in soils (promulgated SG 71 of 12 August 2008)**

The ordinance determines the norms for admissible content of harmful substances in soils and the requirements concerning sample collection and testing of soil samples to determine the content of harmful substances.

✓ **Ordinance No. 9 of 16.03.2001 on the quality of water, intended for drinking and domestic purposes (promulgated SG 30 of 28.03.2001, as amended and supplemented, SG 1 of 4.01.2011, as amended, SG 15 of 21.02.2012, effective as of 21.02.2012), transponing Directive 98/83/EC.**

The ordinance determines the requirements as regards the quality of water intended for drinking and domestic purposes. In Annex No. 1, Table B “Chemical indicators” regulating the maximum value (MV) for pesticides of 0.1 µg/L for each separate active substance, metabolite or a reactive product of pesticides and pesticides (total) of 0.5 µg/L as a sum of the concentrations of all the separate pesticides, detected within the process of monitoring, determined by a quantitative manner. MV for aldrin, dieldrin, heptachlor and heptachlor epoxide is 0,03 µg/L.

✓ **Ordinance No. 12 on the quality requirements regarding surface water intended for drinking and domestic water supply (SG 63 of 2002, as amended SG 15 of 21.02.2012, effective as of 21.02.2012), transponing Directives 75/440/EEC and 79/869/EEC.**

The ordinance determines the requirements regarding the quality of fresh surface water which, after being subjected to appropriate treatment, is used, or is deemed suitable for abstraction of water for drinking and domestic water supply, its categorization and conditions for measurement, sample collection and testing of the indicators, specified in Annex No. 1. The ordinance is applicable to all water from surface water sources which is supplied for drinking and domestic purposes through the water distribution network.

Annex No. 1 “Requirements regarding the quality of surface water intended for abstraction of drinking water” regulates the mandatory value (MV) for category A1, A2 and A3 surface water as follows:

No.	Indicator	Units	Category A1		Category A2		Category A3	
			RV	MV	RV	MV	RV	MV
34.	Pesticides - total	mg/L		0,001		0,0025		0,005

RV: recommendable value
MV: mandatory value

✓ **Ordinance on the requirements regarding bottled natural mineral, spring and table water intended for drinking purposes (promulgated SG 68 of 3.08.2004, as amended SG 66 of 25.07.2008 г. (Regulation 852/2004/EC and Directive 2009/54/EC).**

The ordinance determines the requirements regarding bottled natural, spring and table water, intended for drinking purposes, the conditions and order for application of the methods for processing of natural mineral and spring water and for import of mineral water.

As regards spring and table water the maximum values (MV) for pesticides are as per Annex No. 1, Table B «Chemical indicators» to Ordinance No. 9 on the quality of water intended for drinking and domestic purposes (see above).

✓ **Ordinance No. 11 of 25.02.2002 on the quality of bathing water (promulgated SG 25 of 8.03.2002, as amended, SG 53 of 10.06.2008, effective till 31.12.2014)**

The Ordinance determines the requirements as regards the quality of natural water, intended for bathing in order to protect the health of people, using such natural water for bathing.

The quality of bathing water is determined as per physical, chemical and microbiological indicators, specified in Annex No. 16 regulating the recommendable value (RV) for Pesticides – a total of 1 μg/L. The indicators are determined when the check in the bathing zone proves or raises a doubt as to the presence of a particular pollutant, respectively deteriorated water quality.

✓ **Ordinance No. 5 on bathing water management (promulgated SG 53 of 2008, as amended, SG 15 of 2012)**

This ordinance transpones the requirements of Directive 2006/7/EC concerning the management of bathing water quality and repealing the above specified Ordinance No. 11. Ordinance No. 5 does not pose any requirements as regards the monitoring of pesticides in bathing water. After the 2011 bathing season, MoH applies the requirements under Ordinance No. 5 as regards the determination of indicators being monitored for bathing water. The ordinance provides a possibility, in the course of conducting research related to preparation of the bathing water profiles, if a contamination doubt exists, etc., to perform analyses of pesticides as well, including POPs pesticides.

✓ **Ordinance No. 3 of 16.10.2000 on the conditions and order for research, design, establishment, validation and operation of sanitary protection zones around water sources and facilities for drinking and domestic water supply and around the sources of mineral water used for healing, preventive, drinking and hygiene needs (promulgated SG 88 of 27.10.2000)**

This ordinance determines the conditions and order for conducting a research, design, establishment, validation and operation of sanitary protection zones (SPZ) around the water sources and the facilities for: drinking and domestic water supply from surface water; drinking and domestic water supply from groundwater; and mineral water used for healing, preventive, and hygiene-related needs.

3.1.4. Placing on the market and use, import and export of plant protection products (PPP)

3.1.4.1. PPPs authorized for placing on the market and use in Bulgaria

The active substances (AS) intended for production of plant protection products (PPP) for the purpose of placing on the market and use in Bulgaria must be approved following the order provided for under Regulation 1107/2009.

In 2011 for placing on the market and use there are 517 authorized PPPs (fungicides, insecticides and herbicides), containing 209 active substances.

Source: BFSA, February 2012

3.1.4.2. Import and export of PPPs authorized for placing on the market and use

Intercommunity shipments of PPP for EU member states

Since Bulgaria's accession to the EU, during the period 2007 – 2010 the intercommunity shipments of permitted PPPs from Bulgaria to EU member states amount to a total of about 16 tons. The greatest percentage share in the intercommunity shipments of permitted PPPs from Bulgaria is of Greece – 94.4%, followed by Germany – 6.3%.

Source: NRA, April 2011

Intercommunity deliveries of PPPs from EU member states

For the period from the year 2007 to 2010 the intercommunity deliveries of PPPs permitted for use in the country from EU member states amount to 439.8 tons.

The greatest percentage share in the intercommunity deliveries of permitted PPP in the country is of France – 44.9%, followed by the Netherlands – 20.1% and Italy – 12.6%. The percentage share of the remaining EU member countries is below 10%.

Source: NRA,April 2011

3.1.4.3. Control on PPP market

The control over the market and use of plant protection products (PPP) in Bulgaria is exercised by Bulgarian Food Safety Agency (BFSA) through the 28 regional food safety directorates (RFSDs) in accordance with the Single multi-annual national control plan (SMANCP). The competent authority in the area of plant protection is BFSA.

The main objective of the control over the offering on the market, storage, repackaging and use of plant protection products is to guarantee the safety of foods of plant origin; to admit for offering on the market only plant protection products which are permitted and fit for use, with labels in Bulgarian language, contained in original sealed packages of their producer, or repackaged by an entity holding a permit thereto.

The analyses of and samples from PPP and plant sampling is performed at the Central Laboratory for Chemical Testing and Control (CLChTC) – Sofia.

The inspectors conduct regular inspections of the regulated sites for trade and storage of PPP (agricultural chemist's, warehouses and repackaging workshops), as well as of unregulated sites (markets, market-places, shops) on the territory of the respective RFSD, as well as on the territory of neighbouring RFSDs.

In the course of exercising the controlling activity, any PPP as to which it has been established that they are not permitted, with a past expiry date, incompliant as compared to their labeling, with proven incompliance of the indicators, approved when the product has been permitted, shall be banned for sale, sealed and left for custody at the sites where same have been detected. A time period for their disposal is provided as per the Waste Management Act, or they are seized by the RFSD inspectors and left for storage at the warehouses determined for such purpose within the territory of the country.

For 2011 the total amount of the PPPs which were banned for sale, sealed and seized, is 556,515 kg, in granulated or powder form, and 7551,979 l liquid products (BFSA, February 2012).

Source: BFSA, March 2012

3.1.5. Inventory of POPs pesticides and other obsolete pesticides and pesticides with expired shelf-life

3.1.5.1. Methodology for performance of Inventory

The management of POPs pesticides in Bulgaria is performed in accordance with the adopted and effective statutory instruments, mechanisms and procedures. Their implementation guarantees the prevention to a maximum degree of the harmful impact of POPs pesticides on human health and the environment.

The collection of information for updating an inventory (amounts and location of obsolete pesticides, number of warehouses per regions, number of BB-cubes and amounts of pesticides therein, as well as other data) is executed as per:

- ✓ available data (archive documents) for import and use of POPs pesticides and other obsolete pesticides;
- ✓ data provided by MoEW; EEA ; BFSA ;NSI; NRA; CA;
- ✓ data of MoEW under other projects related to POPs pesticides;
- ✓ reports of the Bulgarian EEA on the state of environment for previous years ;
- ✓ implemented projects for safe storage and/ or disposal of obsolete pesticides out of the territory of Bulgaria.

3.1.5.2. Introduction

The purpose of inventory is to identify and update the available amounts of POPs pesticides, as listed in Annex A and B to the Stockholm Convention and other obsolete and expired plant protection products (PPP) on the territory of Bulgaria.

The problems with obsolete pesticide stockpiles arise in the country after the year 1990, as a result of the lack of rational planning and excessive hoarding by the former CF and AIC.

In respect of these amounts of obsolete pesticides, as per the Environment Protection Act (Article 15.1, item 3) and the Waste Management Act (Article 16) the responsibility is currently being borne by the mayors of municipalities who organize waste management activities on the territory of the relevant municipality.

Since the year 2000 to date RIEW at the MoEW annually inspect the warehouses for obsolete pesticides and collect information about the available amounts and their current status. The monitoring and control is executed by MoEW (EEA and RIEW) with the assistance of MoAF (BFSA and RFSDs) General Directorate “Fire Safety and Protection of the Population” at the Ministry of Interior (MoI). Since 2007 to date EEA maintains the provision of public access to database of obsolete pesticides on the website of EEA: http://eea.government.bg/.

The safeguarding of the obsolete pesticide stockpiles available in Bulgaria, including: also POPs pesticides is implementedthrough storage in centralized state or municipal warehouses, disposal in BB cubes (reinforced steel-concrete containers with dimensions 195 x 19 5x 195 cm, hermetically sealed and useful volume of 5 m^3) or export for final disposal/incineration out of the country.

3.1.5.3. Inventory of POPs pesticides

3.1.5.3.1. Production, placing on the market, use, import and export of POPs pesticides

Production of POPs pesticides: It was found out, that none of the 15 POPs pesticides, listed in Annex A, or B to the Stockholm Convention, had never been produced in Bulgaria. Plant protection products (PPP), containing POPs substances have not been formulated in the country.

Import of POPs pesticides: Currently, the import in Bulgaria of all 15 POPs pesticides, listed in the Stockholm Convention is prohibited.

POPs pesticides have been imported in Bulgaria mainly during the period 1950 – 1990, mostly during the 1960s of the XXth century in amounts ranging from 100 t to 200 t per annum. Aldrin, dieldrin and endrin have been imported during the period 1960 -1969 , DDT – from 1950 to 1969; heptachlor and toxaphene – until 1991 and until 1985, accordingly; lindane (γ-HCH) – till 1990, and endosulfan - till 2004. Mirex, HCB, chlordane, chlordecone, PeCB, α-HCH and β-HCH have not ever been imported in Bulgaria.

Placing on the market and use of POPs pesticides: In Bulgaria most of the POPs pesticides were used in the past as insecticides.

All 15 POPs pesticides are currently prohibited for placing on the market and use in Bulgaria. The initial 9 POPs pesticides have been prohibited for placing on the market and use several decades ago. In 1969 the use of aldrin, dieldrin, endrin and DDT is prohibited, in 1985 - the use of toxaphene, in 1991 – the use of heptachlor, and in 1996 – the use of lindane. Endosulfan has been used in Bulgaria till the year 2005. Mirex, HCB, chlordane, chlordecone, PeCB, α-HCH and β-HCH have not been placed on the market and used in the country.

In Bulgaria for the following PPP, containing the active substance lindane, have been permitted for placing on the market and use: "A Lindane 2,8"(1964); "Lindane 2,8"(1966); "Lindane 2,8 P" (1988 – 1990 as an insecticide); "Combicid 5 G"(1994). During the period 1991 – 1993 not any PPPs with lindane as active substance have been registered. The permitted PPP "Lindane 2,8 P" and "Combicid 5 G (4,6% fenitrothion и 0,5% lindane) have been prohibited for use in the year 1994. On the List of PPPs permitted for use in use в Bulgaria from the year 1996, lindane falls within the section "PPPs, prohibited for import and use in Bulgaria". Since the year 2000 lindane is added to the list of active substances for which the European Commission has adopted a decision not to be included in the list of active substances permitted in the European Union (EU), (Directive 2000/801/EC concerning the non-inclusion of lindane in Annex I to Council Directive 91/414/EEC and the withdrawal of authorizations for plant-protection products containing this active substance).
Endosulfan has been placed on the market in the country till the year 2004 and has been used as an insecticide under various trade names (Thiodan 35 EC, Thiodan C, Thionex 35 EC, Thiodin 33 EC, Thiotox 35 EC, Thiocide One, Thiodin 35 EC, Thiogreen 35 EC). It is prohibited for placement on the market in the year 2005. Its use has been permitted till June 2006. Since 2005, endosulfan is included in the list of active substances, in respect of which the European Commission has decided not to be included in the list of active substances, permitted in the EU and which may not be used for manufacturing of plant protection products for the purpose of being placed on the market and of being used on the territory of EU (Directive 2005/864/EC concerning the non-inclusion of endosulfan in Annex I to Council Directive 91/414/EEC and the withdrawal of authorizations for plant protection products containing this active substance).

Export of POPs pesticides: POPs pesticides have not been exported from Bulgaria, except for the purpose of environmentally sound disposal outside of the territory of Bulgaria, due to the lack of a suitable incineration facility in the country.

In August 2000 from warehouses for prohibited and obsolete pesticides from four regions in the country there were collected and analyzed samples from approx. 41,2 t of obsolete pesticides supposed to contain DDT, aldrin, dieldrin, heptachlor and endrin. The analysis of the samples proved the presence of DDT, aldrin, dieldrin, endrin, heptachlor and toxaphene in about 28 t of POPs pesticides. The identified amounts of POPs pesticides were repackaged in new barrels, labeled in accordance with the requirements as per the European standards, and transported to an interim storage-site. Under the project "Destruction of risk pesticides from Bulgaria in the Netherlands", 27,680 kg of POPs pesticides from the regions of Sofia, Plovdiv, Shumen and Burgas have been exported, and destroyed in an incinerator in Rotterdam, the Netherlands, with funds granted by the Government of the Netherlands.

During the period 2007 – 2010 another 82,018 kg of prohibited, obsolete and unfit for use pesticides with unknown composition have been exported for final disposal in Germany, as a part of these could have been contaminated with POPs (Table No. 11).

Table 11: Export of POPs and other obsolete pesticides for disposal out of the territory of the country for the period 2000 – 2010.

Waste – POPs and other obsolete pesticides	Type of waste	Year of export	Amount, kg	EU member state
Waste – POPs pesticides	Aldrin	2000	3 531	The Netherlands
	Dieldrin	2000	131	The Netherlands
	Endrin	2000	204	The Netherlands
	Toxaphene	2000	720	The Netherlands
	Heptachlor	2000	4 609	The Netherlands
	DDT	2000	18 485	The Netherlands
	Total	2000	27 680	The Netherlands
Waste – obsolete pesticides with unknown composition	Obsolete banned and unfit for use pesticides	2007	13 790	Germany
		2008	51 720	Germany
		2009	12 156	Germany
		2010	4 352	Germany
Total obsolete pesticides	Obsolete pesticides	2007-2010	82 018	Germany
Total POPs and other obsolete pesticides		2000 – 2010	109 698	

The total export of POPs and other obsolete pesticides during the period 2000 – 2010 amounted to 109,698 kg, destroyed in the Netherlands and Germany.

SUMMARIZED CONCLUSIONS:

- **No POPs pesticides have ever been produced in Bulgaria;**
- **The initial 9 POPs pesticides included in the Stockholm Convention have been imported and used in Bulgaria during the period 1950 – 1991. Aldrin, dieldrin, endrin and DDT have been imported and used till the year 1969, toxaphene – till the year 1985, and heptachlor – till the year 1991. The new POPs pesticide Lindane has been imported to Bulgaria in the period 1988 – 1990, and its use has been prohibited in 1996. The import and use of endosulfan have been terminated in 2004.**
- **Mirex, HCB, chlordane, chlordecone, α-HCH and β-HCH and PeCB have not been imported and used in Bulgaria.**
- **Currently the import and use of all 15 POPs pesticides are prohibited in Bulgaria.**
- **POPs pesticides have not been exported from the country, unless for the purpose of environmentally sound disposal outside the territory of Bulgaria due to the lack of a suitable incineration facility in the country.**
- **In August 2000, POPs pesticides amounting of 27,680 kg (containing or contaminated with DDT, aldrin, dieldrin, toxaphene and heptachlor) were exported to the Netherlands and destroyed in an incinerator in Rotterdam. During the period 2007– 2010 another 82,018 kg of other obsolete pesticides of unknown composition have been exported for final disposal in Germany. The total export of POPs and other obsolete pesticides amounts to 109,698 kg, destroyed in the Netherlands and Germany.**

3.1.5.3.2. Waste contaminated with or consisting of POPs pesticides

In 1995 a documents-based inventory was performed in order to identify the availability of any POPs pesticides prohibited for use by NPPS, and in 1996 – by MoAF. Certain amounts of POPs pesticides were identified. In 1995 there were declared about 47,267 kg of obsolete POPs pesticides, out of which the greatest amount was of DDT (29,234 kg), followed by heptachlor (11,156 kg). The inventory in the year 1996 established the availability of 77,215 kg of POPs pesticides, as the greatest amount was that of Toxaphene – 34 954 kg (Table No. 12).

Table 12: Available amounts of POPs pesticides in Bulgaria in 1995 and in 1996.

POPs pesticides	Declared POPs pesticides in inventory based on documents in the year 1995, kg	Declared POPs pesticides in inventory based on documents in the year 1996, kg
Aldrin	4 926	1563
Dieldrin	1 726	528
Endrin	20	200
Toxaphene	205	34 954
Heptachlor	11 156	11 156
DDT	29 234	28 814
Total POPs	47 267	77 215

The results of these two inventories are documentary only, no site inspections were performed and no analyses were initiated. The amount of POPs pesticides in Bulgaria cannot be accurately determined due to the lack of documentation, due to inability for identification caused by torn packaging, missing labels, and mixing with other pesticides.

In the course of the inventory in the year 2000 and in the year 2001 (Table No. 13) there was established the availability of obsolete POPs pesticides and mixtures, containing or contaminated with POPs, but the amounts differed from those declared in the years 1995 and 1996.

Table 13: Identified amounts of POPs pesticides in 2001 after export in 2000

POPs pesticides	Number of warehouses	Regions	Amount before export, kg, 2000	Export, kg, 2000	Amount after export, kg, 2001
Aldrin	8	8	3 531	3 531	-
Dieldrin	7	6	131	131	-
DDT and DDT-treated wheat*	22	11	18 485	18 485	50 312*
Endrin	3	2	204	204	-
Heptachlor	57	16	11 156	4 609	6 547
Toxaphene	2	1	720	720	-
TOTAL POPs pesticides before and after export	99	22	33 927	27 680	56 859

The available in the year 2001 6,547 kg of heptachlor and 50,312 kg of DDT were encapsulated in 30 BB-cubes in the years 2004 and in 2005. The amount of DDT* is not known; however, it is supposed to be about 1/3, while the remaining amount consists of wheat treated with DDT, since the useful volume of the BB-cubes is not filled up.

During the annual inventories for the period 2002 – 2010 there were additionally identified 104,045 kg of lindane. Taking into account also the data from the previous inventories, the stored obsolete POPs pesticides in Bulgaria in the year 2010 are assessed at a total of 160,904 kg, DDT, heptachlor and lindane (Table No. 14 and figure No. 3) as follows:

✓ Encapsulated in 91 BB-cubes: a total of 156,434 kg, comprising 6,547 kg heptachlor (in 2 BB-cubes); 50,312 kg of DDT (DDT in12 BB-cubes and wheat treated with DDT in 16 BB-cubes) and 99,575 kg of lindane (in 61 BB-cubes). The obsolete POPs pesticides are encapsulated in BB-cubes in the period 2004 – 2007 as an alternative to their disposal in mines (operation D12). The BB-cubes are located on the territory of 13 municipalities: with heptachlor – in the village of Kranevo, municipality of Aytos and in the village of Atiya, municipality of Sozopol; with DDT – in the village of Bozhurishte, town of Breznik, village of Kosharevo, municipality of Breznik, town of Devnya, village of Ivanovo, municipality of Ruse, village of Stefanovo, municipality of Radomir, with lindane – in the village of Kranevo, municipality of Aytos; village of Dolna Chubrika, municipality of Ardino; town of Breznik, and the village of Kosharevo, municipality of Breznik, village of Krushovene, municipality of Dolna Mitropoliya; village of Elov Dol, municipality of Zemen, village of Gabrovnitsa, municipality of Montana; village of Elenovo, municipality of Nova Zagora; village of Stefanovo, municipality of Radomir; village of Atiya, municipality of Sozopol; village of Suvorovo; town of Shabla and the village of Meden Kladenets, municipality of Yambol.

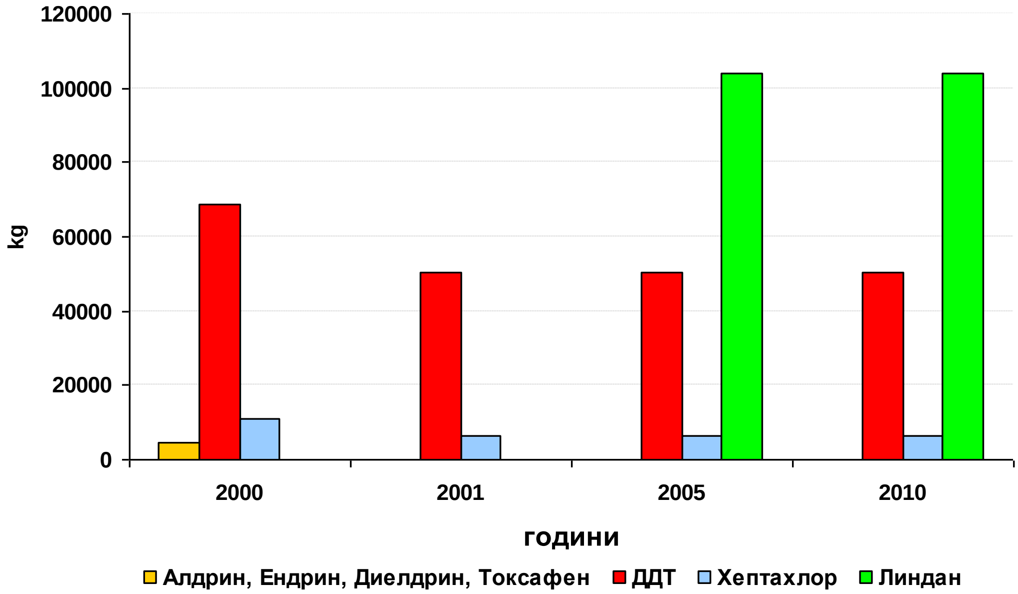
✓ A total of 4,470 kg of lindane, stored at 4 warehouses in good condition (2 municipal and 2 privately owned) on the territory of 3 municipalities. The municipal warehouses are located in the village of Zvenimir, municipality of Glavinitsa (30 kg) and in the village of Razdel, municipality of Dulovo (2600 kg). The private warehouses are situated in the village of Zafirovo, municipality of Glavinitsa (40 kg) and in the village of Kalipetrovo, municipality of Silistra (1,800 kg).

✓ POPs pesticides comprise only 1.18% of all available in the year 2011 obsolete and unfit for use pesticide stockpiles in Bulgaria (see Table No. 15).

In the course of the conducted annual inventories of obsolete pesticides, including the one in the year 2010, there has not been established any availability of the following POPs pesticides: mirex, HCB, chlordane, chlordecone, PeCB, α-HCH and β-HCH, since these have not been imported and used in Bulgaria.

Table 14: Identified amounts of obsolete POPs pesticides in Bulgaria in 2010

POPs pesticide	UoM	Amount
Aldrin	kg	-
Dieldrin	kg	-
Endrin	kg	-
Endosulfan	kg	-
Toxaphene	kg	-
Heptachlor in 2 BB cubes	kg	6 547
DDT in 28 BB cubes	kg	50 312
Lindane, total - in 61 BB-cubes - in 4 warehouses	kg	104 045 99 575 4 470
TOTAL POPs pesticides	**kg**	**160 904**



YEARS
aldrin, endrin, dieldrin, toxaphene DDT heptachlor lindane
Figure 3: Available POPs pesticides in the country per years: 2000 – 2010.

As regards the treatment of agrochemical waste from obsolete pesticides, the following options exist: above ground incineration at hazardous waste incineration plants (operation D10) and permanent underground storage in mines (operation D12). Due to the lack of incinerator facilities for incineration of hazardous waste in the country, such waste is exported to Europe for disposal.

SUMMARIZED CONCLUSIONS:

- ✓ **Several inventories of POPs pesticides have been compeleted in Bulgaria over the years.**
- ✓ **In 2010 in Bulgaria there about 161 t of obsolete POPs pesticides (heptachlor, DDT and lindane) were identified. Approximately 156.5 t of POPs pesticides have been disposed in 91 BB-cubes during the period 2004 – 2007, as an alternative to disposal in mines, and about 4.5 t of lindane are stored in 4 warehouses in good condition, as it will be exported for disposal outside the territory of the country.**
- ✓ **Obsolete pesticides are located on the territory of 16 municipalities.**
- ✓ **POPs pesticides comprise only 1.18% out of all obsolete pesticides in Bulgaria in the year 2011.**
- ✓ **No available amounts of the following POPs pesticides have been identified : mirex, HCB, chlordane, chlordecone, PeCB, α-HCH and β-HCH, since no import and use in the country has been found out .**

3.1.5.4. Inventory of other obsolete and expired pesticides

Any expired PPPs in Bulgaria constitute hazardous waste, under the Waste Management Act.

In Bulgaria, the mayors of municipalities organize the activities for waste management on the territory of the respective municipality and are responsible for the management of hazardous waste from obsolete pesticides.

Obsolete pesticides are stored at state, municipal, cooperative and private warehouses and in BB-cubes, as the greater part of the warehouses are owned by the municipalities.

Warehouses for storage of obsolete pesticides are one of the potential sources of local soil contamination. The presence of expired pesticides stored at abandoned or unsafeguarded places pose a risk to the environment and human health. This necessitates taking of urgent measures for their safeguarding and/ or final disposal.

While on the one hand the responsibility for disposal of obsolete pesticides is within the competencies of the mayors of municipalities, the environmentally sound disposal of pesticides requires the existence of an appropriate incineration plant for incineration of such waste, as such plant in Bulgaria does not exist. On the other hand, the ownership of the warehouses for storage of obsolete pesticides is not only municipal, and this explains the existence of a number of financial, organizational and legal restrictions, obstructing the mayors in the performance of their obligations. The private and cooperative owners of warehouses for storage of waste from obsolete pesticides also face problems, including with the access to crediting, or other type of financing for waste disposal.

Since 2000 to date, every year RIEW at MoEW inspect the warehouses for obsolete pesticides and collect information about the available amounts and their condition. Monitoring and control are exercised by MoEW (EEA and RIEW) with the assistance of MoAF (BFSA and RFSD).

The control over the storage of non-permitted PPPs, remaining available amounts with a terminated permit for placement on the market and use, or with expired shelf-life, placed in warehouses of producers, traders and distributors of PPP, is exercised by BFSA. Such PPP are stored in places specially marked for such purpose within the sites.

The construction of centralized state and municipal warehouses and BB-cubes meeting the regulatory requirements for safe disposal, liable storage of available obsolete pesticides stockpiles and cleaning up of emptied storage premises and sites, as well as their final disposal outside the territory of Bulgaria, are activities, that illustrate the consistency in envrionment protection policy and sustainable management of obsolete pesticides.

Since 2007 to date EEA maintains the provision of public access to a database of the amounts of obsolete pesticide stockpiles on the webpage of EEA : http://eea.government.bg/.

3.1.5.4.1. Available amounts of obsolete pesticides for the period 2001 – 2011.

The summarized data about stored obsolete pesticides in Bulgaria for the period 2001 - 2011 indicate that the available amounts vary over the years, which is on the one hand due to the ever better reporting and identification of the stored pesticides, and on the other – due to the identified new amounts of abandoned pesticides, or those confiscated by RFSDs.

The available amounts of obsolete pesticides have increased from 7,416 t in the year 2001 to 13,623 t in the year 2011, and yet at the same time, great efforts are made and measures are taken for their safe disposal and custody, as the safeguarded amounts of obsolete pesticides, stored in newly-built and repaired state and municipal warehouses and those disposed in BB cubes have increased by several imes from barely 1,851 t in the year 2001 to 12,023 t in the year 2011.

In Table No. 15 and figure 4 the identified amounts of obsolete and expired pesticides are specified per years for the period 2001 – 2011.

Table 15: Available obsolete pesticides stockpiles in Bulgaria for the Years 2001 -2011

Available obsolete pesticide stockpiles in Bulgaria by Years	Amount, t
Year 2001	
Total in warehouses and BB-cubes	**7 416**
in 772 warehosues, including:	5565
in 16 centralized;	1017
in 756 not repaired warehouses	4548
in 468 BB-cubes	1851
Total safeguarded obsolete pesticides, stored in warehouses and in BB-cubes	**2828**
Year 2002	
Total in warehouses and BB-cubes	**8 952**
in 715 warehouses, including:	6386
in 37 centralized warehouses, and	1995
in 678 not repaired warehouses	4391
in 710 BB-cubes	2566
Total safeguarded obsolete pesticides, stored in warehouses and in BB- cubes	4521
Year 2003	
Total in warehouses and BB-cubes	**12 394**
in 651 warehouses, including:	8835
in72 centralized warehouses	4656
in 579 not repaired municipal warehouses	4179
in 957 BB-cubes	3559
Total safeguarded obsolete pesticides, stored in warehouses and in BB-cubes	**8215**
Year 2004	
Total in warehouses and BB-cubes	**11 222**
in 561 warehouses, including:	7011
in 84 centralized warehouses	4703
in 477 not repaired municipal warehouses	2308
in 1255 BB- cubes	4211
Total safeguarded obsolete pesticides, stored in warehouses and in BB-cubes	**8914**
Year 2005	
Total in warehouses and BB-cubes	**13 519**
in 495 warehouses, including:	7492
in 81 centralized warehouses	4979
in 414 not repaired municipal warehouses	2513
in 1612 BB-cubes	6027
Total safeguarded obsolete pesticides, stored in warehouses and in BB-cubes	**11006**
Year 2006	
Total in warehouses and BB-cubes	**14111**
in 463 warehouses, including:	7730
in 84 centralized warehouses	5197
in 379 not repaired municipal warehouses	2533
in 1604 BB cubes	6381
Total safeguarded obsolete pesticides, stored in warehouses and in BB-cubes	**11 578**

Available obsolete pesticide stockpiles in Bulgaria by Years	Amount, t
Year 2007	
Total in warehouses and BB-cubes	**13 655**
in 405 warehouses, including:	6447
in 72 centralized warehouses	4429
in 333 not repaired municipal warehouses	2018
in 1802 BB-cubes	7208
export to Germany	14
Total safeguarded obsolete pesticides, stored in warehouses and in BB-cubes	**11 637**
Year 2008	
Total in warehouses and in BB-cubes	**13 590**
in 385 warehouses, including:	6138
in 72 centralized warehouses	4162
in 313 not repaired municipal warehouses	1976
in 1863 BB- cubes	7452
export to Germany	52
Total safeguarded obsolete pesticides, stored in warehouses and in BB-cubes	**11 614**
Year 2009	
Total in warehouses and BB-cubes	**13 786**
in 371 warehouses, including:	6082
in 73 centralized warehouses	4126
in 298 not repaired municipal warehouses	1956
in 1926 BB-cubes	7704
export to Germany	12
Total safeguarded obsolete pesticides, stored in warehouses and in BB-cubes	**11830**
Year 2010	
Total in warehouses and BB-cubes	**14 083**
in 381 warehouses, including:	6403
in 74 centralized warehouses	4301
in 307 not repaired municipal warehouses	2102
in 1920 BB- cubes	7680
export to Germany	4.5
Total safeguarded obsolete pesticides, stored in warehouses and in BB cubes	**11 981**
Year 2011	
Total in warehouses and BB-cubes	**13 623**
In 377 warehouses, including:	6067
in 92 centralized warehouses	4467
in 285 not repaired municipal warehouses	1600
in 1889 BB-cubes	7556
Total safeguarded obsolete pesticides, stored in warehouses and in BB cubes	**12 023**

The National Programme for Waste Management Activities (NPWMA) for the period 2009 – 2013 sets forth a policy on the management of obsolete pesticides in the country, which is related to undertaking measures for final disposal of obsolete pesticides.

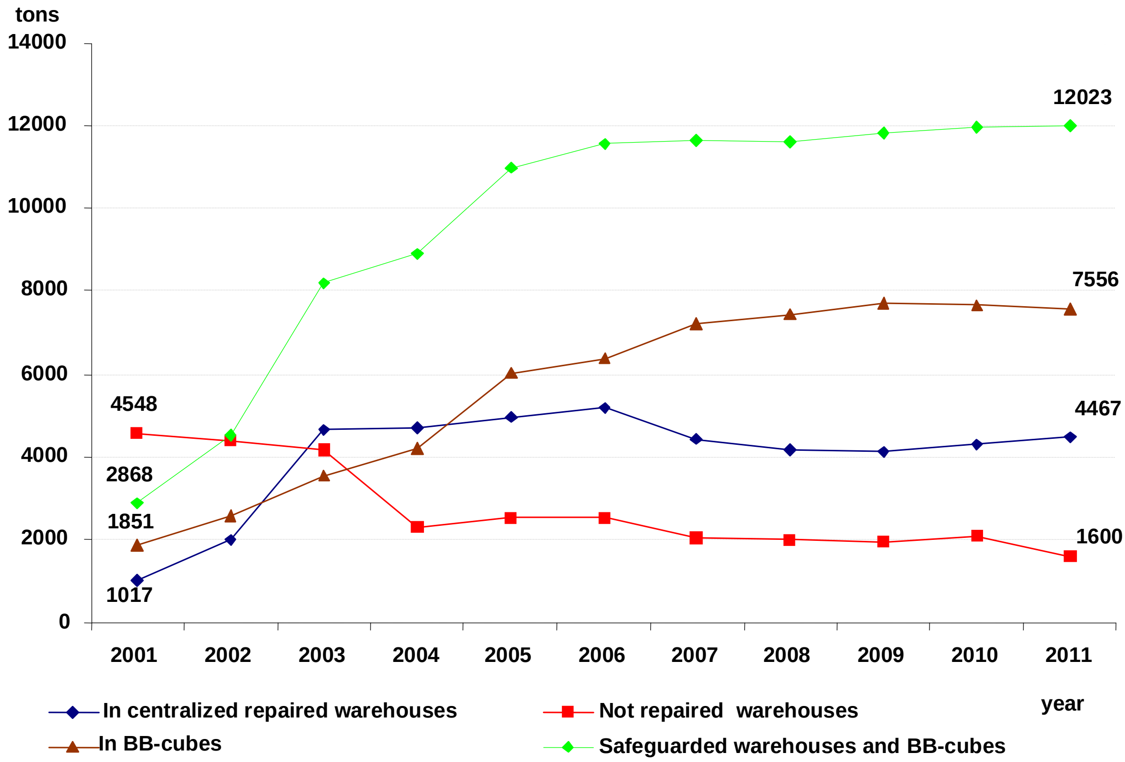


Figure 4: Amounts of other obsolete pesticides which are banned, unfit for use and with expired shelf-life in Bulgaria per years for the period 2001 – 2011

Source: MoEW, EEA, 2001 and March 2012

During the period 2001 – 2011 more than 470 unrepaired warehouses were liquidated, as the obsolete pesticides stored therein have been collected, repackaged, and moved to repaired, or newly built centralized warehouses, while another part thereof was encapsulated in BB cubes. During the same period the unsafeguarded obsolete pesticides, stored at unrepaired warehouses decreased by 65%.

In the year 2011 the secured amount of obsolete pesticides, stored in newly-built or repaired centralized warehouses and/ or disposed in BB-cubes amounted to 12,023 t (4,467 t in 92 centralized warehouses and 7,556 t in 1,889 BB-cubes), constituting 88.3% of the total amount of stored obsolete pesticides.

The former practice of disposal of pesticides in BB-cubes has already been terminated, taking into account its temporary nature, necessity of subsequent care for the storage thereof, such as guarding and monitoring, as well as the provision of subsequent actions in view of the final disposal thereof, as thereby the final price for disposal of the pesticides is being raised. Due to the lack of a suitable facility for disposal in the country, obsolete pesticides will be exported out of the country with priority for the purpose of their final disposal.

Before the year 2007, export of obsolete pesticides for disposal out of the country was initiated, as during the period 2007 – 2011, 82.5 t of obsolete pesticides were exported for disposal in Germany.

3.1.5.4.2. Swiss programme for export of obsolete pesticides for disposal

Under the Bulgarian – Swiss programme for cooperation the project «Environmentally sound disposal of pesticides unfit for use and other plant protection preparations» has been approved, and is to be implemented in the period 2012 – 2019. It is envisaged to repackage and export at least 6,403 t of obsolete pesticides, out of which 5 t of lindane. It is planned that during the period 2015 – 2019 these will be disposed at a licensed facility in Europe. As a result of these activities, 131 warehouses for obsolete pesticides will be removed on the territory of 16 regions and 60 municipalities, as priority is to be given to vacation of warehouses in bad condition near settlements and those containing lindane. It is expected that warehouses and sites having a total area of 400,000 m^2 will be refurbished. About 156 t of DDT, heptachlor and lindane which will be additionally disposed in 91 BB-cubes, will also be exported for disposal under the Swiss programme, as thereby all 161 t of POPs pesticides available in the country will be disposed.

The reduction of the number of warehouses for storage of obsolete pesticides will reduce the threat of pollution for the environment and the risk for the people living in the proximity of these warehouses. The problem with the available obsoleteте POPs pesticides will be resolved definitively as the country will fulfill its obligations for liquidation of the POPs pesticides under the Stockholm Convention.

The funds for financing the programme are provided by the Swiss government and through national co-financing. As a result of the project, it is expected to systematize the disposal of obsolete pesticides and provide such disposal with the necessary specialized studies, to create a clear-cut, economically justified and operational institutional organization for solving the problem and to establish and observe a time schedule for financing the remaining activities related to the disposal of obsolete pesticides and reclamation of the territories on which same have been located.

3.1.5.4.3. Funding from the state budget

Funds from the state budget (SB) are granted annually in order to safeguard the obsolete amounts of pesticides, distributed through the Enterprise for Management of Environmental Protection Activities (EMEPA) at MoEW and through MoAF for gratuitous financing of municipal projects for collection, repackaging, relocation and safe storage at repaired or newly-built centralized warehouses, or permanent storage in BB-cubes and/ or collection, repackaging, transporting and disposal out of the territory of Bulgaria pesticides which are unfit for use (figure.No. 5).

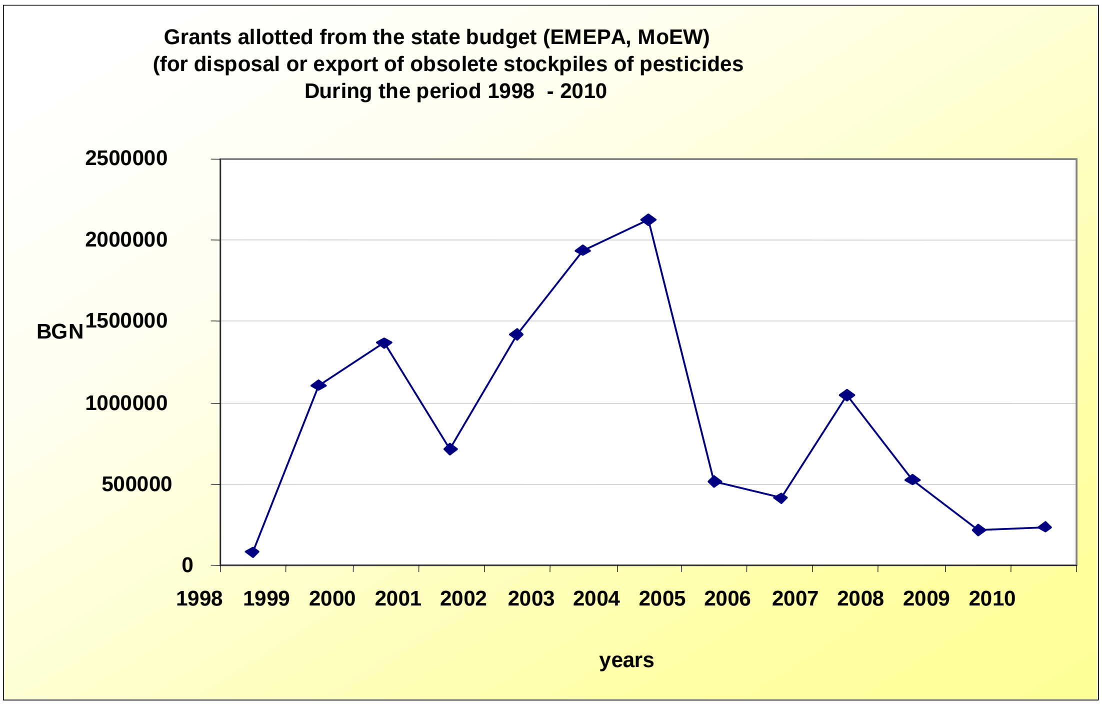


Figure 5: Funds granted from the state budget for safe storage or disposal outside the territory of Bulgaria of obsolete and unfit for use pesticides till the year 2010.

For the period 1998 – 2010 for safe storage or disposal of obsolete pesticides out of the territory of Bulgaria SB were been annually granted through EMEPA, as their sum amounts to BGN 11,726,456 (EUR 5,995,734).

For the period 2000 – 2010, EMEPA provided funding to 134 municipalities through 206 signed and performed contracts at a total value of BGN 9,279,595 for construction of new, or repair of old warehouses for safe storage, disposal in BB-cubes, or disposal of obsolete pesticides out of the territory of Bulgaria.

Source: EMEPA, MoEW, 2011

SUMMARIZED CONCLUSIONS:

❖ **Since the year 2000 annual inventories are carried out in Bulgaria in respect of obsolete pesticides, including such that contain POPs;**

❖ **Obsolete pesticides are stored in state, municipal, cooperative, and private warehouses, a part of which are centralized (repaired or newly constructed) and the remaining are not safeguarded to a sufficient extent, or disposed in BB-cubes;**

❖ **For the period 2001 - 2011 the amounts of obsolete pesticides stored in Bulgaria vary over the years, which is on the one hand due to the ever better reporting and identification of stored pesticides, and on the other – due to the detected new amounts of obsolete pesticides, resulting from illigal disposal, or from confiscation of unpermitted or expired PPPs.**

❖ **In 2011 the stored obsolete pesticides, expired pesticides and pesticides not permitted for use amount to a total of 13,623 t, which are stored at 92 centralized warehouses (4,467 t), 285 unrepaired warehouses (1,600 t) and in 1,889 BB-cubes (7,556 t), as only about 161 tons of these are POPs pesticides (1.18%). A decrease in the available obsolete pesticides is reported by 460 t as compared to those in the year 2010.**

❖ **In 2011 the safeguarded amounts of obsolete pesticides, stored in newly-built, or repaired centralized warehouses meeting all requirements and/ or disposed in hermetically sealed reinforced concrete containers BB-cubes, amount to 12 023 t, constituting 88.3 % of the total of the stored obsolete pesticides.**

❖ **Not safeguarded to a sufficient extent remain the obsolete pesticides stored at unrepaired warehouses. In 2011 obsolete pesticides are stored at 285 unrepaired warehosues, as their amount equals approx. 1,600 t (12 % of all obsolete pesticides), as a decrease by 5,002 t is marked, as compared to the year 2010.**

❖ **Since 2007 export of obsolete pesticides has been initiated for the purpose of their final disposal out of the territory of Bulgaria, as for the period 2007 – 2011 a total of 82.5 t of obsolete pesticides have been exported to Germany due to the lack of appropriate facility for disposal thereof in Bulgaria.**

❖ **Since 2007 a public register of warehouses for storage of obsolete pesticides is kept and annual updating is performed in respect of the database of the amounts of obsolete pesticides, stored at warehouses and BB-cubes at a national (EEA) and regional level (RIEW) in the course of the annual monitoring of these sites.**

❖ **Since 2007 monitoring of the areas and soils around the warehouses and the locations for storage of obsolete pesticides is performed to check for any contamination with POPs and other PPP which are not permitted for use.**

❖ **For the period 1998 - 2010 funds have annually been alloted from the state budget for safe storage or disposal of obsolete pesticides out of the territory of Bulgaria, as the amount thereof exceeds BGN 11.5 million.**

❖ **The former practice of disposing pesticides in BB-cubes is terminated taking into account its temporary nature, necessity of subsequent care for the storage thereof, such as security guarding and monitoring, as well as the provision of subsequent actions for their end disposal, thus making the final price for disposal of pesticides much higher.**

❖ **The priority activities for the next years will inlcude gradual elimination of the stored amounts of obsolete pesticide stockpiles through their disposal out of the territory of Bulgaria, including the available amounts of POPs pesticides.**

❖ **The Bulgarian – Swiss programme for cooperation under the project «Environmentally sound disposal of pesticides unfit for use and other plant protection preparations» has been approved, and is to be implemented in the period 2012 – 2019. It is envisaged to repackage and export at least 6,403 t of obsolete stockpiles including: about 161 t of POPs pesticides (DDT, lindane and heptachlor). It is planned for the period 2015 – 2019 for these to be incinerated in a licensed facility in Europe, as 131**

state and municipal warehouses with obsolete pesticides will be liquidated on the territory of 16 regions and 60 municipalities, as priority will be given to the vacation of warehouses in bad condition near settlements and to those storing lindane.

3.1.6. Monitoring of POPs pesticides in the environment and in foods

The competent authority for monitoring of POPs pesticides in the components of the environment (air, surface and groundwater and soils) is MoEW, respectively EEA, with the exception of drinking water, bathing water and mineral water intended for drinking, or used for preventive, healing and hygiene purposes, where the competent authority is MoH and its regional structures – RHI.

As regards human and body liquids (human milk and blood plasma) the competent authority is MoH, accordingly NCPHA and RHI.

Animal origin foods intended for human consumption and live animals, feed and plant origin foods are controlled by BFSA at MoAF.

3.1.6.1. Monitoring of POPs pesticides in the environment

The monitoring of POPs pesticides in the components of environment (surface and groundwater and soils) is performed through the National System for Environmental Monitoring (NSEM). The system is managed by the Minister of environment and water through EEA, which administers NSEM on the entire territory of the country. All measurements and monitoring are carried out by the structures of EEA following unified patterns of sample collection and analyses (БДС EN ISO 6468:2006, БДС ISO 10382:2005, БДС ISO 11464:2002, etc.) while complying with the procedures for quality assurance of measurements and data. All laboratories of EEA are accredited under БДС EN ISO/IEC 17025 "General requirements regarding the competence of testing and calibrating laboratories" by the Executive Agency Bulgarian Accreditation Service (EA BAS).

EEA keeps informational databases at a national and regional levels. The databases at national and regional levels are structured per components of the environment and use shared nomenclatures.

In Bulgaria there are 8 regional laboratories (RL), accredited to determine the content of POPs pesticides in water and soil: Sofia, Burgas, Varna, Veliko Tarnovo, Pleven, Plovdiv, Ruse, at the General Directorate Laboratories and Analytical Activities(GD LAA), EEA at MoEW, in which there are 11 experts working with chromatographic analysis methods.

The assessments of the environmental components status and the reporting of data at a national level are performed by EEA; the assessments at regional level – by RIEWs, the assessments and reporting as regards the status of water resources at basin level – by the 4 River Basin Directorates.

The system for monitoring of chlororganic POPs pesticides includes the National Networks for Monitoring of Surface and Groundwater, Land and Soil.

3.1.6.1.1. Norms for maximum admissible concentrations of POPs pesticides in soils, water and waste

Table No. 16 specifies the norms for maximum admissible concentrations of POPS in the environment.

Table 16: Norms for maximally admissible concentrations of POPs pesticides in environment

Component of the environment, or product	National legislation	Annex to the statutory instrument	Norm for admissible concentration limits (ACL)
SURFACE WATER			
Surface flowing water	Ordinance No. 7 of 8.08.1986 on indicators and norms for determining the quality of surface flowing water,	Annex No. 1: Indicators and norms for determining the admissible degree of contamination (ADC) in various categories of surface	ADC for aldrin = 0.2 μg/L for I, II and III category

<table>
<tr><th>Component of the environment, or product</th><th>National legislation</th><th>Annex to the statutory instrument</th><th>Norm for admissible concentration limits (ACL)</th></tr>
<tr><td></td><td>promulg. SG 96 of 12.12.1986</td><td>flowing water</td><td></td></tr>
<tr><td>Surface water</td><td>Ordinance on the environmental quality standards in respect of priority substances and certain other pollutants, SG 88/09.11.2010</td><td>Annex No. 2:
Part A: Environmental quality standards (EQS)
MAV: mean annual value;
MAC: maximum admissible concentration.</td><td>Standard for surface water (SW) quality
MAV: mean annual value;
MAC: maximum admissible concentration.
<table>
<tr><th>POPs</th><th>MAV internal SW, μg/L</th><th>MAV other.SW, μg/L</th><th>MAC internal SW, μg/L</th><th>MAC other SW, μg/L</th></tr>
<tr><td>Aldrin
Dieldrin
Endrin
Isodrin</td><td>Σ = 0,01</td><td>Σ = 0,005</td><td>not applied</td><td>not applied</td></tr>
<tr><td>total DDT</td><td>0,025</td><td>0,0025</td><td>not applied</td><td>not applied</td></tr>
<tr><td>p,p'-DDT</td><td>0,01</td><td>0,01</td><td>not applied</td><td>not applied</td></tr>
<tr><td>Endosulfan</td><td>0,005</td><td>0,0005</td><td>0,01</td><td>0,004</td></tr>
<tr><td>HCB</td><td>0,01</td><td>0,01</td><td>0,05</td><td>0,05</td></tr>
<tr><td>HCH</td><td>0,02</td><td>0,002</td><td>0,04</td><td>0,02</td></tr>
<tr><td>PeCB</td><td>0,007</td><td>0,0007</td><td>not applied</td><td>not applied</td></tr>
</table></td></tr>
<tr><td>Water intended for drinking and domestic purposes</td><td>Ordinance No. 9 of 16.03.2001 on the quality of water intended for drinking and domestic purposes, SG 30/27.03.2001 last amendment SG 1/04.01.2011 г.</td><td>Annex No. 1:
Table B "Chemical indicators"</td><td>Maximum value (MV) of pesticides
MV for pesticides – 0.1 μg//L for each individual pesticide
MV for pesticides (total) – 0.5 μg//L as a sum of the concentrations of all separate pesticides
MV for persistent organochlorine pesticides (aldrin, dieldrin, heptachlor and heptachlor epoxide) - 0.03 μg/L
MV for persistent organochlorine pesticides (DDT, chlordane, eldrin and HCB) - 0.1 μg/L</td></tr>
<tr><td>Surface water intended for drinking and domestic water supply</td><td>Ordinance No. 12 of 18.06.2002 on the quality requirements regarding surface intended for drinking and domestic water supply, SG 63/ 28.06.2002</td><td>Annex No. 1:
Requirements concerning the quality of surface water intended for drinking water abstraction.</td><td>Requirements regarding the quality of surface water intended for extraction of drinking water
<table>
<tr><th>Indicator</th><th colspan="2">Category A1</th><th colspan="2">Category A2</th><th colspan="2">Category A3</th></tr>
<tr><td>mg/L</td><td>RV</td><td>MV</td><td>RV</td><td>MV</td><td>RV</td><td>MV</td></tr>
<tr><td>Pesticides-total</td><td>-</td><td>0.001</td><td>-</td><td>0.0025</td><td>-</td><td>0.005</td></tr>
</table>
RV: recommended value
MV: mandatory value</td></tr>
<tr><td>Characterization of surface water</td><td>Ordinance No. 13 of 2.04.2007 on surface water (SW) characterization, SG 37 of 8.05.2007</td><td>Annex No. 1: Types of surface water bodies: rivers, lakes, transitional water and coastal water
Annex No. 2: Ecological quality of surface water bodies
Annex No. 3:
List of main pollutants</td><td>Annex No. 2: Table 1.2.1. Definitions of very good, good and moderate ecological status of the rivers, lakes and transitional water: physicochemical quality elements
Status of water bodies
<table>
<tr><th rowspan="2">Physicochemical elements</th><th rowspan="2">Water body</th><th colspan="3">Status</th></tr>
<tr><th>very good</th><th>good</th><th>moderate</th></tr>
<tr><td rowspan="4">Specific synthetic pollutants</td><td>Rivers</td><td rowspan="4">C near zero and lowest < LOD as per the most state of the art and broadly applied analytical methods</td><td rowspan="4">C < EQS</td><td rowspan="4">C > EQS< BL</td></tr>
<tr><td>Lakes</td></tr>
<tr><td>Transitional water</td></tr>
<tr><td>Coastal water</td></tr>
</table>
C = concentration
EQS = environmental quality standard
BL= background levels
LOD = limit of detection
Annex No. 3: Main pollutants (POPS)
1. Organohalogenic compounds and substances that may form such compounds in water environment.
2. Substances and preparations or their disintegration products with proven carcinogenic or mutagenic properties or properties, which</td></tr>
</table>

<table>
<tr><th>Component of the environment, or product</th><th>National legislation</th><th>Annex to the statutory instrument</th><th>Norm for admissible concentration limits (ACL)</th></tr>
<tr><td></td><td></td><td></td><td>may have an impact on steroidogenic, thyroide, reproductive or other related endocrine functions in or by way of water environment.
3. Persistent organic carbohydrates and persistent bioaccumulating organic toxic substances.
4. Biocides and plant protection products</td></tr>
<tr><td>Coastal sea water</td><td>Ordinance No. 8 of 25.01.2001 on the quality of coastal sea water, SG 10/02.02.2001</td><td>Annex: Indicators and norms for determining the quality of coastal sea water</td><td>B. Indicators of organic substances of industrial origin
Pesticides (total) – 0.01 mg/L</td></tr>
<tr><td>Sea water</td><td>Ordinance on protection of sea water environment, SG 94/30.11.2010</td><td>Maintenance of the good condition of the sea water environment (marine environment).</td><td>1. Protection and conservation of marine environment, prevention of its deterioration, or, when practicable, restoration of marine ecosystems in territories which have been adversely affected;
2. Prevention and limiting the introduction and exemption of substances of anthropogenic origin, including POPs, in the environment, with the aim of stage-by-stage elimination of pollution and guaranteeing the lack of material impact or threat to human health, biodiversity of marine ecosystems and the lawful use of the sea.</td></tr>
<tr><td>Fresh water inhabited by fish and shellfish organisms</td><td>Ordinance No. 4 of 20.10.2000 on the quality of water for fisheries and farms for breeding of shellfish organisms, SG 88/27.10.2000</td><td>Annex No. 1:
Quality norms for fresh surface water inhabited by fish

Annex No. 2: Quality norms for coastal sea water inhabited by shellfish organisms</td><td>Annex 1: Quality norms for fresh surface water inhabited by fish
<table>
<tr><th>Indicator</th><th>Trout and carp water</th><th>Note</th></tr>
<tr><td>HCH</td><td>total HCH in surface water – 0.05 μg//L
total HCH in surface water, impacted by discharges – 0.1 μg//L</td><td>The total concentration of HCH in bottom deposits and in fish must not indicate a significant increase over time</td></tr>
<tr><td>DDT - total</td><td>p,p’–DDT: 10 μg//L
total DDT: 25 μg/L</td><td></td></tr>
<tr><td>Aldrin</td><td>0.01 μg/L</td><td>The concentration of aldrin in bottom deposits and in fish must not indicate a significant increase over time</td></tr>
<tr><td>HCB</td><td>0,03 μg//L</td><td>The concentration of HCB in bottom deposits and in fish must not indicate a significant increase over time.</td></tr>
</table>
Annex 2: Norms for the quality of coastal sea water inhabited by shellfish
<table>
<tr><th>Indicator</th><th>Recommended</th><th>Mandatory</th></tr>
<tr><td>Chlor-organic compo nds</td><td colspan="2">Concentration of each substance in the water as regards shell and meat of the shellfish organisms must not reach or exceed the level which has a harmful impact on shellfish and their larvae.</td></tr>
<tr><td>HCH</td><td>total HCH for river estuaries and territorial sea water:
< 0.02 μg//L</td><td>-</td></tr>
<tr><td>DDT - total</td><td>p,p’–DDT: 10 μg//L
total DDT : 25 μg/L</td><td>-</td></tr>
<tr><td>Dieldrin</td><td>For water in river estuaries, inland water and territorial sea water : 0.01 μg//L</td><td></td></tr>
<tr><td>Endrin and isodrin</td><td>For water in river estuaries, inland water and territorial sea water : 0.005 μg//L</td><td>-</td></tr>
<tr><td>HCB</td><td>for water in river estuaries, inland water and territorial sea water : 0.03 μg//L</td><td></td></tr>
</table></td></tr>
<tr><td>Bathing water</td><td>Ordinance No. 11 on the quality of bathing water, SG</td><td>Annex: Requirements regarding the quality</td><td>Requirements in respect of bathing water
<table>
<tr><th>Indicators</th><th>Recommended</th><th>Mandatory value</th></tr>
</table></td></tr>
</table>

<table>
<tr><th>Component of the environment, or product</th><th>National legislation</th><th>Annex to the statutory instrument</th><th>Norm for admissible concentration limits (ACL)</th></tr>
<tr><td></td><td>25/08.03.2002, as amended, SG 53/10.06.2008</td><td>of bathing water</td><td><table><tr><td></td><td>value</td><td></td></tr><tr><td colspan="3">Physicochemical</td></tr><tr><td>Pesticides (total)</td><td>1 μg//L</td><td>-</td></tr></table></td></tr>
<tr><td>Surface water</td><td>Ordinance on the use of surface water, SG 56/22.07.2011</td><td>Issuance of permits for water abstraction from surface water</td><td>Measures for reducing the negative impact from the activity on the components of the environment
Non-admission of the water object contamination and the surrounding areas with hazardous chemical substances, including POPs.</td></tr>
<tr><td colspan="4">GROUNDWATER</td></tr>
<tr><td>Ground water</td><td>Ordinance No. 1 of 10.10.2007 on exploration, use and protection of groundwater, SG 87/30.10.2007, as amended and supplemented, SG 2/ 8.01.2010.</td><td>Annex No. 1: Groundwater quality standards (GWQS)</td><td>Groundwater quality standards (GWQS):
GWQS for pesticides - 0.1 μg/L for each separate AS
GWQS for pesticides – total - 0.5 μg/L as a sum of the concentrations of all separate pesticides
GWQS for persistent and organochlorine pesticides (aldrin, dieldrin,heptachlor and heptachlor epoxide) - 0.03 μg/L
GWQS for persistent and organochlorine pesticides (DDT, chlordane, eldrin and HCB) - 0.1 μg/L</td></tr>
<tr><td colspan="4">WASTEWATER</td></tr>
<tr><td>Wastewater, from certain industrial sectors, discharged in water objects</td><td>Ordinance No. 6 of 9.11.2000 on the emission norms for the admissible content of harmful and hazardous substances in wastewater discharged in water objects, promulgated SG 97/ 28.11.2000, as amended and supplemented, SG 24 /23.03.2004</td><td>Annex No. 1:
1. Organohalogenic compounds and substances, which may form such compounds in water environment
Annex No. 2:
Emission norms for POPs pesticides</td><td>Average emission norms per month (AENM) and average emission norms per day (AEND) for POPs pesticides
<table>
<tr><td rowspan="2">Type of industrial enterprise</td><td rowspan="2">Mean value</td><td colspan="2">Emission norms</td></tr>
<tr><td>Mass</td><td>Concentration in wastewater</td></tr>
<tr><td colspan="4">Emission norms for HCH</td></tr>
<tr><td>Production of HCH</td><td>AENM
AEND</td><td>2 g/t prod. HCH
4 g/t prod. HCH</td><td>2 mg/L
4 mg/L</td></tr>
<tr><td>Extraction of lindane</td><td>AENM
AEND</td><td>4 g/t proc. HCH
8 g/t proc. HCH</td><td>2 mg/L
4 mg/L</td></tr>
<tr><td>Industrial enterpirses in which HCH is produced and lindane is extracted</td><td>AENM
AEND</td><td>5 g/t prod. HCH
10 g/t prod. HCH</td><td>2 mg/L
4 mg/L</td></tr>
<tr><td colspan="4">Emission norms for DDT</td></tr>
<tr><td>Production of DDT, including formulation of .DDT-preparation from available AS</td><td>AENM
AEND</td><td>4 g/t substances, prod., proc. or used
8 g/t substances prod., proc. or used.</td><td>2 mg/L
4 mg/L</td></tr>
<tr><td colspan="4">Emission norms for aldrin, dieldrin и endrin</td></tr>
<tr><td>Production of aldrin, dieldrin or endrin, including formulation of preparation from ready to use AS at the same place</td><td>AENM
AEND</td><td>3 g/t total production capacity
15 g/t total production capacity</td><td>2 μg/L
10 μg/L</td></tr>
<tr><td colspan="4">Emission norms for HCB</td></tr>
<tr><td>Production and processing of HCB</td><td>AENM
AEND</td><td>10 g/t total production capacity
20 g/t total production capacity</td><td>1 mg/L
2 mg/L</td></tr>
</table></td></tr>
<tr><td colspan="4">SOILS</td></tr>
<tr><td>Soils [mg/kg dry soil]</td><td>Ordinance No. 3 of 1.08.2008 on the norms for admissible content of harmful</td><td>Annex No. 2: norms for preventive concentrations (PC), maximum admissible concentrations</td><td><table>
<tr><td>No.</td><td>Name</td><td>PC*</td><td>MAC*</td><td>IC*</td></tr>
<tr><td colspan="5">III.Chlororganic pes cides</td></tr>
<tr><td>1</td><td>Hexachlorbenzene (HCB)</td><td>0,025</td><td>0,25</td><td>10</td></tr>
<tr><td>2</td><td>α- and β-HCH</td><td>0,001</td><td>0,01</td><td>2</td></tr>
<tr><td>3</td><td>Lindane (γ–HCH)</td><td>0,001</td><td>0,01</td><td>2</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Component of the environment, or product</th><th>National legislation</th><th>Annex to the statutory instrument</th><th>Norm for admissible concentration limits (ACL)</th></tr>
<tr><td></td><td>substances in soils, promulgated SG 71/12.08.2008</td><td>(MAC) and intervention concentrations (IC) for POPs pesticides per mg/kg dry soil</td><td><table>
<tr><td>4</td><td>DDX sum</td><td>0,3</td><td>1,5</td><td>4</td></tr>
<tr><td>4.1</td><td>o,p'-and p,p'-DDE</td><td>0,1</td><td>0,5</td><td>-</td></tr>
<tr><td>4.2</td><td>o,p'-andp,p'-DDD</td><td>0,1</td><td>0,5</td><td>-</td></tr>
<tr><td>4.3</td><td>o,p' and p,p'-DDT</td><td>0,1</td><td>0,5</td><td>-</td></tr>
<tr><td>5</td><td>Aldrin</td><td>0,1</td><td>0,5</td><td>-</td></tr>
<tr><td>6</td><td>D eld n</td><td>0,1</td><td>0,5</td><td>-</td></tr>
<tr><td>7</td><td>Mirex</td><td>0,1</td><td>0,5</td><td>-</td></tr>
<tr><td>8</td><td>Heptachlor</td><td>0,1</td><td>0,5</td><td>-</td></tr>
<tr><td>9</td><td>Chlordane</td><td>0,1</td><td>0,5</td><td>-</td></tr>
<tr><td>10</td><td>Toxaphene</td><td>0,1</td><td>0,5</td><td>-</td></tr>
</table>
* Norms for PC, MAC and IC for POPs and oil products in soils (determined as a total content per mg/kg dry soil).</td></tr>
<tr><td colspan="4">WASTE</td></tr>
<tr><td>Waste</td><td>REGULATION (EC) No 850/2004 OF THE EUROPEAN. PARLIAMENT AND OF THE COUNCIL of 29 April 2004 on persistent organic pollutants</td><td>Annex IV: List of substances subject to the provisions for waste management, as set forth under Artcile 7

Annex V: Waste management, Part 1: Disposal;

Part 2: Waste and activities</td><td>Annex IV: All waste containing POPs pesticides over MACs shall be treated as hazardous waste:

MAC for POPs pesticides, specified under Article 7, pargarpah 4, letter a)
Aldrin, DDT, HCH, including lindane, dieldrin, endrin, heptachlor, HCB, chlordecone, mirex, PeCB, Toxaphene = 50 mg/kg

Annex V, Part 1: the disposal of waste containing POPs pesticides shall be performed through the following operations:
D9: physicochemical treatment;
D10: above-ground incineration

Annex V, Part 2: MAC for waste containing POPs pesticides, disposed in hazardous waste landfills: 5000 mg/kg for all POPs pesticides. These MAC does not refer to final underground deployment of hazardous waste, including in salt mines or in case of above-ground incineration.</td></tr>
<tr><td>Annually amounts of POPs pollutants from industrial plants released in the air, water and soil.</td><td>REGULATION (EC) No 166/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 18 January 2006
concerning the establishment of a European Pollutant Release and Transfer Register (EPRTR)</td><td>Annex II
Limit amounts (LA) for releasing of PCB in the air, water and soil</td><td>Aldrin, Chlordane, Chlordecone, DDT, Dieldrin, Endosulfan, Endrin, Heptachlor, Lindane, Mirex, Pentachlorbenzene (PeCB) and Toxaphene:
LA in the air: 1 kg/year
LA in the water: 1 kg/year
LA in the water: 1 kg/year
Hexachlorbenzene (HCB), Hexachlorciclohexane (HCH):
LA in the air: 10 kg/year
LA in the water: 1 kg/year
LA in the water: 1 kg/year</td></tr>
<tr><td colspan="4">SANCTIONS FOR ENVIRONMENTAL POLLUTION</td></tr>
<tr><td>Imposing of sanctions for environmental pollution exceeding the maximum admissible concentrations</td><td>Ordinance on the type, amount and order of imposing sanctions upon inflicting a harm on, or pollution of the environment exceeding the admissible norms and/ or upon noncompliance with the established emission norms and restrictions, SG 70/ 09.09.2011, effective as of 10.11.2011</td><td>Imposing of sanctions upon inflicting a harm or pollution of the environment above the admissible norms</td><td>Annex No. 1:Polluting substances and indicators and unit amounts of the sanctions for contamination of surface water and water objects.

Annex No. 4: Types of pollutants and damages of the soil and unit amounts of the sanctions:

- organochlorine plant protection preparations – BGN 40.80/m^2

- burning of stubble fields and plant waste: BGN 20.16/m^2</td></tr>
</table>

3.1.6.1.2. Monitoring of water

The EU Water Framewrok 2000/60/EC (WFD) is the main document of the European Union in the sector of water management policy, in response to the growing requirements as regards sufficient amounts of good quality water intended for any type of purposes.

Basic information on water quality is obtained from the National Water Monitoring System (NWMS), which enables identification of the reasons for ground and surface water contamination (total contamination, toxic substances, biogenic elements, etc.), as well as of the pollution sources (point and diffuse), determination of the effectiveness of various monitoring programmes and water quality trends, and taking of measures for improvement of the quality thereof.

The National Water Monitoring System (NWMS) includes:
- Surface water monitoring;
- Hydrobiological monitoring of surface water;
- Drinking water monitoring;
- Groundwater monitoring;
- Control and information system “Emission control of wastewater”.

3.1.6.1.2.1. Surface water monitoring

The conducted annual monitoring of surface water quality and the evaluation of the obtained results enables characterization of the chemical status of rivers, dams, lakes and the Black Sea. Each point within the monitoring network characterizes a certain section of the rivers which could have been contaminated by wastewater, agriculture and other polluters. Samples from water are collected in accordance with an established programme and are analyzed by accredited laboratories.

- **NSEM, SUBSYSTEM “SURFACE WATER MONITORING”**

Surface water monitoring forms part of NSEM and encompasses programmes for controlling and operational monitoring. The operational monitoring programmes are employed for determining the status of water bodies at risk and for evaluation of the changes which have taken place as a result of the measures that have been taken. The networks for controlling and operational monitoring of surface water and the indicators being measured thereby are regulated by Order of the Minister of environment and water No. RD - 715/02.08.2010.

The total number of points on the territory of the country is 533, distributed into four basin management regions, as follows:
- Danube Region Basin Directorate - 115 points for control monitoring and 53 points for operational monitoring;
- Black Sea Region Basin Directorate - 73 points for control monitoring, including 20 for sea water monitoring, 41 points for operational monitoring;
- East Aegean Region Basin Directorate – 35 points for control monitoring and 88 points for operational monitoring;
- West Aegean Region Basin Directorate – 52 points for control monitoring and 76 points for operational monitoring.

The indicators which are subject of monitoring are divided into three main groups – main physicochemical, priority substances and specific pollutants, as their monitoring frequency varies from 4 to 12 times per annum. About 22-30 indicators are explored. The POPs pesticides are included in the priority substances (endosulfan, HCB, PeCB) and in the specific pollutants (aldrin, dieldrin, endrin, isodrin, total DDT, p,p- DDT).

POPs pesticides fall within the groups of priority substances [endosulfan, HCB, PeCB and HCH and lindane] and specific pollutants (DDT sum and p,p'-DDT, aldrin, dieldrin, endrin and isodrin).

Surface water is divided into three categories depending on its use: surface water (a) for drinking and domestic purposes; (b) for bathing, fishing and industrial needs; and (c) for irrigation.

MONITORING OF POPS PESTICIDES IN SURFACE WATER FOR THE PERIOD 2007 – 2010.

During the period 2007 - 2010 a total of 3,803 samples were collected from 599 points and analyzed for content of organochlorine pesticides: aldrin, dieldrin, DDT, endrin, mirex, heptachlor, chlordane, HCB, HCH and lindane, endosulfan. The monitoring included all big rivers: Danube, Maritsa, Iskar, Yantra, Tundzha, Struma, Mesta, Ogosta, Vit, etc. and the dams, as well as the Black Sea coastal water.

In 2010 alone within the surface water monitoring subsystem a total of 3,182 samples were collected from 475 points, at a frequency of 4 to 12 times per annum (Order RD No. 715/02.08.2010).

The chemical status assessment is performed in respect of the presence and comparison of the values of measured concentrations of priority substances and specific chemical pollutants (Directive 2008/105/EC) in the water of water bodies with the quality standards.

As per the performed assessment the status in respect of priority substances and specific chemical pollutants in the period 2007 -2010 in surface water bodies in the 4 basin management regions, no water bodies have been determined as being in bad chemical status.

Table No. 17 presents data from the surface water monitoring in Bulgaria as regards the pollution with POPs pesticides for the period 2007- 2010.

No exceeding of surface water quality standards (SWQS) has been established in respect of DDT sum, mirex, heptachlor, chlordane, HCB and HCH for the entire monitoring period - 2007 – 2010.

In 2007 no exceeding of SWQS was registered also in respect of the remaining POPs pesticides – aldrin, dieldrin, endrin, lindane and endosulfan. In 2008 and 2010 there was an exceeding of SWQS for endosulfan and lindane in accordingly 0.1% and less than 2% of the analyzed samples which is probably due to point source pollution.

Less than 1% of the samples analyzed for content of aldrin, dieldrin and endrin in 2009 and in 2010 exceeded SWQS, as for the years 2007 and 2008 no exceeding of SWQS for these pesticides was detected.

The reported single cases of exceeding EQS or MAV are probably due to point source pollution, resulting from to the impact of local sources of pollution on the receiving water bodies.

On the grounds of the information collected by the National Surface Water Monitoring System during the period 2000 – 2010, there was established a preservation of the trend of improvement of surface water quality observed during the last decade. There were still identified single cases of pollution with certain POPs above EQS in less than 2% of the analyzed samples due to local point pollutions. The classic representative of persistent chlororganic pesticides – DDT and its metabolites were not present in the country’s hydrosphere in the period 2007 – 2010. In more than 98% of analyzed samples there was no presence of POPs pesticides in surface water in Bulgaria.

Table 17: Monitoring of surface water in Bulgaria for contamination with POPs pesticides during the period 2007 -2010.

Year	Number of points	Number of samples	Aldrin	Aldrin %	Dieldrin	Dieldrin %	Endrin	Endrin %	Lindane	Lindane %	Endosulfan	Endosulfan %	Σ DDT	Σ DDT %	HCB	HCB %
EQS MAC(µg/L) MAV(µg/L)			0.01		0.01		0.01		0.04 0.02		0.01 0.005		0.025		0.05 0.01	
2007	50	77	76<LOD 1<EQS 0 > EQS	98.7% <LOD 1,3%<EQS 0% > EQS	76<LOD 1<EQS 0 > EQS	98.7% <LOD 1,3%<EQS 0% > EQS	76< LOD 1<EQS 0 > EQS	98.7% <LOD 1,3%<EQS 0% > EQS	77< LOD 0 > EQS	100% <LOD 0% > EQS	77< LOD 0 > EQS	100% <LOD 0% > EQS	77< LOD 0 > EQS	100% <LOD 0% > EQS	77< LOD 0 > EQS	100% <LOD 0% > EQS
2008	209	1552	1478<LOD 74<EQS 0 > EQS	95.2% <LOD 4,8%<EQS 0% > EQS	1481<LOD 71<EQS 0 > EQS	95.4% <LOD 4,6%<EQS 0% > EQS	1478<LOD 74<EQS 0 > EQS	95.2% <LOD 4,8%<EQS 0% > EQS	1274<LOD 250<EQS 28 > EQS	82.0% <LOD 16,2%<EQS 1.8% > EQS	1416<LOD 135<EQS 1 > EQS	91.2% <LOD 8,7%<EQS 0.1% > EQS	1480<LOD 71<EQS 1 > EQS	95.4% <LOD 4,6%<EQS 0.1% >EQS	1262<LOD 284<EQS 0 > EQS	81.3% <LOD 18,7%<EQS 0.1% >EQS
2009	193	1262	1170 <LOD 81<EQS 11 > EQS	92.7% <LOD 6,4%<EQS 0.9% > EQS	1170 <LOD 81<EQS 11 > EQS	92.7% <LOD 6,4%<EQS 0.9% > EQS	1166 <LOD 85<EQS 11 > EQS	92.5% <LOD 6,7%<EQS 0.8% > EQS	1262 <LOD 0 > EQS	100% <LOD 0% > EQS	1240 <LOD 22<EQS 0 > EQS	98.3% <LOD 1,7%<EQS 0% > EQS	1181 <LOD 81<EQS 0 > EQS	93.6% <LOD 6,4%<EQS 0% > EQS	1175 <LOD 92<EQS 0 > EQS	93.1% <LOD 6,9%<EQS 0% > EQS
2010	147	913	843 <LOD 64<EQS 6 > EQS	92.3% <LOD 7,0%<EQS 0.7% > EQS	848<LOD 65<EQS 0 > EQS	92.8% <LOD 7,2%<EQS 0 % > EQS	849 <LOD 62<EQS 2 > EQS	92.9% <LOD 6,8%<EQS 0.3 % > EQS	805<LOD 94<EQS 14 > EQS	88.2% <LOD 10,3%<EQS 1.5 % >EQS	879 <LOD 33<EQS 1 > EQS	96.3% <LOD 3,6%<EQS 0.1 % >EQS	-	-	-	-

MONITORING OF SURFACE WATER INTENDED FOR DRINKING AND DOMESTIC WATER SUPPLY

The drinking water monitoring is conducted by the River Basin Directorates through the Regional Laboratories at EEA, the Regional Health Inspectorates (RHI) and the WS&S companies in accordance with section III of Ordinance No. 12 of 18.06.2002 on the quality requirements regarding surface water intended for drinking and domestic water supply. For the successful implementation of the monitoring programmes, a subsequent evaluation of the results and exercising of effective control over water abstracted for drinking and domestic water supply, in the beginning of each calendar year, River Basin Directorates elaborate programmes for control and their own monitoring of drinking water. The programmes for the year 2010 were regulated by Order of the Minister of environment and water No. RD - 715/02.08.2010.

In the year 2010 the network for monitoring of surface water intended for drinking and domestic water supply included 216 points. The distribution of the points per basin regions is the following:

- Danube Region Basin Directorate - 90 points;
- Black Sea Basin Directorate - 3 points;
- East Aegean Region Basin Directorate - 89 points;
- West Aegean Region Basin Directorate – 34 points.

The frequency of sample collection depends on the number of population being serviced by the particular water source and varies from 1 to 12 times a year.

The indicators for control and monitoring are grouped in three groups, with POPs pesticides falling within group III, as the content of total pesticides is analyzed. Depending on the obtained results from the conducted monitoring, the water intended for drinking and domestic needs is divided into three categories: A1 (0.001 mg/L) , A2 (0.0025 mg/L) and A3(0.005 mg/L), as per the mandatory values (MV), specified in Annex No. 1 to Ordinance No.12 of 18.06.2002. The categorization is performed by the River Basin Directorates (RBD), jointly with the state sanitary control authorities. The sample collections and analyses are performed by the Regional Laboratories at EEA, by the WS&S companies for the purposes of their in-house monitoring. The analyses results are provided to the River Basin Directorates for drawing up of Annual reports on the status of the water intended for drinking and domestic water supply.

The results from the analysis of the samples collected in the year 2010 show that within category A1 there are detected concentrations values of the pesticide content indicators, including as regards POPs pesticides: aldrin, dieldrin, DDD/DDE/DDT metabolites, HCB, and lindane.

No exceeding of the mandatory values for content of POPs pesticides has been registered for categorization of surface water in category A1, intended for abstraction of drinking water on the territory of all basin management regions (Table No. 18).

Table 18: Levels of POPs pesticides in surface water intended for abstraction of drinking water in the Black Sea Basin Management Region.

Basin management region (BMR)	Ordinance No.12 of 18.06.2002 Pesticides- total 1.Organochlorine (aldrin, dieldrin, DDD/DDE/DDT, HCB, lindane). 2. Nitrogen containing				
Black Sea Region	MAC = 0.001 mg/L (Category A1)				
	2010	2008			
	POPS pesticides total	HCB	Lindane	DDT sum	aldrin, dieldrin, endrin:
Kamchiya Dam - A1	< 0,001	0,0003	0,0003	-	-
Yasna Polyana Dam - A1	< 0,001	0,0003	0,0003	-	-
Ticha Dam - A1	< 0,0006	-	-	0.0000002	0.0000001

Source: EEA, Report on the status of water in BSBMR, 2008 and 2010.

The accounted values are of several orders: < 0,001 mg/L (MV for category A1 of the surface water intended for drinking water abstraction).

The values of PeCB found in the surface water intended for drinking water abstraction are 0.0053 μg/L < mean annual value, MAV (0.007 μg/L) in Yasna Polyana dam in the Black Sea Basin Region.

There is no exceeding of MAC as regards the content of DDT in sediments in coastal sea water which provides normal conditions for life and reproduction of shellfish organisms.

The monitoring of surface water intended for drinking and domestic needs shows that it is categorized as category A1 water.

MONITORING OF DRINKING WATER, BATHING WATER AND MINERAL WATER

The competent authority in Bulgaria in the field of drinking water, bathing water and mineral water, intended for drinking, or used for preventive, healing, and hygiene needs, including: of bottled mineral water is the Ministry of Health (MoH) and its regional structures – the 28 Regional Health Inspectorates (RHI).

Those responsible for meeting the requirements of the legislation on drinking water, including for conducting of monitoring of drinking water quality in its full scope, are the water supply entities, in their capacity as structures carrying out the activity of water supply for drinking and domestic purposes.

The national legislation in the field of drinking water is fully harmonized with the EU directives and is in the process of implementation. The main statutory regulations, applicable to this sphere are:

- Ordinance No. 9 on the quality of water intended for drinking and domestic purposes (SG 30 of 2001) (Council Directive 98/83/EC on the quality of water intented for human consumption);
- Ordinance No. 12 on the quality requirements in respect of surface water intended for drinking and domestic water supply (SG 63 of 2002) (Council Directive 75/440/EEC of 16 June 1975 concerning the quality required of surface water intended for the abstraction of drinking water in the Member States and Council Directive 79/869/EEC of 9 October 1979 concerning the methods of measurement and frequencies of sampling and analysis of surface water intended for the abstraction of drinking water in the Member States);
- Ordinance No. 3 on the conditions and order for research, design, validation and operation of sanitary protection zones around water sources and of facilities for drinking and domestic water supply and around sources of mineral water used for healing, preventive, drinking and hygiene related needs (SG 88 of 2000).
- Ordinance on the requirements regarding bottled natural, mineral, spring and table water intended for human consumption (promulgated SG 68 of 3.08.2004, as amended SG 66 of 25.07.2008.)

According to the aforementioned, as well as to other statutory regulations, MoH, accordingly, RHI, exercise state health control over drinking water, bathing water, mineral water, water sources and water supply sites and facilities, sanitary protection zones, bathing locations in open-air water areas, etc.

<u>The activity of RHI</u> in the field of drinking water and bathing water includes the following main lines:

- Monitoring (sample collection and laboratory analysis) of drinking water quality in all settlements in the country at the “end consumer”, as well as of raw water from water sources for drinking and domestic water supply, water at various stages of its processing and supply to the “end consumer”, water from independently supplied sites, water from “local public water sources”. RHI have the obligation to complete a minimum of 50% of the full scope of the research which is to be carried out by the water supply companies. The information presented below as regards drinking water quality in the country is based on data provided by RHI;

- Control (checks) of the sanitary and hygienic status of the sites and facilities for central drinking and domestic water supply – water sources, water abstraction facilities, sanitary protection zones

(SPZ), drinking water treatment plants (DWTP), chlorating and other plants for water disinfection, reservoirs, sites independently supplied with water, “local public water sources”, etc., as well as bathing zones, etc.; co-ordination of project documentations for sanitary protection zones for drinking and domestic water sources and of project documentations of water supply facilities and networks, participation in acceptance committees for such sites;

- Taking of administrative or criminal measures (orders, actions, penal orders, suspension orders, financial sanctions, dismissal from job, etc.) and other measures in the event of establishment of any inconsistencies in the quality of drinking water and any violations of the sanitary and hygiene requirements regarding water sources, water supply sites and facilities, sanitary protection zones, bathing zones, etc.;

- Research and analysis of problems with drinking and bathing water, participation in the preparation of projects and programmes, and participation in resolving thereof;

- Performance of paid analyses of drinking water following a request by individuals or legal entities.

DRINKING WATER

In the country for drinking and domestic water supply in 2010 there have been used 6,315 water sources, 335 out of which are surface water sources. The number of surface water sources with treatment facilities complied with the water category, is 112**.** This equals 33.5 % of all surface water sources.

This percentage remains identical in the past few years, which shows that a large part of the water supply companies continue to disregard their obligation regulated under the Water Act and Ordinance No. 12 for construction of the respective facilities needed for implementation of the necessary appropriate methods for surface water treatment according to its category. The fulfillment of this requirement must be embedded in the investment programmes within the regional agglomeration master plans and the business plans, accordingly developed by the WS&S operators, the integrated water projects under Environment Operational Programme, as priority shall be given to surface water sources servicing larger settlements, or being strongly influenced by adverse weather conditions, as well as to those with deteriorated water quality (within category A2 or A3 under Ordinance No. 12).

There are a total of 2,739 separate water supply zones in the country, 196 out of which are large (supplying over 1,000 m^3 of water per 24 hours and/ or supplying more than 5,000 individuals).

SUMMARIZED DATA FROM THE DRINKING WATER QUALITY MONITORING CONDUCTED BY RHI IN THE COUNTRY IN THE YEAR 2010

The points where sample collection has been performed along the water supply network in the settlement areas are 8,395**.**

During the year there have been collected and tested 17,342 samples as per the permanent monitoring indicators (encompassing only a part of the indicators being monitored as per the regulatory requirements) and 3,068 samples as per the periodic monitoring indicators.

The percentage of noncompliance with the standards in the permanent monitoring samples is 10.0% and shows a slight drop as compared to the year 2009 when it was 10.6%. As regards periodic monitoring samples, a slight increase is recorderd in noncompliant samples as percentage relative to the preceding year – from 15.4% for the year 2009 to 15.7% for the year 2010.

In 2010 RHI performed a total of 409,567 tests (analyses) as per the indicators being monitored in drinking water collected from points in settlements. Out of these 316,049 analyses were performed within the framework of the State Health Control (SHC), and the remaining were performed as paid service following a request by individuals and legal entities.

The number of completed organoleptic, chemical and radiological analyses within SHC in the year 2010 is 266,014. The percentage of analyses showing incompliance with the requirements is 0.75% (relative to 0.74% in the year 2009).

In the year 2010 for the various RHI the incompliance percentage per physicochemical and radiological indicators varies from 0.00% for the region of Vidin to 2.72% for the region of Targovishte. Comparatively high is also the percentage in the region of Haskovo (2.21%), the region of Burgas (1.97%), the region of Pazardzhik (1.82%) and the region of Veliko Tarnovo (1.73%).

No exceeding of drinking water quality norms is established in respect of the content of POPs pesticides during the period 2008 – 2010.

As a whole, the percentage of compliance of water in Bulgaria according to the results from the monitoring performed by RHI is 98,67 % (calculated as percentage of the total number of analyses performed by RHI within SHC, meeting the requirements, relative to the total number of analyses performed by RHI within SHC).

BATHING WATER

In the 2010' bathing season to research has been subjected a total of 14 of the parametres prescribed for monitoring under Directive 76/160/EEC as regards the bathing water quality. Additional research was performed also of the indicators "E. coli" and "intestine enterococces" the monitoring of which is necessary according to the new Directive 2006/7/EC concerning the management of bathing water quality. According to the directions of the European Commission, when verifying the compliance of bathing water for each zone, throughout the bathing season, out of all tested indicators five are taken into account: two microbiological ("total coliforms" and "fecal coliforms") and three physicochemical (surface active substances, reactive of methylene blue, mineral oils and phenols).

POPs pesticides are not regulated by European and national laws.

RESULTS FROM THE CONDUCTED MONITORING OF BATHING WATER QUALITY PERFORMED BY RHI IN THE COUNTRY FOR THE YEAR 2010.

In 2010 no bathing zones in which bathing water does not meet the mandatory requirements were reported. In 2009 their number was 1, and in 2008 - 6 (two in the region of Varna and 4 in the region of Burgas). This means that 100% of the bathing zones comply with the mandatory requirements.

SUMMARIZED CONCLUSIONS

- **Based on the information collected by the National Surface Water Monitoring System during the period 2000 – 2010, it may be concluded that there is a preservation of the trend observed in the past few years for improvement of surface water quality. There are still observed single cases of pollution with certain POPs pesticides above the EQS in less than 2% of the analyzed samples due to local point sources of pollution.**

- **The classic representative of persistent chlororganic pesticides – DDT and its metabolites - is not present in our country's hydrosphere during the period 2007 – 2010.**

- **More than 98% of surface water in Bulgaria has a good ecological status and no presence of POPs pesticides was detected within the entire period from 2000 to 2010.**

- **Not one positive sample of POPs pesticides has been found in surface water sources used for drinking purposes (dams). The recorded values are lower by several orders than the mandatory value for category A1 of surface water intended for abstraction of drinking water (< 0,001 mg/L).**

- **There is no exceeding of MAC as regards the content of DDT in sediments in coastal sea water providing normal life and reproduction of shellfish organisms.**

- **The status of surface water intended for drinking and domestic needs is good. No exceeding of MAC has been found as regards the content of POPs pesticides.**

- **No exceeding of the norms for drinking water quality was found as regards the content of POPs pesticides during the period 2008 – 2010 as shown by the analyses performed by the State Health Control (SHC).**

❖ **No exceeding of MAC is found as regards the content of DDT in sediments in coastal sea water providing normal life and reproduction conditions of shellfish organisms.**

❖ **POPs pesticides are not regulated in bathing water by European and national laws.**

3.1.6.1.2.2. Groundwater monitoring

NSEM, GROUNDWATER MONITORING SUBSYSTEM

The networks for monitoring of groundwater are a part of NSEM and are regulated by Order of the Minister of environment and water No. RD -715/02.08.2010. They comprise 290 points for control and operational monitoring of the chemical status of groundwater, points for monitoring or water protection areas, as well as points for monitoring of the quantity status of groundwater – measurement of water level in wells and of spring flow rates. The network dealing with the chemical status comprises 238 control monitoring points, operational monitoring points, as 58 of the above points are concurrently a subject of control and of operational monitoring. In the Danube Basin Region, 82 points are established for monitoring of water protection areas which also overlap with the control monitoring points. The points' distribution between the River Basin Directorates is as follows:

- Black Sea Basin Region – 50 control monitoring points and 35 operational monitoring points;
- Danube Basin Region – 98 control monitoring points and 22 operational monitoring points;
- West Aegean Basin Region – 37 control monitoring points;
- East Aegean Basin Region – 53 control monitoring points and 63 operational monitoring points.

The points for monitoring of the quantitative status of groundwater include: 282 points for water level measurement and 112 points for measurement of flow rates, as control monitoring is performed at 69 points out of these, while control and operational monitoring are performed at 8 points. Pursuant to the Order, 299 points of the quantitative monitoring network (222 wells for measurement of water levels, 60 springs, 2 Artesian wells and 2 surface water sources – for measurement of flow rates) are serviced by NIMH. RBDs monitor independently 76 points, and 4 of the laboratories at EEA collect samples from 19 points.

Groundwater samples are collected and analyzed by the regional laboratories at EEA in the country as per indicators determined under Order No. RD -715/02.08.2010.

The protection of groundwater from contamination with POPs and other pollutants is regulated by Ordinance No. 1 of 10.10.2007 on exploration, use and protection of groundwater (promulgated, SG 87/30.10.2007, as amended and supplemented, SG 2/ 8.01.2010) and the Water Act (promulgated, SG 67/27.07.1999, last amended and supplemented, SG35/03.05.2011). In order to protect groundwater from contamination, a ban is imposed on: direct discharge of pollutants into groundwater (effective as of 22.12.2013); the disposal, including landfilling, of priority substances, which may lead to indirect discharge of pollutants into groundwater; other activities on the surface and in the groundwater body, which may lead to indirect discharge of priority substances into groundwater.

The status of groundwater is characterized by the quantitative and chemical status of groundwater bodies. The quantitative and chemical status of groundwater bodies can be good or bad. Groundwater bodies for which in the course of characterization it has been established that there is an existing risk for not achieving good groundwater status, are determined as water bodies at risk.

The criteria for assessment of the chemical status of groundwater are:

1. Groundwater quality standards (GWQS), determined in Annex No. 1;
(Ordinance No. 1 of 10.10.2007 on the exploration, use and protection of groundwater);

2. The pollution limits (PL) of groundwater, determined as provided under Article 118b of the Water Act.

The pollution limit can be established at a national level or for each water management region, or for a part of an international basin management region, or for a groundwater body, or a group of bodies. The pollution limit at a basin level is determined in the river basin management regions. The updating of the list of substances, for which a pollution limit is determined and the initial points of their concentration is performed along with the updating of the river basin management plans.

The measured physicochemical indicators of groundwater (as per Order No. RD -715/02.08.2010) are divided into four categories and the specific parametres divided into 2 groups. POPs pesticides fall within Group II of specific pollutants - (sum of alpha-, beta-, gamma- and delta-HCH), lindane, heptachlor, chlordane.

The frequency of sampling in the course of performing control monitoring for POPs pesticides is once a year. Subject of operational monitoring are only points where the status of groundwater in groundwater bodies has been determined as bad. The measurement results are entered by the regional laboratories through the laboratory software module GWLaboratory, as the data are accessible for the respective basin directorate and through an administrative software module the information is forwarded to the national groundwater database at EEA.

GROUNDWATER MONITORING DURING THE PERIOD 2000 – 2006.

During the period 2000 - 2006 two groups of sample collections were implemented for analyzing the content of POPs pesticides in groundwater – at high groundwater levels in springtime and at low level – at the end of the summer and the beginning of autumn. Analyses of the collected samples were performed for aldrin, dieldrin, DDT sum, endrin, mirex, chlordane, heptachlor and hexachlorbenzene (HCB).

In 2003 within the territory of the Danube, the Black Sea, the East Aegean and the West Aegean basin regions samples were tested for residual content of POPs pesticides - aldrin, dieldrin, endrin, heptachlor, hexachlorbenzene, isomers and metabolites of DDT (op-DDT, pp-DDT, op-DDD, pp-DDD, opDDE, pp-DDE) in groundwater. In all cases the values were below the minimum detectable limit (MDL) (Table No. 19).

Table 19: Analyzed samples for content of POPs pesticides in groundwater in Bulgaria in the year 2003.

Basin regions (BR)	Number of samples	Aldrin	Dieldrin	Endrin	HCB	Heptachlor	DDT	HCH
Danube BR	23-25	< MDL(25)	< MDL(24)	< MDL(24)	< MDL(23)	< MDL(25)	< MDL(25)	< MDL
Black Sea BR	10	< MDL	< MDL	< MDL	< MDL(1)	< MDL	< MDL(10)	< MDL
Eastern –Aegean Sea BR	23	< MDL	< MDL	< MDL	< MDL(13)	< MDL	< MDL	< MDL
Western Aegean Sea BR	1	< MDL	< MDL	(0)	< MDL	< MDL	< MDL	< MDL

MDL – minimum detectable limit (0,001 μg/l) = Limit of detection (LOD), μg/l

Source: EEA,2000-2006

In the year 2004 a study was conducted as regards groundwater contamination with POPs pesticides (aldrin, endrin, heptachlor, p,p'-DDT, p,p'-DDE and p,p'-DDD) in selected areas with intensive agriculture. One-off analyses were performed of 103 groundwater sources in 16 regions in Bulgaria, for which there are data about past incidents. No available POPs pesticides were identified in excess of the limit of detection in any of the samples (0,001μg/l)[18]. In 2004 analysis of POPs was performed also at 64 points within the national groundwater monitoring network (as per data of EEA) – single cases of exceeding the limit of detection were established.

The analysis and assessment of the data for the period 2000 – 2006 show that in Bulgaria there is no contamination of groundwater with aldrin, dieldrin, DDT sum, endrin, mirex, chlordane, heptachlor and HCB. No cases of exceeding of the groundwater quality standards (GWQS) have been identified and it can be concluded that groundwater in Bulgaria is with a good ecological status as regards the content of POPs pesticides. For the most part, values are below the minimum detectable limit (MDL).

18 Bratanova, Zl. et al., Water contamination with pesticides in selected areas with intensive agriculture", 2005, Hygienne and healthcare, XLVIII.

PROJECT GEF TF 050706 WETLANDS RESTORATION AND POLLUTION REDUCTION

Under Project GEF TF 050706 Wetlands restoration and pollution reduction, in the year 2004 hydrochemical local monitoring was conducted of surface and groundwater, soils and sediments, before the restoration of the alluvial regime of the wetlands along the Danube at Persina Nature Park and the protected area Kalimok-Brushlen within the Danube River region.

There were identified and examined 26 points at surface water and 5 at groundwater. To tests were subjected 3 points in order to determine the quality composition of sediments in bogs within areas covered by the project. Several points were determined for exploration of soils around the bogs in several places within areas covered by the project and beyond them, within the adjoining areas.

The data about the groundwater status in the different areas explored for POPs pesticides are presented in Tables No. 20 and 21.

I. Area Persina Nature Park, period – 23 June –20 July 2004.

Table 20:Content of POPs pesticides in groundwater at point No. 13: Pischensko Blato, 23 June -20 July 2004.

No.	Indicators	UoM	Point 13 – Piezometer at Pischensko Blato P31	Groundwater quality standard (GWQS) according to Ordinance No.1/2000, µg/L
1	lindane	µg/L	<0.01	1
2	p,pDDT	µg/L	<0.5	0.1*

No exceeding of the grdoundwater quality standards is established in respect of DDT and lindane.II. Protected area Kalimok- Brushlen , period – 23 June –20 July 2004.

Table 21: Content of POPs pesticides in groundwater at point No. 13, exploration pit No. 10, 30 July 2004

No.	Indicators	UoM	Point 13 Exploration pit No.10, 30 July 2004	Pollution limit (PL) accoridng to Ordinance No.1/2000, µg/L
	Heptachlor	µg/L	<0.0050	1
	Alfa- HCH	µg/L	<0.0050	1
	Beta-HCH	µg/L	<0.0050	1
	Gamma-HCH (lindane)	µg/L	<0.0050	1
	Delta-HCH	µg/L	<0.0050	1
	Epsilon-HCH	µg/L	<0.0050	0.1
	HCB	µg/L	<0.0050	0.1
	Aldrin	µg/L	<0.0050	0.03
	Cis- Heptachlorepoxide	µg/L	<0.0050	0.03
	Trans- Heptachlorepoxide	µg/L	<0.0050	0.03
	o.p- DDE	µg/L	<0.0050	0.1*
	p.p- DDE	µg/L	<0.0050	0.1*
	o.p- DDD	µg/L	<0.0050	0.1*
	p.p- DDD	µg/L	<0.0050	0.1*
	o.p- DDT	µg/L	<0.0050	0.1*
	p.p- DDT	µg/L	<0.0050	0.1*
	Oxy-Chlordane	µg/L	<0.0050	0.1
	Mirex	µg/L	<0.0050	0.1

* PL for sum of DDT/DDD/DDE = 0.1 µg/L

No exceeding of PL for POPs pesticides at point No. 13 is established. DDT sum (0.03 µg/L) is also below GWQS. No presence of POPs pesticides is detected in point No. 15.

The analysis and assessment of the data, obtained under Project GEF TF 050706 Wetlands restoration and pollution reduction, about the wetlands along the Danube River at Persina Nature Park and the protected area Kalimok-Brushlen within the Danube River region in the year 2004 show that there is no contamination of groundwater with aldrin, DDT isomers, mirex, chlordane, heptachlor, HCB, HCH-compounds and lindane. No exceeding of GWQS is detected and a conclusion can be drawn that groundwater in the wetlands along the Danube within Persina Nature Park and the protected area Kalimok-Brushlen is with good ecological status as regards the content of POPs pesticides.

GROUNDWATERMONITORING DURING THE PERIOD 2007 – 2010.

In 2010 monitoring of groundwater was conducted at 313 points, as 1,245 samplings were performed and the samples were analyzed also for any available POPs pesticides. No exceeding of MAC was established also as regards specific POPs pollutants in groundwater.

Assessment of groundwater quality was performed for the period 2007 – 2010. To analysis have been subjected specific POPs organic pollutants: aldrin, dieldrin, DDT, endrin, mirex, heptachlor, chlordane, HCB, HCH-compounds, lindane and endosulfan. In respect of groundwater in the whole country there has been established the lack of any excessive content of pesticides, including POPs pesticides (Table No. 22).

Quality of groundwater per basin regions:

THE DANUBE BASIN REGION

Out of the 50 groundwater bodies (GWB), which were subjected to monitoring during the period 2007 – 2010 within the Danube Basin Region, no groundwater bodies at risk were found as regards the content of POPs pesticides. The results from the analyses of POPs pesticides are all much below 0,1 μg/l. As positive change is accounted the clearing of pesticides out of groundwater, as in the period 2007 - 2010 the analyses results everywhere indicate values falling below the groundwater quality standards (GWQS).

THE BLACK SEA BASIN REGION

Out of the 35 GWB which were subjected to monitoring during the period 2007 – 2010 within the Black Sea Basin Region, no GWB at risk were identified as regards the content of POPs pesticides. The data from the analysis of chlororganic pesticides do not show any exceeding of the groundwater quality standards (GWQS) and values are much below 0,1 μg/L

THE EAST– AEGEAN BASIN REGION

Out of the 40 GWB which were subjected to monitoring during the period 2007 – 2010 within the East Aegean Basin Region, no GWB at risk was identified as regards the content of POPs pesticides. After the year 2000 the results from the analysis of chlororganic pesticides show that all values fall below the set standards for groundwater quality(GWQS).

THE WEST AEGEAN BASIN REGION

Out of the 31-то GWB, which have been subjected to monitoring during the period 2007 - 2010 within the West Aegean Basin Region, no GWB at risk were identified as regards the content of POPs pesticides. Throughout said period not any exceeding of the groundwater quality standards (GWQS) was registered as regards pesticides, including POPs pesticides.

Table 22: Monitoring of groundwater in Bulgaria for contamination with POPs pesticides during the period 2000 - 2010.

Year	number of points	number of samples	Aldrin (μg /L)	Dieldrin (μg /L)	Σ DDT (μg/L)	Endrin (μg/L)	Mirex (μg/L)	Heptachlor (μg/L)	Chlordane (μg/L)	HCB (μg/L)	Σ HCH (μg/L)	Lindane (μg/L)	Endosulfan (μg/L)
PL/GWQS (μg/L)			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2000	116	165	143< MDL	141< MDL 1 < EQS	130< MDL 14< EQS	143< MDL	0	141< MDL	1< MDL	72< MDL	124< MDL 14< EQS	140< MDL	1< MDL
2001	48	53	36 < MDL	36< MDL	31< MDL 4< EQS	35< MDL	5< MDL	36< MDL	13< MDL	14< MDL	32< MDL	35< MDL	11< MDL
2002	50	54	46< MDL	46< MDL	46< MDL	34< MDL 2< EQS	4< MDL	46< MDL 1 < EQS	10< MDL	23< MDL	17< MDL	46< MDL	9< MDL
2003	66	69	58 < MDL 1 < EQS	58< MDL	58< MDL 1< EQS	57< MDL	12< MDL	59< MDL	25< MDL	37< MDL	58< MDL	58< MDL	17< MDL
2004	67	72	67 < MDL	57< MDL	63< MDL 1< EQS	57< MDL	14< MDL	66< MDL	26< MDL	34< MDL	64< MDL 2< EQS	66< MDL 1< EQS (0.0001-0.01)	18< MDL
2005	62	63	57 < MDL	47< MDL	57< MDL	48< MDL	15< MDL	55< MDL	12< MDL	32< MDL	57< MDL	57< MDL	2< MDL
2006	231	242	238 < MDL	232< MDL	238< MDL	232< MDL	54< MDL	235< MDL	61< MDL	141< MDL	235< MDL 1< EQS	236< MDL	187< MDL
2007	113	123	100 < MDL	100< MDL	99< MDL	100< MDL	56< MDL	100< MDL	31< MDL	64< MDL	97< MDL	97< MDL	90< MDL
2008	201	344	177 < MDL 1 < EQS	179< MDL	160< MDL 1< EQS	178< MDL	1< MDL	177< MDL	115< MDL	67< MDL	142< MDL 1< EQS	143< MDL	148< MDL
2009	167	307	111 < MDL	119< MDL	94< MDL	111< MDL	0	110< MDL	96< MDL	60< MDL	119< MDL 1< EQS	120< MDL	113< MDL
2010	90	111	80 < MDL	80< MDL	57< MDL	80< MDL	14< MDL	80< MDL	50< MDL	0	69< MDL	69< MDL	71< MDL

PL : pollution limit

GWQS: groundwater quality standard

MDL = LOD or LOQ

(after the year 2007)

Summarized conclusions

❖ **Groundwater in Bulgaria has good ecological status as regards the content of chloroorganic POPs pesticides during the entire period from the year 2000 to 2010.**

❖ **No groundwater contamination has been observed both by chloroorganic POPs pesticides, and by the remaining pesticides, subject of monitoring .**

❖ **All analysis results show values below the pollution limit (PL) or the groundwater quality standards (GWQS) and are much lower than 0.1μg/L.**

❖ **The analyzed POPs pesticides in more than 50% of the values are below the minimum detectable limit (MDL) of laboratory analysis methods.**

3.1.6.1.2.3. Monitoring of land and soils

NSEM, Soil Monitoring Subsystem

Monitoring and control over the status of land and soil is exercised by the National Soil Monitoring System (NSMS), which was established in the year 2004. POPs pesticides are monitored at Level I (large-scale monitoring) and Level III (local soil contamination within which an inventory of areas with contaminated soil is carried out).

❖ At Level I 8 chlororganic pesticides are included (aldrin, DDT/DDD/DDE, dieldrin, endrin, alpha- and beta-HCH, gama-HCH (lindane), HCB, mirex and heptachlor. In the year 2009 the Networks for control and protection of soils from industrial pollution reported the loading of soils with persistent organic pollutants within the national network comprising 95 points. The periodicity of monitoring is every 5 years. For a first baseline year is accepted 2005, and in 2010 the next full monitoring cycle started. In addition, for the purpose of validation of the obtained data, the soil status is monitored on an annual basis in ¼ of the total number of points. In 2010, 2,382 soils samples were collected and analyzed from 397 points.

❖ At Level III 8 chlororganic pesticides are included (aldrin, DDT/DDD/DDE, dieldrin, endrin, alpha- and beta-HCH, gamma-HCH (lindane), HCB, mirex and heptachlor. As of the year 2007 soil sampling is performed on annual basis around old warehouses for storage of obsolete pesticides and the samples are analyzed at the Regional Laboratories of EEA at MoEW.

Monitoring of soils in arable lands during the period 2005 – 2010

During the period 2005 ÷ 2010, under the soil monitoring programme, more than 500 soil samples were collected and distributed evenly throughout the country, as they were analyzed for content of POPs pesticides (in 2005 – 48 samples; in 2006 – 93 samples; in 2007 – 91 samples; in 2008 – 82 samples; in 2009 – 95 samples and in 2010 - 113, or a total of 522 samples). The sampling and analyses of the soil samples were performed at accredited regional laboratories at EEA (Table No. 20).

During the period 2005 – 2010 under the soil monitoring programme, samples were collected and analyzed for content of POPs chlororganic pesticides (aldrin, dieldrin, DDT/DDD/DDE, DDT sum, HCH-compounds, lindane, HCB, mirex, heptachlor, chlordane and toxaphene) in agricultural land soils (Level I) till the year 2010 and in soils in the vicinity of warehouses for storage of obsolete pesticides (Level III) till the year 2009. (Tables No. 23, 24 and 25).

Table 23: Number of analyzed samples for content of POPs pesticides in agricultural land soils in Bulgaria per years for the period 2005 - 2010

Year	number of samCLes	Aldrin	Dieldrin	DDT (сума)	DDE	DDD	DDT	Endrin	HCB	α-HCH	β-HCH	Lindane (γ-HCH)	Mirex	Heptachlor	Chlordane	Toxaphene
LC/MAC/ IC, mg/kg		CL=0.1 MAC=0.5	CL=0.1 MAC=0.5	CL=0.3 MAC=1.5 IC=4	CL=0.1 MAC=0.5	CL=0.1 MAC=0.5	CL=0.1 MAC=0.5	CL=0.1 MAC=0.5	CL=0.025 MAC=0,25 IC=10	CL=0.001 MAC=0,01 IC=2	CL=0.001 MAC=0,01 IC=2	CL=0.001 MAC=0,01 IC=2	CL=0.1 MAC=0.5	CL=0.1 MAC=0.5	CL=0.1 MAC=0.5	CL=0.1 MAC=0.5
2005	48	13 <CL 35 <LOD 48<MAC	15 <CL 33 <LOD 48< MAC	1>IC -14.6 47 << MAC	1>MAC 2>CL 47<<MAC	1>MAC 2>CL 47 << MAC	1>MAC 2>CL 45 < CL	15 <CL 33 <LOD 48<<MAC	8 <CL 40 <LOD 48 << MAC	n.d.a.	n.d.a.	n.d.a.	8 <CL 40 <LOD 48 << MAC	12 <CL 36 <LOD 48 << MAC	8 <CL 40 <LOD 48<< MAC	48 <LOD 48<< MAC
2006	93	8 <CL 85 <LOD 93<MAC	11 <CL 82 <LOD 93<MAC	1>MAC -1.73 4>CL 92 <<MAC	3>CL-0.34 93 <MAC	2 >CL-0.22 93 <MAC	1=MAC- 0.5 4>CL-0.38 92 <<MAC	11 <CL 82 <LOD 93<MAC	3 <CL 90 <LOD 93<< MAC	n.d.a.	n.d.a.	n.d.a.	4 >CL<MAC 1 <CL 88 <LOD	7 <CL 86 <LOD 93<< MAC	4 <CL 89 <LOD 93<< MAC	93 <LOD 93<< MAC
2007	91	91 << MAC	91 << MAC	1>CL-1.44 91 << MAC	3>MAC-0.96 90 << MAC	91 << MAC	1>MAC-1.1 90 << MAC	n.d.a.	91 << MAC	91 << MAC	91 << MAC	91 << MAC	50 < LOD 91 << MAC	91 << MAC	n.d.a.	n.d.a.
2008	82	56 <LOD 82 << MAC	656 <LOD 82 << MAC	82 << MAC	82 << MAC	82 << MAC	82 << MAC	n.d.a.	82 << MAC	82 << MAC	1>MAC-0.02 81 << MAC	82 << MAC	57 <LOD 82 << MAC	63 <LOD 82 << MAC	n.d.a.	n.d.a.
2009	95	65 <LOD 35 << MAC	65 <LOD 35 << MAC	1>CL-0.79 94 << MAC	1>CL-0.7 94 << MAC	95 << MAC	1>CL-0.3 95 << MAC	n.d.a.	17 <LOD 95 << MAC	95 << MAC	95 << MAC	95 << MAC	83 <LOD 95 << MAC	83 <LOD 95 << MAC	n.d.a.	n.d.a.
2010	113	n.d.a.	n.d.a.	4>CL-1.48 105 << MAC	7>CL-0.3 1>MAC.0.63 105 << MAC	113 << CL	3>CL-0.19 110 << MAC	n.d.a.	113 <<CL	1>CL-0.003 112 << MAC	10>CL-0.0096 103 << MAC	3>CL-0.003 2>MAC-0.06 108 << MAC	n.d.a.	n.d.a.	n.d.a.	n.d.a.

Table 24: Number of analyzed samples for content of POPs pesticides in soils in arable lands and meadows, located near warehouses for obsolete pesticides for the years 2005, 2006 and 2009 in Bulgaria

Year /	number of samCLes	Aldrin	Dieldrin	DDT (sum)	DDE	DDD	DDT	Endrin	HCB	α-HCH	β-HCH	Lindane (γ-HCH)	Mirex	Heptachlor	Chlordane	Toxaphene
CL/MAC/ IC, mg/kg		CL=0.1 MAC=0.5	CL=0.1 MAC=0.5	CL=0.3 MAC=1.5 IC=4	CL=0.1 MAC=0.5	CL=0.1 MAC=0.5	CL=0.1 MAC=0.5	CL=0.1 MAC=0.5	CL=0.025 MAC=0,25 IC=10	CL=0.001 MAC=0,01 IC=2	CL=0.001 MAC=0,01 IC=2	CL=0.001 MAC=0,01 IC=2	CL=0.1 MAC=0.5	CL=0.1 MAC=0.5	CL=0.1 MAC=0.5	CL=0.1 MAC=0.5
2005	22	6 <LOD 22<MAC	1>CL-0.11 6 <LOD 22<MAC	2>IC -9.68 2>MAC-2.49 1>CL-0.63 18 << MAC	4>MAC-1.02 18<<MAC	22 << MAC	4>MAC-8.82 22 < CL	6 <LOD 22<MAC	6 <LOD 22<MAC	n.d.a.	n.d.a.	n.d.a.	6 <LOD 22<MAC	6 <LOD 22<MAC	1 >CL-0.24 4 <LOD 22<< MAC	22 <LOD 22<< MAC
2006	30	5 <LOD 30<MAC	26 <LOD 30<MAC	2>IC -477.2 1>MAC-1.79 2>CL-1.27 27 <<MAC	2>MAC-4.2 1>CL-0.4 28 <MAC	2>MAC-5.5 28 <MAC	5>MAC-17.41 25 <MAC	5 <LOD 30<MAC	5 <LOD 30<MAC	n.d.a.	n.d.a.	n.d.a.	5 <LOD 30<MAC	5 <LOD 30<MAC	9 <LOD 30<MAC	30 <LOD 30<MAC
2009	33	8 <LOD 25 <CL 33 << MAC	8 <LOD 2 >CL-0.27 33 << MAC	4>IC -80.17 1>MAC-3.59 1>CL-1.03 28 <<MAC	6>MAC-24.1 3>CL-0.24 27 <<MAC	5>MAC-15.7 3>CL-0.21 28 <<MAC	5>MAC-40.4 2>CL-0.43 28 <<MAC	n.d.a.	33 << MAC	2>MAC-0.9 31 <<MAC	2>IC -2.44 2>MAC-0.162 2>CL-0.009 29 <<MAC	2>MAC-1.36 1>CL-0.003 31 <<MAC	12 <LOD 21 <CL 33 << MAC	8 <LOD 25 <CL 33 << MAC	n.d.a.	n.d.a.

Table 25: Number of points within the National soil monitoring network in which there has been registered exceeding of MAC (1.5 mg/kg) and IC (4 mg/kg) for DDT sum in the period 2005 - 2010.

Number of samples with exceeding values/ total	2005		2006		2007		2008		2009		2010	
	IC	mg/kg	IC	mg/kg	IC	mg/kg	IC	mg/kg	IC	mg/kg	IC	mg/kg
Soils in arrable lands	1/48	14.64	1/93	1.73	0/91	-	0/82	-	0/95	-	0/113	-
Soils around warehouses for obsolete pesticides	4/22	9.68 8.44 2.49 1.68	3/30	477.20 3.24 1.79	n.d.a.	n.d.a.	n.d.a.	n.d.a.	5/33	80.17 17.40 13.58 8.41 3.59	n.d.a.	n.d.a.

The measured content of POPs pesticides (aldrin, dieldrin, HCH-compounds, lindane, HCB, mirex, heptachlor, chlordane and toxaphene) in soils of arable agricultural lands during the period 2005-2010 are several times lower than MAC, as their values are either below the concentration limit (CL) or below LOD. In one sample only in the year 2008 exceeding was established (0.02 mg/kg) of β-HCH over MAC (0.01 mg/kg), and 2 samples exceeding MAC (0.03 and 0.06 mg/kg), which however is lower than the intervention concentration (IC = 2 mg/kg).

The performed monitoring under the Programme for large scale soil monitoring during the period 2005 -2010 allows for drawing the conclusion that soils in arrable lands in the country have good ecological status and there is no soil contamination with aldrin, dieldrin, HCH-compounds and lindane, HCB, mirex, heptachlor, chlordane and toxaphene.

There are still single point sources of pollution of soils in agricultural lands with DDE/DDD/DDT over MAC, irrespective of the fact that the use of DDT was prohibited more than 50 years ago. In 2005 in the area of Pazardzhik a three-time exceeding of IC in one sample (14.64 mg/kg) was established probably due to old contamination with DDT by a warehouse situated in the vicinity (Table No. 22). In 2006 the content of DDT sum in the same region significantly decreased and fell below IC. In the period 2007 – 2010 no exceeding of MAC was registered for DDT sum in any of the tested soils samples.

The results from the soil monitoring during the period 2007 – 2010 show that soils in agricultural lands have a very good ecological status and no pollution with POPs pesticides exceeding MAC is registered.

LOCAL CONTAMINATION OF SOILS AROUND WAREHOUSES FOR OBSOLETE PESTICIDES IN THE YEARS 2005, 2006 AND 2009.

In relation to the existing warehouses with obsolete and/ or prohibited plant protection products, to additional study are subjected regions/ nearby sites – as places in which contamination of the adjoining areas is expected due to leaking roofs, buildings with pulled down fences and exposure of obsolete pesticides to atmospheric influence. The monitoring includes the following POPs pesticides: aldrin, dieldrin, DDT, HCB, mirex, heptachlor, α-, β- and γ-HCH (lindane). Out of the samples tested in the year 2009 for content of chlororganic pesticides, over 85% of the measured contents are either below the maximum admissible concentrations (MAC) or below the preventive concentrations (PC). An exceeding in 6.7 % to 12.1% of the tested samples above IC for DDT sum was detected in the years 2005, 2006 and 2009 and for β-HCH for the year 2009, which indicated the availability of DDT and HCH-compounds in the warehouses for obsolete pesticides in the regions of Stara Zagora, Pazardzhik, and Veliko Tarnovo (Table No. 24).

ANALYSES OF POPS PESTICIDES IN SOILS DURING THE PERIOD 2006 – 2009 (MOAF , BFSA - CLCHTC)

NPPS at MoAF and in particular, the Central Testing and Control Laboratory (CLChTC) has never performed any specifically targeted programmes for monitoring of residual persistent organic pollutants(POPs) in soils and food.

During the period 2006 – 2009 CLChTC received samples from soils and food (mostly herbs) provided by clients against payment, which, following the wish of the latter, were tested for content of residual POPs. Within the scope of the analyses the following residual POPs pesticides were included: aldrin; chlordane; dieldrin; endrin; heptachlor; hexachlorbenzene (HCB); DDT and metabolites; lindane; alpha-HCH and beta–HCH. Within the specified period of time 40 soil samples were tested, as in 37 out of these the presence of residual POPs was proven. The results of these tests are presented in Table No. 26.

Table 26: Content of residues of POPs pesticides in soils samples during the period 2006 – 2009.

Successive number	Type of sample	Year	POPs - pesticides	Content of residues of POPs [mg/kg]	Region	MAC/IC [mg/kg]
1	field soil	2006	DDT and metabolites	0.010		1.5/4
2	field soil	2006	DDT and metabolites	0.168		1.5/4
3	field soil	2006	DDT and metabolites	0.038	village of Damyanitsa, area of Ormana	1.5/4
4	field soil	2006	DDT and metabolites	0.007		1.5/4
5	field soil	2006	DDT and metabolites	3.126	village of Katunitsa, Plovdiv	1.5/4
6	field soil	2006	DDT and metabolites	2.173	village of Katunitsa, Plovdiv	1.5/4
7	field soil	2006	DDT and metabolites	0.028		1.5/4
8	field soil	2006	DDT and metabolites	0.032		1.5/4
9	field soil	2006	DDT and metabolites	0.041		1.5/4
10	field soil	2006	DDT and metabolites	0.019		1.5/4
11	field soil	2007	DDT and metabolites	0.099	town of Samokov	1.5/4
12	field soil	2007	DDT and metabolites	2.803		1.5/4
13	field soil	2007	DDT and metabolites	2.825		1.5/4
14	field soil	2007	DDT and metabolites	1.587		1.5/4
15	field soil	2007	DDT and metabolites	1.876		1.5/4
16	field soil	2007	DDT and metabolites	0.028		1.5/4
17	field soil	2007	HCB	0.006		0.01/2
18	greenhouse soil	2007	Dieldrin	0.416	town of Marten	0.5
19	greenhouse soil	2007	Dieldrin DDT and metabolites	0.436 0.033	town of Marten	0.5
20	greenhouse soil	2007	Dieldrin DDT and metabolites	0.599 0.023	town of Marten	0.5
21	greenhouse soil	2007	Dieldrin DDT and metabolites	0.615 0.012	town of Marten	0.5
22	greenhouse soil	2007	Dieldrin DDT and metabolites	0.117 0.014	town of Marten	0.5
23	greenhouse soil	2007	Dieldrin	0.615	town of Marten	0.5
24	greenhouse soil	2007	DDT and metabolites	0.115	village of Zvanichevo	0.5
25	greenhouse soil	2007	DDT and metabolites	0.012	village of Zvanichevo	0.5
26	greenhouse soil	2007	DDT and metabolites	0.019	village of Zvanichevo	0.5
27	greenhouse soil	2007	DDT and metabolites	0.025	village of Zvanichevo	0.5
28	greenhouse soil	2007	Dieldrin	0.066	town of Levski	0.5
29	field soil	2007	DDT and metabolites	0.024	area of Krushova Niva	1.5/4
30	field soil	2007	DDT and metabolites	0.016	area of Gerena	1.5/4
31	field soil	2008	DDT and metabolites	0.545		1.5/4
32	field soil	2008	DDT and metabolites	0.039		1.5/4
33	field soil	2008	DDT and metabolites	0.033		1.5/4
34	field soil	2008	DDT and metabolites	0.028		1.5/4

Successive number	Type of sample	Year	POPs - pesticides	Content of residues of POPs [mg/kg]	Region	MAC/IC [mg/kg]
35	field soil	2008	Dieldrin	0.017	village of Cherven, region of Ruse	0.5
36	field soil	2009	DDT and metabolites	0.090		1.5/4
37	field soil	2009	DDT and metabolites	0.015		1.5/4

(Source: BFSA, 2010)

The analysis of the data from the tested soils samples shows that there were detected levels of residual DDT sum and metabolites over MAC = 1.5 mg/kg in 2 soils samples in the year 2006 (3.126 mg/kg and 2.173 mg/kg dry soil in the village of Katunitsa, region of Plovdiv) and in 4 soil samples in the year 2007 (1.587 mg/kg ÷ 2.825 mg/kg dry soil), which could have been due to the local soils contamination from old warehouses for obsolete pesticides, located in the vicinity of arable lands. It is evident that these are “local hot spots” of old pollution with DDT, but the residues of DDT sum and metabolites do not exceed the intervention concentration (IC = 4 mg/kg) and no additional remediation measures prove necessary.

In 2007 there was detected the presence of residual dieldrin slighthly above MAC = 0.5 mg/kg in 3 soils samples (0.599 mg/kg ÷ 0.615 mg/kg dry soil, town of Marten, region of Ruse) which is again probably due to the availability of an old warehouse for obsolete pesticides in the vicinity of agricultural lands.

In the years 2008 and 2009 no exceeding was detected as regards the levels of residual DDT sum and metabolites and dieldrin in any of the tested soil samples, which shows that the pollution sources (old warehouses in the vicinity of agricultural lands) were eliminated.

The established levels of residual HCB in soils do not exceed MAC= 0.01 mg/kg.

LEVELS OF POPS PESTICIDES IN SOILS UNDER THE PROJECT MONET CEEC-SOIL SAMPLING 2007

Under the Regional International Project “Determination of trends in the ambient air POPs concentrations in Bulgaria using the polyurethane foam based passive air samplers” (PAS_CEECs) – Phase II, 2007, in parallel to determining POPs in atmospheric air, at 6 points were collected and analyzed from the soils under the filters of said points (Tables No. 27 and 28).

Table 27: Concentrations of POPs pesticides in soils (mg/kg) in sample collection points in Bulgaria for the year 2006 (MONET CEEC-Soil sampling 2006)

Concentration of POPs pesticides in soil, mg/kg,	Sofia, Industrial zone, Yana station, BG-01	Sofia, heavy traffic zone, Orlov most BG-02	Sofia, urban zone, Hipodruma quarter BG-03	Pernik, industrial zone, near Stomana Pernik AD BG-04	Plovdiv, rural region, near KCM AD /non-ferrous metals plant/, BG-05	Sofia, suburban zone, Boyana quarter BG-06
Alpha-HCH	0.0001	0.0001	0.0003	0.0004	0.0002	0.0003
Beta-HCH	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
Gamma-HCH	0.0003	0.0004	0.0004	0.0007	0.0003	0.0002
Delta-HCH	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
Total HCH	0.0004	0.0005	0.0008	0.0011	0.0006	0.0005
p,p' - DDE	0.0045	0.0142	0.0784	0.0309	0.0481	0.0307
p,p' -DDD	0.001	0.0072	0.0456	0.0054	0.0111	0.0457
p,p' -DDT	<LOQ	0.0001	0.0011	0.0001	0.0002	0.0012
DDT sum	0.0055	0.0214	0.1251	0.00364	0.00594	0.07.6
HCB	0.0002	0.0004	0.0001	0.0001	0.0001	0.0001

Table 28: Minimum, maximum, mean and median concentration of POPs pesticides in soils (mg/kg) at 6 sample collection points (MONET CEEC-Soil sampling 2006)

Concentration of POPs pesticides in soil	Number of points	Minimum mg/kg	Maximum mg/kg	Mean mg/kg	Median mg/kg
HCH sum	6	0.0006	0.0013	0.0008	0.0007
DDT sum	6	0.0056	0.1251	0.0543	0.0479
HCB	6	0.0001	0.0004	0.0002	0.0001

The results show content of the POPs pesticides in soil samples which is by several times lower than MAC both for the individual HCH- and DDT isomers, and for HCH sum and DDT sum and HCB in all points – industrial, urban, and suburban zones, and rural regions.

SUMMARIZED CONCLUSIONS

<u>ACCORDING TO DATA PROVIDED BY EEA, MOEW.</u>

- **The soils in the country in the year 2010 have good ecological status as regards the presence of any residual POPs pesticides. There are no registered soil contaminations with persistent organic pollutants, with the exception of DDT and lindane.**

- **There were detected single point sources of pollution in soils in agricultural lands with DDT over MAC in the region of Pazardzhik in the years 2005 and 2006, which marked a considerable decrease in the year 2007 and are already below MAC to date. The measured content of the POPs pesticides aldrin, dieldrin, HCH-compounds and lindane, HCB, mirex, heptachlor, chlordane and toxaphene during the period 2005 - 2009 are by several times lower than MAC, as in over 90% of the samples they are below the limit of detection (LOD).**

- **The soil monitoring results duirng the period 2007 – 2010 show that soils in agricultural lands have good ecological status and no contaminations with POPs pesticides exceeding MAC were found.**

- **These conclusions are confirmed also by the results obtained from the analyzed soils samples at 6 points (industrial, urban, suburban, and rural) under the Regional International Project “Determination of trends in the ambient air POPs concentrations in Bulgaria using the polyurethane foam based passive air samplers” (PAS_CEECs) – Phase II, year 2007. The measured content of POPs pesticides in soil samples is by several times lower than MAC, both as regards individual HCH- and DDT isomers and for HCH sum and DDT sum and HCB at all points.**

- **The monitoring during the period 2007 – 2009 on sites and soils in the vicinity of old warehouses for storage of obsolete pesticides for presence of aldrin, dieldrin, DDT, HCB, HCH-compounds, including lindane, heptachlor and mirex show that in 85% of the samples the measured content is either below MAC, or below PC. There was established exceeding within the range of 6.7 % - 12.1% in the tested samples above IC for DDT sum in the years 2005, 2006 and 2009 and for β-HCH in the year 2009, which is indicative of the presenbce of DDT and HCH in the warehouses for obsolete pesticides in the regions of Stara Zagora, Pazardzhik and Veliko Tarnovo. The problem will be resolved by liquidation of these warehouses, disposal of the obsolete pesticides stored therein, and reclamation of the contaminated areas.**

- **The measured content of POPs pesticides in the soil samples (MONET CEEC-Soil sampling 2007) are by several times lower than MAC both for individual HCH- and DDT isomers, and for HCH sum and DDT sum and HCB in all points – industrial, urban, and suburban zones and rural regions.**

<u>ACCORDING TO DATA PROVIDED BY BFSA, MOAF</u>

- **A presence of residual DDT sum and metabolites above MAC was established (MAC = 1.5 mg/kg in 2 soil samples in the year 2006 and in 4 soils samples in the year 2007, analyzed by NPPS, which could be due to local soil contamination from old warehouses for obsolete pesticides, located in the vicinity of arrable lands, and yet these old contaminations do not exceed IC =4 mg/kg;**

- **In the year 2007 there was established a presence of residual dieldrin slightly above MAC = 0.5 mg/kg in 3 soil samples, which is again due to old contaminations from old warehouses for obsolete pesticides;**

- **No exceeding of MAC = 0.01 mg/kg for HCB in the analyzed soil sample was established in the year 2007;**

❖ **In the years 2008 and 2009 no exceeding of the levels of residual DDT sum and metabolites and dieldrin was detected in any of the tested soil samples, which shows that the pollution sources (old warehouses in the vicinity of these agricultural lands) were eliminated.**

3.1.6.1.2.4. Levels of POPs pesticides in atmospheric air under Project MONET CEEC-Passive Air Sampling 2007

Under Regional International Project "Determination of trends in the ambient air POPs concentrations in Bulgaria using the polyurethane foam based passive air samplers" (PAS_CEECs) – Phase II, 2007, in order to determine POPs pesticides in atmospheric air at 6 points (4 points in Sofia – BG-01, industrial zone, Yana Station, BG-02, heavy traffic zone BG-03, urban residential zone, and BG-06, suburban zone Boyana; 1 point – BG-04, industrial zone – Pernik and 1 point – BG-05, rural region in the vicinity of Non-ferrous Metals Plant – Plovdiv) there were collected and analyzed samples from the filters at these points for concentrations of POPs pesticides in atmospheric air. The project was implemented during the period 2006 – 2008 in 17 states in Central and Eastern Europe and was funded by the Czech Government. The filter samples were sent by the Brno University and were analyzed for content of HCH, DDT and HCB. The results for determination of POPs pesticides in atmospheric air are specified in Tables No. 29 through No. 34.

Table 29: Statistical evaluation of HCH concentrations (sum of α, β, γ, δ-HCH) in atmospheric air, determined following a passive method (PAS_CEEC_2007) at 6 points in Bulgaria (5 periods of sample collection) in 2007.

Sample collection point/HCH	Min (ng/filter)	Max (ng/filter)	Mean (ng/filter)	Median (ng/filter)
Sofia, BG-01, industrial zone, Yana station	5.5	11.6	8.7	8.3
Sofia, BG-02, heavy traffic zone, Orlov Most	14.1	25.3	20.1	20.8
Sofia, BG-03, urban residential zone Hipodruma	22.7	95.7	39.5	26.0
Pernik, BG-04, industrial zone Tsurkva	9.7	21.5	14.3	15.1
Plovdiv, BG-05, rural region near Non-ferrous Metals Plant Dolni Voden"	25.6	47.9	32.3	26.3
Sofia, BG-06, suburban zone Boyana	12.3	29.1	23.6	24.4
Bulgaria, total	**5.5**	**95.7**	**23.1**	**23.2**

Source: RECETOX-TOCOEN Report No.339, Brno, Czech Republic, 2008 , p. 281

Table 30: Statistical evaluation of the DDT concentrations in atmospheric air, determined following a passive method (PAS_CEEC_2007) at 6 points in Bulgaria (5 periods of sample collection) in 2007.

Sample collection point/DDT	Min (ng/filter)	Max (ng/filter)	Mean (ng/filter)	Median (ng/filter)
Sofia, BG-01, industrial zone, Yana station	7.2	17.9	13.0	14.3
Sofia, BG-02, heavy traffic zone, Orlov Most	12.0	21.8	15.7	14.3
Sofia, BG-03, urban residential zone Hipodruma	7.1	19.0	14.2	15.7
Pernik, BG-04, industrial zone Tsurkva	3.9	7.6	6.1	6.0
Plovdiv, BG-05, rural region near the non-ferrous metals plant KCM Dolni Voden"	17.9	36.1	27.1	28.0
Sofia, BG-06, suburban zone Boyana	4.4	13.1	10.1	10.5
Bulgaria, total	**3.9**	**36.1**	**14.4**	**13.3**

Source: RECETOX-TOCOEN Report No.339, Brno, Czech Republic, 2008 , p. 284

Table 31: Statistical evaluation of the HCB oncentrations in atmospheric air, determined following a passive method (PAS_CEEC_2007) at 6 points in Bulgaria (5 periods of sample collection) in 2007.

Sample collection point/HCB	Min (ng/filter)	Max (ng/filter)	Mean (ng/filter)	Median (ng/filter)
Sofia, BG-01, industrial zone, Yana station	2.6	6.8	4.5	4.2
Sofia, BG-02, heavy traffic zone, Orlov Most	8.4	15.0	11.8	12.3
Sofia, BG-03, urban residential zone Hipodruma	4.8	7.5	6.2	6.3
Pernik, BG-04, industrial zone Tsurkva	4.1	5.3	4.8	5.2
Plovdiv, BG-05, rural region near non-ferrous metals plant KCM Dolni Voden	3.7	6.8	4.8	4.3
Sofia, BG-06, suburban zone Boyana	3.6	5.5	4.8	5.3
Bulgaria, total	**2.6**	**15.0**	**6.2**	**5.3**

Source: RECETOX-TOCOEN Report No.339, Brno, Czech Republic, 2008 , p. 287

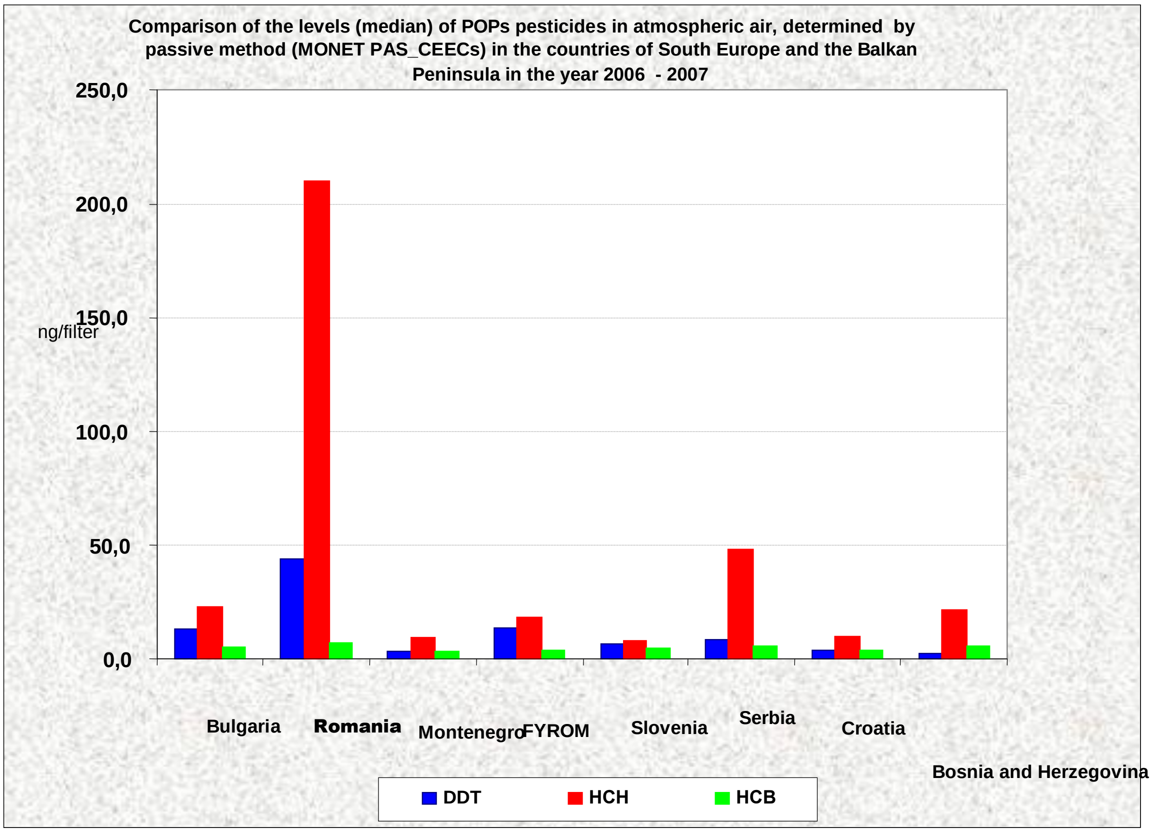


Figure 6: Levels (median) of POPs pesticides in atmospheric air, determined through a passive method (MONET PAS_CEECs) in the countries of South Europe and the Balkan Peninsula in the period 2006 - 2007.

In 2007 the highest levels of HCH (sum α, β, γ, δ-HCH) in atmospheric air, determined following a passive method (PAS_CEEC_2007) are determined in FYROM (Skopje – urban residential zone OHIS, 343.5 ng/filter) and in Bulgaria (Sofia – urban residential zone Hipodruma, 95.7 ng/filter), and in 2006 the highest levels of HCH are registered in Romania (Turda – urban residential zone Metallurgy Plant, 2767.0 ng/filter) and Serbia (Novi Sad – urban industrial zone Refinery, 443.9 ng/filter).

Table 32: Comparison of HCH (sum of α, β, γ, δ-HCH concentrations in atmospheric air, determined by way of passive method (MONET PAS_CEECs) in the countries of South Europe and Bulgaria for the period 2006 - 2007.

Country	Year	Number of points	Min (ng/filter)	Max (ng/filter)	Mean (ng/filter)	Median (ng/filter)
Bulgaria	2007	6	5.5	95.7	23.1	23.2
Croatia	2007	5	4.2	16.8	10.3	9.9
FYROM	2007	6	8.3	343.5	88.1	18.3
Montenegro	2007	7	0.8	56.9	16.3	9.1
Slovenia	2007	7	3.6	35.4	10.0	8.2
Bosnia and Herzegovina	2006	2	8.6	46.5	23.3	21.5
Romania	2006	20	19.4	2767.0	358.0	209.9
Serbia	2006	7	6.7	443.9	87.7	48.0

Source: RECETOX-TOCOEN Report No.339, Brno, Czech Republic, 2008 , pp. 88-89

The relatively high levels of HCH in atmospheric air in Bulgaria are probably due to air transfer exactly from the neighbouring states of Romania, Serbia and FYROM. The mean and mediane values for Bulgaria in industrial, urban and rural zones are within the range of mean 8.7 – 39.5 ng/filter and median 10.5 – 28.0 ng/filter. The average HCH concentration in atmospheric air for Bulgaria is relatively low, 23.1 ng/filter, and is by several times lower than the one in Romania, Serbia and FYROM and is similar to those, registered in the other states within the region. The high values of HCH in Romania, FYROM and Serbia are probably caused by stored large amounts of obsolete HCH (Romania and Former Yugoslavia are states which used to produce lindane), which has inevitably influenced the registered HCH levels in Bulgaria, due to air transfer.

Table 33: Comparison of DDT concentrations in atmospheric air, determined by way of passive method (MONET PAS_CEECs) in the countries of South Europe and Bulgaria for the period 2006 – 2007.

Country	Year	Number of points	Min (ng/filter)	Max (ng/filter)	Mean (ng/filter)	Median (ng/filter)
Bulgaria	2007	6	3.9	36.1	14.4	13.3
Croatia	2007	5	1.6	6.9	4.0	4.0
FYROM	2007	6	2.5	25.4	14.3	14.0
Montenegro	2007	7	1.3	11.3	4.4	3.5
Slovenia	2007	7	2.5	14.2	7.2	6.6
Bosnia and Herzegovina	2006	2	0.7	5.2	2.6	2.8
Romania	2006	20	4.0	253.1	61.9	44.1
Serbia	2006	7	0.2	132.0	22.6	8.3

Source: RECETOX-TOCOEN Report No.339, Brno, Czech Republic, 2008 , pp. 91-93

By comparing the registsred levels of DDT in atmospheric air in the years 2006 and 2007 in the countries on the Balkan Peninsula and in Bulgaria, it has been established that there are still detected sites contaminated with DDT and metabolites, but for Bulgaria these values are by several orders lower than the levels of DDT in Romania and Serbia. The highest levels of DDT are found in a rural region in the vicinity of Plovdiv (36.1 ng/filter), probably due to the existence of old warehouses for obsolete pesticides in this area, followed by the region of the capital city Sofia (heavy traffic zone Orlov Most, 21.8 ng/filter and industrial zone Yana Station, 17.9 ng/filter), probably due to air transfer from neighbouring countries. As a whole, the maximum levels of DDT and metabolites are not high and are comparable to those registered in the other Balkan countries, with the exception of the levels in Romania and Serbia.

Table 34: Comparison of HCB concentrations in atmospheric air, determined by way of the passive method (MONET PAS_CEECs) in the countries of South Europe and Bulgaria for the period 2006 - 2007

Country	Year	Number of points	Min (ng/filter)	Max (ng/filter)	Mean (ng/filter)	Median (ng/filter)
Bulgaria	2007	6	2.6	15.0	6.2	5.3
Croatia	2007	5	2.8	5.5	4.2	4.1
FYROM	2007	6	2.5	6.5	4.0	3.9
Montenegro	2007	7	2.3	5.1	3.4	3.5
Slovenia	2007	7	3.1	7.5	4.7	4.5
Bosnia and Herzegovina	2006	2	0.1	7.7	5.8	6.0
Romania	2006	20	1.8	16.3	8.0	7.3
Serbia	2006	7	0.5	20.2	6.7	5.7

Source: RECETOX-TOCOEN Report No.339, Brno, Czech Republic, 2008 , pp. 95-97

The even distribution in atmospheric air is typical of HCB. The average levels of HCB, reported for Bulgaria are very low and comparable to those in the other Balkan countries. Nevertheless, HCB has never been imported and used in Bulgaria.

CONCLUSIONS

- **The results for the levels of POPs pesticides (DDT, HCB, HCH sum of isomers) in atmospheric air, determined following the passive air sampling method by way of polyurethane foam based filters under the Regional International Project MONET PAS_CEEC_2006_2007, implemented in 17 countries in Central, Eastern and Southern Europe show the presence of these POPs pesticides in atmospheric air, varying in different ranges.**

- **In Bulgaria in the year 2007 at 6 points (in Sofia, Pernik and Plovdiv) sampling was performed in 5 periods following a passive metod through polyurethane foam-based filtres and the samples are analyzed in the Czech Republic for levels of HCH sum, DDT, HCB;**

❖ **By comparing the reported levels of DDT in atmospheric air in the years 2006 and 2007 in the countries on the Balkan Peninsula and in Bulgaria, it is established that there are still detected sites contaminated by DDT and metabolites, but for Bulgaria these values are by several orders lower than the levels of DDT in Romania and Serbia;**

❖ **The relatively high maximum levels of HCH (cum of α, β, γ, δ-HCH) in atmospheric air, reported for Bulgaria (95.7 ng/filter) are probably due to air transport from the neighbouring countries (Romania, Serbia and FYROM), where the highest concentrations of HCH are registered. And yet, the reported levels of HCH sum in atmospheric air for Bulgaria are by 29 times lower than those registered in Romania, almost 5 times lower than those registered in Serbia and almost 4 times lower than those registered in FYROM.**

❖ **The average levels of HCB in atmospheric air, measured for Bulgaria, are much lower and comparable to those for the other Balkan countries. HCB has never been imported to and used in Bulgaria.**

3.1.6.2. Monitoring of POPs pesticides residues in food and feed

Till the year 2010 the monitoring of residual pesticides and other harmful substances in and on food of plant origin (fruit, vegetables and feeds on the field) had been carried out by NPPS at MoAF .

The official control over the safety of food of non-animal origin till the establishment of BFSA in March 2011 has been performed by MoH and RHI under the Foods Act.

Monitoring and analysis of the offered Bulgarian production and imported foods is carried out as per their safety indicators. The monitoring of safety of foods of non-animal origin includes only particular POPs pesticides. The control over live animals and animal products intended for human consumption has exercised by the National Veterinary Service (NVS) at MoAF till the year 2010.

The control over the safety of food of plant and animal origin till the year 2010 has been exercised under 3 national monitoring programmes.

- ✓ Monitoring programme for residues of pesticides in materials and products of plant origin in the course of harvesting;
- ✓ Monitoring programme for chemical pollutants – pesticide residues and micotoxins in plants and plant products intended for feed production;
- ✓ Monitoring programme for control of the residues of specific substances and their residues in live animals, materials and food of animal origin [(Chlororganic pesticides, B (3) (a)].

As of the beginning of the year 2011 the three monitoring programmes are unified into a National programme for monitoring of residues of pesticides and other harmful substances in and on food of plant and animal origin and the control of foods has been transferred to BFSA.

The control over materials and products of plant origin in the course of harvesting, on plants and plant products, intended for production of feed and on foods of plant origin intended for human consumption includes only monitoring of the residues from chlororganic POPs pesticides. The food is analyzed by way of referent methods for analysis of POPs pesticides in food of plant and animal origin.

Source: BFSA, 2011.

In Bulgaria there are 11 laboratories accredited for testing of residual POPs pesticides in raw materials and products of plant origin, food of plant and animal origin, and feed. Two laboratories for testing of POPs pesticides are accredited at BFSA and MoAF.

Within the system of MoH and NCPHA at MoH there are 7 accredited laboratories for testing of POPs pesticides in food of plant and animal food distributed on the market for residues of chlororganic POPs pesticides, and there is one accredited laboratory at the Agricultural University in the city of Plovdiv. *(Source: BFSA, 2011).*

3.1.6.2.1. Norms for maximum admissible concentrations of residues of POPs pesticides in food and feed

Table No. 35 specifies the norms for maximum admissible concentrations of residues (MALRS) of POPs pesticides in or on food and feed.

Table 35: Norms for maximum admissible concentrations of residues (MALRS) of POPs pesticides in or on food and feed

Food	National or European legislation	Annex to the regulatory document	Norm for maximuma admissible limits of residual substances (MALRS)
FOOD			
Food of plant and animal origin	Ordinance No. 31 of 29.12.2003 on the norms for maximum admissible amounts (MALRS) of residual pesticides in food, promulgated in the State Gazette, 14/24.02.2004, last amended, SG 29/18.03.2009; Regulation (EC) No. 396/2005 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 February 2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origin and amending Council Directive 91/414/EEC	Annex No. 2: Part I – List of pesticides and their residues in or on food Part II – Norms for maximum admissible amounts of pesticide residues (MALRS) in or on food, in mg/kg Source: Latest update as at 10.08.2011 from MRL_EU pesticide database	Annex No. 2 (see below)

Annex No. 2

Part I: Part I – List of POPs pesticides and their resides in or on food

POPS pesticide	Note
Aldrin and Dieldrin	(1) for food of plant origin, other than cereals: aldrin and dieldrin, in combination expressed as dieldrin (2) for cereal plants and food of animal origin: aldrin and dieldrin, on their own, or in combination, expressed as Dieldrin (HEOD)
DDT	Sum of pp'-DDT, op'-DDT, pp'-DDE and pp'-ТДЕ (DDD), expressed as DDT
Dicofol	(1) for food of plant origin and food of animal origin: with the exception of liver from bovine animals, sheep and goats: sum of P, P' and O, P' isomers (2) for food of animal origin: liver of bovine animals, sheep and goats: 1.1-bis-(parachlorophenol)-2,2-didichloroethanol (PP'-FW152), expressed as dicofol
Endosulfan	Sum of alpha- and beta- isomers and endosulfan sulphate expressed as endosulfan
Endrin	Endrin
Toxaphene (Camphechlor)	(1) for food of plant origin, other than cereals: camphechlor (toxaphene) (2) for cereal plants: camphechlor (chlorinated camphene with 67-69% chlorine) (3) for food of animal origin: camphechlor (sum of the three indicator ingredients Parlar No. 26 (2-endo, 3-exo, 5-endo, 6-exo, 8, 8, 10, 10-octachlorobornan), Parlar No. 50 (2-endo, 3-exo, 5-endo, 6-exo, 8, 8, 9, 10, 10-nonachlorobornan) and Parlar No. 62 (2, 2, 5, 5, 8, 9, 9, 10, 10- nonachlorobornan)
Lindane	Gamma hexachlorocyclohexane
Hexachlorbenzene(HCB)	Hexachlorbenzene
Hexachlorcyclohexane (HCH)	HCH, sum of isomers, with the exception of gamma isomer
Heptachlor	Sum of heptachlor and heptachlor epoxide, expressed as heptachlor
Chlordane	(1) for food of plant origin, other than cereals (grain foods): chlordane (sum of cis- and trans- chlordane) (2) cereals (grain foods): chlordane (sum of cis- and trans- isomers, expressed as chlordane) (3) for food of animal origin: (sum of cis- and trans- isomers and oxichlordane, expressed as chlordane)

Part II: MALRS in or on food for POPS pesticides, mg/kg

POPs pesticide	Plant origin foods				Animal origin foods				
MALRS (mg/kg)	Fruit и vegetables, fresh, frozen and dried mushrooms	Oil plant seeds	Other plants:	Cereal (grain) crops	Meat, fats and meat products	Milk and milk products	Eggs	Bee honey	Other foods
Aldrin and	Cucumbers: 0.02	0.02	Tea, coffee, herbs:	0.01	0.2	0.006	0.02	0.01	Frogs' legs:

Food	National or European legislation	Annex to the regulatory document	Norm for maximuma admissible limits of residual substances (MALRS)									
			Dieldrin	melons, pumpkins, water melons: 0.03 courgettes: 0.05 All other fruit and vegetables: 0.01		0.02 Cocoa: 0.05 Hops: 0.02 Spices: 0.1 Sugar beet and cane, chicory: 0.01						0.01 Snails: 0.01
			DDT	All fruit and vegetables: 0.05	0.05	Tea: 0.2 Coffee: 1 Cocoa: 0.5 Herbs: 0.5 Hops: 0.05 Spices: 1 Sugar beet and cane, chicory: 0.05	0.05	1	0.04	0.05	0.05	Frogs' legs: 0.05 Snails: 0.05
			Dicofol	All fruit: 0.05 Potatoes, carrots: 0.1 Onions: 0.1 Cabbage: 0.1 Lettuce and spinach: 0.1 Peas: 0.1 All other vegetables: 0.05	0.05	Tea, Coffe, Cocoa, Herbs, Hops,Spices, Beet root and Cane, Chicory: 0.05	0.05	Meat: 0.05 Liver:0.1 Poultry: 0.1	0.01	0.01	0.01	Frogs' legs: 0.01 Snails: 0.01
			Endosulfan	Nuts: 0.1 Pears: 0.3 Grapes: 0.5 All other fruit: 0.05 Tomatoes: 0.5 peppers: 1 All other vegetables: 0.05	Soya: 0.5 Cotton: 5 All other :0.1	Tea: 30 Coffee: 0.11 Cocoa: 0.1 Herbs: 0.5 Hops: 0.1 Spices: 1 Anise: 1 Clove: 0.1 Cinnamon: 0.1 Curcuma/turmeric: 0.5 Horse radish: 0.1 Cummin: 5 Beet root: 0.5 Sugar cane and Chicory: 0.05	0.05	0.05	0.005	0.05	0.01	Frogs' legs: 0.01 Snails: 0.01
			Endrin	All fruit and vegetables: 0.01	0.01	Tea and coffee and cocoa: 0.01 Hops: 0.1 Herbs: 0.1 Spices: 0.1 Beet root and cane, chicory: 0.1	0.01	0.05	0.0008	0.005	0.01	Frogs' legs: 0.01 Snails: 0.01
			Lindane	All fruit: 0.01 All vegetables: 0.01	0.01	Tea: 0.02 Coffee: 0.1 Herbs: 1	0.01	0.02	0.001	0.01	0.01	-

Food	National or European legislation	Annex to the regulatory document	Norm for maximuma admissible limits of residual substances (MALRS)									
						Hops: 0.05 Spices: 1 Beet root and cane, chicory: 0.01						
			HCB	All fruit and vegetables: 0.01	Seeds: 0.02 Fruit: 0.01	Tea, coffee, cocoa: 0.02 Herbs (infusions, dried): 0.02 Hops: 0.02 Spices: 0.02 Beet root and cane, chicory: 0.01	0.01	0.2	0.01	0.02	-	-
			α-HCH β HCH	All fruit and vegetables: 0.01	Seeds: 0.02 Fruit: 0.01	Tea, coffee, cocoa: 0.02 Herbs: 0.02 Hops: 0.05 Spices: 0.02 Beet root and cane, chicory: 0.01	0.02	α-HCH: 0.2 β HCH : 0.1	0.004 0.003	0.02 0.01	-	-
			Heptachlor	All fruit и vegetables : 0.01	0.01	Tea: 0.02 Coffee: 0.02 Herbs: 0.1 Hops: 0.05 Spices: 0.1 Beet root and cane, chicory: 0.01	0.01	0.2	0.004	0.02	0.01	Frogs' legs: 0.01 Snails: 0.01
			Chlordane	All fruit and vegetables : 0.01	0.02	Tea, coffee, cocoa, Herbs, Hops, spices: 0.02 Beet root and cane, chicory: 0.01	-	0.05	0.002	0.005	0.01	Frogs' legs: 0.005 Snails: 0.005
			Chlordecone	Almonds, hazelnuts, walnuts: 0.01 Stone and seed fruit: 0.01 Blackberries, raspberries, cranberries, wine grapes, hips: 0.01 All other fruit: 0.02 Beans, lentils: 0.02 Peas: 0.01 Cultivated mushrooms: 0.01 Wild mushrooms: 0.02 Vine leafs: 0.01 All other vegetables: 0.02	Peanuts, Soya, Pumpkins: 0.02 All other: 0.01	Tea, coffee and cocoa: 0.02 Herbs : 0.02 Hops: 0.02 Spices: 0.02 Beet root and Chicory: 0.01 Sugar cane: 0.02	Corn 0.02 All other: 0.01	Pork: 0.1 Other meat: 0.1 Poultry: 0.2 Rabbit meat: 0.1	0.02	0.02	0.02	Frogs' legs: 0.02 Snails: 0.02
			Toxaphene	All fruit and vegetables:	0.1	0.1	0.1	0.05	0.01	-	-	-

Food	National or European legislation	Annex to the regulatory document	Norm for maximuma admissible limits of residual substances (MALRS)		
			0.1		
FEED					
Materials and products for production of feeds	Ordinance No. 10 of 3 April 2009 on the maximum admissible concentrations (MAC) of undesirable substances and products in feeds, SG 29/17.04.2009, transponing DIRECTIVE 2002/32/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 7 May 2002 on undesirable substances in animal feed (OJ L 140, 30.5.2002, p. 10)	Annex No. 1: MAC of undesirable substances and products in feeds	Organochlorine compounds:		
			Undesired substance (US)	Products and feeds intended for feeding animals	MAC (mg/kg), co-related to feeds with humidity of 12%
			1.Aldrin [(1)] 2.Dieldrin[(1)]	Feed materials and compound feedingstuffs, with the exception of: -fats and oils; -compound feedingstuffs for fish.	0.01[(2)] 0.1[(2)] 0.02[(2)]
			3.Camphechlor (toxaphene) — sum of indicator congenera CHB 26, 50 and 62[(3)]	Fish, other aquatic animals and products, derived from these, with the exception of - fish oil. Complete feedingstuffs for fish.	0.02 0.2 0.05
			4.Chlordane (sum of cis- and trans-isomers and of oxichlordane, expressed as chlordane)	Feed materials and compound feedingstuffs, with the exception of: -fats and oils.	0.02 0.05
			5.DDT (sum of DDT-, DDD- (or TDE) and DDE-isomers, expressed as DDT	Feed materials and compound feedingstuffs, with the exception of: -fats and oils.	0.05 0.5
			6.Endosulfan (sum of alpha- and beta-isomers and endosulfan sulphate, expressed as endosulfan)	Feed materials and compound feedingstuffs, with the exception of: -corn and corn products, obtained through corn processing; -oleaginous seeds and products, extracted through their processing, with the exception of crude vegetable oil; -crude vegetable oil; -complete feedingstuffs for fish.	0,1 0,2 0,5 1,0 0,005
			7.Endrin (sum of endrin and delta-ketoi-endrin, expressed as endrin)	Feed materials and compound feedingstuffs, with the exception of: -fats and oils.	0.01 0.05
			8. Heptachlor (sum of heptachlor and heptachlorepoxide, expressed as heptachlor)	Feed materials and compound feedingstuffs, with the exception of: -fats and oils.	0.01 0.2
			9.Hexachlorobenzene (HCB)	Feed materials и compound feedingstuffs, with the exception of: -fats and oils.	0.01 0.2

Food	National or European legislation	Annex to the regulatory document	Norm for maximuma admissible limits of residual substances (MALRS)		
			10.Hexachlorocyclohexane (HCH) -alpha-isomers -beta-isomers -gamma-isomers	 Feed materials и compound feedingstuffs, with the exception of: -fats and oils. Feed materials, with the exception of: -fats and oils. Compound feedingstuffs,with the exception of: -compound feedingstuffs for milk cows. Feed materials и compound feedingstuffs, with the exception of: -fats and oils.	 0,02 0,2 0,01 0,1 0,01 0,005 0,2 2,0

(1) On its own or in combination, expressed as dieldrin.
(2) Maximum admissible limit for aldrin and dieldrin, on their own, or in combination, expressed as dieldrin.
(3) Numbering system complied with Parlar, with a prefix „CHB“ or „Parlar“: CHB 26: 2-endo,3-exo,5-endo,6-exo,8,8,10,10-octochlorobornane, CHB 50: 2-endo,3-exo,5-endo,6-exo,8,8,9,10,10-nonachlorobornane, CHB 62: 2,2,5,5,8,9,9,10,10- nonachlorobornane.

3.1.6.2.2. Monitoring of pesticide residues in materials and products of plant origin in the course of harvesting

BFSA and CLChTC in particular, has not performed any targeted programmes for monitoring of residual persistent organic pollutants (POPs) in food. For the period 2006 – 2008 a monitoring programme was implemented as regards pesticide residues in materials and food of plant origin (fruit and vegetables), under which all samples were tested for content of residues of approximately 100 different active pesticide bases, among which are also some POPs pesticides, as no residues thereof were identified in fruit and vegetables.

During the period 2006 – 2010 at CLChTC samples of food (mostly herbs) were submitted by clients against payment, as following the wish of the latter, such samples were tested for content of POPs residues.

At CLChTC 40 plant samples (fruit and vegetables, herbs, wheat) were tested for content of residues of nearly 100 different active pesticide bases, among which also some POPs pesticides (aldrin; chlordane; dieldrin; endrin; heptachlor; hexachlorbenzene; DDT; lindane; alpha-HCH and beta-HCH). In 31 of the tested samples there was established a presence of POPs pesticide residues. The results of these tests are given in Table No. 36. A slight exceeding is found above the maximum admissible limits of residual substances (MALRS) of dieldrin in 4 samples and of chlordane in 5 of the tested samples of cucumbers. In the tested samples of herbs, spices and wheat for residual substances from DDT and metabolites, no exceeding of MALRS was detected.

Table 36: Levels of POPs pesticide residues in materials and food of plant origin (fruit and vegetables) during the period 2006 – 2008, tested at CLChTC

Succ. No.	Type of sample	Year	POPs – pesticides	Residual POPs – pesticides [mg/kg]	MALRS [mg/kg]	Region
1	herbs-peppermint	2006	DDT and metabolites	0.034	0.5	
2	herbs-peppermint	2006	DDT and metabolites	0.026	0.5	
3	herbs-peppermint	2006	DDT and metabolites	0.017	0.5	
4	herbs-peppermint	2006	DDT and metabolites	0.035	0.5	
5	herbs-peppermint	2006	DDT and metabolites	0.013	0.5	
6	roots- valerian	2006	DDT and metabolites	0.987	1	
7	herbs-peppermint	2007	DDT and metabolites	0.054	0.5	
8	wheat	2007	DDT and metabolites	0.023	0.05	village of Sokolovo, Kavarna
9	herbs-peppermint	2007	DDT and metabolites	0.020	0.5	
10	herbs-melissa	2007	DDT and metabolites	0.009	0.5	
11	camomile	2007	DDT and metabolites	0.008	0.5	
12	herbs-peppermint	2007	DDT and metabolites	0.064	0.5	
13	herbs-peppermint	2007	DDT and metabolites	0.107	0.5	
14	herbs-peppermint	2007	DDT and metabolites	0.060	0.5	
15	herbs-peppermint	2007	DDT and metabolites	0.028	0.5	
16	herbs-peppermint	2007	DDT and metabolites	0.266	0.5	
17	cucumbers	2007	Dieldrin Chlordane	0.023 0.011	0.02 0.01	town of Marten, Ruse
18	cucumbers	2007	Dieldrin Chlordane	0.039 0.014	0.02 0.01	
19	cucumbers	2007	Dieldrin	0.021	0.02	
20	cucumbers	2007	Dieldrin Chlordane	0.092 0.033	0.02 0.01	

Succ. No.	Type of sample	Year	POPs – pesticides	Residual POPs – pesticides [mg/kg]	MALRS [mg/kg]	Region
21	cucumbers	2007	Chlordane	0.040	0.01	
22	cucumbers	2007	Dieldrin Chlordane	0.018 0.020	0.02 0.01	
23	cucumbers	2007	Dieldrin	0.018	0.02	Levski
24	herbs-peppermint	2008	DDT and metabolites	0.036	1	
25	roots- valerian	2008	DDT and metabolites	0.045	1	
26	roots- valerian	2008	DDT and metabolites	0.062	1	
27	roots- valerian	2008	DDT and metabolites	0.047	1	
28	herbs-peppermint	2008	DDT and metabolites	0.016	0.5	
29	herbs-peppermint	2008	DDT and metabolites	0.019	0.5	
30	herbs-peppermint	2008	DDT and metabolites	0.035	0.5	
31	roots- valerian	2008	DDT and metabolites	0.103	1	Veliko Tarnovo

Source: NPPS, CLChTC, 2006 – 2008

Since 2009 a monitoring programme is being implemented, as parts thereof are assigned to CLChTC and the Central Laboratory of Veterinary Control and Ecology (CLVCE), jointly with the Regional Food Safety Directorates (RFSDs).

The programme includes mainly agricultural regions and crops in resepct of which there is an intensive use of plant protection products. In 2010 samples from plant products are collected at the place of production (on the field, in greenhouses), in the course of harvesting, prior to placement on the market.

In 2010 the programme had as its object 12 types of crop varieties - grapes (dessert); tomatoes, peppers; carrots; late-ripening cabbage; lettuce/ salad; leeks; cauliflower; potatoes; peaches; apples; wheat, and in the year 2009 – nine crop varieties: tomatoes, carrots, potatoes, salads (lettuce), cabbage, peaches, apples, grapes and wheat.

In 2010, 140 samples were collected and in 2009 – 170 samples per crops and per regions. All samples were analyzed for content of residues of 101 (in 2010) and 85 (in 2009) active substances/ ingredients of plant protection products. The POPs pesticides being the object of the porgramme in the year 2010 included aldrin, DDT, dieldrin, dicofol, endosulfan and endosulfan sulphate, endrin, HCH and lindane, HCB, heptachlor and heptachlor epoxide, and in the year 2009 - aldrin, DDT, dieldrin, dicofol, endosulfan, HCH and lindane and HCB.

In 2009 in 42.4% of the samples there was proven a presence of pesticide residues, but in amounts which do not exceed the maximum admissible concentrations (MAC), while 9.4 % of these contained amounts of pesticide residues exceeding the norms. In any of the samples (including from carrots) no POPs pesticide residues, whatsoever, were detected.

In 2010 in 40 % of the samples, pesticide residues presence was proven, but in amounts not exceeding MAC, whereas 2 % of these contained excessive amounts of pesticide residues other than POPs.

In 2010 in one of the samples from carrots was detected the presence of residues of the POPs pesticide DDT, but in concentration below MAC. In the evaluation of the toxicological risk it was established that in none of the cases the limit of risk for the population upon consumption of the contaminated products had been reached.

No presence of aldrin, dieldrin, toxaphene, chlordane, endosulfan, endrin, heptachlor, HCB, HCH and lindane above MAC was detected in the carrots sample.

In none of the samples from grapes, tomatoes, peppers, carrots, cabbage, leeks, cauliflower, lettuce, peaches, apples and wheat, have been found any residues from the listed POPs pesticides in amounts exceeding the MAC for the respective crop.

The measured concentrations in excess of the norms in all plant products are subjected to calculation for assessment of the risk to adults and children.

In summary, it may be concluded that in the years 2009 and 2010 the larger part of the analyzed batches of fruit and vegetables is completely safe for human consumption and does not contain any measurable residual amounts of the target pesticide compounds.

For the first time in the year 2010 the batches with detected residual amounts above the norm constituted about 2 % of all analyzed samples, relative to 9.4% for the year 2009, which was a value commensurate with the percentage values reported by other member states.

In 2009 in none of the samples, including from fruit and vegetables, and carrots in particular, has been evidenced any presence of POPS pesticides' residues, of any nature, whatsoever .

In 2010 additional inspections were performed of vegetables and fruit producers regarding the placement on the market of produce grown in the field, or in greenhouses. 39 greenhouses were inspected and 25 samples from cucumbers, tomatoes, salad, radish and green onions, were collected and analyzed.

A total of 34 agricultural producers of vegetables and fruit were inspected and 36 samples from tomatoes, peppers, cucumbers, onions, field production, and peaches, plums and dessert grapes, were collected and analyzed.

None of the samples evidenced any unregulated use of PPP (not permitted and prohibited for use), as well as any residues from the used PPP, in amounts exceeding the established MAC.

Checks were also conducted at large vegetable wholesale and retail markets and marketplaces, as well as at warehouses of large hypermarkets, offering for sale vegetable crops being demanded by consumers mainly for canning during the autumn season – cabbage, cauliflower, pepper, carrots, leeks, as well as potatoes, for the performance of an analysis for content of residual amounts of pesticides. A total of 17 samples were collected from commercial sites.

Parallel to the joint inspections of the sales network, checks of agricultural producers have been carried out as well – field and greenhouse vegetable production, who have not harvested their vegetable produce yet. In the course of the checks 15 samples have been collected at the time of harvesting.

No presence of any pesticide residues was detected in any of the tested samples, including of POPs pesticides, exceeding MAC.

A procedure for control of non-animal origin food for content of pesticide residues was validated by Order No. RD-11-136/31.01.2012 of the Executive Director of BFSA.

Laboratory tests were performed as well in respect of pesticide residues in food of non-animal origin under agreement between MoH and MoAF at accredited laboratories / No. RD-28-280/12.10.2011/. 286 samples were collected and tested.

SUMMARIZED CONCLUSIONS

- **In the years 2009 and 2010 the greater part of the analyzed batches of fruit and vegetables was completely safe for human consumption and did not contain any residual amounts of the target pesticide compounds, including POPs.**

- **For the first time in the year 2010 the batches, in which resdiual amounts exceeding the norm were found, comprised only about 2 % of all analyzed samples, as compared to 9.4% in the year 2009,**

which is a conmensurate value in comparision with the percentage values reported by the other members states.

- **In the year 2009 in none of the samples from fruit and vegetables, including carrots, any presence of POPs pesticides, whatsoever, was evidenced. In the year 2010 there was detected contamination with DDT residues in one batch of carrots; however, the DDT concentration therein was below MAC. Accoridng to the performed toxicological risk assessment, the limit of the risk for the population upon consumption of the contaminated products had not been reached in any of the cases.**

- **In the course of the checks performed in the years 2009 and 2010 at large vegetable wholesale and retail markets and marketplaces, as well as warehouses of large hypermarkets offering for sale vegetable crops, being demanded by consumer maliny for canning during the autumn season, in none of the collected and tested samples a presence of pesticide residues, including POPs pesticide residues was detected in excess of the maximum admissible concentrations (MAC).**

3.1.6.2.3. Monitoring of chemical pollutants – pesticide residues in primary production of feed

The main purpose of the monitoring is to exercise control over the grain produce intended for production of feed, in the course of harvesting in the year 2010 year, over the proper application of PPP, any abuses with non-permitted PPP or any uses non-permitted for the respective crop, as well as for any presence of undesirable residues of POPS pesticides and contamination with regulated toxic substances produced by phytopathogenic fungi (micotoxins). On the list of active substances, the pesticides subjected to control over the proper application of PPP upon primary production of feedstuffs are included also POPs pesticides [aldrin and dieldrin (on their own or as a sum aldrin+dieldrin, expressed as dieldrin); chlordane (combination of cis- and trans-isomers of oxichlordane, expressed as chlordane); DDT (sum of DDT-, DDD- (or TDE) and DDE-isomers, expressed as DDT); Endrin (sum of endrin and delta-keton-endrin, expressed as endrin); alpha- and beta - endosulfan; Heptachlor (sum of heptachlor and heptachlor-epoxide, expressed as heptachlor); Hexachlorbenzene (HCB); Hexachlorcyclohexane (HCH) – alpha-, beta- isomers; and lindane (gamma-HCH);].

The object of the programme in the year 2010 are the crops: wheat, barley, corn, lucerne – fresh and dried, and in the year 2009 – wheat, barley, corn, oats, lucerne – fresh and dried. These crops are the main crops being grown in our country with a designation to be used for feedstuffs. The number of samples and the sampling locations has been complied with the data about the areas under crop in the country.

The wheat samples comprise representative samples from wheat under the Monitoring programme for pesticide residues in materials and products of plant origin in 2010 and 2009, whereas the samples from barley and corn are collected according to a sampling procedure for micotoxins in primary production of agricultural crops intended for feedstuffs. The samples from fresh lucerne are collected at the time of mowing, and the samples from dried lucerne – from the field after drying of the mown amounts. They have been analyzed for content of any pesticides residues.

Out of the planned 70 samples in 2010, 69 were collected and analyzed for content of persistent chlororganic pesticides and PPP permitted for use. Out of the planned 120 samples in 2009, 120 samples were collected and analyzed for content of persistent chlororganic pesticides PPP permitted for use.

The obtained results for contamination with pesticide residues and micotoxins were evaluated through comparison to the established norms under the legislation (Regulation (EC) 1126/2007, Ordinance No. 10 of 3 April 2009 on maximum admissible concentrations of undesirable substances and products in feedstuffs, Regulation (EC) 396/2005).

The object of control within the primary production of feedingstuffs were the following chloroganic pesticide residues: aldrin, dieldrin, chlordane, DDT sum, endosulfan, endrin, heptachlor, HCB, HCH (alpha-, beta- and gamma-isomers).

The analysis of the obtained results shows that in the analyzed 69 samples (2010) and 120 samples (2009) from materials for production of feedingstuffs, no residues of persistent chlororganic pesticides above MAC have been found. The obtained results are consistent with the previous results of similar control over water and over plant materials.

The materials for feedingstuffs produced in our country in the years 2009 and 2010 contain pesticide residues only from PPP that are permitted for use, within the normal range, and do not contain any residues of prohibited POPs pesticides. The materials for feedingstuffs produced in our country in the year 2009 are harmless as far as persistent chlororganic pesticides are concerned.

The assessment of human exposure after intake with food in the established norm for incompliance cases, shows acceptable risk, and therefore it may be concluded that these materials are harmless and can be used for feedingstuffs production.

SUMMARIZED CONCLUSIONS

- **The assessment of the obtained results shows that in the analyzed samples in the years 2009 and 2010 from materials for production of feedingstuffs no residues of persistent chlororganic pesticides above MAC have been detected. The obtained results are consistent with preceding results from similar monitoring of water and plant materials.**

- **The materials for feedingstuffs produced in our country in the years 2009 and 2010 contain pesticide residues only of PPP permitted for use within the normal range and do not contain any residues from POPs pesticides. The materials for feedingstuffs produced in our country in the year 2009 are harmless as far as POPs pesticides, alpha-toxins and zearalenon.**

- **The assessmnet of human exposure upon intake with food in the established cases of incompliance with the norms show acceptable risk, and therefore it may be concluded that these materials and harmless and can be used for production of feedstuffs.**

3.1.6.2.4. Monitoring of food of animal origin food[19]

The official control as regards VMP residues and pollutants is exercised by BFSA through the National monitoring programme for control of veterinary medicinal products' residues and pollutants of environment (NMPCVMP) in live animals and animal origin products in the year 2010.

The groups of residues and pollutants which are subject of control include also organochlorine compounds, including PCB[B (3) (a). National monitoring programme for control of residues of chlororganic pesticides [DDT sums of isomers, aldrin, heptachlor epoxide, α- and β-HCH, lindane (γ-HCH) , including PCB [B (3) (a)] comprises collection and analysis of samples from fresh meat of cows, pigs, sheep, lambs, goats, kids and horses; of birds (ducks and broilers); eggs (hen's and quail's); of fish (carp, trout, sturgeon species, bighead); cow and sheep milk; game (pheasants, rabbits); bee honey.

NMPCVMP is prepared in accordance with Directive 96/23/EC, introduced into the national legislation by Ordinance No.119 (SG 6 of 2007).

[19] Reports under the National monitoring programme for control of the residues of veterinary medicinal products and pollutants from the environment in live animals and products of animal origin, 2008, 2009, 2010 and 2011, MoAF

Residues of chlororganic POPs pesticides are analyzed also in imported produce from third countries: fresh and frozen meat, including fresh by-products and products of bovine animals, sheep, goats, pigs and horses; fresh and frozen fish; dried and/ or salted fish products, fish products in hermetically sealed containers; and fats of animal origin.

The Central Laboratory of Veterinary Control and Ecology (CLVCE), city of Sofia, at BFSA is designated as National Reference Laboratory (NRL) for control of residues of veterinary medicinal preparations and pollutants of the environment in live animals, materials and food products of animal origin, feed and feed additives.

Samples have been collected from farms, slaughterhouses, or food processing plants, milk collection points (milk storage premises), individual producers of bee honey, water sources, or fisheries, hunting grounds, egg packing plants. Samples of bovine animals, sheep, goats, lambs, kids, pigs, rabbits, diving birds, hen-related species, fish, wild animals, have been collected as well as samples of eggs, bee honey and milk.

In 2010 under NMPCVMP the separate regions sent to CLVCE a total of 2,319 samples. A total of 7,174 analyses thereof were performed at CLVCE.

LABORATORY CONTROL OF ANIMAL ORIGIN FOOD

Over the years samples have been collected and analyzed for residues of chlororganic pesticides, as follows: 2007 – 564 samples; 2008 – 503 samples; 2009 – 460 and in 2010 – 424 samples of the food products subjected to control within Group B (3) (a). In the period 2007 - 2010 in Bulgaria no presence of residues of chlororganic POPs pesticides [DDT sum of isomers, aldrin, heptachlor epoxide, α- and β-HCH, lindane (γ-HCH)] above MALRS, was detected, or of any unlawful use of prohibited substances in food products of animal origin produced in Bulgaria, or imported from any other third countries.

IMPORT OF LIVE ANIMALS, MATERIALS AND FOOD OF ANIMAL ORIGIN

The competent authority within this control system is BFSA, through Veterinary Medical Border Control Directorate.

The official control over the shipments of animal origin products, feedingstuffs and live animals is exercised by the border veterinary inspectors of the 8 apporved by the European Commission Border inspection veterinary points (BIP): Port Burgas, Port Varna – Zapad, Bregovo, Kalotina, Kapitan Andreevo, Zlatarevo, Gyueshevo, and Sofia Airport. In addition to the specified BIP, there are also ingoing border points (BCP): Plovdiv Airport, Port Tsarevo, Port Nessebar, Port Silistra, Port Lom, Port Vidin ferryboat, Port Oryahovo ferryboat, Varna Airport, Burgas Airport, Logodazh, Dimitrovgrad Railway Station, Strazimirovtsi, Vrashka Chuka, Malko Tarnovo and Lesovo, at which control is exercised control only over the import of animal origin products intended for personal consumption of the passengers – in accordance with Regulation (EC) 206/2009, as well as control of the pets accompanying the passengers and entering the country – in accordance with Regulation (EC) 998/2003.

The official veterinary border control (VBC) of animal origin food products, live animals, and feedingstuffs, comprises check of documents, identity check and physical inspection.

The veterinary border control of live animals, animal origin food and feed is exercised while strictly adhering to the requirements set forth under the European and Bulgarian legislation.

In 2010 at BIPs were processed: 3,346 shipments with animal origin products and 1,076 transit shipments of animal origin products.

The collection of samples for analysis upon physical inspection is performed in accordance with: the National monitoring programme for control of residues of veterinary medical products and pollutants from the environment in live animals and animal origin products for the year 2010, Regulation (EC) 94/360, or if any doubt of incompliance exists. Some of the samples collected from the shipments imported through BIPs in the year 2010 were tested for residues of organochlorine pesticides under Group B (3) (a) (Table No. 37).

Table 37: Samples collected from food products of animal origin imported through BIP **in the year 2010**

Type of product	Exporter country	Importer country	Number of shipments	Amount (t)	Number of samples	Tested for	Result
Fish	TR	EU	1852	15522.4	68	B/3/a	negative
Fish products	TR	EU	436	3423.6	10	B/3/a	negative
Bee honey	TR	EU	6	80.6	3	B/3/a- 1 piece	negative
Frozen fish and fish products	Chile	BG	4	66.002	3	chlororganic compounds	negative
Egg powder	Argentina	BG	1	21.000	1	chlororganic compounds	negative

SUMMARIZED CONCLUSIONS

❖ **In 2007 - 2010 in Bulgaria no presence of chlororganic POPs pesticides [DDT sum of isomers, aldrin, heptachlor epoxide, α- and β-HCH, lindane (γ-HCH)] was identified above the maximum admissible limit of residual substances (MALRS) or any unlawful use of prohibited substances in food products of animal origin produced in Bulgaria or imported from third countries.**

❖ **In the period 2007 - 2010 in the course of performance of border veterinary control of food products of animal origin imported from third countries, the samples collected and analyzed for residues of organochlorine pesticides under group B (3) (a) of the shipments imported through BIP are negative and do not prove any availability of persistent chlororganic pesticides - DDT sum of isomers, aldrin/dieldrin, heptachlor, α- and β-HCH, lindane (γ--HCH).**

3.1.6.2.5. Monitoring of food of non-animal origin

The official health control of food of non-animal origin in the year 2010 was exercised by NCPHA and the regional RHI at MoH. Laboratory tests for control and monitoring of food safety was performed at six accredited laboratories of RHI- Sofia, Pleven, Veliko Tarnovo, Varna, Burgas, and Plovdiv. The laboratories meet the requirements under Regulation (EC) No 882/2004 of the European Parliament and of the Council of 29 April 2004 on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules and are accredited under БДС ISO EN 17025.

During the period 2007 - 2010 effective and stringent health control was exercised on food and sites for production and trade in food products of non-animal origin for the purpose of protecting the health of the population and the interests of the consumers.

A number of planned thematic checks were performed, as well as unplanned thematic checks assigned by MoH, joint checks were carried out with representatives of MoI , NVS, NPPS, municipalities and other competent authorities in relation to complaints and signals by citizens, checks related to received notifications under the Rapid Alert System for Food and Feed (RASFF) as regards any available dangerous food on the market.

In the year 2010 the state health inspectors performed a total of 15,809 checks on sites for production of non-animal origin food.

Laboratory control of non-animal origin food

Laboratory control was exercised over non-animal food produced in Bulgaria and imported as per safety indicators, including for residues of POPs pesticides.

For chemical pollutants in food in the year 2010 were analyzed a total of 5,236 samples, out of which 632 from imported products. No excessive amounts of chemical pollutants were found, including of POPs. For comparison, in the year 2009 there were collected 3,069 samples, out of which 569 from imported products.

For residues of pesticides, DDT sum of isomers, aldrin, heptachlor, α- and β-HCH, lindane (γ-HCH) in the year 2010 there have been analyzed a total of 519 samples, out of which 167 samples from imported products. There have been tested over 30 types of food for 144 active substances. The greatest number of samples were collected from vegetables and vegetable juices; fruit, fruit juices, marmalades, potatoes and root fruit and vegetables and cereal-based food. No deviations from the norms were found. In the year 2009 the tested samples were 742, out of which 169 were from imported products, as deviations were detected in 0.4% thereof, but not in respect of the listed POPs pesticides. More than 26 types of food were tested for 69 active substances. In 2008 no deviation was found in any of the tested 920 samples.

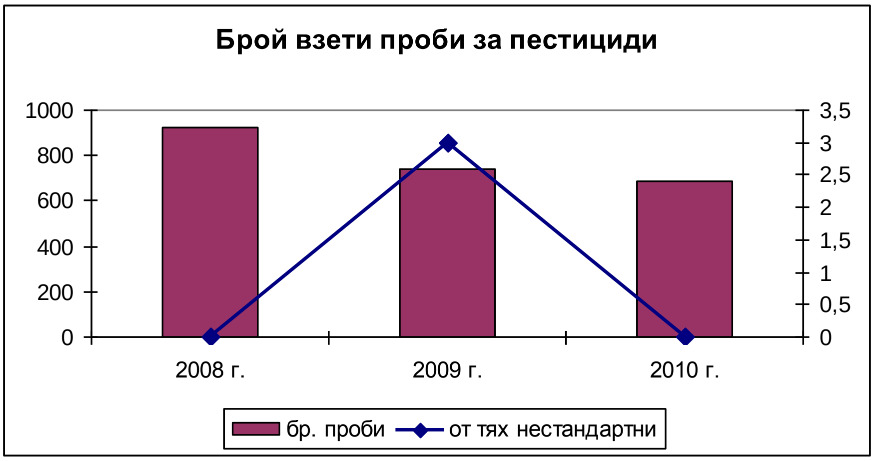


Figure 7: Number of collected samples for residual pesticides in the period 2008 – 2010.
(number of samples/ noncompliant samples)

Rapid alert system for food and feed (RASFF)

For a fourth consecutive year the structures of the State Health Control (MoH and 28th RHI), responsible for the official control over food of non-animal origin continiue to participate in the RASFF system.

A multitude of thematic checks have been performed following notifications received within the RASFF system. A part of these are related to published Decisions of the European Commission, others are checks following notifications concerning products distributed in Bulgaria's neighbouring countries, as well as checks of products, distributed also in other European states.

In 2010 procedures were initiated in respect of a total of 56 notifications (28 ingoing and 28 outgoing). All notifications were processed and submitted within the set period and the necessary feedback was sent to the European Commission.

Control of non-animal origin food imported from third countries

In 2010 to control were subjected 32,583 shipments of food from third countries falling within the scope of the Regulation (alphatoxins, cadmium, lead and residues of pesticides (endosulfan) for fruit (mango, bananas, pears) and vegetables (peppers, courgettes, tomatoes, eggplants and cabbage). Samples were collected for performance of laboratory analysis of 1,818 shipments.

Deviation was identified in 13 shipments, but not in respect of POPs pesticides, as these were destroyed or re-exported out of the territory of the EU.

- **CONCLUSIONS**

❖ **In the period 2008 - 2010 in Bulgaria there was established the availability of residues of chlororganic POPs pesticides [DDT sum of isomers, aldrin, heptachlor, α- и β-HCH, lindane (γ-HCH)] above MAC in the tested samples of non-animal origin food produced in Bulgaria (vegetables and vegetable juices; fruit, fruit juices; potatoes and root fruit and vegetables and grain-based food) and food imported from third countries (fruit and vegetables). More than 30 types of foods were tested for 144 active substances.**

3.1.7. Monitoring of POPs pesticides in human milk

In Bulgaria no independent national research has been performed as regards the levels of persistent chlororganic pesticides in human milk or blood plasma up to date.

Apart from data for analysis of POPs pesticides in human milk performed within the study conducted by WHO in the period 2001 -2002, there is no other available information on this issue.

Within the elaborated by 19 countries (Brazil, Bulgaria, Croatia, Czech Republic, Egypt, Finland, Hungary, Ireland, Italy, New Zealand, Norway, Romania, Russia, Slovakia, Spain, Sweden, The Netherlands, Ukraine) international project "3rd Round of WHO-coordinated Exposure Study on the Levels of PCB, PCDD/PCDF in Human Milk, Organohalogen Compounds, 2003" [20] in Bulgaria there has been conducted a study of the content of certain POPs pesticides in human milk from 30 healthy women, distributed by 10 from three regions in the country (Bankya –ecologically clean and two - Sofia and Blagoevgrad – ecologically polluted to a different degree). The results show that the levels of POPs pesticides in human milk in Bulgaria are among the lowest for the 19th countries (Table No. 38).

Table 38: Levels of POPs pesticides in human milk (mg/kg lw) in samples collected from 10 women, region of Bankya, Bulgaria, year 2002.

POPs pesticide	Concentration, median (mg/kg lw)	MAC for cow's milk (mg/kg lw)
Aldrin	0.0004	0.006
Chlordane	0.0179	0.002
DDT sum	0.499	0.04
p,p' - DDE	0.452	
o,p' - DDT	0.003	
p,p' - DDT	0.044	
Dieldrin	0.0004	0.006
Endrin	0.0004	0.001
Heptachlor	0.0125	0.004
HCB	0.012	0.01
Mirex	-	-
Toxaphene	0.0015	0.01

The results show that in human milk from the ecologically clean region of Bankya there are no residues of aldrin, dieldrin, endrin, toxaphene and mirex above MAC.

The highest is the content of ∑ DDT (0.499 mg/kg lw) in human milk from Bankya mainly due to p,p' - DDE (0.499 mg/kg lw), which is an evidence of old DDT contaminations. MAC for chlordane, heptachlor and HCB is also exceeded.

- **CONCLUSIONS**

[20] WHO-coordinated Exposure Study on the Levels of PCBs, PCDDs and PCDFs in Human Milk, Submitted to Dioxin 2002. Organohalogen Compounds, 2003.

❖ **The levels of residues of POPs pesticides in human milk in Bulgaria are amidst the lowest in Europe.**

❖ **No exceeded MAC (for cow's milk) is established in human milk from the region of Bankya in respect of aldrin, dieldrin, endrin, mirex and toxaphene. Cases of exceeded MAC are established for DDT sum, chlordane, heptachlor and hexachlorbenzene, which is an evidence of old contaminations with these persistent chlororganic pesticides due to unregulated use in the past, or due to diffuse pollution.**

3.1.8. Monitoring of POPs pesticides in biota (fish)

Under Project DVU 440/2008 „Safety and nutrition value of Black Sea products“[21], 2007 – 2012, Medical University, Chemistry Department, city of Varna, financed by the Ministry of Education and Science (MoES), content of chlororganic POPs pesticides (DDT and metabolites DDD and DDE) was identified in Black Sea fish species in relation to the assessment of their safety as food.

After a preliminary research into sea fishing and the situation of the market in our country, ten species of Black Sea fish species were selected for study: goby, sprat, mullet, horse mackerel, Pontic shad, bluefish, bonito, garfish, turbot, and red mullet from three Black Sea regions.

❖ North Region – Krapets, Kavarna, Zelenka, Balchik;

❖ Varna Region – Trakata, Varna bay, Varna lake, Kamchiya, Byala;

❖ South Region – Nessebar, Burgas, Primorsko;

The samples for analysis were collected in three regions within the period 2007 – 2010. Figure 8 shows the main sampling locations along the Bulgarian Black Sea coastline.

Figure 8: Map of Bulgarian Black Sea coastline – main sampling locations

21 Project DVU 440/2008 "Safety and nutrition value of Black Sea products", Medical university, Department of Chemistry, city of Varna, associated professor Mona Stancheva, et al, 26 April 2012.

The employed analytical method for qualitative and quantitative analysis of chlororganic pesticides – DDT and metabolites, is based on method No. 1668a EPA /United States Environmental Protection Agency/.

The concentrations of chlororganic pesticides – DDT and metabolites (DDD and DDE) are determined. 85 fish samples are analyzed, as each sample has been tested three times. For statistical processing and analysis of the results, the programme SPSS 16 has been used. The results are presented as arithmetic mean and geometric mean, related per gram of fat (ng/g fat) and per gram of fresh weight (ng/g ww). The statistical analysis and results show that they follow the normal logarithmic distribution, but since a number of authors use arithmetic means, in order to enable the comparison to scientific literature data, we present the results in both manners.

RESULTS FOR CONTENT OF DDT AND METABOLITES IN FISH

DDT PER YEARS PER DRAUGHT

Tables No. 39 and No. 40 and figures No. 9 and No. 10 present the results for DDT and metabolites (DDD and DDE) for the draught years 2007 – 2010 as regards the content of lipids (ng/g fat) and as regards the entire sample of fresh weight (ng/g ww)

Table 39: DDT presented in respect of lipid content in ng/g fat

Year	Arithmetic mean concentration of DDT,ng/g fat	Geometric mean concentration of DDT,ng/g fat
2007	936	770
2008	875	655
2009	1200	1035
2010	810	586

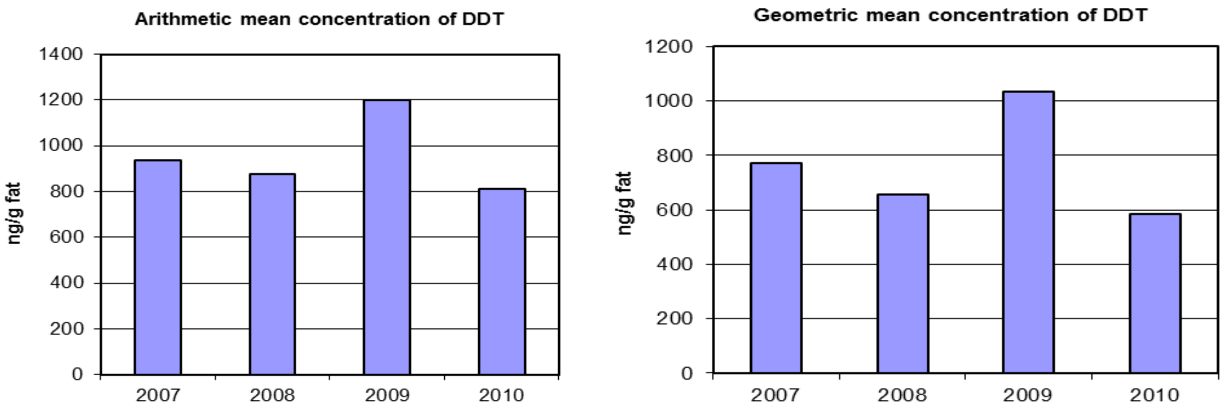


Figure 9: Arithmetic mean and geometric mean values of lipid content of DDT per years 2007 – 2010 in ng/g fat

Table 40: DDT presented in respect of a whole sample of fresh weight in ng/g ww

Years	arithmetic mean concentration of DDT, ng/g ww	geometric mean concentration of DDT, ng/g ww
2007	80	57
2008	68	41
2009	108	73
2010	77	48

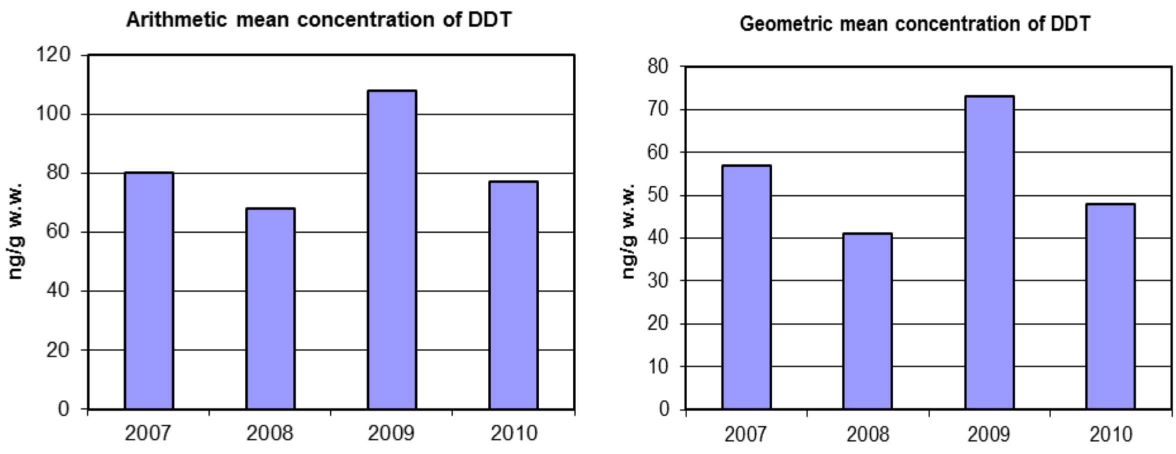


Figure 10: Arithmetic mean and geometric mean values of DDT in a whole sample of fresh weight for the years 2007 – 2010 in ng/g ww

DDT PER DRAUGHT REGION

Tables No. 41 and No. 42 and figures No. 11 and No. 12 present the results for DDT and metabolites (DDD and DDE) per draught regions as regards the lipid content (ng/g fat) and as regards the whole sample of fresh weight (ng/g ww)

Table 41: DDT presented in respect of lipid content in ng/g fat

Black Sea Region	Arithmetic mean concentration of DDT, ng/g fat	Geometric mean concentration of DDT, ng/g fat
North	1020	801
Varna	968	829
South	928	675

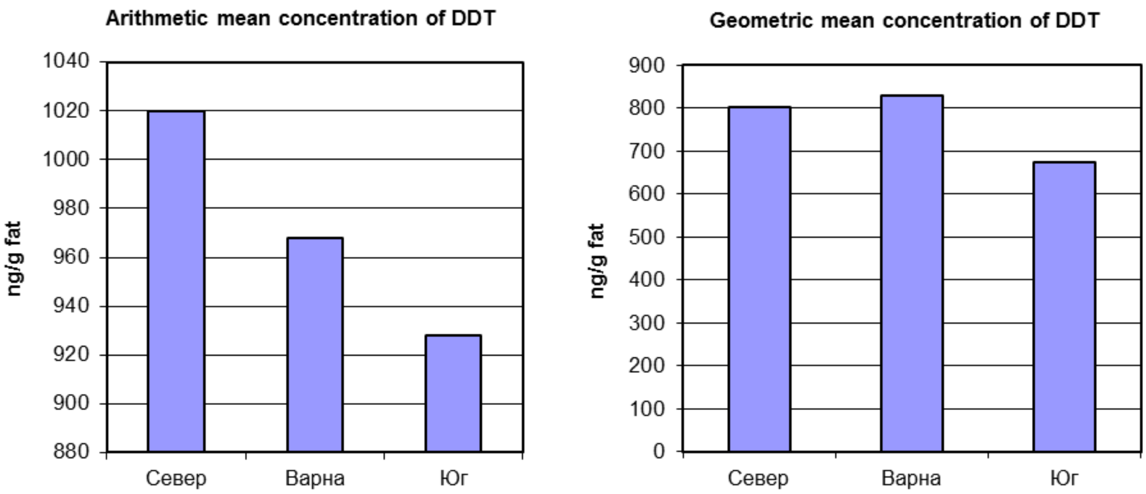


Figure 11: Arithmetic mean and geometric mean values of the lipid content of DDT per draught regions in ng/g fat

Table 42: DDT presented in respect of a whole sample of fresh weight in ng/g ww

Black Sea Region	Arithmetic mean concentration of DDT, ng/g ww	Geometric mean concentration of DDT, ng/g ww
North	77	53
Varna	84	51
South	92	58

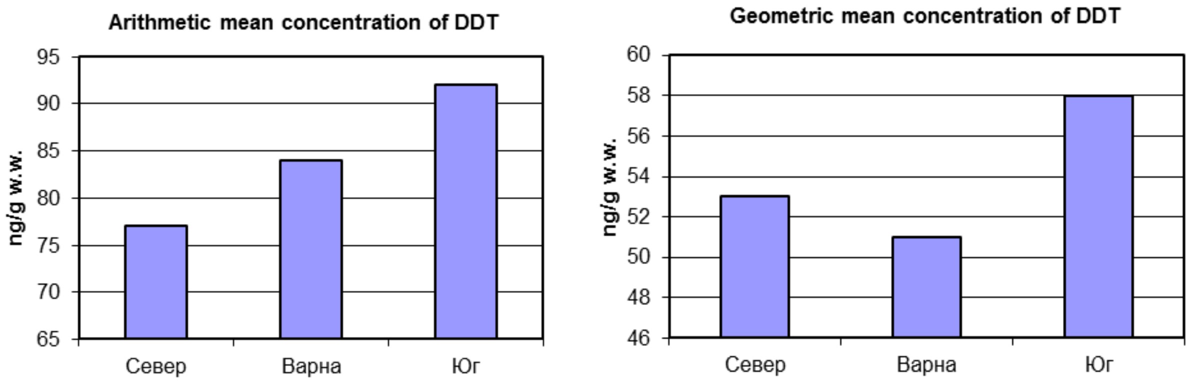


Figure 12: Arithmetic mean and geometric mean concentrations of DDT in a whole sample of fresh weight per draught regions in ng/g ww

<u>**DDT PER FISH SPECIES**</u>

Tables No. 43 and No. 44 and figures No. 13 and No. 14 present the results for DDT and metabolites (DDD and DDE) per fish species in respect of the lipid content (ng/g fat) and in respect of a whole sample of fresh weight (ng/g ww).

Table 43: DDT presented in respect of lipid content in ng/g fat

Fish species	Arithemtic mean concentration of DDT, ng/g fat	Geometric mean concentration of DDT, ng/g fat
Goby	1400	1180
Sprat	1181	1050
Horse mackerel	493	421
Hickory shad	989	832
Mullet	837	604
Bluefish	951	895
Bonito	676	364
Garfish	1170	1150
Turbot	1374	1260

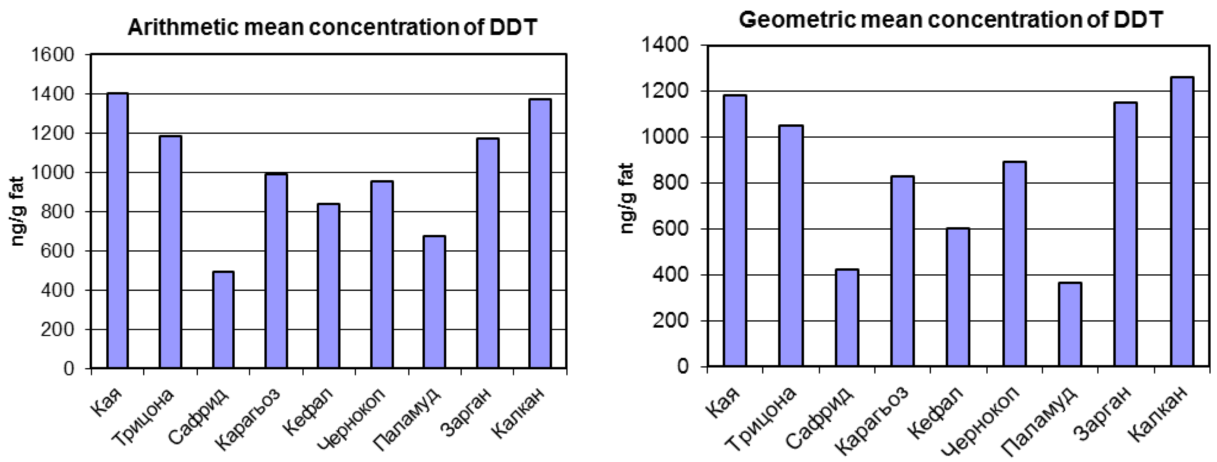


Figure 13: Arithmetic mean and geometric mean values of the lipid content of DDT per fish species in ng/g fat

Table 44: DDT presented in respect of a whole sample of fresh weight in ng/g ww

Fish species	Arithmetic mean of DDT concentration, ng/g ww	Geometric mean of DDT concentration, ng/g ww
Goby	22	20
Sprat	69	63
Horse mackerel	52	45
Hickory shad	213	173
Grey mullet	62	47
Bluefish	178	165
Bonito	81	44
Garfish	101	100
Red mullet	105	101

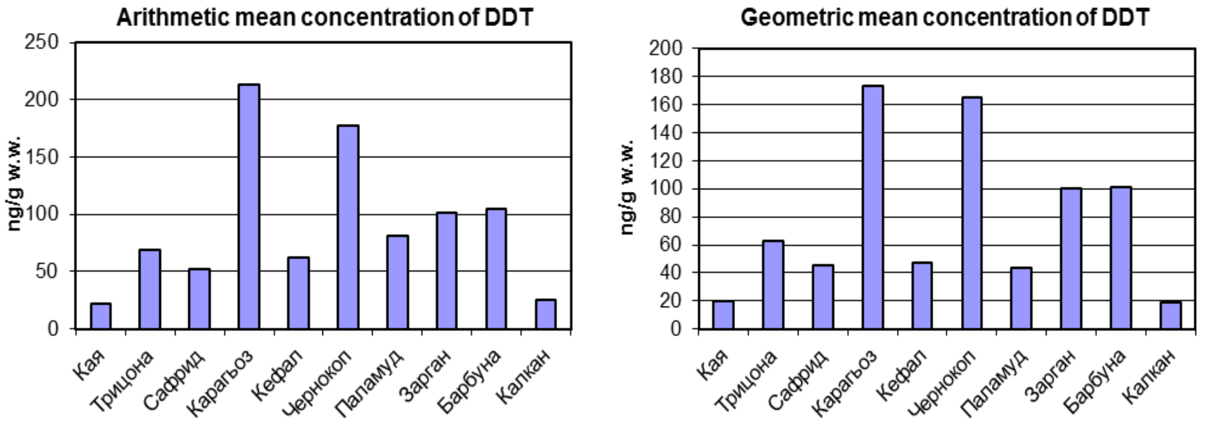


Figure 14: Arithmetic mean and geometric mean concentrations of DDT in a whole sample of fresh weight per types of fish in ng/g ww

The results presented above refer only to DDT sum and its metabolites DDD and DDE.

The percentage ratio of DDT and metabolites DDD and DDE for all tested fish throughout the period is the following:

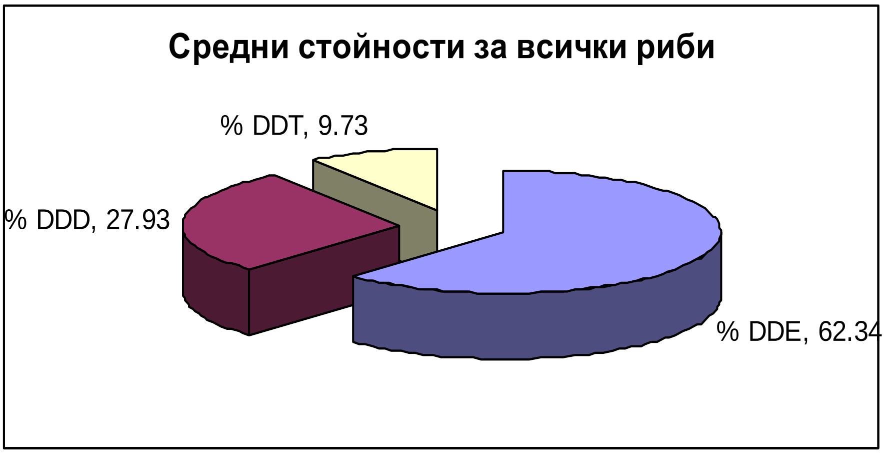


Figure 15: Average values of DDT and metabolites DDD and DDE for all fish in %

The results show that in the tested samples the metabolites DDE and DDD prevail, which indicates that the greater part of DDT used in the past has metabolized, and there is no use of any new amounts of DDT in the Black Sea region of Bulgaria.

There are no set maximum admissible limits for residue substances[22] (MALRS) for DDT in fish, and yet, if the obtained results for the levels of total DDT in fish are compared to MALRS for total DDT in meat of 1,000 μg/kg fat (1000 000 ng/kg fat), it is established that contamination is insignificant.

In conclusion, the results from the conducted study show that the pollution with PCB and DDT in fish from the Bulgarian Black Sea coastal line is lower or commensurate, as compared to the results for fish in other Black Sea regions and neighbouring seas – Sea of Marmara and the Mediterranean Sea.

CONCLUSIONS

- **The levels of residues of DDT and metabolites (DDD and DDE) in fish along the Bulgarian Black Sea coastline are lower or commensurate to those for fish in other Black Sea regions and neighbouring seas – the Sea of Marmara and the Mediterranean sea.**

- **In the tested fish samples there is a predominance of the metabolites DDE and DDD, which indicates that there is no use of new amounts of DDT in the Black Sea Region of Bulgaria.**

3.2. INDUSTRIAL POPS CHEMICALS

The group of industrial POPs chemicals, used as dielectric fluids or additives thereto in electrical equipment includes the following POPs substances: polychlorinated biphenyls (PCB) and pentachlorobenzene (PeCB).

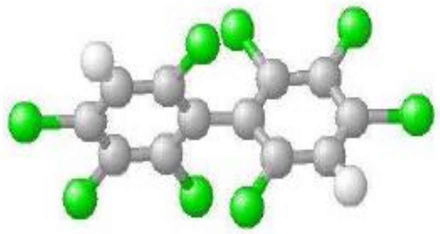
Other industrial POPs chemicals, used as fire resistant additives – fire retardants and for other industrial applications, include tetrabromdiphenyl ether and pentabromodiphenyl ether (c-pentaBDEs); hexabromdiphenyl ether and heptabromdiphenyl ether (c-octaBDEs); perfluoroctan sulfonic acid (PFOS), its salts and perfluoroctan sulfonil fluoride (PFOS-F); hexabromobiphenyl (HBB) and hexachlorbenzene (HCB).

3.2.1. Polychlorinated biphenyls (PCB)

Polychlorinated biphenyls (PCB) are synthetic chlororganic compounds falling within the group of industrial chemicals, included in the initial 12 POPs, covered by the scope of the Stockholm Convention.

Polychlorinated biphenyls are defined as: polychlorinated biphenyls (PCB), polychlorinated terphenyls (PCT), monomethyl-tetrachlorodiphenyl methane, monomethyl-dichloro-diphenyl methane, monomethyl-dibrom-diphenyl methane and any mixture/ compound containing any of the aforementioned substances in concentration bigger than 0005 % of its weight;

Polychlorinated biphenyls is the trivial name of a group of chemicals known as PCB, belonging to the group of aromatic chlorinated carbohydrates. 209 isomers (congenera) of PCB exist, in which hydrogen atoms from the biphenyl molecule can be replaced by 1 to 10 chlorine atoms, but only about 130 of them are produced as commercial products (Holoubek, 2000). Most of the PCB congeners in their pure form are colourless crystals without odour. Depending on the degree of chlorination, commercial mixtures vary from colourless oil-resembling liquids to viscose dark oils and yellow to black resins. Normally,



[22] Ordinance No. 119 of 21.12.2006 on the measures for control over certain substances and their residues in live animals, and animal origin materials and food products intended for human consumption, promulgated in SG 6/ 19.01.2007, effective as of 19.01.2007.

PCB are slightly dissoluble in water and have low steam pressure at 25°C, but they dissolve in many organic solvents, oils and fats.

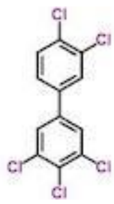
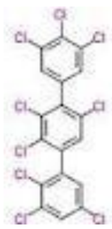
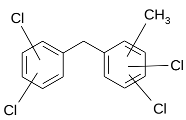
Polychlorinated terphenyls (PCT) also belong to the group of halogenated carbohydrates. They are very similar to halogenated carbohydrates. They are very similar to the chemical structure of PCB, with the difference that PCT contain three phenyl rings instead of two. Consequently, they may contain up to 14 chlorine atoms. Theoretically, 8,148 congeners of PCT are possible, but only a few of them are available in commercial formulations. PCT are practically insoluble in water and are highly resistant to disintegration. Unlike PCB, PCT are less volatile.

Monomethyl-tetrachlordiphenyl methane[23] **and monomethyl-dichloro-diphenyl methane** belong to the group of alkilaromatic halogenated carbohydrates – tetrachlorbenziltoluenes (TCBT) and dichlorbenziltoluenes (DCBT), comprising a mixture of isomers. Two groups of TCBT and DCBT are produced for commercial purposes under the trademarks Ugilec 141, Ugilec 121 and Ugilec 21. Ugilec 141 is a mixture of 70 isomers of TCBT (Ehmann and Ballschmitter, 1989, Cramer at.al 2000). Ugilec 121 and Ugilec 21 contain a mixture of isomers of DCBT and they have identical properties with Ugilec 141, but are produced for other uses.

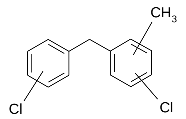
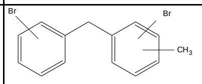
Monomethyl-dibromo-diphenyl methane belongs to the group of aromatic halogenated carbohydrates dibromobenziltoluenes (DBBT). This substance is produced for commercial purposes under the trademark DBBT.

Table No. 45 specifies the industrial POPs chemicals, belonging to the group of PCB.\

Table 45: Industrial POPs chemicals, belonging to the group of PCB

Industrial POPs chemical	CAS No.	EC No.	Structural formula	Prohibition	Specific exemption
Polychlorinated biphenyls (PCB)	1336-36-3 and others.	215-648-1 and others		Prohibited 21.03.2006	Production: none Use: in electrical equipment (transformers and capacitors) till 31.12.2010.
Polychlorinated terphenyls (PCT)	61788-33-8	262-968-2		Prohibited 21.03.2006	Production: none Use: none
Monomethyl-tetrachlordiphenyl methane (Ugilec 141)	76253-60-6	278-404-3		Prohibited 21.03.2006	Production: none Use: none

[23] Startup Guidance for the new 9 POPs (general information, implications of listing, information sources and alternatives), HBB, UNEP, Switzerland, December 2010

Monomethyl-dichloro-diphenyl methane (Ugilec 121 and Ugilec 21)	81161-70-8	400-140-6		Prohibited 21.03.2006	Production: none Use: none
Monomethyl-dibromo-diphenyl methane (DBBT)	99688-47-8	402-210-1		Prohibited 21.03.2006	Production: none Use: none

Source: http://edexim.jrc.it/list_annex_chemical_details

3.2.1.1. General characteristic of polychlorinated biphenyls (PCB)

Table No. 46 presents the specified physical and chemical properties and some POPs characteristics of PCB and the other chemicals, belonging to this group.

Table 46: Properties, POPs characteristics of PCB

POPs	POPs: characteristics and exposure
Polychlorinated biphenyls (PCB)	Chemical name: Polychlorinated biphenyls (PCB) CAS No.: 1336-36-3; EC No.215-648-1; Molecular formula: $C_{12}H_{(10-n)}Cl_n$, n = от 1 до 10; Molecular mass: mono-PCB - 188,7; deca-PCB-498,7 Outer appearance: Most PCB congeners in their pure form are colourless and odourless crystals. At room temperature PCB are liquids. Depending on their degree of chlorination, commercial mixtures vary from colourless oil-resembling liquids to viscose dark oils and yellow to black resins. Their relative density is: 1.182-1.566 kg/L Properties[24]: Flashpoint: 170-380°C; Boiling point[25]: varies within the range 245 - 420^o C at 2 mm Hg; Henry's constant[26]: 0.01-1 atm L/mol at 25^o C; log K_{OW}: 4,5-8,23; Vapour pressure[27]: 1.43x10^{-7} (PCB28) - 3.2·10^{-10} (PCB153) atm at 25^o C; Water solubility[28]: PCB are slightly soluble in water (from 0.085-0.266 ng/l for PCB-28 to 0.0012-0.0095 ng/l C PCB153 at 25°) as solubility decreases with the increase of the chlorine atoms number. PCB dissolve in many organic solvents, oils and fats. A considerable part of PCB isomers, especially those with unsubstituted neighbouring positions of the biphenyl rings (for instance, 2,4,5-, 2,3,5- or 2,3,6-substituted of the two rings), are characterized by much greater persistence in environment. They accumulate in soil. The half-life period of PCB in the air is from three weeks to two years (with the exception of mono- and dichlorlobiphenyls) and more than 6 years in aerobic soils and sediments. PCB in adult fish organisms disintegrate very slowly, for instance, within the course of an eight-year study, it has been established that the half-life period of PCB-153 in eels is more than ten years. PCB accumulate in inferior aquatic organisms and fish in concentrations higher than those in water. Exposure and harmful effects: The harmful effects for animals and/ or humans include: damage of the liver, thyroid gland, skin and eyes, immunotoxicity, neuro-behavioural deviations, body mass decrease of the newborn, disorders in the reproductive ability and carcinogenicity in animals. The International Agency for Research of Cancer (IARC) classifies PCB in Group 2A – probably carcinogenic to humans.

[24] UNEP-POPs_Asses_IPCS_Ritter[1];
[25] WHO/EURO (1987).
[26] Fiedler *et al.* 1994;
[27] Dunnivant & Elzerman 1988;
[28] Shiu & Mackay 1986;

POPs	POPs: characteristics and exposure
Polychlorinated terphenyls (PCT)	Chemical name Polychloroterphenyls; Polychloroterphenyls (PCT) CAS No.: 61788-33-8; EC No. 262-968-2; Molecular formula: $C_{18}H_{(14-n)}Cl_n$, n = from 1 to 14; Molecular mass: 230.3 g/mol; Outer appearance: PCT are incombustible light yellow to amber-coloured transparent adhesive resins or brittle flakes. Properties: PCT share many similar chemical and physical properties with PCB. PCT are heat-resistant, incombustible compounds, corrosion-resistant to alkaline hydroxides and strong acids, practically insoluble in water, but dissolving in various organic solvents and oils. Once released in the environment, PCT are highly resistant to bio- and photo- disintegration. PCT are lipophil substances and accumulate in the fat tissue of living organisms via the food chain. Exposure and harmful effects: PCT cause liver damage, skin problems (acne), body mass loss, etc.
Monomethyl-tetrachlordiphenyl methane (Ugilec 141)	Chemical name: Monomethyl-tetrachloro-diphenyl methane, Dichloro [(dichlorophenyl)methyl] methylbenzene CAS No.: 76253-60-6; EC No. 278-404-3; Molecular formula: $C_{18}H_{14}Cl_4$; Molecular mass: 320.05 g/mol; Properties: Water solubility 5 µg/L at 20 °C; Vapour pressure < 10 Pa at 20 °C; log K_{OW}: 6.725 – 7.538; log BCF: 1.67 – 2.68 (fish); Relative density: 1,25. Ugilec 141 has many physical and chemical properties similar to those of PCB and PCT, such as slight water solubility, persistence in environment, high ecotoxicity and bioconcentration potential, irrespective of the fact that they these are less toxic to humans and the environment than PCB.
Monomethyl-dichloro-diphenyl methane (Ugilec 121 and Ugilec 21)	Chemical name: Monomethyl-dichloro-diphenyl methane; Dichloro-benzyl toluene, mixture of isomers CAS No.: 81161-70-8 ; EC No. 400-140-6; Molecular formula: $C_{18}H_{12}Cl_2$; Molecular mass: 251.16 g/mol; Properties: Water solubility < 1 µg/L at 20 °C; Vapour pressure 0.005 Pa at 20 °C; log K_{OW}: 5.85; log BCF: 3.81 (fish); Relative density: 1,25. Ugilec 121 and Ugilec 21 have many physical and chemical properties similar to those of PCB and PCT, such as slight water solubility, persistence in environment, high ecotoxicity and bioconcentration potential, irrespective of the fact that they are less toxic to humans and the environment than PCB.
Monomethyl-dibromo-diphenyl methane (DBBT)	Chemical name: Bromobenzylbromotoluene; Monomethyldibromodiphenyl-methane; Bromobenzylbromotoluene CAS No.: 99688-47-8; EC No. 402-210-1; Molecular formula: $C_{14}H_{12}Br_2$ Properties: DBBT has physical and chemical properties similar to those of PCB and PCT, but is less toxic than PCB.

3.2.1.2. PCB according to the Stockholm Convention

PCB are industrial chemicals included in Annex A, Part II of the Stockholm Convention. The production of PCB is prohibited for all parties to the convention. The use of PCB is permitted only in electrical equipment up to the year 2025, as such equipment must be decontaminated by the year 2028. In May 2009 in Geneva a PCB Elimination Network (PEN) has been established.

3.2.1.3. Historical global production and use of PCB

3.2.1.3.1. Historical production of PCB on a global scale

Polychlorinated biphenyls (PCB)

The production of PCB on industrial scale starts in the year 1929 and continues till the year 1993.

PCB are produced in the following countries: the USA (from 1929 till the end of the 1970s of the past century), Europe – Austria, France, Germany, Spain, England, Italy[29], former Czechoslovakia[30] (1959 -1985); Russia[31] (1939 – 1993); China[32] (till the year 1974) and Japan (1954 – 1972). That is why it is considered that any equipment produced after the year 1993 does not contain PCB.

The commercial products of PCB are placed on the market under different trade names, as the most popular among them include: Apirolio (Italy); Aroclor (USA); Clophen; (Germany); Delor (former Czechoslovakia); Elaol (Germany); Fenchlor (Italy); Kanechlor (Japan); Phenoclor (France); Pyralene (France); Pyranol (USA) Pyroclor (USA); Santotherm (Japan); Sovolp Sovtol (former USSR). Some other trade names refer to polychlorinated terphenyls (PCT): Aroclor 2565; Aroclor 5442; Aroclor 5460; to monomethyl-tetrachloro-diphenyl methane: Ugilec 141; to monomethyl-dichloro-diphenyl methane : Ugilec 121; and to monomethyl-dibromo-diphenyl methane : DBBT[33].

The series PCB „Aroclor" contain a four-digit code. With PCB the first two numbers are 10 or 12. The second two numbers from the four-digit code specify chlorination percentage (for instance, "Aroclor 1254" contains 54 weight % of chlorine).

In the former USSR (Russia) technical mixtures of PCB have been produced at the plant "Orgsteklo", town of Dzherdinsk, county of Nizhniy Novgorod, and "Orgsintez", town of Novomoskovsk, county of Tula. It is believed that for the period 1939 – 1993 about 180,000 tons of PCB have been produced, which have been used as dielectric fluids in transformers and capacitors and as additives in hydraulic, coolant, and lubricant fluids. PCB have also been used as additives to inks, paint plasticizers and fire-resistance additives:

- Sovol: mixture of tetra- and pentachlorinated PCB, used as plasticizers in paints and lacquers;
- Sovtol: Sovol mixed with 1,2,4 trichlorbenzene in ratio 9:1, known under the trade name Sovtol-10, used in transformers. Out of the total produced amount of Sovtol-10 in the USSR (57 000 t), 60% have been used in Russia, and the remaining 40% have been used in the other Soviet Republics of the USSR;
- Trichlorobiphenyl (TCB): mixture of isomers of trichlorbiphenyl, used in capacitors. The entire produced amount of TCB (70 000 t) is used for filling of capacitors, manufactured in the USSR.

In former Czechoslovakia PCBs have been produced at the chemical plant Chemko, Strážske (East Slovakia) from the year 1959 to the year 1984 under the trademark Delor (Holoubek, et.al. 1999).

Polychlorinated terphenyls (PCT)[34]

PCT have been produced in much lower amounts as compared to PCB. They have been employed for the same applications as PCB, as well as for additives to waxes, plastics, hydraulic fluids, paints and lubricants (Jensen and Jørgensen, 1983). In the USA the "Aroclor" series of PCT are marked by a digit code 54 in the first two positions of a four-digit code, for instance, Aroclor 5432, Aroclor 5442 and Aroclor 5460 (IPCS, 1992). The American company Monsanto has also manufactured hydraulic fluids called Pydraul and Montar 5, containing PCT. Other trademarks of PCT are:

[29] Fiedler 1997; Jakobi 1996; Environment Canada, 1985
[30] Holoubek,et.al. 2004
[31] Artic Monitoring and Assessment Programme, 2000);
[32] China State Environmental Protection Agency, 2002
[33] Polychlorinated Biphenyl Inspection Manual, US EPA, 2004
[34] Updated technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with polychlorinated biphenyls (PCBs), polychlorinated terphenyls (PCTs) or polybrominated biphenyls (PBBs), K0760119, 23/03/2007, UNEP Chemicals, Switzerland

Clophen Harz (W), Cloresil (A, B, 100), Electrophenyl T-50 and T60, Kanechlor KC-C (Japan), Leromoll, Phenoclor, Pydraul, Kanechlor KC-C (Japan).

PCT are produced in the USA, France, Germany, Italy and Japan till the beginning of the 1980s of the past century when their production is terminated (UNECE, 2002).

In Europe[35] PCT are produced by several manufacturers: in Germany by Bayer under the trademarks Leromoll and Clophen Harz (W) till the year 1977; in Italy – by Caffaro under the trade name Cloresil (A, B, 100), between the years 1948 and 1978; in France - by Produits chimiques ugine Kuhlman under the trade names Electrophenyl T-60 and Phenoclor, from the year 1966 till the year 1980.

Monomethyl-tetrachlordiphenyl methane and monomethyl-dichlordiphenyl methane (Ugilec 141 and Ugilec 121), monomethyl-dibromodiphenyl methane

Monomethyl-tetrachlordiphenyl methane and monomethyl-dichlordiphenyl methane are produced for industrial applications under the trademarks Ugilec 141 and Ugilec 121, accordingly from the year 1981 and from the year 1984, as a safer substitute of PCB.

Ugilec 141 and Ugilec 121 are produced by the French chemical plants Atochem and Prodelec for dielectric and coolant fluids used to fill capacitors and transformers, or as hydraulic fluids in mining extraction equipment. Ugilec C21 has been used in capacitors. They are deemed safer in case of fire, due to their lower potential of dioxins and furans formation. The production of Ugilec has been prohibited in Europe since the middle of the year 1994.

Monomethyl-dibromodiphenyl methane is produced as the commercial product DBBT.

3.2.1.3.2. Historical use of PCB on a global scale

Polychlorinated biphenyls (PCB)[36, 37]

PCB are tremendously stable compounds with excellent dielectric and heat-transmission properties, having long life, incombustible, and heat- and chemical-resistant. These characteristics precondition their wide use over a multitude of applications in industry and everyday life.

The applications of PCB are categorized as applications in fully closed, partially closed and in open systems (IPCS, 1992).

Fully closed systems – as insulation and/ or coolant fluids in transformers, dielectric fluids in capacitors (including small capacitors in luminescent, lead and neon lamps; capacitors in motors of refridgerators, heating systems, air-conditioning, hair-dryers, electric well pump motors; capacitors in electronic equipment, such as television sets and microwave ovens); electric switches; relays, etc.;

Partially closed systems – in heat-transmission systems (heaters and heat exchangers); hydraulic systems (hoisting machinery, high pressure pumps in mining equipment); vacuum pumps; voltage regulators; electric cables with oil insulation; high-voltage circuit-breakers with oil insulation;

Open systems– plasticizers for polyvinyl chloride, neoprene and other synthetic rubbers; ingredients of paints and other covering materials; in printing inks and carbon-free photocopier, coloured ink cartridges; lubricants in oils and grease; waterproof impregnating agent and fire

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[35] Information dossier for the reassessment of production and use of polychlorinated terphenyls (pcts) under the United National Economic Commission for Europe Protocol on persistent organic pollutants (POPs), Task Force On Persistent Organic Pollutants (POPs), Greg Filyk, Environment Canada, April 2004

[36] Guidelines for Identification of PCBs and Materials, containing PCBs, First Issue, 1999, UNEP, Switzerland

[37] Neumeier, 1998; US EPA 1994; ICF 1989b

resistance additive in wood, papers, fabrics and leathers; laminating agent in cellulose and paper industry; additive in glues and corrosion protection covers; filler for insecticides; additive to lubricants and joint-filling mixtures; fire-resistance additive in upholsteries, carpets, polyurethane foam, roof-tiles, ceramic tiles, floorings; microscope immersion oils; catalyst carriers in oil products polymerization; pesticide formulations; linings/ covers of electric cables.

Polychlorinated terphenyls (PCT)[38]

PCT are used for almost the same applications as PCB, but in significantly smaller amounts. It is known that small amounts of PCT are used in electrical equipment (Jensen and Jørgensen, 1983).

The main uses of PCT include: plasticizers in synthetic resins, adhesives, lubricants, coats for paper and cardboards, waxes, printing inks, non-carbon copy paper, compacting agents for concrete pavements and joint-filling agents; fire resistance additives; fillers for insecticides; anti-mildew and water resistant coatings for fabrics, metal linings, abrasives for sanding discs, polishing agents, lacquers, paints, impregnating agents for woven cotton lining of conductors and asbestos insulations, in the linings of electrical conductors and cables, and as dielectric gaskets, PCT containing waxes for tooth prints in dental medicine, etc.

Monomethyl-tetrachlordiphenyl methane and monomethyl-dichlordiphenyl methane (Ugilec 141 and Ugilec 121), monomethyl-dibromodiphenyl methane

Ugilec 141 and Ugilec 121, or Ugilec 21 have been used as dielectrics in capacitors and transformers in the beginning of the 1980s of the past century as substitutes for PCB. Ugilec 141 is also used as a hydraulic fluid in mining equipment. Ugilec 141 and Ugilec 121 & Ugilec C 21 have been on the market in Europe as a commercial product since the year 1981, and 1984, accordingly. They have been offered on the market by two French companies till the middle of the year 1994 when they have been prohibited.

Monomethyl-dibromodiphenyl methane

Monomethyl-dibromodiphenyl methane is offered on the market as a substitute for PCB under the trademark DBBT for use as dielectric fluid in transformers and capacitors, or as a fire-resistance additive – fire retardant in switchboards and in plastic parts of electronic equipment.

3.2.1.4. Alternatives to PCB

The following alternatives exist for PCB substitution:

- Dielectric fluid in transformers: mineral oils; silicon oils; tetrachlorbenzene; chlorinated diphenylethanes, chloralkylenes, and biphenyls;
- Dielectric fluid in capacitors: alkyl-substituted benzenes; mixture of methyl (phenylmethyl)benzene and methylbis(phenylmethyl)benzene; benzene; phenylxililethane, etc.
- Hydraulic fluids: plant oils;
- Heat transmission fluids: biphenyl oxide; mineral oil; silicon oil; biphenyl; diphenyl oxide;
- Plasticizers: chlorinated paraffins;

Instances of alternatives for substitution of Ugilec and DBBT for applications in transformers include[39]:

[38] Updated technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with polychlorinated biphenyls (PCBs), polychlorinated terphenyls (PCTs) or polybrominated biphenyls (PBBs), K0760119, 23/03/2007, UNEP Chemicals, Switzerland

[39] EU Legislation for Ugilec and DBBT in several products, CBI Ministry of Foreign Affairs, March 2010.

❖ Synthetic ethers, mineral and silicon oils, such as poly-dimethyl siloxanes, ethers of pentaeritrit, mixtures of water and glycol, dodecylbenzene, methyl (phenylmethyl) benzene, or castor oil;

❖ Another alternative is the use of other technologies, such as dry transformers.

3.2.1.5. Key legislation on PCB

3.2.1.5.1. International and European legislation on PCB

✓ **Stockholm Convention on the persistent organic pollutants**

The production of PCB is completely prohibited for the parties to the convention. The use of PCB in equipment is permitted till the year 2025. By the year 2028 is to be attained safe and environmentally sound disposal of wastes and equipment containing PCB in a manner that prevents their release into the environment.

✓ **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal**

The Basel Convention introduces a mechanism for control of transboundary movements and management of hazardous waste containing PCB and their disposal. Subject to control are the following categories of waste containing PCB:

У 10: Waste substances and products, contaminated by or containing PCB and/ or PCT, or polybrominated biphenyls (PBB), or their admixtures;

The Basel Convention adopts technical guidelines on the environmentally sound management of waste contaminated by or containing PCB, PCT, or PBB.

✓ **Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade with certain hazardous chemical substances and pesticides**

The Rotterdam Convention imposes bans and severe restrictions on international trade with PCB and PCT, which is subject of PIC procedure.

✓ **Aarhus Protocol on Persistent Organic Pollutants (UNECE) of 24 June 1998 to the Geneva Convention on Long-range Transboundary Air Pollution of 1979 (CLRTAP)**

The Protocol on POPs prohibits the production of PCB. The operation of equipment containing PCB in a volume larger than 5 dm^3 and concentration higher than 0.05 weight % has been permitted till 31.12.2010. The import and export of any equipment containing PCB is prohibited, save for the purposes of environmentally sound disposal of such waste.

✓ **Regulation (EC) No. 850/2004 on the persistent organic pollutants**

The Regulation introduces bans on the production and use of PCB in electrical equipment with a volume of the operating fluid exceeding 5 dm^3 and PCB concentration higher than 0.005 weight .% in accordance with the provisions of Directive 96/59/EC. Specific exemption permits the use of equipment within closed systems till the date of 31.12.2010.

✓ **Council Regulation (EC) No. 1195/2006 of 18 July 2006 amending Annex IV to Regulation (EC) No 850/2004 of the European Parliament and of the Council on persistent organic pollutants, (OJ of EU, L 217/08.08.2006)**

Annex IV to Regulation (EC) No. 850/2004 introduces the maximum admissible concentrations of POPs in waste contaminated by or containing PCB exceeding 50 mg/kg, which are disposed or recovered in a manner guaranteeing that the content of PCB has been destroyed or irrevocably transformed into such that does not possess any POPs characteristics.

✓ **Regulation (EC) No. 172/2007 of 16 February 2007 amending Annex V to Regulation (EC) No 850/2004 of the European Parliament and of the Council on persistent organic pollutants (OJ of EU, L 55/23.02.2007)**

Alternative methods for treatment of waste containing more than 50 mg/kg PCB are introduced, which include the following operations: permanent storage only in safe, deep, underground rock formations, salt mines, or landfills for hazardous waste.

✓ **Regulation (EC) No. 689/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 June 2008 concerning the export and import of dangerous chemicals (OJ of EU, L 204/31.07.2008), effective for Bulgaria as of 31.07.2008.**

Annexes I, II, or II list the chemicals that are subject to export notification: DBBT, -Ugilec 121 or Ugilec 21, Ugilec 141, PCT and PCB.

✓ **COMMISSION REGULATION (EC) No 552/2009 of 22 June 2009 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) as regards Annex XVII (OJ of EU, L 164/26.06.2009), effective for Bulgaria as of 22.06.2009.**

Annex XVII includes the following industrial chemicals (Table No. 47):

Table 47: Annex XVII to Regulation (EC) No. 1907/2006(REACH)

No.	Name of substances, group of substances, or mixtures	Restriction conditions
1.	Polychlorinated terphenyls (PCT) — Mixtures including waste oils with content of PCT higher than 0,005 weight %.	1. Their use is prohibited. Their use is admitted in equipment, installations, and fluids, which are in use up to 30 June 1986, until their decommissioning, or earlier termination of their operational period: a) transformers, resistors and inductors in electrical equipment within closed systems; b) large capacitors (≥ 1 kg of the total weight); c) small capacitors; d) heat transfer fluids in a closed circuit used in heat exchangers; e) hydraulic fluids used in equipment used for mining production underground. 2. The placement on the market of second-hand equipment, installations and fluids not intended for decommissioning, is prohibited.
24.	Monomethyl –tetrachloro-diphenyl methane (Ugilec 141) CAS No. 76253-60-6	1. The placement on the market and the use of this substance, as well as of the products and mixtures containing it, is prohibited. 2. The use of installations and machines commissioned as of 18 June 1994 is permitted till the expiry of their operation period. 3. The placement on the market of any second-hand articles or installations/ machines containing monomethyl-tetrachlordiphenyl methane.
25.	Monomethyl-dichloro-diphenyl methane (Ugilec 121 Ugilec 21) CAS No. — unknown	Any placement on the market and use of the substance, both in mixtures and articles containing it, are prohibited.
26.	Monomethyl-dibromo-diphenyl methane, bromobenzyl-bromotoluene, mixture of isomers (DBBT), CAS No. 99688-47-8	Any placement on the market and use of the substance, both in mixtures and articles containing it, is prohibited.

✓ **Regulation (EC) No. 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste, (OJ of EU, L 190/12.07.2006)**

The Regulation establishes procedures and regimes for control over the shipments of waste, depending on the origin, destination and route of their transportation, the type of wastes being transported, and the types of treatment being applied in respect of the wastes at their destination:

A 3180: Wastes, substances and products containing, consisting of, or contaminated by PCB, PCT and PBB, or any other polybrominated analogues of these compounds in concentration of 50 mg/kg, or more.

✓ **Council Directive 96/59/EC of 16 September 1996 on the disposal of polychlorinated biphenyls and polychlorinated terphenyls (PCB/PCT) (OJ of EU, L 243/24.09.1996), effective for Bulgaria as of 21.03.2006.**

Directive 96/59/EC regulates the stage-by-stage decommissioning of electrical equipment (transformers and capacitors), containing PCB and its disposal till the date of 31.12.2010. To that end, the member states perform inventories of any equipment containing PCB (transformers and capacitors) with a volume greater than 5 dm^3. Requirements regarding the environmentally sound disposal of PCB are also introduced.

3.2.1.5.2. National legislation on PCB

✓ **Waste Management Act (WMA), (promulgated, SG 53 of 13.07.2012, effective as of 13.07.2012.)**

WMA regulates the environmentally sound management of hazardous waste containing PCB, as well as the treatment and transportation of such waste, and introduces the provisions of Directive 96/59/EC on the disposal of PCB/PCT.

✓ **Ordinance on the order and method for classification, packaging, and labeling of chemical substances and mixtures, (promulgated, SG 68/31.08.2010), effective as of 31.08.2010 to 31.05.2015.)**

The Ordinance determines the order and method for classification of chemical substances and mixtures and the requirements for packaging and labeling of hazardous chemical substances and mixtures; PCB are included in Tables 3.1 and 3.2 of Annex No. VI to Regulation (EC) No. 1272/2008 (Tables No. 48 and 49).

Table 48: Table 3.1 of Annex VI to Regulation (EO) No. 1272/2008

Index No.	International chemical identification	EC No	CAS No	Classification		Labeling		Specific limit concentrations, M-factors
				Class code and hazard category	Hazard warning code	Pictogramme and signal word code	Hazard warning code	
602-039-00-4	Polychlorinated biphenyls; (PCB)	215-648-1	1336-36-3	STOT RE 2 * Aquatic Acute 1 Aquatic Chronic 1	H373 ** H400 H410	GHS08 GHS09 Wng	H373 ** H410	STOT RE 2; H373: C ≥ 0,005 %
602-072-00-4	Monomethyl-tetrachlorodiphenyl methane (Ugilec 141)	278-404-3	76253-60-6	Aquatic Acute 1 Aquatic Chronic 1	H400 H410	GHS09 Wng	H410	-
602-071-00-9	Monomethyl - dibromo-diphenyl methane (DBBT)	402-210-1	99688-47-8	STOT RE 2 * Skin Sens. 1 Aquatic Acute 1 Aquatic Chronic 1	H373 ** H317 H400 H410	GHS08 GHS07 GHS09 Wng	H373 ** H317 H410	-

Source: http://edexim.jrc.it/list_annex_chemical_details

Table 49: Table 3.2 of Annex VI to Regulation (EC) No. 1272/2008

Index No.	International chemical identification	EC No	CAS No	Classification	Labeling	Limit concentrations
602-039-00-4	Polychlorinated biphenyls; (PCB)	215-648-1	1336-36-3	R33 N; R50-53	N R: 33-50/53 S: (2-)-60-61	R33: C ≥ 0,005 %
602-072-00-4	Monomethyl-tetrachlorodi-phenyl methane (Ugilec 141)	278-404-3	76253-60-6	N; R50-53	N; R50-53 S: 60-61	-

Index No.	International chemical identification	EC No	CAS No	Classification	Labeling	Limit concentrations
602-071-00-9	Monomethyl -dibromo-diphenyl methane (DBBT)	402-210-1	99688-47-8	Xn; R48/22 R43 N; R50-53	Xn; R48/22 R43 N; R50-53 S: 2, 24, 37, 41, 60, 61	-

Source: http://edexim.jrc.it/list_annex_chemical_details

✓ **Ordinance No. 3 of 1.04.2004 on classification of waste (promulgated SG 44/25.05.2004, as amended and supplemented, SG 23/20.03.2012)**

The Ordinance determines the conditions and order for classification of hazardous waste per types and properties, including as regards wastes containing PCB. The classification codes for waste contaminated by or containing PCB are as follows:

– 13 01 01 (*) hydraulic oils containing PCB[40];
– 13 03 01 (*) insulation or heat transfer oils containing PCB;
– 13 03 06 (*) chlorinated insulation and heat transmission mineral-based oils, other than those specified in 13 03 01;
– 16 02 09 (*) transformers and capacitors, containing PCBs;
– 16 02 10 (*) decommissioned equipment, contaminated by or containing PCB, other than that specified in 16 02 09;
– 17 09 02 (*) other waste from construction and demolition, containing PCB (for instance, compaction materials containing PCB, raisin-based flooring containing PCB, closed sealed systems containing PCB, PCB capacitors)

✓ **Ordinance on the requirements regarding the order and method for inventory of equipment containing polychlorinated biphenyls, its marking and cleaning, as well as the treatment and transportation of waste containing polychlorinated biphenyls, (promulgated, SG 24 of 21.03.2006, as amended, SG 53 of 10.06.2008, as amended and supplemented, SG 29 of 8.04.2011).**

The Ordinance determines the order and method for inventory, marking and cleaning of equipment containing PCB and the requirements concerning the treatment and transportation of waste containing PCB.

3.2.1.6. Detailed inventory of PCB in electrical equipment

3.2.1.6.1. Methodology for performance of the inventory

During the period from July 2006 to July 2007, MoEW through RIEW performed detailed inventory of PCB-containing equipment, in accordance with the requirements of Annex No. 1 to the Ordinance on PCB, through circulating of Inventory Forms to companies-holders of such equipment.

3.2.1.6.2. Obligations of PCB equipment holders

The holders of equipment with a volume of the operating fluid greater than 5 dm^3 and PCB concentration above 0,005 mass % completed and sent to RIEW inventory forms regarding their own equipment, which were certified by the directors of the respective RIEW. Plans were elaborated for cleaning and/ or disposal of the inventoried equipment within specific time periods by the date of 31.12.2010. RIEW exercised stringent control over the plans' implementation. The disposal of waste containing PCB was performed only by way of operations D8, D9, D10, D12 and D15 through delivery to licensed companies under Article 37 of WMA.

[40] PCBs mean: polychlorinated biphenyls, polychlorinated terphenyls, monomethyltetrachlordiphenyl methane, monomethyldichlordiphenyl methane, monomethyldibromdiphenyl methane and any mixture containing more than 0,005 weight % of these substances.

It should be noted that after the date of 01 January 2011 the entire operating and decommissioned equipment (transformers and capacitors) with a volume exceeding 5 dm^3 and concentration of PCB in the operating fluid exceeding 0.05 mass % (500 mg/kg) is considered as waste and is subject to immediate dismantling and disposal.

Since 21.03.2006 an effective ban has been introduced on the export and import, as well as on the placement on the market of any PCB equipment. The export of wastes and decommissioned equipment containing PCB is permitted only for the purpose of environmentally sound disposal.

3.2.1.6.3. Production, import and export of PCB

3.2.1.6.3.1. Production of PCB, PCT, Ugilec 141, Ugilec 121 and DBBT

PCB, PCT, Ugilec 141, Ugilec 121,Ugilec 21 and DBBT have never been produced in Bulgaria.

3.2.1.6.3.2. Import of dielectric fluids containing PCB

Dielectric fluids for filling of transformers and capacitors were imported in Bulgaria from the former USSR, Czechoslovakia and Hungary during the period from 1955 to 1972. Their amount equals 24, 120 t, as 83% of the total amount of imported dielectric fluids is from the USSR (NSI, 2002).

The transformer oil Sovtol-10 (57,000 t) was produced in the USSR and in other Soviet Republics. Sovtol–10 was exported only by Orgsintez, town of Novomoskovsk, which exported some 39.5 t Sovtol–10 to Cuba, Vietnam, and Pakistan within the period 1981 ÷1989. The entire amount of the dielectric trichlorbiphenyl (TCB) for capacitors produced in the USSR was used for filling of capacitors made in Russia. There was no export of TCB from the USSR to Bulgaria.

Transformer and capacitor oils imported from former Czechoslovakia amount to 1,946 t, or 8% of the total import. PCB have been produced at the chemical plant Chemko in Strážske (East Slovakia) from 1959 to 1984 under the trademark Delor (Holoubek, et.al.1999), but there was no export to Bulgaria[41]. Hungary has never produced any PCB.

In summary, it may be concluded that the imported dielectric fluids for transformers and capacitors from the USSR, Czechoslovakia and Hungary do not contain PCB. Nevertheless, there is a possibility that a part of the imported transformer oils delivered as reserve from the USSR could have contained PCB.

There are no data about any import of dielectric fluids containing PCT, Ugilec 141, Ugilec 121,Ugilec C 21, DBBT in Bulgaria.

3.2.1.6.3.3. Export of dielectric fluids containing PCB

Bulgaria has never exported any dielectric fluids containing PCB, PCT, Ugilec 141, Ugilec 121, Ugilec 21, DBBT and PeCB, since they have never been produced in the country.

Export for final disposal out of the territory of Bulgaria of any waste fluids, containing PCB, a total of 45 t, was carried out during the period 1996 – 2010 (NSI, April 2011). Waste dielectric fluids containing PCB, were disposed at licensed facilities in Germany, France and the Netherlands.

3.2.1.6.5. Production, import and export of transformers and capacitors

3.2.1.6.4.1. Transformers

In Bulgaria three companies are producers of transformers. The first plant for production of power transformers in the country was commissioned in the year 1950. The transformers that were produced at that time were filled with imported transformer oils, some of which could have contained PCB. In 1972 the production of Bulgarian oils without any PCB content was initiated.

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41 Proposal for National Implementation Plan for POPs in Czech Republic,TOCOEN Report No.252, January 2004.

This year marks the start of the production of transformers filled with Bulgarian oils, intended mainly for the power engineering industry, metallurgy and mining. In the 1980s of the past century transformers were produced with capacity of up to 1000 кVA, intended for furnishing of kiosks switchgear within the power transmission grid. The produced transformer types were TM 120, TM 160, TM 180, TM 400, TM 630, TM 1000, TM 1600 and TM 2500.

The main amounts of transformers were produced during the period 1961 -1990, as at present their production has considerably decreased. For the entire period from 1950 to 1990 some 227,142 transformers were produced. Intensive export of transformer started in the year 1962. A total of 162,966 transformers were exported during the period 1955– 1990. In Bulgaria transformers were imported in the period 1972 – 1990, a total of 1,954 transformers. According to data of the producers, the 66,150 transformers being available in the country as at the year 1990, do not contain any PCB.

The greatest number of transformers was imported from Romania – 951 pcs., followed by Korea – 378 pcs., from the former USSR – 313 pcs., West and East Germany – 238 pcs., and former Czechoslovakia – 55 pcs. Romania, Hungary, and Korea have not produced any PCB. China terminated the production of PCB in the year 1972. In Europe PCB for transformers were produced within the period 1959 -1985, and in the USSR – till the year 1988. Supposedly, some of the imported 226 transformers from Germany before the year 1985, the 291 transformers from the USSR before the year 1988, and the 55 transformers from Czechoslovakia before the year 1985, or a total of 572 pcs., could have contained PCB(NSI, 2002).

3.2.1.6.4.2. Capacitors

Capacitors are produced in Bulgaria by two plants, the first of which has been commissioned in the year 1965, as the capacitors produced until the year 1971 have been filled up with imported dielectric oils. After the year 1972 the capacitors have been filled up with Bulgarian dielectric fluids (mineral), not containing PCB. The second capacitor plant was commissioned in the mid-1980s of the past century, as the capacitor batteries produced therein were filled with dielectric fluids produced in Bulgaria and not containing any PCB. Both plants have never produced capacitors, containing PCB, PCT, Ugilec 141, Ugilec 121, Ugilec C 21 and/ or DBBT.

The capacitors produced in Bulgaria are intended mainly for use in the country. Capacitors containing PCB were imported in the country till the year 1993 from the former Socialist countries (the USSR, GDR, Czechoslovaka and Romania) and from West Europe (France, Sweden, and Switzerland) mainly as complex supplies of new equipment for different companies within the energy sector and the chemical , metallurgic, and mining industries, and yet no reliable information regarding such import is available. There are no data about any export of capacitors, containing PCB.

❖ **SUMMARIZED CONCLUSIONS:**

✓ **In Bulgaria no PCB, PCT, Ugilec 141, Ugilec 121, Ugilec C 21 and DBBT have ever been produced and/ or any electrical equipment (transformers and capacitors) containing these compounds.**

✓ **The imported dielectric fluids for transformers and capacitors, imported in Bulgaria during the period 1955 – 1972 from the USSR, Czechoslovakia and Hungary, do not contain any PCB. Nevertheless, the possibility that some of the imported transformer oils supplied as reserve transformer oil for filling up transformers from the USSR could have contained PCB, cannot be entirely excluded.**

✓ **There are no data about any import in Bulgaria of dielectric fluids containing PCT, Ugilec 141, Ugilec 121, Ugilec C 21 and DBBT;**

✓ **Three companies in Bulgaria are producers of transformers. The first plant for power transformers in the country was commissioned in the year 1950. The transformers produced during that period were filled with imported transformer oils, some of which could have contained PCB. After the year 1972, transformers are filled with Bulgarian mineral oils not containing any PCB.**

✓ **Transformers were imported to Bulgaria within the period from 1972 to 1990, a total of 1,954 pcs., from Romania, Korea, the USSR, Germany, Czechoslovakia, Hungary and China. Romania, Hungary and Korea have not produced any PCB. China terminated its production of PCB in the year 1972. In Europe PCB was produced till the year1985 , and in the USSR – till the year 1988. Supposedly, some of the 226 transformers imported from Germany before the year 1985, 291 transformers imported from the USSR before the year 1988 and the 55,291 transformers imported from Czechoslovakia before the year 1985, or a total of 572 pcs., could have contained PCB.**

✓ **Two plants in Bulgaria are producers of capacitors. The first capacitor plant was commissioned in the year 1965, and the second – in the mid-1980s of the past century. After the year 1972 the capacitors produced in Bulgaria are filled with Bulgarian dielectric fluids (mineral) not containing PCB. None of the two plants has produced capacitors containing PCB, PCT, Ugilec 141, Ugilec 121, Ugilec C 21 and DBBT.**

✓ **PCB containing capacitors were imported in Bulgaria up to the year 1993 from the former Socialist block countries (the USSR, GDR, Czechoslovakia and Romania) and from West Europe (France, Sweden, and Switzerland), mainly as complex supplies of new equipment for various companies within the energy sector and the chemical, metallurgic and mining industries, however no reliable information exists as regards such import. There are no data as regards any export of capacitors containing PCB.**

3.2.1.6.5. Use of PCB in electrical equipment

PCB are used in Bulgaria as electrical insulation and/or cooling liquids in transformers and as dielectric fluids in capacitors. Transformers and capacitors containing PCB have been operated in Bulgaria between the years 1950 and 2010 when almost the entire equipment was decommissioned and/or exported for definitive disposal outside the territory of Bulgaria.

It is assumed that Ugilec 141, Ugilec 121, Ugilec C 21, DBBT have not been used as additives for dielectrics in transformers and capacitors as their production in Europe started in the late 70-ies of the last century when Bulgaria already had its own production of transformer and capacitor oils not containing PCB.

Despite that the production of PCT started at the beginning of 60-ies of the 20-th century, it is considered that PCT have not been used in Bulgaria for applications in capacitors which is established by the detailed inventory made of electrical equipment in 2007. There is not any information of PCT, Ugilec 141, Ugilec 121, Ugilec C 21, DBBT and PCB being used in Bulgaria.

3.2.1.6.5.1. Use in transformers

Power transformers containing PCB have been used in Bulgaria during the period 1974 – 2010 in various industry branches, mainly as complex deliveries of equipment to plants. Energy production and distribution companies have not used transformers containing PCB. Until 1988 most power transformers were filled up with transformer oils containing PCB.

Image 1: PCB-containing transformers in use, also operated in Bulgaria

A considerable portion of the data about the transformers is shown on the manufacturer signs attached thereto.

Image 2: Manufacturer sign of a Russian PCB transformer (Sovtol), operated in Bulgaria

Various types of transformers have been operated in Bulgaria (157 pcs.), containing PCB and mainly originating in Europe (former USSR, Germany, England, France and Italy), (MoEW, 2007).

The largest number of transformers operated in Bulgaria originate in the former USSR– 59.24 % (93 pcs.), followed by France – 29.30 %(46 pcs.), Eastern Germany – 5.73 % (9 pcs.), Italy – 3.82 % (6 pcs.) and Poland – 0.64 % (1 pcs).

The Russian transformers are mainly of types ТНЗ, ТНЗП, ТНП and ТНПУ, production of the Chirchiksky and Sverdlovsky transformer factory representing 71.23 % (562 440 kg) of the total gross weight of the equipment (789 570 kg). The trademark of the transformer oil is Sovtol-10. The French transformers have been filled up with Pyralene, the Italian – с Apirolio, and the German ones - – with Clophen A50. The French transformers comprise 21.26 % (167 780 kg) of the total gross weight of the equipment. All companies (France TRANSFO S.A.S., Metz, France; ITALTRAFO S.p.a., Italy, VOLTAWERKE, Germany, Monsanto LTD, England, FIAT Lodz, Poland) have produced transformers containing PCB. More than 74 % of the used PCB transformers by gross weight (591 150 kg) and above 65 % by number (103 pcs.) originate in the countries of the former Socialist bloc (USSR, GDR and Poland), (fig.16 and 17).

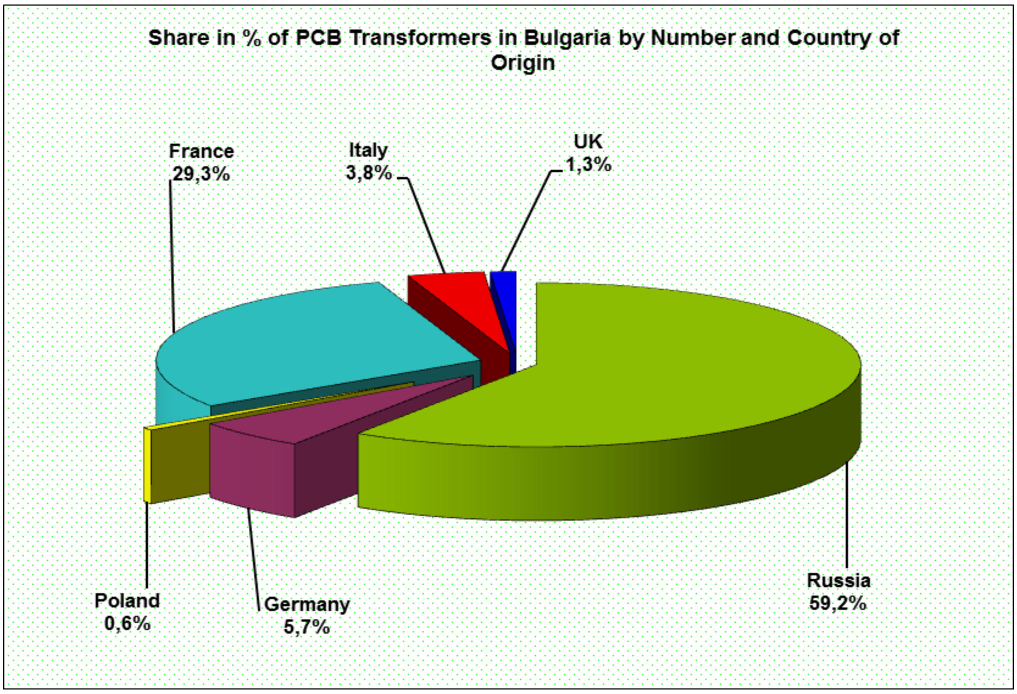

Figure 16: Percentage of the PCB transformers operated in Bulgaria by number and country of origin

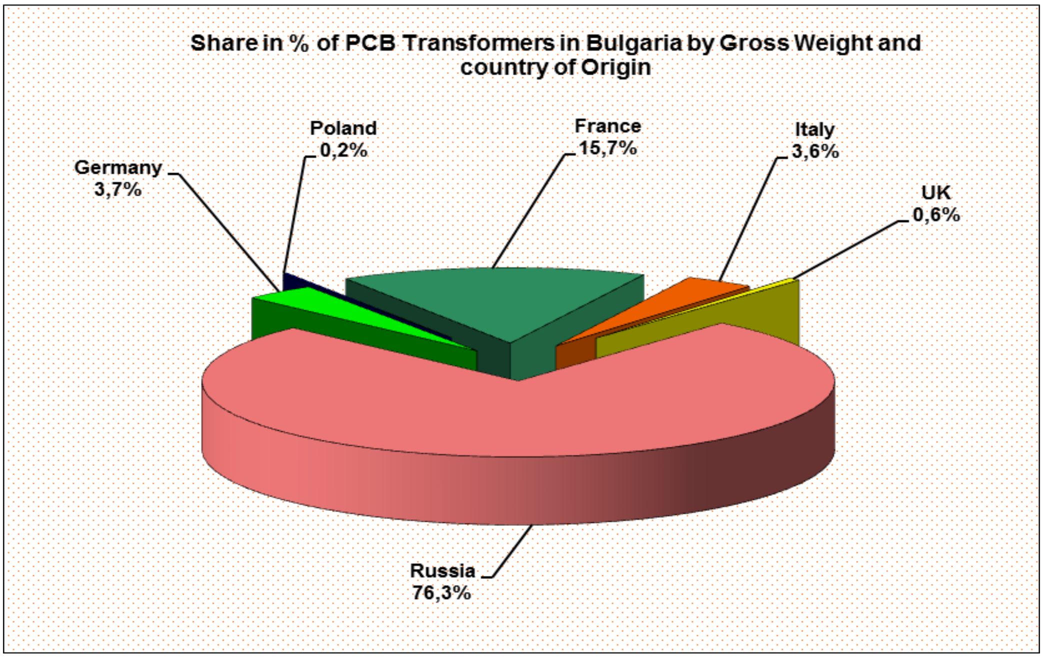

Figure 17: Percentage of the PCB transformers operated in Bulgaria by gross weight and country of origin

3.2.1.6.5.2. Use in capacitors

In the electricity distribution system the main use of the capacitors is for correction of the power factor. They are usually arranged in a group of 3 capacitors (capacitor battery). The capacitors for correction of the power factor are large capacitors (containing from 1.4 kg to 20 kg PCB), which are usually located in proximity to large transformer substations (central compensation) and at the consumers (local compensation).

The capacitors containing PCB are marked as containing "Askarel" or bear other trade names. Practically all oil capacitors produced between 1930 and 1988 contain PCB.

Image 3: Decommissioned PCB capacitors operated in Bulgaria

A considerable portion of the data about the capacitors is shown on the manufacturer signs attached thereto.

Image 4: Manufacturer sign of a German PCB capacitor (city substation) operated in Bulgaria

Image 5: Manufacturer sign of Russian capacitors, containing PCB, operated in Bulgaria

The most widely operated in Bulgaria PCB capacitors are Russian and German, differing from each other by type and weight and trademark of the dielectric. They comprise 95.7 % of all inventoried capacitors containing PCB > 500 ppm (MoEW, 2007)

In 2007 an inventory was made of a total of 20 767 pcs. of PCB capacitors with gross weight 984 494 kg. The largest number of the PCB capacitors used in Bulgaria originate in the countries of the former Socialist bloc (98.75 %, 20 507 pcs.): former USSR – 49.60 % (10 301 pcs.), followed by Eastern Germany – 46.09 % (9 571 pcs.), Romania – 2.23 % (463 pcs) and the Czech Republic – 0.83 % (172 pcs.). The percentage of the capacitors from France, Switzerland and Sweden is minimal – 1.25 % (260 pcs.). Almost the same is the percentage of the capacitors with respect to the gross weight of the equipment of the former Socialist bloc (98.84 %, 973 042 kg): former USSR – 48.96 % (482 016 kg), followed by Eastern Germany – 46.88 % (461 513 kg), Romania – 2.35 % (23 150 kg) and former Czech Republic – 0.65 % (6 363 kg). The weight of the capacitors from the Western European countries comprises only 1.16 % (114 52 kg), (fig.18 and fig.19).

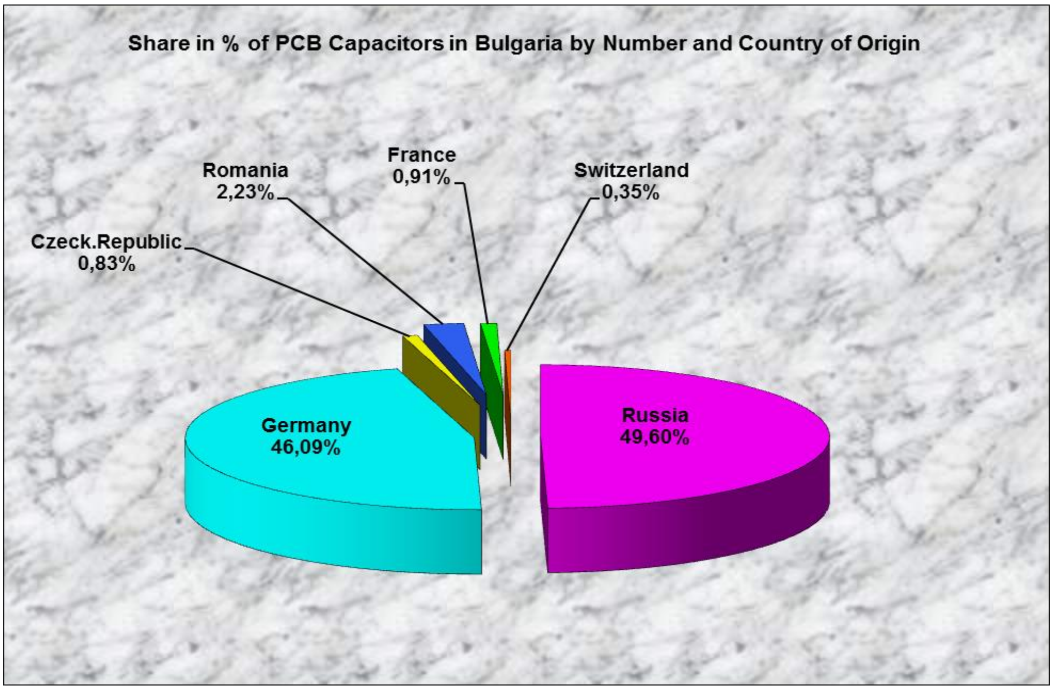

Figure 18: Percentage of the PCB capacitors operated in Bulgaria by number and country

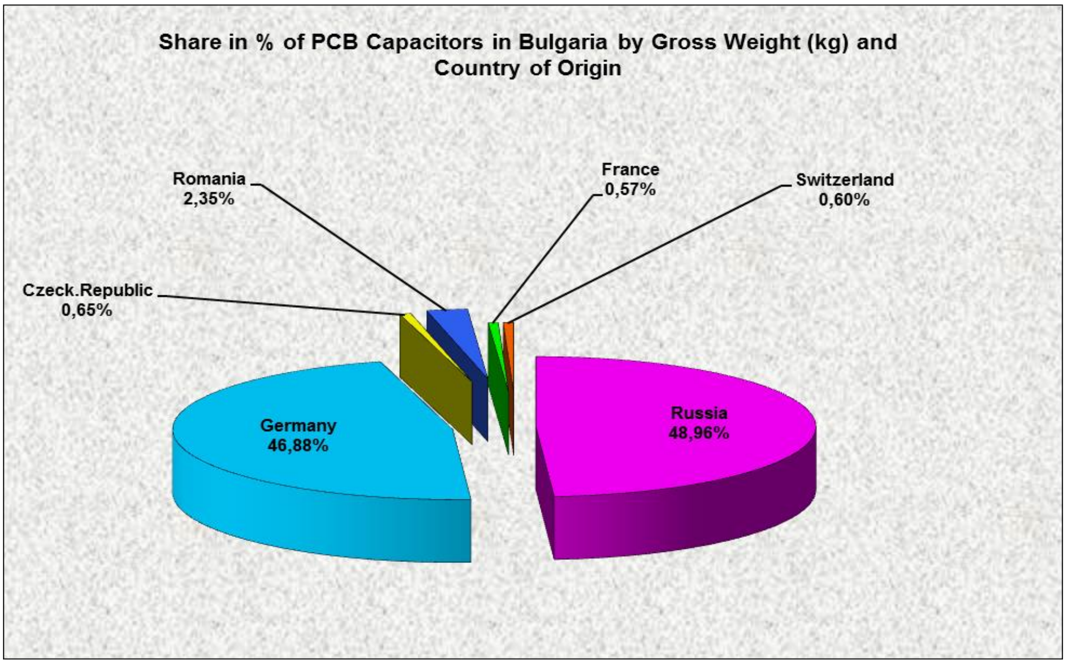

Figure 19: Percentage of the PCB capacitors operated in the Bulgaria by gross weight, kg and country

The Russian PCB capacitors used in Bulgaria, are mainly of the types ЭСВ, ЭСВК, ЭСВП, КС1, КС2, КСК1, КСК2, КСЭК, production of the Ust-Kamenogorsky and Serpuhovsky capacitor factories. The capacitors contain between 8 kg and 20 kg of PCB. According to the Russian specifications and standards, the letter 'C' in the Cyrillic alphabet means that they contain PCB.The trademark of the dielectric is TCB (mixed isomers of trichlorobiphenyl)[42].

Power PCB capacitors were produced in Eastern Germany from 1958 to 1987 by the following companies: VEB Isokond GmbH, Berlin – 1985 ÷ 1987.; OTTO JUNKER – 1958 -1983.; VEB RFT Kondensatoren- Electronicon GmbH, Gera – by 1986; Berliner Kond. Fabrik BAUGATZ Ludwig, Berlin – by 1983; Simens – by 1982. German capacitors have been identified as belonging to the types 4RH, 4RF3, 4300RST, BK, Co, HSE, LKC, LKCF, LKCI, LKF, LKCP, LKP, LKPF, LKI, LKO, LKPF, LKPH, LKPI, LKPS, LPXF, LPXC, LPXI, LPXL, LPOI, LPOR, Nvde 0560, RSFS, RFT, SPXI. The trademarks of the dielectrics are: Delor, Clophen A30 и A50, Orophen, Cp30, Cp40, Cp50, 3CD, 5CD, CP A 30 (Co, Simens), 3CD (HSE), Clophen (4RH, 4RF3, 4300RST, RSFS, Simens), Chlordiphenyl (RFT, Gera)[43] .

The Romanian capacitors are of the type CpdC and have been produced at the Krajova plant (Centrala Industriei Electronica), marked as containing chlorodiphenyl (CD).

In former Czechoslovakia PCB capacitors were produced at the capacitor plant ZEZ Zamberg, Prague from 1967 to 1985 (Holoubek, et.al. 2004), while PCB dielectrics were produced at the chemical plant Chemko, Strážske (Eastern Slovakia) from 1959 to 1984 under the trademark Delor (Holoubek, et.al. 1999). The Czechoslovakian capacitors identified in Bulgaria are of the types CCKA, CCAJ, CPAJK and PTAE.

In France and Sweden PCB capacitors were produced by 1982, and in Switzerland – by 1985.[44] The French capacitors in Bulgaria, containing Pyralene, are of the type Maxivar and Sivar, produced at the plant Alsthom Savoisienne, Levallois-Perret Cedex. The Swiss capacitors are of the type 3CP980, produced at the XAMAXAG plant, Zurich, and the Swedish capacitors are of the type CPH 2D6, produced at ASEA-Lepper (former DOMINIT), Brilon. The trademarks of the dielectric are respectively 3CP and CP.

❖ **SUMMARY CONCLUSIONS**

✓ **In Bulgaria PCB are mainly used as insulating/cooling and dielectric fluids in electrical equipment – transformers and capacitors;**

✓ **The transformers operated in the country and containing PCB are produced in the former USSR (59.2 %), France (29.3 %), the former GDR (5.7 %), Italy (3.8 %), England (1.3 %) and Poland (0.6 %);**

✓ **The Russian transformers are mainly of the types ТНЗ, ТНЗП, ТНП и ТНПУ, representing 71.23 % of the total gross weight of the equipment. The trademark of the transformer oil isSovtol-10. The transformers from Eastern Germany are filled up with-Clophen A50;**

✓ **34 % of all PCB transformers originate in Western Europe (France, Italy and England). They are filled up respectively with Pyralene, Apirolio и Pyroclor;**

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[42] PEN Magazine, PCBs Elimination Network – Sharing information on PCBs, Issue 01, 2010

[43] Kondensatoren-Verzeichnis zur Erkennung und Kennzeichnung betreffend PCB, Teil B Anhang „Liste der Kondensatoren mit PCB-Status“, Juli 2004; Identification of PCB-containing capacitors, New Zealand Environment and Conservation Council (ANZECC), 1997; UK Guidance: Collection and Disposal of Equipment containing PCBs, Scottish Executive Environment Group, 2002.

[44] (Kondensatoren-Verzeichnis zur Erkennung und Kennzeichnung betreffend PCB, Teil B Anhang „Liste der Kondensatoren mit PCB-Status“, Juli 2004).

- ✓ **The largest number of PCB capacitors (98.75 %) originate in the countries of the former Socialist bloc (USSR, GDR, Czechoslovakia and Romania).**
- ✓ **The number of capacitors from Western Europe (France, Switzerland and Sweden) is minimal – 1.25 %.**
- ✓ **The Russian PCB capacitors are mainly of the types ЭСВ, ЭСВК, ЭСВП, КС1, КС2, КСК1, КСК2, КСЭК. The trademark of the dielectric is TCB.**
- ✓ **German capacitors of the following main types LKC, LKF, LKP, LKI, LKO, LPX are used in the country. They are filled up with Clophen или Orophen.**
- ✓ **The Romanian capacitors are of the type CpdC, marked as containing chlorodiphenyl (CD).**
- ✓ **The identified Czechoslovakian capacitors are of the types CCKA, CCAJ, CPAJK and PTAE. The trademark of the dielectric is Delor;**
- ✓ **The French capacitors are filled up with Pyralene, type Maxivar and Sivar. The Swiss capacitors are of the type 3CP980, and the Swedish capacitors - CPH 2D6. The trademarks of the dielectric are respectively 3CP and CP.**

3.2.1.6.6. Inventories of PCB electrical equipment, 2007 - 2011.

In 2007 an electronical database was established on regional (RIEW) and national level (MoEW) of the PCB equipment in the country which was updated annually and in 2011 –monthly. The results according to the last update of the PCB database as at December 31, 2011 may be summarized, as follows:

1 042 companies in total from different sectors of the economy made an inventory of their electrical equipment (transformers, capacitors and other high voltage equipment and/or redundant transformer oil kept in stock). Owners of PCB equipment as at 31.12.2011 are 205 companies, comprising 19.7 % of the total number of companies. Actually their number is smaller because it includes state enterprises for power production and distribution, water supply, irrigation systems, BDZ and TPP together with their regional branches considered as independent companies and numbering 67 in total.

The total inventory equipment is 69 591 pcs., of which 45 513 pcs. were identified as not containing PCB. As at 01.01.2007 a total of 24 078 pcs. transformers, capacitors, rheostates, passage insulators and barrels with redundant transformer oil containing PCB, comprising 34.6 % of the total number of inventoried equipment.

Owners of PCB transformers are 16 companies that possess 162 transformers, containing PCB, with gross weight 805 230 kg. It was subsequently established by analysis that 5 transformers[45] with gross weight of 15 560 kg, property of 2 companies contain < 3 mg/kg PCB and may remain in operation. Accordingly, the identified transformers with volume of above 5 dm^3 and concentration of PCB > 500 mg/kg are 157 with gross weight 789 670 kg, of which 111 pcs. in operation, 38 pcs. – decommissioned and 8 pcs. – redundant and kept in stock.

[45] Protocol No. 518/17.05.2010 and Protocol No. 673/23.09.2008 issued by the Laboratory and Analytical Activity Directorate, Executive Agency Environment

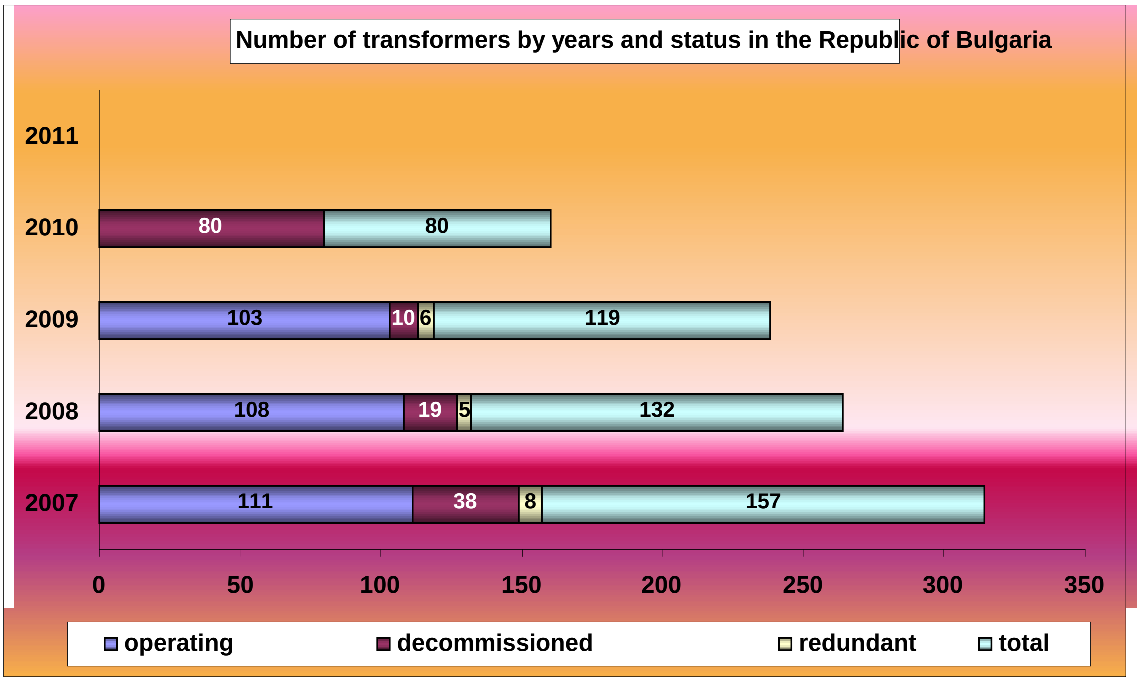

Figure 20: Number and status of the PCB transformers by years 2007 – 2011 in Bulgaria

By the deadline for decommissioning and disposal (31.12.2010) there are 80 pcs. available in the country and decommissioned PCB transformers which have been prepared for definitive disposal outside the territory of Bulgaria. (figures 20 and 21), owned by 3 private companies of the metallurgy and chemical industry sectors. By 31.12.2011 all transformers containing PCB have been exported and disposed outside the territory of the Bulgaria.

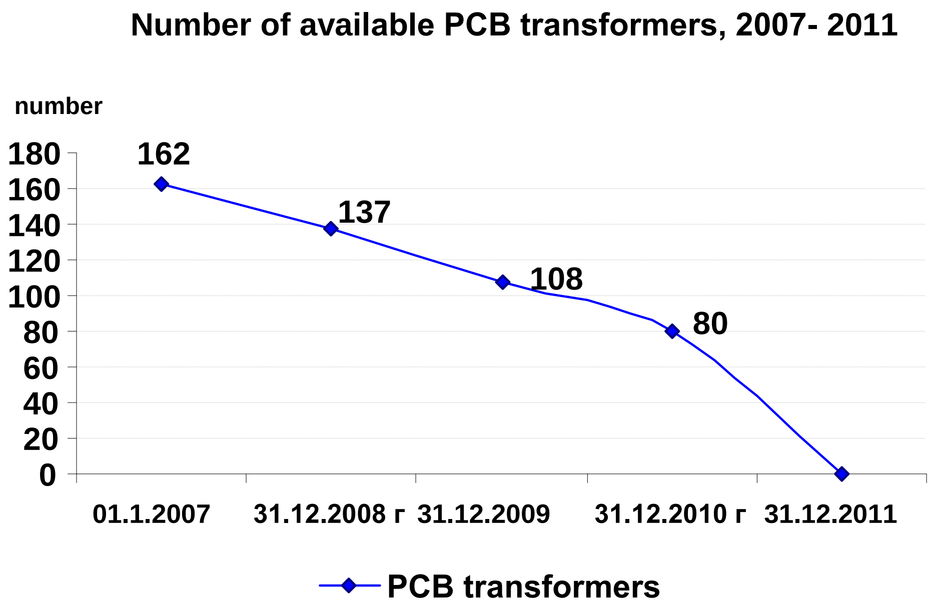

Figure 21: Number of available PCB transformers, 2007 – 2011

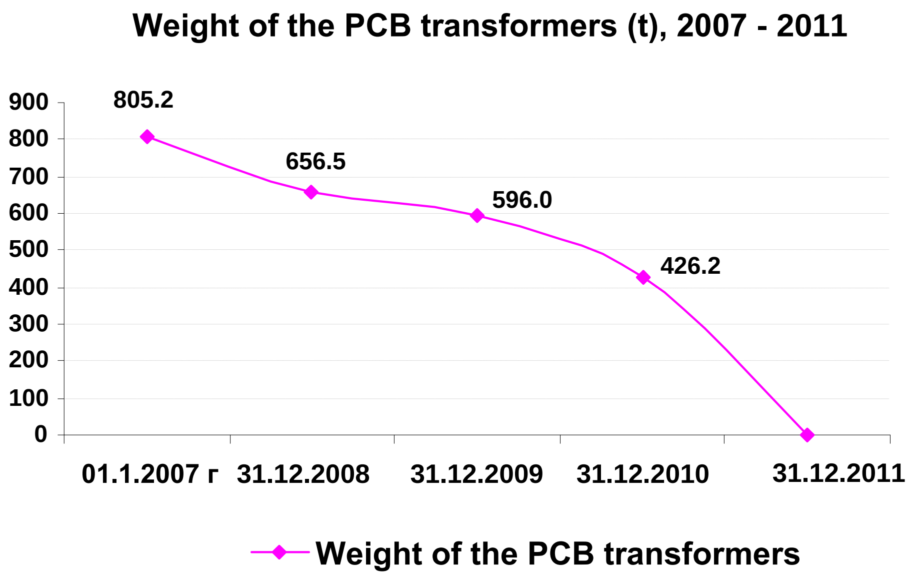

Figure 22: Weight of the PCB transformers (тона), 2007 – 2011

Owners of the PCB capacitors are 197 companies, owning 23 888 capacitors with gross weight 1 156 661 kg, of which 12 344 pcs. – in use, 8021 pcs. – decommissioned and 3 533 pcs. – redundant and kept in stock by the end of 2007 (fig.23).

2 178 capacitors were identified as not containing and/or containing less than 500 mg/kg PCB. For 1 587 pcs. it was confirmed by the manufacturer that they do not contain PCB, and for another 591 capacitors it was proved by analysis [46,47], that they either do not contain PCB or contain less than 500 mg/kg PCB. Accordingly, it is assumed that by the end of 2007 the PCB capacitors available in the country are 21 710 pcs.

During the annual updates of the inventory it was also found out that 2 848 pcs. capacitors are missing due to theft, illegal disposal or storage incompliant with the regulations. For these cases pre-trial proceedings have been instituted by the competent law enforcement authorities and prosecutor investigations are ongoing.

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[46] Protocol No. 2016/29.10.2008 issued by the Laboratory and Analytical Activity Directorate, Executive Agency Environment

[47] Protocol No. 1557/21.12.2010, Protocol No. 1600/07.05.2007, issued by the Laboratory and Analytical Activity Directorate, Executive Agency Environment; Protocol 639/20.12.2006 and Protocol № 561/08.12.2006, issued by the Central Laboratory for Energy Oils, NEK EAD.

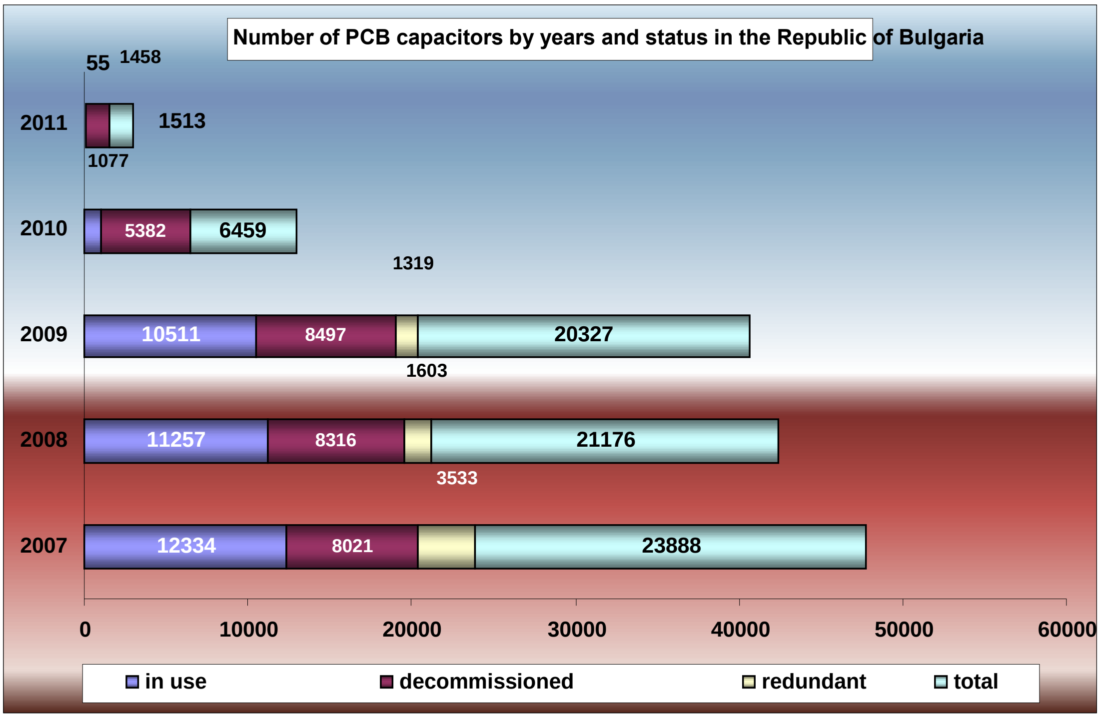


Figure 23: Number and status of the PCB capacitors by years 2007 - 2011 in Bulgaria

By 31.12.2010 there are 6 459 pcs. available PCB capacitors in the country (1 077 pcs. still operating and 5 382 pcs. decommissioned and dismantled), (fig. 24 and 25). 183 companies have dismantled and exported for disposal in Europe the PCB capacitors in their possession. Only 14 companies possess operating PCB capacitors, and have partially decommissioned and dismantled a part of them. These companies are mainly from the metallurgy (founding) and energy sector.

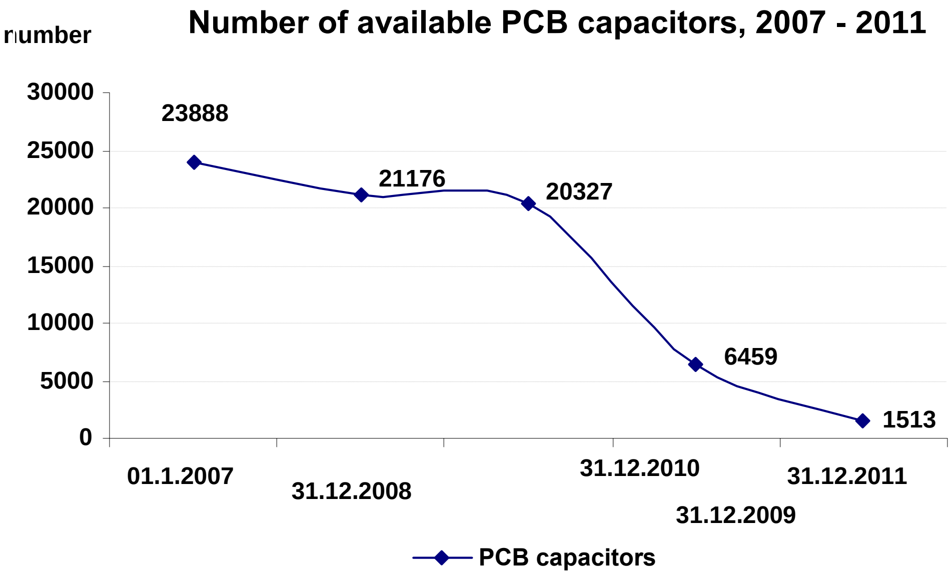


Figure 24: Number of available PCB capacitors, 2007 – 2011

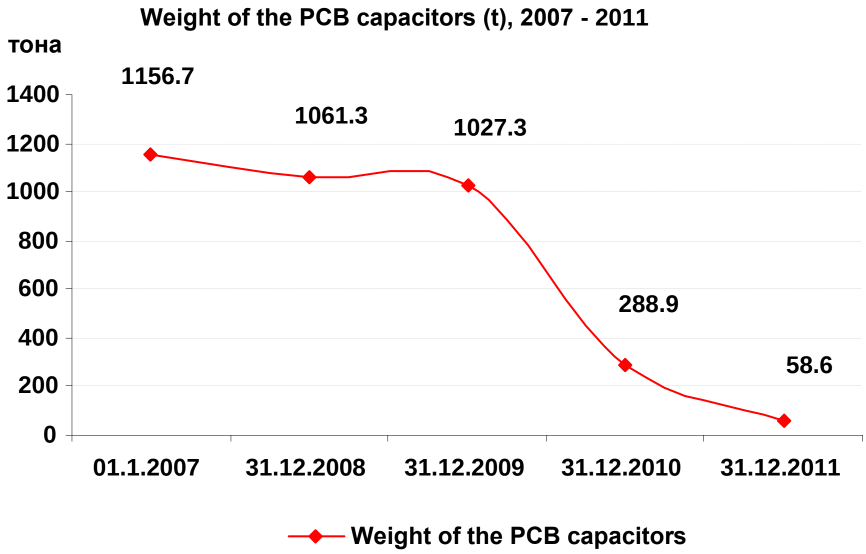


Figure 25: Weight of the PCB transformers (tons), 2007– 2011

By 31.12.2011 there were 1 513 pcs. available PCB capacitors in the country (fig. 24), however a small part of the capacitors (55 pcs.) are still operating due to the declared insolvency of the two companies - owners and lack of funds. Compared to 2010 the number of capacitors has considerably decreased by 76.6 %.

The percentage of decrease of the available PCB capacitors as at 31.12.2011 is 97 % as compared to the availability in 2007. 96.4 % of the available 1 513 pcs. have been decommissioned and prepared for definitive disposal outside the territory of Bulgaria, and 0.6 % have not been dismantled.

By 01.01.2007 two companies have declared the availability of 19 barrels with redundant transformer oil containing PCB for filling up. 6 800 kg Sovtol-10 and 120 kg Clophen A50 were identified.

The owners of other equipment (rheostats and passage insulators) are 4 companies, possessing 9 pcs. of other equipment, containing PCB, with gross weight 15 370 kg, which was subsequently cleaned and the refuse dielectric fluids- disposed.

By 31.1.2010 a total of 192 companies have fulfilled their obligations for decommissioning and/or disposal of the PCB equipment in their possession, while as at 31.12.2011 they were already 202, comprising respectively 94 % and 99 % of all 205 company-owners. Of them 117 (61 %) by 31.12.2010 and 192 (96 %) by 31.12.2011 have disposed their PCB equipment outside the country.

❖ SUMMARY CONCLUSIONS

✓ **During the period July 2006 – July 2007 in Bulgaria under the methodological guidance of RIEW detailed inventory was made of electrical equipment with volume 5 dm3, containing PCB above 0.005 weight % PCB (50 mg/kg) countrywide and marked with unique inventory numbers.**

✓ **In 2007 an electronical database was created for the inventoried PCB equipment at RIEW and MoEW level which has been updated on an annual basis.**

✓ **Owners of PCB equipment (transformers and capacitors) are 205 companies of different sectors of the economy.**

✓ **By 01.01.2007 in Bulgaria a total of 24 078 pcs. of PCB equipment (transformers, capacitors and other) was inventoried.**

- ✓ **Owners of PCB transformers are 16 companies, possessing 162 transformers with gross weight 805 230 kg. 5 transformers (15 560 kg) were identified as not containing PCB. The transformers actually containing PCB in the country are 157 pcs (789 670 kg). By 31.12.2011 all PCB transformers were exported and disposed outside the territory of Bulgaria.**
- ✓ **Owners of PCB capacitors are 197 companies, possessing 23 888 capacitors with gross weigth 1 156 661 kg, comprising 99.2 % of the total number of PCB equipment. For 2 178 capacitors it was established based on manufacturer's data or through analysis that they do not contain or contain less than 500 mg/kg PCB and may remain in use. Therefore, it is assumed that the PCB capacitors available in the country by 01.01.2007 are 21 710 pcs. The available PCB capacitors as at 31.12.2011 were 1 513 pcs. (58 558 kg), of which 96.4 % have been dismantled and prepared for definitive disposal. A considerable decrease of PCB capacitors has been reported of 97 % as compared to 2007. Only 55 pcs. capacitors have not been dismantled due to the declared insolvency of their owners. During the annual updates of the inventory 2 848 capacitors were established as missing due to thefts, illegal disposal or storage incompliant with the regulations.**
- ✓ **By the deadline 31.1.2010 a total of 192 companies have fulfilled their obligations for decommissioning and/or disposal of the PCB equipment, while as at 31.12.2011 they were already 202, comprising respectively 94 % and 99 % of all 205 company-owners. Of them 117 companies (61 %) by 31.12.2010 and 192 companies (96 %) by 31.12.2011 have disposed their PCB equipment outside the country.**

3.2.1.6.7. Export of equipment and waste contaminated or containing PCB

The waste containing or contaminated with PCB have been exported to Europe for defininive disposal through operation D10 (incineration on land), due to the lack of an appropriate incineration facility in Bulgaria.

3.2.1.6.7.1. Export of dismantled equipment and waste containing PCB by years

For the period 2007 - 2011 a total of 19 353 pcs. of PCB-containing equipment (transformers, capacitors and other equipment) with real weight 1 543 tons have been exported for definitive disposal outside Bulgaria. The PCB equipment was disposed in licensed incinerators in Germany, the Netherlands, Italy, France and Belgium. By 31.12.2011 a total of 157 PCB transformers were exported and disposed in Europe (real weight 590.5 tons) and 19 177 pcs. PCB capacitors (real weight 940.8 tons). Another 19 barrels, containing 9. 1 tons redundant stock of PCB transformer oil and waste contaminated with PCB from the cleaning of other equipment (2.5 tons) have been exported for incineration over the period 2008– 2010, in total 11.6 tons PCB. The export was carried out by 4 licensed companies for treatment and management of hazardous waste (table No. 50 and fig.26, 27 and 28).

Table 50: Export of equipment and waste containing PCB, for disposal outside the territory of Bulgaria for the perioda 2007 – 2011.

Type of waste	Year of export	Number	Actual exported weight, kg	Export to EU MS
Waste: PCB transformers– decommissioned	2007	24	139 410	the Netherlands, Germany
	2008	1	1 220	the Netherlands
	2009	14	16 586	the Netherlands
	2010	25	116 615	Belgium, the Netherlands, Germany
	2011	93	316 718	Italy, the Netherlands, France, Germany
Total PCB transformers	**2007- 2011**	**157**	**590 549**	
Waste: PCB capacitors – decommissioned	2007	60	2 865	the Netherlands
	2008	2 275	87 954	the Netherlands
	2009	774	32 415	the Netherlands

Type of waste	Year of export	Number	Actual exported weight, kg	Export to EU MS
	2010	4 159	165 387	Belgium, the Netherlands
	2011	11 909	652 132	Italy, the Netherlands, France, Germany
Total PCB capacitors	**2007- 2011**	**19 177**	**940 753**	
TOTAL PCB EQUIPMENT	**2007- 2011**	**19 334**	**1 531 302**	
Waste - PCB transformer oils (Sovtol-10, Clophen A50)	2008	17	8 980	the Netherlands
	2010	2	120	Italy
Total PCB waste oils (barrels)	**2007- 2011**	**19**	**9 100**	
Waste – PCB dielectric fluids of cleaning of other equipment	2009	-	2 500	the Netherlands
TOTAL PCB waste			**11 600**	
Total PCB equipment and waste	**2007- 2011**	**19 353**	**1 542 902**	

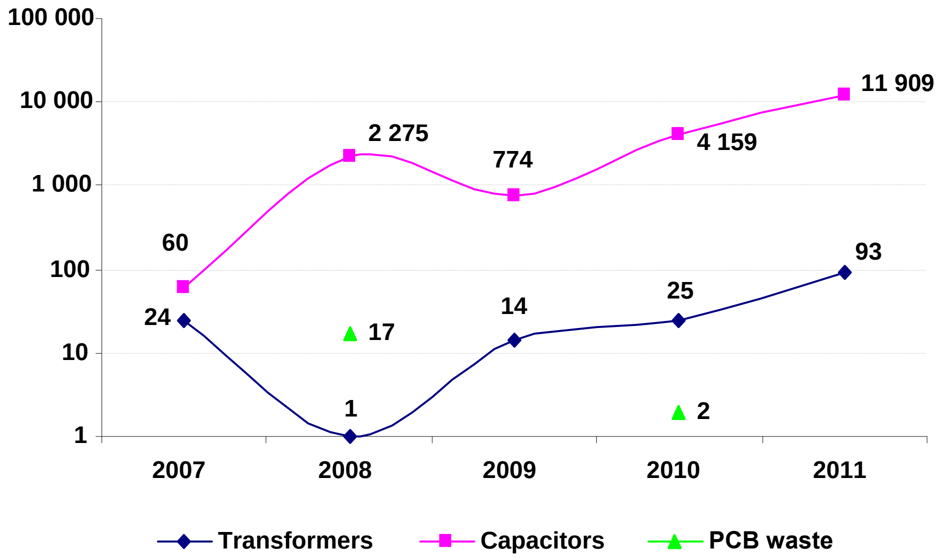


Figure 26: Number of exported transformers, capacitors and waste containing PCB, outside the country for definitive disposal, 2007– 2011.

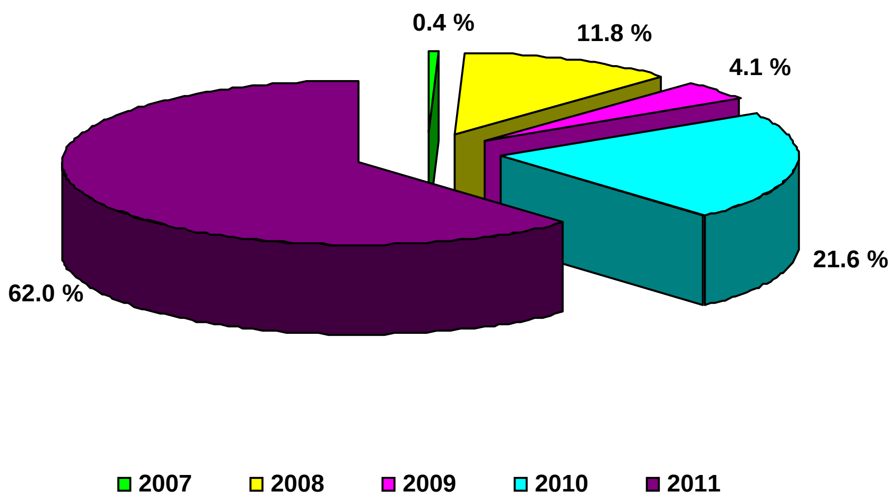


Figure 27: % share of the exported PCB equipment (number) from Bulgaria for disposal, 2007 – 2011

The approaching of the deadline intensifies the export of PCB equipment outside the territory of Bulgaria. In 2010 and 2011 81.6 % was exported of the total number of exported PCB equipment. The largest number of transformers and capacitors (62 %) was exported in 2011. It is logical due to the fact that the operation of PCB equipment was allowed until 31.12.2010. Almost the same is the percentage of the actually exported weight of the PCB equipment during 2010 and 2011 (81.1 %) and in 2011 (62.8 %) against the total exported quantity of PCB equipment for the whole period 2007. – 2011.

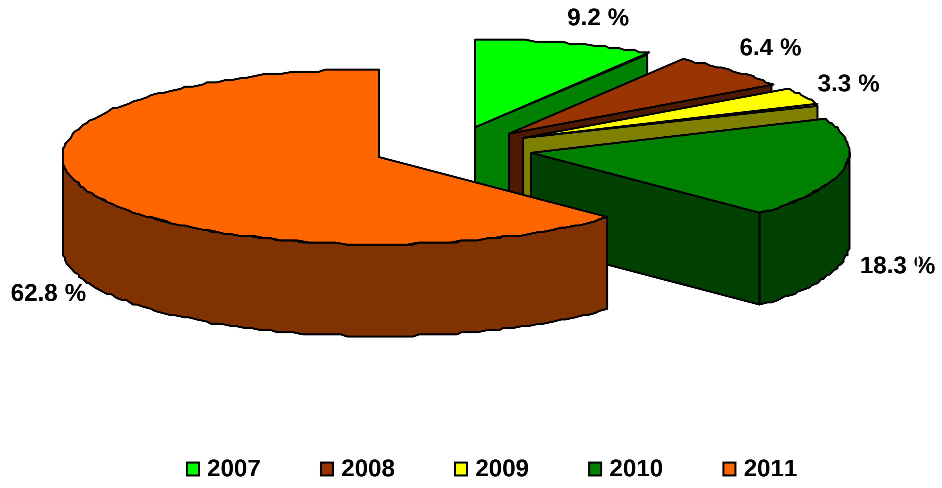


Figure 28: Percentage of the actually exported weight (kg) of PCB equipment and waste, 2007 – 2011

The number of exported PCB transformers comprises hardly 0.8 % (157 pcs.) of the total exported equipment while by actually exported weight the PCB transformers occupy a considerably larger share – 38.3 % (590.5 tons), in view of the bigger unit gross weight of the transformers reaching up to 10 t. Most PCB transformers (93 pcs.) were exported in 2011, while for the period 2007– 2010 64 PCB transformers were exported. Almost the same is the percentage of the actually exported weight of the PCB transformers in 2011 (53.6 %, 316.7 tons) against that in 2007 – 2010 (46.4 %, 273.8 tons).

The largest number of PCB capacitors (16 068 pcs., 817.5 tons) has been again exported within the period 2010 – 2011, representing 83.8 % of the total number and 86.9 % of the total weight for the whole period 2007– 2011. Over one half of the capacitors were exported and disposed in 2011 (62.1 % of the total number and 69.3 % of the total exported quantity of PCB capacitors).

The data analysis has shown that in 2011 the 591 capacitors containing between 50 mg/kg и 500 mg/kg PCB, which could remain in operation until the end of their lifetime.

Another positive fact is the export of PCB capacitors, property of 3 new companies which have identified them and delivered at their own initiative to a licensed export company in 2011 г.

3.2.1.6.7.2. Export of PCB equipment for disposal outside the territory of Bulgaria by countries for the period 2007 – 2011 .

The decommissioned PCB equipment (transformers, capacitors and waste) was exported for disposal in Belgium, Germany, France, Italy and the Netherlands over the period 2007 – 2011.

The largest number of PCB was exported to Italy only in 2011 (89 pcs), followed by the Netherlands (58 pcs), mainly before 2010, representing respectively 56.7 % (304 tons) and 36.9 %

(243.8 tons) of the total number of exported PCB transformers (157 pcs.), (table No. 51 and fig.29, 30 and 31). **Table 51: Export of PCB equipment and waste by countries and years, 2007 – 2011.**

Importer country	Export of PCB transformers, pcs.	Actual weight of the exported PCB transformers, (tons)	Export of PCB capacitors, pcs.	Actual weight of the exported PCB capacitors, (tons)	PCB waste, pcs.	Actual weight of PCB waste (tons)
Netherlands	58	243.8	12 276	636.4	19	11.6
Italy	89	304.0	4 056	169.4		
France	2	11.0	2 269	106.7		
Germany	8	31.7	230	9.1		
Belgium			346	19.2		
Total	**157**	**590.5**	**19 177**	**940.8**	**19**	**11.6**

However, the situation with PCB capacitors doesn't stay so. The largest number of PCB capacitors was exported and disposed in the Netherlands (12 276 pcs), followed by Italy (4 056 pcs.) and France (2 269 pcs.), representing respectively съответно 64.0 % (636.4 tons), 21.2 % (169.4 tons) and 11.8 % (106.7 tons) of the total amount of capacitors exported and disposed outside the country (19 177 pcs.) (table No. 51).

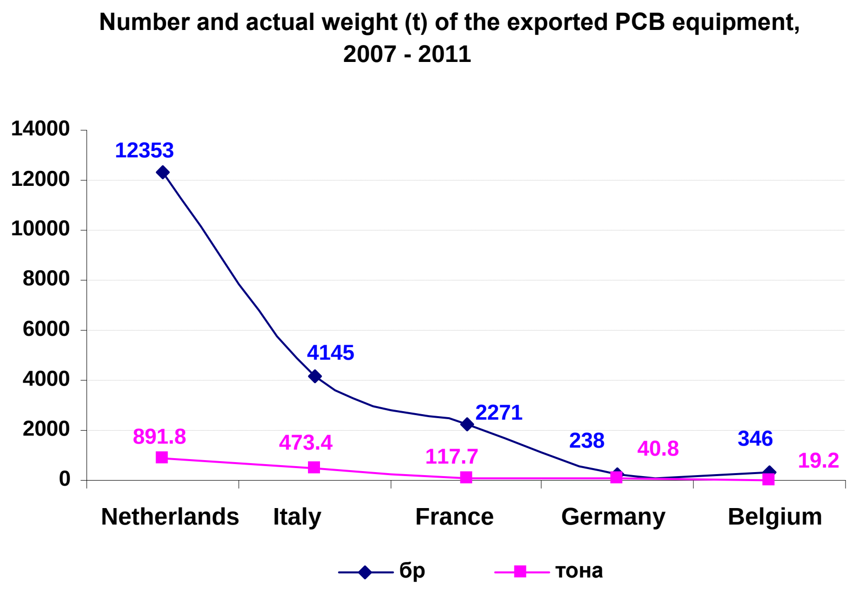


Figure 29: Total number and actual weight of the exported PCB equipment by countries, 2007 – 2011

Waste containing PCB was disposed in the Netherlands (11.6 tons), mainly PCB transformer oil and refuse dielectric from cleaining of equipment. (Table No. 51).

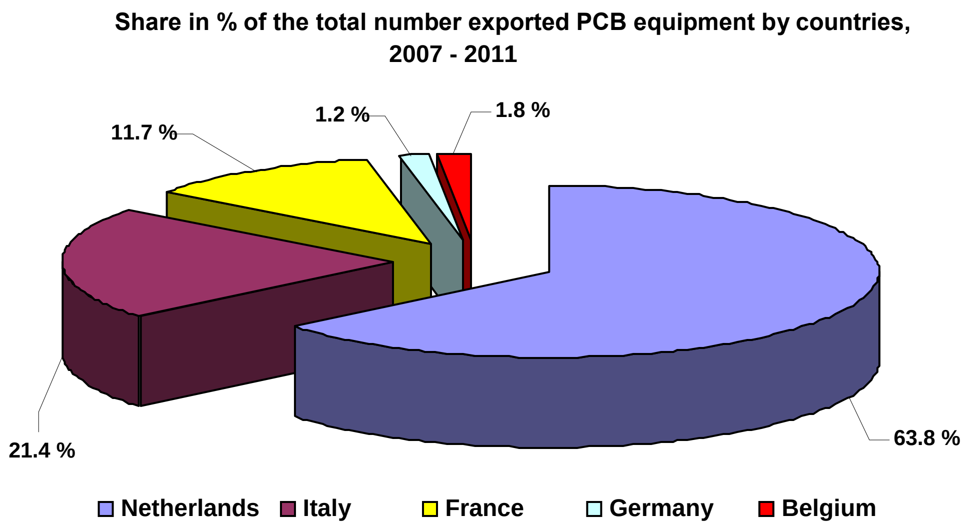


Figure 30: Percentage of the total number exported PCB equipment by countries, 2007 – 2011

The distribution as percentage of the total disposed PCB equipment and waste by countries is, as follows: the Netherlands (63.8 % by number and 57.8 % by actual weight), followed by Italy (21.4 % by number and 30.7.8 % by actual weight), France (11.7 % by number and 7.6 % by actual weight), and Germany and Belgium (3.0 % by number and 2.8 % by actual weight) (fig.30 and 31).

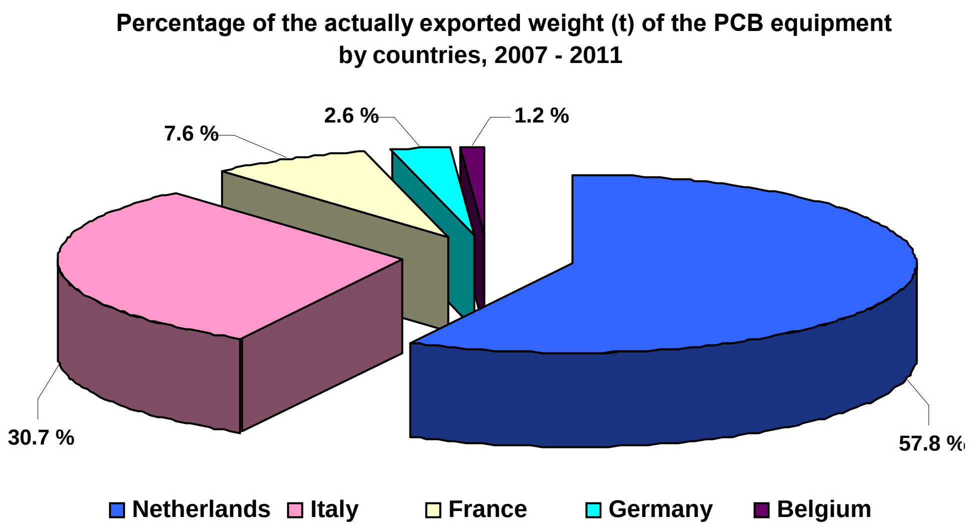


Figure 31: Percentage of the actually exported weight of PCB equipment (t) by countries, 2007– 2011

By 31.12.2011 all available PCB transformers were exported and disposed outside the country. During 2012 the remaining minimum quantity of PCB capacitors (6.3 %) will be exported and disposed in Europe, and thus Bulgaria will finally fulfill its obligations for disposal of the available PCB equipment.

❖ SUMMARY CONCLUSIONS

✓ **During the period July 2007 – 2011 in Bulgaria out of total 19 353 pcs. PCB-containing equipment (transformers and capacitors) and waste with actual weight 1 542.9 tons were exported for definitive disposal outside Bulgaria. The dismantled PCB equipment was disposed at licensed facilities in Germany, the Netherlands, Italy, France and Belgium.**

- ✓ **The export was made by 4 licensed companies for treatment and management of hazardous waste. Definitively disposed outside the territory of Bulgaria were 157 PCB transformers (590.5 t) and 19 177 PCB capacitors (940.8 t). Another 19 barrels containing 9.1 tons of redundant kept in stock PCB transformer oil and waste of cleaning of other PCB equipment contaminated with PCB (2.5 tons) were exported for incineration in the Netherlands over the period 2008– 2010, a total of 11.6 tons PCB.**
- ✓ **Most of the transformers (75.2 %, 118 pcs.) and capacitors (83.8 %, 16 068 pcs.), containing PCB were exported for disposal outside the territory of Bulgaria over the period 2010 – 2011.**
- ✓ **The number of exported and disposed PCB transformers constitutes hardly 0.8 % (157 pcs.) of the total exported equipment 19 353 pcs., due to the bigger unit gross weight of the transformers while the by actually exported weight the PCB transformers comprise a rather larger percentage– 38.3 % (590.5 tons) of totally 1542.9 tons.**
- ✓ **The most PCB equipment (12 353 pcs., 63.8 %) has been disposed in the Netherlands, followed by Italy (4 145 pcs., 21.5 %) and France (2 271 pcs. 11.7 %). Approximately 3 % of PCB equipment (584 pcs.) was disposed in Germany and Belgium.**

3.2.1.7. Monitoring of PCB in the environment and food

The competent authority for monitoring of PCB in the atmospheric air, surface and underground waters is the MoEW through the EEA. The monitoring of live animals and foods of plant and animal origin and fodder is carried out by BSFA with the MoAF .

3.2.1.7.1. Limit values for PCB concentration in waters, soils, waste and foods of animal origin

The limit values for PCB concentration (LV) in the components of the environment, waste and products are shown in table No. 52.

Table 52: Limit values for concentrations in environment, waste and products

<table>
<tr><th>Component of the environment or a product</th><th>National legislation</th><th>Annex to the regulation</th><th>Limit values for concentrations</th></tr>
<tr><td colspan="4">SURFACE WATERS</td></tr>
<tr><td>Surface waters</td><td>Ordinance No. 7 of 8.08.1986 on running surface water quality standards and norms, promulgated SG No. 96 of 12.12.1986</td><td>Annex No. 1:
Standards and norms for determination of the limit pollution rates (LV) of the different categories of running surface waters</td><td>MAC for (PCB9 total) = 1 μg/L
PCB9- (PCB 28; PCB 52; PCB 101; PCB 105; PCB 118; PCB 138; PCB 153; PCB 156; PCB 180);</td></tr>
<tr><td colspan="4">UNDERGROUND WATERS</td></tr>
<tr><td>Underground waters</td><td>Ordinance No. 1 of 10.10.2007 on research, use and preservation of underground waters, promulgated SG No.87/30.10.2007, amended and supplemented, No. 2/ 8.01.2010,</td><td>Annex 2: Pollution threshold (PT) by 2007
No underground water quality standards for persistent organochlorine compounds (PCB)</td><td>PT for (PCB) = 1 μg/L (до 2007 г.)
Total of 7PCB (PCB 28; PCB 52; PCB 101; PCB118, PCB 138; PCB 153, PCB 180).</td></tr>
<tr><td colspan="4">WASTEWATERS</td></tr>
<tr><td>Sediments of wastewater treatment</td><td>Ordinance on the order and methods for use of sediments of the cleaning of wastewaters in the agriculture, promulgated SG No. 112/23.12.2004, amended and supplemented No. 29/8.04.2011.</td><td>Annex 2: Limit values of POPs in sediments intended for use in the agriculture</td><td>LV for (PCB) = 1 mg/kg dry compound
PCB6 - (PCB 28; PCB 52; PCB 101; PCB 138; PCB 153, PCB 180)</td></tr>
<tr><td>Wastewaters of certain industry sectors discharged to water bodies</td><td>Ordinance No. 6 of 9.11.2000 on emission limit values of the content of harmful and hazardous compounds in wastewaters, promulgated SG No. 97/ 28.11.2000, amended and supplemented No.24/23.03.2004</td><td>Annex № 5:
Emission standards (ES) for wastewaters of certain industry sectors discharged to water bodies (Production of chemical products)
AOH (absorbable organic hallogens)</td><td>1. Chlorine-alkali production with non-asbestos diaphragm:
Emission standards for AOH= 0,5 mg/ dm^3;
2. Production of pharmaceutical products and medicines:
Emission standards for AOH= 1,0 mg/ dm^3;
3. Production of synthetic dyes
Emission standards for AOH= 1,0 mg/ dm^3;
4. Production of pesticides :
Emission standards for AOH= 1,0 mg/ dm^3;
5. Production of textile and knitwear:
Emission standards for AOH= 8,0 mg/ dm^3;</td></tr>
<tr><td colspan="4">SOILS</td></tr>
<tr><td>Soils [mg/kg dry soil]</td><td>Ordinance No. 3 of 1.08.2008 on the limit values for hazardous substances in soils, promulgated SG No. 71/12.08.2008</td><td>Appendix No. 2: Limits for precautionary concentrations (PC), maximum allowable concentrations (MAC) and intervening concentrations (IC) for PCB in mg/kg dry soil</td><td>
<table>
<tr><th>PCB, mg/kg</th><th>SPS (sanitary and phytosanitary measures)</th><th>PC*</th><th>MAC*</th><th>IC*</th></tr>
<tr><td>PCB6(total)</td><td>0,005</td><td>0,02</td><td>0,2</td><td>1</td></tr>
<tr><td>PCB-28</td><td>0,001</td><td>0,001</td><td>0,01</td><td></td></tr>
<tr><td>PCB-52</td><td>0,001</td><td>0,001</td><td>0,01</td><td>-</td></tr>
<tr><td>PCB-101</td><td>0,001</td><td>0,004</td><td>0,01</td><td>-</td></tr>
<tr><td>PCB-138</td><td>0,001</td><td>0,004</td><td>0,04</td><td>-</td></tr>
<tr><td>PCB-153</td><td>0,001</td><td>0,004</td><td>0,04</td><td>-</td></tr>
<tr><td>PCB-180</td><td>0,000</td><td>0,004</td><td>0,04</td><td>-</td></tr>
</table>
*Limits for PC, MAC and IC for POPs in soils (determined as total content in mg/kg dry soil).
PC for (PCB) = 0.02 mg/kg dry substance</td></tr>
<tr><td>Soils in industrial</td><td>Ordinance No. 3 of</td><td>Appendix No. 2: Limits for</td><td>MAC for (PCB) = 0.2 mg/kg dry substance</td></tr>
</table>

Component of the environment or a product	National legislation	Annex to the regulation	Limit values for concentrations
traffic areas [mg/kg DM]	1.08.2008 on the limit values for hazardous substances in soils, promulgated SG No. 71/12.08.2008	precautionary concentrations (PC), maximum allowable concentrations (MAC) and intervening concentrations (IC) for PCB in mg/kg dry soil	
WASTE			
Waste - landfills	Ordinance No. 8 of 24.08.2004 on the conditions and requirements for construction and operation of landfills and other facilities for use and disposal of waste, promulgated SG No. 83/24.09.2004, amended and supplemented No.27/1.04.2011	Table 3: Limit values (LV) for total content of organic substances for waste accepted at inert waste landfills	LV for PCB7(total) = 1 mg/kg
Waste	Regulation 850/2004/EC on POPs	Annex IV: MAC for PCB in waste	MAC for PCB = 50 mg/kg
Annually released quantities of POPs pollutants by industrial facilities into the air, water and soil	Regulation (EC)166/2006 of the European Parliament and of the Council concerning the establishment of a European Pollutant Release and Transfer Register	Annex II Threshold limit values (TLV) for release of PCB into the air, water and soil	PCB TLV in the air: 0.1 kg/year TLV in the water: 0.1 kg/year TLV in the soil: 0.1 kg/year
FOODS			
Foods	Ordinance No. 119 of 21.12.2006 on control over certain substances and their residues in live animals, raw materials and foods of animal origin intended for human use, promulgated SG No. 6/ 19.01.2007, effective of 19.01.2007	Group B – Veterinary-medical products and pollutants of the environment: 3a) organic chlorine compounds, including PCB;	B 3a: Maximum residue levels (MRLs) for PCB – beef, sheep, goat, pork, horse meat- 200 µg/kg fat; – poultry meat - 200 µg/kg fat; – fish and aquacultures - 200 µg/kg fat; – milk - 200 µg/L milk; – eggs - no; – rabbit meat, meat of game and wild animals bred in voliers and farms for wild animals- 200 µg/kg fat; – bee honey – no;
SANCTIONS FOR ENVIRONMENTAL POLLUTION			
Imposition of sanctions for environmental pollution above MAC	Ordinance on the type, amount and procedure for imposing sanctions for environmental damage or pollution above the limit values and/or for non-compliance with the set emission standards and restrictions, SG No..70/ 09.09.2011, effective of 10.11.2011	Imposition of sanctions for environmental damage or pollution above the limit values	Annex No. 1:Pollutants and indicators and single amounts of the sanctions for pollution of surface waters and water bodies. Annex No. 4: Types of pollutants and damages of the soil and single amounts of the sanctions: 2.Polychlorinated biphenyls (PCB) –BGN 40.80 /m^2

3.2.1.7.2. PCB monitoring in the environment

The PCB monitoring in the components of the environment (waters and soils) is carried out through the National Environmental Monitoring System (NEMS)

In the EU countries the following reference methods have been implemented: BSS EN 12 766-1, BSS EN 12 766-2, BSS EN 61619 for determination of the PCB concentration in the working fluid. These methods have been implemented into the Bulgarian legislation by the Ordinance on the requirements for the procedure and method for inventory of equipment containing polychlorinated byphenyls, marking and cleaning thereof, and of the treatment and transportation of waste containing polychlorinated byphenyls.

For analysis of PCB in the environment the following reference methods are used: BSS EN ISO 6468:2006 for water quality and BSS ISO 10382:2005 for soil quality.

There is 1 laboratory in Bulgaria accredited for the determination of PCB content in oils (working fluids) and 7 laboratories for determination of PCB content in waters and soils.

3.2.1.7.2.1. PCB monitoring in soils

The evaluation of the conditions of soils is carried out within the National Soil Monitoring System based on a network of 16x16 km, wherein surveys are made at 397 points through observations of 6 PCB congeners- PCB 28, PCB 52, PCB 101, PCB 138, PCB 153 and PCB 180. The periodicity of monitoring is 5 years. The network was built in 2004 and has assumed as first basic year 2005, while in 2010 the next full monitoring cycle commenced. Furthermore, for the purpose of validation of generated data, the condition of soils at 1/4 of the total number of points is being monitored on annual basis.

Over the period 2000÷ 2010, under the soil monitoring programme over 900 soil samples have been taken, uniformly distributed countrywide which have been analyzed for PCB content. Over the period 2005 – 2010 the analyzed samples are, as follows: in 2005 – 48 samples; 2006 – 93 samples; 2007 – 91 samples; 2008 – 82 samples; 2009– 95 samples, and in 2010 - 113 samples, 522 samples in total. The sampling and analysis of soil samples was performed at accredited regional laboratories with the EEA.

The measured contents of polychlorinated byphenyls PCB6 (total) in soils, over the period 2005 - 2009 have been times lower than the maximum allowable concentrations (MAC = 0.2 mg/kg dry soil), and the indicative 6 PCB congeners for the period 2005 – 2008 have been considerably below the MAC for the individual PCB congeners, most of them below the limit of detection (LOD<0.0005 mg/kg). In 2009 the content of PCB-28 in 7 of the analyzed 95 samples exceeded MAC of 0.01 mg/kg, however PCB6 (total) was many times lower than MAC of 0.2 mg/kg (in over 92.6 % of the analyzed soil samples the content of PCB-28 was below the reference background values. The established concentrations for the remaining 5 PCB (52, 101, 138, 153 и 180) congeners are below the reference background values. In 2010 the PCB6 (total) was many times lower than MAC of 0.2 mg/kg, while in only one of the analyzed 113 samples of PCB-180, the content exceeds the limit concentration (LC) of 0,004 mg/kg, but is much lower than MAC (table No. 53).

Table 53: Number of analyzed samples and content of the indicative 6 PCB congeners and the PCB6 total in soils by years for 2005 – 2010 in Bulgaria

Year	No. of samples	Content of PCB6 (total) and the indicative 6 PCB congeners in soils, mg/g dry soil						
		PCB6 (total)	PCB-28	PCB-52	PCB-101	PCB-138	PCB-153	PCB-180
MAC, mg/kg		0,2	0,01	0,01	0,04	0,04	0,04	0,04
2005	48	48 << MAC	48 < MAC	48 < MAC	48 < MAC	48 < MAC	48 < MAC	48 < MAC
2006	93	93<< MAC	93 < MAC	93 < MAC	93 < MAC	93 < MAC	93 < MAC	93 < MAC
2007	91	91<< MAC	91 < MAC	91 < MAC	91 < MAC	91 < MAC	91 < MAC	91 < MAC
2008	82	82<< MAC	56 < LOD 26<< MAC	56 < LOD 26<< MAC	56 < LOD 26<< MAC	56 < LOD 26<< MAC	56 < LOD 26<< MAC	56 < LOD 26<< MAC
2009	95	95<< MAC	7.> MAC 88 < MAC	95 < MAC	95 < MAC	95 < MAC	95 < MAC	95 < MAC
2010	113	113<< MAC	113 < LOD	113 < LOD	113 < LOD	110 < LOD 3 < 113<< MAC	110 < LOD 3 < LC 113<< MAC	110 < LOD 3 >LC, 113<< MAC

The observations made under the wide-scale soil monitoring programme over the period 2005 - 2010 allow for the drawing the conclusion that the soils in the country are with a very good environmental status and there is no pollution of the soils with PCB6 (total) above MAC of 0.2 mg/kg.

Under the Regional International Project "Determination of trends in the ambient air POPs concentrations in Bulgaria using the polyurethane foam based passive air samplers (PAS_CEECs) – II-nd phase 2007"[48], with parallel determination of POPs in the athmospheric air at 6 points, samples of the soil under the filters at these points have been taken and analyzed. The results show PCB content in the soil samples, as follows: min 0.4 ng/g – max 1.0 ng/g, mean 0.7 ng/g, median 0.6 ng/g, (0.0006 mg/kg), which is considerably lower than the reference background values and many times lower than MAC = 0.2 mg/kg.

❖ **SUMMARY CONCLUSIONS**

✓ **The observations made under the wide-scale soil monitoring over the period 2005 -2010 show that there are no registered values of PCB (total) above MAC of 0.2 mg/kg in the soils. The reported values for the indicative 6 PCB congeners in their majority fall below the limit of detection (LOD).**

✓ **These conclusions are confirmed by the results obtained from the analyzed soil samples under the Regional International Project "** Determination of trends in the ambient air POPs concentrations in Bulgaria using the polyurethane foam based passive air samplers (PAS_CEECs) **– II-nd phase 2007 г [median PCB6 (total) = 0.0006 mg/kg .**

Source: EEA, NEMS, Monitoring of soils and lands, 2007 ÷2009

3.2.1.7.2.2. PCB Monitoring in groundwaters

The network for monitoring of the chemical status of undergrounds waters covers 238 control monitoring points, 120 operative monitoring points, while 58 of the above points are simultaneously subject to control and operative monitoring. The chemical status of underground waters includes sample collection and analysis of 9 PCB congeners - PCB 28, PCB 52, PCB 101, PCB 105, PCB 118, PCB 138, PCB 153, PCB 156, and PCB 180, sample collection is done once a year.

Over the period 2000 ÷ 2009 tested for PCB were 128 monitoring points for underground waters – once annually – 137 samples in total. Over the years the number of points varies, as follows: in 2000 – 5 points, in 2001 – 9 points, in 2006 – 90 points, in 2007– 14 points, in 2007 – 14 points, in 2008 – 19 points; and after that in 2009 and 2010 underground waters have not been tested for PCB.

❖ **SUMMARY CONCLUSIONS**

✓ **The underground waters are in excellent environmental status over the entire territory of the country as over the period 2000 ÷ 2008 there are no registered pollutions with PCB, and the measured contents of the 9 individual PCB congeners, when summed, are many times lower than the pollution threshold for underground waters - 1 µg/L, which refers to the sum of the 7 PCB (7PCB (PCB 28; PCB 52; PCB 101; PCB118, PCB 138; PCB 153, PCB 180). In 97 % of the analyzed samples the values are below the limit of detection. Therefore, no PCB monitoring in underground waters was carried out in 2009 and 2010.**

Source: EEA, NEMS, Underground water monitoring, 2000 ÷2010

[48] RECETOX_TOCOEN Reports № 339 and 341, Brno, Czech Republic, 2008

3.2.1.7.2.3. PCB monitoring in surface waters

Surface water monitoring is a part of the National Environmental Monitoring System (NEMS) and covers programmes for control and operative monitoring. The total number of points over the territory of the country is 533, including 275 points for control and 258 points for operative monitoring distributed in the four basin management areas covering all big rivers - Danube, Struma, Mesta, Iskar, Arda, lakes, dams and 20 stations at the Black Sea. A part of the national surface water monitoring system (111 points for rivers and dams) is included in the European network for surface water monitoring (EUROWATERNET).

The parameters subject of monitoring are divided into three main groups– basic physico-chemical parameters, 33 priority substances and various specific pollutants and their monitoring frequency is from 4 to 12 times annually. The specific pollutants include also 9 PCB congeners - PCB 28, PCB 52, PCB 101, PCB 105, PCB 118, PCB 138, PCB 153, PCB 156, PCB 180.

Over the period 2007÷ 2010 3132 samples of surface waters have been taken from different surface water bodies (rivers, lakes, channels, dams) and analyzed for content of 10 PCB congeners by the 6 accredited regional laboratories with the EEA. There are no registered pollutions of the surface waters with the individual 9 PCB congeners and the measured values (within limits 0.006 μg/L – 0.001 μg/L) are times lower than MAC for surface waters of 1.0 μg/L, over 99 % of the values being below the limit of detection. The data analysis of the PCB monitoring in surface waters shows that over the period 2007 ÷ 2010 in the country there is no registered pollution with the 9 PCB congeners of the surface waters above MAC of 1.0 μg/L .

❖ **SUMMARY CONCLUSIONS**

✓ **The surface waters in Bulgaria are with excellent environmental status as over the period 2007 ÷ 2010 there are no registered pollutions with the 9 PCB congeners and the measured contents of the individual 9 indicative PCB congeners are many times lower than the MAC for surface water quality of 1.0 μg/L and in 99 % of the analyzed samples the values are below the limits of detection.**

Source: EEA, NEMS, Surface water monitoring, 2007. ÷2010

3.2.1.7.3. PCB monitoring in foods

The control over live animals and products of animal origin intended for human use was exercised until 2010 by the National Veterinary Service (NVS) with the MoAF .

A monitoring programme for control of residues of veterinary-medical products and environmental pollutants in live animals and products of animal origin is a part of the National Programme for Monitoring of Pesticide Residues in and upon Foods of Plant and Animal Origin (National Residue Monitoring and Control Programme /NRMCP/ and also includes monitoring of PCB residues. NRMCP is drawn up in accordance with Directive 96/23/EO, implemented in the national legislation through Ordinance No. №119 (SG No.6/2007)

The Central Laboratory of Veterinary Control and Ecology (CLVCE), Sofia with the BSFA has been nominated as a National Reference Laboratory (NRL) for control of residues of veterinary-medical preparations and environmental pollutants in live animals and food products of animal origin, fodder and fodder additives.

The control over raw materials and products of plant origin during harvesting, of plants and plant products intended for fodder production and of foods of plant origin intended for human use does not include monitoring of PCB residues but only of residues of chlorine organic POPs pesticides. The reference methods for PCB analysis in foods of animal origin include the following standards: BSS EN 1528-1, 2, 3 and 4:2001 for foods containing fats.

3.2.1.7.3.1. Monitoring of foods of animal origin [49]

The residue and pollutant groups subject to control include PCB too. [group B (3) (a)]. The monitoring programme includes taking and analysis of samples of fresh meat of cattle, pigs, sheep, lambs, goats, kids and horses, of fowl (ducks and broilers); eggs (of hens and quails); of fish (carp, trout, sturgeon fish, ich); fresh cow and sheep milk, domesticated game (pheasants, domesticated rabbits), bee honey.

For the period 2007 – 2010 taken and analyzed were 1 951 samples for PCB residues in foods of animal origin, as follows: 2007 – 564 samples, 2008 – 503 samples, 2009– 460 samples, 2010 – 424 samples. During this period in Bulgaria presence of PCB residues above the maximum residue limit (MRL) has not been established or of illegal use of forbidden substances in the food products of animal origin both locally produced and imported from third countries.

❖ **SUMMARY CONCLUSIONS**

✓ **Results of monitoring of PCB residues in Bulgarian and imported food products of animal origin for 2007-2010 in Bulgaria do not show any presence of PCB residues above MRL in the food products of animal origin both produced in Bulgaria and imported from third countries.**

Source: BSFA (NVS), NRCMP, 2007 – 2010, June 2011

3.2.1.8. PCB in human milk

The data for monitoring of PCB in human milk are scarce. No own studies of the PCB levels in human milk or blood plasma have been conducted in Bulgaria so far. Apart from data of analysis of PCB in human milk conducted within the study of WHO during 2001-2002, there is no other available information on that issue.

Within the international project developed by 19 countries "3rd Round of WHO-coordinated Exposure Study on the Levels of PCBs, PCDD and PCDF in Human Milk, Organohalogen Compounds, 2003" [50] in the Republic of Bulgaria a study was conducted of the PCB content in human milkof 30 healthy women distributed by 10 in three regions of the country (Bankya – environmentally clean and two – Sofia and Blagoevgrad – environmentally polluted to a different degree). Results show that the PCB levels in human milk in Bulgaria are among the lowest in the 19 countries.

The results show the highest content of PCB in human milk to be in Blagoevgrad (20.29 ng/g fat - PCB153), followed by Sofia. The lowest level is found in the milk of the mothers of the environmentally clean region of Bankya (11.37 ng/g fat – PCB153). The lowest content is that of PCB180 (table No. 54).

Table 54: Level of the 3 most important PCB markers in human milk (ng/g fat)

PCB∗	Bankya	Sofia	Blagoevgrad
PCB 138	9.64	14.06	16.33
PCB 153	11.37	17.42	20.29
PCB 180	6.38	9.40	13.20

The sum of the 3 PCB (138,153,180) markers constitutes > 90 % of the sum of the 6 primary PCB markers and the results for Bulgaria are valid for the study. The sum of the PCB6 (28,52,101,138,153,180) in the samples of human milk are within limits 32 – 52 ng/g fat and are

[49] Reports of the National Residue Control Monitoring Programme of veterinary medical products and pollutants of the environment in live animals and products of animal origin, 2008, 2009, 2010 and 2011, MoH.

[50] WHO-coordinated Exposure Study on the Levels of PCBs, PCDDs and PCDFs in Human Milk, Submitted to Dioxin 2002. Organohalogen Compounds, 2003.

among the lowest in Europe, whereas the aggregate level of the 3 primary PCB congeners is within limits 27.4 – 49.8 ng/g fat (table No. 55). Only Hungary has lower levels of the 6 PCB markers of 18.32 ng/g fat.

Table No. 55: Values of the primary 6 PCB markers in human milk (ng/g fat) for Bulgaria[51]

PCB*	Average PCB values	PCB geometric mean	Min PCB value	Max PCB value
PCB 138	13.34	13.03	9.64	16.33
PCB 153	16.36	15.90	11.37	20.29
PCB 180	9.66	9.25	6.38	13.20
Sum PCB_6 (28,52,101,138,153,180)	-	42	32	52
Sum PCB_3 (138,153,180)	39.4	38.2	27.4	49.8

* For indicative purposes: Out of the sum of 6 PCB congeners, PCB138, PCB153 and PCB180 constitute > 90 % of the sum of the 6 PCB markers (valid for human milk samples).

PCB levels of the aggregate content of the three PCB indicators below 50 ng/g fat have been found in human milk in Bulgaria. Highest is the aggregate content of the 6 primary PCB markers in Ukraine, Russia, Slovakia and the Czech Republic (respectively 148 ng/g fat, 238 ng/g fat, 621 ng/g fat and 1000 ng/g fat). The maximum allowable concentrations of PCB residues in fresh milk (cow and sheep) is 200 μg/kg, and the aggregate content of the three PCB indicators for Bulgaria is below 50 μg/kg fat.

Source: RECETOX_TOCOEN Reports № 339 and 341, Brno, Czech Republic, 2008

❖ SUMMARY CONCLUSIONS

✓ **The PCB content in human milk in Bulgaria is rather low and considerably smaller than the established level in the industrialized countries in Europe.**

3.2.1.9. PCB monitoring in biota (fish)

Under the Project DVU 440/2008 „Safety and nutritional value of Black Sea products“[52], 2007 – 2012, Medical University, Chemistry Department, city of Varna, financed by the Ministry of Education and Science (MoES) the content of polychlorinated byphenyls (PCB) was established in Black Sea fish related to the evaluation of their safety as food.

After a preliminary study of sea fishing and the market condition in our country ten species of Black Sea fish have ben selected for testing: goby, sprat, grey mullet, scad, Danube mackerel, blue-fish, belted bonito, garfish, turbot, red mullets (goatfish) of three Black Sea regions: North Region (Krapets, Kavarna, Zelenka, Balchik); Region Varna (Trakata, Varna Gulf, Varna Lake, Kamchia, Byala) and South Region (Nessebar, Bourgas, Primorsko), (see map in figure 6, p.3.1.5.8.).

The samples for analysis have been collected from three regions over the period 2007– 2010 The employed analythical method for qualitative and quantitative analysis of PCB is based on the method No.1668a EPA /United States Environmental Protection Agency/.

Established were the concentrations of the following PCB congeners with numbers under IUPAC: 28, 31, 52, 77, 101, 105, 118, 126, 128, 138, 153, 156, 169, 170, 180, based on which the total PCB content in the samples was determined. 85 fish samples were analyzed, and every sample was

[51] 3rd Round of WHO-coordinated exposure study on PCB, PCDD and PCDF levels of human milk, 2001;RECETOX, Global Monitoring Plan for POPs, Central and Eastern Europe and Central Asia, Masaryk University, Brno, Czech Republic, September 2008, p.112-114.

[52] Project DVU 440/2008 „Safety and nutritional value of Black Sea products“, Medical University, Chemistry Department, Varna, Ass.Prof. Mona Stancheva et al., April 26, 2012.

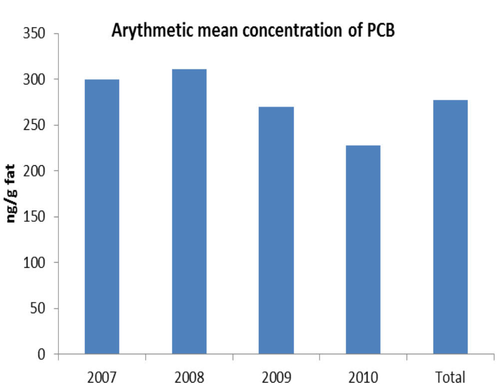
determined three times. For statistical processing and analysis of the results the programme used was SPSS 16. The results have been represented as arythmetic and geometric mean referred to a gram of fat (ng/g fat) and for a gram of fresh weight (ng/g ww). The statistical analysis of the results shows that they follow normal logarithmical dstribution, but as many authors use arythmetic mean values, and in order to be able to compare against bibliographical data, we have represented the results both way. The results for PCB content in fish by years of draught, regions of draught and by fish species are shown in the tables No.56 to 61.

PCB BY YEARS OF DRAUGHT

Table No.56 and № 57 and figures No. 32 and No. 33 represent the results for PCB by years 2007 – 2010 of draught with respect to the lipid content (ng/g fat) and with respect to a whole fresh weight sample (ng/g ww).

Table 56: PCB represented with respect to the lipid content in ng/g fat

Year	Arythmetiv mean concentration of PCB, ng/g fat	Geometric mean concentration of PCB, ng/g fat
2007	300	232
2008	311	259
2009	270	223
2010	228	148
Total	277	212



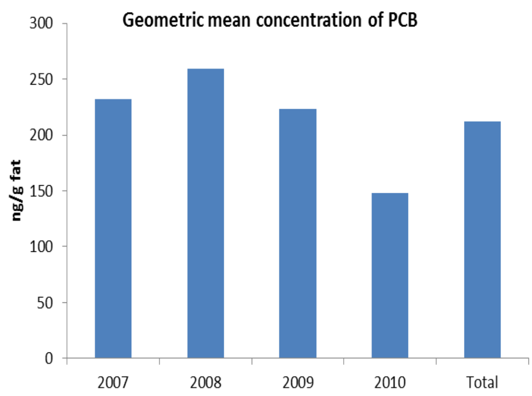


Figure 32: Arythmetic mean and geometric mean values of PCB lipid content by years 2007- 2010 in ng/g fat

Table 57: PCB represented with respect to a whole fresh weight sample in ng/g ww

Years	Arythmetic mean concentration of PCB, ng/g ww	Geometric mean concentration of PCB, ng/g ww
2007	20,2	16,5
2008	17,9	15,4
2009	20,9	16,0
2010	16,4	11,7
Total	19,0	14,9

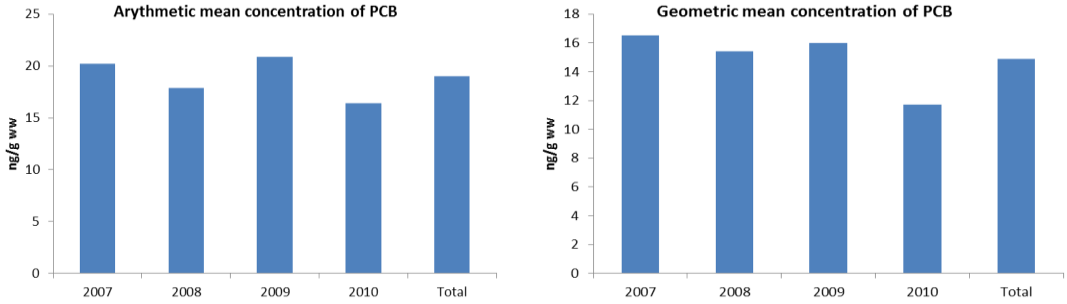


Figure 33: Arythmetic mean and geometric mean PCB values in a whole fresh weight sample by years 2007 – 2010 in ng/g ww

PCB BY REGION OF DRAUGHT

Tables No.58 and No. 59 and figures No. 34 и No. 35 represent the results for PCB by regions of draught with respect to the lipid content (ng/g fat) and with respect to a whole fresh weight sample (ng/g ww).

Table 58: PCB represented with respect to lipid content in ng/g fat

Black Sea region	Arythmetic mean concentration of PCB, ng/g fat	Geometric mean concentration of PCB, ng/g fat
North	320	251
Varna	319	233
South	207	169
Total	277	212

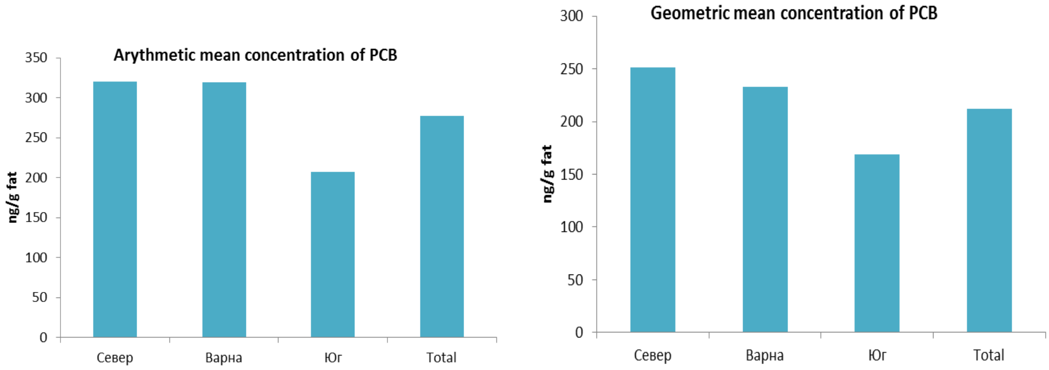


Figure 34: Arythmetic mean and geometric mean values of the lipid content of PCB by regions of draught in ng/g fat

Table 59: PCB represented with respect to a whole fresh weight sample in ng/g ww

Black Sea region	Arythmetic mean concentration of PCB, ng/g fat	Geometric mean concentration of PCB, ng/g fat
North	21,5	16,5
Varna	16,7	14,0
South	19,0	14,5
Total	19,0	15,0

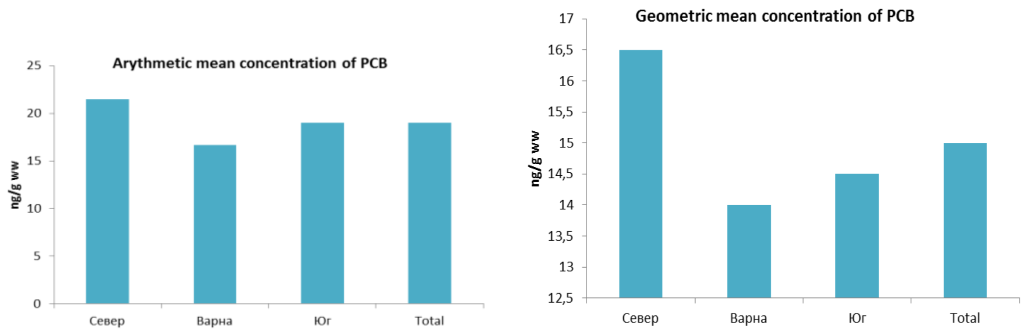


Figure 35: Arythmetic mean and geometric mean values of PCB in a whole fresh weight sample by regions of draught in ng/g ww

PCB BY FISH SPECIES

Tables No. 60 and No. 61 and figures No. 36 and No. 37 represent the results for PCB by fish species with respect to lipid content (ng/g fat) and with respect to a whole sample of fresh weight (ng/g ww).

Table 60: PCB represented with respect to the lipid content in ng/g fat

Fish species	Arythmetic mean concentration of PCB, ng/g fat	Geometric mean concentration of PCB, ng/g fat
Goby	528	471
Sprat	317	285
Scad	160	135
Danube mackerel	184	159
Grey mullet	216	163
Blue-fish	135	117
Belted bonito	196	183
Garfish	283	270
Goatfish	153	148
Turbot	518	456

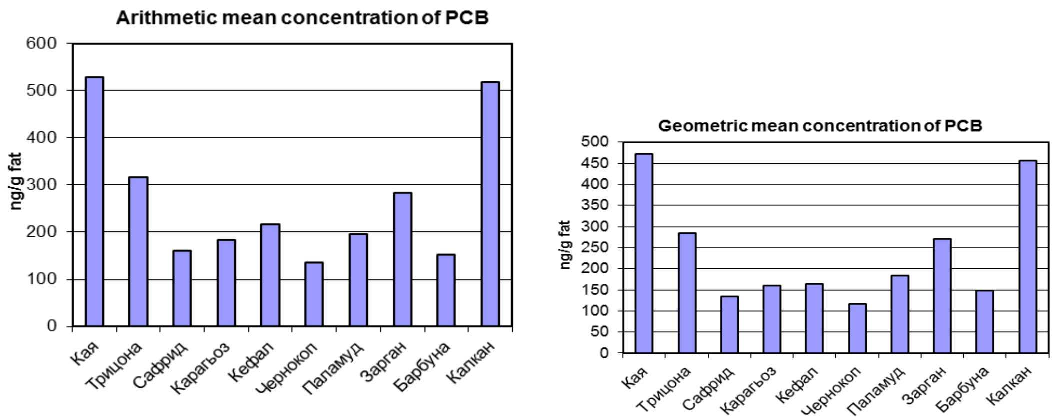


Figure 36: Arythmetic mean and geometric mean values of the lipid content of PCB by fish species in ng/g fat

Table 61: PCB represented with respect to a whole fresh weight sample in ng/g ww

Fish species	Arythmetic mean concentration of PCB, ng/g ww	Geometric mean concentration of PCB, ng/g ww
Goby	10,5	8,3
Sprat	16	15,4
Scad	16,5	14,4
Danube mackerel	36,9	32,8

Fish species	Arythmetic mean concentration of PCB, ng/g ww	Geometric mean concentration of PCB, ng/g ww
Grey mullet	15,7	12,4
Blue-fish	24,3	21,5
Belted bonito	24	17,4
Garfish	24	23,4
Goatfish	24,8	23,4
Turbot	9,3	7,3

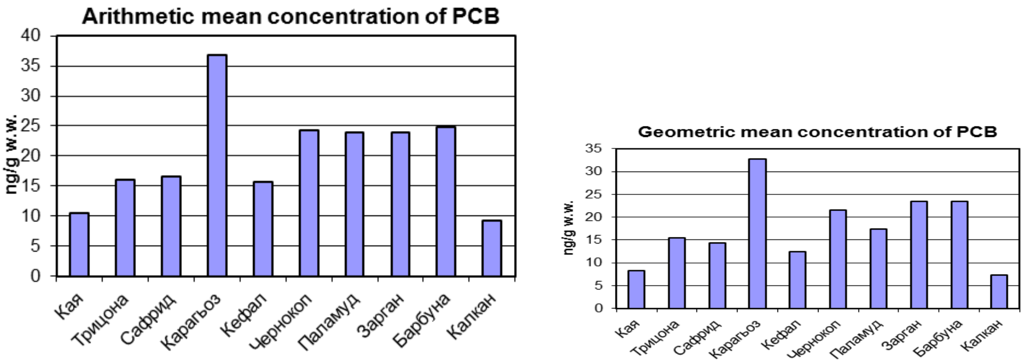


Figure 37:Arythmetic mean and geometric mean values of PCB in a whole fresh weight sample by fish species in ng/g ww

There are no limits for PCB in fish, however if we compare the results obtained for PCB levels in fish with maximum residue limit [53] (MRLs) for DDT in meat of 1 000 µg/kg fat (1000 000 ng/kg fat) or 200 µg/kg fat (200 000 ng/kg fat) for aldrin, it is established that pollution is insignificant and the values obtained are rather low and below the limit of detection (LOD) for PCB in meat [25 µg/kg (25 000 ng/kg fat)] in accordance with Ordinance 119.

In conclusion, the results of the conducted survey show that the pollution with PCB sum and PCB congeners 8, 31, 52, 77, 101, 105, 118, 126, 128, 138, 153, 156, 169, 170, 180 in fish from the Bulgarian coast of the Black Coast is lower or comparable to the results for fish from other regions of the Black Sea and neighbouring seas - the Sea of Marmara and the Mediterranean.

CONCLUSIONS

❖ **The levels of PCB in fish from the Bulgarian coast of the Black Sea are lower and comparable to those for fish from other regions of the Black Sea and neighbouring seas – the Sea of Marmara and the Mediterranean.**

3.2.2. Hexabromobiphenyl (HBB) and polybrominated biphenyls (PBB)

Polybrominated biphenyls (PBB) are toxic, stable organic substances which are very persistent in the environment and they accumulate in the biosphere through the food chain.

PBB are part of a large group of brominated hydrocarbons in which 2–10 hydrogen atoms are replaced by bromine atoms in the molecular structure (i.e. biphenyl). There are 209 distinct molecular combinations or congeners, possible for PBB. As with polychlorinated biphenyls (PCB), only certain congeners are found in commercial mixtures. Depending on the number of bromine atoms, there are 10 homologous series of PBB congeners – from monobrominated to

[53] Ordinance No. 119 of 21.12.2006 on the control measures for certain substances and their residues in live animals, raw materials and foods of animal origin intended for human use, promulgated SG No. 66/19.01.2007, effective of 19.01.2007

decabrominated. Mono-, di-, tri-, tetra-, penta-, hexa-, hepta-, octa-, nona- and decabromo congeners can exist respectively in 3, 12, 24, 42, 46, 42, 24, 12, 3 and 1 isomers. The general structure of PBB is presented in Figure 1, where m+n = 1–10:

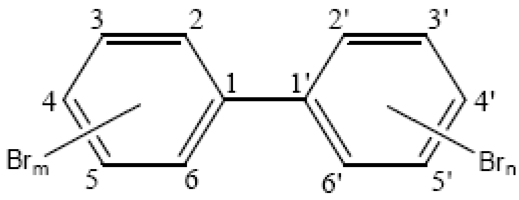
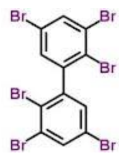


Figure 38: General structure formula of PBB

Hexabromobiphenyl (HBB) is a part of the larger group of polybrominated biphenyls (PBB), formed by replacement of hydrogen atoms in the biphenyl by up to 6 bromine atoms. Hexabromo congeners exist in 42 isomer forms. PBB compounds are used as flame retardants, added to synthetic fiber and plastics to make them difficult to burn. The technical polybrominated biphenyls contain various PBB compounds, isomers and congeners, where HBB is one of the main components of the technical product.

Table 62 shows the HBB part of the PBB group.

Table 62: HBB part of the PBB group

Industrial POPS chemical	CAS No.	EU No.	Structural formula	Prohibition	Specific exemption
Hexabromobiphenyl (HBB)	36355-01-8	252-994-2		Prohibited 25.08.2010	Production: none Use: none
Firemaster (R) BP-6 *(EHC 192 (IPCS, 1997)*	59536-65-1			Prohibited 25.08.2010	Production: none Use: none
FireMaster(R) FF-1 (EHC 192 *(IPCS, 1997)*	67774-32-7			Prohibited 25.08.2010	Production: none Use: none

Source: http://edexim.jrc.it/list_annex_chemical_details

The structure of the main component in Firemaster (R) commercial products, 2,2’,4,4’,5,5’ hexabromobiphenyl (CAS No. 59080-40-9, PBB-153 congener) is shown on Figure 39 (EHC 192 (IPCS, 1997)):

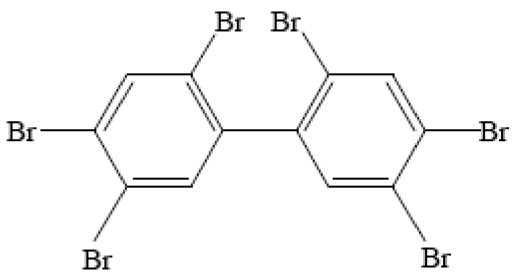


Figure 39: Structural formula of 2,2’,4,4’,5,5’ hexabromobiphenyl

3.2.2.1. Properties and POPS characteristics of HBB

Table 63 shows the properties and some POPS characteristics and exposure to PBB.

Table 63: Properties, POPS characteristics and exposure to PBB compounds

POPS	POPS characteristics and exposure
Hexabromobiphenyl [54] (HBB)	Chemical name: Hexabromo-1,1´-biphenyl; Hexabromobiphenyl Biphenyl, hexabromo; 1,1´- biphenyl, hexabromo (HBB) CAS No.: 36355-01-8; EU No. 252-994-2; CAS No.: 59536-65-1 Firemaster (R) BP-6 (EHC 192 (IPCS, 1997) CAS No.: 67774-32-7 FireMaster(R) FF-1 (EHC 192 (IPCS, 1997) Molecular formula: $C_{12}H_4Br_6$; Molecular mass: 627.58 Appearance: HBB is a white solid or light-brown powder. FireMaster BP-6, for example, is a light yellow powder while FireMaster FF-1 is brown flakes. Properties[55]: Melting point: 72^o C; boiling point: 455^o C; Specific density: 2.6 g/cm^3(25^{o}C);log K_{OW}: 6.39; log Koc: 3.33-3.87; water solubility: 11 µg/l (25^o C), soluble in acetone and benzene and lipids; vapour pressure: 6.9x10-6 Pa (25° C); Henry's Law constant: 3.95x10^{-1} Pa m^3/mol. PBB (HBB) are stable and persistent in the environment. HBB are lipophilic and they bioconcentrate in the food chain (BCF: 4,700-18,100) where for fish BCF: > 10 000 (fish). HBB is less volatile than the other POPS chemicals. Although long-range environmental transport has not been proven, PBB is found throughout the Arctic. Exposure and hazardous effects[56]: PBB are chemicals which can damage the endocrine system, hazardous effects have been observed on the reproductive capability of rats, minks and monkeys. There is epidemiological evidence of damage to the thyroid gland (hypothyroidism) of workers exposed to PBB and higher lung cancer incidence rates of women exposed to PBB. IARC classifies PBB in Group 2B – possible human carcinogens.

3.2.2.2. Historical global production and use of HBB

3.2.2.2.1. Historical global production of HBB[57]

The industrial production of polybrominated biphenyls (PBB) starts in 1970. Ca. 6 000 tons of PBB were produced from 1970 to 1976 in the US, of which 5400 tons (≈ 88%) are HBB.

Michigan Chemical Corporation, St. Louis, Michigan, the only producer of HBB in the US, stopped its production in 1975 (Quoted from US ATSDR, 2004). The production of PBB was restricted to octa- and decabromobiphenyls which lasted until 1979. (IARC 1986; Neufeld et. al., 1977).

Two English companies marketed or produced technical decabromobiphenyl. In 1977 the production of PBB in England was discontinued. Highly brominated PBB (Bromkal, 80-9D) was produced in Germany until the mid 1985.

Until 2000 the only industrial production of PBB is that of decabromobiphenyl (decaBB), which is produced by one company (Atochem) in France (Hardy, 2000). By the time the production of decaBB (Modified from US ATSDR, 2004) was discontinued in France, the global production of PBB was discontinued as well (Darnerud, 2003).

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[54] http://www.POPs.int/documents/meetings/poprc/drprofile/drme/DraftRME_HBB.pdf
[55] UNEP-POPs_NPOPs_GUID_StartupGuidance9POPs_December 2010.
[56] http://www.POPstoolkit.com/about/chemical/hbb.aspx
[57] UNEP/POPS/POPRC.2/17/Add.3, Risk profile on hexabromobiphenyl (HBB), November 2006.

The European Database on the Export Import of Dangerous Chemicals under the Rotterdam Convention has registered a total of 6 export applications from the European Union (EU) for PBB for the period 2003 – 2006, while no import was registered for PBB in this period. According to the information currently available, PBB and more specifically HBB are no longer produced in any country.

Three commercial mixtures of PBB are produced globally: hexabromobiphenyl (HBB), octabromobiphenyl (OBB) and decabromobiphenyl (DBB).

Hexabromobiphenyl (HBB) used to be manufactured with the trade names FireMaster(R) BP-6 and FireMaster(R) FF-1.

The technical mixtures of the FireMaster® series contain various PBB compounds and congeners where HBB is the main component. For example, the main components of FireMaster(R) BP-6 are 2,2',4,4',5,5'-hexabromobiphenyl (60-80%), and 2,2',3,4,4',5,5'-heptabromobiphenyl (12-25%) together with less brominated compounds and minimum quantities of polybrominated naphthalenes (EHC 152 (IPCS, 1994)).

FireMaster FF-1 is FireMaster BP-6 to which 2% calcium polysilicate was added as an anticaking agent (EHC 152 (IPCS, 1994).

The commercial mixtures of octabromobiphenyl (OBB) comprise mainly nonabromobiphenyl (47.4–60.0%), while the commercial mixtures of decabromobiphenyl (DecaBB) comprise mostly (96.8%) DecaBB (see Table 64).

Table 64: Composition of the commercial mixtures of polybrominated biphenyls

Commercial mixture of PBB	Composition	Source
FM BP-6 (Hexabromobiphenyl)	Hexabromobiphenyl (HBB), 62.6% (2,2',4,4',5,5'-HBB, heptabromobiphenyl and pentabromobiphenyl, respectively 56.0%, 33.4% and 4.0%)	Gupta et al., 1981
FM FF-1 (Hexabromobiphenyl)	2% calcium polysilicate added to FM BP-6	Gupta et al., 1981
OBB (Octabromobiphenyl)	Octabromobiphenyl, 33.0% Nonabromobiphenyl, 60.0% Decabromobiphenyl, 6.0% Heptabromobiphenyl, 1.0%	Waritz et al., 1977
	Octabromobiphenyl, 45.2% Nonabromobiphenyl, 47.4% Decabromobiphenyl, 5.7% Heptabromobiphenyl, 1.8%	Norris et al., 1975
DBB(Decabromobiphenyl)	Decabromobiphenyl, 96.8% Nonabromobiphenyl, 2.9% Octabromobiphenyl, 0.3%	Di Carlo et al., 1978

3.2.2.2.2. Historical use and applications of HBB

HBB is one of the technical products of PBB used as flame retardants in three major commercial products: acrylonitrile-butadiene-styrene (ABS) thermoplastics for the production of electronic equipment housings and in industrial (electric engines) and electrical (radio and TV parts) products; as a fire retardant in coatings and lacquers, and in polyurethane foam for auto upholstery. (Neufeld et. al., 1977 quoted from UNEP 2006), (Modified from EHC 152 (IPCS, 1994) and US ATSDR, 2004).

The exact quantity of FireMaster(R) used in the polyurethane foam for auto upholstery has not been made public but the two major producers discontinued the use of HBB (one in 1972), since PBB did not decompose in the ultimate incineration of scrapped automobiles (Neufeld et. al., 1977) (Quoted from EHC 152 (IPCS, 1994)).

Since 1980 (EHC 152 (IPCS, 1994), HBB has not been used (Neufeld et. al., 1977; Di Carlo et. al., 1978; Brinkman & de Kok, 1980) (Quoted from EHC 152 (IPCS, 1994)).

3.2.2.3. Alternatives to HBB

Since brominated flame retardant additives make up for only 15% of the global consumption of flame retardants, a wide range of compounds can be alternatives of HBB in the three main applications of acrylonitrile-butadiene-styrene (ABS): thermoplastics, coatings and lacquers, and polyurethane foam.

The reported chemical substitutes of HBB currently used in Europe are divided into three groups: (a) organophosphorus compounds, (b) inorganic flame retardants and (c) nitrogen-based compounds (Danish EPA, 1999).
(a) The group of organophosphorus compounds comprises the following major substances divided into 2 groups:
1. Halogenated organophosphorus compounds [tris-dichloropropyl phosphate, tris-chloropropylphosphate and tri-chloroethyl phosphate];
2. Non-halogenated organophosphorus compounds [triphenyl phosphate, tricresyl phosphate, resorcinal bis(biphenylphosphate), phosphonic acid, (2-((hydroxymethyl)carbamyl)ethyl)- dimethyl ester)]
(b) the group of inorganic compounds used as flame retardants includes aluminium trihydroxide, magnesium hydroxide, ammonium polyphosphate, red phosphorus and zinc borate
(c) The group of nitrogen-based compounds comprises melamine and its derivatives, such as melamine cyanurate and melamine polyphosphate.

Alternatives to HBB for ABS thermoplastics

The organic phosphorus compounds marketed as halogenated and non-halogenated substances can substitute for HBB in ABS thermoplastics.

Halogenated organophosphorus compounds include: tris-chloropropyl-phosphate (TCPP), tris-chloroethyl-phosphate, and tris-dichloropropyl phosphate (TDCPP) (BMU, 2000). According to (USEPA, 2005), TDCPP is often used in polyurethane foam.

Tetrabromobisphenol A (TBBPA or TBBP-A) is regarded as very poisonous to water-living organisms and very persistent. Since TBBP-A is chemically bound to the resin of the printed circuit board, there is no exposure of the aquatic environment and therefore no risk.[58]

Non-halogenated organic phosphorus compounds as alternative flame retardants for High Impact Polystyrene (HIPS) and poly carbonate (PC) plastics include triphenyl phosphate (TPP), tricresyl phosphate (TCP), resorcinol bis(biphenylphosphate) (RDP), and phosphonic acid (2-((hydroxymethyl) carbamyl)ethyl)- dimethyl ester (Pyrovatex®) (Danish EPA, 1999).

(USEPA, 2005) reports overall hazard for TPP due to its toxicity to aquatic organisms. TCP toxicity (BMU, 2000) apparently differs according to isomer. RDP is usually used in combination with TPP. Pyrovatex® is not well-characterized, easily separates formaldehyde and often is used together with ethylene carbamide to help trap released formaldehyde (BMU, 2000).

Alternatives to HBB in textile coatings and lacquers

Halogen-free rubber cables can contain aluminium trihydroxide and zinc borate as flame retardant alternatives and incorporate the ethylene vinyl acetate polymer as well.

[58] Morf LS, Tremp J, Gloor R. Huber Y, Stengele M, Zennegg M. Brominated flame retardants in waste electrical and electronic equipment: substance flows in a recycling plant. Environ Sci Technol 39:8691-8699, 2005

Aluminum trihydroxide is the most frequently used flame retardant (Danish EPA, 1999). Due to an endothermic reaction when decomposing and other properties it is highly effective and also suppresses smoke but large amounts are required (up to 50%) to achieve these functional properties. Accumulation of the substance in food chains is not detectable (Danish EPA, 1999).

Magnesium hydroxide has comparable effects, however the environmental effects still have to be assessed (Danish EPA, 1999).

Zinc borate in combination with aluminum trihydroxide is often used as an alternative to antimony trioxide.

Alternatives to HBB for polyurethane foams (PUR)

Ammonium polyphosphate (APP) is an additive flame retardant currently used to flame retard flexible and rigid polyurethane foams, as well as laminations, molding resins, sealants and glues. APP formulations account for approximately 4-10% in flexible foam, and 20-45% in rigid foam (USEPA, 2005). APP is commonly used in combination with Aluminium hydroxide and Melamine. It metabolizes into ammonia and phosphate and is not thought to cause acute toxicity in humans (BMU, 2000). Ammonium polyphosphate breaks down rapidly and does not accumulate in the food chain.

Red phosphorus mainly used in polyamids is easily ignited and poorly characterized toxicologically. There is no data available for red phosphorus on ecotoxicity, carcinogenicity, mutagenicity, long-term toxicity, or toxicokinetics. Ecosystem accumulation is thought to be unlikely (BMU, 2000).

Melamine and its derivatives (cyanurate, polyphosphate) are currently used in flexible polyurethane foams, coatings, polyamides and thermoplastic polyurethanes (Special Chemicals, 2004). They are used effectively in Europe in high-density flexible polyurethane foams but require 30 to 40 percent melamine per weight of the polyol. Melamine and its derivates display several toxic effects in animals. (USEPA, 1985, Danish EPA, 1999). In a fire, melamine cyanurate will release toxic fumes such as hydrocyanic acid and isocyanate (BMU, 2000).

Polyglycol esters of methyl phosphonic acid (CAS 676-97-1) have been used for flame retardants in polyurethane foam (e.g. CAS 294675-51-7) (OPCW, 2006). The phosphonic acid family also includes amino-methyl phosphonic acid (AMPA), a degradation product of the herbicide, glyphosate (also known as [carboxymethylamino] methyl phosphonic acid.) (Annex F responses, 2007, IPEN).

3.2.2.4. Key HBB legislation

3.2.1.5.2. International and European legislation on HBB

✓ **Stockholm Convention on Persistent Organic Pollutants (POPs), revision effective for Bulgaria of 26.08.2010.**

HBB is included in Annex A to the convention and its production and use are fully prohibited for all parties to the Stockholm Convention.

✓ **Protocol on persistent organic pollutants to the 1979 Geneva Convention on Long-Range Transboundary Air Pollution, effective 23.10.2003**

HBB is included in Annex A to the Protocol on POPS and its production and use are prohibited.

✓ **The Rotterdam Convention on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade (PIC), effective for Bulgaria as of 24.02.2004**

The Rotterdam Convention imposes prohibitions and strict restrictions for international trade in HBB, which is subject to the prior informed consent procedure (PIC).

✓ **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, effective for Bulgaria as of 16.05.1996.**

The Basel Convention classifies PBB, including HBB, as hazardous waste in Annex VIII. The convention introduces prohibitions for the export of such hazardous waste by members of the EU, OECD and Liechtenstein in all other countries which have ratified the convention. The following are subject to control:
Y 10: Waste substances and articles containing or contaminated with polychlorinated biphenyls (PCBs) and/or polychlorinated terphenyls (PCTs) and/or polybrominated biphenyls (PBBs).

✓ **Regulation 850/2004/EC on persistent organic pollutants amending Council Directive 79/117/EEC (OJ, L 158/30.04.2004)**

Regulation 850/2004/EC prohibits the production, placing on the market and use of HBB, (Annex IA).

✓ **Commission Regulation (EU) No 756/2010 amending Regulation (EC) No 850/2004 of the European Parliament and of the Council on persistent organic pollutants as regards Annexes IV and V, (OJ, L 223/25.08.2010), effective for Bulgaria as of 25.08.2010.**

Annex IV to Regulation (EC) No 850/2004 determines provisional maximum concentration limits for HBB of 50 mg/kg, while Annex V provides for maximum concentration limits for HBB of 5 000 mg/kg, which applies exclusively to a landfill site for hazardous waste and does not apply to permanent underground storage facilities for hazardous wastes, including salt mines.

✓ **Regulation (EC) No 689/2008 concerning the export and import of dangerous chemicals (Official Journal of the European Union L 204/31.07.2008), effective for Bulgaria as of 31.07.2008.**

Regulation (EC) No 689/2008 prohibits the export of chemicals defined as persistent organic pollutants in the Stockholm Convention, other than for environmentally- sound disposal.

Annex I includes PBB with CN 2903 69 90, subject to export ban. HBB is part of the group of PBB. The Regulation requires from the member states to control the import of the chemicals listed in Annex I. Annex III lists the following PBB: hexabromobiphenyl, octabromobiphenyl and decabromobiphenyl with HS 3824.82 – industrial chemicals subject to an export ban according to the Stockholm Convention.

✓ **Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) (Official Journal of the European Union L 396/29.05.2007), effective for Bulgaria as of 1 June 2007.**

Regulation (EC) No 1907/2006 (REACH) introduces bans and restrictions for the production, placing on the market and use of certain hazardous substances, mixtures and products on the territory of the EU, which are listed in Annex XVII to (Regulation (EC) No 552/2009, effective for Bulgaria as of 22.06.2009)(Table 65).

Table 65: Annex XVII of Regulation (EC) No 1907/2006 (REACH)

No	Name of the substances, groups of substances or mixtures	Restriction conditions
8.	Polybromobiphenyls; Polybrominatedbiphenyls; (PBB) CAS No 59536-65-1	1. Shall not be used in textile articles, such as garments, undergarments and linen, intended to come into contact with the skin. 2. Articles not complying with paragraph 1 shall not be placed on the market.

✓ **Regulation (EC) No 1013/2006 on shipments of waste, (OJ, L 190/12.07.2006), effective for Bulgaria as of 01.01.2007.**
The classification of waste plastics under Regulation (EC) No 1013/2006 on shipments of waste comprises entry A 3180 in the list of waste subject to the procedure of prior written notification and consent (“yellow“ waste list).

A 3180:

Wastes, substances and articles containing, consisting of or contaminated with polybrominated biphenyl (PBB), or any other polybrominated analogues of these compounds, at a concentration level of 50 mg/kg or more.

✓ **Regulation 1272/2008/EC (CLP) on classification, labeling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006, (OJ, L 353/31.12.2008), effective for Bulgaria as of 20.01.2009.**

Regulation No 1272/2008/EC (CLP) provides for the terms and conditions governing the classification of chemical substances and mixtures and the packaging and labeling requirements for hazardous chemical substances and mixtures.

✓ **Directive 2002/95/EC (RoHS) on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE), (OJ, L 174/01.07.2011), effective for Bulgaria as of 01.07.2006.**

RoHS Directive 2002/95/EC introduces restrictions for the placing on the market and use of polybrominated biphenyls (PBB) in electrical and electronic equipment (EEE), which are expressly exempted from the restrictions under Anex XVII of REACH Regulation 1907/2006/EC. The Directive prohibits the placing on the market and use of new EEE containing PBB in maximum concentration exceeding 0,1 % by weight (1000 mg/kg) as of 1 July 2006. This use restriction does not apply to any EEE equipment placed on the market before 01.07.2006.

✓ **Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (OJ, L 174/01.07.2011)**

Directive 2011/65/EU provides rules for the restriction of the use of hazardous substances in electrical and electronic equipment (EEE), as well as the environmentally-sound recovery and disposal of waste EEE.

Annex I comprises 10 categories of EEE and Annex II introduces restrictions for the use of polybrominated biphenyls (PBB) to the maximum concentration of 0,1 % by weight in EEE.

This restriction applies to medical devices and monitoring and control instruments which are placed on the market from 22 July 2014, to in vitro diagnostic medical devices which are placed on the market from 22 July 2016 and to industrial monitoring and control instruments which are placed on the market from 22 July 2017.

The restriction does not apply to cables or spare parts for the repair, the reuse, the updating of functionalities or upgrading of capacity of EEE placed on the market before 1 July 2006; reused spare parts, recovered from EEE placed on the market before 1 July 2006 and used in equipment placed on the market before 1 July 2016, provided that reuse takes place in auditable closed-loop business-to-business return systems, and that the reuse of parts is notified to the consumer, and to the applications listed in Annexes III and IV.

✓ **Directive 2002/96/EC on waste electrical and electronic equipment (WEEE), (OF, L 32/131.02.2003), effective for Bulgaria as of 01.07.2006.**

This directive applies to electrical and electronic equipment falling under the categories set out in Annex IA provided that the equipment concerned is not part of another type of equipment that does not fall within the scope of this Directive. Annex IB contains a list of products which fall under the categories set out in Annex IA. Annex II Selective treatment for materials and components of waste electrical and electronic equipment provides that plastic containing brominated flame retardants (such as PBB), including HBB, have to be removed from any separately collected waste electrical and electronic equipment (WEEE).

3.2.2.5.2. National legislation on HBB

✓ **Law on protection from the harmful effects of chemical substances and mixtures (LPHECSM), (as last amended, State Gazette, issue 98 dd. 14.12.2010, effective 01.01.2011)**

This law governs the measures for the application of Regulation (EC) No 850/2004 on persistent organic pollutants and subsequent amendments.

✓ **Waste Management Act (Promulgated in the State Gazette, issue 53 dd. 13.07.2012, effective 13.07.2012)**

The Waste Management Act (WMA) governs the environmentally-sound management of hazardous waste containing PBB, including HBB, as well as the treatment and transportation of such waste.

✓ **Regulation No. 3 dd. 1.04.2004 on the classification of waste (promulgated in the State Gazette, issue 44/25.05.2004, as amended and supplemented, State Gazette, issue 23/20.03.2012)**

This regulation provides for the terms and conditions on the classification of waste by types and properties. The following codes apply for the classification of waste plastics containing brominated flame retard

nts (such as PBB) including HBB.

Table 66: Annex 1 "Waste List"

Code	Waste name
16 01 21 *	Hazardous components other than those under codes 16 01 07 to 16 01 11, 16 01 13 and 01 14
16 02 16	Components removed from discarded equipment, other than those under code 16 02 15
16 01 04*	End-of-life vehicles
16 01 19	Plastics
16 02 15 *	Hazardous components removed from obsolete equipment

✓ **Regulation on the requirements for placing on the market of electrical and electronic equipment (EEE) and waste electrical and electronic equipment (WEEE) treatment and transportation, (Promulgated in the State Gazette, issue 36/02.05.2006, last amended, State Gazette, issue 29/08.04.2011)**

This regulation provides the requirements for placing on the market of EEE and the collection, transportation, temporary storage, pretreatment, reuse, recycling, recovery and/or treatment of discarded EEE (discarded EEE). There shall be no placing on the market of any EEE listed in categories 1 to 10 according to Annex 1, containing polybrominated biphenyls (PBB), including HBB.

3.2.2.5. Inventory of hexabromobiphenyl (HBB)

3.2.1.6.1. Inventory methodology

A preliminary inventory of PBB, including HBB, was made in 2011. The main purpose of the preliminary inventory was to collect, summarize and assess input information about the production, import and export, placing on the market and identification of waste plastic containing HBB on the territory of Bulgaria considering the major uses and applications of the substance as a brominated additive - flame retardant.

The collection of information for the preliminary inventory of HBB was done using:

✓ available data about the use of HBB;
✓ data about import and export provided by the NSI; NRA; The Customs Agency;
✓ HBB data on the INTERNET.

3.2.2.6.2. Production, import and export of PBB and HBB in the country

PRODUCTION OF PBB AND HBB: PBB and HBB as brominated flame retardants are not produced in Bulgaria.

IMPORT AND EXPORT OF POLYBROMINATED BIPHENYLS (PBB) AND HEXABROMOBIPHENYL (HBB)

Data about the import and export of hexabromobiphenyl (HBB, CN code 27109900) was requested from the National Statistical Institute (NSI) for the period 1996 – 2010. The results show that for the said period of 15 years there is no import or export of HBB.

Source: NSI, April 2011

Information was additionally requested from the Customs Agency regarding the import and export of hexabromobiphenyl (HBB, CN code 27109900) and acrylonitrile-butadiene-styrene copolymers (ABS, CN code 39033000) and brominated polystyrene (HIPS), with content of 58% by weight or more, but not exceeding 71% bromine (CN code 39039020) and waste plastic – styrene polymers (CN code 39152000) for the period 2000 – 2010. The results show that over the said 10-year period no import or export has been registered for HBB of products (ABS) of waste plastic of styrene polymers, containing brominated flame retardant additives (PBB or HBB), considering the fact that in Bulgaria no commercial mixtures of polybrominated biphenyls (PBB) are produced - hexabromobiphenyl (HBB), octabromobiphenyl (OBB) and decabromobiphenyl (DBB). There is no information about any import of commercial products of hexabromobiphenyl (HBB) with the trademarks FireMaster$^{(R)}$ BP-6 and FireMaster$^{(R)}$ FF-1.

Source: The Customs Agency, April 2011

Since Bulgaria's accession as a full member of the European Union (EU) in 2007, the National Revenue Agency (NRA) has been keeping a database of intra-community arrival and dispatch from and to EU member states. This is why information was requested from the NRA regarding the intra-community arrival and dispatch to and from Bulgaria for the period 2007 – 2010 for hexabromobiphenyl (HBB, CN code 27109900), commercial mixtures of polybrominated biphenyls (PBB, CN code 29036990) - hexabromobiphenyl (HBB), octabromobiphenyl (OBB) and decabromobiphenyl (DBB), and the following products - acrylonitrile-butadiene-styrene copolymers (ABS) and brominated polystyrene (HIPS) and waste plastic of styrene polymers. However, please note that CN code 27109900, in addition to hexabromobiphenyl (HBB), includes condenser dielectric fluid (Ugilec 141, Ugilec 121 Ugilec 21) and pentachlorbenzene (PeCB).

The information for the period 2007 – 2010 shows that there is no intra-community arrival or dispatch from and to Bulgaria of any of the substances and commercial mixtures listed above from and to EU member states.

Table 67: Intra-community arrivals of brominated polystyrene (HIPS) for Bulgaria of EU member states for 2007 – 2010

Year	HS/CN2010 product code	Code description	Country of dispatch	Country of origin	Quantity, net weight (kg)
2007	39039020	Brominated polystyrene containing 58% by weight or more but not more than 71% of bromine (HIPS)	Netherlands	USA	359
2010	39039020	Brominated polystyrene, containing 58 % by weight or more but not more than 71% of bromine (HIPS)	Greece	Greece	3 450
Total					3 809

Source: NRA, April 2011

For the period 2007 – 2010 the country received from EU member states ca. 3.8 tons brominated polystyrene (HIPS), which could not have contained HBB since the USA discontinued its production in 1976 and Greece has never produced HBB. In Europe, only commercial mixtures of decabromobiphenyl (decaBB) have been produced, which was discontinued in 2000. Probably the polystyrene contains other brominated flame retardant additives which are permitted for placing on the market and use throughout the EU (Table 67).

Table 68: Intra-community dispatch of brominated polystyrene (HIPS) from Bulgaria for EU member states for 2007 – 2010

Year	HS/CN2010 product code	Code description	Country of arrival	Quantity, net weight (kg)
2009	39152000	Waste plastic of styrene polymers	Greece	720
2010	39039020	Brominated polystyrene, containing 58 % by weight or more but not more than 71% of bromine (HIPS)	Greece	100
2010	39152000	Waste plastic of styrene polymers	Romania	1041
Total				1861

Source: NRA, April 2011

For the period 2007 – 2010. intra-community dispatch from Bulgaria for EU member states amounts to ca. 1.9 tons, mainly waste plastic of styrene polymers (1.8 t), dispatched for utilization/disposal in neighboring countries (Romania and Greece). There is no data that they contained any brominated flame retardant additives (PBB or HBB) (Table 68).

3.2.2.6.3. Placing on the market and use of HBB and PBB

Regulation (EC) No 850/2004 introduces a prohibition for the production, placing on the market and use of HBB (Annex IA) effective 25.08.2010.

Annex XVII to Regulation (EC) No 1907/2006 (REACH) dd. 22.06.2009 prohibits the use and placing on the market of PBB in textile articles, such as garments, undergarments and linen, intended to come into contact with the skin.

The placing on the market and use of PBB, including HBB independently, in mixtures and products is prohibited in the Republic of Bulgaria – as of 01.07.2006 in EEE; as of 25.08.2010 in mixtures and products.

Directive 2002/95/EC (RoHS) prohibits the placing on the market and use of new EEE containing PBB in maximum concentration exceeding 0,1 % by weight (1000 mg/kg) as of 1 July 2006. This use restriction does not apply to any EEE equipment placed on the market before 01.07.2006.

PLACING ON THE MARKET AND USE OF HBB

There are three known applications of PBB, including HBB – as a flame retardant added to three main commercial products: acrylonitrile-butadiene-styrene (ABS) thermoplastics for the production of electronic equipment housings (radio and TV parts, etc.) as a fire retardant additive in coatings and lacquers, and in polyurethane foam (PUR) for auto upholstery. The use of HBB as a flame retardant in PUR for auto upholstery was discontinued in 1972. After 1980 no HBB is being used anywhere in the world.

A preliminary study of the EEE placed on the market which could contain brominated flame retardants (HBB) established that no reliable data is available about the EEE placed on the market. Information about the EEE placed on the market and the collected discarded EEE is collected in the system of the MoEW (EEA) as of July 2006 without taking account of the content of hazardous substances, including HBB in the waste plastic treated with flame retardants generated in the dismantling of discarded EEE.

In Bulgaria until 2011, no passenger cars have been produced and all cars in the country have been imported. Information about end-of-life vehicles (ELV) imported, exported, placed on the market and accepted from temporary storage sites and dismantling centers is collected in the system of the MoEW (EEA) as of 2005, as required by the Regulation on the requirements applicable to the treatment of vehicle waste. However, no information about hazardous substance content is recorded, including HBB, in the waste plastic treated with flame retardants generated in the dismantling of ELV.

No reliable data is available about the products, articles, EEE and vehicles treated by the brominated flame retardant HBB with the brands FireMaster(R) BP-6 and FireMaster(R) FF-1, but it is highly unlikely that there are any, as their production was discontinued globally before 1980.

3.2.2.6.4. Plastic Waste containing HBB

Waste plastic styrene polymers and copolymers, polyurethane and brominated polystyrene generated from the dismantling of discarded EEE and vehicles.

No data is available about the existence of any waste plastic of acrylonitrile-butadiene-styrene copolymers (ABS), brominated polystyrene (HIPS) and polyurethane foam (PUR) containing HBB, which is quite natural considering that their production and use were terminated globally before 1980; what is more, no tests were made in the country of samples of such waste regarding HBB content.

❖ **GENERAL CONCLUSIONS**

✓ **The production, import, export, placing on the market and use of hexabromobiphenyl (HBB) in Bulgaria are prohibited.**

✓ **No commercial mixtures of hexabromobiphenyl (HBB) and other polybrominated biphenyls (PBB) are known to have been produced in the country;**

✓ **For the period 1996 – 2010 there is no registered import of HBB independently or in commercial mixtures containing HBB or PBB;**

✓ **No information is available about any import of products or articles containing HBB or PBB;**

✓ **No waste plastic generated from the dismantling of discarded EEE and ELV is registered, containing commercial mixtures of HBB (FireMaster(R) BP-6 and FireMaster(R) FF-1), since their production was terminated globally before 1980; what is more, no tests were made in the country of samples of such waste regarding HBB content.**

✓ **No information is available about the existence of waste plastic of styrene polymers and copolymers, polyurethane and brominated polystyrene containing brominated flame retardants (HBB) exceeding 50 mg/kg.**

3.2.3. Polybrominated diphenyl ethers (PBDE)

With the growing use of thermoplastics and hard polymers globally for construction materials, vehicles, electric and electronic equipment (EEE) over the last 40 years, more than 200 types of difficult to burn compounds were developed, called flame retardants (FR).

Flame retardants are a large group of chemical substances, mainly inorganic and organic compounds containing bromine, chlorine, phosphorus, nitrogen, boron and metal oxides and hydroxides. Chemical flame retardant compounds are categorized as either additive or reactive.

Reactive flame retardant compounds are added during polymerization, chemically binding with the polymer. As a result, a modified polymer is produced with better flame retardant qualities and a different molecular structure.

Flame retardant additives are incorporated in the polymer before, during or most often after polymerization. They are used exclusively in thermoplastic polymers. If they are compatible with the polymer, they act as plasticisers, otherwise they are considered fillers. Flame retardant additives are monomer molecules which are not chemically bound to the polymer and can migrate outside the polymer material and be discharged into the environment. About 350 separate types of chemical substances have been described as flame retardants, but in fact over 200 are produced.

There are four main groups of flame retardant chemicals and several types of systems providing flame retardant qualities[59]: inorganic; organophosphorus; nitrogen-based and halogenated flame retardants.

Halogenated flame retardant chemicals contain chlorine or bromine and they react with flammable gases retarding or preventing the burning process. They are divided into three classes:

✓ *Aromatic,* including PBDE, hexabromobiphenyl (HBB), pentachlorbenzene (PeCB) – POPS, included in Annex A to the Stockholm Convention.
✓ *Cycloaliphatic,* including hexabromocyclododecane (HBCD) – could be assessed as POPS.
✓ *Aliphatic*, which are a small group of substances – short-chain chlorinated paraffins, C_{10}-C_{13} (SCCP) – could be assessed as POPS.

The commercial products of brominated flame retardants (BFR) should have the following properties:

<u>Flame retardant properties</u>: the thermal activity should start before or during the polymer breakdown; it should not generate toxic gases other than those discharged during breakdown, and it should not increase the density of the smoke generated during burning.

<u>Mechanical properties:</u> it should not materially alter the mechanical properties of the polymer; it should be easy to incorporate into and be compatible with it; it should be easy to extract/separate from the polymer upon recycling.

<u>Mechanical properties:</u> it should be colourless or at least colour consistent; it should have good light stability, good ageing and hydrolysis stability and corrosion resistance.

<u>Toxicity and environmental toxicology properties:</u> it should not have hazardous effects on the health of people and the environment.

<u>Commercial applications:</u> should be available on the market at a reasonable price.

3.2.3.1. Polybrominated diphenyl ethers (PBDE) – Introduction

Polybrominated diphenyl ethers (PBDE) are a group of brominated organic substances which retard or suppress the burning of polymers widely used as flame retardant additives in various applications.

Theoretically, there are 209 individual isomers (congeners) of PBDE, in which 1 to 10 hydrogen atoms are replaced by bromine atoms. The structural formula of PBDE is $C_{12}H_{10-x}Br_xO$, where "X" varies from 1 to 10. Congeners include mono-, di-; tri-; tetra-; penta-; hexa-; hepta-; octa-; nona-; and decabromodiphenyl ethers and the number of isomers is 3, 12, 24, 42, 46, 42, 24, 12, 3, and 1, respectively. The general structural formula of PBDEs is provided below, where X + Y= 1 to 10.

[59] Guidance on alternative flame retardants to the use of commercial pentabromodiphenylether (c-PentaBDE), SFT, Oslo, February 2009

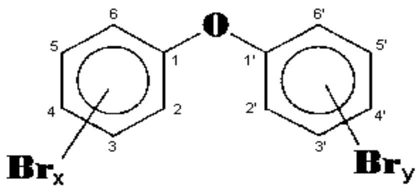


Figure 40: General structural formula of PBDE

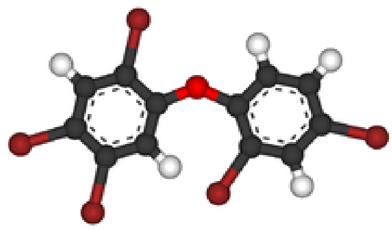


Figure 41: Spatial structure of PBDE

Exposure and health effects

PBDE are discharged into the environment during their production and use in consumer goods during their lifecycle. The path of their intake in the human body is through emissions during the production or processing of these compounds to products and finished articles.

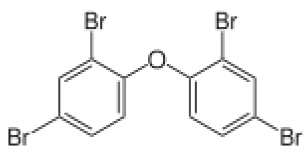
It is known that lower-brominated PBDE (1÷5 bromine atoms) affect the hormonal levels of the thyroid gland, they cause liver damage, reproductive and neurobehavioral changes. There are no proven health effects of higher-brominated PBDE (more than 5 bromine atoms) in humans but in experiments with animals, harmful effects are established on the liver, the thyroid gland, as well as neurobehavioral changes.

Source : http://en.wikipedia.org/wiki/Polybrominated_biphenyl_ethers

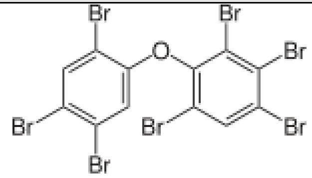
3.2.3.2. PBDE included in the Stockholm Convention

The following industrial PBDE were included in Annex A to the Stockholm Convention in May 2009 (Table 69)

Table 69: Polybrominated diphenyl ethers (PBDEs) included in the Stockholm Convention

Industrial POPS chemical	CAS No.	EU No.	Structural formula[60]	Annex	Acceptable purpose / Specific exemption
Tetrabromodiphenyl ether and pentabromodiphenyl ether (commercial mixtures of pentabromodiphenyl ether, c-PentaBDE)	c-pentaBDE : 32534-81-9; BDE-47: 5436-43-1; BDE-99: 60348-60-9.	c-pentaBDE: 251-084-2	BDE-47 	A	Production: none Use: in products complying with the requirements of Part V of Annex A
Hexabromodiphenyl ether and heptabromodiphenyl ether (commercial mixtures of octabromodiphenyl ether, c-OctaBDE)	c-octaBDE : 32536-52-0; BDE-153: 68631-49-2; BDE-154: 207122-15-4;	c-octaBDE: 251-087-9	BDE-183:	A	Production: none Use: in products complying with the requirements of Part IV of Annex A

[60] Wikipedia, the free encyclopedia: c-pentaBDE and c-octaBDE

Industrial POPS chemical	CAS No.	EU No.	Structural formula[60]	Annex	Acceptable purpose / Specific exemption
	BDE-175: 446255-22-7; BDE-183: 207122-16-5				

Definition: The Stockholm Convention defines PBDE as:

<u>“Hexabromodiphenyl ether and heptabromodiphenyl ether”</u> shall mean 2,2',4,4',5,5'-hexabromodiphenyl ether (BDE-153, CAS No. 68631-49-2); 2,2',4,4',5,6'- hexabromodiphenyl ether (BDE-154, CAS No. 207122-15-4); 2,2',3,3',4,5',6- heptabromodiphenyl ether (BDE-175, CAS No. 446255-22-7), 2,2',3,4,4',5',6- heptabromodiphenyl ether (BDE-183, CAS No. 207122-16-5) and other hexa- and heptabromodiphenyl ethers, found in commercial mixtures of octabromodiphenyl ether (c-octaBDE).

<u>“Tetrabromodiphenyl ether and pentabromodiphenyl ether”</u> shall mean 2,2',4,4'-tetrabromodiphenyl ether (BDE-47, CAS No. 5436-43-1) and 2,2',4,4',5-pentabromodiphenyl ether (BDE-99, CAS No. 60348-60-9) and other tetra- and pentabromodiphenyl ethers, found in commercial mixtures of pentabromodiphenyl ether (c-pentaBDE).

The convention prohibits the production, import and export of c-octaBDE and c-PentaBDE. Import and export is only permitted for environmentally-sound disposal and/or treatment. A specific exemption is provided for their use in products complying with the requirements of Part IV and V of Annex A.

Specific exemption for the use in compliance with Part IV and V of Annex A

1. A Party may allow recycling of articles that contain or may contain c-OctaBDE and c-PentaBDE, and the use and final disposal of articles manufactured from recycled materials that contain or may contain hexabromodiphenyl ether and heptabromodiphenyl ether, provided that:
(a) The recycling and final disposal is carried out in an environmentally-sound manner and does not lead to recovery of hexabromodiphenyl ether and heptabromodiphenyl ether for the purpose of their reuse;
(b) The Party takes steps to prevent exports of such articles that contain levels/concentrations of hexabromodiphenyl ether and heptabromodiphenyl ether exceeding those permitted for the sale, use, import or manufacture of those articles within the territory of the Party; and
(c) The Party has notified the Secretariat of its intention to make use of this exemption.
2. This specific exemption shall in any case expire at the latest in 2030.

3.2.3.3. *Properties and characteristics of PBDE*

Three main commercial products of PBDE are marketed: technical mixtures of penta-BDE, octa-BDE and deca-BDE, where each product is a mixture of several brominated diphenyl ethers with a various degree of bromination (Table 70).

Table 70: Composition of technical PBDE products

Technical product	CAS No.	EU No.	Content, %							
			TriBDE	TetraBDE	PentaBDE	HexaBDE	HeptaBDE	OctaBDE	NonaBDE	DecaBDE
c-PentaBDE	32534-81-9	251-084-2	0 ÷ 1	24 ÷ 38	50 ÷62	4 ÷8				
c-OctaBDE	32536-52-0	251-087-9				10 ÷ 12	43 ÷ 44	31 ÷ 35	9 ÷11	0 ÷ 1
c-DecaBDE	1163-19-5	214-604-9							0.3 ÷ 3	97 ÷ 98

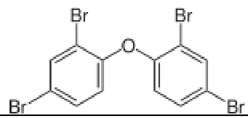
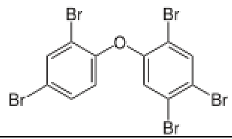
Source: Bromine Science and Environmental Forum (BSEF)

PBDE are practically water insoluble hydrophobic substances with a low vapor pressure and a high Log Kow value. Commercial PBDE products are viscous liquids to resins and pure congeners are hard crystalline substances at room temperature. They are not flammable and they are highly fire-resistant (EU, 2001, 2002, 2003).

3.2.3.3.1. Properties and POPs characteristics of c-penta-BDE

Commercial pentabromodiphenyl ether (c-penta-BDE) is a mixture of 2 main congeners: 2,2`,4,4´´tetrabromodiphenylether (BDE-47), and 2,2´,4,4´,5-pentabromodiphenylether (BDE-99). Minimum quantities of 2,2´,4-tri-bromodiphenylether (BDE-17) and 2,4,4´- tribromodiphenylether (BDE-28) are also found in commercial c-penta-BDE (Table 71).

Table 71: Chemical identity of c-pentaBDE (tetra-BDE and penta-BDE)

Chemical name	BDE congener	CAS No.	EU No.	Empirical formula	Molecular weight	Structural formula
2,2′,4,4′-tetra-bromodiphenyl ether	BDE-47	40088-47-9	254-787-2	$C_{12}H_5Br_4O$	485,7950 g/mol	
2,2′,4,4′,5-penta-bromodiphenyl ether	BDE-99	32534-81-9	251-084-2	$C_{12}H_5Br_5O$	564,6911 g/mol	

C-penta-BDE are high molecular weight compounds with molecular weight varying from 407 g/mol (tri-BDE) to 564 g/mol (penta-BDE). Vapor pressure is relatively low, varying from 2.7 x10^{-3} Pa at 25^{o}C (triBDE) to 4.69.10^{-5} Pa at 25^{o}C (pentaBDE). The extremely hydrophobic nature of penta-BDE is determined by the high value of Log Kow > 6. (EU, 2001, 2002, 2003)(Table 72).

Table 72: Physico-chemical properties of commercial c-penta-BDE products[61]

Properties	c-pentaBDE	
Chemical formula	$C_{12}H_5Br_5O$	
Molecular weight	564.69 g/mol	
Melting point	-7 to – 3 ^{o} C (commercial product)	
Boiling point	Decomposes at > 200^{o}C (commercial product)	
Relative density	2.25 – 2.28 (commercial product)	
Vapor pressure	4.69.10^{-5} Pa (commercial product)	
Water solubility	13.3 µg/L (commercial product) pentaBDE = 2.4 µg/L tetraBDE = 10.9 µg/L	
Log K_{ow}	6.57 (measured, commercial product)	
Flammability	Not applicable. Flame retardant (BFR)	
Autoflammability	Decomposes at > 200^{o}C (commercial product)	
Explosive properties	None	
Oxidizing properties	None	
Br content	70.8% w/w	
Viscosity	Highly viscous at room temperature (2.10^6 cps at 25^{o}C)	
Physical state	Amber viscous liquid or semi-solid (commercial product). Pure congeners of PBDE are crystalline solids.	
Components of the commercial product	TriBDE TetraBDE PentaBDE HexaBDE HeptaBDE	0 – 1 % 24 – 38 % 50 – 62 % 4 – 12 % Traces

[61] European Commission, Pentabromodiphenyl ether, Summary RAR 015, 2001, Final Reort 2000, UK.

Behavior in the environment and environmental toxicity[4]

Penta-BDE[62] are widely spread in the environment and can be found in the atmosphere, the biota (fish, birds and terrestrial mammals) globally. Penta-BDE are highly resistant to decomposition in the soil, water and sediments (Penta_UNEP 2006 and Watson et al. 2010).

Table 73: Average half-life (biotic and abiotic) of isomers of penta-BDE in the soil, sediments and water [Palm (2001) with the Syracuse Corporation's EPIWIN program].

Environmental component	Half-life DT50 (days)	BDE congener
Aerobic sediment	600	BDE-47
Soil	150	BDE-47
Water	150	BDE-47
Aerobic sediment	600	BDE-99
Soil	150	BDE-99
Water	150	BDE-99

Emissions of c-penta-BDE may result from the dismantling and recycling of end-of-life vehicles (ELV) and discarded electric and electronic equipment (discarded EEE). Toxic substances such as brominated dibenzo-r-dioxins and furans could form during the incineration of products containing c-penta-BDE.

The components of c-penta-BDE have a very low volatility and water solubility (between 2 and 13 μg/l), which decrease with the increase of bromination.

C-penta-BDE and all of its components have high logKow > 5 values and carp bioconcentration factor (*Cyprinus carpio*), BCF ≈ 27,400. The potential for bioaccumulation of congeners BDE-47 and BDE-99 in blue mussels (*Mytilus edulis*) is 10 times higher than that of the studied congeners of PCB (PCB-31, PCB-52, PCB-77, PCB-118 and PCB-153), (Gustafsson et al. 1999).

Penta-BDE can be transported over long distances in the atmosphere (10–20 days for BDE-99; and 11 days for BDE-47). Both BDE-47 and BDE-99 are found in the Arctic (Canada and Russia). The data about remote areas is still limited but it shows growing pollution with penta-BDE. The reported levels of the two main congenera in whales are from 66 to 864 ng/g fat (BDE-47) and 24 to 169 ng/g fat (BDE-99). Over the last years the levels of PentaBDE in the wild fauna and in the human body have increased considerably (RPA, 2000).

Exposure and health effects

Penta-BDE from the soil and the sediments pass to the food chain and accumulate in living organisms.

People are exposed through contaminated food, use of penta-BDE containing products and inhaling polluted air and dust indoors. Penta-BDE pass to the embryos and through milk to breast-fed children. They accumulate in the fat tissue of people where they remain for long years.

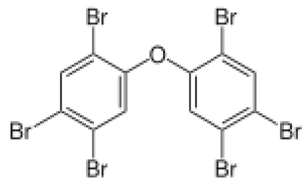
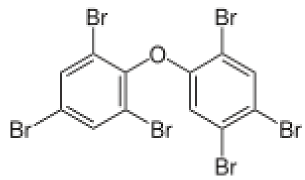
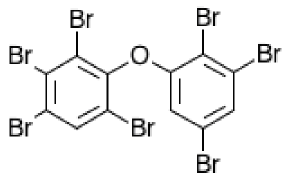
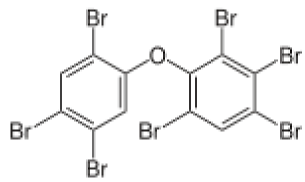
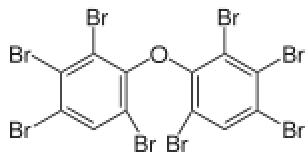
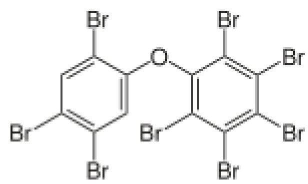
A study performed in 2007 found that tetraBDE (BDE-47) and pentaBDE (BDE-99) have a bioconcentration factor (BCF = 98) in terrestrial carnivores which is higher than that of any other tested industrial chemical. PentaBDE has no recorded harmful health effects on people but studies with animals (rats) prove hazardous effects on the liver, the thyroid gland and cause neurobehavioral changes.

[62] The 9 New POPs, Risk Management Evaluations 2005-2008 (POPRC1-POPRC4),[(UNEP/POPS/POPRC.3/20/Add.1) and (UNEP/POPS/POPRC.4/15/Add.1)].

3.2.3.3.2. Properties and POPS characteristics of c-octaBDE

Commercial pentabromodiphenyl ether (c-octa-BDE) is a mixture of 5 main congener: 2,2,’,4,4’,5,5’ hexabromodiphenylether (BDE-153); 2,2,’,4,4’,5,6’-hexabromodiphenylether (BDE-154); 2,2,’,3,3’,4,5’,6-heptabromodiphenylether (BDE-175); 2,2,’,3,4,4’,5’,6-heptabromodiphenylether (BDE-183); 2,2′,3,3′,4,4′,6,6′-octa-bromodiphenyl ether (BDE-197); and 2,2′,3,4,4′,5,5′,6-octa-bromodiphenyl ether (BDE-203). Minimum quantities of penta-, hexa-, nona, and deca- BDE are also found in commercial c- octa-BDE (Table 74).

Table 74: Chemical identity of c-octaBDE (hexa-BDE and hepta-BDE)

Chemical name	BDE congener	CAS No.	EU No.	Empirical formula	Molecular weight[63]	Structural formula
2,2',4,4',5,5'-hexabromodiphenyl ether	BDE-153	68631-49-2	253-058-6	$C_{12}H_4Br_6O$	643,5872 g/mol	
2,2',4,4',5,6'-hexabromodiphenyl ether	BDE-154	207122-15-4	253-058-6	$C_{12}H_4Br_6O$	643,5872 g/mol	
2,2',3,3',4,5',6-heptabromodiphenyl ether	BDE-175	446255-22-7	273-031-2	$C_{12}H_3Br_7O$	722,4832 g/mol	
2,2',3,4,4',5',6-heptabromodiphenyl ether	BDE-183	207122-16-5	273-031-2	$C_{12}H_3Br_7O$	722,4832 g/mol	
2,2′,3,3′,4,4′,6,6′-octabromodiphenyl ether	BDE-197	17964-21-3	251-087-9	$C_{12}H_2Br_8O$	801,3793 g/mol	
2,2′,3,4,4′,5,5′,6-octa-bromodiphenyl ether	BDE-203	32536-52-0	251-087-9	$C_{12}H_2Br_8O$	801,3793 g/mol	

C-octa-BDE are high molecular weight compounds with molecular weight varying from 643 g/mol (heptaBDE) to 801 g/mol (octaBDE). Vapor pressure is relatively low, varying from $6.59x10^{-6}$ Pa

63 BFR standards for validation. Soil and Sludge. Determination of selected polybrominated diphenylethers (PBDEs) by gas chromatography-mass spectrometry (GC-MS).

at 21°C (c-octa-BDE). The extremely hydrophobic nature of octa-BDE is determined by the high value of Log Kow > 6 (Table 75).

Table 75: Physico-chemical properties of commercial c-octaBDE products[64]

Properties	c-octa-BDE	
Chemical formula	$C_{12}H_2Br_8O$	
Molecular weight	801.38 g/mol	
Melting point	130-155°C (Dead Sea Bromine Group, 1993), 70-150°C (Albemarle, 1997) and 167-257°C (Ethyl Corporation, 1992), (various commercial products)	
Boiling point	None. Decomposes at high temperatures over 400°C (commercial product)	
Relative density	2.9 (commercial product)	
Vapor pressure	$6.59.10^{-6}$ Pa (commercial product)	
Water solubility	0.5 µg/L (commercial product)	
Log Kow	6.29	
Flammability	Not applicable. Flame retardant (BFR)	
Autoflammability	Not applicable. Flame retardant (BFR)	
Explosive properties	None	
Oxidizing properties	None	
Br content	79% w/w	
Physical state	Commercial products are light-grey powder or flakes. Pure congeners of PBDE are crystalline substances.	
Components of the commercial product	Hexa/PentaBDE: HeptaBDE: OctaBDE: NonaBDE: DecaBDE:	1.4– 12% 43 – 58% 26 – 35% 8-14% 0 – 3%

Behavior in the environment and environmental toxicity

C-Octa-BDE[65] form tight bonds with soil particles and sediment and they do not decompose quickly in anaerobic conditions. Increased concentrations of octa-BDE are found in the air, water, soil, food, sediment, sludge and dust. In the environment, processes such as photolysis, anaerobic breakdown and metabolism in biota could result in debromination of octa-BDE, where the product is PBDE with a lower content of bromine atoms which have higher toxicity and bioaccumulation potential.

For example, volatile losses during a 10-year lifecycle of a finished product make up 0.54% of the c-Octa-BDE content, while losses from non-homogenized particles from c-OctaBDE amount to 2%. These emissions end up in industrial and urban soils (~75%), air (~0.1%) and surface waters (~24.9%). The greatest rate is that of emissions during the lifecycle of the finished products, upon dismantling and recycling of products, especially waste containing c-OctaBDE.

Exposure and health effects

Even though octa-BDE congeners are bioaccumulating, experimental results show that they do not bioconcentrate (BCF < 9.5) in living organisms, probably because of the large size of the molecules which cannot pass through the cell walls of living organisms.

OctaBDE has no recorded harmful health effects on people but studies with animals prove hazardous effects on the liver, the thyroid gland and cause neurobehavioral changes.

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[64] European Commission, Octabromodiphenyl ether, Summary RAR 014, 2001, Final Report 2004, UK.
[65] The 9 New POPs, Risk Management Evaluations 2005-2008 (POPRC1-POPRC4),[(UNEP/POPS/POPRC.3/20/Add.1) and (UNEP/POPS/POPRC.4/15/Add.1)].

3.2.3.3.3. Properties and POPS characteristics of c-deca-BDE

The technical product of decabromodiphenyl ether (deca-BDE) is a mixture of 2 main congeners: decabromodiphenyl ether (deca-BDE) and nonabromodiphenyl ether (nona-BDE). Table 77 shows the physico-chemical properties of the commercial mixtures of decaBDE.

Table 76: Chemical identity of c- deca BDE

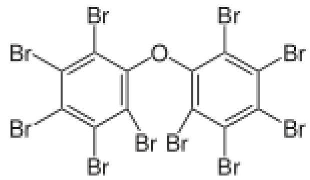
Chemical name	BDE congener	CAS No.	EU No.	Empirical formula	Molecular weight	Structural formula
Deca-bromodiphenyl ether	BDE-209	1163-19-5	214-604-9	$C_{12}Br_{10}O$	959,1714 g/mol	

Table 77: Physico-chemical properties of commercial c- deca BDE BDE products[66]

Properties	C-decaBDE
Chemical formula	$C_{12}Br_{10}O$
Molecular weight	959.20 g/mol
Melting point	300-310°C (various commercial products)
Boiling point	Decomposes at > 320°C,, >400 and 425 °C (for the various commercial products)
Relative density	3.0 (commercial product)
Vapor pressure	$4.63.10^{-6}$ Pa at 21°C (commercial product)
Water solubility	< 0.1 µg/L at 25°C
Log Kow	6.27
Flammability	Not applicable. Flame retardant (BFR)
Autoflammability	Not applicable. Flame retardant (BFR)
Explosive properties	None
Oxidizing properties	None
Br content	83% w/w
Physical state	Commercial products are white to light-grey crystalline powder, depending on the manufacturer.
Components of the commercial product	OctaBDE: 0.04% NonaBDE: 2.5% DecaBDE: 97.4%

Behavior in the environment and environmental toxicity

Deca-BDE are discharged in the environment through various processes – in the production of deca-BDE-containing products and by the products themselves as well as in the recycling of products containing this substance. A study conducted in 2006 established that the concentration of deca-BDE(BDE-209) in the environment is increasing. DecaBDE has a very low potential for forming dioxins/furans during recycling. This makes it possible to recover these materials. Plastics treated with deca-BDE remain non-flammable and with good mechanical properties even after repeated recycling.

Exposure and health effects

Deca-BDE is one of the best studied compounds with over 1 000 studies of the potential effects on the human health and the environment.

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[66] European Commission, Decabromodiphenyl ether, Summary RAR 017, 2002, Final Reort 2002, France and UK.

Exposure to deca-BDE is possible through contaminated food. People and animals do not absorb deca-BDE well, only ca. 2% of the oral dose is absorbed and can be metabolized. Once in the human body, deca-BDE exits unchanged or as metabolites within a couple of days. In people deca-BDE is found in the blood and in milk but with lower levels than the other PBDE congeners like 47, 99 and 153. Results show that deca-BDE are not a special risk for the human health and the environment.

3.2.3.4. Production, manufacturers and composition of commercial mixtures of PBDE

Even though theoretically there are 209 isomers/congeners of PBDE, commercial products used as BFR contain only a limited number of congeners. The production of PBDE ranks second in today's flame retardant compounds, represented mostly by the fully brominated isomer decabromodiphenyl ether (decaBDE-209).

The following 7 congeners of brominated diphenyl ethers are mainly found in the commercial products of PBDE (Table 78).

Table 78: Main congeners of PBDE found in commercial products[67]

Polybrominated diphenyl ethers (PBDE)	CAS No.
Tetrabromodiphenyl ether (tetraBDE)	40088-47-9
Pentabromodiphenyl ether (pentaBDE)	32534-81-9
Hexabromodiphenyl ether (hexaBDE)	36483-60-0
Heptabromodiphenyl ether (heptaBDE)	68928-80-3
Octabromodiphenyl ether (octaBDE)	32536-52-0
Nonabromodiphenyl ether (nonaBDE)	63936-56-1
Decabromodiphenyl ether (decaBDE)	1163-19-5

PBDE are manufactured in China, Japan, USA and the EU countries (Peltola et al., 2001, & TNO-report 2005). China also used to manufacture PBDE for its domestic market[10]. At the beginning of the 90s, PBDE was manufactured worldwide by 9 companies with various trademarks – one in the Netherlands, one in France, one in Belgium, one in England, two in the USA, one in Israel and three in Japan (WHO, 1994 and KEMI, 1994)[68].

BFR are produced by three corporations in the following regions:

Table 79: Manufacturers of PBDE

BSEF companies	Albemarle	Chemtura	ICL Industrial Products
Countries manufacturing BFR	USA, France, Belgium, England, Germany, Austria, Jordan, Japan	USA, England, France	Israel, the Netherlands, China

The typical composition of the modern commercial mixtures of PBDE is shown in table 80.

Table 80: Typical composition of the modern commercial mixtures of PBDE (DecaBDE RAR 013, 2002)

Component	Abbreviation	Composition of commercial mixtures of PBDE, %			
Congener of PBDE		c-PentaBDE		c-OctaBDE	c-DecaBDE
Year		1997	2000	1997	2000
Tribromodiphenyl ether	TriBDE		0.23		
Tetrabromodiphenyl ether	TetraBDE	33.7	36.02		

[67] Risk Management Strategy for Polybrominated Diphenyl Ethers (PBDEs) Emvironment Canada, December 2006; UNEP-POPs-POPRC-SUBM-F08-OBDE-CAN-A1.
[68] European Commission, Decaaromodiphenyl ether, Final RAR 013, 2002, UK and France.

Component	Abbreviation	Composition of commercial mixtures of PBDE, %			
Congener of PBDE		c-PentaBDE		c-OctaBDE	c-DecaBDE
Year		1997	2000	1997	2000
Pentabromodiphenyl ether	PentaBDE	54.6	55.10		
Hexabromodiphenyl ether	HexaBDE	11.7	8.58	5.5	
Heptabromodiphenyl ether	HeptaBDE			42.3	
Octabromodiphenyl ether	OctaBDE			36.1	0.04
Nonabromodiphenyl ether	NonaBDE			13.9	2.5
Decabromodiphenyl ether	DecaBDE			2.1	97.4

3.2.3.4.1. *Production, use and content of commercial mixtures of c-penta-BDE* [69]

HISTORICAL PRODUCTION OF C-PentaBDE[70]

Commercial mixtures of c-PentaBDE were manufactured in Israel, Japan, USA and Europe. China also used to manufacture c-PentaBDE for its domestic market until 2007. Since 2004 c-PentaBDE is not manufactured in the countries which are parties to the Bromine Science and Environmental Forum (BSEF). In Japan the production of c-PentaBDE was voluntarily discontinued in 1990 (UNECE, 2007), and in the USA – at the beginning of 2005 [Landry S Albermarle, personal communication (2008)]. In the EU the production of c-penta-BDE was discontinued in 1997 and its use decreased drastically in 2001, where it is only used in polyurethane foam (PUR).

The use of c-penta-BDE in the EU was prohibited in 2004 and as of 1 July 2006 its use in EEE has been restricted to 0,1%, pursuant to the RoHS Directive 2002/95/EC. Currently c-penta-BDE is not manufactured in the USA, Canada, Europe, Australia, Japan, Israel [SFT 2009].

MANUFACTURERS OF C-PentaBDE

Only 6 companies manufactured commercial mixtures of c-penta-BDE: four companies in Europe (England and the Netherlands), one in the USA and one in Israel. Currently, they do not manufacture c-PentaBDE (Table 81). No data is available about the manufacturers in Japan and China.

Table 81: Manufacturers of commercial mixtures of c-PentaBDE[71]

Manufacturer	Country
BRE - BUILDING RESEARCH ESTABLISHMENT	England
GREAT LAKES CHEMICAL (EUROPE) LTD.	England
INSTITUTE FOR TERRESTRIAL ECOLOGY	England
EUROBROM B.V.	The Netherlands
GREAT LAKES CHEMICAL CORPORATION (now CHEMTURA)	USA
ISRAEL CHEMICAL AND INDUSTRIAL PRODUCTS (former Dead Sea Bromine Group)	Israel

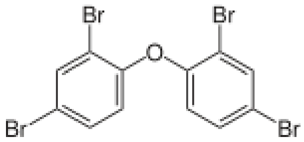
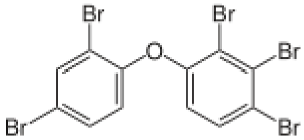
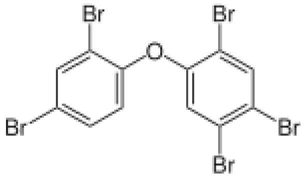
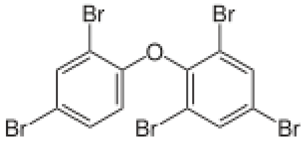
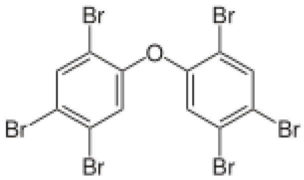
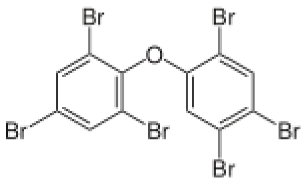
COMPOSITION OF THE COMMERCIAL MIXTURES OF C-penta-BDE

C-PentaBDE is a technical mixture of brominated diphenyl ethers, mainly isomers of penta-BDE and tetra-BDE, predominantly BDE-47 (38 – 42 %) and BDE-99 (45 – 49%).

C-PentaBDE is used mostly for the production of PUR for furniture and upholstery, in car seats and in EEE. Commercial mixtures of PentaBDE are also used for special applications in textiles and in the industry. The typical composition of c-PentaBDE is given in table 82.

[69] UNEP/POPS/COP.4/INF24, Guidance on feasable flame - retardant alternatives to commercial pentabromodiphenyl ether, 2009.
[70] European Commission, Pentaromodiphenyl ether, Summary RAR 015, 2000, Final Reort 2000, UK.
[71] UNEP/POPS/POPRC.2/17/Add.1, Pentabromodiphenyl ether, Risk profile, November 2006.

Table 82: Composition of the commercial product c-PentaBDE[72]

Structural formula	Congener	Name	% content∗
	BDE-47	2,2′,4,4′-tetra-bromodiphenyl ether	38–42 %
	BDE-85	2,2′,3,4,4′-penta-bromodiphenyl ether	2.2–3.0 %
	BDE-99	2,2′,4,4′,5-penta-bromodiphenyl ether	45–49 %
	BDE-100	2,2′,4,4′,6-penta-bromodiphenyl ether	7.8–13 %
	BDE-153	2,2′,4,4′,5,5′-hexa-bromodiphenyl ether	5.3–5.4 %
	BDE-154	2,2′,4,4′,5,6′-hexa-bromodiphenyl ether	2.7–4.5 %

∗ Only congeners with more than 1 % content are listed.

Source : http://en.wikipedia.org/wiki/Polybrominated_biphenyl_ethers

The two major components tetra-BDE (BDE-47) and penta-BDE (BDE-99; BDE-100) of the commercial product c-penta-BDE make up respectively 31% and 56% of its content. There are also traces (<1%) of congeners BDE-17, BDE-28 and BDE-154 and minimum quantities (4-12%) of BDE-153 [Risk 2000]. The content of congeners varies in the different regions of the world [SFT 2009; Penta_UNEP 2006], (Table 83).

Table 83: Composition of c-penta-BDE (Canada 2006; SFT 2009)

PBDE	TriBDE	TetraBDE	PentaBDE	HexaBDE	HeptaBDE
CAS No.	49690-94-0	40088-47-9	32534-81-9	36483-60-0	68928-80-3

[72] M. J. La Guardia, R. C. Hale, E. Harvey: Detailed Polybrominated Diphenyl Ether (PBDE) Congener Composition of the Widely Used Penta-, Octa-, and Deca-PBDE Technical Flame-retardant Mixtures, Environ. Sci. Technol., 2006, 40, 6247–6254.

Congeners	BDE-17	BDE-28	BDE-47	BDE-99	BDE-100	BDE-153	BDE-180
Content, %	Traces		Basic	Basic	Minimum	Minimum	Traces
	[~0-1%]		[~24-38%]	[~50-62%]		[4-12%]	[<1%]
Average %			[31%]	[56%]		[8%]	[1%]
			Σ (Tetra-, Penta-, Hexa- and HeptaBDE) ~96%				

TRADEMARKS WITH C-penta-BDE

C-pentaBDE[73] are marketed with various trademarks: DE-60F; Great Lakes DE-61; Great Lakes DE-62; Great Lakes DE-71; Bromkal 70'; Bromkal 70 DE; Bromkal 70-5DE, Bromkal G1; FR 1205/1215; Pentabromprop; Saytex 115; Tardex 50. Bromkal 70-5DE and Saytex 115 are no longer manufactured and marketed in the EU.

3.2.3.4.2. Production, use and composition of commercial mixtures of c-octa-BDE[74,75,76]

HISTORICAL PRODUCTION OF C-OctaBDE

C-octa-BDE were manufactured in Europe (England, Belgium, the Netherlands, and France), USA and Israel. In Japan, there was no production and their import and sales were voluntarily banned in 2005.[77] Today the production of c-OctaBDE has been terminated globally [BiPRO 2007].

MANUFACTURERS OF C-OctaBDE

According to the International Uniform Chemical Information Database (IUCLID, http://ecb.jrc.it/iuclid), BSEF and [BiPRO, 2007], there are eight companies manufacturing c-OctaBDE, six of which are based in Europe. In Europe the production of c-OctaBDE was discontinued in 1997/1998 [ECB 2003], and in the USA – at the beginning of 2005 [Landry S Albermarle, (2008)].

Table 84: Manufacturers of commercial mixtures of c-OctaBDE (ECB 2011)

Manufacturer	Country
ALBEMARLE S.A.	Belgium
BRE - BUILDING RESEARCH ESTABLISHMENT	England
GREAT LAKES CHEMICAL (EUROPE) LTD.	England
EUROBROM B.V.	The Netherlands
ELF ATOCHEM	France
CHEMISCHE FABRIK KALK	Germany
ISRAEL CHEMICAL AND INDUSTRIAL PRODUCTS (former Dead Sea Bromine Group)	Israel
GREAT LAKES CHEMICAL CORPORATION (now CHEMTURA)	USA

COMMERCIAL MIXTURES OF C-OctaBDE

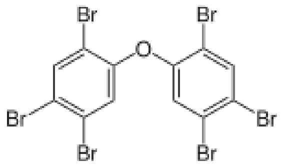
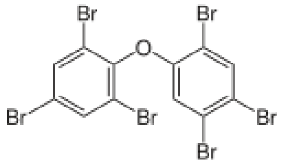
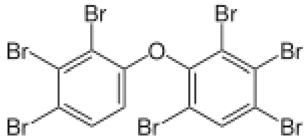
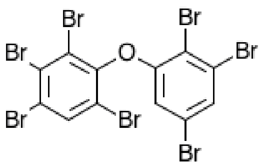
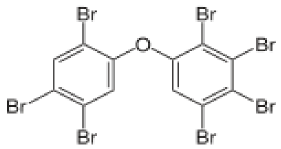
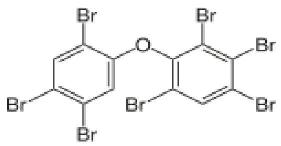
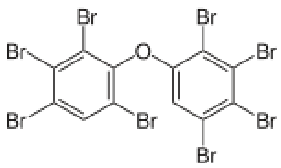
HexaBDE and HeptaBDE are major components of c-octa-BDE, but in practice they contain congeners from penta- to deca-BDE, in various rates depending on the year or country of production.

The summarized information about the composition of commercial mixtures of c-OctaBDE (UNEP, 2008) from various sources (e.g. WHO, OECD, Great Lakes Chemical Corporation,

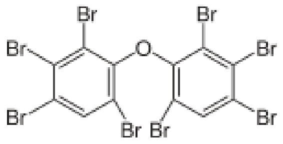
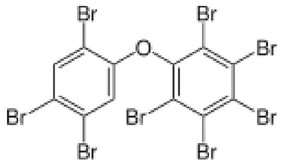
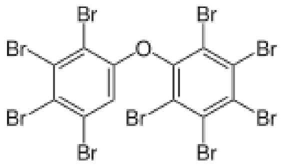
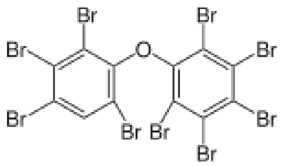
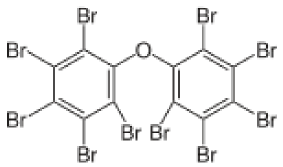
[73] WHO IPCS (1994) and COM(2000)
[74] Final Report "Study on waste related issues of newly listed POPs and candidate POPs", BiPRO, 25 March 2011, updated 13 April 2011
[75] Information on New POPs, Summary of Risk Profiles, POPRC meetings 2-4
[76] European Commission, Octabromodiphenyl ether Risk Assessment Report RAR 014, 2003
[77] Japan's Comments on the Draft Risk Management Evaluation for Commercial octabromodiphenyl ether

Chemische Fabrik Kalk, wikipedia, etc.) shows that the % of the main components hexa-BDE and hepta-BDE in commercial mixtures varies from 0.3% to 12.0% for hexa-BDE and from 12.8% to 58.0% for hepta-BDE in the period of production 1994 – 2005.

Table 85: Composition of the commercial product c- OctaBDE[78]

Structural formula	Congener	Name	% content
	BDE-153	2,2′,4,4′,5,5′-hexa-bromodiphenyl ether	0.15–8.7 %
	BDE-154	2,2′,4,4′,5,6′-hexa-bromodiphenyl ether	0.04–1.1 %
	BDE-171	2,2′,3,3′,4,4′,6-hepta-bromodiphenyl ether	0.17–1.8 %
	BDE-175	2,2′,3,3′,4,5′, 6-hepta-bromodiphenyl ether	43 – 58 %
	BDE-180	2,2′,3,4,4′,5,5′-hepta-bromodiphenyl ether	n.d.–1.7 %
	BDE-183	2,2′,3,4,4′,5′,6-hepta-bromodiphenyl ether	13–42 %
	BDE-196	2,2′,3,3′,4,4′,5,6′-octa-bromodiphenyl ether	3.1–10.5 %

[78] M. J. La Guardia, R. C. Hale, E. Harvey: Detailed Polybrominated Diphenyl Ether (PBDE) Congener Composition of the Widely Used Penta-, Octa-, and Deca-PBDE Technical Flame-retardant Mixtures, Environ. Sci. Technol., 2006, 40, 6247–6254.

Structural formula	Congener	Name	% content
	BDE-197	2,2′,3,3′,4,4′,6,6′-octa-bromodiphenyl ether	11–22 %
	BDE-203	2,2′,3,4,4′,5,5′,6-octa-bromodiphenyl ether	4.4–8.1 %
	BDE-206	2,2′,3,3′,4,4′,5,5′,6-nona-bromodiphenyl ether	1.4–7.7 %
	BDE-207	2,2′,3,3′,4,4′,5,6,6′-nona-bromodiphenyl ether	11–12 %
	BDE-209	Deca-bromodiphenyl ether	1.3–50 %

Source : http://en.wikipedia.org/wiki/Polybrominated_biphenyl_ethers

TRADEMARKS OF C-OctaBDE

The trademarks of OctaBDE products placed on the market are mainly: DE-79™; Bromkal 79-8DE; FR 143; Tardex 80; FR 1208; Adine 404; Saytex 111.

3.2.3.4.3. Production, use and composition of commercial mixtures of c-DecaBDE

MANUFACTURERS OF C-deca-BDE[79,80,81]

Deca-BDE manufactured in Europe (Belgium, England, France and the Netherlands), Japan and USA [ECB 2003]. In the EC the production of c-deca-BDE was discontinued in 2004. They are currently manufactured in the USA, Israel and Japan. There are six companies manufacturing c-deca-BDE, five of which are based in Europe (Belgium, England, France and the Netherlands).

Table 86: Manufacturers of commercial mixtures of c-deca-BDE [IUCLID and BSEF (BiPRO 2007)]

Manufacturer	Country
ALBEMARLE S.A.	Belgium
BRE - BUILDING RESEARCH ESTABLISHMENT	England
ELF ATOCHEM	France

[79] European Commission, Bis(Pentabromophenyl) – decaBDE, Risk Assessment Report RAR 013, 2002 & RAR 013 add (2004)
[80] The Swedish Chemicals Inspectorate's Survey of June 2005 on alternatives to DecaBDE in plastics (KEMI, 2005)
[81] The publications of the Danish EPA (2006)

Manufacturer	Country
SYLACHIM DIVISION SOCHIBO	France
EUROBROM B.V.	The Netherlands
GREAT LAKES CHEMICAL CORPORATION (now CHEMTURA)	USA

According to another source[82], after 2004 deca-BDE is manufactured by 4 companies – two from the USA, one from Israel and one from Japan.

Table 87: Manufacturers of commercial mixtures of c-DecaBDE (Peele, 2004)

Manufacturer	Trademark	Country
ALBEMARLE S.A.	SAYTEX 102E	USA
ISRAEL CHEMICAL AND INDUSTRIAL PRODUCTS (former Dead Sea Bromine Group)	FR 1210	Israel
GREAT LAKES CHEMICAL CORPORATION (now CHEMTURA)	DE-83R, DE-83E	USA
TOSOH CORPORATION	Flamecut 110R	Japan

COMMERCIAL MIXTURES OF c-DecaBDE

C-deca-BDE are used in a number of polymer materials used in EEE where their content in plastic components reaches 10-15%. C-deca-BDE[83,84] manufactured in the EU include over 97% deca-BDE and 0.3 – 3% other brominated diphenyl ethers, mostly nona-BDE (European Commission, 2002). The composition of older products or products from other sources is different: 77.4% deca-BDE, 21.8%, nona-BDE and 0.85 % octa-BDE (which are no longer marketed in the EU).

TRADEMARKS C- deca-BDE

Commercial mixtures of deca-BDE are marketed with the following trademarks: FR-300 BA; DE-83-RTM; Saytex 102; Saytex 102E; FR-1210; Adine 505; AFR 1021; Berkflam B10E; BR55N; Bromkal 81; Bromkal 82-ODE; Bromkal 83-10 DE; Caliban F/R-P 39P; Caliban F/R-P 44; Chemflam 011; DE 83; DP 10F; EB 10FP; EBR 700; Flame Cut BR 100; FR 300BA; FR P-39; FRP 53; FR-PE; FR-PE(H); Planelon DB 100; Tardex 10; NC-1085; HFO-102; Hexcel PF1; Phoscon Br-250; NCI-C55287.

Source: Brominated diphenylethers (EHC 162, 1994); http://www.inchem.org/documents/ehc/ehc/ehc162.htm

3.2.3.5. Historical use of PBDE

PBDE are a large group of brominated flame retardant additives (BFR) with various applications globally (Table 88). Three major commercial products of PBDE are manufactured and marketed: c-penta-BDE, c-octa-BDE and c-deca-BDE.

Table 88: Use of the various technical PBDE products

Deca-BDE	Octa-BDE	Penta-BDE
• TV sets • PC casings • Electronic equipment	• TV sets • PC casings • Office equipment	• Printed circuit boards • Cable applications and electrical boxes • Car seats

[82] BSEF, Major Brominated Flame Retardants Estimates, http://www.bsef-site.com.
[83] M. J. La Guardia, R. C. Hale, E. Harvey: Detailed Polybrominated Diphenyl Ether (PBDE) Congener Composition of the Widely Used Penta-, Octa-, and Deca-PBDE Technical Flame-retardant Mixtures, Environ. Sci. Technol., 2006, 40, 6247–6254.
[84] Risk Assessment Report (RAR), “Review of production processes of DecaBDE used in polymeric applications in electrical and electronic equipment and assessment of the availability of potential alternatives to DecaBDE”, Sazan Pakalin et al., January 2007, EUR 22693 EN, European Chemicals Bureau, European Commission, DG ENV.

Deca-BDE	Octa-BDE	Penta-BDE
components • Printed circuit boards • Cable applications and electrical boxes • Car seats • Furniture • Textiles	• Consumer electronics • Car parts • Electronic equipment	• Upholstered furniture • Textiles • Foam fillers • Isolation boards • PVC piping • Isolation foam, wall coatings • Carpets • Construction panels • Plastic paneling • Transport belts

47 separate commercial products of PBDE have been identified [Lassen et al. (1999) and WHO IPCS (1997)]. Ca. 30 of them are widely used for various applications (OECD 1994).

PBDE are used in various resins, polymers, copolymers and materials. The main uses of PBDE in decreasing order of importance are: high impact polystyrene (HIPS), acrylonitrile-butadiene-styrene copolymers (ABS), elastic polyurethane foam (PUR), textile articles (exclusive of garments), wire and cable isolations, electronic/electric connectors/plugs ad other internal parts. (WHO IPCS, 1994).

❖ The commercial products of penta-BDE are almost entirely used in PUR for applications related to the production of upholstered furniture, mattresses, carpets and car seats.

❖ The commercial products of octa-BDE are used in ABS polymers for EEE applications.

❖ The commercial products of deca-BDE are mostly used in HIPS, which are most often used for the production of TV casings, PC casings, printed circuit boards and some types of non-flammable textile articles.

3.2.3.5.1. Historical use of c-PentaBDE

The widest use of c-PentaBDE in Europe (EU-27) is in PUR, making up 95 % of the total use of c-PentaBDE, mainly for the following applications: car seats, upholstered furniture, curtains, upholstery, mattresses, pillow filling, wadding, etc.

The other applications of c-PentaBDE include materials and finished products such as polyvinyl chloride (PVC); epoxy resins (ER); unsaturated (thermosetting) polyesters (USPE); rubber, dye/lacquers, textiles and hydraulic oils, comprising only ~5 % of the total use of c-PentaBDE.

3.2.3.5.2. Historical use of c-octa-BDE in Europe

The main historical use of c-octa-BDE in Europe (EU-27) is in ABS polymers (95%). The typical concentration of c-Octa-BDE in ABS varies from 12 % by weight to 15 % by weight. On the other hand, ABS polymers are used mainly for the production of EEE and office equipment casings. Other insignificant applications (~5 %) include HIPS, polybutylene terephthalate (PBT), polyamide polymers (PA). Other possible applications are in nylon, low-density polyethylene (LDPE), polycarbonate (PC), phenol-formaldehyde resins, unsaturated esters (UPE), adhesives and coatings.

EEE and consumer electronics are identified as the only categories of EEE (3 and 4) – which are a significant source of c-octa-BDE in EU-27, representing 97.7 % of the waste plastic from discarded EEE, contaminated with octa-BDE.

3.2.3.5.3. Historical use of c-DecaBDE

Commercial mixtures of deca-BDE are used in numerous polymer applications. According to information provided by the industry, the content of c-deca-BDE in polymers is between 10% and 15%, and it is always used together with antimony trioxide (ATO) as a synergist.

The main application[85] of c-deca-BDE is in HIPS, which are used for TV casings. It is used in a number of other polymers ultimately used in EEE (PCs, connectors, electric boards, wires and cables, etc.). Examples of such polymers include polypropylene (PP) for electronics, acetate copolymers of ethylene-vinyl acetate (EVA) and ethylene copolymers for wires and cables, ethylene propylene diene terpolymer (EPDM) and thermoplastic elastomers for wires and cables and polyester resins for electronics. Other insignificant applications include styrene rubbers, polycarbonates, polyamides and terephthalates.

In Europe deca-BDE are permitted for all applications except EEE, where restrictions on the use were introduced in 2008. In the USA by the end of 2012 the production and use of deca-BDE will have been discontinued.

3.2.3.6. Alternatives to PBDE

Over the last years a number of corporations manufacturing electronics have been voluntarily giving up the use of c-DecaBDE as a flame retardant additive, gradually replacing it with safer compounds, like: Philips, Sony, Toshiba, Epson, Intel, Panasonic, NEC, Samsung, Hewlett Packard, Ericsson Apple, IBM, Network Technologies, Electrolux, Siemens, etc. Companies manufacturing furniture and textiles and garments such as IKEA, Marks & Spencer, H&M, and Skanska have already taken measures for the elimination of brominated diphenyl ethers from their products and their replacement by safer flame retardant additives.

Table 89: Examples of PBDE substitutes

Substance	CAS No.
DEEP, diethylethylphosphonate	78-38-6
DPK, biphenylcresylphosphate	247-693-8
RDP, resorcinol bis (biphenylphosphate)	57583-54-7
TEP, triethylphosphate	78-40-0
TCP, tricresylphosphate	1330-78-5
TPP, triphenylphosphate	1330-78-5
TPP, triphenylphosphate	115-86-6

The companies Dell, Hewlett-Packard, Compaq, Sony, IBM, Ericsson, Apple, Panasonic and Intel, which are manufacturers of EEE, have declared that they do not use PBDE in their products.

Table 89 shows examples of PBDE substitutes.

The following alternatives to PBDE as flame retardants are available:

ALTERNATIVES TO c-penta-BDE

- Inorganic alternatives: aluminium hydroxide (ATH); magnesium hydroxide or extruded graphite; ammonium polyphosphate; red phosphorus; zink hydroxystannate (ZHS); zink stannate (ZS); ZHS/ZS-coated ATH; zink borat; zink molybdenum compounds (together with phosphate esters); ammonium polyphosphate; red phosphorus; borax; antimony trioxide (ATO) and borax;

- Phosphorus/nitrogen organic alternatives: metal phosphinates; reactive nitrogen and phosphorus compounds (DOPO); triethyl phosphate; triphenyl phosphate; ammonium polyphosphate (APP); tricresyl phosphate; nitrogen-based melamine; *dimethylpropyl* phosphonate (DMPP); Reofos (non-halogenated flame retardant); alkyl diaryl phosphates; tetrakis hydroxymethyl phosphonium salts such as as chloride (THCP) or ammonium (THPX); dimethyl phosphono (N-methylol) propionamide; Diguanidine hydrogen phosphate; aromatic phosphates; dimethyl hydrogen phosphite (DMHP); Phospho nitrilic chloride (PNC);

[85] BSEF Fact Sheet for Deca-BDE, February 2006.

❖ Halogen organic alternatives: tribromoneopentyl alcohol; Tris(1,3-dichloro-2-propyl) phosphate(TDCPP); tetrabromobis phenol A (reactive); etylenebis (tetrabromo) phtalimid; vinylbromide; bromoalkyl phosphates; tetrabromophtalic anhydride based diol; tris(chloroethyl) phosphate (TCPP) (together with brominated polyols or red phosphorus); dibromostyrene; bis (tribromophenoxy) ethane; tetrabromo phthalate diol; trichloropropyl phosphate.

Source: (EHC 162 1994), (UNEP/POPS/POPRC.3/INF/23 2007), (Kemi, 2006), (Timpe 2007), (Haglund 2000), (Troitzsch 2007),(Supresta 2008). http://en.wikipedia.org/wiki/Penabromobiphenyl_ether

ALTERNATIVES TO c-OctaBDE

In the 90s, flame retardant additives tetrabromobisphenol-A (TBBPA) and 1,2-bis(tribromophenoxy)ethane (TBPE) were widely used as substitutes of c-octa-BDE in ABS polymers [Watson et al. (2010)].

For ABS applications, the following alternatives to c-octa-BDE are available: tetrabromobisphenol-A; 1,2-bis (pentabromophenoxy) triphenyl phosphate; resorcinol bis(biphenylphosphate); brominated polystyrene.

Source: http://en.wikipedia.org/wiki/Octabromobiphenyl_ether

ALTERNATIVES TO c-decaBDE[86,87]

Alternatives to c-decaBDE include non-halogen organo-phosphorous FRs (RDP, BDP,TPP), intumescent FR systems based on phosphorous and nitrogen compounds, red phosphorous, melamine cyanurate, melamine polyphosphate, organic phosphinates and magnesium dihydroxide. A total of 27 substitutes for c-DecaBDE have been identified, of which 16 are halogenated compounds and 11 are non-halogenated substances.

ALTERNATIVES TO BFR IN VARIOUS TYPES OF PLASTICS USED IN EEE CATEGORIES 1 TO 4

Table 90 shows the possible alternatives to BFR for certain types of plastics for EEE categories 1 to 4 (Kemmlein et al., 2009).

Table 90: Possible alternatives to BFR for certain types of plastics for EEE categories 1 to 4

ABS	EBP; EBTPI; TBBPA; TBBPA-epichlorhydrinpolymer; TBPE; 2,4,6-tris (2,4,6-tribromophenoxy)-1,3,5 triazine; brominated epoxy oligomer
ABS/PC	EBP; EBTPI; TBBPA carbonate oligomer; TBBPA-epichlorhydrinpolymer; brominated epoxy oligomer.
HIPS	EBP; EBTPI; HBCD; 2,4,6-tris(2,4,6-tribromophenoxy) -1,3,5 triazine; brominated epoxy oligomer.
PA	EBP; EBTPI; brominated polystyrene; poly(dibromostyrene)
PE	EBP; EBTPI; TBBP-A bis(2,3-dibromopropylether).
PP	EBP; EBTPI;

EBP: 1,2-bis(pentabromophenyl)ethane; EBTPI: ethylene bistetrabromophtalimide; TBBPA: Tetrabromobisphenol A; TBPE: bis(tribromophenoxy)ethane

[86] 2007_Review of Production process on decaBDE_Alternatives
[87] Deca-BDE and Alternatives in Electrical and Electronic Equipment, Environmental Project No. 1141, 2006, Miljøprojekt, Danish Ministry of Environment, Environment Protection Agency, Denmark, 2006.

USE OF COMMERCIAL MIXTURES OF BROMINATED FLAME RETARDANTS (BFR) TODAY

Table 91 below shows 21 various BFR which are used today (according to information provided by manufacturers, 2004).

Table 91: Brominated flame retardants (BFR) used today for commercial purposes88

№	CAS No.	CA name	Other names
1	79-94-7	Phenol, 4,4'-(1-methylethylidene) bis[2,6-dibromo-	Tetrabromobisphenol A (TBBPA)
2	21850-44-2	Benzen, 1,1'-(1-methylethylidene) bis[3,5-dibromo-4- (2,3- dibromopropoxy)-	Tetrabromobisphenol A 2,3-dibromopropyl ether
3	25327-89-3	Benzen, 1,1'-(1-methylethylidene) bis[3,5-dibromo-4-(2-propenyloxy)-	Tetrabromobisphenol A bis (allyl ether)
4	1163-19-5	Benzene, 1,1'-oxybis[2,3,4,5,6 pentabromo-	Decabromodiphenyl ether, (DecaBDE)
5	3194-55-6	Cyclododecane, 1,2,5,6,9,10-hexabromo-	Hexabromocyclododecane, (HBCDD or HBCD)
6	84852-53-9	Benzene, 1,1'-[1,2-ethanediylbis] bis[2,3,4,5,6-pentabromo-	Decabromobiphenylethane
7	37853-59-1	Benzene, 1,1'-[1,2-ethanediylbis(oxy)] bis[2,4,6-tribromo-	1,2-Bis (2,4,6-tribromophenoxy) ethane
8	637-79-1	1,3-Isobenzofurandione, 4,5,6,7-tetrabromo-	Tetrabromophthalic anhydride
9	3278-89-5	Benzene, 1,3,5-tribromo-2-(2- propenyloxy)-	2,4,6-Tribromophenyl allyl ether
10	20566-35-2	1,2-Bezenedicarboxylic acid, 3,4,5,6-tetrabromo-,2-(2-hydroxyethoxy) ethyl 2-hydroxypropyl ether	2-(2-Hydroxyethoxy) ethyl 2-hydroxypropyl 3,4,5,6-tetrabromophtalate
11	26040-51-7	1,2-Bezenedicarboxylic acid, 3,4,5,6-tetrabromo-,bis (2-ethylhexyl) ester	Di (2-ethylhexyl) tetrabromophthalate
12	25713-60-4	1,3,5-Triazine,2,4,6-tris (2,4,6-tribromophenoxy)	2,4,6-Tris (2,4,6-tribromophenoxy)-1,3,5-triazine
13	32588-76-4	1H-Isoindole-1,3(2H)-dione, 2,2'-(1,2-ethanediyl)bis [4,5,6,7-tetrabromo-	1,2-Bis (tetrabromophthalimido) ethane
14	58965-66-5	Benzene, 1,2,4,5-tetrabromo-3,6-bis (pentabromophenoxy)-	1,4-Bis (pentabromophenoxy) tetrabromobenzene
15	59447-55-1	2-Propenoic acid, (pentabromophenyl) methyl ester	2,3,4,5,6-pentabromobenzyl acrylate
16	118-79-6	2,4,6-tribromophenol	Tribromophenol
17	3296-90-0	1,3-Propanediol, 2,2-bis(bromomethyl)-	Pentaerythritoldibromide
18	36483-57-5	1-Proanol, 3-bromo-2,2-bis (bromomethyl)-	Tribromoneopentyl alcohol
19	79-27-6	1,1,2,2-tetrabromoethane	Tetrabromoethane
20	19186-97-1	1-Propanol, 3-bromo-2,2-bis (bromomethyl)-phosphate	Tris[3-bromo-2,2-bis(bromomethyl) propyl] phosphate
21	155613-93-7	1H-Indane, 2,3-dihydro-1,1,3-trimethyl-3-phenyloctabromo	Brominated Trimethylphenyl Indane

[88] Daniel Teclechiel, Synthesis and characterization of highly polybrominated diphenyl ethers, Department of Environmental Chemistry Stockholm University, 2008.

3.2.3.7. Key legislation for PBDE

✓ **Stockholm Convention on Persistent Organic Pollutants**

The Stockholm Convention bans the production, use, import and export of the following PBDE: tetrabromodiphenyl ether and pentabromodiphenyl ether (c-PentaBDE) and hexabromodiphenyl ether and heptabromodiphenyl ether (c-octaBDE), included in Annex A. The production and use of these PBDE in new products is prohibited. A specific exemption is provided for the use of PBDE in products manufactured from recycled materials which contain or could contain the same in compliance with the requirements of Part IV and V of Annex A. The import and export of commercial mixtures of c-penta-BDE and c-octa-BDE is prohibited, other than for environmentally-sound disposal and/or treatment.

✓ **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal**

The Basel Convention controls transboundary movements and management of hazardous wastes and their disposal. Control is exercised regarding waste of organohalogen compounds, including PBDE (Y 45).

✓ **Rotterdam Convention on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade (PIC)**

The Rotterdam Convention imposes bans and stringent restrictions in international trading in the following especially hazardous POPS – industrial chemicals for professional use: penta-BDE and octa-BDE, which are subject to the PIC procedure.

✓ **Persistent Organic Pollutants Protocol (UNECE) to the 1979 Geneva Convention on Long-range Transboundary Air Pollution (CLRTAP).**

The POPS Protocol introduces bans (b) or stringent restrictions (sr) for the production and use of certain industrial POPS chemicals for professional use and requires that conditions are provided for their environmentally-sound disposal and/or management and transboundary transportation of such waste in compliance with the requirements of the Basel Convention: commercial c-penta-BDE (sr) and c-octa-BDE (sr), added in Annex I to the POPS Protocol in 2009.

✓ **Regulation (EU) No 757/2010 and Regulation (EU) No 756/2010 amending Regulation (EC) No 850/2004 of the European Parliament and of the Council on persistent organic pollutants as regards Annexes I and III and Annexes IV and V respectively (OJ, L 223/25.08.2010), effective for Bulgaria as of 26.08.2010.**

The amendments to Annexes I, III and IV, V of Regulation (EC) No 850/2004 add the individual PBDE groups of the congeners tetra-BDE, penta-BDE, hexa-BDE and hepta-BDE.

Annex I introduces values for insignificant quantities of all congeners of PBDE occurring as insignificant pollutants in substances, preparations, articles or as constituents of the flame-retarded parts of articles, in concentrations equal to or below 10 mg/kg (0,001 % by weight).

Annex I additionally introduces restrictions on the production, placing on the market and use of c-penta-BDE and c-octa-BDE in the EU. By way of derogation, the production, placing on the market and use of tetra-BDE, penta-BDE, hexa-BDE and hepta-BDE is allowed in the EU for

❖ articles and preparations containing concentrations below 1 000 mg/kg (0,1 % by weight), when produced partially or fully from recycled materials or materials from waste prepared for re-use;

❖ electrical and electronic equipment within the scope of Directive 2002/95/EC of the European Parliament and Council.

❖ use of articles already in use in the Union before 25 August 2010 containing PBDE is allowed.

The maximum concentration limit (MCL) of tetra-BDE, penta-BDE, hexa-BDE and hepta-BDE over which waste shall be considered hazardous in Annex IV and V has not been determined yet.

✓ **Directive 2002/96/EC on waste electrical and electronic equipment (WEEE) (OJ, L 37/13.02.2003)**

Directive 2002/96/EC applies to waste from discarded EEE falling into 10 categories listed in Annex I A, determining priorities for the utilization and re-use of components, materials and substances and recycling.

Annex II specifies the components, materials and substances which should be removed from any separately collected waste of discarded EEE, including plastics with brominated flame retardant additives.

✓ **Directive 2000/53/EC on end-of-life vehicles (ELV), (OJ, L 269/21.10.2000).**

The purpose of this Directive is to prevent the formation of ELV waste, to promote the re-use, recycling and other forms of recovery of ELV and their components.

In this context, it shall be kept in mind that ELV normally contain averagely 75% metal parts and 25% plastic components, and only some of them are elastic PUR containing brominated flame retardant additives such as c-penta-BDE.

The requirements introduced with Directive 2000/53/EC were transposed in the national legislation by the Regulation on the requirements governing the treatment of end-of-life vehicle waste, (Promulgated in the State Gazette, issue 104 dd. 26 November 2004), effective 15.01.2005.

✓ **Directive 2003/11/EC relating to restrictions on the marketing and use of certain dangerous substances and preparations (pentabromodiphenyl ether, octabromodiphenyl ether), (OJ, L 42/15.02.2003)**

As of 15 August 2004, pentabromodiphenyl ether and octabromodiphenyl ether can no longer be placed on the market in the EU or be used as substances or as components of substances or preparations in concentrations exceeding 0.1 % by weight. They may not be marketed or used in articles if such articles or their components treated with flame retardants contain these substances in concentrations exceeding 0.1 % by weight. In Bulgaria these restrictions apply as of 15 January 2005.

✓ **Directive 2002/95/EC (RoHS) on the restriction of the use of certain hazardous substances in electrical and electronic equipment (OJ, L 37/13.02.2003)**

The RoHS Directive prohibits the placing on the market and use of new EEE containing PBDE in concentrations exceeding 0,1 % by weight (1000 mg/kg) as of 1 July 2006 and applies to all congeners of PBDE. This restriction on the use does not apply to any EEE placed on the market before 1 July 2006.

✓ **Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE), (OJ, L 174/01.07.2011)**

Directive 2011/65/EU introduces restrictions on the placing on the market and use of hazardous substances in EEE, as well as the environmentally-sound recovery and disposal of waste EEE.

Annex II introduces restrictions for the use of PBDE in EEE to the maximum concentration of 0,1 % by weight in EEE.

Member States shall ensure that EEE placed on the market, including cables and spare parts for its repair, its reuse, updating of its functionalities or upgrading of its capacity, does not contain the PBDE substances listed in Annex II.

This restriction applies to medical devices and monitoring and control instruments which are placed on the market from 22 July 2014, to in vitro diagnostic medical devices which are placed on the market from 22 July 2016 and to industrial monitoring and control instruments which are placed on the market from 22 July 2017.

Member States shall adopt and publish, by 2 January 2013, the laws, regulations and administrative provisions necessary to comply with this Directive.

✓ **Regulation (EC) No 1907/2006 on the Registration, Evaluation, Authorisation and Restriction of chemicals (REACH), (OJ, L 396/29.05.2007)**

Regulation 1907/2006/EO (REACH) introduces restrictions on the placing on the market and use of certain hazardous substances, mixtures and articles on the territory of the EU, listed in Annex XVII.

Table 92: Annex XVII to Regulation (EO) 1907/2006 (REACH), amended by Regulation (EO) 207/2011

№	Designation of the substance, of the group of substances or of the mixture	Conditions of restriction
45.	Diphenylether, octabromo derivative $C_{12}H_2Br_8O$	1. Shall not be placed on the market, or used: — as a substance, — as a constituent of other substances, or in mixtures, in concentrations greater than 0,1 % by weight. 2. Articles shall not be placed on the market if they, or flame-retardant parts thereof, contain this substance in concentrations greater than 0,1 % by weight (1000 mg/kg). 3. By way of derogation, paragraph 2 shall not apply: — to articles that were in use in the Community before 15 August 2004, — to electrical and electronic equipment within the scope of Directive 2002/95/EC.

✓ **Regulation (EC) No 689/2008 concerning the export and import of dangerous chemicals (OJ, L 204/31.07.2008)**

The scope of this Regulation includes industrial chemicals for professional use penta-BDE and octa-BDE, subject to the PIC procedure; which are subject to strict restrictions on the use within the EU, and when exported, regarding their classification, packaging and labeling.

✓ **Regulation 1272/2008/EC (CLP) on the classification, labeling and packaging of substances and mixtures, (OJ, L 353/31.12.2008).**

This Regulation determines the terms and conditions for the classification of chemical substances and mixtures and the requirements on the packaging and labeling of hazardous chemical substances and mixtures. Pentabromodiphenyl ether (pentaBDE, CAS No. 32534-81-9) is included in tables 3.1 and 3.2 of Annex VI to the CLP Regulation.

❖ According to the CLP Regulation, pentaBDE is classified as toxic to certain human organs, very toxic to aquatic organisms, acute and chronic hazard category 1.

❖ Under Directive 67/548/EEC pentaBDE is classified as hazardous for humans and very toxic to aquatic organisms.

For OctaBDE and decaBDE there is no harmonized classification.

✓ **Directive 2008/105/EC on environmental quality standards in the field of water policy (OJ, L 348/24.12.2008)**

Directive 2008/105/EC establishes environmental quality standards (EQS) for priority substances and certain other pollutants, where the priority substances subject to monitoring include octa-BDE and deca-BDE. For penta-BDE*, the following EQS are determined both for the average annual values for inland surface water (AA-EQS), and the maximum concentration levels MCL (MAC-EQS):

❖ AA-EQS: 0.0005 μg/L

❖ MAC-EQS: 0.0002 μg/L

* For the group of priority substances covered by “brominated diphenylethers“ (No. 5), listed in Decision No. 2455/2001/EC, EQS is established only for the homogeneous substances No. 28, 47, 99, 100, 153 and 154.

✓ **Regulation No. 3 dd. 1.04.2004 on the classification of waste (promulgated in the State Gazette, issue 44/25.05.2004), effective 25.05.2004, as amended, State Gazette, issue 23/20.03.2012**

This regulation provides for the terms and conditions on the classification of waste by types and properties. The following codes apply for the classification of waste plastic or textiles contaminated with hazardous additives (PBDE):

Table 93: Annex 1 “Waste List”

Code	Waste description
04 02 09	Wastes from composite materials (impregnated textile, elastomer, plastomer)
04 02 22	Waste from processed textile fibers
07 02 13	Waste plastic
15 01 02	Plastic packaging
15 01 10 *	Packaging containing residues of hazardous substances or contaminated with hazardous substances
16 01 04 *	End-of-life vehicle waste
16 01 19	Waste plastic from dismantling end-of-life vehicle
16 01 21 *	Hazardous components other than 160107 to 160114, exclusive of 160112
16 02 15 *	Hazardous components removed from discarded equipment
16 02 13 *	Discarded equipment containing hazardous components (3), other than that in 16 02 09 to 16 02 12.
16 02 16	Components removed from discarded equipment, other than that in 16 02 15 *
16 03 05 *	Off-specification batches and unused products: organic wastes containing hazardous substances
17 02 04 *	Plastics, glass and wood containing hazardous substances
19 02 11*	Waste from physical and chemical processing of waste: Other wastes containing hazardous substances
19 12 04	Wastes from mechanical treatment of wastes: Plastic and rubber
20 01 35 *	Used electrical and electronic devices which contain hazardous components, with the exception of those that fall under 20 01 21 and 20 01 23 (3)

(3) Electrical and electronic devices which contain hazardous components include car batteries and batteries given in subgroup 16 06, and mercury lamps, glass cathode rods and other contaminated glass, etc. classified as hazardous

✓ **Regulation on the requirements for placing on the market of electrical and electronic equipment (EEE) and waste electrical and electronic equipment (WEEE) treatment and transportation, (Promulgated in the State Gazette, issue 36/02.05.2006, last amended, State Gazette, issue 29/08.04.2011)**

This regulation provides the requirements for placing on the market of EEE (category 1 to 10) and the collection, transportation, temporary storage, pretreatment, reuse, recycling, recovery and/or treatment of discarded EEE.

The regulation governs the restriction on the use of hazardous substances in EEE, including PBDE up to 0.1% by weight in homogeneous materials.

There shall be no placing on the market of any EEE listed in categories 1 to 10 according to Annex 1, containing PBDE, effective 01.07.2006.

✓ **Regulation on the requirements on the treatment of motor vehicle waste, promulgated in the State Gazette, issue 104/26.11.2004, effective 1.01.2005, as amended and supplemented, State Gazette, issue 53/10.06.2008, State Gazette, issue 5/20.01.2009, as last amended and supplemented, State Gazette, issue 29 dd. 8.04.2011.**

This regulation provides the terms and conditions governing the collection, temporary storage and dismantling of ELV and the recovery and/or disposal and attainment of the targets for reuse, recycling and/or recovery of waste from ELV and the requirements on the placing on the market of materials and components for the same. ELV shall be dismantled before further treatment or other appropriate measures shall be taken to restrict any adverse effect on the environment; hazardous materials and components shall be separated selectively as soon as possible so as to prevent the subsequent contamination of the waste from the shredding of ELV.

✓ **Regulation on environmental quality standards for priority substances and certain other pollutants (promulgated in the State Gazette, issue 88/09.11.2010, effective 09.11.2010)**

The regulation establishes environmental quality standards (EQS) for priority substances and certain other pollutants. Annex 1 provides the EQS for pentabromodiphenyl ether (pentaBDE)* both for the average annual values for inland surface water (AA-EQS), and the maximum concentration levels MCL (MAC-EQS):

- AA-EQS: 0.0005 µg/L
- MAC-EQS: 0.0002 µg/L

* For the group of priority substances covered by “brominated diphenylethers“ (No. 5), listed in Decision No. 2455/2001/EC, EQS is established only for the homogeneous substances No. 28, 47, 99, 100, 153 and 154.

✓ **Regulation on the terms and conditions governing the classification, packaging and labeling of substances and mixtures (promulgated in the State Gazette, issue 68/31.08.2010), effective 31.08.2010 to 31.05.2015**

This regulation provides the terms and conditions governing the classification of chemical substances and mixtures and the requirements on the packaging and labeling of hazardous chemical substances and mixtures. Pentabromodiphenyl ether (pentaBDE) is included in table 3.2 of Annex VI to Regulation (EC) No 1272/2008 (tables 94 and 95).

Table 94: Table 3.1 of Annex VI to Regulation (EC) No 1272/2008

Index	International chemical identification	EC No	CAS No	Classification		Labeling	
				Hazard Class and Category Code(s)	Hazard statement Code(s)	Pictogram, Signal Word Code(s)	Hazard statement Code(s)
602-083-00-4	Pentabromodiphenyl ether	251-084-2	32534-81-9	STOT RE 2 * Lact. Aquatic Acute 1 Aquatic Chronic 1	H373 ** H362 H400 H410	GHS08 GHS09 Wng	H373 ** H362 H410

Table 95: Table 3.2 of Annex VI to Regulation (EC) No 1272/2008

Index	International chemical identification	EC No	CAS No	Classification	Labeling
602-083-00-4	Pentabromodiphenyl ether	251-084-2	32534-81-9	Xn; R48/21/22, R64 N; R50-53	Xn; N R: 48/21/22-50/53-64 S: (1/2-)36/37-45-60-61

3.2.3.8. Preliminary Inventory of PBDE

3.2.3.8.0. Inventory methodology

The purpose of the preliminary inventory is to investigate the possible uses and applications of PBDE as independent substances or components of articles, EEE and vehicles and the potential presence of waste containing such compounds on the territory of Bulgaria. The preliminary investigation focused on the import, export, placing on the market and use of commercial mixtures of penta-BDE and octa-BDE in articles, EEE and vehicles for their main applications.

The collection of primary information for the preliminary inventory of PBDE was based on data about the import and export provided by years by the NSI, the Customs Agency and NRA; and about the use and application received from the industry using questionnaires. Data was also collected from EUROSTAT 2012 regarding the vehicles placed on the market by years for the period 1998 – 2010.

Additional information was received from the annual reports and public registers and electronic statements maintained by the EEA with the MoEW:

✓ Statements about the EEE placed on the market and the collected discarded EEE; statements about the import, export and placing on the market of vehicles according to information provided by the General Directorate Security Police (GD SP), Transport Security sector, and the accepted ELV from temporary storage sites and from ELV dismantling centers;

✓ Reports on the satisfaction of the requirements regarding placing on the market of EEE and treatment and transportation of EEE waste for the period 2006 – 2010;

✓ Methods to establish detailed rules for monitoring of objectives set out in terms of the reuse and recovery and recycling in Directive 2000/53/EO regarding ELV, approved by Order No. RD-1/03.01.2011 of the Minister of Environment and Water;

✓ Report on the satisfaction of the vehicle waste treatment requirements for 2005 – 2009;

Other sources of information used to identify and calculate the presumed net quantities of PBDE:

- EU Twinning Project BG07-IB-EN-05 "Strengthening the administrative capacity for practical implementation of legislation in the fields of electrical and electronic equipment, batteries and accumulators at national and regional level in Bulgaria", between the MoEW – Bulgaria, the Federal Environment Agency – Austria, the Ministry of Environment, Energy and Climate Change – Greece and the Federal Ministry of Environment, Nature Conservation and Nuclear Safety – Germany which ended on 31.07.2010.
- EU "Study on waste related issues of newly listed POPs and candidate POPs", 25 March 2011 (Update 13 April 2011), ESWI, BiPRO, 2011 and 26 August 2010, ESWI, BiPRO, 2010.
- Study assigned by the EC for the RoHS substances in discarded EEE "RoHS substances in mixed plastics from Waste Electrical and Electronic Equipment", Final Report, September 17, 2010, Patrick Wäger, Mathias Schluep and Esther Müller, EMPA, Swiss Federal Laboratories for Materials Science and Technology.
- Guidance under the Stockholm Convention "Guidance on feasible flame-retardant alternatives to commercial pentabromodiphenyl ether", 2009 (UNEP/POPS/COP.4/INF24).
- Stockholm Convention Statement on the 9 New POPS "Risk Management Evaluations 2005-2008" (POPRC1-POPRC4).
- Publications in the press about the registered new and used cars, 2011.

The preliminary inventory covers the following brominated flame retardant additives: commercial mixtures of penta-BDE, octa-BDE and deca-BDE, even though the latter is not prohibited for production and use under the Stockholm Convention but it is prohibited for import, export, production, placing on the market and use in the EU as of 2008.

The economic sectors included in the analyses of the mass waste flows were selected depending on the importance of the PBDE applications based on the available information. The following economic sectors were studied and identified as possible sources of PBDE in the mass waste flows assessed by importance of the individual commercial products of PBDE in the general flows.

Table 96 below shows the studied uses of PBDE by sectors of importance in Bulgaria.

Table 96: Selected uses of PBDE by sectors and importance for the purposes of the preliminary inventory in Bulgaria

Industry	Use	PBDE	Studied use
Vehicles	Use in PUR for seats in cars and other vehicles	C-pentaBDE C-decaBDE	□
Upholstered furniture and textile articles	Use in PUR for the manufacturing of upholstered furniture, mattresses, working apparel	C-pentaBDE C-decaBDE	□
EEE	Use in ABS polymers for EEE casings/boxes. Use in HIPS and PS;	C-octaBDE C-decaBDE	□
Construction, packaging, dyes/lacquers, hydraulic oils, cables, electric boards	Use in PVC, UPE, PS, rubber, dyes/lacquers, hydraulic oils	C-pentaBDE C-decaBDE	□

3.2.3.8.2. Production, placing on the market and use, import and export of commercial mixtures of PBDE

PRODUCTION OF COMMERCIAL MIXTURES OF PBDE

In Bulgaria, no commercial mixtures of penta-BDE, octa-BDE and deca-BDE are manufactured (Source: Industry, March 2012)

IMPORT AND EXPORT OF COMMERCIAL MIXTURES OF PBDE

According to information as at April 2011 from the NSI, AM and NRA for the period 1996 ÷ 2010 it is established that in Bulgaria there is no registered import and export of commercial mixtures of penta-BDE, octa-BDE and deca-BDE. For the period 2007 ÷ 2010, since Bulgaria's accession to the EU, no intra-community arrivals or dispatch are registered for and to the country, according to information of the NRA (Source: NSI, NRA, AM, April 2011).

PLACING ON THE MARKET AND USE OF COMMERCIAL MIXTURES OF PBDE

There is no information about placing on the market and use of PBDE as a substance or in commercial mixtures in Bulgaria. (Source: Industry, March 2012)

GENERAL CONCLUSIONS:

- **No PBDE or commercial mixtures of PBDE are manufactured in Bulgaria;**
- **The placing on the market of PBDE as a substance and in mixtures in concentration exceeding 0,1 % by weight is prohibited in Bulgaria, and no such products have been placed on the market;**
- **For the period 1996 ÷ 2010 there is no registered import and export of commercial mixtures of PBDE in Bulgaria.**

3.2.3.8.3. Production, placing on the market and use, import and export of polymer materials, finished products and articles potentially containing PBDE

POTENTIAL CONTENT OF C-PENTA-BDE IN RAW MATERIALS, FINISHED PRODUCTS, VEHICLES AND TEXTILE ARTICLES AND MATERIALS IN BULGARIA

- **PRODUCTION AND PLACING ON THE MARKET OF PUR CONTAINING c-penta-BDE**

In Europe the production of c-penta-BDE was discontinued in 1997, in China – in 2007, in Japan – in 1990 and in the USA – in 2005. [Landry S Albermarle, personal communication (2008)].

The widest use of c-penta-BDE in Europe (EU-27) is in PUR, making up 95 % of the total use of c-penta-BDE, used for car seats, upholstered furniture, mattresses, upholstery, carpets, textile articles, etc.

Therefore, this study for Bulgaria focuses on the production of PUR used mainly for upholstered furniture, mattresses, carpets, textile articles.

Expanding hard to burn polyurethane foam (PUR) "KovaFoam", and elastic hard to burn polyurethane block foam "HR", known as "DUNAPREN", is currently produced by two Bulgarian companies, mainly intended for upholstering furniture, production of mattresses, seats, pillows, etc. details which require softness and elasticity. Both companies have flame retardant certificates under British Standard BS 5852. The flame retardant additive used ["Fyrol PCF HA-1003" – Tris(2-chloroisopropyl)phosphate] does not contain bromine (Br).

As no import of commercial mixtures of c-penta-BDE has been registered in Bulgaria for the period 1996 ÷ 2010[89], it can be concluded that the PUR manufactured in the country do not contain c-penta-BDE. The same applies to the finished products manufactured in Bulgaria over the same period: upholstered furniture, mattresses, seats, pillows, etc. textile articles such as upholstering fabrics, curtains, upholstery, wadding, etc., where PUR are used.

CONCLUSIONS:

- ✓ **No PUR containing c-penta-BDE and finished products containing PUR are manufactured in Bulgaria;**
- ✓ **Two Bulgarian companies produce PUR, mainly intended for upholstering furniture, production of mattresses, seats, pillows, etc. Details. The flame retardant additive used does not contain c-penta-BDE.**

❖ **PRODUCTION, PLACING ON THE MARKET AND USE OF PRODUCTS AND FINISHED ARTICLES CONTAINING PBDE**

In the period January – March 2012, a preliminary study was conducted by the MoEW regarding the use of PBDE (penta-, octa- deca-BDE) in various applications as well as regarding the available alternatives in the country. For this purpose, detailed questionnaires were made which were distributed through RIEW to 185 various companies – importers, manufacturers and consumers down the chain and organizations for recovery and recycling of waste plastic. The selection criteria applied were connected to the various uses by economic sectors.

The analysis of the results from the study shows that PBDE is not imported, placed on the market or used independently, in mixtures and products, by any of the studied companies in the country. The study focused on the following applications: production of rubber and plastics, plastic and rubber products, elastic polyurethane foam (PUR), soft block polyurethane foam (dunapren), expanded polystyrene (EPS), upholstered and leather furniture, mattresses, working and protective apparel, textile (upholstering for furniture, curtains, canvas, tents, parachutes, spring-boards, shades, blinds, tents), rubber-coated and impregnated fabric, marine dye and lacquers, conveyor belts, carpets, rugs, leather and leather products, electric cables.

Organizations for recovery and recycling of waste plastic, discarded EEE and ELV stated that they did not identify any waste containing PBDE.

Alternatives to PBDE used for a variety of applications in Bulgaria

From all 185 studied companies, 4 stated that they use the following alternatives to PBDE for various applications:

[89] Information provided by the National Statistical Institute (NSI), the Customs Agency and the National Revenue Agency (NRA), 30.04.2011

1. Rubber and plastics: aluminum hydroxide: $Al(OH)_3$, CAS No.- 21645-51-2 (white powder with melting point 300°C), trademark: ARTINAL OL 104; manufacturer: MARTINSWERK, Germany, imported 800 kg/year from Germany.

2. Technical rubber articles: rubber mixtures delivered by a Bulgarian company based on SBR, NBR, EPDM and NR rubber. In 2011, 800 tons of rubber mixtures were used.

3. Elastic polyurethane foam (PUR): polyurethane PU 552 FL, manufacturer WEVO CHEMIE, Germany. Used in a two-component mixture with hardener WEVO HĂRTER 300 M, for 2011, 17 tons were imported from Germany.

4. Soft block polyurethane foam (PUR), (dunapren): alkylphosphate [Tris(2-Cloroisopropyl)Phosphate], CAS No. 13674-84-5, EU No. 237-158-7; trademark: Fyrol PCF; Manufacturer: ICL-IP Europe B.V., the Netherlands. In 2011, 1670 kg were used for the production of hard to burn dunapren, type CME – 40 40 B, satisfying fire requirements BS 5852, Part II, crib 5. Deliveries were made through the company's headquarters in Poland.

❖ IMPORT AND EXPORT OF POLYMER MATERIALS, PRODUCTS AND FINISHED ARTICLES CONTAINING C-PENTA-BDE

IMPORT OF POLYURETHANE RAW MATERIALS, MATERIALS AND ARTICLES (PUR) IN BULGARIA

The analysis of the data provided by the Customs Agency shows that there is no registered import from China of PUR which could have been treated with c-PentaBDE.

From the data about the import of PUR for the period 2001 – 2010 it is established that polymer materials were used for various applications – in construction, for marine lacquers and dyes, installation foam, flooring for sports facilities, glue, isolation foam for joints, anti-corrosion ground coats, in the textile industry, polyurethane foam for upholstering furniture and production of mattresses, etc.

Table 97: Import of polyurethane (PUR) and fabrics in Bulgaria from the USA (US) for the period 2001 - 2004

Year	IM (import)	Country of dispatch	Description	Country of origin	Net weight (kg)
2000	IM	DE	Liquid polyurethane	US	110
2001	IM	BE, NL, US	Polyurethane VULKEM 116 and VULKEM 451 - sealants for construction; Polyurethane resins QUALIPUR; Polyurethane coating TEKTAN 685 for metal surfaces	US	913
2002	IM	BE	Polyurethane VULKEM 116 - sealant; Polyurethane in unmodified form	US	472
2003	IM	DE, TR	Polyurethane and polyurethane resins; Polyurethane SONOLASTIC NP1 for joints	US	2 636
2004	IM	US, IT, DE	Polyurethane CARLISLE; Polyurethane in unmodified form	US	2 719
2000-2004			Total import in Bulgaria		**6 850**
2004	IM	US	Curtain blackout fabrics	US	13 806
2004			Total import in Bulgaria		**13 806**

Source: the Customs Agency, April 2011

It is assumed that the quantities of polyurethane foam (6.8 tons), and fabrics (13.8 tons) impregnated with PUR imported from the USA could not contain c-Penta-BDE over 0.1% by weight as the countries of dispatch are EU member states in which restrictions were introduced in 2003.

(Source: The Customs Agency, April 2011)

The polyurethane foam trademarks included in the statement show that the polymer materials have not been treated with c-Penta-BDE and it can be assumed that they do not contain brominated flame retardant additives.

- **CONCLUSIONS:**

✓ **For the period 2001 – 2010 there is no registered import of PUR and fabrics impregnated with PUR which could contain c-penta-BDE**

❖ EXPORT OF POLYMER MATERIALS AND POLYURETHANE (PUR) FROM BULGARIA

Polyurethane and polyurethane foam and polyurethane raw materials and articles were exported from Bulgaria mainly as waste or were reexported in another EU member state for the period 2001 – 2003. Polyurethane in unmodified form with country of origin USA and polyurethane foam with country of origin the Netherlands was reexported for Romania in 2001 and 2002 (11 340 kg).

Raw material for the production of dye - Polyurethane with the brand VORANOL CP 305, country of origin the Netherlands, was exported in 2002 for the Czech Republic (210 kg). 1 131 kg waste fabrics were exported - England (1114 kg) and the Netherlands (17 kg).

Table 98: Export of polyurethane (PUR) in kg from Bulgaria for the period 2001 – 2003

Polymer material	Year	Country of destination	Country of origin	Export/EX, Quantity, kg
Fabrics with PVC/waste residue coating	2001	England/GB	England/GB	200
Polyurethane in unmodified form	2001	Romania/RO	USA/US	10 710
Impregnated fabrics – floc in pieces, waste	2002	England/GB	England/GB	584
Fabrics with waste PVC coating	2002	England/GB	England/GB	330
Polyurethane foam	2002	Romania/RO	The Netherlands/NL	630
Raw materials for the production of dye - Polyurethane VORANOL CP 3055	2002	Czech Republic/CS	The Netherlands/NL	210
Laminated fabrics – defective and torn pieces	2003	The Netherlands/NL	The Netherlands/NL	17
Total export from Bulgaria				12 681

Source: The Customs Agency, 30 April 2011

- **CONCLUSIONS:**

✓ **PUR was exported from Bulgaria (12. 7 tons) for the period 2001 – 2003, mainly as waste, or it was reexported to another European country. It is unlikely that these materials were treated with c-Penta-BDE.**

❖ IMPORT AND EXPORT OF PASSENGER CARS WITH PUR CONTAINING C-PENTABDE

One of the main applications of c-penta-BDE is in PUR, used mainly in the car industry (car seats, head rests, upholstering on the roof, doors and over the trunk, shades and other plastic parts).

For Bulgaria it is assumed that the imported new (NPC) and used (UPC) passenger cars manufactured before 15 January 2005 could contain c-PentaBDE. This is why the study focuses on the export and import of NPC and UPC manufactured before that date.

Until 2011, no passenger cars were manufactured in Bulgaria, only busses and trucks. In 2012, a factory was opened for assembly of Chinese passenger cars in Lovech.

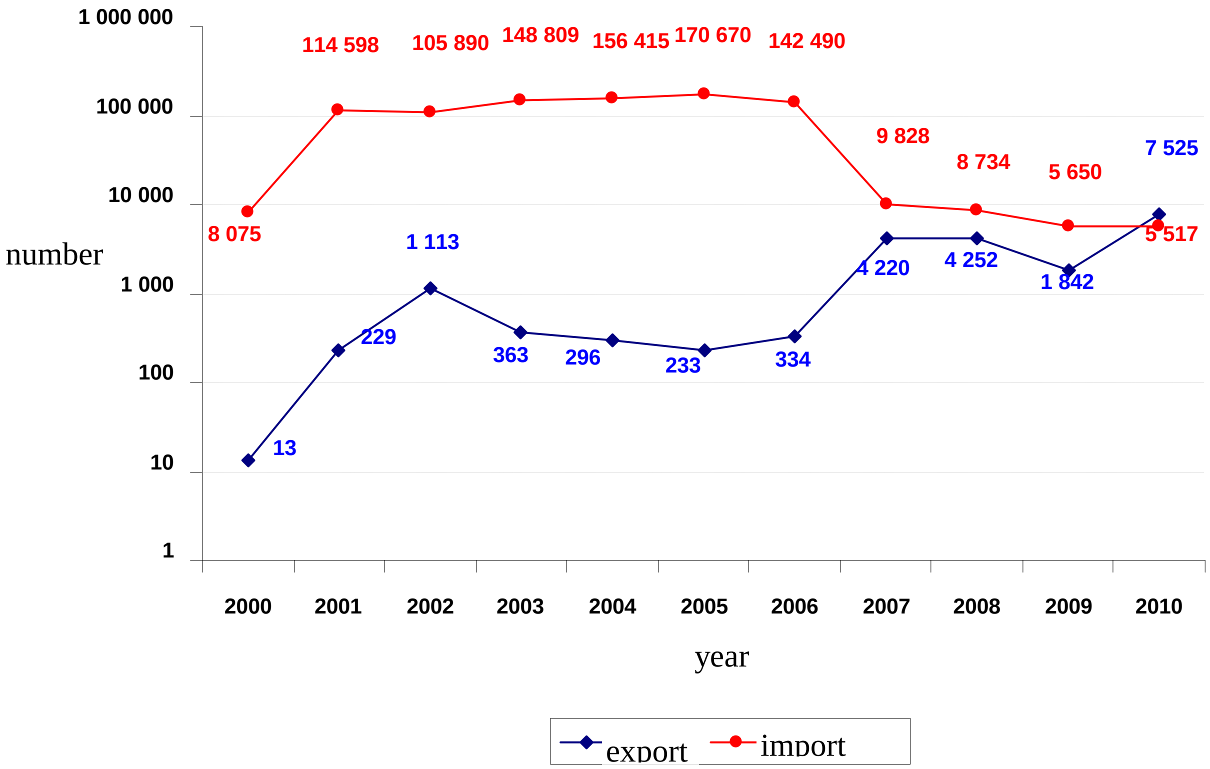
All cars and other vehicles (except for trucks and vans) with first registration were imported from countries outside the EU or were introduced from another EU member state. According to information provided by the Customs Agency from April 2011, for the period 2000 – 2010 a total of 948 967 passenger cars were imported in the country with net weight of 1 134 049 tons and 20 420 vehicles were exported with net weight 26 451 tons.

The Chinese cars assembled in Bulgaria do not contain any PUR treated with c-PentaBDE according to information provided by the company (questionnaire, March 2012).

Generally, the concentration of c-PentaBDE in the PUR foams used in the car vary between 2% and 18% by weight but concentration of 4% by weight of c-PentaBDE as specified by the manufacturers of car seats is considered to be the most realistic one and this is the value used for assessment of the potential presence of c-PentaBDE in passenger cars. Based on this assumption it is considered that a passenger car with average weight of 1000 kg could contain ca. 250 g c-PentaBDE, even though this figure is rather exaggerated since the treated PUR is ~6-7 kg per car on average[90].

Based on the information provided by the Customs Agency regarding the import of NPC and UPC (number and net weight, kg) for the period 2000 – 2010, the potential content of c-PentaBDE was calculated. The following formula was used for these calculations: ***net weight of the vehicle (kg) x 0.250 kg C-PentaBDE/1000 kg,*** for the NPC imported until 2005 and UPC imported until 2010.

It is assumed that the exported vehicles for the period 2000 – 2006 are only UPC (2 581) and they could potentially contain ca. 0.9 t C-PentaBDE. From 2007 until 2010, a total of 17 839 NPC and UPC were exported with net weight ca. 22 920 tons. For the period 2007 – 2010 the export of passenger cars increases even though Bulgaria does not have any production facilities. For example, in 2010 from the 7 525 cars exported, 40% are NPC, mainly reexported to EU member states due to the considerably lower prices of cars in Bulgaria.



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[90] FINAL REPORT “Study on waste related issues of newly listed POPs and candidate POPs”, BiPRO, 25 March 2011, (Update 13 April 2011).

Figure 42: Export of UPC (until 2006) and NPC+UPC (2007-2010) and import of NPC + UPC (2000 – 2005) and UPC (2006 – 2010) in Bulgaria, number of cars

Figure 42 and Table 99 show the number of vehicles imported and exported from the country by years, respectively the possible potential content of c-pentaBDE, kg. As the concentration limits for c-pentaBDE content in waste plastic from dismantled ELV have not been determined yet, and there is no legal requirement for specifying the content of c-pentaBDE в UPC, it could not be determined whether ELV contain any c-pentaBDE. The said quantities are indicative only, assuming that the passenger cars manufactured until 2005 contain 250 g c-pentaBDE per vehicle.

Table 99: Export of UPC (until 2006) and NPC+UPC (2007-2010) and import of NPC + UPC (2000 – 2005) and UPC (2006 – 2010) in Bulgaria, number and potential content of c-pentaBDE, kg

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Export, number of vehicles	13	229	1 113	363	296	233	334					2581
c-pentaBDE,kg	4	82	374	126	100	82	113					881
Import	8 075	114 598	105 890	148 809	156 415	170 670	142 490	9 828	8 734	5 650	5 517	876676
c-pentaBDE,kg	2 220	34 188	29 150	42 831	46 113	51 653	43 047	3 215	3 164	1 908	1 978	259467

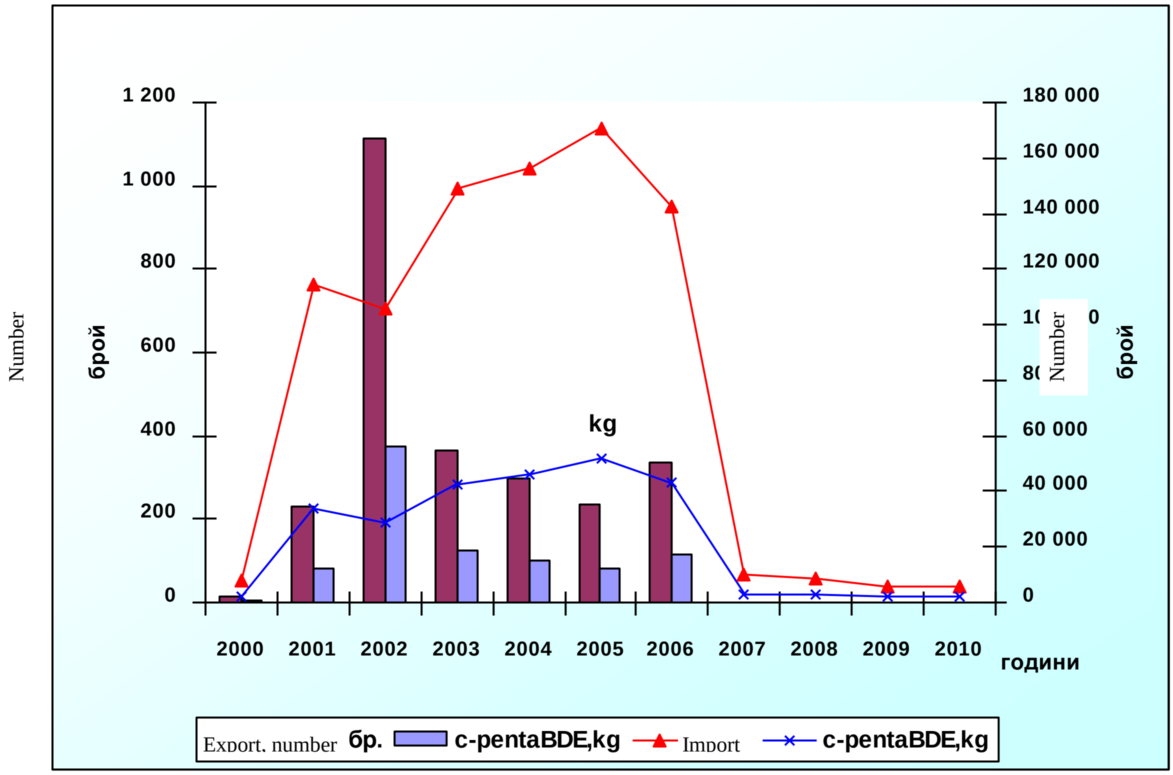


Figure 43: Export of UPC (until 2006) and NPC+UPC (2007-2010) and import of NPC + UPC (2000 – 2005) and UPC (2006 – 2010) in Bulgaria, number and potential content of c-pentaBDE, kg

According to information of the Customs Agency, for the period 2000 – 2010, 876 676 NPC and UPC were imported in Bulgaria, where the possible indicative content of c-pentaBDE calculated using the above formula is 259.5 tons. No tests were conducted regarding the content of c-pentaBDE.

GENERAL CONCLUSIONS:

✓ **No passenger cars are manufactured in Bulgaria, only busses and trucks. In 2012, a factory was opened for assembly of Chinese passenger cars in Lovech. The Chinese cars**

assembled in Bulgaria do not contain any PUR treated with c-PentaBDE according to information provided by the company.

✓ **For the period 2000 – 2010, a total of 876 676 NPC and UPC were imported in Bulgaria, mainly from EU member states, with 259.5 t indicative potential content of c-PentaBDE.**

✓ **For the period 2000 – 2010, 2 581 NPC and UPC were exported from Bulgaria, mainly for EU member states, with 0.9 t indicative potential content of c-PentaBDE.**

✓ **C-PentaBDE in NPC (until 2006) and UPC (until 2010) is 0.025% per passenger car based on the assumed content of 0.250 kg c-PentaBDE per 1000 kg average weight, which is below the admissible 0.1 % by weight.**

✓ **The presence of c-PentaBDE in ELV can be unconditionally identified only by testing samples from the waste plastic generated in the dismantling of the ELV. No such tests have been made in Bulgaria to date. This is why the specified quantities are indicative, especially considering that the plastic fraction waste is mixed which would result in concentrations within the admissible limits of 0.1% by weight.**

❖ **PLACING ON THE MARKET AND USE OF PASSENGER CARS (NPC AND UPC) AND ASSUMED CONTENT OF C-PENTA-BDE BY YEARS IN BULGARIA**

The number of initially registered NPC and UPC by years for the period 1992 ÷ 2011 has been constantly increasing and for 2011 this number is 2 815 157.

Figure 44 shows the total number of all registered vehicles (NPC and UPC) in the state register of vehicles in the country for the respective year over the period 1992 – 2011.

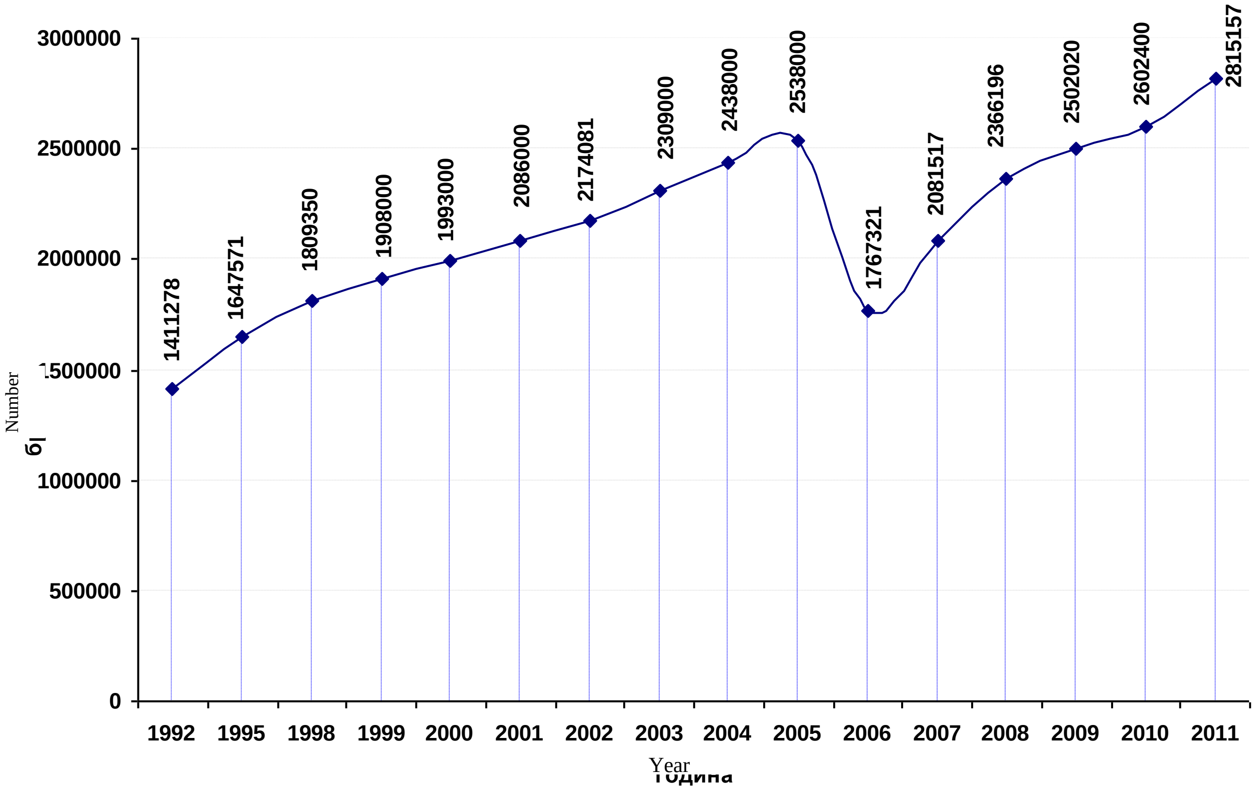


Figure 44: Initially registered NPC and UPC by years for the period 1992 ÷ 2011, number[91]

[91] Information from EUROSTAT, 2010; Capital Daily, 20.01.2012; EEA, Program for application of Directive 2000/53/EC for ELV, 2003;

Regardless of the constantly growing number of purchased NPC (2001 – 2008), they are still only a small part of passenger cars with first registration in the country.

The initially registered passenger cars in the MoI – GD SP in 2009 are 201 304 cars, but in 2010 they drop to 152 637 cars. The trend over the last couple of years for constantly growing numbers of purchased NPC and of UPC was discontinued in 2009 when the number of passenger cars placed on the market decreased by 43% compared to 2008. This is a result of the global financial crisis which had a considerable effect on the passenger car market. In the same time, the market of new cars has decreased with over 55% in 2009 and further 27% in 2010. This is paired by an increase in the purchased UPC (in 2010 there are 149 990 UPC and only 2 647 NPC). Until 2008 ca. 75% of the registered cars on average are UPC. In 2009 and 2010 this ratio increases to 87% while in 2011 it has reached 91%.

Table 100: Newly registered new and used passenger cars by years for the period 1992 – 2011, number[92]

Year	New passenger cars +	Used passenger cars	Total
1992	19839	24347	44186
1993	19703	64010	83713
1994	13566	62963	76529
1995	11129	45573	56702
1996	7570	61930	69500
1997	7790	20376	28166
1998	12196	58601	70797
1999	11958	91501	103459
2000	13069	85116	98185
2001	13365	103968	117333
2002	14361	92033	106394
2003	17220	159597	176817
2004	25786	143480	169266
2005	33434	149547	182981
2006	42625	152616	195241
2007	52009	296879	348888
2008	53812	297621	351433
2009	25705	175599	201304
2010	18820	133817	152637
2011	19136	193621	212757
Total++	433093	2 413 195	2 846 288

* According to information provided by the UIAB (Union of Importers of Automobiles in Bulgaria)
** According to information of the MoI, Traffic Police Sector

The market of new cars in Bulgaria in 2011 has recovered to some extent, with a 21% increase compared to 2010, 40% of which were reexported for EU member states. Newly registered UPC in 2011 are ten times the number of NPC (Table 100).

[92] EEA, Program for application of Directive 2000/53/EC for ELV, 2003; Reports by the EEA under the regulation on the terms and conditions for the treatment of waste from motor vehicles, 2005, 2006, 2007, 2008, 2009; information from the NSI; information from the Customs Agency, Capital Daily, 20.01.2012;

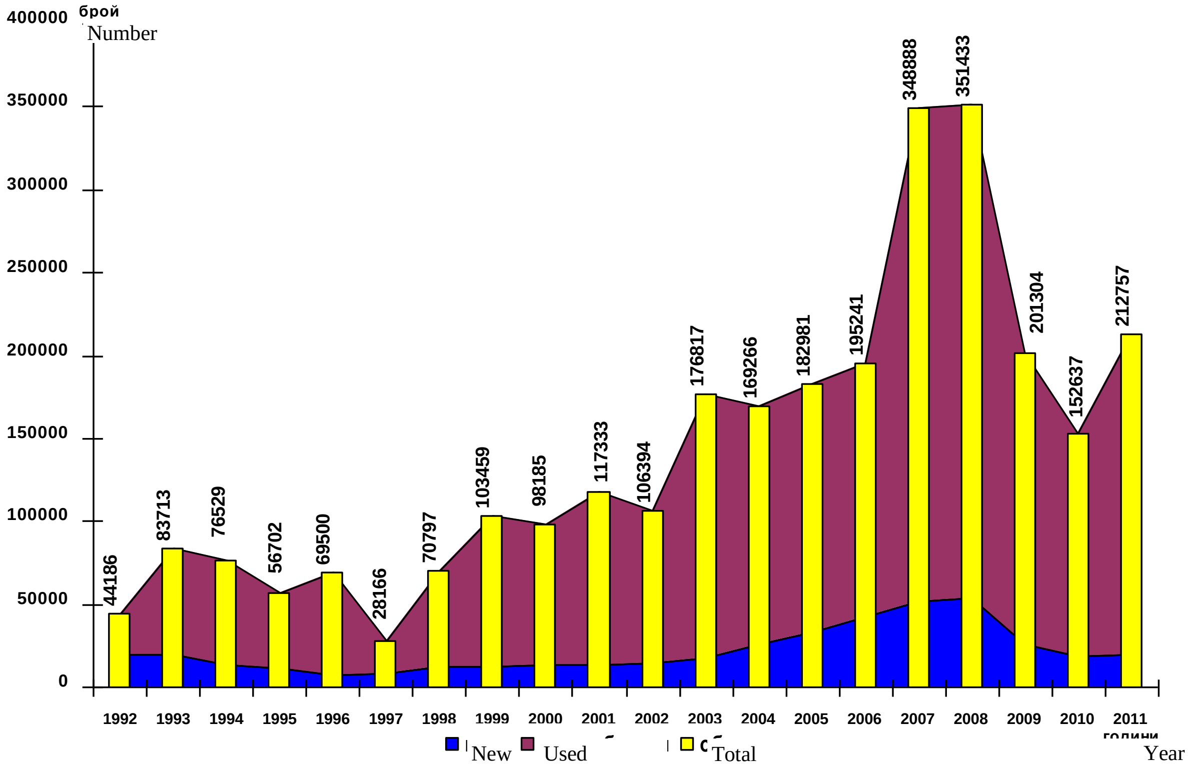


Figure 45: Newly registered NPC and UPC by years 1992 – 2011, number

When comparing the information from Figure 45 and Figure 46, it can be concluded that in 2011 the registration of 31 131 vehicles was terminated, which is the difference between the number of newly registered new and used vehicles in the TC by years for the period 1992 ÷ 2011 and the data about the new and used vehicles registered in the TC in 2011.

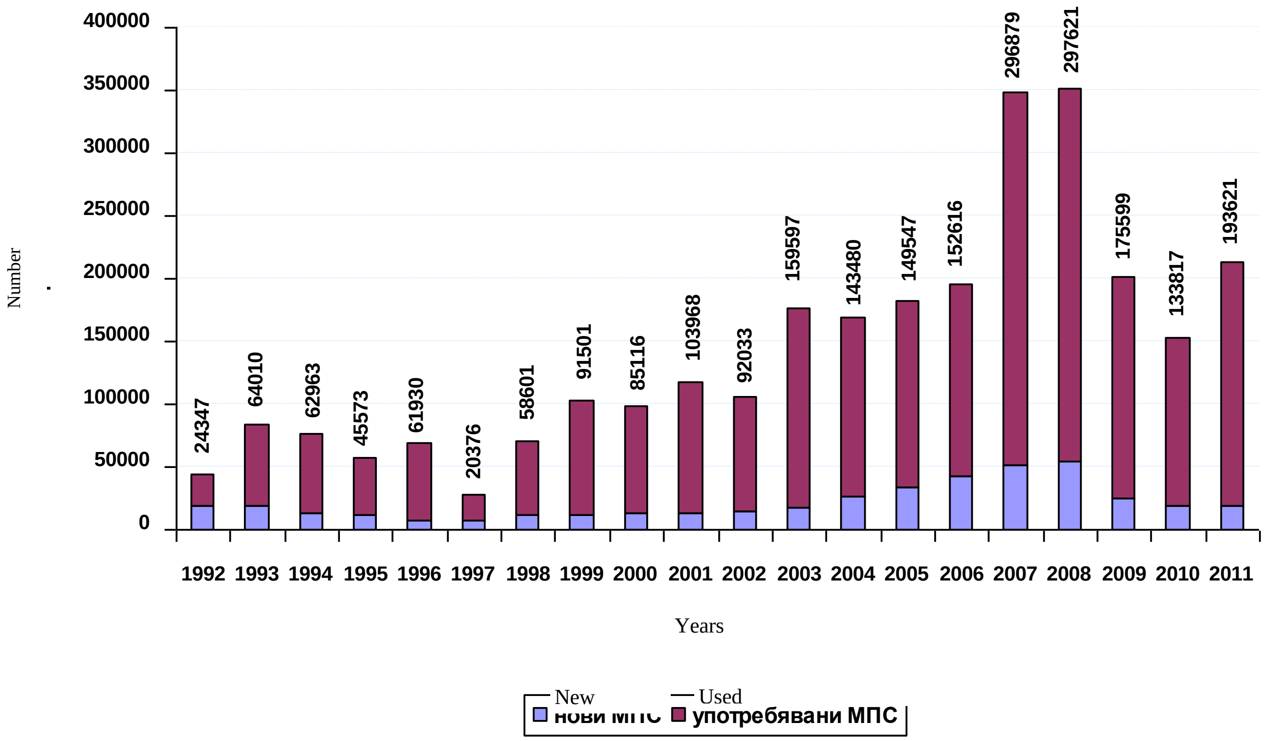


Figure 46: Newly registered NPC and UPC by years for the period 1992 – 2011, number

A specific feature of the car fleet in Bulgaria is its age structure. According to the statistics of the TC (2010), over 57% of the Bulgarian car fleet exceeds 15 years of age. More specifically, as a percentage the age of cars is as follows: 1 to 5 years - 8,39%; 6 to 10 years - 9,46%; 11 to 15 years - 24,35%; 16 to 20 years - 30%, and over 20 years - 27,34% (source: e-vestnik, 9 February 2011). The NPC imported and placed on the market for the period 1992 – 2005 are a total of 220 986 and the number of registered UPC for the period 1992 – 2011 is 2 413 195. For the purpose of the preliminary inventory of the indicative possible content of c-penta-BDE in vehicles, the total number of 2 634 181 vehicles is assumed for NPC (1992 – 2005) and UPC (1992 – 2011), making up 85% of the total number of registered vehicles.

Table 101: Newly registered new (1992 – 2005) and used passenger cars (1992 – 2011), number

Year	New passenger cars*	Used passenger cars	Total	Penta-BDE, kg
1992	19 839	24 347	44 186	11 047
1993	19 703	64 010	83 713	20 928
1994	13 566	62 963	76 529	19 132
1995	11 129	45 573	56 702	14 176
1996	7 570	61 930	69 500	17 375
1997	7 790	20 376	28 166	7 042
1998	12 196	58 601	70 797	17 699
1999	11 958	91 501	103 459	25 865
2000	13 069	85 116	98 185	24 546
2001	13 365	103 968	117 333	29 333
2002	14 361	92 033	106 394	26 599
2003	17 220	159 597	176 817	44 204
2004	25 786	143 480	169 266	42 317
2005	33 434	149 547	182 981	45 745
2006		152 616	152 616	38 154
2007		296 879	296 879	74 220
2008		297 621	297 621	74 405
2009		175 599	175 599	43 900
2010		133 817	133 817	33 454
2011		193 621	193 621	48 405
Total**	220 986	2 413 195	2 634 181	658 545

* According to information provided by the UIAB (Union of Importers of Automobiles in Bulgaria)

** According to information of the MoI, Traffic Police Sector

Source: Capital Daily, 20.01.2012;

The calculated indicative potential content of c-penta-BDE in 2 413 195 NPC and UPC placed on the market is ca. 658 tons, assuming that one passenger car contains 0.250 kg c-penta-BDE/1000 kg (0.025% by weight), which is below the admissible content of 0.1% by weight.

Directive 2000/53/EC provides for specific short-term and long-term objectives common to all member states, determines the general rules for organizing the systems for collection and dismantling, and expands the scope of obligations of vehicle manufacturers in terms of the cars manufactured and imported by them.

The agreed transitional periods for attainment of the objectives provided by Directive 2000/53/EC and transposed in the Regulation are presented in Table 102.

Table 102: Transitional periods for attainment of the objectives provided by Directive 2000/53/EC93

Periods from 01 January until 31 December of year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2015
Level of reuse and recovery	75%	85%	86%	87%	88%	89%	90%	91%	93%	95%
Level of reuse and recycling	70%	80%	80%	81%	81%	82%	82%	83%	84%	85%

Source: MoEW

GENERAL CONCLUSIONS:

✓ **For the purposes of a preliminary inventory to determine the indicative potential content of c-penta-BDE in vehicles, the total number of 2 634 181 vehicles is assumed from NPC (1992 – 2005) and UPC (1992 – 2011), making up 85% of the total number of registered vehicles (2 815 157).**

✓ **The calculated indicative potential content of c-penta-BDE in 2 413 195 UPC placed on the market is ca. 658 tons, assuming that one passenger car contains 0.250 kg c-penta-BDE/1000 kg (0.025% by weight), which is below the admissible content of 0.1% by weight.**

✓ **No tests have been made in Bulgaria to determine the content of c-PentaBDE in the waste plastic resulting from the dismantling of ELV and the specified quantities are indicative, especially considering that the plastic fraction waste is mixed which would result in concentrations within the admissible limits of 0.1% by weight.**

❖ **POTENTIAL CONTENT OF C-PENTA-BDE IN THE ELV ACCEPTED FOR DISMANTLING (WASTE)**

To determine the indicative content of c-penta-BDE in vehicle targets, the same data and assumptions were used as those in the Report of the European Commission (No ENV.G.4/FRA/2007/0066)[94].

For a more realistic evaluation of the condition of c-penta-BDE in a car, data about the component composition of dismantled ELV was also used according to the Methods setting detailed rules for monitoring the targets defined in terms of reuse and recovery and recycling in Directive 2000/53/EO regarding ELV.

Table 103: Component composition of dismantled ELV

Materials	%
Ferrous metals	77.05
Non-ferrous metals	4.84
Plastics	3.97
Rubber	3.69
Glass	1.86
Catalysts	0.15
Oil filters	0.13
Liquids (other than fuel)	0.85
Batteries	0.82
Other	6.64
Total	100.00

The component composition of dismantled ELV was calculated based on the average weight of the vehicles accepted for dismantling (tables 103 and 104).

[93] The targets for vehicles manufactured before 1 January 1980 are as follows: from 1 January to 31 December 2005 no less than 70 per cent of the weight of each ELV, where no less than 65 per cent shall be recycled, and from 1 January to 31 December 2006 no less than 75 per cent of the weight of each ELV, where no less than 70 per cent shall be recycled.

[94] FINAL REPORT "Study on waste related issues of newly listed POPs and candidate POPs", BiPRO, 25 March 2011, (Update 13 April 2011).

Table 104: Average weight of the ELV accepted for dismantling in Bulgaria

Average weight of ELV stated by the dismantling centers, in kg	Average weight of ELV, according to annual reports for 2008, in kg, (code: 16 01 04*)	Average weight of ELV, according to annual reports for 2008, in kg, (code: 16 01 06)	Average weight of ELV, according to quarterly statements for 2009, in kg	Average weight of ELV in the country, in kg
866.2	1014.8	918.3	1083.4	**970.68**

Considering this data, the quantity of plastics in a car with average weight of 970.68 kg is ca. 40 kg.

To assess the potential content of c-penta-BDE in ELV, the annual statements were used for the ELV accepted by temporary storage sites and dismantling centers for the period 2005 – 2011, elaborated on an annual basis by the EEA.

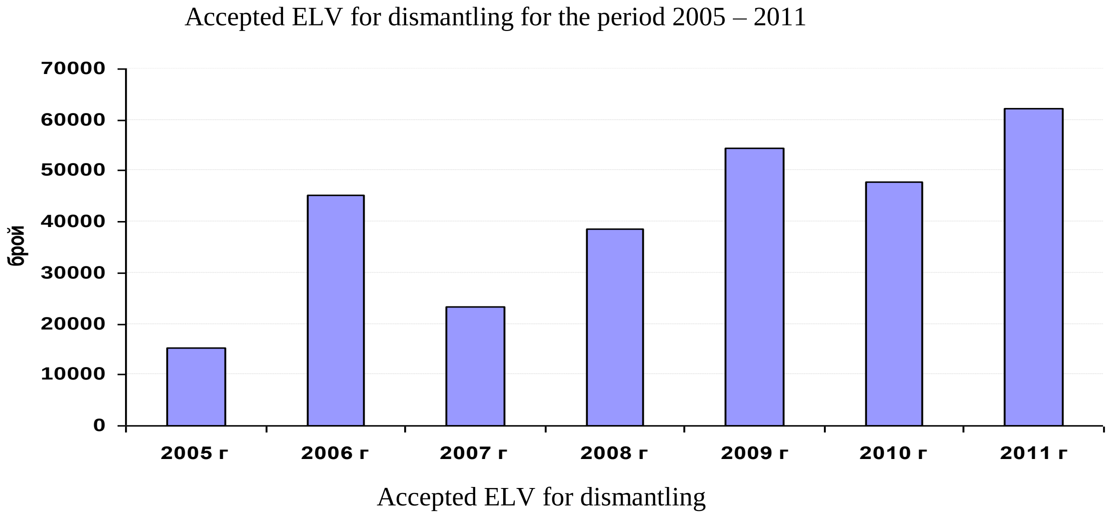
Table 105 and Figure 47 show the data about the number of accepted ELV by temporary storage sites and dismantling centers by years for 2005 – 2011.

Table 105: Statement about the end-of-life vehicles for the period 2005 – 2011

Statement about the vehicles, periods from 01 January until 31 December, year(1)	2005	2006	2007	2008	2009	2010	2011	Total 2005-2011	c-penta-BDE, kg
Accepted ELV by temporary storage sites and dismantling centers, number	15 340	45 127	23 433	38 600	54 451	47 755	62 276	286 982	71 746

Source: EEA, 2005 – 2011

Figure 47: Accepted ELV for dismantling for the period 2005 – 2011



According to information of the EEA, the ELV accepted for dismantling for the period 2005 – 2011 are 286 692, assumingly containing 71.7 tons c-penta-BDE.

Considering the specifics of the car fleet in Bulgaria, namely its age structure which is as follows according to the statistics of the TC (2011): over 57.5% of the Bulgarian car fleet (1 624 345 cars) exceeds 15 years of age and further 9,5% (18 985 cars) are between 6 and 10 years old, in the next

5 years the country will be facing a serious problem related to the generation of a large quantity of ELV waste.

Almost the whole quantity of ELV potentially contains c-penta-BDE, and upon the adoption of the MCL on PBDE in wastes, above which the waste will be considered hazardous, our country will be facing serious difficulties in the disposal of ELV waste containing c-penta-BDE since Bulgaria does not have a hazardous waste incineration plant and any polymer waste generated in the dismantling of ELV will have to be exported for disposal in EU countries.

The content of c-penta-BDE in a passenger car with average weight of 1000 kg is 0.025% (250 mg/kg) where for the purposes of placing on the market the maximum concentration is 0,1 % by weight c-penta-BDE (1 000 mg/kg). But if we calculated the content of c-penta-BDE considering the quantity of plastics which is 40 kg per car on average, we get 0.625% (6 250 mg/kg), which is 6 times the limit applicable for placing on the market, namely 0,1 % by weight c-penta-BDE. In case of approval of the proposed MCL of 5 000 mg/kg[95] for PBDE (per congener) in waste plastic according to Annex V to Regulation (EC) No 850/2004, the whole quantity of 435.9 tons of PUR waste (in the 62 276 ELV accepted in 2011 x 7 kg PUR per UPC)) generated in the dismantling of ELV will have to be treated as hazardous waste and be exported for disposal outside Bulgaria, provided that the remaining waste plastics have been separated (bumpers, dashboards, liquid tanks, etc., which do not contain any hazardous substances and are to be shredded.

No tests have been made in Bulgaria of samples of waste resulting from the dismantling of ELV (plastic components or elastic polyurethane foam from upholstered car seats) to determine the content of c-penta-BDE, because this is not required by the law. This is why the specified quantities of c-penta-BDE in ELV are indicative and it is currently assumed that they do not exceed the admissible limits of 0.1% by weight per ELV.

GENERAL CONCLUSIONS:

- ✓ **In Bulgaria the ELV accepted for dismantling by temporary storage sites and dismantling centers by years for the period 2005 – 2011 amount to a total of 286 692 cars and could contain c-penta-BDE. The indicative content is assessed at 71.7 tons.**
- ✓ **No tests have been made in Bulgaria of samples of waste resulting from the dismantling of ELV (plastic components or elastic polyurethane foam from upholstered car seats) to determine the content of c-penta-BDE, because this is not required by the law.**
- ✓ **This is why the specified quantities of c-penta-BDE in ELV are indicative and it is currently assumed that they do not exceed the admissible limits of 0.1% by weight per ELV.**

❖ POTENTIAL PRESENCE OF C-PENTABDE, C-OCTA-BDE AND DECA-BDE IN EEE PLACED ON THE MARKET AND COLLECTED DISCARDED EEE

To make a preliminary assessment of the potential presence of penta-BDE, octa-BDE and deca-BDEin EEE placed on the market and collected, pre-treated and recycled discarded EEE, information was used from the annual statements and reports of the EEA, elaborated in compliance with the Regulation on the requirements for placing on the market of electrical and electronic equipment (EEE) and waste electrical and electronic equipment (WEEE) treatment and transportation (Regulation on EEE), (Promulgated in the State Gazette, issue 36/02.05.2006, last amended, State Gazette, issue 29/08.04.2011), effective 01.07.2006.

The Regulation on EEE provides full transposing into Bulgarian legislation of the requirements of Directive RoHS 2002/95/EC on the restriction of the use of certain hazardous substances in

[95] Interim Report –Summary Report, “Study on waste related issues of newly listed POPs and candidate POPs”, BiPRO, Contract No ENV.G.4/FRA/2007/0066, 26 August 2010.

electrical and electronic equipment and of Directive 2002/96/EC regarding electrical and electronic equipment waste.

This preliminary assessment of the potential presence of penta-BDE, octa-BDE and deca-BDE was made based on the data collected for the period 2006 - 2011 regarding: the EEE placed on the market in the country from the persons placing EEE on the market; the collected, pre-treated and recovered discarded EEE from operators of collection and temporary storage sites, pre-treatment facilities and/or facilities for recovery of discarded EEE; the imported and exported EEE and the discarded EEE from the Customs Agency (CA); the quantities of EEE accepted and dispatched on the territory of the country from/to other member states of the European Community (EC) from the NRA; the EEE placed on the market in the country, including manufactured imported and exported EEE, from the NSI.

The Regulation on EEE prohibits the placing on the market of new EEE of certain categories containing PBDE (commercial mixtures of PentaBDE, OctaBDE and DecaBDE) over 0.1 % by weight.

The Regulation on EEE applies for:
a) EEE falling into the following categories:
1. Large household appliances; 2. Small household appliances; 3. IT and telecommunications equipment; 4. Consumer equipment; 5. Lighting equipment; 6. Electrical and electronic tools; 7. Toys, leisure and sports equipment; 8. Medical devices; 9. Monitoring and control instruments; 10. Automatic dispensers.
b) discarded EEE resulting from the use of EEE
c) waste resulting from the pre-treatment of discarded EEE.

Electrical and electronic equipment is conditionally divided into: household and non-household EEE.

The manufacturers of EEE and the manufacturers of materials and components for EEE are obliged to facilitate the pre-treatment and recovery, especially for reuse and recycling of discarded EEE and the materials and components for EEE in order to protect the human health, the environment and improve the safety of EEE.

The persons placing consumer EEE on the market are responsible for the separate collection, transportation, temporary storage, pre-treatment, reuse, recycling, recovery and disposal of discarded household EEE.

The persons placing consumer EEE on the market are responsible for the collection of discarded consumer EEE equal to no less than 4 kg per capita per annum. The source of information about the population is the NSI, where for the current year the data as at 31 December of the preceding year is used.

The manufacturers and importers of consumer EEE create systems for separate collection of discarded consumer EEE and they should ensure its collection from the end users.

The whole quantity of collected discarded EEE should be submitted for reuse as a whole appliance or for preliminary treatment, recycling and/or recovery. The recovery of discarded EEE organizations should have a permit issued as provided for by WMA. In 2010 there were eleven recovery of discarded EEE organizations.

Most of the discarded EEE collected separately for the period 2006 – 2011 was collected from households.

Every quarter there is an update on the EEA webpage regarding the quantity of EEE placed on the market in the country and the quantity of collected discarded EEE for each year and a summary statement of the EEE placed on the market and the collected discarded EEE for the whole year.

EEE PLACED ON THE MARKET IN THE COUNTRY

Based on the data received, the quantity of new household and non-household EEE placed on the market in Bulgaria for 2011 is 51 172 818 kg and over the whole period 1 July 2006 – 2011 it is 472 843 525 kg (Table 106).

Table 106: Statement about the household and non-household EEE placed on the market by categories EEE for the period 2006 2011[96]

Year / category	2006	2007	2008	2009	2010	2011*	2006 - 2011
	tons	tons	tons	tons	tons	tons	tons
1	8 649.988	6 933.264	2 855.540	41 097.443	36 381.159	36 606.506	132 523.900
2	119.460	213.800	145.620	2 537.459	3 100.252	2 879.013	8 995.604
3	631.213	1 255.415	618.640	3 301.070	3 334.479	3 104.598	12 245.415
4	206.501	219.306	71.530	5 631.114	4 880.724	4 743.490	15 752.665
5	161.376	599.426	231.940	613.091	478.415	452.636	2 536.884
5a	0.000	0.000	0.000	556.576	606.713	422.790	1 586.079
6	160.577	81.920	35.310	1 061.037	1 423.071	1 858.591	4 620.506
7	36.026	0.000	64.040	539.052	232.981	277.825	1 149.924
8	11.871	40.156	15.650	291.362	129.125	167.403	655.567
9	18.574	6.096	1.280	222.899	458.937	374.521	1 082.307
10	0.074	1.122	0.000	198.721	181.162	285.445	666.524
	76 062.000	104 250.14	102 236.77	8 038.33	440.906	0.000	291 028.150
Total	**86 057.660**	**113 600.648**	**106 276.322**	**64 088.153**	**51 647.924**	**51 172.818**	**472 843.525**

The suppositions, assumptions and conclusions regarding the potential presence of penta-BDE, octa-BDE and deca-BDE over 0.1 % by weight in the new EEE placed on the market are based on information from a recent market study in Switzerland for new EEE (Bantelmann, 2009). It covers consumer electrics, office equipment, household appliances and lighting equipment specified in a report[97] on hazardous substances in mixed plastics from discarded EEE dd. 17 September 2010 elaborated by the Swiss Federal Laboratories for Materials Science and Technology, with the contribution of the LIFE financial instrument of the European Community.

From the 1 359 pieces of new EEE which were studied, in 476 plastic components of these articles, mainly category 10 (automatic dispensers), 4 (consumer equipment) and 5 (lighting equipment), there were brominated flame retardant additives in concentrations > 500 ppm. The additional analysis of 214 samples regarding the content of TBBPA, HBCDA, PentaBDE (technical mixture BDE 71), OctaBDE (technical mixture BDE 79), DecaBDE and PBB found that these chemicals were present in 60 samples where DecaBDE was identified in 11% samples and OctaBDE – in 1%. PentaBDE were identified in no samples. Other BFR were found in 72 % of the samples. The market study leads to the conclusion that PBDE (penta-BDE, octa-BDE and deca-BDE) in the

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[96] Statements regarding the EEE placed on the market and the collected discarded EEE, 2006 – 2011, EEA and Reports under Article 50 of the Regulation on EEE, 2006 to 2010, EEA.

[97] RoHS substances in mixed plastics from Waste Electrical and Electronic Equipment (WEEE), Final Report, September 17, 2010, Patrick Wäger, Mathias Schluep and Esther Müller, Technology & Society Lab EMPA, Swiss Federal Laboratories for Materials Science and Technology, with the contribution of the LIFE financial instrument of the European Community.

scope of application of the Regulation on EEE have been replaced by other brominated compounds (Bantelmann, 2009; Kanton Bern, 2009; Tremp, 2010).

The quantity of new EEE categories 3 and 4 increases drastically from 1475 tons to 8932 tons in 2009, after which there is a certain decrease to 7848 tons in 2011, which is explained by the economic crisis of the last three years (Figure 9). The share of EEE categories 3 and 4, most probably containing polymer components treated with BFR, is 5.92% (27 998 t) of the total quantity of EEE placed on the market (472 844 tons) (Figure 48 and 49).

Figure 48: EEE placed on the market by categories in tons for 2006 – 2011

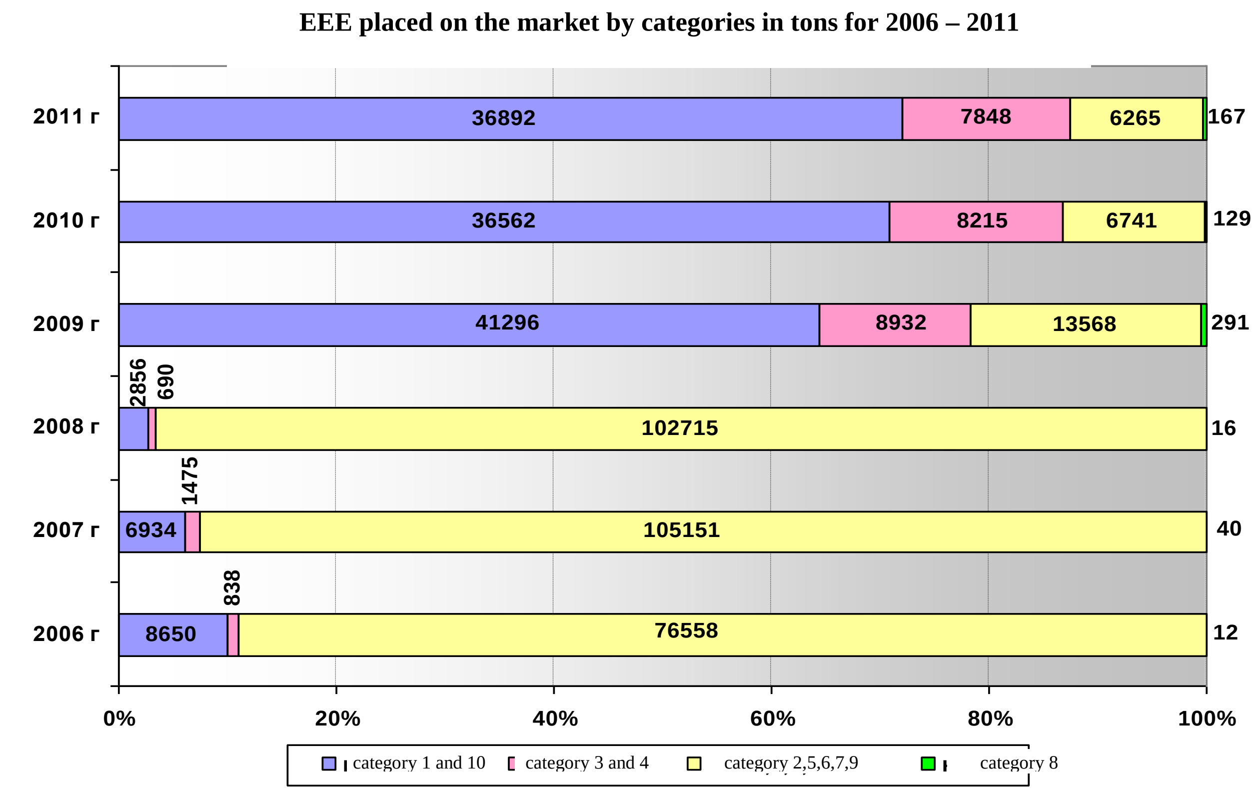
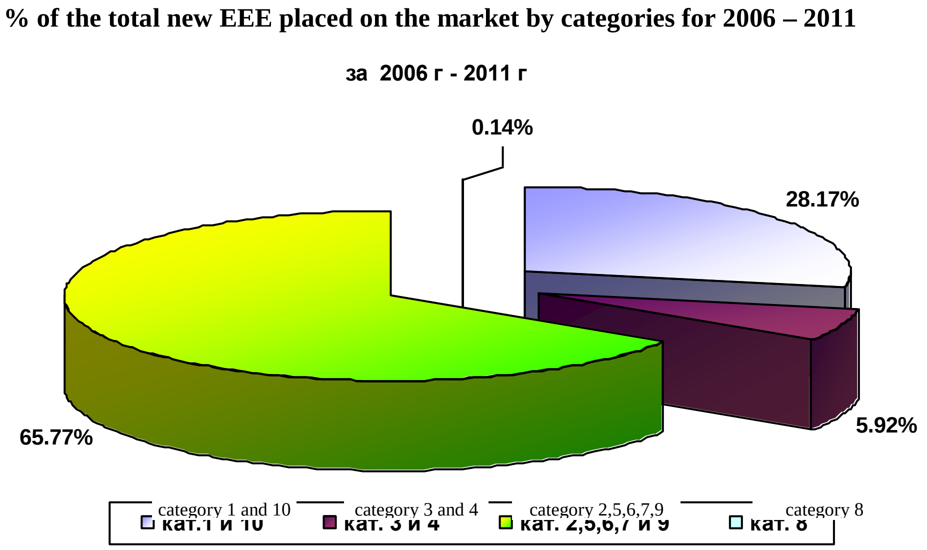


Figure 49: % of the total new EEE placed on the market by categories for 2006 – 2011



Since the prohibition for placing on the market of new EEE containing PBDE over 0,1 % by weight, mostly in ABS (category 1 to 4) and HIPS (category 3 and 4) polymer components, is effective as of 1 July 2006, the new EEE placed on the market in Bulgaria in the period 2006 – 2011 is not expected to exceed the maximum content limit of PBDE (octaBDE and decaBDE).

❖ **GENERAL CONCLUSIONS:**

✓ **The placing on the market of new EEE containing PBDE (penta-BDE, octaBDE and decaBDE) over 0,1 % by weight in Bulgaria is prohibited as of 1 July 2006.**

✓ **Over the period 2006 – 2011, the new EEE placed on the market in the country is 472 844 tons, of which 5.92% (27 998 tons) is EEE category 3 and 4;**

✓ **The new EEE placed on the market in Bulgaria is not expected to exceed the PBDE maximum content limit of 0,1 % by weight;**

✓ **No tests were made of any equipment, therefore no presence of prohibited PBDE has been established in practice in the EEE placed on the market.**

DISCARDED EEE COLLECTED IN THE COUNTRY

The collection systems and recovery organizations in Bulgaria are responsible for the collection, logistics and treatment / recycling/ recovery/ disposal of discarded EEE.

Waste flow management is one of the main issues in environmentally-sound collection and recycling of discarded EEE. The Regulation on EEE determines, among other, targets for separate collection and recycling/recovery and requires from the member states to take action for the achievement of these targets.

Table 107 shows the transitional periods for achieving the targets under the Regulation on EEE.

Table 107: Transitional periods for achieving the targets under the Regulation on EEE (Directive 2002/95/EC and Directive 2002/96/EC)

Transitional periods /Targets	01.07. – 31.12.2006	01.01. – 31.12.2007	01.01. – 31.12.2008	01.01. – 31.12.2009 ...
Collection of discarded EEE, kg per capita	0.4 kg	2.7 kg	4 kg	4 kg
Rate of recovery of discarded EEE, category 1 and 10	68%	75%	80%	80%
Rate of recycling or reuse of discarded EEE, category 1 and 10	65%	70%	75%	75%
Rate of recovery of discarded EEE, category 3 and 4	33%	50%	75%	75%
Rate of recycling or reuse of discarded EEE, category 3 and 4	30%	45%	65%	65%
Rate of recovery of discarded EEE, category 2, 5, 6, 7 and 9	45%	60%	70%	70%
Rate of recycling od reuse of discarded EEE, category 2, 5, 6, 7 and 9	43%	46%	50%	50%
Rate of recycling or reuse of discarded EEE, category 5a	45%	60%	80%	80%

A number of components, materials and substances, including plastics [PU; PUR; HIPS, ABS, PE, PP, PVC] containing PBDE (penta-BDE, octa-BDE and deca-BDE) must in all cases be removed from the separately collected discarded EEE without preventing the reuse and recycling of the components or the whole devices.

This study focuses on waste plastics from the dismantling of discarded EEE collected by recovery organizations, categories 1 (large household appliances); 2. (small household appliances); 3. (IT and telecommunications equipment); 4. (consumer equipment) (Table 108).

Table 108: List of the types of equipment falling into EEE categories 1 to 4

EEE category 1: Large household appliances	EEE category 2: Small household appliances:	EEE category 3: IT and telecommunications equipment	EEE category 4: Consumer equipment
Large cooling appliances	Vacuum cleaners	Mainframes	Radio sets
Refrigerators	Carpet sweepers	Minicomputers	Television sets
Freezers	Other appliances for cleaning	Printer units	Video cameras
Other large appliances used for refrigeration, conservation and storage of food	Appliances used for sewing, knitting, weaving and other processing for textiles	Personal computers (CPU, mouse, screen and keyboard included)	Video recorders
Washing machines	Irons and other appliances for ironing, mangling and other care of clothing	Laptop computers (CPU, mouse, screen and keyboard included)	Hi-fi recorders
Cooking	Grinders, coffee machines and equipment for opening or sealing containers or packages	Copying equipment	other products or equipment for the purpose of recording or reproducing sound or images (cameras, etc/)
Clothes dryers	Toasters	Notebook and Notepad computers	Audio amplifiers
Dish washing machines	Fryers	Printers	Musical instruments
Electric stoves	Electric knives	Electrical and electronic typewriters	
Electric hot plates	Appliances for hair-cutting, hair drying, tooth brushing, shaving, massage and other body care appliances	Pocket and desk calculators	
Microwaves	Clocks, watches and equipment for the purpose of measuring, indicating or registering time	other products and equipment for the collection, storage, processing, presentation or communication of information by electronic means	
Other large appliances used for cooking and other processing of food	Scales	User terminals and systems	
Electric heating appliances	Other small appliances for cooking and food processing	Facsimile and Telex, Telephones	
Electric radiators		Pay telephones	
Other large appliances for heating rooms, beds, seating furniture		Cordless telephones	
Electric fans		Cellular telephones	
Air conditioner appliances		Answering systems	
Other fanning, exhaust ventilation and conditioning equipment		other products or equipment of transmitting sound, images or other information by telecommunications	

An exemption is made for waste plastics from discarded EEE categories 6 (Electrical and electronic tools) and 7. (Toys, leisure and sports equipment) as well as those from cables and printed circuit boards. The suppositions, assumptions and conclusions are based on information from the report[98] on hazardous substances in mixed waste plastics from discarded EEE, 17 September 2010, elaborated by EMPA, Switzerland.

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[98] RoHS substances in mixed plastics from Waste Electrical and Electronic Equipment (WEEE), Final Report, September 17, 2010, Patrick Wäger, Mathias Schluep and Esther Müller, Technology & Society Lab EMPA, Swiss Federal Laboratories for Materials Science and Technology, with the contribution of the LIFE financial instrument of the European Community.

TOTAL PERCENTAGE OF PLASTICS IN DISCARDED EEE IN EUROPE (EU-27)

In Europe IT and telecommunications equipment makes up 40% of the plastics used in EEE, large household appliances – 33%, consumer equipment –15% and small household appliances – 10%. These 4 categories in total make up 97% of the plastics used in EEE (APME, 2001). Depending on the category or device, the rate of plastics varies from 3% for medical equipment to 73% for toys (Table 109).

Table 109: Total % of plastics in discarded EEE in Europe (EU-27) plus Norway and Switzerland for 2008 by categories EEE, excluding printed circuit boards and cables.

Category / device		Plastics [% by weight]		
		Minimum	**Maximum**	**Average**
1	Large household appliances	17%	21%	19%
1	Refrigerators and freezers	13%	43%	28%
2	Small household appliances	29%	48%	37%
3	IT and telecommunications equipment	26%	58%	42%
3	Computer monitors	17%	22%	20%
4	Consumer equipment such as screens	21%	26%	24%
4	TV sets	10%	22%	16%
5	Lighting equipment – lamps	3%	3%	3%
6	Electrical and electronic tools	11%	11%	11%
7	Toys, leisure and sports equipment	73%	73%	73%
8	Medical devices	3%	3%	3%
9	Monitoring and control instruments	60%	60%	60%
10	Automatic dispensers	20%	20%	20%

PERCENTAGE OF PLASTICS IN DISCARDED EEE IN EUROPE (EU-27)

The most commonly used types of plastics in EEE in Europe in terms of quantity are ABS, HIPS and PP (APME, 2001), mostly in categories 3 and 4.

a) *Types of plastics in discarded EEE by categories and types of devices*

The study of the EC identifies the following as the most commonly used types of plastics in discarded EEE by categories of EEE and types of devices which are present in considerable quantities:

- ❖ Large household appliances such as cooling devices: PP, followed by PUR, ABS, PS and HIPS.
- ❖ Refrigerators and freezers: ABS, HIPS and PUR, followed by PP and PVC, which are also present in considerable quantities
- ❖ Small electric appliances: PP and HIPS, followed by ABS.
- ❖ IT equipment such as screens (CRT monitors and flat screens): ABS, followed by ABS/PC and HIPS.
- ❖ CRT monitors and TV casings: ABS, followed by HIPS, ABS/PC and PPO/PPS.
- ❖ Consumer equipment such as screens (CRT monitors and flat screens): HIPS, followed by ABS, PPO, PPO/PS and PMMA.
- ❖ TV devices such as TV sets: HIPS, followed by ABS, ABS/PC, PPO and PPO/PS.

b) *PBDE concentration in plastics from discarded EEE*

Various sources contain data about the concentration of PBDE (penta-BDE, octa-BDE and deca-BDE) in waste plastics from discarded EEE, mainly focusing in certain fractions like TV sets and casings and lids of CRT monitors with cathode ray tubes or mixed shredded residues from discarded EEE (category 3 and 4).

PBDE IN PLASTIC COMPONENTS FROM DISCARDED EEE

For the 5 most common types of plastics in terms of quantity found in discarded EEE, table 44 shows where PBDE could or is most probably found in concentrations exceeding the MCL of 0.1 % by weight. In ABS, OctaBDE and DecaBDE could exceed the MCL in discarded EEE categories 1 and 2, while in ABS from discarded EEE category 3 and 4, concentrations over the MCL are possible for DecaBDE and are expected for OctaBDE. In HIPS, the MCL is expected to be exceeded only by DecaBDE, mostly in discarded EEE category 3 and 4. In PP, DecaBDE could exceed 0.1 % by weight, while in PUR it is possible that in certain cases the concentration of PentaBDE exceeds the MCL (Table 110).

Table 110: Expected presence of PBDE in the five most common types of polymer materials from discarded EEE categories 1 to 4*

Polymer materials	Category 1	Category 2	Category 3	Category 4
ABS	OctaBDE, DecaBDE	OctaBDE, DecaBDE	**OctaBDE,** DecaBDE	**OctaBDE,** DecaBDE
HIPS	DecaBDE	DecaBDE	**DecaBDE**	**DecaBDE**
ABS/PC				
PP	DecaBDE	DecaBDE		DecaBDE
PUR	PentaBDE	PentaBDE		

***** bold text in pink cells: the concentration of PBDE is expected to exceed the RoHS MCL of 0.1 % by weight; normal text in white cells: the RoHS MCL of 0.1 % by weight could be exceeded for PBDE; grey cells: no substantial quantities of the types of polymer materials are found in the respective category discarded EEE.

Table 111 shows the main results from the study in the EU for the period October 2009 – February 2010 through a wide-scale campaign for analyzing samples from plastic fractions from various categories of discarded EEE, mixed categories of discarded EEE and separate devices from discarded EEE and comparison of the measured values with the MCL.

Table 111: Comparison of the measured concentrations for PBDE (PentaBDE, OctaBDE, DecaBDE) with the MCL of 0.1 % by weight in the analyzed samples from waste plastic from mixed categories of discarded EEE, discarded EEE by categories and single articles from discarded EEE

	Discarded EEE/Devices	**Penta BDE**	**Octa BDE**	**Deca BDE**
Mixed categories discarded EEE (11 samples)	Small household appliances such as CRT- and flat screens (category 2,3,4,6,7)		*ABS*	*ABS, HIPS,PP*
	Small household appliances, toys, leisure and sports equipment (category 2,6,7)			*ABS, HIPS,PP*
	IT and telecommunications equipment (ICT) such as CRT- and flat screens (category 3,4)		*ABS*	*ABS, HIPS*
Discarded EEE by categories (10 samples)	Large household appliances such as refrigerators and freezers (category 1)			*ABS, PP*
	Small household appliances (category 2)			
	IT and telecommunications equipment (ICT) such as CRT- and flat screens (category 3)		*ABS*	*ABS, HIPS*

	Discarded EEE/Devices	Penta BDE	Octa BDE	Deca BDE
	Consumer equipment such as CRT- and flat screens (category 4)		*ABS*	*ABS, HIPS*
Separate devices from discarded EEE (32 samples)	Refrigerators and freezers (external seals) (category 1)			*ABS, HIPS, PP*
	Refrigerators and freezers (all plastic parts except for polyurethane foam) (category 1)			*ABS, HIPS,PP*
	Vacuum cleaners (+plastic hoses) (category 2)			*ABS, HIPS*
	Small household equipment for high-temperature applications (category 2)			*ABS, HIPS, PP*
	CRT monitors (category 3)		*ABS*	*ABS, HIPS*
	Flat screen monitors (category 3)			
	Printers (category 3)			*ABS, HIPS*
	TV sets with cathode ray tubes (CRT) (category 4)		*ABS*	*ABS, HIPS*

Legend:

Not found or are in average concentrations much lower than the MCL

In average concentrations lower than the MCL

In average concentrations exceeding the MCL

PentaBDE is found in only one mixed sample from small household appliances (CRT- and flat screens) and in consumer equipment (CRT- and flat screens) in concentration of 0.1 g/kg. This would mean that PentaBDE is no longer present in plastic fractions from discarded EEE in concentrations exceeding the MCL, which was established by earlier studies as well ((Mark et al.,2006); (Morf et al., 2005); (Schlummer et al., 2007); (Tange and Slijkhuis, 2009)).

OctaBDE is found in concentrations over MCL (1 g/kg) in plastics from ICT and consumer equipment such as CRT- and flat screens (on average 1 g/kg, max. 1.6 g/kg), from CRT monitors (on average 2.5 g/kg, max. 10.6 g/kg) and from CRT TV sets (on average 0.9 g/kg, max. 3.5 g/kg). OctaBDE is found in concentrations close to the MCL in plastics from small household appliances (CRT- and flat screens) and from ICT equipment (CRT- and flat screens). In plastics from consumer equipment (CRT- and flat screens) OctaBDE is found in concentrations a lot less than the MCL (0.15 g/kg). No OctaBDE is found in large household appliances (sample from discarded EEE category 1). The measured concentrations correspond to the results from earlier studies ((Mark et al., 2006); (Morf et al., 2005); (Schlummer et al., 2007), where the levels exceeding the MCL are found in plastics from CRT monitors and TV sets and concentrations close to the MCL are found in shredded fractions from mixed categories. The results are also comparable to the typical values found in discarded EEE, summarized in a study (Tange and Slijkhuis, 2009), where the maximum established concentrations in CRT monitors in this study definitely exceed the indicative values of 500 – 3000 ppm (see Table 46). To summarize the results from the analyzed samples and the older studies, it can be concluded that higher concentrations of OctaBDE can be expected in plastics from ICT equipment (with the highest levels in CRT monitors) and CRT TV sets. According to sources these concentrations are due mainly to the application of OctaBDE in ABS plastics in the past. OctaBDE exceeding the MCL can be expected in small devices as well (category 2 and 3), but not in large household appliances.

DecaBDE were measured in concentrations close to or below the MCL in almost all analyzed samples. The highest levels were found in plastics from CRT monitors (on average 3.2 g/kg, max. 7.8 g/kg) and CRT TV sets (on average 4.4 g/kg, max. 7.8 g/kg). The sources treating plastics from CRT monitors and TV sets confirm these concentrations in a similar range ((Mark et al., 2006); (Morf et al., 2005); (Schlummer et al., 2007). A little over the MCL are the concentrations in large household appliances such as refrigerators (on average 0.6 g/kg, max. 1.6 g/kg). DecaBDE is found in all other samples as well, with the exception of plastics from mixed samples from small household appliances and flat screens where the concentration of DecaBDE is below the limit of detection (LOD). The results correspond to the indicative values (Tange and Slijkhuis, 2009). In conclusion we can summarize that the plastics from CRT monitors and TV sets contain the highest concentrations of decaBDE. This is quire natural considering that DecaBDE were typically used in ABS and HIPS plastics (monitors and TV sets) as well as PP (large and small household appliances for high-temperature applications). The results from the study of available sources also show that ABS is the main source of DecaBDE, found in categories 2 and 3 of discarded EEE as well as in refrigerators and freezers (category 1). CRT and other consumer equipment are deemed to be a source of DecaBDE in HIPS plastics.

Table 112 shows the indicative values of the established levels of PentaBDE, OctaBDE, DecaBDE and PBDE in total in the various groups of plastics most frequently recycled by the specialized recovery companies according to data and measurements of MBA Polymers, Kematen and the Austrian Ministry of Environment (Tange and Slijkhuis, 2009).

Table 112: Indicative concentrations of BFRs in selected groups of plastics which are most often recycled by specialized recovery companies

EEE	PentaBDE [ppm]	OctaBDE [ppm]	DecaBDE [ppm]	Total PBDE [ppm]
TV sets and CRT monitors	< 100	500 – 3000	500 – 3000	< 10000
Refrigerators and freezers	< 100	< 1000	< 1000	< 1000
White goods (washing machines and clothes dryers)	< 100	<1000	< 1000	< 1000
Small household appliances (brown goods)	< 100	< 200	< 1000	< 2000
Office equipment, IT and telecommunications equipment (ICT)				
A). ICT equipment generating heat such as laser printers, copy machines, servers from which plastic components are separated and recycled.	< 100	500 – 3000	500 – 3000	< 10000
B). Other ICT equipment (ink jet printers, personal computers, telephone sets, routers, etc.)	< 100	< 500	< 1000	< 2000

The results, conclusions and findings from the European study on the presence of PentaBDE, OctaBDE, DecaBDE in plastic components and mixed plastics from discarded EEE will be used later in the preliminary assessment of the potential presence of PBDE in the collected discarded EEE in Bulgaria for the period 2006 – 2011.

<u>POTENTIAL PRESENCE OF PBDE (PENTABDE, OCTABDE, DECABDE) IN DISCARDED EEE IN BULGARIA</u>

For a preliminary assessment of the potential presence of penta-BDE, octa-BDE and deca-BDE in the collected, pre-treated and recycled discarded EEE, data was used from the annual statements and reports by the EEA regarding the collected discarded EEE.

To determine the waste flows, including of plastic components treated with brominated flame retardant additives (BFR), the following were used: "Instructions for managing waste generated from the treatment and recycling of discarded EEE" and the Excel instrument based on the technical approach for identifying and calculation of waste flows from discarded EEE to determine waste flows developed by the Federal Environment Agency – Austria under Twinning Project[99]: BG/2007/IB/EN/05 "Strengthening the administrative capacity for practical implementation of legislation in the fields of electrical and electronic equipment, batteries and accumulators at national and regional level in Bulgaria" (2009). The project was finalized in 2010 with the partners from the Federal Environment Agency – Austria, the Federal Ministry of Environment, the Nature Conservation and Nuclear Safety – Germany, the Ministry of Environment, Energy and Climate Change – Greece and the Ministry of Environment and Water, Bulgaria.

Waste flow management is one of the crucial issues in relation to the implementation of the requirements of legislation instruments governing discarded EEE. Establishing appropriate collection and treatment infrastructure is fundamental for the environment and the lawful implementation of the requirements regarding discarded EEE as a single waste category. Bulgarian authorities are obliged to establish and implement the respective inspection and monitoring activities.

The instrument under Twinning Project BG/2007/IB/EN/05 for waste flows from discarded EEE was used to calculate the potential levels of penta-BDE, octa-BDE and deca-BDE in the collected, pre-treated and recycled discarded EEE in Bulgaria by years for the period 2006 – 2011 according to data of the EEA.

The instrument for waste flows from discarded EEE allows calculation of the mass and various fractions as a result from the treatment of discarded EEE under the 10 categories and for calculation of the mass of the various fractions under the 5 categories of discarded EEE for collection and treatment (large mixed equipment; small mixed equipment; refrigeration equipment; CRT devices with cathode way tubes (including LCD devices) and gas-discharge lamps). The instrument is comprised of two parts:

✓ Calculation based on the categories for collection and treatment presented in Excel document "Instrument for waste flows from discarded EEE (Collection and treatment categories) V1.xls";

✓ Calculation based on the categories of discarded EEE presented in Excel document "Instrument for waste flows from discarded EEE (Categories of discarded EEE) V1.xls"

The following spreadsheets are found in all versions of the instrument:

- Background: a short introduction;
- Discarded EEE input data: a basic breakdown by weight according to the collection and treatment categories;
- Results: final summarized spreadsheet;

The following spreadsheets are characteristic of each version of the instrument:

- Categories of discarded EEE variant;
- Collection and treatment categories variant;

Based on the input data recorded in the instrument regarding the mass of collected discarded EEE in tons according to statements regarding the collected discarded EEE by years for the period 2006 – 2011, the quantity of the various fractions of components/materials generated in the dismantling of discarded EEE was calculated (tables 113 and 114):

[99] Twinning project BG/2007/IB/EN/05

Table 113: Fractions of materials, components and substances which need to be removed in the dismantling of discarded EEE

Fraction/material	The following components, materials and substances should be removed:
1. Iron-containing metals	1. Capacitors containing polychlorinated biphenyls and polychlorinated terphenyls (PCBs/PCTs)
2. Copper	2. Mercury-containing components, such as switches or backlighting lamps
3. Aluminum	3. Batteries
4. Mixed metals	4. Printed circuit boards of mobile phones generally, and of other devices if the surface of the printed circuit board is greater than 10 cm2
5. Precious metals	5. Toner cartridges, liquid and pasty, as well as colour toner
6. Non-iron metals	6. Plastic-containing brominated flame retardants (BFR)
7. Pure steel	7. Asbestos waste and components which contain asbestos
8. Polymers (plastics and rubber)	8. Cathode ray tubes (CRTs)
8. Glass	9. Chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs) or hydrofluorocarbons (HFCs), hydrocarbons (HCC)
10. Isolation foam	10. Gas discharge lamps
11. Oils	11. Liquid crystal displays (LCDs) (together with their casing where appropriate) of a surface greater than 100 cm2 and all those back-lighted with gas discharge lamps
12. Cement and ceramics	12. External electric cables
13. Residues (from various hazardous substances)	13. Components containing refractory ceramic fibers
14. Hazardous substances and components	14. Components containing radioactive substances under the Safe Nuclear Power Act and the secondary legislation on its application
	15. Electrolyte capacitors containing substances of concern (height >25 mm, diameter • >25 mm or proportionately

The total quantity of the collected discarded household and non-household EEE for all categories of EEE in 2006 - 2011 in Bulgaria is 185 562.3 tons.

The total quantity of the collected discarded household EEE for all categories of EEE in 2006 - 2011 in Bulgaria is 179 825.3 tons (Table 114). The % of collected discarded household EEE category 3 and 4 is equal (5.4% each), (Figure 50). Discarded EEE category 3 and 4 are the most probable source of plastics containing BFR (octa-BDE and deca-BDE).

Table 114: Collected discarded household EEE by categories of EEE in 2006 - 2011

Year/ Category	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2006 -2011**
	tons	tons	tons	tons	tons	tons	tons
1	1 211.000	13 670.526	29 827.353	28 801.634	30 938.713	27 649.095	**132 098.321**
2	202.000	2 827.326	2 434.525	4 260.843	3 064.020	3 276.914	**16 065.628**
3	278.090	1 610.431	1 240.299	1 736.478	2 707.254	2 095.646	**9 668.198**
4	165.000	1 269.132	2 581.175	1 284.037	2 395.447	1 867.004	**9 561.795**
5	173.500	1 653.931	1 996.127	245.651	288.025	318.628	**4 675.862**
5a	0.000	0.000	141.843	160.413	268.071	125.986	**696.313**
6	3.149	80.078	612.024	727.844	1 411.329	1 745.815	**4 580.239**
7	0.000	53.300	125.489	83.657	226.450	131.450	**620.346**
8	0.000	0.000	83.467	145.164	125.432	137.901	**491.964**
9	0.000	0.000	71.960	57.705	451.872	226.050	**807.587**
10	0.000	0.000	60.972	91.869	218.154	187.981	**558.976**
Total	**2 032.739**	**21 164.724**	**39 175.234**	**37 595.295**	**42 094.767**	**37 762.470**	**179 825.229**

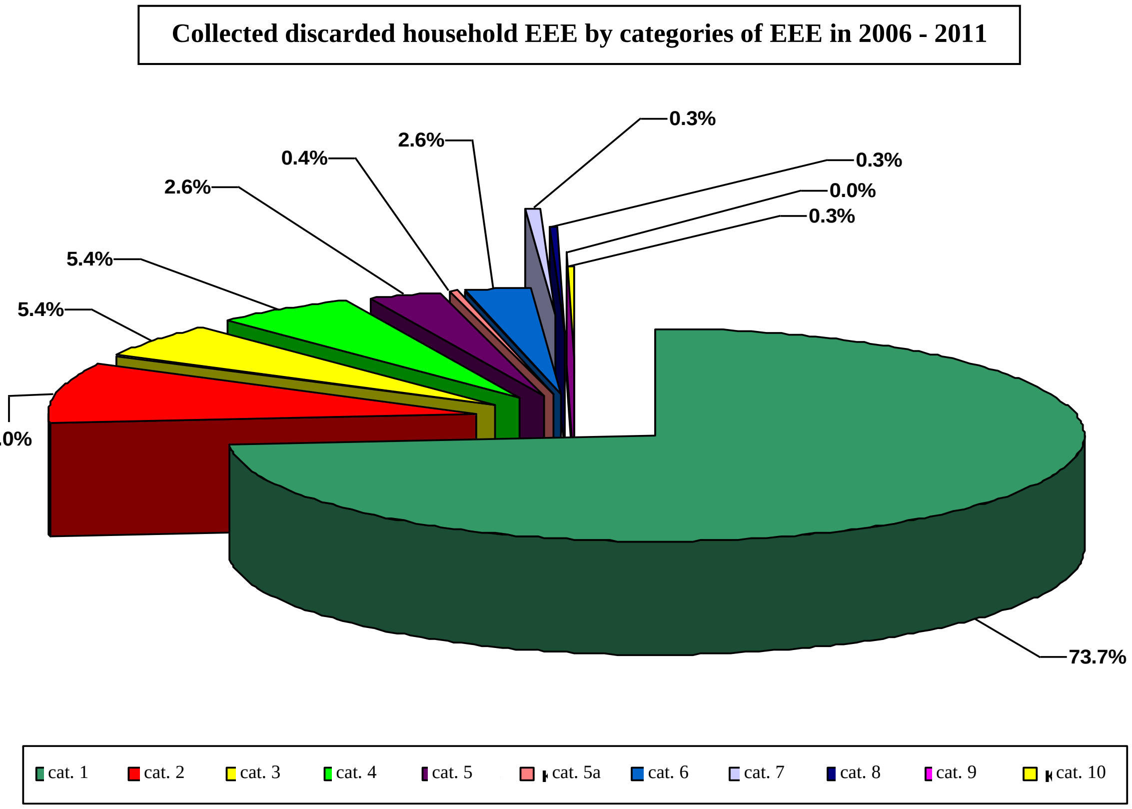


Figure 50: % of collected discarded household EEE by categories in 2006 - 2011

Excel document "Instrument for waste flows from discarded EEE (Categories of discarded EEE) V1.xls" was used to calculate the quantities by years and in total for the collected discarded EEE categories 3 (ICT equipment) and 4 (consumer equipment) – 19 230 tons; the quantity of polymer fractions in category 3 and 4 – 3 444 tons; the quantity of plastics containing BFR - octa-BDE and deca-BDE – 41.63 tons; as well as the potential presence of octa-BDE and deca-BDE in plastics– 4.09 tons for the period 2006 – 2011 (Table 115 and Figure 51).

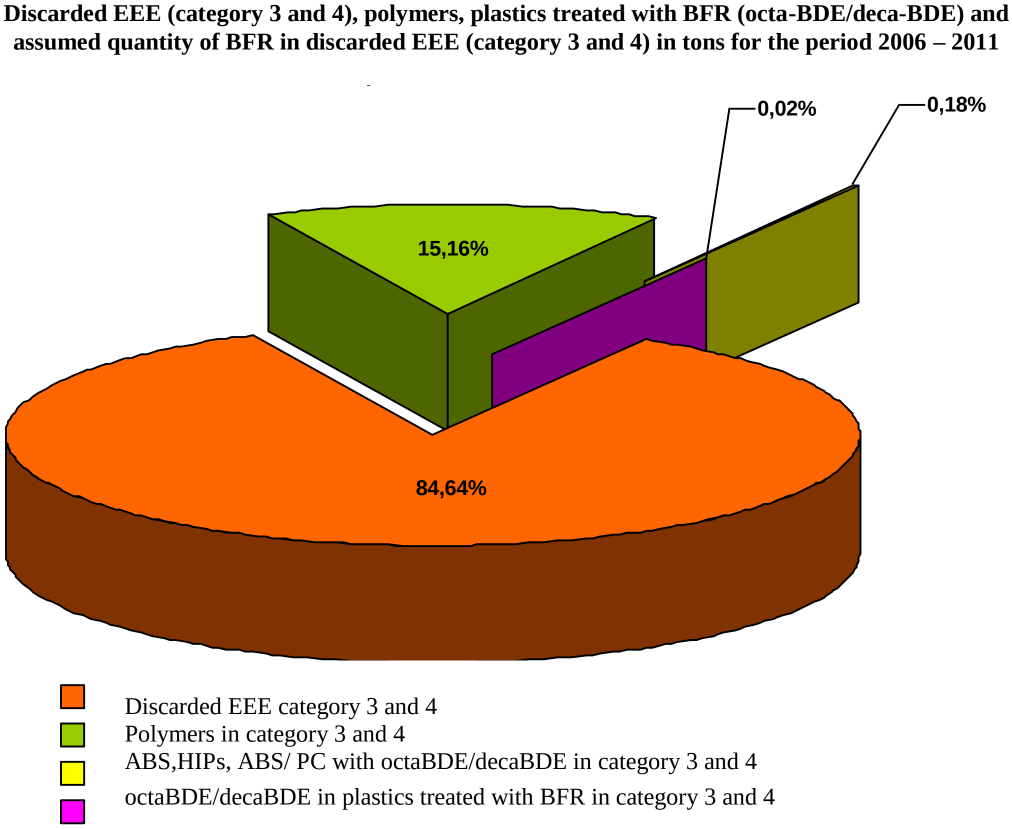
Table 115: Discarded EEE (category 3 and 4), polymers and plastics treated with BFR (octaBDE) in tons for 2006 – 2011

Discarded EEE and polymer content	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2006 -2011**
Discarded EEE category 3 and 4	443	2 880	3 822	3 021	5 103	3 963	**19 230**
Polymers in discarded EEE category 3 and 4	81	520	670	542	918	713	**3 444**
ABS, HIPs, ABS/ PC with octaBDE/decaBDE in discarded EEE category 3 and 4	0.89	5.76	7.64	6.04	11.99	9.31	**41.63**
octaBDE in plastics treated with BFR in category 3 and 4	0.11	0.61	0.53	0.66	1.22	0.96	**4.09**

To assess the potential presence of octa-BDE and deca-BDE in plastics treated with BFR in category 3 and 4, the average indicative concentration used (Table 112) was 0.175 % by weight (500 ppm- 3000 ppm; 0.05 – 0.3 % by weight for octa-BDE and deca-BDE).

Plastics containing brominated flame retardant additives (BFRs) (octa-BDE and deca-BDE) make up only 0.18% of the total quantity of discarded EEE (category 3 and 4), while the potential quantity of octa-BDE and deca-BDE is only 0.02% of the general quantity of discarded EEE (category 3 and 4) (Figure 51).

Figure 51: Discarded EEE (category 3 and 4), polymers, plastics treated with BFR



No samples were analyzed in Bulgaria from plastic fractions from discarded EEE which are assumed to have been treated with BFR but it is considered that the concentrations of octa-BDE and deca-BDE are comparable to those found in Europe and they are not expected to considerably exceed the MCL of 0.1 % by weight in the total mass of collected discarded EEE.

Excel document “Instrument for waste flows from discarded EEE (Collection and treatment categories) V1.xls” was used to calculate the quantities by years and in total for the collected discarded EEE by collection and treatment categories: total small mixed equipment and mixed CRT – 91 988 tons; total polymers in such equipment – 22 912 tons; total plastics treated with BFR (octa-BDE and deca-BDE) – 2 592 tons; as well as potential presence of octa-BDE and deca-BDE in the same– 3.94 tons for the period 2006 – 2011 (Table 116).

Table 116: Discarded EEE (total small mixed equipment and mixed CRT), polymers in discarded EEE and plastics treated with BFR (octaBDE) in tons by years for 2006 – 2011

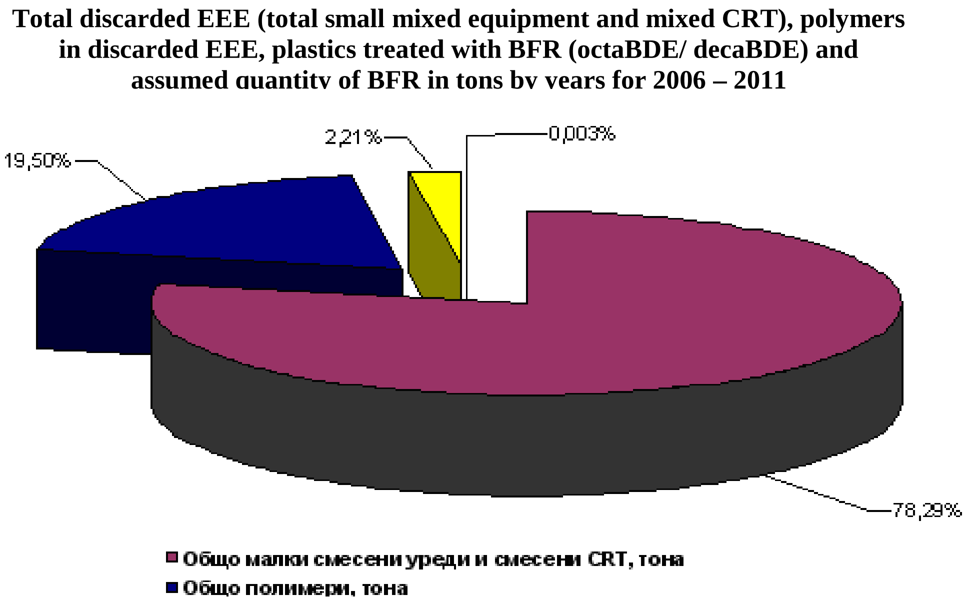
Discarded EEE/year	2006	2007	2008	2009	2010	2011	Total
Total small mixed equipment and mixed CRT, tons	1 040	10 828	20 042	19 234	21 536	19 319	**91 998**
Total polymers, tons	259	2 697	4 991	4 790	5 363	4 811	**22 912**
Total plastics treated with BFR, tons;	29	305	565	542	607	544	**2 592**
octaBDE in plastics containing BFR, tons	0.04	0.46	0.86	0.82	0.92	0.83	**3.94**

To assess the potential presence of octa-BDE and deca-BDE in plastics treated with BFR in small mixed equipment and mixed CRT), the indicative concentration used (Table 112) was 0.02 % by weight (200 ppm for octa-BDE and deca-BDE) for such mixed equipment.

Plastics containing BFR (octa-BDE and deca-BDE) make up only 2.21% of the total quantity of discarded EEE (small mixed equipment and mixed CRT), while the potential quantity of octa-BDE and deca-BDE is only 0.003% of their total quantity. (Figure 52).

The calculated potential content of octa-BDE and deca-BDE using the two applications of the instrument for discarded EEE by categories and by collection and treatment categories is almost the same, 4.09 t and 3.94 t respectively.

Figure 52: Total discarded EEE (small mixed equipment and mixed CRT), polymers in discarded EEE treated with BFR



Total small mixed equipment and mixed CRT, tons
Total polymers, tons
Total plastics treated with BFR, tons;
octaBDE in plastics containing BFR, tons

Considering the averagely short lifecycle (less than 8 years) of EEE category 3 (ICT equipment) and 4 (consumer equipment) and the fact that the production of octa-BDE and deca-BDE was discontinued in EU countries in 1998 and 2004 respectively and the import of EEE is mainly from EU member states, it is assumed that it is unlikely for the collected discarded household EEE for the period 2006 – 2011 to contain octa-BDE over 0.1 % by weight. Still, if some mixed plastic fractions from discarded EEE, category 3 and 4 contain PBDE over the MCL, this would most probably be deca-BDE which is not included in Annex I to Regulation (EO) 850/2004.

In Bulgaria, no tests have been made of waste plastic samples from the dismantling of discarded EEE expected to have been treated with BFR, therefore no presence of PBDE has been established in practice in the collected discarded EEE. It is assumed that the concentrations of octa-BDE and deca-BDE are comparable to those established in Europe for mixed waste plastic from discarded EEE. They are not expected to exceed the MCL of 0.1 % by weight in the total mass of collected discarded EEE or the mixed plastics of various categories collected discarded EEE, which is confirmed by the low % of brominated flame retardant additives in the total mass of discarded EEE.

In the meantime, the maximum concentration limit has not been determined for PBDE in waste, including in discarded EEE, over which the waste will be considered hazardous in Annex IV and the maximum concentration limit of these compounds in the various types of waste specified in Annex V of Regulation (EO) 850/2004 for POPS. If the maximum concentration determined for PBDE is 5000 mg/kg waste, as is for HBB, then PBDE in mixed plastic fractions from discarded EEE will not exceed 5000 mg/kg and the plastics may be recycled and recovered, which will allow achievement of the targets for collection, recycling and recovery of discarded EEE

❖ **GENERAL CONCLUSION**

✓ **The total quantity of the collected discarded household EEE for all categories of EEE in 2006 - 2011 in Bulgaria is 179 825.3 tons, which is 97% of the total quantity of collected discarded household and non-household EEE. The % of collected discarded household EEE category 3 and 4 is 10.8% of the discarded household EEE in all categories;**

✓ **Discarded EEE category 3 and 4 is the most probable source of plastic components treated with BFRs (octa-BDE and deca-BDE);**

✓ **The two Excel documents, "Instrument for waste flows from discarded EEE (Categories of discarded EEE) and (Collection and treatment categories). V1.xls" were used to calculate the total quantities (2006 – 2011) of plastics in category 3 and 4 (41.63 tons) and in mixed small and CRT equipment (2 592 tons) treated with BFR (octa-BDE or decaBDE). The assumed content of octa-BDE or deca-BDE in these plastic fractions is assessed at ca. 4 tons, calculated based on the average concentrations measured for these substances in European discarded EEE of these categories and mixed discarded EEE.**

✓ **In Bulgaria, no tests have been made of waste plastic samples from the discarded EEE expected to have been treated with BFR, but it is assumed that their concentrations are comparable to those established in Europe and they are not expected to considerably exceed the MCL of 0.1 % by weight in the total mass of collected discarded EEE or the mixed plastics of various categories collected discarded EEE.**

✓ **Considering the averagely short lifecycle of EEE category 3 and 4 and that the import of EEE is mainly from EU member states, it is assumed that it is unlikely for the collected discarded household EEE for the period 2006 – 2011 to contain octa-BDE over 0.1 % by weight. Still, if some mixed plastic fractions from discarded EEE, category 3 and 4 contain PBDE over the MCL, this would most probably be deca-BDE which is not included in Annex I to Regulation (EO) 850/2004.**

3.2.4. Perfluorooctane sulfonic acid and its salts (PFOS)

Perfluorooctane sulfonic acid (PFOSH), its salts and perfluorooctane sulfonyl fluoride (PFOS-F) and other derivatives known under the general name of **perfluorooctane sulfonates (PFOS)**, are parts of the large family of perfluoroalkyl sulfonates (PFAS). PFOS can also be formed by degradation from a large group of derivative substances known as PFOS-derivatives. A total of 96 PFOS-derivatives have been identified, most of which are high molecular polymers.

The spatial structure of the anion of perfluorooctane sulfonate (PFOS) is shown on Figure 53.

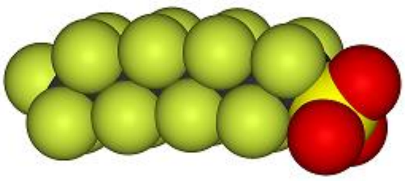
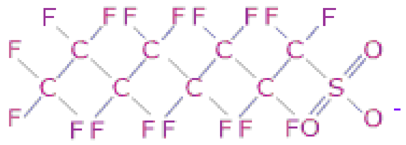
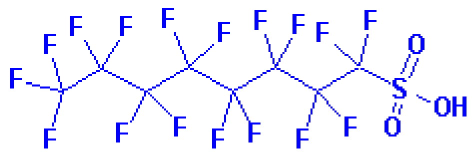


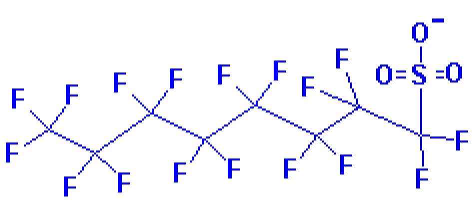
Figure 53: Spatial structure of PFOS

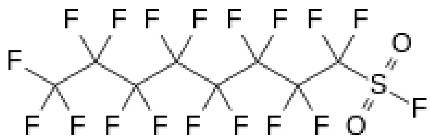
Figure 54 shows the structural formulas of the PFOS anion, PFOSH acid and its potassium and fluoride salts.





PFOS – anion ($C_8F_{17}SO_3$) PFOSH – acid (C_8HF_{17} O_3S)





PFOS – Potassium salt (C_8HF_{17} O_3S.K) **PFOS – Fluoride salt (C_8HF_{18} O_3S)**

Figure 54: Structural formulas of the PFOS anion, PFOSH acid, PFOSK and PFOSF salts

3.2.4.1. PFOS compounds included in the Stockholm Convention

The term "PFOS" means perfluorooctane sulfonic acid (PFOSH), its salts and perfluorooctane sulfonyl fluoride (PFOS-F) as listed in Annex B to the Stockholm Convention and PFOS derivatives. PFOS derivatives are chemical substances which have a PFOS structural element in their molecular structure, produced as a final or intermediate product.

The production and use of PFOS is prohibited for all countries except for specified acceptable purposes and specific exemptions as provided for by Part I of Annex B (Table 117).

Table 117: PFOS included in Annex B to the Stockholm Convention

Industrial POPS chemical	CAS No.	EU No.	Molecular formula[100]	Acceptable purpose/Specific exemption
Perfluorooctane sulfonic acid (PFOSH)	1763-23-1	217-179-8	$C_8HF_{17}O_3S$	*Acceptable purpose:* In accordance with part III of this Annex, production of other chemicals to be used solely for the uses below. Production for uses listed below. *Specific exemption:* As allowed for the Parties listed in the Register.
Perfluorooctane sulfonyl fluoride (PFOSF)	307-35-7	206-200-6	$C_8F_{18}O_2S$	
Potassium perfluorooctane sulfonate (PFOS.K)	2795-39-3	220-527-1	$C_8HF_{17}O_3S$.K	*Acceptable purpose:* In accordance with part III of this Annex for the following acceptable purposes, or as an intermediate in the production of chemicals with the following acceptable purposes: • Photo-imaging • Photo-resist and anti-reflective coatings for semi-conductors • Etching agent for compound semi-conductors and ceramic filters • Aviation hydraulic fluids • Metal plating (hard metal plating) only in closed-loop systems • Certain medical devices (such as ethylene tetrafluoroethylene
Lithium perfluorooctane sulfonate (PFOS.Li)	29457-72-5	249-644-6	$C_8HF_{17}O_3S$.Li	
Ammonium perfluorooctane sulfonate ($PFOS.NH_3$)	29081-56-9	249-415-0	$C_8HF_{17}O_3S.H_3N$	
Diethanolammonium perfluorooctane sulfonate (PFOS-DEA)	70225-14-8	274-460-8	$C_8HF_{17}O_3S.C_4H_{11}$ NO_2	
tetraethylammonium perfluorooctane sulfonate (TeEt-PFOS)	56773-42-3	260-375-3	$C_8H_{20}N.C_8F_{17}O_3S$	
Didecyldimethylammonium perfluorooctane sulfonate	251099-16-8	-	-	

[100] http://esis.jrc.ec.europa.eu/

Industrial POPS chemical	CAS No.	EU No.	Molecular formula[100]	Acceptable purpose/Specific exemption
				copolymer (ETFE) layers and radio-opaque ETFE production, in-vitro diagnostic medical devices, and CCD colour filters) • Fire-fighting foam • Insect baits for control of leaf-cutting ants from *Atta spp.* and *Acromyrmex spp.* *Specific exemption:* For the following specific uses, or as an intermediate in the production of chemicals with the following specific uses: • Photo masks in the semiconductor and liquid crystal display (LCD) industries • Metal plating (hard metal plating) • Metal plating (decorative plating) • Electric and electronic parts for some colour printers and colour copy machines • Insecticides for control of red imported fire ants and termites • Chemically driven oil production • Carpets • Leather and apparel • Textiles and upholstery • Paper and packaging • Coatings and coating additives • Rubber and plastics.

Part III of Annex B provides the conditions under which the PFOS specified in Part I may be produced provided that they are entered in the Register of Acceptable Purposes. The Parties producing and/or using PFOS shall take into account the general instructions by the BAT and BET Regulations specified in Part V of Annex C.

3.2.4.2. PFOS DERIVATIVES NOT INCLUDED IN ANNEX B TO THE STOCKHOLM CONVENTION[101]

There are a number of other PFOS-derivative chemicals and PFOS precursors. 96 PFOS-derivatives have been specified.

The more complex PFOS derivatives which are not shown in Annex B to the convention (Table 118) were covered by the inclusion of perfluorooctane sulfonyl fluoride (PFOSF) which is an intermediate material for production of all C8- perfluorinated alkyl sulfo compounds. This is why the production and use of PFOSF and all C8-perfluorinated alkyl sulfo compounds are restricted to the uses listed as acceptable purposes and specific exemptions under the Convention.

Table 118: Examples of PFOS derivatives not listed in Annex B to the SC

Chemical name	Abbreviation	CAS No.
Perfluorooctane sulfonamide	PFOSA	754-91-6
N-Methyl perfluorooctane sulfonamide	MeFOSA	31506-32-8
N-Methyl perfluorooctane sulfonamidoethanol	MeFOSE	2448-09-7
N-Methyl perfluorooctane sulfonamidoethyl acrylate	MeFOSEA	25268-77-3
Ammonium bis[2-*N*-ethyl perfluorooctane sulfonamidoethyl] phosphate		30381-98-7
N-Ethyl perfluorooctane sulfonamide (sulfluramid)	EtFOSA	4151-50-2
N-Ethyl perfluorooctane sulfonamidoethanol	EtFOSE	1691-99-2

[101] UNEP-POPS-POPRC.6-13-Add.3

Chemical name	Abbreviation	CAS No.
N-Ethyl perfluorooctane sulfonamidoethyl acrylate	EtFOSEA	432-82-5
Di[*N*-ethyl perfluorooctane sulfonamidoethyl] phosphate	EtFOSEP	67969-69-1
3-[[(Heptadecafluorooctyl)- sulfonyl]amino]-*N*,*N*,*N*-trimethyl-1-propanammonium iodide/perfluorooctyl sulfonyl quaternary ammonium iodide	Fluorotenside-134	1652-63-7
Potassium *N*-ethyl-*N*-[(heptadecafluorooctyl) sulfonyl] glycinate		2991-51-7
N-Ethyl-*N*-[3-(trimethoxysilyl)propyl] perfluorooctane sulfonamide		61660-12-6

There are a number of perfluorinated alkyl sulfonates (PFAS) and derivatives with a shorter or longer chain which are used for the same or similar applications as PFOS and as their substitutes. Some parameters are shown in table 119:

Table 119: Perfluorinated alkyl sulfonates (PFAS)

Chemical name	Acronym	CAS No.
Potassium perfluoroethyl cyclohexyl sulfonate	FC-98	67584-42-3
Perfluorobutane sulfonic acid	PFBS	59933-66-3
Potassium perfluorobutane sulfonate		29420-49-3
Perfluorohexane sulfonic acid	PFHxS	432-50-7
Perfluorodecane sulfonic acid	PFDS	335-77-3
Perfluorodecane sulfonate		67906-42-7

Because of the restrictions on PFOS use it is expected that closely related but unregulated chemical structures, such as perfluoro[hexyl methyl ether sulfonate], could be commercialized. The similarity of these substances to PFOS is illustrated by the following structural formulas (Figure 55):

Perfluorooctane sulfonate   Perfluoro[hexyl methyl ether sulfonate]

Figure 55: Structural formulas of PFOS and PFAS

For example, perfluoro[hexyl methyl ether sulfonate], (FC-53) is used as mist suppressant in Chinese chrome plating enterprises.

3.2.4.3. Properties and POPS characteristics of PFOS

PFOS is a completely fluorinated anion containing eight carbon atoms which is used as a salt or is incorporated into longer chain polymers. PFOS and its derivatives, called “PFOS precursors”, are part of the larger chemical group of perfluoroalkyl sulfonates.

Due to its unique surface-active properties it is used in a wide variety of applications as a surface-active substance (SAS).

PFOS and PFOSH are part of the group of fluorinated SAS, but there all hydrogen atoms in the hydrophobic part of the molecule are replaced by fluorine (Kissa 2001).

The very strong carbon-fluorine bindings makes the perfluoroalkyl chain found in PFOS extremely chemically persistent, even in terms of acids and bases, as well as high temperature. The perfluorocarbon chain is both oleophobic and hydrophobic; thus it repels water, oil and dirt and insulates electricity.

For the purpose of the inventory, all substances (simple or polymer) which have a PFOS chain (C8F17SO3-) are called PFOS-derivative compounds.

CHEMICAL AND PHYSICAL PROPERTIES

Table 120 shows the main physico-chemical properties of some PFOS derivatives.

Table 120: Physico-chemical properties of PFOS

Property	PFOS acid (Perfluorooctane sulfonic acid, also called PFOSH)	Potassium salt of PFOS (PFOS.K)	Perfluorooctanoic Acid (PFOA)	Ammonium Perfluorooctanoate (APFO)
Chemical formula	$C_8F_{17}SO_3H$	$C_8F_{17}SO_3.K$	$C_7F_{15}COOH$	$C_7F_{15}COO\text{-}NH+$
Molecular mass	500.1 g/mol	538.2 g/mol	414.07 g/mol	431.10 g/mol
Melting point	Not measured	>400°	45 – 50 ^{o}C (Beilstein, 1975)	130 (decomposition) 157 - 165 (decomposition starts above 105° C)
Boiling point	133 °C at 6 torr	Not measured	188 °C	decomposition
Relative density	1.25 g/cm^3	potassium ~0.6; lithium ~1.1; ammonium ~1.1; diethanolamine ~1.1.	1.792 g/cm^3 (20° C)	0.6-0.7 g/cm^3 (20° C)
Vapor pressure	3.31x10^{-4} Pa	potassium : 3.31 x10^{-4} Pa	4.2 (25° C) extrapolated from the recorded value of 2.3 (20° C) extrapolated from the recorded value 128 (59.3° C)	0.0081 (20° C) calculated from the recorded value 3.7 (90.1° C)
Water solubility	520 mg/L	519 mg/L (20 ± 0,5ºC) 680 mg/L (24 - 25ºC)	9.5 g/L(25° C)	> 500 g/L
Log K_{ow}	6.28	4.13	Not measured	Not measured
Henry's law constant	Not measured	3,09 x 10^{-9} atm m^3/mol	Not measured	Not measured
Appearance	White to yellowish crystalline powder	White to yellowish crystalline powder	Solid	Solid

Source: PFOSH and PFOS.K. (OECD, 2002); PFOA and APFO (IUCLID)

POPS CHARACTERISTICS OF PFOS

Table 121 shows the main POPS characteristics of PFOS.

Table 121: POPS characteristics of PFOS and exposure

Criterion	Characteristics
Potential for Long-Range Atmospheric Transport	Vapour pressure = 3,31 x 10^{-4} Pa Atmospheric half life DT50air > 2 days (estimated value based on photolytic half life > 3,7 years)
Toxicity	Sub-chronic exposure: Mortality in monkeys at 4,5 mg/kg bw/day. Reproductive toxicity: mortality in pups at 1,6 mg/kg bw/day. Acute toxicity to fish: LC50 = 4,7 mg/L (R51/53) Chronic toxicity NOEC =0.25 mg/L in shrimps
Persistence	Highly persistent (DT50soil > 41 years). Decomposes neither biotically not abiotically. Decomposes only by high-temperature decomposition.
Bioaccumulation	PFOS has a considerable bioaccumulation potential (BMF = 22 – 160), even though it does no accumulate in fat tissue like the other POPS, it binds to the proteins in the blood and the liver. Higher concentrations were measured in large predators like the polar bear, wolf, eagle and mink. Bioaccumulates in fish as well.(BCF in fish = 2796 – 3100)
Exposure in the environment	PFOS and its derivatives are discharged in the environment in their production, in their use and disposal thereafter. Higher concentrations of PFOS were found in waste waters and

Criterion	Characteristics
	drain waters from landfills, oceans and in the flora and fauna in various places throughout the world. Alarmingly high concentrations of PFOS were also found in arctic animals, away from anthropogenic sources.
Exposure to people	It has been proven that fish is a source of exposure for humans (Falandysz et al. 2006), but as a whole the presence of PFOS substances follows two distinct models in humans and animals, which indicates that fish and other types of food are not the main source of exposure for humans. Nevertheless, some groups of people may be exposed through polluted food, mostly from the packages of microwave popcorn, which pass to the food through the package and metabolize in the body to PFOSH acid (Begley et al. 2005). Another type of exposure may originate from the use of PFOS in various products like carpets, apparel and various personal hygiene and cleaning products (Shoeib et al. 2005).
Health effects	The possible health effects related to PFOS may include: biochemical or cellular alterations, human fetus damage or developmental alterations[102]. PFOS are PFOSH absorbed orally and are very quickly eliminated from the human body with a half-life of ca. nine and four years respectively. The chronic exposure in animals includes hazardous effects on the liver, the stomach and the levels of thyroid hormones. PFOS and PFOSH do not have mutagenic properties. No information is available about harmful effects on the reproduction and development in humans[103]

3.2.4.4. Production and use of PFOS

3.2.4.1.1. *Historical production of PFOS worldwide*

The production of PFOSF, a major raw material for the production of PFOS, started in 1970. The greatest global manufacturer of PFOS compounds is the American 3M with subsidiaries in Europe, which discontinued the production of PFOS in 2002 and made a transition to the production of shorter-chain polyflorinated chemicals. The awareness of the risks from these substances gradually resulted in a decrease of their use in the period 2000 – 2004 (NERA 2006). The respective alternatives to PFOS are perfluorinated telomeres with a shorter chain. After the production of PFOS was stopped in the USA, in 2003 China started the production of PFOS, PFOSF and PFOS derivatives (15 companies), and in 2006 their production exceeded 200 t, of which at least 100 t were exported for other countries, including Brazil and EU member states. In 2003 Germany and Italy produced less than 60 t and 22 t PFOS respectively.

MANUFACTURERS OF PFOS-COMPOUNDS

The manufacturers of PFOS-compounds are Arkema; Asahi (Japan); BASF Corporation; Clariant (Germany); Daikin (Japan); Huntsman; DuPont (USA); 3M (USA); Solvay Solexis, etc.

In 2005 there were 4 manufacturers of APFO (ammonium salt): Miteni (Italy), DuPont (USA), Daikin (Japan) and one Chinese manufacturer. OECD identified the following manufacturers of PFOS-compounds (Table 122):

Table 122: List of the manufacturers of PFOS-compounds according to OECD (OECD 2002).

Miteni S.p.A (Italy)	BNFL Fluorochemicals Ltd. (England)
EniChem Synthesis S.p.A (Italy)	Fluorochem Ltd. (England)
Dianippon Ink & Chemicals, Inc. (Japan)	Milenia Agro Ciencias S.A. (Brazil)
Midori Kaguka Co., Ltd. (Japan)	Changjiang Chemical Plant (China)
Tohkem Products Corporation (Japan)	Indofine Chemical Company, Inc. (India)
Tokyo Kasei Kogyo Company, Ltd. (Japan)	Scientific Industrial Association P & M Ltd. (Russia)
Fluka Chemical Co, Ltd. (Switzerland)	DuPont (USA)
	3M (USA)

[102] http://www.ewg.org/chemindex/chemicals/23251
[103] http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1246260032570

OECD has identified the following manufacturers of PFOSH acid (Table 123):

Table 123: List of the manufacturers of PFOH according to OECD (US EPA 2002).

3M Company (USA) – production discontinued	Hoechst Aktiengesellschaft (Germany)
DuPont (USA)	EniChem Synthesis S.p.A. (Italy)
Exflour Research Corporation (USA)	Miteni S.p.A (Italy)
PCR Inc. (USA)	Asahi Glass (Japan)
Ciba Speciality Chemicals (Germany)	Daikin (Japan)
Clariant (Germany)	Dainippon Ink & Chemicals, Inc. (Japan)
Dyneon (Germany)	Tohkem Products Corporation (Japan)

3.2.4.1.2. *Historical uses of PFOS*

PFOS and about 96 derivatives are produced for various uses. In Europe the subsidiary of the American 3M in Belgium used to manufacture PFOS and derivatives until 2004. The uses include: fire-fighting foam, carpets, leather goods, textiles and upholstering, cardboard packaging, protective covering, electrical and electronic components, industrial cleaning products, pesticides, insecticides, etc.

PRESENT USE OF PFOS

The gradual discontinuation of the production of PFOS by the company 3M gradually resulted in a considerable decrease of the consumption of PFOS and derivatives. At present PFOS is being used in metal plating, in hydraulic fluids for the aviation industry, in the photographic industry.

MAIN USES OF PFOS

- Textile impregnation and surface protection
- Impregnation of leather and leather goods
- Impregnation of packaging (paper/cardboard)
- Cleaning agents, waxes and polishes for cars and floors
- Surface coating, paint and varnish
- Oil production and mining
- Photographic industry
- Electrical and electronic parts
- Semiconductor industry
- Aviation hydraulic fluids
- Fire-fighting foams
- Pesticides
- Medical devices
- Metal plating (non-decorative and decorative)

USES OF PFOS FOR VARIOUS APPLICATIONS

1. Impregnation of textiles, leather, carpets and protective covers:

PFCs are used extensively by the textile industry for the treatment of textiles, leather, carpets to repel water and oil. The main PFOS derivatives (normally 2–3% of the fibre weight for textiles but 15% for carpets) used for textile and carpet surface treatment applications were the acrylate, methacrylate, adipate and urethane polymers of *N*-ethyl perfluorooctane sulfonamidoethanol (EtFOSE). Bayer, DuPont, 3M and Daikin are some of the main suppliers of these chemicals (Hekster et al. 2002). In the production of textiles, PFAS substances are also used as wetting agents to enhance dyeing and as a binder in non-woven fabrics. PFAS substances are also used as antifoaming agents in textile treatment baths, emulsifying agents for fiber finishes, and for bleaching fibers (RPA 2004).In carpets, PFOS-derivatives are additionally used as impregnating agents (RPA 2004).

Producers: 3M (USA), DuPont (USA), Daikin (Japan); Miteni (Italy), and one manufacturer (China)

Trademarks: Well-known trademarks for dirt repellents include Scotchgard® (3M), Zonyl® (DuPont), Baygard® (Bayer), Foraperle® (Atofina/DuPont) (Hekster et al. 2002).

In leather furniture, leather makes up about 20%, which contain ca. 0.04% PFOS or 80 mg/kg. In leather car seats the weight of leather is 6 kg/m2, and PFOS about 2.4 g/m2 (0.04%). PFOS was used in cars until 2004. In synthetic carpets the PFOS polymer is about 588 g/m2, and that of PFOS is about 3 g/m^2, they were manufactured until 2009 in Europe. In China, PFOS are still manufactured.

2. For impregnation of paper and cardboard packaging

PFOS derivatives are used in the paper industry for the production of water-proof and grease-proof impregnated paper in concentration of 1-1.5% by weight of paper.

Manufacturers and trademarks: 3M (Scotchban); Bayer (Baysize S); BASF (Lodyne); Clariant (Cartafluor) and DuPont (Zonyl).
Applications: for food contact applications such as pizza boxes, popcorn bags, and wraps and in non-food contact applications such as folding cartons, containers, etc.

The following PFOS derivatives are used: Mono-, di- or triphosphate esters of N-ethyl perfluorooctane sulfonamidoethanol (EtFOSE) and *N*-Methyl perfluorooctane sulfonamidoethanol acrylate polymers

3. Cleaning agents, floor polishes and auto polishes

The PFOS derivative used in cleaning agents, floor polishes and auto polishes has been potassium N-ethyl-N-[(heptadecafluorooctyl)sulfonyl] glycinate (CAS No. 2991-51-7). Its concentration in the final product is usually between 0.005% and 0.01%, but may be several times higher.

3.2.4.1.3. *PFOS substitute alternatives*

There are alternatives for certain applications, but not all. The most common PFOS alternatives in use are fluorotelomers, which are precursors for perfluoroalkyl carboxylic acids (PFCA). Formerly, C8-fluorotelomers were a frequent choice; they have been shown, however, to degrade into perfluorooctanoic acid (PFOA), which also has hazardous properties. For that reason the major global producers of fluorochemicals have agreed to phase out C8-fluorotelomers before 2015 shifting to the less hazardous, shorter-chain C6-, C4- and C3-perfluoroalkylated chemicals.

ALTERNATIVES TO PFOS

The following alternatives to PFOS have been found: shorter-chain perfluoroalkyl sulfonates; shorter-chain perfluoroalkyl ketones and ethers; polyfluorodialkyl ether sulfonates; fluorotelomers and fluorophosphates; fluorinated co-polymers; fluorinated polyethers; siloxanes and silicone polymers; propylated aromatics; sulfosuccinates; stearamidomethyl pyridine chloride; and polypropylene glycol ether, amines and sulfates.

3.2.4.5. Legislation on PFOS and PFOS derivatives

✓ **Regulation (EU) No 757/2010 and Regulation (EU) No 756/2010 amending Regulation (EC) No 850/2004 on persistent organic pollutants as regards Annexes I and III and Annexes IV and V (OJ, L 223/25.08.2010, effective for Bulgaria as of 26.08.2010)**

Regulation (EU) No 757/2010 amending Regulation (EC) No 850/2004 on POPS as regards Annexes I and III (OJ, L 223/25.08.2010, effective for Bulgaria as of 26.08.2010) transposes the requirements of the Stockholm Convention as regards the new POPS included in the convention

PFOS is included in Annex I, Part A with specific exemptions. Annex I provides the minimum quantities which shall be considered insignificant pollutants in substances or preparations in PFOS concentrations equal to or under 10 mg/kg (0,001 % by weight).

There is not ban on the placing on the market and use of semi-finished products or articles, or parts thereof, if the concentration of PFOS is lower than 0,1 % by weight (1000 mg/kg), calculated with reference to the mass of structurally or micro-structurally distinct parts that contain PFOS or, for textiles or other coated materials, if the amount of PFOS is lower than 1 μg/m 2 of the coated material.
Use of articles already in use in the Union before 25 August 2010 containing PFOS as a constituent of such articles shall be allowed. Fire-fighting foams that were placed on the market before 27 December 2006 could be used until 27 June 2011.
Production and placing on the market is allowed for the following specific uses provided that Member States report to the Commission every four years on the progress made to eliminate PFOS: until 26 August 2015, wetting agents for use in controlled electroplating systems; photoresists or anti-reflective coatings for photolithography processes; photographic coatings applied to films, papers, or printing plates; mist suppressants for non-decorative hard chromium (VI) plating in closed loop systems; hydraulic fluids for aviation.

PFOS is also included in Annexes IV and V but the maximum concentration limits in the various types of waste according to their classification in Decision 2000/532/EC of the Commission specified in Annex V have not been determined yet.

✓ **Regulation (EC) No 689/2008 concerning the export and import of dangerous chemicals (Official Journal of the European Union L 204/31.07.2008), effective for Bulgaria as of 31.07.2008.**

This Regulation prohibits or strictly limits the export of chemicals defined as persistent organic pollutants in the Stockholm Convention, other than for environmentally-sound disposal. PFOS are included in Annex I Part 1 and 2 and they are subject to the export notification procedure. The Regulation requires from the member states to control the import of the chemicals listed in Annex I.

✓ **Directive 2008/105/EC on environmental quality standards in the field of water policy**

This Directive establishes environmental quality standards (EQS) for priority substances and certain other pollutants in terms of the water policy. PFOS is proposed for a priority substance included in Annex III.

3.2.4.6. Preliminary inventory of PFOS and PFOS derivatives

Considering that PFOS are new compounds and were included in the Stockholm Convention in 2009, there is still insufficient information available for making a full inventory. A preliminary study has been conducted regarding their import, placing on the market and use. The information was provided by the industry using questionnaires through the RIEW, NSI, NRA, the Customs Agency and the EUROSTAT database.

3.2.4.6.1 Production

Production: PFOS and PFOS derivatives have not been produced in Bulgaria. All these substances are imported in finished products or end products.

Source: Industry, January 2009 and March 2012

3.2.4.6.2 Import and export

Import: In 1991, 12 t fire-fighting foam was imported which contains 6 % PFOS, with the brand “FC 600 ATC” of „3M”, Switzerland. For the period 2000 – 2010, no PFOS compounds are registered as imported independently or in mixtures containing PFOS.

Export: Considering that PFOS or derivatives were never produced in Bulgaria, there has been no export.

Source: NSI, NRA, the Customs Agency, April 2011

3.2.4.6.3 Placing on the market and use

In 2009 the MoEW made an express survey through the RIEW regarding the placing on the market and use of PFOS in mixtures and products – fire-fighting foams, in the photographic industry, non-decorative hard plating, metal plating, etc. Information was requested from 202 companies in various sectors.

With the exception of only one company which declared the presence of 12 tons of fire-fighting foam containing 6 % PFOS, brand “FC 600 ATC”, none of the inspected companies in Bulgaria uses PFOS-containing compounds or products for its activities.

In January – March 2012, a new study was conducted by the MoEW regarding the use of PFOS in various applications and regarding the availability of alternatives on the territory of the whole country, with special detailed questionnaires. Through the RIEW the questionnaires were sent to 202 companies – importers, manufacturers and users down the chain and organizations for recovery and recycling of waste plastic. The selection criteria for the companies were the various uses by economic sectors.

The analysis of the results from the study shows that PFOS is not imported, placed on the market or used by the inspected companies in Bulgaria. Most applications of PFOS were covered. The study focused on the following sectors: production of polymer mixtures, plastic and rubber products, upholstered and leather furniture, mattresses, shades, blinds, tents, working and protective apparel, textiles, rubber-coated and impregnated fabrics, glues and mixtures, ground coats, putty, dyes and lacquers, thinners, washing, cleaning and polishing agents, rubber and textile conveyor belts, electrical and electronic parts for EEE, printed circuit boards, soft polyurethane foam (dunapren), expanded polystyrene (EPS), carpets, flooring (vinyl flooring), water-proofing foil, leather and leather goods, photographic products, household electric appliances, cardboard and plastic packaging.

Organizations for recovery and recycling of waste plastic, discarded EEE and ELV stated that no waste had been identified containing PFOS.

The study established fire-fighting foam containing 6% PFOS, type FC 600 or 6000 ATC, light water, manufactured by 3M, Switzerland, which was found in the district Fire Safety and Protection of the Population services.

3.2.4.6.4 Alternatives to PFOS used in Bulgaria for various applications

From all 202 companies which were inspected, 5 stated that they use the following alternatives to PFOS for various applications:

- Fire-fighting foam (2): Sthamer F-15, CAS No. 111-76-2, manufacturer – Dr. Sthamer – Hamburg, Germany, import 150 - 200 kg/year.
- Dye and lacquers: Capstone^{R} FS-61 Fluorosurfaktant, manufacturer DuPont de Nemours, the Netherlands, import 160 kg/ year.
- Polyurethane mixtures: WEVO HĂRTER 300 M – polyurethane hardener in the mixture with polyurethane PU 552 FL, manufacturer WEVO CHEMIE, Germany.
- Rubber mixtures: ready-made rubber mixtures are used which are supplied by a Bulgarian company based on SBR, NBR, EPDM and NR rubbers. In 2011, 800 tons of rubber mixtures were used.

3.2.4.6.5 Waste containing PFOS

In November 1991, a large oil company purchased 12 tons of fire-fighting foam with the brand “FC 600 ATC” manufactured by “3M”, Switzerland, which contains 6 % PFOS. On 24.11.2009 the company donated 10 t of this foam, which was permitted for use until 27 June 2011, to the General Directorate Fire Safety and Protection of the Population. The remaining 2 t of the said foam were used on 20.06.2011.

From the donated 10 t fire-fighting foam, 610 kg were used to extinguish fires. The total quantity of the PFOS fire-fighting foam used is 2610 kg.

After 27 June 2011, the foam should be treated as hazardous waste and as at April 2012, 8 110 kg of fire-fighting foam “FC 600 ATC” containing 6 % PFOS were identified as waste in the country, stored in tightly sealed containers (210 kg) in restricted-access premises at the General Directorate Fire Safety and Protection of the Population. Further 1 280 kg were delivered for disposal to licensed companies for hazardous waste treatment.

In 2012, GD FSPP initiated a public procurement procedure for selecting a licensed company for disposal of the available 8 110 kg of the product outside Bulgaria.

❖ **GENERAL CONCLUSIONS**

✓ **PFOS and PFOS-derivatives were never manufactured in Bulgaria according to industry data.**

✓ **The import, export, placing on the market and use of PFOS independently is either prohibited or strictly limited in Bulgaria;**

✓ **For the period 1996 – 2010, no import of PFOS has been registered, whether independently, in mixtures or products.**

✓ **There is no reliable data regarding export of products or articles containing PFOS;**

✓ **There is no ban on the placing on the market and use of semi-finished products or articles, or parts thereof, if the concentration of PFOS is lower than 0,1 % by weight for textiles or other coated materials, if the amount of PFOS is lower than 1 µg/ m^2 of the coated material.**

✓ **Use of articles already in use in the Union before 25 August 2010 containing PFOS as a constituent of such articles shall be allowed.**

✓ **Production and placing on the market is allowed for the following specific uses in the country: until 26 August 2015, wetting agents for use in controlled electroplating systems; photoresists or anti-reflective coatings for photolithography processes; photographic coatings applied to films, papers, or printing plates; mist suppressants for non-decorative hard chromium (VI) plating in closed loop systems; hydraulic fluids for aviation.**

✓ **In 2009, 12 000 kg fire-fighting foam containing 6% PFOS, brand FC 600 ATC, was found.**

✓ **Until 27 June 2011, 2 610 kg fire-fighting foam containing 6% PFOS, brand FC 600 ATC, were used to extinguish fires.**

✓ **In 2011, 1 280 kg fire-fighting foam containing 6% PFOS were delivered as waste for disposal outside the country;**

✓ **No permitted use of PFOS has been registered in the country for decorative and non-decorative hard plating, for the photographic industry, dyes and lacquers, in the furniture and leather industry, in cleaning agents, car and floor polishes, cardboard packaging;**

✓ **No waste plastic was been identified which was generated from the dismantling of discarded EEE and ELV, containing PFOS. No samples were analyzed in the country from plastic fractions from discarded EEE regarding PFOS content due to the fact that there have been no legal grounds for such analyses.**

✓ **8 110 kg of fire-fighting foam containing 6 % PFOS were identified as waste which will be disposed of outside Bulgaria due to there being no hazardous waste incineration facilities in Bulgaria;**

✓ **There are some alternatives to PFOS in various applications in the country.**

3.3 Releases from unintentionally produced POPS (PCDD/PCDF, HCB, PCB, PeCB, PAH)

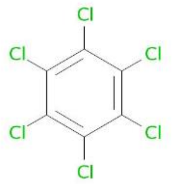
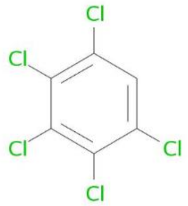
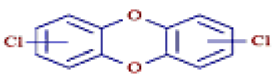
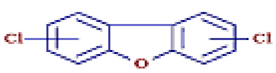
PCDD and PCDF, HCB, PCB, and PeCB belong to persistent organic pollutants, generated and released unintentionally from anthropogenic sources, identified in Annex C of the Stockholm Convention. They are generated and released from thermal processes, including organic substances and chlorine, as a result of incomplete combustion or chemical reactions.

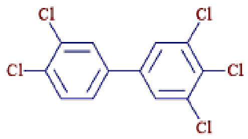
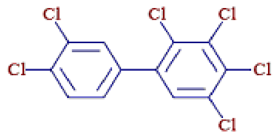
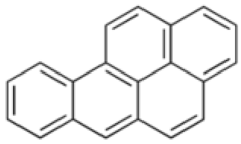
PAH are organic compounds, belonging to the group of the persistent organic pollutants, identified in Annex III of Regulation 850/2004 and Annex III of the Protocol on POPs, they are not included in the Convention.

During the last two decades, a total reduction of the levels of PCDD/PCDF, PCB, HCB and PeCB in the environment and in humans was achieved through control over the industrial emission sources. However, taking into account the persistency of these chemicals, it is expedient to continue the efforts for reduction of the anthropogenic emissions to the environment with the ultimate goal to minimize and finally eliminate them, where possible. Furthermore, the levels in food and feed should additionally be reduced in order to limit the exposure of humans.

Table No. 124 sets out the unintentionally produced POPs, included in Annex C of the SC, in Annex III of the Protocol on POPs and in Annex III of Regulation 850/2004/EC.

Table 124: Unintentionally produced POPs, included in Annex C of the SC, in Annex III of the Protocol on POPs and in Annex III of Regulation 850/2004/EC

No.	POPs chemical	CAS No.	EC No.	Structural formula	Annex	Acceptable purpose for production or specific exemption for use
16)	Hexachlorobenzene (HCB)	118-74-1	204-273-9		A and C	Production: none Use: none
17)	Pentachlorbenzene (PeCB)	608-93-5	210-172-0		A and C	Production: none Use: none Included in Annexes A and C of the Stockholm Convention in May 2009 Ban – 26.08.2010
18)	Polychlorinated dibenzo-p-dioxins/furans (PCDD/PCDF)	2,3,7,8-TetraCDD - 1746-01-6 2,3,7,8-TetraCDF - 51207- 31-9	217-122-7 etc.	 75 congeners  135 congeners	C	Not in production or use. Unintentionally generated.

No.	POPs chemical	CAS No.	EC No.	Structural formula	Annex	Acceptable purpose for production or specific exemption for use
19)	Polychlorinated biphenyls (PCB)	1336-36-3 etc.	215-648-1 etc.	 Non-*ortho* PCB PCB #126  Mono-*ortho* PCB PCB #156	A and C	Production: none Use: in equipment according to Part II of Annex
20)	Polycyclic aromatic hydrocarbons (PAH)	207-08-9 etc.	205-916-6 etc.	 Benzo(a)pyrene	III	Not in production or use. Unintentionally generated.

3.3.1. Properties and characteristics

Table No. 125 sets out the main properties and POPs characteristics of PCDD/PCDF, PCB, HCB, PeCB and PAH.

Table 125: Properties, characteristics and exposure of PCDD/PCDF, PCB, HCB, PeCB and PAH

POPs	POPs characteristics and exposure
PCDD/PCDF	PCDD/PCDF are tricyclic, aromatic compounds formed by two benzene rings which are connected by two oxygen atoms in polychlorinated dibenzo-p-dioxins and by one oxygen atom and one carbon-carbon bond in polychlorinated dibenzofurans and the hydrogen atoms of which may be replaced by up to eight chlorine atoms. Theoretically, there exist 75 possible isomers of PCDD and 135 of PCDF. The toxicity of PCDD and PCDF is expressed by toxic equivalence factor, which measures the relative dioxin-like toxic activity of different congeners of polychlorinated dibenzo-p-dioxins and dibenzofurans and coplanar polychlorinated biphenyls in comparison to 2,3,7,8-tetrachlorodibenzo-p-dioxin. PCDD/PCDF are generated unintentionally as by-product in the production of other chemicals or are released in many thermal processes – in incineration of hazardous and medicinal waste, emissions from motor vehicles, in incineration of coal, peat, wood etc. <u>Routes to the environment and exposure</u> PCDD/PCDF are emitted in the air in the form of gas or bound to the particulates dispersed in the waste gases (drops, dust, soot, ash) and this stops them from disintegrating. In the form of gas, they are photo-degradable. Because of their low vapour pressure they are prone to long-range atmospheric transport. In water, dioxins and furans exhibit extremely low solubility but, also, high capacity for adsorption into sediments and into the biota. It has been established that more than 90% of the 2,3,7,8-THDD available in the aquatic environment exist in adsorbed state. PCDD/PCDF enter soils by means of wet and dry deposits adsorbed onto solid particles and water drops, hence their evaporation from the soil surface is limited. They do not infiltrate from

POPs	POPs characteristics and exposure
	soils into the ground water and do not wash away from surface water. PCDD/PCDF are likely to cause adverse effects to human health associated with: dermal toxicity (chloracne and hyper pigmentation), altered liver function and lipid metabolism, weight loss, depression of the immune system, and endocrine and nervous system abnormalities. Other effects on human health are peripheral neuropathies, fatigue, depression, personality changes, hepatomegaly, and hepatitis. 2,3,7,8- PCDD is a potent teratogenic and fetotoxic agent in animals and causes cancer in rats. The groups most sensitive to the effects of PCDD/PCDF are fetus and neonatal infants. The International Agency for Research on Cancer (IARC) classifies PCDD/PCDF in Group 3 (not classifiable as to carcinogenicity to humans), excluding 2,3,7,8- PCDD – classified in Group 1 (carcinogenic to humans).
PCB	PCB are aromatic compounds formed in such a manner that the hydrogen atoms on the biphenyl molecule may be replaced by up to ten chlorine atoms. Routes to the environment and exposure PCBs are heavier than air and can settle in the ground layer. PCB molecules bind to volatile dust particulates and to fine aerosols, they spread into the atmosphere, and settle long-range, mainly in areas of cold climate. PCB evaporate from ground and water surfaces over several days. They accumulate in the sediments on water basin bottoms and may, through infiltration, pollute ground water. Local pollution is possible also in result of emergencies or accidents. PCB enter soils by means of wet and dry deposits adsorbed onto solid particles and water drops. Increasing chlorine atoms increases the adsorption and resistance to biodegradation in soils, and reduces the speed of infiltration. PCB are likely to cause adverse effects to human health associated with: a skin condition called chloracne; liver and thyroid gland damage, immunotoxicity, neurobehavioral deviations, reduced body mass of the newly born, reprotoxicity and carcinogenicity. IARC classifies PCBs in group 2A (probable carcinogen to humans).
HCB	HCB belongs to the group of chlorbenzenes in which the hydrogen atoms on the benzene ring may be replaced by up to 6 chlorine atoms. Routes to the environment and exposure HCB are emitted in the air through the particulates dispersed in the waste gases - drops, dust, and soot. Hexachlorobenzene is resistant to ultraviolet radiation. Photo degradation in the atmosphere takes approximately 2 years and the metabolites may cause the formation of greenhouse gases. HCB is highly volatile and enters the air. It is highly resistant to degradation in aerobic and anaerobic soils (DT50soil = from 2.7 to 22.9 years). HCB does not dissolve in water but is transported by water and in this way pollutes other water basins and, thus, soils. HCB adverse effects on human health are associated with: alterations in liver enzyme activities and liver and thyroid gland damage, neurobehavioral deviations, depression of the immune system, and endocrine and nervous system abnormalities, reduced body mass of the newly born and reprotoxicity. HCB is known to cause liver disease in humans (porphyria cutanea tarda). The IARC classifies HCB in group 2B (possible carcinogen to humans).
PeCB	PeCB belongs to the group of chlorbenzenes in which the hydrogen atoms on the benzene ring are replaced by up to 5 chlorine atoms. Routes to the environment and exposure PeCB is persistent in the environment and is prone to bioaccumulate into the biota. It is classified as moderately toxic for humans and highly toxic for aquatic organisms. PeCB is emitted in the air through thermal processes and incomplete combustion in various industrial processes. It is strongly resistant to degradation in the air (DT50air = 277 days) and is prone to long-range atmospheric transport. The half-life (DT50water) of PeCB in surface water

POPs	POPs characteristics and exposure
	varies from 194 to 1 250 days. Humans may be exposed to the adverse effect of PeCB through breathing air, eating food or drinking water contaminated with PeCB. It is found in mother's milk and accumulates in the placenta and adipose tissue. It causes liver and kidney damages, increase in body mass and histopathological changes. PeCB is a potent teratogenic agent in mammals in high doses. IARC classifies PeCB in group 3 (not classifiable as to carcinogenicity to humans).
PAH	PAH are organic compounds, composed of no less than two fused aromatic rings formed entirely from carbon and hydrogen. PAH represent a group of more than 100 various chemical compounds, which consist of aromatic rings and do not contain heteroatoms or carry substituents. Naphthalene is the simplest example of a PAH. PAH occur in oil and coal, and are produced as byproducts of fuel burning. For the purposes of the inventory of the emissions, the following four indicatory PAH compounds are used: benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene and indeno (1,2,2-cd) pyrene <u>Routes to the environment and exposure</u> PAH are emitted in the air in result of incomplete combustion of petrol, diesel and coal or in pyrolysis of organic material. Cigarette smoke contains high concentrations of PAH. They are separated in the form of evaporations and bind to particulates, which we breathe in and which are released by the engines of the motor vehicles and by companies using coal. This type of pollution is typical for the big cities with intensive motor vehicle traffic. PAH may also penetrate the aquatic environment as a result of waste water discharge from industrial enterprises and in the soil from landfill sites. They may be found also in some foodstuffs (smoked meat) and cosmetic products (creams). As a pollutant, they are of importance for the environment and the human health because of their persistence, bioaccumulation and toxicity for the leaving creatures. Some of the PAH compounds have been identified as mutagenic, carcinogenic and teratogenic. A long-term exposure of humans to PAH causes cataracts, damages to the kidneys, liver and the gall. In case of repeated contact with the skin, PAH naphthalene may lead to cutaneous erythema and inflammation. Inhaling and swallowing large quantities of naphthalene may destroy red blood cells. IARC classifies 3 indicatory representatives of PAH: benzo(a)pyrene, benzo[a]antheacene; and dibenz[a,h]antheacene in group 2A (probable carcinogen to humans).

3.3.2. Categories of industrial sources of POPs emissions

CATEGORIES OF MAJOR STATIONARY SOURCES OF POPS EMISSIONS

The following Categories of industrial sources have a potential to form comparatively large quantities of **PCDD and PCDF, HCB, PCB and PeCB** emissions to the environment:

(a) Waste incineration, including co-incineration of municipal waste, hazardous waste, medical waste or sewage sludge;
(b) Cement kilns burning hazardous waste;
(c) Production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching;
(d) The following thermal processes in the metallurgical industry:
(i) Secondary copper production;
(ii) Sinter plants in the iron and steel industry;
(iii) Secondary aluminum production;
(iv) Secondary zinc production.

The categories of major stationary sources of **PAH** emissions include:

a) domestic wood and coal heating;
b) open fires such as refuse burning, forest fires and after-crop burning;
c) coke and anode production;

d) aluminum production (via Soederberg process); and
e) wood preservation installations, except for a Party for which this category does not make a significant contribution to its total emission of PAH

The major sources of **HCB** emissions may be as follows:
a) waste incineration plants, including co-incineration;
b) thermal sources of metallurgical industries; and
c) use of chlorinated fuels in furnace installations.

OTHER CATEGORIES OF STATIONARY SOURCES OF POPS EMISSIONS

PCDD and PCDF, PeCB, HCB and PCB may also be unintentionally formed and released from the following source categories, including:
(a) Open burning of waste, including burning of landfill sites;
(b) Thermal processes in the metallurgical industry not mentioned in Part II;
(c) Residential combustion sources;
(d) Fossil fuel-fired utility and industrial boilers;
(e) Firing installations for wood and other biomass fuels;
(f) Specific chemical production processes releasing unintentionally formed persistent organic pollutants, especially production of chlorophenols and chloranil;
(g) Crematoria;
(h) Motor vehicles, particularly those burning leaded gasoline;
(i) Destruction of animal carcasses;
(j) Textile and leather dyeing (with chloranil) and finishing (with alkaline extraction);
(k) Shredder plants for the treatment of end of life vehicles;
(l) Smouldering of copper cables;
(m) Waste oil refineries.

3.3.3. Institutional and legal framework on POPs in emissions

3.3.3.1. Competent bodies and responsibilities

MoEW implements the government policy on ambient air protection. Municipal authorities and RIEW exercise control and management of the activities related with the quality of air in their respective territory.

Air quality is monitored through the National Monitoring, Control and Information System. The National System for Environment Monitoring evaluates the air quality (NAAQMS) on the territory of the country, divided into 6 regions for assessment and management of the air quality (RAAQAM), approved by Order No. 1046/03.12.2010 of the Minister of Environment and Water.

An annual statistical and mandatory tool control of the emissions of harmful substances from stationary sources is conducted on the territory of the country through inventory of sites and sources of harmful substances.

Annually, MoEW, EEA and RIEW determine the enterprises, which are sources of harmful substances in the atmosphere and are subject to control through filling-in registration cards according to a list approved by the Minister of environment.

The data base contains information on the emissions from all sources of harmful substances from anthropogenic activities and nature, summarized in 11 main groups. The emissions of the following POPs are calculated: PCDD/PCDF, PCB, and HCB and PAH.

The assessment of the air quality related health and environmental risk is performed by **MoH** and **MoEW.**

The immediate control over the status and the operation of the sites with sources of emissions in the atmosphere and over the emissions from the separate sources is exercised by RIEW and the municipal authorities;

Determination of limit concentration of harmful substances in the emissions from vehicles and control over their application falls within the competency of **MoTITC**.

3.3.3.2. Existing policy

HARMFUL SUBSTANCES AIR EMISSIONS INVENTORY SYSTEM

In Bulgaria, two parallel inventory programs are implemented. The first one covers 150 major stationary sources and is implemented by RIEW and EEA. The second one covers 2000 point sources and is implemented by NSI. Both programs are managed by MoEW. The data collected refer to the control of air contamination from industrial installations and their efficiency, technological and production data, as well as data for the fuels used and any sanctions imposed.

NSI is responsible for the assessment of the following emission sources:
- Combustion processes in energy production and transformation;
- Combustion processes in the commercial and administrative sector, the agriculture, forestry and water management sectors;
- Combustion processes in the industry;
- Production processes;
- Production and distribution of fossil fuels;
- Agriculture and forestry;
- Nature.

EEA is responsible for the assessment of the following emission sources:
- Road transport;
- Combustion processes in the residential sector;
- Other motor vehicles and machines;
- Waste treatment and disposal.

Data for the emissions are kept on national and regional level. On national level EEA is the institution responsible for the final preparation of the national air emissions inventory of harmful substances and reporting of the data to the Convention on Long Range Transboundary Air Pollution (UNECE/CLRTAP).

3.3.3.3. Regulatory framework on the management of POPs emissions

✓ **The Stockholm Convention on the Persistent Organic Pollutants**

The Convention introduces measures to reduce or eliminate releases derived from unintentional production of POPs, included in Annex C: PCDD and PCDF, PeCB, HCB and PCB.

The total releases of by-products unintentionally derived from anthropogenic sources are subject to continuing minimization and, where possible, ultimate elimination. The most stringent requirement regarding the control of the emissions is to promote and, in accordance with the implementation schedule of its action plan, require the use of best available techniques for new sources within source categories which a Party has identified as warranting such action in its action plan, with a particular initial focus on source categories identified in Part II of Annex C.

In any case, the requirement to use best available techniques for new sources in the categories listed in Part II of Annex C should be phased in as soon as practicable but no later than four years after the entry into force of the Convention for that Party (for Bulgaria 20.03.2009). For the identified categories, Parties should promote the use of best environmental practices (BEP). For this purpose, Parties should encourage the use of best available techniques and best environmental practices for both the existing sources within the source categories identified in Part II, and the new sources within the source categories identified in Part III of Annex C.

The Convention contains also general guidance on BAT and BEP, aimed to prevent or reduce the releases of the chemicals listed in Part I.

A. General prevention measures relating to both BAT and BEP

Appropriate measures to prevent the formation and release of POPs substances could include:

(a) the use of low-waste technology;

(b) the use of less hazardous substances;

(c) promotion of the use of methods for recovery and recycling of waste and of substances generated and used in a process;

(d) replacement of feed materials which are persistent organic pollutants or where there is a direct link between the materials and releases of persistent organic pollutants from the source;

(e) good housekeeping and preventive maintenance programmes;

(f) improvements in waste management with the aim of the cessation of open and other uncontrolled burning of wastes, including the burning of landfill sites;

(g) minimization of these chemicals as contaminants in products;

(h) avoiding elemental chlorine or chemicals generating elemental chlorine for bleaching.

B. Best Available Techniques (BAT)

The concept of BAT is aimed at taking into account the technical characteristics of the installation concerned, its geographical location and the local environmental protection conditions. In determining best available techniques, special consideration should be given to the following factors, bearing in mind the likely costs and benefits of a measure and consideration of precaution and prevention:

(a) General Considerations:

- the nature, effects and mass of the releases concerned: techniques may vary depending on source size;
- the commissioning dates for new or existing installations;
- the time needed to introduce the best available technique;
- the consumption and nature of raw materials used in the process and its energy efficiency;
- the need to prevent or reduce to a minimum the overall impact of the releases to the environment and the risks to it;
- the need to prevent accidents and to minimize their consequences for the environment;
- the need to ensure occupational health and safety at workplaces;
- comparable processes, facilities or methods of operation which have been tried with success on an industrial scale;
- technological advances and changes in scientific knowledge and understanding.

(b) General Release Reduction Measures:

When considering proposals to construct new facilities or significantly modify existing facilities using processes that release chemicals listed in Annex C, priority consideration should be given to alternative processes, techniques or practices that have similar usefulness but which avoid the formation and release of such chemicals. The measures for reducing the releases include:

- use of improved methods for flue-gas cleaning such as thermal or catalytic oxidation, dust precipitation, or adsorption;
- treatment of residuals, wastewater, wastes and sewage sludge by, for example, thermal treatment or rendering them inert or chemical processes that detoxify them;
- process changes that lead to the reduction or elimination of releases, such as moving to closed systems;
- modification of process designs to improve combustion and prevent formation of the chemicals listed in this Annex, through the control of parameters such as incineration temperature or residence time.

✓ **Regulation (EC) No. 850/2004 on POPs**

The Regulation introduced in the European Union legislation the obligations formulated by the Stockholm Convention and the Protocol on POPs. It includes the obligation to prepare inventories of the releases from unintentionally produced POPs and the measures for their reduction or elimination, where applicable. Annex III of the Regulation lists PCDD/PCDF, PAH, PCB and HCB.

✓ **Regulation (EC) No. 166/2006 of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register (EPRTR)**

EPRTR obliges the EU Member States to report the releases from all activities within the scope of Annex I of the Regulation.

Annex I of the Regulation includes 65 activities, grouped into 9 sectors:

1. Energy Industries,
2. Production and Processing of Metals,
3. Minerals Industry,
4. Chemicals Industry,
5. Waste and Waste Water Management,
6. Production and Processing of Paper and Wood,
7. Intensive Livestock Farming and Aquaculture,
8. Animal and Vegetable Raw Materials for Food and Beverages Industry,
9. Other Activities

The operator of each facility that undertakes one or more of the activities specified in Annex I exceeding the applicable capacity thresholds specified therein is obliged to report the release and the transfer of the pollutants, listed in Annex II, which includes 91 pollutants.

Limit values (thresholds) are defined for the releases to air, water and soil, as well as the transfer outside the site of any pollutant specified in Annex II. This Annex specifies the following limit values for POPs emissions to the air of HCB (10 kg/g), PCDD/F(0,0001 TEF), PeCB (1 kg/g), PCB (0,1 kg/g), PAH (50 kg/g).

✓ **Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control (IPPC) (OJ 2008 L 24/29.01.2008)**

The aim of the Directive is to achieve integrated prevention and control of pollution arising from different categories of industrial activities. The main objectives of IPPC are achieved through undertaking a number of measures, including also through application of any possible measures for prevention of the pollution by using BAT.

Annex III of Directive 2008/1/EC specifies an exemplary list of the main polluting substances, which should be considered, if related to the setting of air emission limit values. Among those are the limit values for PCDD/PCDF.

✓ **Environmental Protection Act**

The requirements of Directive 2008/1/EC on IPPC are transposed in the Bulgarian legislation in the Environmental Protection Act – Chapter Seven "Prevention and Limitation of Industrial Pollution", Section II "Integrated Permits". The integrated approach to prevention and control of pollution (incl. also of POPs – is applied for installations and activities falling within the scope of Annex No. 4 of the Environmental Protection Act.

✓ **Clean Ambient Air Act (CAAA)**

The act regulates the specification of indices and emission limit value of ambient of air quality, limitation of the emissions, the rights and obligations of the respective authorities as regards the control, management and maintenance of the ambient air quality.

In view of securing ambient air quality in line with the established standards, the law aims to limit the emissions and the by-laws thereto introduce limit values for concentrations of harmful substances, released in the atmosphere from stationary sources.

3.3.3.4. Limit values of PCDD/PCDF, PCB, HCB and PAH

The observance of the existing national legislation regarding the management of POPs in emissions from unintentional production guarantees the reduction of their adverse effects on the human health and the environment.

Tables from 3 through 10 show the limit values for PCDD/PCDF, PCB, PAH and HCB in ambient air, approved by the national legislation.

✓ **Ordinance No. 1 dated 27.06.2005 concerning emission limit values of harmful substances (pollutants), released in the atmosphere from facilities and activities with stationary sources of emissions (promulgated SG 64/05.08.2005, in force from 06.08.2006)**

The Ordinance specifies emission limit values (ELV) of harmful substances, emitted in the atmosphere from facilities and activities with stationary sources of emissions, in view of prevention and limitation of any possible direct and/or indirect effects of the emissions on the environment, as well as any related potential risks for the human health.

Annex No. 6 to Article 20, para 1

Table 126: Emission limit values (ELV) of PCDD/PCDF, released from stationary sources

No.	Dioxines and furans (PCDD/PCDF)	ELV ng TE/m3
1	Total emissions of dioxines and furans, released in the atmosphere from operating and new stationary sources of emissions, within a certain site or activity upon reporting their toxic equivalency factors.	0,1 ng TE/m3 0,25 μg/h
2	Emissions of dioxines and furans from iron ore sintering plants	0,4 ng TE/m3
3	The total emissions of dioxines and furans in the waste gas from installations for production of non-ferrous crude metals, excluding aluminum and ferrous alloys	0,4 ng TE/m3
4	The emissions of dioxines and furans in the waste gas - in the smelting, alloying and refining of non-ferrous metals, excluding aluminum - in smelting of copper in blast furnaces	 0,1 ng TE/m3 0,4 ng TE/m3

In order to fix the total adjusted value (under the toxic equivalency method) the mass concentrations of the dioxines and the furans should be multiplied by the following toxic equivalency factors and then summed up:

MAC is calculated totally for PCDD and PCDF, according to the following toxic equivalency factors (TEF)[104]:

[104] Annex IV, Regulation 756/2010 concerning the amendment of Annexes IV and V to Regulation (EO) No. 850/2004 of the European Parliament and the Coucil regarding the persistent organic pollutants

Table 127: Toxic equivalency factors of dioxines and furans

No.	Chemical Compound	Toxic equivalency factors TEF
1	2,3,7,8 - Tetrachlordibenzodioxin (TCDD)	1
2	1,2,3,7,8 - Pentachlorinedibenzodioxin (PeCDD)	1
3	1,2,3,4,7,8 - Hexachlorinedibenzodioxin (HxCDD)	0,1
4	1,2,3,6,7,8 - Hexachlorinedibenzodioxin (HxCDD)	0,1
5	1,2,3,7,8,9 - Hexachlorinedibenzodioxin (HxCDD)	0,1
6	1,2,3,4,6,7,8 - Heptachlorinedibenzodioxin (HpCDD)	0,01
7	- Octachlorinedibenzodioxin (OCDD)	0,0003
8	2,3,7,8 - Tetrachlordibenzofuran (TCDF)	0,1
9	2,3,4,7,8 - Pentachlorinedibenzofuran (PeCDF)	0,03
10	1,2,3,7,8 - Pentachlorinedibenzofuran (PeCDF)	0,03
11	1,2,3,4,7,8 - Hexachlorinedibenzofuran (HxCDF)	0,1
12	1,2,3,6,7,8 - Hexachlorinedibenzofuran (HxCDF)	0,1
13	1,2,3,7,8,9 - Hexachlorinedibenzofuran (HxCDF)	0,1
14	2,3,4,6,7,8 - Hexachlorinedibenzofuran (HxCDF)	0,1
15	1,2,3,4,6,7,8 - Heptachlorinedibenzofuran (HpCDF)	0,01
16	1,2,3,4,7,8,9 - Heptachlorinedibenzofuran (HpCDF)	0,01
17	- Octachlorinedibenzofuran (OCDF)	0,0003

✓ **Ordinance No. 2 concerning the emission limit values (concentrations in waste gas) of harmful substances, released in the ambient air from stationary sources, promulgated SG issue 51/06.05.1998, as last amended in SG, issue 19/08.03.2011)**

The objective is through observing the ELV to prevent or limit the emissions of harmful substances, released in the ambient air from stationary sources.

Table 128: ELV of Dioxines (2, 3, 7, 8- tetrachlordibenzodioxines), emitted from installations for incineration of solid household waste

Waste incineration installations	**ELV** (relative to 11% concentration of O2 in the fume gases) ng/m3		
	Less than 1 t/h	between 1 and 3 t/h	3 t/h or more
Household waste	0,1	0,1	0,1

✓ **Ordinance No. 6 concerning the terms and requirements for the construction and operation of waste incineration and co-incineration plants, promulgated SG, issue 78/07.09.2004, as amended SG, issue 98/2004**

The Ordinance stipulates the terms and requirements for the construction and operation of waste incineration and co-incineration plants in view of preventing, reduction and/or minimizing the environmental pollution, including the emissions of harmful substances released in the ambient air, soils, the surface and ground water, and any risks arising for the human health there from.

Annex No. 1 to Article 2, para 4

Table 129: Daily average ELVs of dioxines and furans in the ambient air from waste incineration plants, fixed as average value for not less than a six-hour and not more than an eight-hour sampling period:

Harmful substances	ELV, ng /m^3
Dioxines and furans	0,1

The emission limit value relates to the total concentration of dioxines and furans, calculated on the bases of their toxic equivalency, according to Annex No. 6. (see table 126 above).

Annex No. 4 to Article 25, para 3

Table 130: Emission limit values for maximum level of harmful and hazardous substances in discharges of waste water from flue gas cleaning

Harmful substances	Emission limit values, ng/l
Dioxines and furans, as a sum of separate dioxines and furans*	0,3

* Recalculated according to Annex VI

In order to determine the accumulated values (toxic equivalency, TE) the mass concentrations of PCDD and PCDF should be multiplied by TEF before adding them up (see table 126 above for the values of TEF)

✓ **Ordinance No. 13 concerning the protection of the health and safety of workers from the risks related to chemical agents at work, promulgated SG, issue 8/2004, in force from 31.01.2005, as last amended, SG issue No. 67 dated 17.08.2007**

The Ordinance stipulates the obligations of the employers to secure health and safety of workers handling chemical agents; the minimum requirements for the protection of the health and safety of workers from the existing or potential risks in exposure to chemical agents at work and the limit values of the chemical agents in the air at the place of work, identified in Annex No. 1.

Table 131: Limit values of the chemical agents in the air of the working environment under Annex 1, to Article 1, para 1, point 3

Item No.	Chemical agent	CAS No.	Limit values	
			8 hours	15 min.
			mg/m^3	mg/m^3
361.	Polychlorinated biphenyls (54 % chlorine)	11097-69-1	0,5	1,0
362.	Polychlorinated biphenyls (42 % chlorine)	53469-21-9	1,0	2,0

✓ **Ordinance No. 11 dated 11.05.2007 concerning the limit values for arsenic, cadmium, nickel and polycyclic aromatic hydrocarbons in the ambient air (promulgated SG issue No. 42 dated 29.05.2007)**

This Ordinance regulates the establishment of target limit values for the levels of arsenic, cadmium, nickel and benzo[a]pyrene in the ambient air and deposition thereof from the ambient air on open areas, the establishment of unified method and criteria for evaluation of their level in the ambient air, as well as improvement of the air quality in the regions where the limit values are exceeded. The limit values are established in view of elimination, prevention or limitation of any possible harmful effects on the human health and the environment related to arsenic, cadmium, nickel and benzo[a]pyrene, (used as a marker for carcinogenic risk from PAH).

Annex No. 1 to Article 3

Table 132: Target limit values for the levels of benzo[a]pyrene in the ambient air

Pollutant/harmful substance	Assessment threshold (a)
Benzo[a]pyrene	1 ng/m3

Annex No. 2 to Article 4, Article 5, para 1 and Article 8, para 1

Table 133: Upper and lower assessment thresholds of the levels of benzo[a]pyrene in the ambient air within a certain region or agglomeration

Assessment threshold	Benzo[a]pyrene,
Upper – expressed in percentage of the target limit value	60 % (0,6 ng/m3)
Lower - expressed in percentage of the target limit value	40 % (0,4 ng/m3)

✓ **Ordinance concerning the type, amount and procedure for imposing sanctions in case of environmental damages or pollution exceeding the limit values and/or in case of failure to comply with the fixed emission limit values and limitations, SG, issue No. 70/09.09.2011, in force from 10.11.2011**

The Ordinance stipulates the type, the amount and the procedure for imposing sanctions in case of environmental damage or pollution exceeding the limit values and/or in case of failure to comply with the fixed emission limit values and limitations.

Annex No. 2: Harmful substances (pollutants) and unit amounts of the sanctions in case of ambient air pollution.

Dioxines and furans – BGN 50/mg

Annex No. 4: Types of pollutants and damages to soils and unit amounts of the sanctions:

1. PAH– BGN 40.80/m^2
2. PCB – BGN 40.80/m^2

3.3.4. Inventory of POPs emissions from unintentional production in Bulgaria

3.3.4.1. Methodology

POPs emissions are calculated using the "Methodology for establishing the emissions of harmful substances in the air"(CORINAIR Emission Inventory Guidebook 2009), as updated for 2009 and approved by order of the Minister of environment and water. It adapts the EU methodology CORINAIR-2009, SNAP-97 to the Bulgarian conditions taking into account the source categories, the existing technological processes, the state of the equipment and the effective regulatory framework in the country. A newly developed and updated methodology CORINAIR 2010 is available, which will be used in future for calculation the POPs emissions. The methodology is used for book inventory of the emissions of harmful substances in the air.

The CORINAIR methodology for inventory of the emissions of harmful substances in the air covers the activities from anthropogenic sources, which may lead to releases of emissions in the air. The CORINAIR methodology includes the SNAP 97 codes encompassing all pollutants and gases subject to inventory. In the methodology the activities are developed into three levels:

The first level includes 11 main groups. These are:

- 01 Combustion in energy and transformation industries,
- 02 Combustion in commerce, administration and residential sectors, in agriculture, forestry and water management (non-industrial combustion plants)
- 03 Combustion in manufacturing industry,
- 04 Non-combustion processes,
- 05 Extraction and distribution of fossil fuels,
- 06 Solvent use,
- 07 Road transport,
- 08 Other mobile sources and machinery,

- 09 Waste treatment and disposal,
- 10 Agriculture and forestry and land-use changes,
- 11 Nature;

Second level – subgroups per categories of activities, third level includes specific activities.

The various pollutants of the ambient air are grouped in 5 groups: greenhouse gases; heavy metals; persistent organic pollutants POPs; dust; and specific organic pollutants. The third group (POPs) includes - PCDD/PDDF, PCB, HCB and PAH, and the fifth group includes the POPs pesticides (Aldrin, Chlordane, Chlordecone, DDT, Dieldrin, Endrin, Heptachlorine, Mirex, Toxaphene and Hexabromobiphenyl).

POPs emissions are calculated using the following formula:

$$E = EF. A$$

where,

E – emission a certain quantity;

EF - emission factor, which is a relative measure and represents an emission related to a quantitative unit that defines adequately the specific activity.

A – statistical value, which is a quantitative characteristic of the activity.

The emission factor reflects the correlation between the quantity of POPs emissions and:

- used raw materials;
- the process type;
- the level of used technology;
- the availability and type of treatment facilities;

A change of one or more of the four EF determining factors requires recalculation of the quantity of the emissions. The emission factor value is not influenced by the geographic location of the activity.

The emission is determined depending on the type of the given activity, as follows:

In combustion processes, the quantity of thermal energy given off or the quantity of fuel burnt is multiplied by EF. In production processes, the emissions are the product of the quantity of production manufactured and EF. In solvent use, the solvent quantity is multiplied by EF. In transport, the POPs emissions are a result of the product of the fuel consumed and EF.

The quantities of the POPs emissions for the period 2006 - 2009 in Bulgaria are calculated on the basis of emission factors, conforming to the levels of technology for the respective year.

3.3.4.2. Scope of the inventory of POPs emissions

The inventory of the POPs emissions covers the POPs substances from unintentional production included in the third group: PCDD/PDDF, PCB, HCB and PAH, determined by book inventory according to the methodology proved by MoEW.

For the fifth group POPs pesticides (Aldrin, Chlordane, Chlordecone, DDT, Dieldrin, Endrin, Heptachlorine, Mirex, Toxaphene and Hexabromobiphenyl) no emission values are reported because the import, marketing and use of POPs pesticides have been banned since tens of years, and some have never been imported in the country. Currently, PeCB is not included in any of the groups of pollutants and, hence, it is not included in the inventory.

3.3.4.3. Annual POPs emissions

The emissions of unintentionally generated persistent organic pollutants – PCDD/PDDF, PCB, HCB and PAH in the ambient air for the period 1990 (accepted as a base year) and for the period 2000- 2009 are presented in Table 134 and Fig. 56.

Table 134: Annual POPs emissions for the period 1990 and 2000 – 2009

Year	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
PCDD/PDDF, g I-TEF/y	554,2	232,50	200,86	218,59	254,90	239,20	229,41	247,10	68,56	52,37	37,661
PCB, kg/y	258,5	228,50	211,88	250,13	260,70	270,37	258,64	281,70	212,50	221,17	58,136
HCB, kg/y	544	54,00	42,50	22,02	44,80	21,20	19,20	24,70	23,03	26,38	22,661
PAH, t/y	677	118,10	97,34	129,33	139,60	129,66	124,05	129,75	19,03	19,36	87,803

Table 135: Reported reduction in the POPs emissions in 2009 compared to 1990 (base year)

Year	1990/2009	2000/2009	2007/2009	1990/2000
PCDD/PDDF, times	14.7	6.2	1.8	2.4
PCB, times	4.4	3.9	3.7	1.1
HCB, times	24.0	2.4	1.0	10.1
PAH, times	7.7	1.3	0.2	5.7

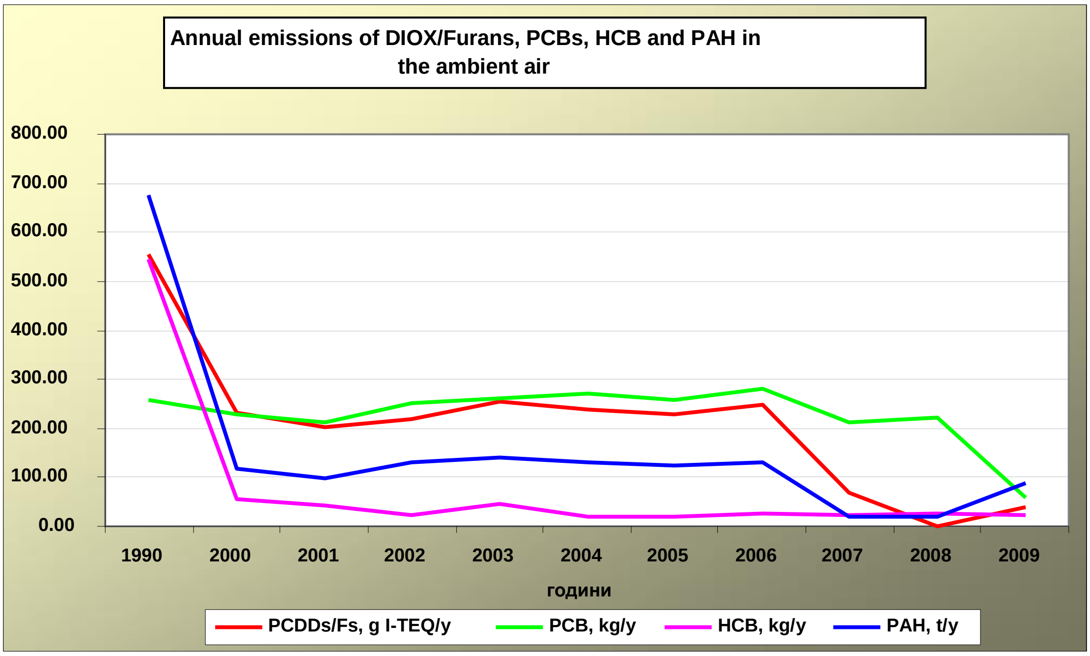


Figure 56: Annual emissions of dioxines and furans, polychlorinated biphenyls, hexachlorobenzene and polycyclic aromatic hydrocarbons in the ambient air by years for the period 1990-2009

In 2009, compared to the base 1990 a significant reduction has been achieved in the POPs emissions as follows:

♦ 14.7 times or 93.2 % reduction in the PCDD/PCDF emissions;
♦ 4.4 times or 77.5 % reduction in the PCB emissions;
♦ 24 times or 95.9 % reduction in the HCB emissions and
♦ 7.7 times or 87 % reduction in the PAH emissions.

The main conclusion to be made is that a significant reduction has been achieved in the POPs emissions compared to the base 1990, which is due mainly to the reduction in the industrial production. The most significant reduction is shown by the HCB emissions followed by PCDD/PCDF and PAH. The lowest reduction is shown by the PCB emissions which are caused mainly by group 7 (road transport), due to the constant increase of the fleet of motor vehicles.

In 2009, a stable reduction in the PCDD/PDDF emissions has been observed (28%), PCB emissions (73.7%) and HCB emissions (14.1%) compared to 2008 and only the PAH emissions show increase, which is due to group 4 activities (oxygen converters and electric furnaces for steel manufacturing), and group 2 (combustion processes in households).

3.3.4.4. POPs emissions per unit area and per capita by years

The values of PCDD/PCDF, PCB and HCB, PAH emissions per capita and per unit area for the base 1990, and for 2000 - 2009 are shown in table No. 136.

Table 136: POPs emissions per unit area and per capita by years in Bulgaria

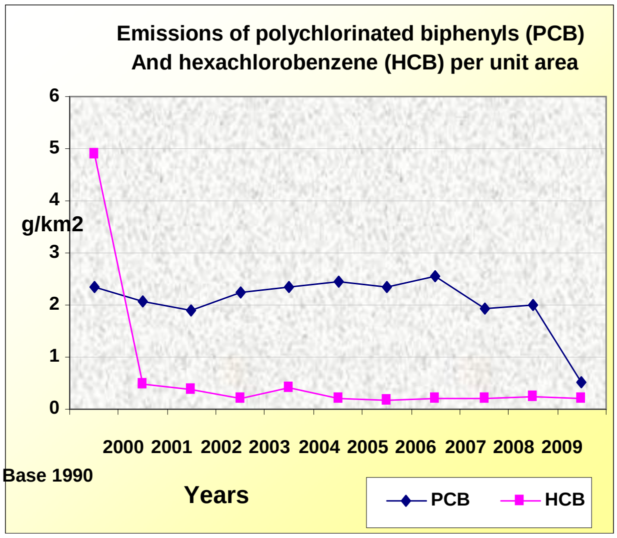
POPs emissions	Year	Per unit area, area (110 993 km^2)	Population	Per capita
PCDD/PCDF, g/y		**g/km^2**	**Number**	**µg/capita/ y**
554.20	**Base 1990**	0.004993108	**8 669 269**	0.063926959
232.50	**2000**	0.002094727	**8 149 468**	0.02852947
200.86	**2001**	0.001809664	**7 932 984**	0.025319602
218.59	**2002**	0.001969403	**7 845 841**	0.027860621
254.90	**2003**	0.002296541	**7 801 273**	0.032674155
239.20	**2004**	0.002155091	**7 761 049**	0.030820576
229.41	**2005**	0.002066887	**7 720 000**	0.029716321
247.10	**2006**	0.002226267	**7 679 290**	0.032177454
68.56	**2007**	0.000617697	**7 640 238**	0.008973542
52.37	**2008**	0.000471832	**7 606 551**	0.006884855
37.66	**2009**	0.00033931	**7 563 710**	0.00497917
PCB, kg/y		**g/km2**		**mg/capita**
258.50	**Base 1990**	2.328975701	**8 669 269**	29.81796966
228.50	**2000**	2.058688386	**8 149 468**	26.35747028
211.88	**2001**	1.908949213	**7 932 984**	24.44035362
250.13	**2002**	2.25356554	**7 845 841**	28.85249033
260.70	**2003**	2.348796771	**7 801 273**	30.07173961
270.37	**2004**	2.435919382	**7 761 049**	31.18717391
258.64	**2005**	2.330237042	**7 720 000**	29.83411866
281.70	**2006**	2.537997892	**7 679 290**	32.49408918
212.50	**2007**	1.914535151	**7 640 238**	24.51187061
221.17	**2008**	1.992648185	**7 606 551**	25.51195493
58.14	**2009**	0.523780779	**7 563 710**	6.705986399
HCB, kg/y		**g/km2**		**mg/capita**
544.00	**Base 1990**	4.901209986	**8 669 269**	62.75038876
54.00	**2000**	0.486517168	**8 149 468**	6.228898884
42.50	**2001**	0.38290703	**7 932 984**	4.902374122
22.02	**2002**	0.19839089	**7 845 841**	2.540006545
44.80	**2003**	0.403629058	**7 801 273**	5.167679074
21.20	**2004**	0.191003036	**7 761 049**	2.445419562
19.20	**2005**	0.172983882	**7 720 000**	2.214719603
24.70	**2006**	0.222536556	**7 679 290**	2.84914449
23.03	**2007**	0.207490562	**7 640 238**	2.656510024
26.38	**2008**	0.237672646	**7 606 551**	3.042932455

POPs emissions	Year	Per unit area, area (110 993 km²)	Population	Per capita
22.66	**2009**	0.204166028	**7 563 710**	2.613945882
PAH, t/y		**kg/km2**		**g/y/capita**
677.00	**Base 1990**	6.099483751	**8 669 269**	78.09193601
118.10	**2000**	1.064031065	**8 149 468**	14.49174351
97.34	**2001**	0.876992243	**7 932 984**	12.2702882
129.33	**2002**	1.165208617	**7 845 841**	16.48389255
139.60	**2003**	1.257736974	**7 801 273**	17.89451542
129.66	**2004**	1.168181777	**7 761 049**	16.70650449
124.05	**2005**	1.117638049	**7 720 000**	16.06865285
129.75	**2006**	1.168992639	**7 679 290**	16.89609326
19.03	**2007**	0.171452254	**7 640 238**	2.490760105
19.36	**2008**	0.174425414	**7 606 551**	2.545174548
87.80	**2009**	0.791067905	**7 563 710**	11.6084567

Table 137: Reduction range (times) of the POPs emissions per unit area and per capita in 2009 compared to 1990 (base)

Year	**1990/2009**		**2000/2009**		**2007/2009**		**1990/2000**	
	Per unit area	Per capita	Per unit area	Per capita	Per unit area	Per capita	Per unit area	Per capita
PCDD/PCDF	14.7	12.8	6.2	5.7	1.8	1.8	2.4	2.2
PCB	4.4	4.4	3.9	3.9	3.7	3.7	1.1	1.1
HCB	24.0	24.0	2.4	2.4	1.0	1.0	10.1	10.1
PAH	7.7	6.7	1.3	1.2	0.2	0.2	5.7	5.4

The reported values for all POPs emissions per capita and unit area for 2009 compared to the base 1990 show a stable tendency to a reduction and the reduction in the PCDD/PCDF emissions is more than 12 times per capita and more than 14 times per unit area. It is observed that the values of HCB and PCB per unit area and per capita are equal for both parameters, respectively 24 times for HCB and 4.4 times for PCB compared to the base 1990, 2000 and 2007. For PAH and PCB the reduction compared to 1990 for both parameters is several times lower compared to the other POPs (PCDD/PCDF and HCB) – Fig. 57 and 58.



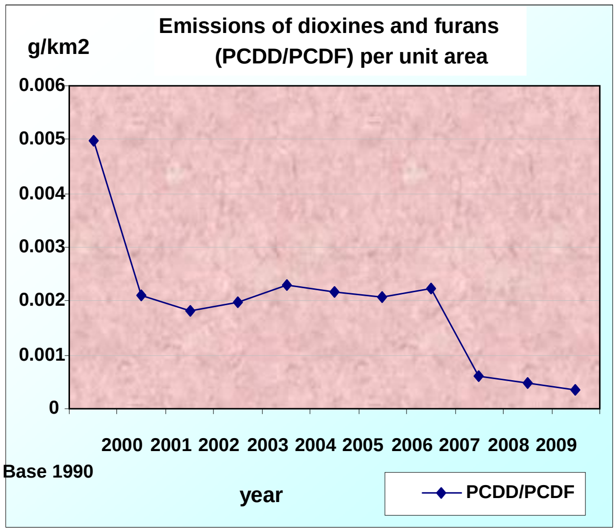


Figure 57: PCDD/PCDF, PCB and HCB emissions per unit area (g/km²) by years

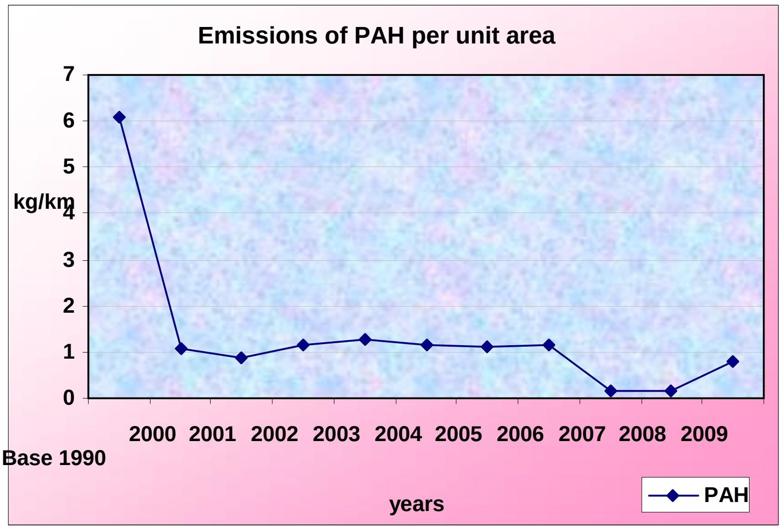


Figure 58: PAH emissions per unit area (g/km^2) by years

3.3.4.5 Annual POPs emissions by source categories

The annual emissions of unintentionally generated POPs emissions by source categories to the ambient air for the period 2000 and 2006 – 2009 are set out in Table No. 138.

Table 138: Annual emissions of persistent organic pollutants in the ambient air by source categories for the period 2000 and 2006 - 2009 in Bulgaria

Emission categories	PCDD/PCDF, g I-TEF/y					PCBs, kg/y					HCB, kg/y					PAH, t/y				
	2000	2006	2007	2008	2009	2000	2006	2007	2008	2009	2000	2006	2007	2008	2009	2000	2006	2007	2008	2009
01: Combustion in energy and transformation industries	109,20	114,40	2,40	2,31	2,108	40,64	44,40	0,001	0,002	0,001						1.186	5,10	0,001	0,002	0,001
02 Combustion in commerce, administration and residential sectors, in agriculture, forestry and water management	58,30	71,90	14,20	14,41	24,997	141,37	175,30	154,60	162,70	2,800					0.17	10.98	39,60	16,20	16,60	24,57
03: Combustion in manufacturing industry	16,40	5,10	28,00	14,37	5,30	5,15	1,79	1,4	1,25	0,70			0,10	0,09	0.035	0.9514	0,75	0,012	0,013	22,27
04: Non-combustion processes	21,50	23,40	10,70	7,72	4,48						19,00	24,70	22,93	26,09	22.39	22.67	16,80	0,160	0,162	39,20
05: Extraction and distribution of fossil fuels																				
06: Solvent use																				1,69
07: Road transport	7,20	15,10	0,231	0,23	0,25	41,24	46,90	44,40	45,50	54,60						19.203	64,60	0,052	0,06	0,09
08: Other mobile sources and machinery	9,70	13,20	12,10	12,05	0,22	0,08	13,20	12,10	11,70							2,16	2,90	2,60	2,52	0,001
09: Waste treatment and disposal	10,20	3,97	0,984	1,28	0,81		0,07	0,017	0,02	0,013	35,00			0,20	0.0620	16,01	0,00	0,001	0,001	0,001
10: Agriculture and forestry and land-use changes																				
11: Nature																				
Total emissions per annum	**232,5**	**247,10**	**68,56**	**52,37**	**37,66**	**228,48**	**281,70**	**212,50**	**221,17**	**58,14**	**54,00**	**24,70**	**23,03**	**26,38**	**22,66**	**73,15**	**129,75**	**19,03**	**19,36**	**87,8**

There was a multiple reduction in the annual PCDD/PCDF, PCB, HCB emissions by source categories for 2009 compared to 2000, excluding the PAH emissions which were increased (16%). This increase is due mainly to the group 4 activities (oxygen converters and electric furnaces for steel manufacturing). In the period 2007 – 2009 the HCB emissions were almost constant, while the PCDD/PCDF emissions were reduced almost twice, and the PCB emissions – almost 4 times.

❖ **PCDD/PCDF emissions**

Fig. 59 sets out the share participation in % of the main source categories, releasing PCDD/PCDF emissions in 2009.

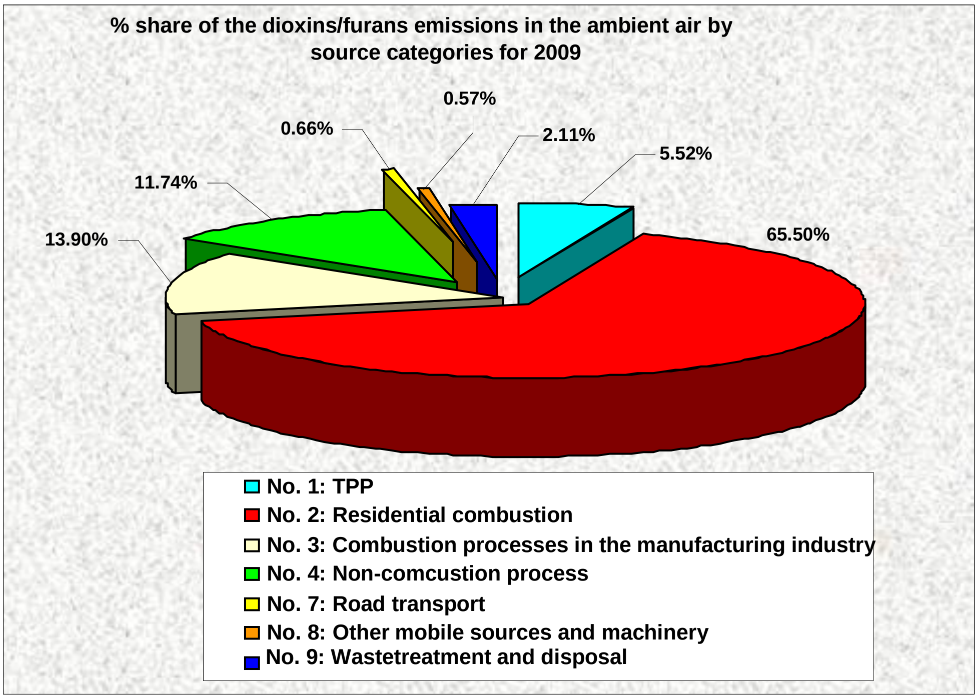


Figure 59: % share of the PCDD/PCDF emissions in the ambient air by source categories for 2009

✓ In 2009 the largest source of PCDD/PCDF emissions has been group 2 (combustion in commerce, administration and residential sectors) - 65,5 % of the total emission quantity, followed by group 3 (combustion in manufacturing industry) – 13,9 % and group 4 (non-combustion processes) – 11.7 %. The least significant share of the total PCDD/PCDF emissions have group 7 (road transport) and group 8 (other mobile sources and machinery) – respectively 0.7 % and 0.6 %. The high share of the emissions from combustion in the residential sector is due to the increased consumption of lignite coal and wood in households. For example, the emission factor for dioxines and furans for black (anthracite) coal is 1.6 μg/t, and of the lignite coal - 4.37 μg /t.

✓ The emissions formed from groups 3 and 4, including the manufacturing of iron and steel, ferrous and non-ferrous metallurgy, comprising 25.6 % from the total quantity of dioxines and furans released, should not be ignored.

✓ In 2009, compared to 2008 an insignificant reduction in the PCDD/PCDF emissions has been achieved only from group 1 sources (Combustion in energy and transformation industries) - thermal power plants.

✓ The obligation to apply any possible measures to prevent the pollution through the use of BAT, which is a requirement for issuing integrated permits for the companies of the power industry, the ferrous and non-ferrous metallurgy and the waste disposal sites represents a significant potential for limitation of the PCDD/PCDF emissions;

✓ The merit for the reduction of the emissions of dioxines and furans goes to the National Energy Efficiency Action Plan. The development and the implementation of the energy efficiency program will contribute to achieve a number of positive results – reduction of the emissions of sulphur, carbon and nitrogen oxides, of dioxines and furans and of PAH. This will be achieved by promoting the development and the use of energy from renewable sources (RS) until a share of 16 % of the ultimate gross energy consumption of energy from RS is reached in 2020 (water, wind, solar and geothermal energy and biomass), as well as by promoting the biofuel production and increasing the minimum volume of biofuel and bioethanol in the diesel and petrol fuels.

❖ **PCB emissions**

Fig. 60 sets out the share participation in % of the main source categories, releasing PCB emissions in 2009.

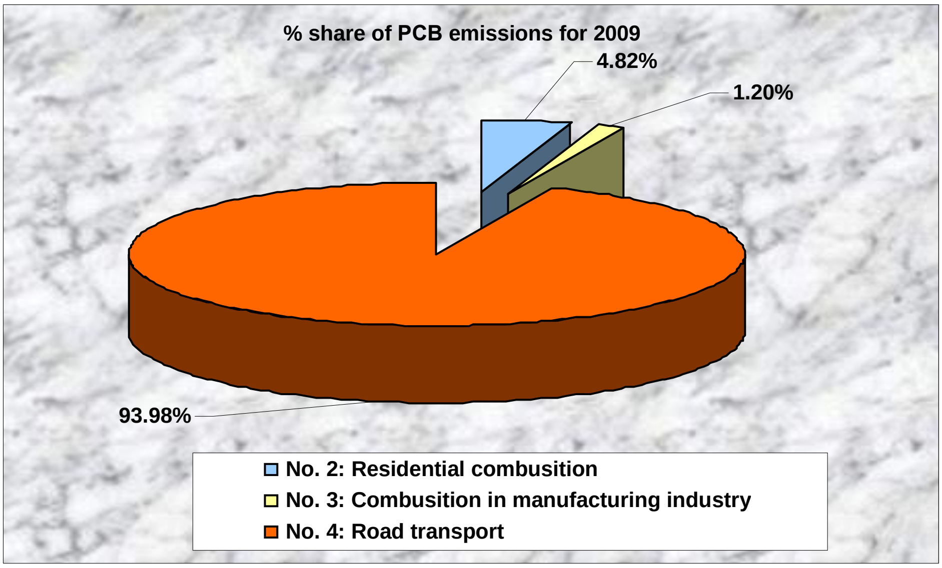


Figure 60: % share of the PCB emissions in the ambient air by source categories for 2009.

✓ In 2009, the main sources of PCB emissions are from group 7 (road transport) - 94 % and group 2 (combustion in commerce, administration and residential sectors) - approximately 5 % of the total share of emissions.

✓ Multiple reduction of the PCB emissions (98%) from group 2 has been reported in 2009 compared to 2008.

✓ Regarding the main source of PCB emissions for 2009 – road transport, no reduction of the emissions from this source has been achieved compared to 2008 but on the contrary – an increase of 20 % has been reported. The cause being the intensive development of the transport – public and private and the growing number of motor vehicles and primarily the second hand vehicles. The quantity of the fuels used is also increasing with high rates.

✓ Additional limitation of the PCB emissions from group 7 (road transport) has been achieved through improving the quality of the fuels.

❖ **HCB emissions**

Fig. 61 sets out the share participation in % of the main source categories, which released HCB emissions in 2009.

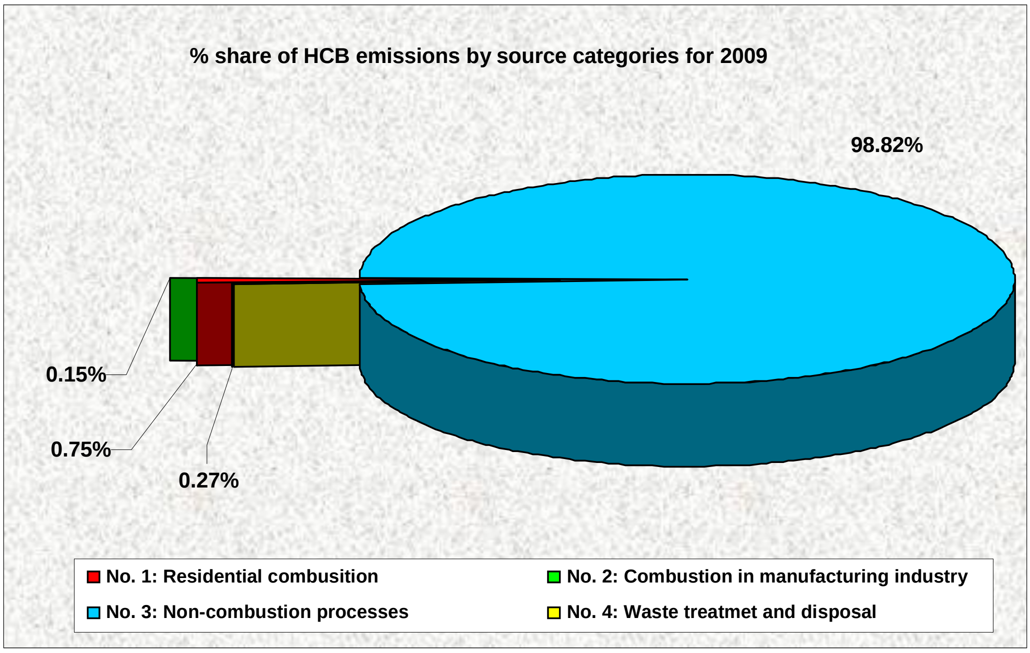


Figure 61:% share of the HCB emissions by source categories for 2009.

✓ The main and only source of HCB emissions for 2009 has been group 4 (non-combustion processes) from iron and steel manufacturing activities; these represent 99 % of the annual emissions of this pollutant.

✓ Compared to 2000, there has been a two-fold reduction in the total annual emissions of HCB.

✓ In 2008, compared to 2009, insignificant reduction in the HCB emissions has been achieved from the main source of this pollutant – non-combustion processes.

❖ PAH emissions

Fig. 62 sets out the share participation in % of the main source categories, releasing PAH emissions in 2009.

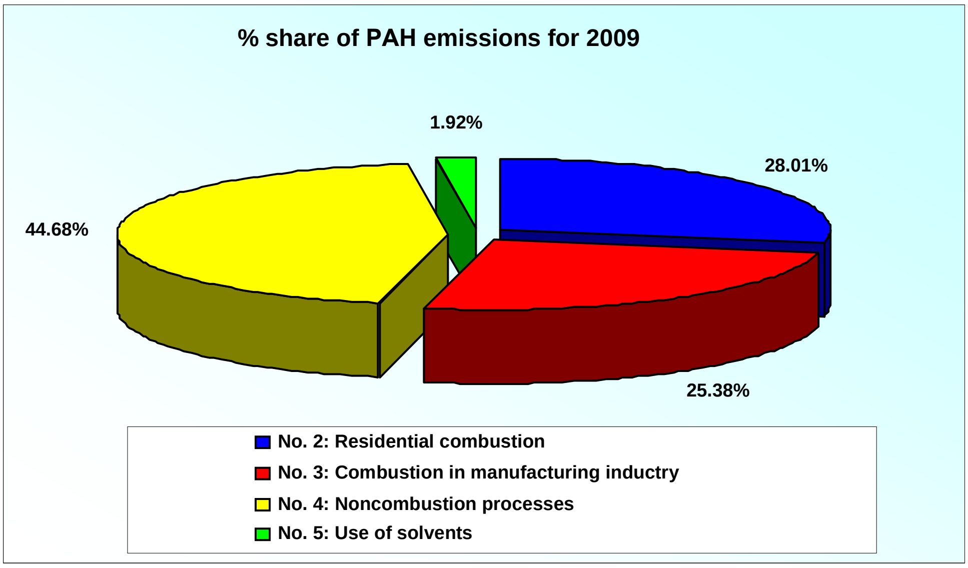


Figure 62: % share of the PAH emissions in the ambient air by source categories for 2009

✓ In 2009, the main source categories, releasing PAH has been group 4 (non-combustion processes) from road asphalting activities - 45 %, followed by group 2 (combustion in commerce, administration and residential sectors) – 28 % and group 3 (combustion in manufacturing industry) from iron and steel manufacturing activities - 25%.

✓ Compared to 2000, no reduction has been reported of the total national annual PAH emissions, and the emissions from this pollutant have grown by 20%, which is due to the intensive construction of highways and re-asphalting of roads from the national road network.

✓ The transition to more environmentally friendly fuels for household heating (natural gas), i.e. accelerated introduction of the gasification and other related adequate measures such as enhancing the energy efficiency of the heating etc., thus reducing the heating with the use of wood and coal, have a significant potential for limitation the PAH emissions from households;

❖ **Measures for prevention of the POPs in emissions in Bulgaria**

In total, 32 reference documents (BREFs) developed on EU level are applied in the field of the industrial emissions for the establishment of BAT for prevention and control of the pollution. For some earlier adopted reference documents a review to take into account new developments has already been completed, including for the cement and lime, pulp and paper and iron and steel sectors.

As installations – generators of harmful POPs emissions compounds are defined mainly chemical installations for the production of basic organic chemical substances such as halogenic hydrocarbons; plastic materials (polymers, synthetic fibers and cellulose-based fibers); synthetic rubbers; dyes and pigments, as well as installations for disposal or recovery of hazardous waste, including for oil recovery, re-refining or disposal of waste oil, with a capacity exceeding 10 tons per day and carrying out one or more activities for hazardous waste disposal; installations for incineration of household waste with a capacity exceeding 3 tons per day; installations for disposal or recycling of animal carcasses or animal waste with a treatment capacity exceeding 10 tons per day; landfills receiving more than 10 tons of waste per day or with a total capacity exceeding 25000 tons, excluding landfills of inert waste.

These installations are subject to issuing and renewal of integrated permits.

SUMMARY CONCLUSIONS:

➤ **The POPs emissions generated in Bulgaria for the period 2000 and 2006 – 2009 range within the following limits:**

❖ **PCDD/F – 37.66 ÷ 247.1 g I-TEF/y, and for 2009 they are 37.66 g I-TEF/y.**

❖ **PCB – 58.14 ÷ 281.7 kg/y, and for 2009 they are 58.14 kg.**

❖ **HCB – 22.66÷ 54 kg/y, and for 2009 they are 22.66 kg.**

❖ **PAH – 19.36 – 129.75 t/y, and for 2009 they are 87.8 t.**

➤ **For the period 2000 – 2009, the POPs emissions in the ambient air show a constant tendency to reduction, excluding the Hexachlorobenzene emissions. The necessary measures for reducing the total releases from anthropogenic sources of POPs have been undertaken.**

➤ **In 2009, the largest sources of PCDD/PCDF emissions are the households, of PCB – the road transport and of HCB and PAH – the non-combustion processes for the manufacturing of iron and steel.**

➤ **The application of BAT, the use of environmentally friendly fuels for household heating, the enhancement of the energy efficiency and the improvement of the quality of fuels for the transport and the renewal of the motor vehicle fleet have a significant potential for reducing the POPs emissions.**

➤ **The country has undertaken measures for integrated prevention and control of the pollution from certain categories of industrial activities (cement plants, metallurgical plants, installations for disposal of hazardous hospital waste and incineration of household waste etc.) through the application of BAT, including also for POPs.**

3.3.4.6 POPs levels in the ambient air under project MONET CEEC-2007[105]

According to the Regional International Project "Evaluation of the trends of POPs concentrations in the ambient air in Bulgaria" under the passive sampling method using polyurethane foam based passive air sampler, the levels of PCB, HCB and PAH in the ambient air were determined at 6 points (4 points in Sofia – BG-01, Gara Yana industrial zone, BG-02, intensive traffic zone, BG-03, urban residential zone, and BG-06, Boyana suburban zone; 1 point – BG-04, Pernik industrial zone and 1 point – BG-05, rural region near KCM-Plovdiv, a plant for non-ferrous metals). The project is financed by the Czech government. The samples are sent to and analyzed at the Brno University. The results of the analysis (with indicated minimum, maximum, average and median values for all points) are set out in Table 139:

Table 139: Average concentration of unintentionally produced POPs in the ambient air (passive sampling method) – 2007, ng filter $^{-1}$.

Point, code	PCB ng/ filter				HCB ng/ filter				PAH ng/ filter			
	min.	max.	average	median	min.	max.	average	median	min.	max.	average	median
Sofia – Gara Yana (BG_01)	11.3	32.7	26.1	29.4	2.6	6.8	4.5	4.2	11 455	21 412	15 654	14 417
Sofia– Orlov Most (BG_02)	13.9	19.5	17.1	18.2	8.4	15.0	11.8	12.3	2 272	4 059	3 252	3 023
Sofia - Hipodruma (BG_03)	22.2	29.6	27.0	28.1	4.8	7.5	6.2	6.3	2 211	3 723	2 721	2 496
Pernik Tsarkva (BG_04)	27.4	37.8	32.8	33.9	4.1	5.3	4.8	5.2	2 318	3 762	2 922	2 632
Plovdiv - Dolni Voden (BG_05)	3.4	7.6	6.0	6.4	3.7	6.8	4.8	4.3	1 477	2 489	1 953	1 939
Sofia –Boyana (BG_6)	6.0	9.6	8.0	8.1	3.6	5.5	4.8	5.3	1 202	2 665	1 675	1 535

The points are selected in such a way as to cover various regions in the country and make a comparison. Point Gara Yana (BG_01) is a suburban industrial metallurgical zone, point Orlov Most (BG_02) is an urban zone with extremely intensive traffic, point Hipodruma (BG_03) is an urban remote zone, point Pernik - Tsarkva (BG_04) is an urban remote zone near a metallurgical company, point Plovdiv - Dolni Voden (BG_05) is a rural zone near a lead and zinc plant, point Sofia – Boyana (BG_6) is a suburban exurb area, affected by local heating systems (Table No. 140).

Table 140: Time changes of the PCB, PAH and HCB concentrations in the ambient air at the sampling locations – 2007, ng/ filter

	Sofia – Gara Yana BG_01					Sofia – Orlov Most BG_02					Sofia – Hipodruma BG_03				
	01	02	03	04	05	01	02	03	04	05	01	02	03	04	05
ΣPCB	29,3	11,2	32,7	24,9	32,2	13,8	18,2	19,5	15,5	18,6	22,2	29,6	28,3	28,1	26,9
Σ_{28} PAH	12027	18693	13234	22051	14829	4322	4324	3259	2445	3075	3192	3995	2388	2671	2377
Σ_{16} PAH	11454	18182	12803	21412	14416	4041	4059	3022	2271	2862	2941	3722	2231	2495	2210
HCB	6,8	2,6	4,2	4,1	4,6	11,0	12,4	12,3	8,4	15,0	6,3	7,5	4,8	6,8	5,7
	Pernik – Tsarkva BG_04					Plovdiv – Dolni Voden BG_05					Sofia – Boyana BG_06				
	01	02	03	04	05	01	02	03	04	05	01	02	03	04	05
ΣPCB	29,6	27,4	35,2	37,8	33,9	5,7	3,0	7,6	6,4	6,9	5,8	7,8	8,3	9,5	8,0
Σ_{28} PAH	3961	2520	2819	2472	3993	2683	2115	1601	2056	2084	2844	1780	1276	1627	1379
Σ_{16} PAH	3578	2316	2630	2318	3760	2488	1994	1476	1863	1937	2663	1667	1201	1533	1302
HCB	5,3	5,2	4,1	4,3	5,3	5,0	4,3	3,7	4,0	6,8	4,6	5,3	3,6	5,5	5,4

[105] RECETOX_TOCOEN Reports № 339 and 341, Brno, Czech Republic, 2008

SUMMARIZED CONCLUSIONS:

❖ **<u>PCB Concentrations</u>: Higher values of the PCB levels in the air are reported for the urban and industrial zones compared to the rural ones. The highest maximum and median values (respectively 38 and 34 ng/filter, corresponding to 380 and 340 pg/m^3) are reported in Pernik – Tsarkva, probably due to the metallurgical plant. Similarly high levels are reported in another two zones in Sofia with very intensive motor vehicles traffic. On the contrary, the lowest values are reported in the suburban zones in Plovdiv – Dolni Voden and Sofia – Boyana (respectively 8 and 10 ng/filter, corresponding to 80 and 100 pg m^3). PCB 28 is most frequently met in all points and in the months of June and July is with the highest levels. The PCB concentrations in the air are similar to the levels in all countries participating in the project.**

❖ **<u>PAH Concentrations:</u> The PAH concentrations decrease from the industrial to the suburban points. The highest levels are measured in the industrial zone point Sofia – Gara Yana (14,5 µg/filter for median, 21,5 µg/filter for maximum value of the sum for the 16 PAH). These concentrations are the highest measured in all countries fro Central and East Europe, participating in the project. Phenanthrene, fluorene, naphthalene and acenaphthalene are met mostly during all sampling periods. There is no typical seasonal variability in the levels of PAH at this point (the higher levels during the winter are explained with the household heating systems). The variation of the concentrations around the median shows that the levels of PAH are of industrial origin. Seasonal trend of the PAH levels is found at the point Sofia – Boyana, which is significantly affected by the local heating systems. At the other points the levels of PAH are of various origin (industry, combustion, heating, motor vehicles traffic). In the suburban zones in Plovdiv and in Boyana the levels of PAH vary between 1,5 and 2 µg/filter).**

❖ **<u>HCB Concentrations:</u> The distribution of HCB is very homogenous – medians and maximum concentrations about 5 ng/filter are measured around all points, with the exception of point Sofia – Orlov Most, where the median concentrations reach 12 ng/filter, and the maximum - 15 ng/filter. This is due to the very intensive motor vehicles traffic in this zone.**

3.3.5. Levels in the Human Body

Globally, a significant number of research has been carried out on the contents of POPs in the mother's milk with the aim to determine the exposure of infants and the related risk. The age of the mothers, the number of the infants and the feeding routine are critical parameters for determining the contamination of the mother's milk with POPs and their accumulation in the human body.

In Bulgaria, there is no targeted research for the contents of PCDD/PCDF and PCB in mother's milk, excluding the participation of the country in the international project developed by WHO – Stage III "WHO-coordinated Exposure Study on the Levels of PCB, PCDD/PCDF in Human Milk, Organohalogen Compounds, 2002" in 19 countries around the world, including several countries in Europe in the period 2001 – 2002.

POLYCHLORINATED BIPHENYLS

The study on the contents of PCB in mother's milk included 30 healthy women, distributed by 10 from three regions of the country (Bankya – ecologically clean and two - Sofia and Blagoevgrad – with a various degree of pollution). The results show that the highest contents of PCB in mother's milk is established in Blagoevgrad, followed by that in Sofia. The lowest level s marked in the milk of the mothers from the ecologically clean region Bankya (Table No. 141).

Table 141: levels of PCB in mother's milk (pg TEF/g fat)

	Bankya	Sofia	Blagoevgrad
WHO- PCB	3.74	4.21	4.70
Sum WHO- PCDD/PCDF + PCB	8.82	10.35	11.81

The data from the study of the three markers of PCB -138, 153 and 180 follow a similar pattern (Table No. 142).

Table 142 Level of the most important PCB markers in mother's milk (ng/g fat)

PCB	Bankya	Sofia	Blagoevgrad	Min	Max	Average	Geo mean
PCB 138	9.64	14.06	16.33	9.64	16.33	13.34	13.03
PCB 153	11.37	17.42	20.29	11.37	20.29	16.36	15.90
PCB 180	6.38	9.40	13.20	6.38	13.20	9.66	9.25
PCB_6 (28,52,101,138,153,180)				32.00	52.00		42.00
PCB_3 (138,153,180)				27.40	49.80	39.40	38.20

Bulgaria is among the countries with the lowest established levels of PCB (below 5 pg TEF/g fat) and of the total contents of the three parameters (below 40 ng/g fat) in mother's milk.

DIOXINES AND FURANS

The results from the third stage of the WHO research, held for the period 2001 – 2002, show lowest levels of PCDD/PCDF in mother's milk for Bulgaria (median – 6,14 pg WHO-TEF/g fat), and for dioxin-like PCB (dl-PCB) – one of the lowest levels (median – 4,21 pg WHO-TEF/g fat) after Hungary (table No. 143).

Table 143: Levels of PCDD/F and dioxin-like PCB in mother's milk (2001 -2002)
[pg WHO-TEF/g fat][106]

Country	PCDD/PCDF		dl-PCB		Number of pools
	Average	Range	Average	Range	
Bulgaria	6.14	5.08-7.11	4.21	3.74-4.70	3
Czech Republic	7.78	7.44-10.73	15.24	14.32-28.48	3
Finland	9.44	9.35-9.52	5.85	5.66-6.03	2
Hungary	6.79	5.26-7.46	2.87	2.38-4.24	3
Ireland	6.91	6.19-8.54	4.66	2.72-5.19	3
Norway	7.30	7.16-7.43	8.08	6.56-9.61	2
Romania	8.86	8.37-12.00	8.06	8.05-8.11	3
Russia	8.88	7.46-12.93	15.68	13.38-22.99	4
Slovakia	9.07	7.84-9.87	12.60	10.72-19.49	4
The Netherlands	18.27	17.09-21.29	11.57	10.90-13.08	3
Ukraine	10.04	8.38-10.16	19.95	14.10-22.00	3

The industrialized countries like the Netherlands show relatively high levels of PCDD/PCDF. Increased levels of dioxin-like PCB in mother's milk are found in Ukraine, Russia and the Czech Republic.

SUMMARIZED CONCLUSIONS

❖ **In Bulgaria, one of the lowest levels of PCB and PCDD/PCDF in mother's milk for Europe in the period 2001 – 2002 have been established and no research has been carried out in the last several years.**

❖ **No targeted research has been carried out in the country for the levels of PCB and PCDD/PCDF, HCB in the blood plasma and the adipose tissue, as well as of HCB in mother's milk. No health or epidemiological research has been carried out of the population and selected risk groups exposed to the impact of PCB and PCDD/PCDF.**

❖ **There is no data for acute and chronic intoxication with PCB and PCDD/PCDF, HCB among the population.**

[106] RECETOX-TOCOEN Reports No. 339, Brno, Czech Republic, September 2008, p 112-114 and Regiaonally based assessment of persistent toxic substances, Global Report 2003, UNEP

3.4. Waste containing POPs and potentially contaminated sites

3.4.1. Waste containing POPs pesticides

The agrochemical waste containing dangerous substances (code 02 01 08), comprising of obsolete POPs pesticides represent just 1.14 % of all obsolete and useless pesticides in Bulgaria (Table No. 144).

Table 144: Hazardous waste, comprising of obsolete POPs pesticides in 2010 in Bulgaria

POPs pesticide	Unit	Quantity
Heptachlorine in 2 BB cubes	kg	6 547
DDT in 28 BB cubes	kg	50 312
Lindane, total - in 61 BB cubes - in 4 warehouses	kg	104 045 99 575 4 470
TOTAL POPs pesticides		**160 904**

As of 31 December 2011, the following obsolete POPs pesticides have been identified in the country – heptachlor (6 547 kg), DDT (50 312 kg) and linden (104 045 kg), stored in warehouses and BB cubes.

3.4.2. Waste, containing industrial chemicals - POPs

WASTE FROM ELECTRICAL EQUIPMENT CONTAINING PCB'S

As of 31 December 2011, the waste (code 16 02 09) from electrical equipment, containing PCBs (transformers and capacitors) existing in Bulgaria (Table No. 145) is approximately 58.5 tons (1 513 capacitors).

Table 145: Waste, containing PCBs (transformers and capacitors) in Bulgaria as of 31.12.2011

Results from PCB data base Inventory 2007 – 2011	PCB holders .	Number of PCB equipment as of 31.12.2010	Weight of PCB equipment, kg, as of 31.12.2010	Number of PCB equipment as of 31.12.2011	Weight of PCB equipment, kg, as of 31.12.2011
PCB TRANSFORMERS	**16**	**80**	**424 830**	**0**	**0**
In operation		0		0	0
Phased-out		80		0	0
Spare in stock		0		0	0
PCB CAPACITORS	**197**	**6 459**	**288 893**	**1 513**	**58 558**
In operation		1 077		55	
Phased-out		5 382		1 458	
Spare in stock		0		0	
OTHER PCB EQUIPMENT		**0**	**0**	**0**	**0**
In operation		0	0	0	0
Phased-out		0	0	0	0
Spare in stock		0	0	0	0
TOTAL PCB EQUIPMENT	**205**	**6 539**	**713 723**	**1 513**	**58 558**
In operation		1 077		55	
Phased-out		5 462		1 458	
Spare in stock		0		0	

WASTE, CONTAINING PFOS

As of 31 December 2011, 8 110 kg of waste, containing PFOS is identified in the country (firefighting foam brand “FC 600 ATC”, containing 6 % PFOS), stored in tightly closed barrels in premises with restricted access.

WASTE, CONTAINING PBDE

As of 31 December 2011, no plastic waste has been identified in the country containing PBDE and generated in disassembling of phased-out WEEE or ELV, as electrical and electronic equipment and motor vehicles, as well as products containing PBDE, which were in use before 25 August 2010 may continue to be used until they reach the end if their service life, which differs for the various products, all the more that no maximum concentration limits for waste have been stipulated yet in the European or the national legislation.

WASTE, CONTAINING HBB

In the country, no waste containing HBB has been identified as of 31 December 2011.

3.4.3. Regions with potential to produce POPs emissions

Regions with potential to produce PCDD, PCDF, PCB, HCB and PAH emissions in the ambient air are the industrial centers where most of the big thermal power plants working with lignite coal and mazut and the industrial metallurgical enterprises are situated, as well as the big cities, where the country’s main railway arteries pass.

3.4.4. Potentially contaminated sites

Pollution could be from a local (point) source or diffusive. The local pollution is usually associated with operating or closed mining and industrial enterprises, while for diffuse pollution the agriculture practice is the main factor.

DIFFUSE SOIL POLLUTION

In 2010, no new levels of soil pollution with POPs have been registered.

The results from the monitoring show that at this stage the agricultural practice leads to no new soil pollution. This fact is due on one side to the decreased consumption of fertilizers and pesticides, as well as to the environmentally sound agriculture and biological production.

The results from the soil monitoring for the period 2007 – 2010 show that the soils from agricultural lands are in a very good ecological state and no pollution with POPs pesticides exceeding MAC has been established.

In the period 2005 – 2010, the measured contents of PCB are below the detection limit.

LOCAL SOIL POLLUTION

Soil pollution from local sources results from industrial activities, waste depots, spills and industrial incidents, fertilizer and pesticide storage sites.

In connection with the existence of warehouses for safe storage of obsolete and banned pesticides, additional survey of the soils in the vicinity is made, where soil pollution of the adjacent terrains may be expected. From the samples tested in 2009 for contents of POPs pesticides, more than 85% of the measured contents are either below MAC or below PC.

3.5 Future production and use and estimated POPs emissions

3.5.1. POPs pesticides

Production: POPs pesticides, incl. also the new POPs have not been produced in Bulgaria and no future production is planned;

Import and use: The import, placing on the market and use of POPs pesticides is banned in Bulgaria;

Export: The export of POPs pesticides is banned, unless it is intended for environmentally sound disposal. The following POPs pesticides are subject to the Prior Informed Consent Procedure (PIC procedure), bans and stringent restrictions: aldrine, chlordane; chlorodecone; DDT; dieldrin; endosulfan; HCH isomers; lindane; heptachlorine; Hexachlorobenzene HCB and toxaphene.

3.5.2. Industrial POPs chemicals

3.5.2.1. PCB in electrical equipment

Production: PCB and electrical equipment, containing PCB (transformers and capacitors etc.) have not been produced in Bulgaria.

Import: The import of PCB and of electrical equipment (transformers and capacitors etc.), containing PCB has been banned in Bulgaria since 21.03.2006;

Placing on the market: The trade and the placing on the market of electrical equipment (transformers and capacitors etc.), containing PCB have been banned in Bulgaria since 21.03.2006.

Use: The use of PCB in electrical equipment under the conditions of a closed system with a volume exceeding 5 dm^3 and concentration of PCB in the dielectric fluid exceeding 0.05 mass % was permitted until 31.12.2010, and with concentration of PCB in the dielectric fluid between 0.005 mass % and 0.05 mass % - until they reach the end of their service life.

Export: The export of PCB and of electrical equipment (transformers and capacitors etc.), containing PCB and/or waste, containing PCB is banned, excluding such for the purposes of their environmentally sound disposal abroad.

3.5.2.2. PBDE in mixtures and in articles

Production: Polybrominated diphenyl ethers (PBDE) – comemrcial mixtures of c-pentaBDE (tetraBDE, pentaBDE), c-octaBDE (hexaBDE and heptaBDE) and c-decaBDE, have not been produced in Bulgaria.

Import: The import of PBDE in electrical and electronic equipment (EEE) in concentrations exceeding 0.1 wight % (1000 mg/kg) has been banned in Bulgaria since 01.07.2006.

Placing on the market and use: The placing on the market and the use of c-pentaBDE and c-octaBDE in mixtures and articles has been restricted in Bulgaria since 25.08.2010. Through derogation, the production, the placing on the market and the use of tetraBDE, pentaBDE, hexaBDE and heptaBDE is permitted for:

- ✓ Articles and mixtures, containing concentrations of these substances below 1 000 mg/kg (0,1 weight %), where they are manufactured totally or partially from recycled material or from waste material, ready for reuse;
- ✓ EEE within the scope of Directive 2002/95/EC and Directive 2011/65/EU.

✓ The use of articles, which have already been in use in the EU before 25 August 2010 and contain as a component c-pentaBDE (tetraBDE, pentaBDE), c-octaBDE (hexaBDE and heptaBDE), is permitted and the Member State shall inform the Commission for the existence of such articles.

Export: The export of Pentabromodiphenyl ether (c-pentaBDE) and Octabromodiphenyl ether (c-octaBDE) is strictly restricted and is subject to a Prior Informed Consent procedure.

3.5.2.3. PFOS in mixtures and in articles

Production: PFOS and its derivatives as substances on their own have not been produced in Bulgaria;

Import: The import of PFOS in mixtures and articles with concentrations exceeding 0.1 wight % (1000 mg/kg) has been banned in Bulgaria since 25.10.2010.

Placing on the market and use: The placing on the market and the use of PFOS and its derivatives in mixtures and articles has been restricted in Bulgaria since 25.08.2010. Through derogation, the production, the placing on the market and the use of PFOS is permitted:

✓ For concentrations of PFOS in semi-finished products or articles, or parts thereof, if the concentration of PFOS is lower than 0,1 % by weight (1000 mg/kg), calculated with reference to the mass of structurally or micro-structurally distinct parts that contain PFOS or, for textiles or other coated materials, if the amount of PFOS is lower than 1 μg/m2 of the coated material;

✓ Use of articles already in use in Bulgaria before 25 August 2010 containing PFOS as a constituent of such articles is allowed;

✓ Through derogation, placing on the market is allowed for the following specific uses provided that Bulgaria reports to the Commission every four years on progress made to eliminate PFOS:

a) until 26 August 2015 - wetting agents for use in controlled electroplating systems;

b) photoresists or anti reflective coatings for photolithography processes;

c) photographic coatings applied to films, papers, or printing plates;

d) mist suppressants for non-decorative hard chromium (VI) plating in closed loop systems;

e) hydraulic fluids for aviation.

Export: The export of PFOS is strictly restricted and is subject to a Prior Informed Consent procedure.

3.5.2.4. HBB in mixtures and in articles

Production: No HBB has been produced in Bulgaria.

Import and use: The import, the placing on the market and the use of HBB have been banned in Bulgaria since 25.08.2010;

Export: The export of HBB is strictly restricted for the purposes of environmentally sound disposal abroad and is subject to a Prior Informed Consent procedure.

3.5.3. Estimated values of the POPs emissions (PCDD/PCDF, PCB, HCB, PAH, PeCB) until 2020

A strategy has been developed for limitation of the emissions from certain pollutants in the ambient air, including also POPs, which thresholds and time horizons are regulated by the international commitments of Bulgaria. The strategy includes the emissions of the following POPs in the ambient air : DIOX/F, HCB, PAH and PCB.

The strategy is developed for time horizons, including the following years: 2000 – adopted as base; 2007 – year of Bulgaria's accession to the European Union; 2010; 2015; and 2020.

For the future releases of POPs in the ambient air from unintentional production, MoEW has developed two versions of estimates for the emissions of DIOX/F, PCB, HCB and PAH for the period 2000 - 2020: a pessimistic one and an optimistic one (Tables from No. 146 through No. 149).

The optimistic version reflects optimistic ideas for the future, rapid revival of all production sectors, technological modernization thereof through the implementation of energy efficient technology, minimum quantities of waste resulting from the processes, incl. also emissions of pollutants in the air. It is envisaged that the development of the economy is favorably affected by the ambient medium. The pessimistic version reflects impossibility for rapid development, the production sectors remain at the present level and the changes are insignificant, which in its turn will render impossible any improvement of the environmental status and the desired reduction of the national emissions.

Table 146: Estimated values of the emissions of DIOX/F for the period 2000 ÷ 2020 and real values for 2000 and for 2007 ÷ 2009

DIOX/F g/per annum	Pessimistic	Optimistic	Real	Years
2000	232,528	188,36	232,50	2000
2007	263,813	244,383	68,56	2007
2010	270,832	241,357	52,37	2008
2015	296,443	264,545	37,661	2009
2020	323,890	271,493		

Table 147 Estimated values of the emissions of PCB for the period 2000 ÷ 2020 and real values for 2000 and for 2007 ÷ 2009

PCB kg/per annum	Pessimistic	Optimistic	Real	Years
2000	228,475	144,262	228,50	2000
2007	228,967	200,000	212,50	2007
2010	262,114	214,100	221,17	2008
2015	305,700	231,024	58,14	2009
2020	355,348	246,808		

Table 148: Estimated values of the emissions of HCB for the period 2000 ÷ 2020 and real values for 2000 and for 2007 ÷ 2009

HCB kg/per annum	Pessimistic	Optimistic	Real	Years
2000	54,30	54,3	54,00	2000
2007	78,30	64,1	23,03	2007
2010	91,70	68,7	26,38	2008
2015	103,10	72,9	22,66	2009
2020	116,06	77,3		

Table 149: Estimated values of the emissions of PAH for the period 2000 ÷ 2020 and real values for 2000 and for 2007 ÷ 2009

PAH t/per annum	Pessimistic	Optimistic	Real	Years
2000	73.200	73.154	118,10	2000
2007	101.043	87.493	19,03	2007
2010	113.667	92.080	19,36	2008
2015	128.272	97.185	87,80	2009
2020	131.510	88.151		

The real values for PAH in 2000 are higher even compared to the pessimistic version, while during the last year of the reported period - 2009, they are even below the values for the optimistic version for 2010.

PeCB as a new substance, included in Annex C of the Stockholm Convention, is not included in the strategy and until 2011 no emissions of PeCB in the ambient air have been calculated.

PAH are included in the Protocol on POPs, whereto Bulgaria is a party, and subsequently in Regulation (EC) 850/2004 on POPs and hence the emissions of PAH in the ambient air have been calculated and estimated values have been set out until 2020.

SUMMARIZED CONCLUSIONS:

- ✓ **The results for the real values of the emissions of PCDD/F in the air are approximately within the limits of the pessimistic version only in 2000, in 2007 they are below the optimistic values, in 2009 the reduction in the emissions of this pollutant, which are due mainly to household combustion, continues.**

- ✓ **The results for the real values of the emissions of PCB in the air are approximately within the limits of the pessimistic version only in 2000, in 2007 they are in the middle between the two versions (pessimistic and optimistic), in 2009 the reduction in the emissions of this pollutant, which are due mainly to road transport, continues.**

- ✓ **There is a double decrease in the real values for HCB after 2000, in the period 2007-2009 they move within the same limits.**

- ✓ **The real values for PAH in 2000 are higher even compared to the pessimistic version, while during the last year from the reported period - 2009, they are even below the values for the optimistic version for 2010**

- ✓ **During the last years, Bulgaria implements a policy of active support of international initiatives related to the global improvement of the environmental status of the planet. With the endeavors which the country makes for the fulfillment of the obligations undertaken by virtue of various conventions and agreements, it contributes thereof, regardless of the limited potential of territorial, demographic or economic nature.**

3.6. Existing programs for monitoring of POPs in the environment and food

3.6.1. Programmes for monitoring of the environment matrices

3.6.1.1. Ministry of Environment and Water, EEA

In Bulgaria, a number of programs exist for monitoring of various pollutants in the elements of the environment, including also POPs, as part of the National System for Environment Monitoring.

THE NATIONAL SYSTEM FOR ENVIRONMENT MONITORING (NSEM)

NSEM is established and functions in compliance with the Article 1, item 7 of the Environmental Protection Act. The system provides timely and reliable information on the status of the elements of the environment and the factors affecting it used as a basis for analysis, assessments and estimates for justification of the activities for preservation and protection of the environment from harmful effects. The system is managed by the Minister of environment and water through EEA, which administers NSEM throughout the country. All measurements and monitoring is performed by the EEA structures according to common, unified methods for sampling and analysis. The EEA laboratories are accredited according to БДС EN ISO/IEC 17025 – „General requirements for the competence of testing and calibration laboratories" of Executive Agency „Bulgarian Accreditation Service".

EEA maintains information data base on national and regional level, which is structured by elements of the environment using common nomenclatures.

NSEM comprises the following National networks for monitoring of the ambient air, water, land and soil, forests and protected areas, biodiversity, radiological monitoring and noise monitoring. The scope of NSEM includes also the control and information systems for: the emissions of harmful substances in the ambient air, the releases of waste water in water bodies, information system on wastes, and information system on preservation of the subsurface.

3.6.1.1.1. Monitoring of the ambient air

- **Monitoring of the air quality (NAAQMS)**

NAAQMS evaluates the air quality on the territory of the country divided into 6 RAAQAM, approved by Order of the Minister of the environment and water.

In 2010, NAAQMS comprised of 54 stationary points, including 10 points with manual sampling and subsequent laboratory analysis, 30 automatic measuring stations (AMS), 10 automatic DOAS systems (optical), as well as 4 AMS for monitoring the air quality in forest ecosystems (Rozhen, Yundola, Vitinya and St. Oryahovo).

On a daily basis, NAAQMS controls the concentrations of the main parameters of the ambient air, incl. PAH. Additionally, according to the nature and the sources of the emissions in separate regions of the country some specific pollutants are controlled.

All AMS and DOAS work in a continuous 24-hour mode and the data for the QAA gathered by them are received in real time by the respective regional control points and the central control point in EEA Sofia.

The air quality system has also 6 mobile automatic stations (MAS), included in RL in Sofia, Plovdiv, Pleven, Stara Zagora, Varba and Ruse.

- **Control of the emissions of harmful substances in the ambient air**

An annual statistical emission control and mandatory instrumental control is held of the emissions of harmful substances from the stationary sources (chimneys) of emissions throughout the whole country by conducting an inventory of sites, which are sources of harmful substances.

A. Emission control

Annually, MoEW, EEA and RIEW specify the companies – large stationary sites, sources of harmful substances in the ambient air - subject to control. The collected information is used as a representative sample for the emissions of harmful substances and is compared with the information received from NSI, as well as for additional information reported to international institutions. Statistical data for more than 2000 industrial sites is collected and analyzed, as well as for all other sources of emissions, according to the EU classification.

The data base contains information on the emissions from all sources of harmful substances from anthropogenic activity and nature, summarized into 11 main groups. The emissions of the following POPs are calculated:-PCDD/PCDF, PCB, HCB and PAH.

B. Instrumental control

All 16 RL of EEA have automatic gas analyzers and sampling equipment for control of the emissions of harmful substances in the air, installed on motor vehicles.

In 2010, 123 companies, sources of emissions of harmful substances in the ambient air have been monitored.

- **National Information Reporting System under EPRTR**

A National Information Reporting System under EPRTR is developed and functioning in compliance with the requirements of Regulation No. 166/2006 and the Environmental Protection

Act. The system provides reporting via the Internet by the operators, verification and validation of the reports by RIEW and issuing the reports to the EC and EEA. Part of the information system comes from the public register providing an opportunity to make references to the data in the system.

Annex II of the Regulation includes the POPs pesticides and POPs occurring as unintentional by-products.

3.6.1.1.2. Monitoring of water

- **Monitoring of surface water**

The monitoring of surface water is part of the NSEM and covers programs for surveillance and operative monitoring. The programmes for surveillance monitoring provide the necessary information to evaluate the status of the water within the river basin or sub-basin. The operative monitoring programmes determine the status of the water bodies at risk and assess any changes resulting from the implementation of the programme of measures. The networks for surveillance and operative monitoring of surface water and the parameters measured by them are regulated by an Order of the Minister of environment and water.

The total number of the points in the country is 533 allocated in the four river basin management regions, as follows:

- RBD Danube region - 115 points for surveillance monitoring and 53 points for operative monitoring;
- RBD Black Sea region - 73 points for surveillance monitoring, including 20 for monitoring of sea water and 41 points for operative monitoring;
- RBD East Aegean Sea region – 35 points for surveillance monitoring and 88 points for operative monitoring;
- RBD West Aegean Sea region – 52 points for surveillance monitoring and 76 points for operative monitoring.

The monitored parameters are divided into three main groups – basic physico-chemical parameters, priority substances and specific pollutants. POPs fall into the second and third group. From the priority substances HCB, PeCB, PCP, PAH, SCCPs, C_{10}-$_{13}$; penta-BDE (congeners No. 28, 47, 99, 100, 153 and 154), HCBD are monitored, and from the specific pollutants - aldrin, dieldrin, endrin, isodrin, DDT (sum) and p,p-DDT.

- **Hydrobiological monitoring of surface water**

Implemented in compliance with Order of the Minister of environment and waters. Hydrobiological monitoring of surface water is carried out for the categories: river, lake/reservoir and coastal water. The points intended for hydrobiological monitoring are not completely monitored each year – the implementation of the programmes is allocated in the period 2010 – 2015 and annually between 500 and 600 points are monitored depending on the capacity of the analytical laboratories and the programmes planned by RBD.

Hydrobiological monitoring is carried out by 9 RL, the results are sent to EEA and RBD. The hydrobiological monitoring of coastal sea waters is carried out by the Institute of oceanography at the Bulgarian Academy of Sciences (BAS) according to methodology developed by the Institute and the results are sent to the Black Sea RBD ant to EEA.

- **Monitoring of drinking water**

The monitoring of surface water, intended for abstraction of drinking water is carried out by RBD through RL at EEA, RHI and „WS&S" companies, in compliance with Section III of Ordinance No. 12 dated 18.06.2002 concerning the quality requirements to surface water, intended for public drinking water supply. RBD monitors the physical and chemical parameters and RHI – the microbiological parameters of the surface water, intended for abstraction of drinking water.

For 2010, the network for monitoring of surface water intended for public drinking water supply comprises of 216 points. The allocation of the points by river basin regions is as follows: RBD Danube region - 90 points; RBD Black Sea region - 3 points; RBD East Aegean Sea region - 89 points and RBD West Aegean Sea region – 34 points. The sampling frequency depends on the number of the population, served by the respective water source and varies from 1 to 12 times per year.

The parameters for control and monitoring are grouped in three groups, monitored from the third group are: PAH and total pesticides.

Depending on the results achieved from the monitoring, the water intended for public drinking water needs is categorized in three categories A1, A2 and A3. The categorization is performed by RBD together with the State Sanitary Control bodies. The sampling and analysis is carried out by RL at EEA, by WS&S companies for the purposes of their own monitoring.

The results from the analysis of the samples taken for 2010 show that the values of the concentrations of the parameters (for category A1) are within the limits of: POPs pesticides – total (aldrin, dieldrin, DDD/DDE/DDT, HCB, lindane) < 0,001 mg/L; PAH < 0,0002 mg/L; DDT in sediments – MAC are not exceeded with regards to coastal sea water, which provide normal conditions for shellfish life and reproduction.

- **Monitoring of ground water (NSGWM)**

The networks for monitoring of ground water are part of NSEM and are regulated by an Order of the Minister of environment and water. They comprise of 290 points for surveillance and operative monitoring. In reality, sampling points in 2010 are 313 points, which are allocated by RBD, as follows:

- Black Sea river basin region – 50 points for surveillance monitoring and 35 points for operative monitoring;
- Danube river basin region – 98 points for surveillance monitoring and 24 points for operative monitoring;
- West Aegean Sea river basin region – 37 points for surveillance monitoring
- East Aegean Sea river basin region – 97 points for surveillance monitoring and 61 points for operative monitoring.

The points for monitoring the quantitative status of the ground water include: 282 points for measuring the water level and 112 points for measuring the water flows, of them 69 points do surveillance monitoring, and 8 points surveillance and operative monitoring. According to the Order, 299 points from the network for quantitative monitoring are served by the National Institute of Meteorology and Hydrology (NIMH) at BAS. RBD monitors independently 76 points, and 4 of the EEA laboratories take samples in 19 points.

The measured parameters are divided into four groups and the forth group (specific ground water pollutants) monitors the following POPs pesticides – aldrin, DDT/DDD/DDE, dieldrin, endosulfan, endrin, alpha- beta-, delta – and epsilon-HCH – compounds, lindane, heptachlorine, chlordane. Order 715 dated 02.08.2010 includes no PCB congeners. The nine PCB congeners (PCB 28; PCB 52; PCB 101; PCB 105; PCB 118; PCB 138; PCB 153 and PCB 180) were analyzed in a different number of points during the period 2000 – 2008, and then no analysis was done in 2009 and 2010.

The monitoring of ground water in 2010 was conducted in 313 points, and 1245 samplings were performed. No excess in MAC of the specific POPs pollutants in ground water has been identified.

- **Control and information system for the status of waste water**

The control and information system functions on the grounds of Article 171, para 1 of the Waters Act, Section IV of Ordinance No. 1/11.04.2011 concerning the monitoring of water (SG 34/29.04.2011). The organization of the activity is regulated by an Order of the Minister of environment and water.

All sites discharging in surface water and liable to authorization pursuant the Waters Act, as well as sites requiring the issuance of integrated permit following the procedure of the Environmental Protection Act, are subject to mandatory control. Sampling is performed twice a year for each discharge from a given site and once per year for the urban sewage systems. The analysis is obligatory for all parameters, for which individual emission restrictions are identified by the permits for use of water bodies for waste water discharge. The number of the sites according to the approved list for 2009 is 531; for 2010 the number is 532 and 557 sites are planned for 2011.

3.6.1.1.3. Monitoring of soils

- **Monitoring of soils (NSSM)**

In 2004, a new soil monitoring programme has been developed and approved by the Minister of the environment and water, which is organized on three levels. It is fully compatible with the last requirements of EC and the European Environment Agency, as well as the national legislation.

NSSM includes collection, evaluation and summarizing the information on soils, as well as the maintenance of the information system for the status of the soils and their alteration. The soil monitoring schemes are approved by an Order of the Minister of the environment and water. NSSM is organized on 3 levels, as follows:

- Ist level observations (wide-scale monitoring) is performed at 397 points. The following POPs are monitored: -16 PAH, 6 PCB congeners, 8 chloroorganic pesticides (aldrin, DDT/DDD/DDE, dieldrin, endosulfan, endrin, lindane, heptachlorine and chlordane. In 2009, the National network for control and protection of the soils from industrial pollution with POPs included 95 points.

- IInd level observations are oriented to regional symptoms of soil degradation processes – soil acidification and salinization.

- IIIrd level observations are identified with the so called local soil pollution within which inventory of areas with polluted soil is conducted. The inventory is still partial and irregular, based on available data. In 2007, a specialized Ordinance concerning the inventory and research of polluted soil areas, the necessary remedial measures, as well as the maintenance of any implemented remedial measures has been approved (promulgated SG, issue 15/16.02.2007, in force from 17.08.2007) to the Environmental Protection Act, and the approval of the methodology for the inventory is imminent.

- **Information system on banned and obsolete pesticides**

The Information system includes data for the quantities of any banned and obsolete pesticides and the state of the warehouses where they are stored. The information is collected on an annual basis through information cards which are filled-in by RIEW and processed t EEA using a specialized software programme. Since 2009, the data base is available to the public on the website of EEA.

- **Information system on local soil pollutions with obsolete POPs pesticides**

The Information system for soil monitoring at level III observes and registers the processes of local soil pollution in the vicinity of the old warehouses for storing of banned and obsolete pesticides, including also POPs pesticides: aldrin, dieldrin, DDE/DDD/DDT, HCH-compounds, lindane, mirex and heptachlorine, locations where pollution of adjacent areas is expected due to leaking roofs, demolished buildings and exposure of products to weather effects.

Since 2007, sampling of soils in the vicinity of the old warehouses for storage of obsolete pesticides hs been carried out annually, the samples have been analysed in the RL of EEA, and the results have been summarized by EEA.

- **Information system on industrial soil pollution with PCB and PAH**

The Information system for soil monitoring at level II comprises of national networks of points for monitoring of regional processes incl. also industrial soil pollution with POPs: 6 PCB (PCB28, PCB52, PCB101, PCB138, PCB153, PCB180) and 16 PAH compaunds). Sampling is carried out on-site by the 15 RL, and the analysis - by 4 base RL. The organization, the coordination, the quality control and the evaluation are exercised by EEA.

For 2009, no excess of the limit values for PCB and PAH in soils has been established.

- **Information system on protection of the underground**

The Information system includes data for the extraction of minerals, waste management and management of the surface damaged/recultivated during the extraction.

3.6.1.1.4. Monitoring of waste

- **Information system on waste**

RIEW and EEA at regional and national level respectively are obliged to summarize and analyze the information for any waste formed and treated, keep the information and maintain data base with information on waste, prepare specialized waste management references for the needs of MoEW and keep registers of the entities, which activity is related to the formation and/or treatment of waste and maintain registers of the waste treatment installations and facilities.

In 2010, EEA has received information for: the production or hazardous waste formed– 16 690 pieces; for the collection, transportation and temporary storage of production or hazardous waste – 964 pieces; for the collection, transportation and temporary storage of household and/or construction waste – 131 pieces; for the disposal of waste – 191 pieces; and for the recovery and/ or disposal of waste – 303 pieces.

Additionally, EEA receives information for other types of waste: waste from packaging; the recovery of sewage sludge and their use in agriculture; waste from used oils and waste petroleum products; waste batteries and accumulators; waste from WEEE and ELV.

3.6.1.2. Ministry of Agriculture and Food, BSFA

- **Monitoring of pesticide residues in soils**

BSFA, and in particular CLChTC, has not implemented targeted monitoring programmes for POPs residues in soils. In the period 2006 – 2010, CLChTC at the BSFA has received samples from soils, provided by clients against consideration, which have been tested for contents of POPs residues. The following POPs pesticides were included within the scope of the analysis: aldrin; chlordane; dieldrin; endrin; heptachlorine; HCB; DDT; lindane; alpha and beta –HCH.

During the said period of time, 40 soil samples have been tested, and in 37 of them the presence of POPs residues has been established.

3.6.2. Monitoring of food and feed

3.6.2.1. Ministry of Agriculture and Food, BSFA

- **The National programme for monitoring of pesticide residues in and on food of plant and animal origin**

Since 2011, BSFA at the MoAF, has undertaken the control of the food throughout the food chain and combines 3 monitoring programmes into a National programme for monitoring of pesticide residues and other harmful substances in and on food of plant and animal origin (NPMCR).

- **Monitoring programme for control of veterinary products residues and of live animals and animal products containing environmental contaminants for 2010, BSFA**

The monitoring programme is part of the NPMCR and aims at observation of certain substances and residues thereof in animal products.

The Central Laboratory of Veterinary Control and Ecology (CLVCE), Sofia at the BSFA is designated as the National Reference Laboratory (NRL) for control of veterinary drugs residues and environmental pollutants in live animals, raw materials and food of animal origin, feed and feed additives.

Groups of residues and contaminants, which are subject to control include also organochlorine compounds, including PCB, chloroorganic pesticides (DDT sum of isomers, aldrin, heptachlorine epoxide, α- and β- and γ-HCH).

- **Monitoring programme for pesticide residues in raw materials and products of plant origin during harvesting for 2010** [107]

The monitoring programme is part of NPMCR. The monitoring of pesticide residues is directed towards ensuring the correct application of the permitted plant protection products in compliance with the Good Plant Protection Practice (GAP). It is implemented by CLChTC, together with RFSD's.

The POPs pesticides, subject to the programme in 2010 include aldrin, DDT, dieldrin, dicophol, endosulfan and endosulfan sulphate, endrin, HCH and lindane, HCB, heptachlorine and heptachlorine epoxide, and in 2009 - aldrin, DDT, dieldrin, dicophol, endosulfan, HCH and lindane and HCB.

- **Monitoring programme[1] for undesired chemical contaminants - pesticide residues and mycotoxins in primary production of feed for 2010, BSFA**

The monitoring programme is part of NPMCR. Its main objective is to exercise control over the grain crops intended for the production of feed, during harvesting in 2010 for the correct application of plant protection products, improper use of unauthorized plant protection products or unauthorized use of the respective crop, as well as the presence of undesired POPs pesticide residues and contamination with mycotoxins. The European legislation is transposed in the national legislation by Ordinance No. 10 dated 3 April 2009 concerning MAC of undesired substances and products in feed.

The List of active substances in the composition of the pesticides, subject to control for the correct application of plant protection products in the primary production of feed includes also the POPs pesticides (aldrin and dieldrin (independently or sum aldrin+dieldrin, expressed as dieldrin); chlordane (combination of cis- and trans-isomers of oxychlordane expressed as chlordane); DDT (sum of DDT-, DDD- (or TDE) and DDE-isomers, expressed as DDT); endrin (sum of endrin and delta-ketone-endrin, expressed as endrin); alpha- and beta - endosulfan; heptachlorine (sum of heptachlorine and heptachlorine- epoxide, expressed as heptachlorine); HCB; α- and β- and γ-HCH.

3.6.2.2. Ministry of Health, NCPHA and RHI

[107] Annual report on the implementation of the single multiannual national control plan of Bulgaria on food and feed safety, animal health and animal welfare rules and plant protection, year 2010

Control and monitoring system on the safety of food of non-animal origin for 2010, MoH, NCPHA and RHI

The official control on the safety of food of non-animal origin has been exercised by RHI until 2010 and since 2011 has been exercised by BSFA. Monitoring and analysis is carried out of any offered food, Bulgarian production, and imported according to parameter for safety thereof. During the control of food of non-animal origin imported from third countries, an inspection and sampling are performed in compliance with the provisions of the European legislation.

In 2010, chemical testing of food, Bulgarian production, and imported has been performed under parameters for safety: nitrates, heavy metals and mycotoxins, pesticide residues. No deviations from the limit values have been established.

No pesticide residues have been found in any of the tested samples, including also POPs, exceeding MAC.

Control and monitoring system on drinking water, bathing water and mineral water, intended for drinking or used for preventive, curative or toilet use, including bottled mineral water

Pursuant to the Water Law and the Health Act, a competent body in Bulgaria on the application of the European and national legislation in the field of drinking water, bathing water and mineral water, intended for drinking or for preventive, curative and toilet use, including bottled mineral water is the Ministry of Health and its regional structures – 28 Regional Health Inspectorates (RHI).

The national legislation in the field of drinking and bottled water, intended for drinking - Water Law, Food Act, Ordinance No. 9 concerning the quality of drinking water (SG, issue 30 of 2001), Ordinance concerning the requirements to bottled natural, mineral, spring and table water, intended for drinking – is completely harmonized with the EU legislation in the respective fields (Regulation 852/2004/EC, Directive 98/83/EC and Directive 2009/54/EC) and is in a process of application. Monitoring of pesticides in drinking water, as well as control thereof in bottled mineral, spring and table water is a mandatory requirement according to the community legislation in the field of drinking water and food.

The water supply organizations in their capacity of drinking water supply structures are responsible for the fulfillment of the requirements of the drinking water legislation, including full scope monitoring of the quality of drinking water.

According to the regulatory acts mentioned above and other acts, the Ministry of Health, respectively RHI exercise State Health Control over drinking water, bathing water, mineral water, water sources and water supply sites and facilities, health protected areas, open water bathing spaces etc.

3.7. Information, awareness and education of the public and training of competent bodies on POPs

In the period 2006 – 2011, a number of actions have been undertaken for information, awareness and education of the public with regards to POPs and their effects on human health and the environment and the application of the legislation concerning management thereof with lecturers from MoEW taking part in seminars and round tables, organized by various ecological NGOs.

A number of brochures, manuals, guidelines, instructions, information materials have been developed and published on hard copies or posted on the Internet site of MoEW, targeted at various target groups from the population, the industry and the government administration.

Training was held of the professional target groups on POPs management and the application of 2006 NIPPOPM and Regulation 850/2004 on POPs.

3.7.1. NIPPOPM

1. The 2006 NIPPOPM was printed on hard copies and disseminated via the press center of MoEW and RIEW in Bulgarian and English language. The soft version may be found on http://www3.moew.government.bg/ of MoEW.

2. The international, European and national legislation in force, as well as the consolidated version of the Stockholm Convention in Bulgarian language, including the new POPs, is posted on http://www3.moew.government.bg/ of MoEW.

3. Two seminars were held (2010 and 2011) with the experts of RIEW titled "Control and application of the legislation in the field of the management of chemicals", including POPs, where the updating of the available quantities of the existing and new POPs was clarified and were identified the guidelines and priorities for exercising control by RIEW under Regulation (EC) 850/2004 on POPs during 2012.

3.7.2. POPS PESTICIDES

1. Various information brochures were developed and published on hard copies with regards to POPs pesticides, which may be found also on soft copy on the website of MoEW.

2. In cooperation with ecological NGOs, in the period 2008 ÷ 2010 a number of seminars and round tables were held with various target groups to raise the public awareness with regards to the effects of POPs pesticides on human health and the environment – in Sofia, Plovdiv, Varna and Pleven.

3. Experts from MoEW assisted the Civil Action Network "BlueLink" in the creation of a specialized Internet site on "POPs – the unknown threat" in 2008.

4. Experts from MoEW took part as lecturers in three seminars for experience and knowledge sharing on the management of obsolete POPs and other pesticides in Belgrade, Serbia; Istanbul, Turkey and Bucharest, Romania in 2008 and 2009.

3.7.3. INDUSTRIAL POPS CHEMICALS – PCB

1. A training was held for the experts of RIEW and experts from the industry on the procedure and methodology for the inventory, marking and management of PCB in equipment – May÷June 2006. Consultations were provided to the industry by experts of MoEW in the period 2007 ÷ 2011 and "Guidance on the inventory, marking and management of equipment containing PCB"– June 2006, update 2007, was developed and published on hard copies and posted on the website of MoEW. By Order of the Minister of the environment and water (RD-366/19.06.2006) "Instructions for the inventory, marking and cleaning of equipment containing PCB, and for the treatment and transportation of waste, containing PCB", were developed and approved, which were posted on the website of MoEW. Soft copies of Inventory form for equipment containing PCB and for equipment free of PCB, as well as a format of a Plan for cleaning and/or disposal of inventoried equipment containing PCB were developed and posted on the website of MoEW;

2. "Technologies for disposal of POPs" and "POPs characteristics and properties of PCB" were developed and posted on the website of MoEW as Appendices to the NIPPOPM dated March, 2006.

3. For the information and awareness of the public, a brochure called "Polychlorinated biphenyls in equipment – potential threat for the human health and the environment" was developed, published on hard copy and posted on the web-page of MoEW.

4. A software programme for the maintenance of electronic data base for the equipment, containing PCB was developed and implemented on a national level (MoEW) and regional level

(RIEW), which has been updated on a regular basis annually or upon occurrence of any change in the status of the PCB equipment. Annual reports were also issued. Last update – 20 June 2011.

5. MoEW issues licenses for the implementation of activities concerning the treatment and management of hazardous waste, including for PCB to the companies engaged in such activities. An electronic register is kept and updated of the issued permits, which may be found on the website http://eea.government.bg of EEA.

3.7.4. POPS IN EMISSIONS

A leaflet „POPs in emissions", and a brochure „POPs in emissions – potential threat for the health and the environment" were prepared.

3.7.5. NEW POPS CHEMICALS

Various information materials on the new POPs, covered by the Stockholm Convention are posted on the Internet site http://www3.moew.government.bg/ of MoEW.

3.8. NGOs activities concerning POPs

3.8.1. Structure of NGOs

On account of the specific nature of the structures, the method of financing and activities of the NGOs, they play an important role in the administration of any country.

The various non-governmental organizations may support the efforts of the public institutions for the management of the hazardous chemical substances and POPs regarding: data analysis; risk assessment; provision of educational programmes on the management of chemical substances and POPs; information campaigns, research activities in the search of ecological substitutes.

3.8.2. ACTIVITIES OF THE ECOLOGICAL NGOS FOR RAISING PUBLIC AWARENESS ON POPS

The Small Grants Programme (SGP) was created in 1992 and is financed by the Global Environmental Facility (GEF). The programme operates in 105 countries around the world, it is managed by the UN Development Programme (UNDP) and is implemented by the United Nations Office for Project Services (UNOPS).

GEF's SGP funds projects of non-governmental organizations in several thematic areas, one of which is the control on the transmission of POPs. For its five years of existence in Bulgaria, the Programme has co-financed 86 projects with a value exceeding USD 3 million. The monetary funds for co-financing provided by the approved projects amount to USD 3 million with voluntary contribution valued at USD 1.4 million. 33 projects have been completed and some projects are in an advanced stage of implementation and are reporting results.

ACTIVITIES OF ECOLOGICAL NGOS

In the field of POPs, 3 projects have been implemented by various NGOs. For two of those experts from MoEW have cooperated through compiling the information on POPs or have taken part as lecturers in the seminars held by the NGOs.

1. Project No. 79 "Training of experts, capacity building and public awareness raising for implementation of Bio/Phyto technologies for remediation of soils and sites polluted by POPs and heavy metals", Foundation - Institute for Sustainable Development, partners under the project - National Agricultural Advisory Service; International HCH and Pesticides Association – Amsterdam, the Netherlands; period of the Project 13.06.2007 - 01.01.2009, national scale activities in Sofia.

The aim of the project is capacity building of experts in the central, regional and local structures of MoAF and the municipalities for issues relating to contaminated soils, as a prerequisite for broad implementation of bio/phyto technologies for remediation thereof. Within the framework of the project the following activities were implemented: preparation of a list of the problematic municipalities/lands with potential to implement bio/phyto remedial technologies, holding a two-level training: - training course for experts from the central structures and regional divisions of MoAF; seminars with experts from problematic municipalities, as well as farmers or organizations thereof. The results achieved are as follows: trained experts from the central and regional structures of MoAF, representatives of the scientific circles, PhD students, students and business organizations; 8 seminars held in various cities, published brochure ”Guidance on phyto/bioremediation of polluted soils and sites”; popular science articles on phyto/bioremediation in a specialized magazine “Ecology and Future”. The project was focused mainly on bio/phyto technologies for remediation of soils and sites polluted by heavy metals and POPs, and the probable use of this technology in case of found sites polluted by POPs. No such sites polluted by POPs have been found.

2. Project No. 80: Greater knowledge of persistent organic pollutants (POPs) in Bulgaria: the right to be informed of the risks – public support for eliminating the global threat, ‘Stop the quiet invaders’ Campaign, ‘BlueLink’ Foundation, partners under the project - Center for Environmental Information and Education and Black Sea NGO Network, national scale, period of the Project 22.03.2007- 01.03.2008.

The ultimate aim of the Project is to contribute to raising public awareness and involvement in the problems of the environment and human health, caused by POPs.

As a result of incomplete combustion or thermal processes in the presence of organic matter and chlorine, in households burning wood and coal, in incineration of household waste etc. POPs – dioxines, furans, polychlorinated biphenyls - are generated and released unintentionally into the environment. This Project has been implemented as part of a national information campaign ‘Stop the quiet invaders’. The specific tasks under the Project were: create conditions for multiplying the effect of the information campaign on POPs through building capacity for work with POPs issues in strategic target groups, reduction of POPs through training and support of certain practices/technologies by implementing two demonstration projects for such practices – refusal to incinerate PVC waste (which generates POPs), separate collection thereof and submission for recycling. The campaign under the Project achieved its goal, namely providing information, building capacity, support and civil participation.

3. Project No. 81: POPs – ‘synthetic bombs’ in our everyday life - Association Misionis partners under the Project – Media Planet EOOD – Public Relations and Advertising Agency, Regional Development Centre - Targovishte and Regional Directorate Fire and Emergency Safety – Targovishte; national scale with pilot activity in Targovishte, period of the Project 13.06.2007 - 01.01.2009.

The aim of the Project is raising public awareness of POPs and their harmful impact on the environment and people’s health when burning agricultural waste, household waste and plastics. Information packages, educational and advertising materials have been prepared, aimed at providing information on POPs in a language comprehensible for the average citizen who finds scientific terminology complicated and intimidating. Accessible and comprehensible information was provided to the journalists enabling the latter to become ‘spokespeople’ of the idea, people having at their disposal the most powerful channels of influence on society. NGOs activities on POPs management.

ACTIVITY OF BALKAN RESEARCH INSTITUTE OF ECOLOGY AND ENVIRONMENTAL PROTECTION (BRIEEP)

The main activities of the centre are educational, scientific and research, advisory, expert, information and design. BRIEEP is a non-governmental organization dealing with the issues related to chemical substances, including POPs, and their effects on the environment.

Projects and publications on POPs, realized by BRIEEP: Project "Public awareness programme - Persistent organic pollutants– health and environmental effects" targeted at young people and the local community stakeholders, financed under the Small Grants Programme of UNEP Chemicals, developed by NGOs, as part of the Bulgarian sub-project GF/2732-02-4454 "Development of a National Implementation Plan for the Management of Persistent Organic Pollutants", April-July 2006. Various brochures and leaflets have been developed and published on POPs effects, Guidance on the inventory, marking and management of equipment containing PCB; the Stockholm Convention in Bulgarian language, a number of round tables and seminars have been held with various target groups. The book "Technologies for disposal of persistent organic pollutants" was published, BRIEEP, 2007, authors Prof. Iv. Dombalov, et al.

3.8.3. INTERNET LINKS WITH INTERNATIONAL ORGANIZATIONS IN THE FILED OF POPS

The official websites of the conventions and some of the international organizations in the filed of POPs are listed below:

Official website of the Stockholm Convention: www.pops.int
Official website of the Rotterdam Convention: www.pic.int
Official website of the Basel Convention: www.basel.int
Official website of UNEP- Chemicals: www.chem.unep.ch
Official website of WHO: www.who.ch
Official website of FAO: www.fao.org
Official website of UNIDO: www.unido.org
Official website of OECD: www.oecd.org
Official website of UNITAR: www.unitar.org
Official website of IFCS: www.who.int/ifcs/
Official website of the European Commission: http://ec.europa.eu/environment/POPs/
Official website of the Protocol on POPs: http://www.unece.org/env/lrtap/POPs/
Official website of IPEN: www.ipen.org

3.9. Laboratory infrastructure for POPs analysis

A number of laboratories in Bulgaria may be involved in the management of chemical substances in the various stages of their life cycle. These laboratories are capable of analyzing chemical quality during the manufacturing process, analyzing and controlling of waste products, identifying unknown substances, studying of possible harmful effects on the elements of the environment (soils, surface and ground water), etc. These laboratories are accredited by Executive Agency "Bulgarian Accreditation Service" (EA BAS) according to Bulgaria's current legislation.

3.9.1. Accredited Laboratories for Testing of POPs

In Bulgaria, there are totally 19 accredited laboratories for testing of POPs - in soils, surface and ground water within the system of EEA, in raw materials and products of plant origin (fruit and vegetables, grain crops, feed) and food of animal and plant origin within the system of BSFA and MoAF and a laboratory complex for testing at the Agricultural University, Plovdiv (water, food and soils).

Table No. 150 sets out the laboratories accredited by EA BAS[108] for testing of POPs in Bulgaria.

Eight accredited regional laboratories: Sofia, Burgas, Varna, Veliko Tarnovo, Pleven, Plovdiv, Ruse to the General Directorate Laboratories and Analytical Activities (GD LAA) at the EEA within the system of MoEW measure the contents of POPs in the ambient air and gas emissions, in the surface, underground and waste water, in the soils and waste for the following parameters: volatile organic compounds (VOCs), POPs pesticides, PCB, PAH using gas-chromatography methods.

The contents of POPs in raw materials and products of plant origin and in food of animal and plant origin is tested and analyzed in 2 accredited laboratories for testing within the systems of BSFA at the MoAF, one accredited laboratory to the Plant Protection Institute (PPI) at the Agricultural Academy (AA), MoAF, and 7 accredited laboratories at the RHI, MoH and NCPHA.

[108] Accreditied laboratories for testing of POPS, EA BAS, 30 September 2011

Table 150: Accredited laboratories for testing of POPs in Bulgaria as of 30 September 2011

No.	Name / Location	Name of the tested products	Name of the tested POPs characteristics
	MoEW, EEA		
1	Central laboratory – Sofia at General Directorate „Laboratory and Analytical Activity”, EEA, MoEW Certificate No. 135 TL, valid from 30.09.2011 to 30.09.2015	1. Surface, underground, drinking and mineral water 2. Soils 3. PCB in oils 4. Bottom deposits/sediments	POPs pesticides – individually and totally; PCB; PCB in oils; PAH
2	RL – Burgas, EEA, Certificate No. 135 TL, valid from 30.09.2011 to 30.09.2015 .	1. Surface, underground, drinking, mineral and sea water 2. Soils 3. Bottom deposits/sediments	POPs pesticides – individually and totally; and PCB; PAH
3	RL– Varna, EEA, Certificate No. 135 TL, valid from 30.09.2011 to 30.09.2015	1. Surface, underground, drinking, mineral and sea water 2. Soils 3. PCB in oils 4. Bottom deposits/sediments	POPs pesticides – individually and totally; and PCB; PCB in oils, PAH
4	RL – Pleven, EEA, Certificate No. 135 TL, valid from 30.09.2011 to 30.09.2015	1. Surface, underground, drinking and mineral water 2. Soils	POPs pesticides – individually and totally; and PCB; PAH
5	RL – Plovdiv, EEA, Certificate No. 135 TL, valid from 30.09.2011 to 30.09.2015	1. Surface, underground and drinking water 2. Soils 3. Bottom deposits/sediments	POPs pesticides – individually and totally; and PCB; PAH
6	RL –Stara Zagora, EEA, Certificate No. 135 TL, valid from 30.09.2011 to 30.09.2015	1. Surface, underground, drinking and mineral water 2. Soils 3. Bottom deposits/sediments	POPs pesticides – individually and totally; and PCB; PAH
7	RL – Ruse, EEA, Certificate No. 135 TL, valid from 30.09.2011 to 30.09.2015	1. Surface, underground and drinking water 2. Soils	POPs pesticides – individually and totally; and PCB; PAH
8.	RL – Veliko Tarnovo, Certificate No. 135 TL, valid from 30.09.2011 to 30.09.2015	1. Soils	POPs pesticides – individually and totally; and PCB; PAH
	MoAF, BSFA		
9	Central Laboratory for Chemical Testing and Control (CLChTC) at BSFA, Sofia, Certificate BAS No. 17 TL/ 07.09.2011 valid until 30.06.2012. Initial accreditation from 21.02.2003 Currently, under a procedure for re-accreditation EA BAS	I. Raw materials and products of plant origin: fruit and vegetables, cereals, tea, herbs and spices II. Soils and sludge	POPs pesticides (aldrin, α-HCH, β-HCH, Chlordane, dieldrin, endrin, endosulfan, endosulfan sulphate, heptachlorine, HCB, lindane, DDT)
10	Central Laboratory of Veterinary Control and Ecology (CLVCE) at BSFA, Sofia, Certificate BAS No. 61 TL, valid until 31.03.2012 Currently, under a procedure for re-accreditation EA BAS.	1. Food of animal origin (meat, milk, eggs, fish and aquaculture animals, wild animals and honey)	POPs pesticides (aldrin, α-HCH, β-HCH, Heptachlorine, HCB, Lindane, DDT) and PCB
11	Laboratory Test Block at Plant Protection Institute (PPI) to AA, MoAF Sofia, Certificate BAS No. 274 TL, valid from 24.09.2010 to 30.09.2014	1. Raw materials and products of plant origin (fruit and vegetables, grain crops, feed) 2. Food of plant origin	POPs pesticides (endosulfan and lindane) in fruit and vegetables, grain crops and feed and endosulfan in food of plant origin.
	MoH, NCPHA, RHI		
12	Test Centre "Health" at NCPHA, Certificate BAS No. 278 TL, valid from 17.12.2010 to 31.12.2014	I. Raw materials and products of plant origin (grain legumes) II. Food of animal (eggs) and plant origin III. Prepared foods and pre-cooked meals	POPs pesticides
13	LABORATORY TEST COMPLEX at RHI – Varna, Certificate BAS	I. Food of animal origin (milk and dairy products, meat and meat	POPs pesticides (DDE/DDT, aldrin, dieldrin,

No.	Name / Location	Name of the tested products	Name of the tested POPs characteristics
	No. 244 TL, valid from 03.12.2009 to 31.12.2013	products, fish etc. sea food, oils and fats) II. Food of plant origin (cereals, potatoes, legumes, vegetables, fruits) III. Raw materials and products of plant origin IV. Other food	endrin, heptachlorine, heptachlorine epoxide, lindane, HCH isomers,)
14	LABORATORY TEST COMPLEX at RHI – Veliko Tarnovo, Certificate BAS No. 245 TL, valid from 03.12.2009 to 31.12.2013	I. Food of animal origin II. Cereals and cereal-based food III. Vegetables IV. Fruits V. Nuts VI. Food of plant origin VII. Baby foods	POPs pesticides
15	LABORATORY TEST COMPLEX at RHI – Plovdiv, Certificate BAS No. 246 TL, valid from 03.12.2009 to 31.12.2013	I. Food of plant origin II. Vegetables III. Fruits IV. Nuts V. Baby foods	POPs pesticides
16	LABORATORY TEST COMPLEX at RHI – Pleven, Certificate BAS No. 247 TL, valid from 03.12.2009 to 31.12.2013	I. Food of animal origin II. Grain crops and cereals and cereal-based food III. Raw materials and food of plant origin IV. Baby foods V. Other food	POPs pesticides
17	LABORATORY TEST COMPLEX at RHI – Sofia, Certificate BAS No. 249 TL, valid from 07.01.2010 to 31.01.2014	I. Food of animal origin II. Grain crops, cereals and cereal-based food III. Raw materials and food of plant origin IV. Nuts and oilseeds V. Baby foods VI. Drinking and surface water	POPs pesticides (DDT sum, aldrin/dieldrin, heptachlorine, α- and β-HCH, lindane) in food of animal and plant origin; baby foods; POPs pesticides and PAH in drinking and surface water
18	LABORATORY TEST COMPLEX at RHI – Burgas, MoH, Certificate BAS No. 254 TL, valid from 08.01.2011 to 31.01.2014	I. Food of plant origin (cereals, fruit and vegetables) II. Drinking water	POPs pesticides
19	LABORATORY TEST COMPLEX at Agricultural University, Plovdiv, Certificate BAS No. 93 TL, valid from 14.08.2009 to 31.08.2013	I. Foodstuffs II. Water (surface, drinking and underground) III. Soils	POPs pesticides, HCB, PCB

3.10. EXITING CHEMICAL MANAGEMENT SYSTEMS AND INCLUSION OF NEW POPS

Measures for prevention the production, the placing on the market and the use of new chemical substances, demonstrating POPs characteristics are provided for by the new harmonized legislation concerning chemicals, plant protection products, biocides and detergents. Measures are undertaken also for the reduction of the risk for the human health and the environment, as set forth in other legislation in the field of the environment (for example control of the risk of major emergencies with hazardous chemical substances and the risk reduction measures, provided for by the integrated permits).

3.10.1. System for registration, evaluation, authorization and restriction of chemicals (REACH)

The main act regulating the chemical substances in the European Union is implemented by the provisions of **Regulation (EC) 1907/2006 concerning the registration, evaluation, authorization and restriction of chemicals (REACH),** according to which the use of substances of very high concern (SVHC) for the human health and the environment are subject to strict control.

The SVHC substances will gradually be included in Annex XIV of Regulation REACH. Once included in this Annex, no placing on the market thereof or use after a certain date will be possible unless a permit is given for a certain use/s. Any company wishing to receive a permit for certain uses of such substance, will have to submit an application for authorization at the European Chemicals Agency (ECHA).

SVHC are substances, which are carcinogenic, mutagenic or toxic for reproduction (CMR), classified in category 1 or 2; persistent, bioaccumulative and toxic (PBT) or very persistent and very bioaccumulative (vPvB), according to the criteria of Annex XIII of Regulation REACH and/or individually defined based on scientific evidence as causing equivalent level of concern for probable serious effects to human health and environment – for example substances, destroying the endocrine system.

The registration is a procedure requiring the generation by manufacturers and importers of a certain data set on the properties of the substances manufactured/imported thereof. This information is used for the evaluation of any hazards and risks, which the said substance may represent and for the formulation and recommendation of risk management measures. It is submitted in the form of a registration file in electronic format to ECHA. For substances manufactured or imported in quantities of 10 t or more, a safety report is required.

Any uses of a restricted substance which are not explicitly restricted, are permitted according to REACH, unless they are subject to authorization or fall within the scope of another European or national legislation, regulating such uses. For the substances subject to restriction there is no tonnage threshold.

Annex XVII of Regulation REACH contains this list with all substances subject to restricted production and the respective uses.

In order to assist the industry, a National Information Bureau on chemicals (REACH helpdesk) has been established according to article 124 of REACH, within the framework of MoEW, which is the competent body for the application of the Regulation.

3.10.2. System for classification, labelling and packaging of substances and mixtures

Regulation (EC) 1272/2008 concerning the classification, labelling and packaging of substances and mixtures (CLP) introducing the Global harmonized System (GHS) in the Community's legislation manages the risks form hazardous substances and mixtures through their classification, labelling and packaging according to the criteria and requirements of the Regulation. It introduces new scientific criteria for the evaluation of the hazardous properties of the chemicals, the new symbols and signs for hazard ('pictograms'), as well as new harmonized hazard warnings and safety recommendations, which will replace the currently existing risk phrases (R-phrases) and safety phrases (S-phrases). With regards to the direct application of the Regulation's Annex, the Member States will have to definitively cancel the currently effective system for classification and labelling in their national legislation as of 1 June 2015. The classification and labelling (C&L) is a useful tool for the management of the risk from hazardous chemical substances. All substances and mixtures placed on the market should be classified and labelled except the self-classified, whereby manufacturers, importers and consumers down the chain determine the hazards and classify the substances and mixtures on their own, CLP includes also provisions for harmonized classification of substances. All substances, for which there is a harmonized classification, are listed in Annex VI of the CLP Regulation. The Regulation contemplates the establishment of an Inventory list for classification and labelling of substances. It will represent a data base containing basic information on the classification and labelling of substance notified and registered by manufacturers and importers. It will also contain a list of any classifications harmonized at EU level.

3.10.3. System for placing on the market of plant protection products

The placing on the market and the use of plant protection products is implemented through the provisions of **Regulation (EC) No. 1107/2009** concerning the placing on the market of plant protection products (EU OJ No., L309/24.11.2009)**.** Active substances, safeners and synergists, adjuvants and co-formulants, which plant protection products contain or consist of are permitted for placing on the market and use, only if they do not have the properties of POPs, or of persistent, bioaccumulative and toxic (PBT) or of very persistent and very bioaccumulative (vPvB) substances. An active substance is defined as candidate for substitution, if it covers two of the PBT criteria. With the enforcement of the new Regulation (EC) No. 1107/2009, the approval or disapproval of any AS envisages the issuance of a special Regulation thereof and a legislative decision is applied directly on the territory of the country. The approval of plant protection products for sale on the Bulgarian market will be again a two-stage process, and the active substance is approved for inclusion in the European positive list, and then the formulated product is permitted on national level through the application of the single principle for the assessment of the risk from the active substance on humans, non-targeted organisms and the environment. Bulgaria falls into the Southern zone.

3.10.4. System for placing biocides on the market

The current regulatory framework on biocides is established by **Directive 98/8/EC** of the European parliament and the Council dated 16 February 1998 and gives harmonized regulatory framework for the issuance of permits and the placing on the market of biocides, the mutual recognition of such permits within the Community and the establishment on the Community level of a positive list of active substances, which may be used in biocides.

The biocides are placed on the market and used where there is a permit thereof issued by the MoH, according to chapter four of LPHECSM, no the placing on the market is permitted for mass users and the use of biocides thereby, which are classified as toxic, very toxic or carcinogenic category 1 or 2, mutagenic category 1 or 2, toxic for the reproduction category 1 or 2.

By **Regulation (EC) No. 1451/2007** of the Commission concerning the second phase of the 10-year working programme set forth in article 16, para 2 of Directive 98/8/EC of the European Union and the Council concerning the placing on the market of biocides detailed rules are set for the implementation of the working programme for systematic research of all active substances, which have already been placed on the market as of 14 May 2000 as of active substances of biocides.

According to Article 14, para 4 of LPHECSM, the Minister of health shall approve by Order lists of the active substances, the low risk active substances and the main substances, permitted in EU for inclusion in the composition of biocides, including the requirements thereto, and lists of the active substances, for which there is a decision of the European Commission for non-inclusion in the lists.

3.10.5. System for placing on the market of detergents/washing preparations

Regulation (EC) 648/2004 concerning detergents (EU OJ No., L104/08.04.2004) lays down the rules**,** which aim to ensure the free circulation within the internal market of detergents and surfactants in detergents (surfactants). The Regulation harmonizes the following rules concerning the placing on the market of detergents and surfactants to be used in detergents: ultimate biodegradability of surfactants for and in detergents: restrictions or bans applied for the use of surfactants, related to biodegradability, additional labelling of detergents, including the fragrances, which may cause allergy; and information, which the manufacturers must provide at the disposal of the medical staff and the users via the Internet.

3.10.6. System for prevention of accidents and mitigating the risk of accidents – Seveso I and Seveso II

Arising of major-accidents and the availability of various standards regarding the control over enterprises using or storing dangerous chemical substances are the basic reason for the European Commission to propose the Directive on control of major-accident hazards. On 24 June 1982, the first Directive 82/501/EEC – known as **Seveso I Directive** (Directive 82/501/EEC of the Council on the major-accident hazards of certain industrial activities concerning the prevention of major-accidents involving hazardous substances, (OJ, No. L 230/05.08.1982). In November 1986, is the second amendment of the Seveso Directive (87/216/EEC – adopted on 19 March 1987 [Directive 87/216/EEC of 19 March 1987 (OJ, No. L 85/28.03.1987) and Directive 88/610/EEC of 24 November 1988 (OJ, No. L 336/07.12.1988)]. On 9 December 1996, a new Directive 96/82/EC is adopted on the control of major-accident hazards – known as **Seveso II Directive**.

Directive Seveso II (Directive 96/82/EC on the control of major-accident hazards, which was amended by Directive 2003/105/EC of the European Parliament and the Council amending Directive 96/82/EC of the Council concerning the control of major-accident hazards, involving hazardous substances) aims at the prevention of major-accident hazards involving dangerous chemical substances and limitation of their consequences not only for man (safety and human health aspects), but also for the environment (environmental aspects).

The requirements of the Directive Seveso II are transposed into the Bulgarian legislation in the Environmental Protection Act – Chapter seven “Prevention and Limitation of Industrial Pollution”, Section I “Prevention of Major Industrial Accidents” and Ordinance on the Prevention of Major Accidents Involving Hazardous Substances and Limitation of their Consequences.

The legislation is applied for establishments and installations where dangerous chemical substances are used or stored in quantities equal or larger than those set forth in Annex 3 of the Environmental Protection Act, and classified as lower-tier establishments and/or installations (LTEI) or upper-tier establishments and/or installations (UTEI) pursuant to Article 103 of the Environmental Protection Act. POPs, for example polychloro-dibenzofurans and polychloro-dibenzodioxines (incl. tetrachlordibenzo-p-dioxin (TCDD)) also fall within the scope of this legislation and Annex 3 of the Environmental Protection Act stipulates very low limit values for POPs (below 1 kg).

3.10.7. System for Integrated Pollution Prevention and Control (IPPC)

The prevention and limitation of the industrial pollution from various categories of industrial activity is regulated by Directive 2008/1/EU and Directive 2010/75/EU concerning the emissions from the industry (IPPC).

The aim of these acts is to achieve integrated prevention and control of pollution resulting from the activities lists in Appendices I to the Directives. Measures are established to prevent or in the cases where this is not possible, to decrease emissions in the air, water and soil resulting from the activities indicated, including measures related to waste, aiming the achievement of high level preservation of the environment.

The requirements of Directive 2008/1/EU are transposed into the Bulgarian legislation in the Environmental Protection Act – Chapter seven "Prevention and Limitation of Industrial Pollution", Section II "Integrated Permits" and the Ordinance on the terms and procedure for issuing integrated permits. The new requirements of the Directive 2010/75/EU – in its part concerning the integrated pollution prevention and control are transposed too.

The integrated approach on the pollution prevention and control is applied for installations and activities falling within the scope of Annex No. 4 of the Environmental Protection Act.

From the installations described in the Annex, the following are defined as generators of harmful POPs emissions: chemical installations for production of basic organic chemicals such as halogen-containing hydrocarbons; plastic materials, polymer synthetic fibers and cellulose-based fibers; synthetic rubbers; dyes and pigments, as well as installations for disposal or recovery of hazardous waste, including for regeneration, treatment or disposal of used oils, with capacity exceeding 10 tons of waste per 24 hours and performing one or more activities for disposal of hazardous waste; installations for incineration of household waste with capacity exceeding 3 tons per hour; installations for disposal or recycling of animal carcasses or animal waste with capacity exceeding 10 tons per day; landfills receiving more than 10 tons of waste per 24 hours or with total capacity exceeding 25 000 tons, excluding landfills of inert waste.

Annex III of Directive 2008/1/EU lays down an exemplary list of the main polluting substances, which should be considered if related to the setting of emission limit values in the air (incl. POPs - polychlorinated dibenzodioxines and polychlorinated dibenzofurans) and the water (incl. POPs - organohalogen compounds and substances, which may form such compounds in the aquatic environment; substances and preparations with proven carcinogenic and mutagenic properties or properties, which may have an effect on the reproduction through the aquatic environment; and persistent hydrocarbons, and persistent and bioaccumulative organic toxic substances).

3.10.8. International Initiatives

The Intergovernmental Forum on Chemical Safety (IFCS) is a supra-institutional means to support the cooperation concerning the risk assessment of chemicals and environmentally sound management of chemical substances and mixtures.

Strategic Approach to International Chemicals Management (SAICM) is a political framework for enhancing the chemical safety throughout the world. The common goal of SAICM is to achieve good chemicals management through their entire life cycle, so that until 2020 they should be produced and used in manners significantly minimizing the harmful effect on the human health and the environment.

INFOCAP represents an Internet network for exchange of information for building administrative capacity for environmentally sound management of chemical substances and mixtures.

INFOCAP acts as „a door to the world” for building administrative capacity for the environmentally sound management of chemical substances and mixtures and provides an opportunity for free search of information regarding National profiles for management of chemical substances, National Implementation Plans, National priorities and needs, sources of assistance in the implementation of projects in the field of the management of chemical substances, realized past, current and future projects, training and guiding materials for management of chemical substances etc.

PART IV:

4. IMPLEMENTATION STRATEGY AND ACTION PLAN ON POPS

4.1. National Commitments

As a Party which has signed and ratified the Stockholm Convention, Bulgaria has entered into commitment for its effective implementation and application. As a Member State of the European Union since 2007, Bulgaria applies the convention, which has been transposed in Regulation (EC) No. 850/2004, main legislative act for the management of POPs in EU. Realizing the threats for the environment and the human health from the effects of POPs, our country has already undertaken the necessary legislative and administrative measures and ancillary activities, in order to fulfill its obligations under the Stockholm Convention.

Undertaking just legislative measures is insufficient for the implementation of the international commitments of the country concerning the management of POPs. That is why other measures are contemplated and applied, including allocation of financial funds from the state budget, as well as looking for additional financing under the programs of the European funds and other international and intergovernmental funding programs.

For the attainment of the main objective of the Stockholm Convention, namely preservation of the environment and the human health from the effects of POPs, MoEW works in close cooperation with MoAF and MoH and concerted and coordinated efforts are used together with the institutions responsible for the activities in the field of the economy, causing damages to the environment such as power engineering, industry, agriculture, transport etc., which are bound both with the preservation and the reclamation of the environment.

Through the implementation of U-NIPPOPM, Bulgaria will continue to keep the commitments undertaken for the application of the Stockholm Convention and the European legislation in the field of the management of POPs.

4.2. Priorities of National Importance

For the attainment of the strategic goal and the operative objectives of the updated NIPPOPM, national priorities have been set through prioritization**.** The key priorities of national importance for the management of POPs are prioritized according to the importance of the issues. **The following <u>8 priorities of national importance</u> have been set, 5 of which of high priority:**

1. Providing conditions for the effective application of the legislation in the field of POPs and exercising control.
2. Disposal abroad of the available obsolete POPs pesticides (DDT, heptachlorine and lindane), of the available residual equipment containing PCB and the available fire extinguishing foam containing PFOS;
3. Enhancement of the laboratory infrastructure for testing and monitoring of the new POPs in the elements of the environment, in articles and waste and in raw materials, products and food of plant and animal origin.
4. Monitoring of POPs in soils, surface and ground water, in articles and waste, in raw materials and products of plant and animal origin and in food of plant and animal origin, which have already entered the distribution network.
5. Inclusion of conditions for the prevention/limitation of the POPs emissions, incl. emission limitations, based on BAT in the integrated permits of combustion installations, metallurgical installations, chemical installations and installations for production of cement clinker

and another 3 of medium priority:

1. Prevention and reduction of the formation of hazardous waste, containing new POPs and increasing the percentage share of the recycled and recovered waste;
2. Reduction and/or prevention of the total POPs emissions from unintentional production;
3. Raising the awareness of the community on the effects of the new POPs on the human health and the environment and provision of publicly available information on the risks of POPs.

4.3. Strategy for implementation of the set objectives and priorities

The strategy for the implementation of the set objectives and priorities includes:

1. Application of an integrated approach in the resolution of the issues with the coordinating role of MoEW through active involvement of the ministries and institutions responsible for the policy related to the management of POPs.
2. Use of diverse and effective measures for implementation and support of the planned activities – legislation and control, information and training, economic measures, use of the currently existing structures.
3. Monitoring of the environment and the health.
4. Prioritization of the activities which may affect positively the health of the population.
5. Engagement of NGOs in the process of information of the community regarding the effects of the new POPs on the human health and the environment.
6. Provision of public access to information on POPs via the Internet site of MoEW.
7. Coordination of the activities for the management of POPs through cooperation in the application of the Stockholm, Rotterdam and Basel Conventions.

4.4. Basic principles of the implementation strategy

The strategy for the implementation of the updated NIPPOPM is based on the following principles:

- ✓ Sustainable management of POPs, aiming at the prevention and mitigation of the risk for the human health and the environment;
- ✓ Priority of the prevention of the pollution with POPs and other dangerous pollutants of the elements of the environment before the subsequent elimination of the damages caused;
- ✓ Application of BAT and BEP, not requiring excessive expenses
- ✓ Application of the principle “the polluter pays for the damages caused”;
- ✓ Application of the principle “liability of the producers” for prevention and reduction of the hazardous waste, formed in the production of their products;
- ✓ Involvement of the community and the stakeholders and transparency in the decision-making process in the field of POPs management.

4.5. Action plan on POPs

The updated Action plan (U-AP) contains a number of subsequent measures and activities as regards to the first 12 POPs and future activities regarding the new 10 POPs, included in the Stockholm Convention (Annex No. 1 of U–NIPPOPM). Concerning the 10 new POPs, detailed inventory of the industrial POPs chemicals is planned – PBDE and PFOS – in products, articles and EEE placed on the market and identification of their presence in the waste from WEEE and ELV.

For the fulfilment of the measures and activities laid down in the U-AP, a Timetable has been prepared by years for the period 2012–2020 (Annex No. 2 of the U-NIPPOPM), as well as allocation of the funding and the financing sources for the implementation of the plan (Annex No. 3 of the U-NIPPOPM).

The estimated expenses for the implementation of the U-NIPPOPM (in BGN) are indicatively allocated by years and are at the expense of the budgets of the responsible ministries for the respective years and the required funds for enhancing the laboratory infrastructure for testing and monitoring of the new POPs in certain targeted matrices and strengthening the administrative capacity will be provided after research of the needs for the development of the national laboratory infrastructure. Simultaneously, the possibilities for securing of external financing sources within the frameworks of the respective EU operational programmes or other donor programmes will be studied.

The expected costs for the implementation of all activities laid down in the U-NIPPOPM amount to BGN 14 364 000 for the period 2012 – 2020.

External financing through the Swiss programme for export and disposal of obsolete pesticides abroad, incl. the available POPs pesticides. The funds amount to approximately 24 million Swiss Francs. The funds for co-financing of the programme are secured by EMEPA through the state budget.

In order to secure a high level of protection of the environment and the human health and to prevent the harmful effect of the persistent organic pollutants, close cooperation and coordinated efforts are required by the bodies responsible for the implementation of the policies in the field of the environment, healthcare, power engineering, industry, agriculture, farming and transport. The establishment of a Standing Working Group on Synergy is planned to improve the coordination and cooperation in the application of the three conventions - the Stockholm, the Rotterdam and the Basel conventions, which in case of inclusion of new POPs will execute the functions and the role of a coordinating body for the implementation of the plan.

4.6. Expected Results

The expected results from the implementation of the U-NIPPOPM and the performance of the measures and the activities laid down in the U-AP are:

1. Harmonized legislation with the European law on the POPs management.
2. Identification of new POPs in products and articles through inventory.
3. Environmentally sound disposal abroad of POPs waste identified in the country .
4. Control of the placing on the market and the use of plant protection products and biocides.
5. Enhancement of the laboratory infrastructure and the administrative capacity for testing and monitoring of the new POPs in the targeted matrices.
6. Enhancement of the laboratory infrastructure for testing the new POPs pesticides.
7. Reduction and/or prevention of the total POPs emissions from unintentional production.
8. Annual monitoring of POPs in the elements of the environment, in raw materials and food of plant and animal origin and feed.
9. Information of the community on the effects of the new POPs on the human health and the environment.
10. Prevention the placing on the market of new dangerous chemical substances, exhibiting POPs properties.

ANNEX NO. 1

UPDATED ACTION PLAN ON THE PERSISTENT ORGANIC POLLUTANTS

STRATEGIC OBJECTIVE: Reduction of the risk for the human health and the environment from the harmful effect of POPs

No.	MEASURE/ACTIVITY	Responsible institutions		Deadline for completion	Estimated costs, BGN		Priority	Expected results
		Leading	Assisting		Value in BGN	Source of Financing		
1.	**HARMONIZATION OF THE REGULATORY FRAMEWORK AND STRENGTHENING THE LABORATORY INFRASTRUCTURE AND THE ADMINISTRATIVE CAPACITY FOR THE MANAGEMENT OF POPs**							
1.1.	Harmonization of the legislation with the European law on the management of POPs							
1.1.1	Transposition of Directive 2011/65/EC of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) (RoHS-2).	MoEW		2013	-	MoEW	High	Ensure conformity with the restriction of the use of certain POPs in EEE during the design and production of EEE in view of the protection of human health and the environment and environmentally sound recovery and disposal of waste from EEE
1.1.2	Introduction in the national legislation of measures for the application of Regulation (EC) No. 1107/2009 concerning the placing on the market of plant protection products and transposition of Directive 2009/128/EC establishing a framework for Community action to achieve the sustainable use of pesticides.	MoAF, BSFA	MoEET MoEW MoH	2012	-	MoAF	High	Ensure harmonized approach and criteria for assessment and control of the risks for the human health and the environment from the use of pesticides and updating the list of active substances, incl. POPs which are banned for production, placing on the market or use.
1.1.3	Introduction in the national legislation of measures for the application of the new European Regulation (EU) No. 528/2012 concerning the making available on the market and use of biocidal products.	MoH	MoEW MoEET	2013 – 2014	-	MoH MoEW	High	Ensure harmonized approach and criteria for assessment and control of the risk for the human health and the environment from the use of biocides and updating the list of active substances, incl. POPs which are banned for production, placing on the market or use.
1.1.4.	Updating of the national legislation with respect to the	MoEW	SAMTS	2013 – 2015	-	MoEW	High	Ensure conformity with the

No.	Measure/Activity	Responsible institutions		Deadline for completion	Estimated costs, BGN		Priority	Expected results
		Leading	Assisting		Value in BGN	Source of Financing		
	surveillance of the market of articles and EEE containing POPs.		Commission for Consumer Protection			MoEET		restrictions for placing on the market and use of certain POPs in articles and EEE and effective market surveillance
1.1.5.	Introduction in the national legislation of measures for the application of Regulation (EC) No. 850/2004 on POPs, upon inclusion of new POPs in the Appendices of the Regulation and the Stockholm Convention and updating the accompanying specific national legislation in the field of water management, soils preservation, prevention of the ambient air pollution, assuring the safety of food and waste management with respect to POPs, incl. the new POPs.	MoEW		Ongoing	-	MoEW	High	Ensure conformity with the restriction for production, placing on the market and use of new POPs upon their inclusion in the Appendices of Regulation (EC) No. 850/2004 and the Stockholm Convention
1.2. Enhancement of the laboratory infrastructure for testing and monitoring of POPs								
1.2.1.	Provision of new specialized and auxiliary laboratory equipment for testing and monitoring of the new POPs in elements of the environment (soils in agricultural land and in the vicinity of warehouses for obsolete pesticides, underground and surface water) and in waste in the laboratory complex at EEA.	EEA MoEW		2014 – 2016	1 500 000	MoEW	High	Creation of opportunities for monitoring and control of POPs in the elements of the environment, in articles and waste and application of the POPs specific legislation
1.2.2	Development, validation and verification of new methods for testing of new POPs in the elements of the environment, and in waste, purchasing of reference materials and accreditation of laboratories.	EEA MoEW	MoEW	2014 – 2019	300 000	MoEW	High	Creation of opportunities for monitoring and control of POPs in the elements of the environment, and in waste and application of the POPs specific legislation
1.2.3	Provision of new specialized and auxiliary laboratory equipment for testing and monitoring of the new POPs pesticides in raw materials, products and food of plant and animal origin in the laboratories at BSFA.	CLChTC and CLVCE BSFA MoAF		2014 – 2016	2 950 000	MoAF	High	Creation of opportunities for monitoring and control of POPs in raw materials, products and food of plant and animal origin and in waste and application of the POPs specific legislation
1.2.4.	Development, validation and verification of new methods for testing of the new POPs pesticides in raw materials, products and food of plant and animal origin, purchasing of reference materials and accreditation of laboratories.	CLChTC and CLVCE BSFA MoAF		2014 – 2016	210 000	MoAF	High	Creation of opportunities for monitoring and control of the new POPs in raw materials, products and food of plant and animal origin, and in waste and application of the POPs specific legislation

No.	MEASURE/ACTIVITY	Responsible institutions		Deadline for completion	Estimated costs, BGN		Priority	Expected results
		Leading	Assisting		Value in BGN	Source of Financing		
1.2.5.	Provision of new specialized and auxiliary laboratory equipment and completing as set the available laboratory equipment for testing of the new POPs pesticides in drinking water, bathing water and bottled water intended for drinking in the laboratory complexes at 3 of the 28 RHI and NCPHA.	RHI NCPHA MoH		2014 - 2016	550 000	MoH	High	Creation of opportunities for monitoring and control of the new POPs pesticides in drinking water and bottled water and application of the POPs specific legislation and Directive 98/83/EC on the quality of water intended for human consumption..
1.2.6.	Development, validation and verification of reference methods for testing of the new POPs pesticides in drinking water and bottled water intended for drinking, purchasing of reference materials and standards, accreditation of laboratories.	MoH RHI NCPHA		2014 – 2016	30 000	MoH	High	Creation of opportunities for monitoring and control of the new POPs pesticides in drinking water and bottled water and application of the POPs specific legislation and Directive 98/83/EC on the quality of water intended for human consumption.
1.2.7.	Research regarding the needs for development and enhancement of the national laboratory infrastructure for monitoring and control of POPs in targeted matrices (elements of the environment, raw materials, products and food of plant and animal origin, articles and EEE, waste plastics in disassembly of WEEE and ELV) and strengthening of the administrative capacity in order to optimize the estimated costs for monitoring and control of new POPs and setting the actually required funding.	MoEW	EEA MoAF BSFA SAMTS MoEET	2013-2014	100 000	MoEW	High	Prioritization of the needs for testing new POPs in certain targeted matrices in order to monitor, control and optimize the estimated costs and fixing the actually required funding.
1.3	Strengthening the administrative capacity							
1.3.1	Training of the experts from the chromatographic laboratories of the laboratory complex at EEA on the introduction in the routine work of the developed new methods for testing the POPs in the elements of the environment and in waste, including training in leading European reference laboratories.	EEA		2014 - 2016	70 000	MoEW	High	Availability of expertise and experts for analytical control and monitoring.
1.3.2	Training of the experts from the chromatographic laboratories in BSFA (CLChTC and CLVCE) on the application of the new methods for testing of the new POPs pesticides in raw materials, products and food of plant and animal origin, including training in leading European reference laboratories.	CLChTC and CLVCE BSFA		2014 – 2016	40 000	MoAF	High	Availability of trained experts for analytical control and monitoring.

No.	MEASURE/ACTIVITY	Responsible institutions		Deadline for completion	Estimated costs, BGN		Priority	Expected results
		Leading	Assisting		Value in BGN	Source of Financing		
1.3.3.	Training of the experts from the chromatographic laboratories on the application of the new methods for testing of the new POPs pesticides in drinking water and bottled water, including training in leading European reference laboratories.	RHI NCPHA		2014 – 2016	20 000	MoH	High	Availability of trained experts for analytical control and monitoring.
2. **PREVENTION OF THE PLACING ON THE MARKET, THE USE AND THE EXPORT OF POPS THROUGH EXERCISING OF CONTROL**								
2.1	Plant Protection Products (PPP), incl. POPs pesticides							
2.1.1	Prevention control of the placing on the market and the use of Plant Protection Products, containing POPs through the application of the existing authorization procedures, pursuant to the Plant Protection Act and Regulation (EC) No. 1107/2009.	BSFA, MoAF	MoEW MoH	Ongoing	-	MoAF, BSFA	High	Prevention of the placing on the market and the use of POPs pesticides.
2.1.2	Control of POPs pesticides residues, incl. the new POPs in raw materials in primary production, products and food of plant and animal origin, which have already entered the distribution network, as well as such imported from third countries	BSFA, MoAF		Ongoing	-	MoAF, BSFA	High	Protection of the human health and the environment.
2.2.	Biocides							
2.2.1	Prevention control of the placing on the market and the use of biocides, containing POPs through the application of the existing authorization procedures, pursuant to Law of Protection from the Harmful Impact of the Chemical Substances and Mixtures and the Ordinance on the Authorization of Biocides.	MoH	MoEW	Ongoing	-	MoH	High	Prevention the placing on the market and the use of POPs in biocides.
2.2.2.	Exercising effective control on biocides placed on the market.	MoH, RHI		Ongoing	-	MoH	High	Protection of the human health and the environment.
2.3.	Industrial POPs							
2.3.1	Control over the placing on the market and the use of the new industrial POPs chemicals in mixtures and articles by company-producers and importers per documents.	RIEW MoEW		Ongoing	-	MoEW	High	Protection of the human health and the environment.
2.3.2	Control of the compliance of new EEE placed on the market with respect to contents of polybrominated diphenyl ethers (PBDE) in EEE per documents and/or through sample testing. Strengthening the administrative capacity.	SAMTS		Ongoing	1 571 000	MoEET SAMTS	High	Prevention of the placing on the market of EEE, containing POPs exceeding the MAC.

No.	Measure/Activity	Responsible institutions		Deadline for completion	Estimated costs, BGN		Priority	Expected results
		Leading	Assisting		Value in BGN	Source of Financing		
2.4	Control of POPs, subject to ban for export according to the PIC Regulation.	Customs Agency		Ongoing	-	MoEET Customs Agency	High	Prevention of the unregulated export of POPs
3. Reduction and/or prevention of total releases of POPs in emissions from unintentional production								
3.1.	Annual inventory of the sources of POPs emissions in the ambient air, distributed in 11 groups of source categories.	EEA NSI		Annually	-	MoEW, EEA NSI	Medium	Current data on POPs emissions.
3.2	Inclusion of conditions in the Integrated Permits of combustion installations, metallurgical installations, chemical installations and installations for production of cement clinker for prevention/restriction of POPs emissions incl. emission restrictions, based on the Best Available Techniques (BAT)	EEA	MoEW, RIEW	Ongoing	-	MoEW, EEA	High	Reduction of the POPs emissions.
4. Reduction of the releases from stockpiles and waste containing POPs								
4.1. Management and environmentally sound disposal abroad of waste containing POPs pesticides								
4.1.1	Annual inventory of the old warehouses for obsolete pesticides, incl. identification of possible presence of POPs pesticides	EEA	BSFA RFSD's RIEW GD FSGP	2012 – 2020	-	MoEW, EEA, RIEW MoAF, BSFA, RFSD's GD FSGP	Medium	Receipt of current data concerning the presence of POPs pesticides.
4.1.2	Collection, repackaging and export for disposal of obsolete pesticides from state and municipal warehouses and restoration of the areas cleared of the liquidated warehouses, incl. 161t of POPs pesticides (DDT, lindane, heptachlorine), within the framework of the Swiss Programme for export and disposal of obsolete pesticides.	EMEPA	MoEW RIEW EEA Municipalities	2015 – 2019	-	Swiss Programme	High	Disposed of obsolete pesticides, incl. POPs pesticides.
4.1.3	Collection, repackaging and export for disposal abroad of proven POPs pesticides, stored in cooperative and private warehouses.	Cooperatives, Private Companies		2015 – 2020	-	Private Financing	Medium	Disposed of obsolete POPs pesticides.
4.2.	Management and environmentally sound disposal abroad of waste, containing industrial POPs							
4.2.1.	Book inventory of the new industrial POPs chemicals in products and articles.	PAD	WMSPD	2013 – 2014	-	MoEW	Medium	Preliminary assessment of the presence of POPs in

No.	MEASURE/ACTIVITY	Responsible institutions		Deadline for completion	Estimated costs, BGN		Priority	Expected results
		Leading	Assisting		Value in BGN	Source of Financing		
		RIEW	MoEW					products and articles.
4.2.2.	Book inventory for identification of the formed hazardous waste, potentially containing PBDE and PFOS, in disassembly of WEEE and ELV.	MoEW	SWGS WMSPD, PAD	2013 – 2015	-	MoEW	Medium	Current assessment of the presence of POPs in WEEE and ELV.
4.2.3.	Updating or the electronic data base of the equipment (transformers and capacitors, containing PCB).	MoEW RIEW	WMSPD PAD	2012	-	MoEW	Low	Updating the data base of PCB equipment and identification of residual quantities of POPs
4.2.4.	Exercising of control under the environmentally sound disposal of hazardous waste, proved to contain PBDE and PFOS, upon disassembly of WEEE and ELV.	RIEW	MoEW PAD WMSPD EEA	2015 – 2020	-	MoEW	Medium	Protection of the human health and the environment.
4.2.5	Final disposal abroad of the available equipment, containing PCB.	WMSPD MoEW		2012 – 2013	-	Owners of PCB equipment	High	Final disposal of the inventoried PCB equipment by the owners of the equipment.
5	**PROVISION OF METHODOLOGICAL SUPPORT**							
5.1.	Adapting of guidelines for less dangerous alternatives for fire retardants as substitutes of commercial mixtures of PBDE and PFOS, based on the developed instructions of the Stockholm and the Basel Conventions.	MoEW PAD SWGS		Ongoing	-	MoEW	Medium	Promotion of the use of less dangerous substitutes
5.2.	Development of instructions/guidelines for the application of the legislation in the field of POPs management, according to the guidelines for coordination and cooperation in the implementation of the activities for the application of the international agreements in the field of chemicals and waste.	MoEW PAD	SWGS	Ongoing	-	MoEW	Medium	Strengthening the capacity of the inspection bodies and the industry in the application of the POPs management requirements.
6	**MONITORING OF POPS**							
6.1. Monitoring of POPs in the elements of the environment								
6.1.1.	Monitoring of POPs pesticides, incl. new POPs pesticides and PCB in soils from agricultural land and in soils in the vicinity of warehouses for obsolete pesticides.	EEA, accredited RL		2012 – 2020	860 000	MoEW EEA	High	Effective monitoring of POPs in soils in order to formulate subsequent measures.
6.1.2	Monitoring of POPs, incl. new POPs in surface water.	EEA, Accredited RL		2012 – 2020	1 135 000	MoEW EEA	High	Effective monitoring of POPs in surface water in order to formulate subsequent measures.
6.1.3	Monitoring of POPs, incl. new POPs in ground water.	EEA,		2012 – 2020	258 000	MoEW	High	Effective monitoring of

No.	Measure/Activity	Responsible institutions		Deadline for completion	Estimated costs, BGN		Priority	Expected results
		Leading	Assisting		Value in BGN	Source of Financing		
		Accredited RL				EEA		POPs in ground water in order to formulate subsequent measures.
6.1.4.	Identification of locations and industrial sites polluted with POPs (pesticides and industrial POPs).	EEA, Accredited RL		2013 – 2020	700 000	MoEW, EEA	High	Identification of polluted sites and formulation of subsequent measures.
6.1.5.	Monitoring of POPs pesticides, including the new POPs pesticides in drinking water and bottled water intended for drinking.	RHI and NCPHA		2013 – 2020	1 230 000	MoH, NCPHA and RHI	High	Effective monitoring of POPs in drinking water and bottled water in order to formulate subsequent measures.
6.2.	Monitoring of POPs in food							
6.2.1.	Monitoring of POPs pesticides residues, incl. new POPs pesticides in raw materials and products of plant origin during harvesting.	BSFA, CLChTC		2013 – 2020	608 000	MoAF BSFA CLChTC	High	Effective monitoring of POPs pesticides and formulation of subsequent measures.
6.2.2.	Monitoring of POPs pesticides residues, incl. new POPs pesticides and PCB in live animals, raw materials and food of animal origin during primary production.	BSFA, CLVCE		2013 – 2020	800 000	MoAF BSFA, CLVCE	High	Effective monitoring of POPs pesticides and PCB and formulation of subsequent measures.
6.2.3.	Monitoring of POPs pesticides residues, incl. new POPs pesticides in food, which have already entered the distribution network.	BSFA, CLChTC, CLVCE		2013 – 2020	1 408 000	MoAF BSFA CLChTC CLVCE	High	Effective monitoring of POPs pesticides and formulation of subsequent measures.
7	**Information, awareness and education of the public and training of the state administration and the industry**							
7.1. Provision of current reference data on POPs								
7.1.1	Maintenance of a current electronic register of warehouses and keeping unsuitable pesticides there	EEA		Ongoing	-	MoEW EEA	Medium	Current register of the unsuitable pesticides.
7.1.2	Maintenance of current reference data on EEE placed on the market and WEEE collected	EEA		Ongoing	-	MoEW EEA	Medium	Current reference data.
7.1.3	Maintenance of current reference data on motor vehicles place on the market and ELV collected	EEA		Ongoing	-	MoEW EEA	Medium	Current reference data.
7.2. Information, awareness and education of the public on POPs								
7.2.1	Maintenance of current information on POPs on the Internet site of MoEW (legislation, guidance, information materials etc.), incl. U-NIPPOPM.	PAD MoEW		Ongoing	-	MoEW	High	Current Internet site.

No.	MEASURE/ACTIVITY	Responsible institutions		Deadline for completion	Estimated costs, BGN		Priority	Expected results
		Leading	Assisting		Value in BGN	Source of Financing		
7.2.2	Securing public access to popular brochures and information materials concerning the properties, characteristics and impact on the environment and the human health of the new POPs, included in Regulation (EC) 850/2004.	MoEW	NCPHA BSFA	Ongoing	-	MoEW	Medium	Information of the public.
7.2.3	Holding of information seminars and round tables by ecological NGOs on the impact of the new POPs on human health and the environment (projects financed by international donor programmes on dangerous chemicals management).	NGOs	MoEW	Ongoing	-	International donor programmes and funds	Medium	Raising the awareness and knowledge of the population.
7.2.4	Translation of the updated NIPPOPM into English language	MoEW		2012 – 2013	6000	MoEW	Medium	Information of the population.
7.2.5	Printing of the updated NIPPOPM in Bulgarian and English language	MoEW		2013	12000	MoEW	Medium	Information of the population.
7.3.	Training of the inspection bodies and the industry							
7.3.1.	Training of the RIEW experts and the experts of other interested institutions taking part in the management of POPs on the implementation of the future measures and activities laid down in the U-NIPPOPM.	MoEW, PAD		2012 – 2013	6000	MoEW	Medium	Getting acquainted with U-NIPPOPM and the measures for implementation.
7.3.2.	Getting the industry acquainted with the measures laid down in the U-NIPPOPM.	MoEW, PAD		2013 -2014	-	MoEW	Medium	Getting acquainted with U-NIPPOPM.
8	**SYNERGY BETWEEN THE STOCKHOLM, BASEL AND ROTTERDAM CONVENTIONS**							
8.1 Improvement of the coordination and cooperation on the application of the Stockholm, Basel and Rotterdam Conventions								
8.1.1	Establishment and functioning of a Standing Interdepartmental Working Group on Synergy (SWGS) to the Minister of Environment and Water for coordination and joint application of the three conventions on the management of dangerous chemicals and waste on national level, the Protocol on POPs to the Convention on Long Range Transboundary Air Pollution (CLRTAP) and the Montreal Protocol on substances that deplete the ozone layer	MoEW PAD APD WMSPD	EEA MoAF and other interested government institutions	2012 – 2020	-	MoEW	High	Good coordination and cooperation between the competent bodies for the application of the legislation on dangerous chemicals and waste, incl. POPs.
8.1.2.	Ongoing coordination and effective application of the three conventions (Stockholm, Rotterdam and Basel) on the management of dangerous chemicals and waste on a national level, as well as the Protocol on POPs to the Convention on Long Range Transboundary Air Pollution (CLRTAP) and the Montreal Protocol on	MoEW PAD APD WMSPD	EEA MoAF (BSFA), MoH (NCPHA and RHI) and other interested government	2012 – 2020	-	MoEW	High	Good coordination and cooperation and effective application of the international, European and national legislation on the management of dangerous

No.	MEASURE/ACTIVITY	Responsible institutions		Deadline for completion	Estimated costs, BGN		Priority	Expected results
		Leading	Assisting		Value in BGN	Source of Financing		
	substances that deplete the ozone layer, Regulation (EC) 850/2004 and the specific European and national legislation in the field of water management, soil preservation, prevention of the pollution of the ambient air, securing the safety of food and waste management with respect to POPs, incl. the new POPs.		institutions					chemicals and waste, as well as the accompanying specific legislation in the field of water management, soils preservation, prevention of the pollution of the ambient air, securing the safety of food and waste management with respect to POPs, incl. the new POPs.

ANNEX NO. 2

TIME-TABLE FOR THE IMPLEMENTATION OF THE UPDATED NIP FOR POPS, 2012 - 2020.

No.	Activities	2012	2013	2014	2015	2016	2017	2018	2019	2020
1	**Harmonization of the regulatory framework and strengthening of the laboratory infrastructure and the administrative capacity on POPs management**									
1.1.	Harmonization of the national legislation with the European law on POPs management, incl. the new POPs.	x	x	x	x	x	x	x	x	x
1.2.	Enhancement of the laboratory infrastructure for testing and monitoring of the new POPs in certain targeted matrices			x	x	x				
1.3.	Strengthening of the administrative capacity		x	x	x	x	x	x	x	
2	**Prevention of the placing on the market, the use and the export of POPs through exercising of control**									
2.1.	Plant protection products, PPP, incl. POPs pesticides	x	x	x	x	x	x	x	x	x
2.2.	Biocides	x	x	x	x	x	x	x	x	x
2.3.	Control of the placing on the market and the use of the new industrial POPs chemicals in mixtures and articles	x	x	x	x	x	x	x	x	x
3	**Reduction and/or prevention of the total releases of POPs in emissions during unintentional production**									
3.1.	Annual inventory of the sources of POPs emissions in the ambient air.	x	x	x	x	x	x	x	x	x
3.2	Inclusion of conditions in the Integrated Permits of combustion installations, metallurgical installations, chemical installations and installations for production of cement clinker for prevention/restriction of POPs emissions incl. emission restrictions, based on the Best Available Techniques (BAT)		x	x	x	x	x	x	x	x
4	**Reduction of the releases from stockpiles and waste containing POPs**									
4.1.	Management and environmentally sound disposal abroad of waste containing POPs pesticides									
4.1.1	Annual inventory of the old warehouses for obsolete pesticides, incl. identification of possible presence of POPs pesticides	x	x	x	x	x	x	x	x	x
4.1.2	Collection, repackaging and export for disposal of obsolete pesticides from state and municipal warehouses and restoration of the areas cleared of the liquidated warehouses, incl. 161t of POPs pesticides (DDT, lindane, heptachlorine), within the framework of the Swiss Programme for export and disposal of obsolete pesticides.				x	x	x	x	x	

No.	Activities	2012	2013	2014	2015	2016	2017	2018	2019	2020
4.2.	Management and environmentally sound disposal abroad of waste, containing industrial POPs									
4.2.1.	Book inventory of the new industrial POPs chemicals in products and articles.		x	x						
4.2.2.	Book inventory for identification of the formed hazardous waste, potentially containing PBDE and PFOS, in disassembly of WEEE and ELV.		x	x	x					
4.2.3.	Updating or the electronic data base of the equipment (transformers and capacitors, containing PCB).	x								
4.2.4.	Exercising of control under the environmentally sound disposal of hazardous waste, proved to contain PBDE and PFOS, upon disassembly of WEEE and ELV.				x	x	x	x	x	x
4.2.5	Final disposal abroad of the available equipment, containing PCB.	x	x							
5	**Provision of methodological support**									
5.1.	Adapting of guidelines for less dangerous alternatives for fire retardants as substitutes of commercial mixtures of PBDE and PFOS, based on the developed instructions of the Stockholm and the Basel Conventions.	x	x	x	x	x	x	x	x	x
5.2.	Development of instructions/guidelines for the application of the legislation in the field of POPs management, according to the guidelines for coordination and cooperation in the implementation of the activities for the application of the international agreements in the field of chemicals and waste.	x	x	x	x	x	x	x	x	x
6	**Monitoring of POPs**									
6.1.	Monitoring of POPs in the elements of the environment and in waste, incl. the new POPs.	x	x	x	x	x	x	x	x	x
6.2.	Monitoring of POPs in raw materials, products and food of plant and animal origin, incl. the new POPs.	x	x	x	x	x	x	x	x	x
6.3.	Monitoring of POPs pesticides in drinking and bottled water, incl. the new POPs.	x	x	x	x	x	x	x	x	x
7	**Information, awareness and education of the public and training of the state administration and the industry**									
7.1.	Provision of current reference data on POPs	x	x	x	x	x	x	x	x	x
7.2	Information, awareness and education of the public	x	x	x	x	x	x	x	x	x
7.3.	Training of the inspection bodies and the industry	x	x							

No.	Activities	2012	2013	2014	2015	2016	2017	2018	2019	2020
8	**Synergy between the Stockholm, Basel and Rotterdam Conventions**									
8.1.	Improvement of the coordination and cooperation on the application of the Stockholm, Basel and Rotterdam Conventions									
8.1.1.	Establishment and functioning of a Standing Interdepartmental Working Group on Synergy (SWGS) to the Minister of Environment and Water for coordination and joint application of the three conventions on the management of dangerous chemicals and waste on national level, the Protocol on POPs to the Convention on Long Range Transboundary Air Pollution (CLRTAP) and the Montreal Protocol on substances that deplete the ozone layer	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**
8.1.2.	Ongoing coordination and effective application of the three conventions (Stockholm, Rotterdam and Basel) on the management of dangerous chemicals and waste on a national level, as well as the Protocol on POPs to the Convention on Long Range Transboundary Air Pollution (CLRTAP) and the Montreal Protocol on substances that deplete the ozone layer, Regulation (EC) 850/2004 and the specific European and national legislation in the field of water management, soil preservation, prevention of the pollution of the ambient air, securing the safety of food and waste management with respect to POPs, incl. the new POPs.	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**

ANNEX NO. 3

FINANCIAL ESTIMATES OF THE COSTS REQUIRED FOR THE IMPLEMENTATION OF THE UPDATED ACTION PLAN ON POPs, 2012 – 2020

No.	Activities	Source of Financing/ Responsible institutions	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total Estimated Costs, BGN
1.2.1.	Provision of new specialized and auxiliary laboratory equipment for testing and monitoring of the new POPs in elements of the environment (soils in agricultural land and in the vicinity of warehouses for obsolete pesticides, underground and surface water) and in waste in the laboratory complex at EEA.	MoEW (EEA)			1 150 000	350 000						**1 500 000**
1.2.2.	Development, validation and verification of new methods for testing of new POPs in the elements of the environment, and in waste, purchasing of reference materials and accreditation of laboratories.	MoEW (EEA)			50 000	50 000	50 000	50000	50000	50000		**300 000**
1.2.3.	Provision of new specialized and auxiliary laboratory equipment for testing and monitoring of the new POPs pesticides in raw materials, products and food of plant and animal origin in the laboratories at BSFA.	MoAF (BSFA CLChTC CLVCE)			2 950 000							**2 950 000**
1.2.4.	Development, validation and verification of new methods for testing of the new POPs pesticides in raw materials, products and food of plant and animal origin, purchasing of reference materials and accreditation of laboratories at BSFA	MoAF (BSFA CLChTC CLVCE)			210 000							**210 000**
1.2.5.	Provision of new specialized and auxiliary laboratory equipment and completing as set the available laboratory equipment for testing of the new POPs pesticides in drinking water and bottled water intended for drinking in the laboratory complexes at 3 of the 28 RHI and NCPHA.	MoH (NCPHA RHI)			550 000							**550 000**
1.2.6.	Development, validation and verification of reference methods for testing of the new POPs pesticides in drinking water and bottled water, purchasing of reference materials and standards, accreditation of laboratories.	MoH (NCPHA RHI)				30 000						**30 000**

No.	Activities	Source of Financing/ Responsible institutions	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total Estimated Costs, BGN
1.2.7.	Research regarding the needs for development and enhancement of the national laboratory infrastructure for monitoring and control of POPs in targeted matrices (elements of the environment, raw materials, products and food of plant and animal origin, articles and EEE, waste plastics in disassembly of WEEE and ELV) and strengthening of the administrative capacity in order to optimize the estimated costs for monitoring and control of new POPs and setting the actually required funding.	MoEW		50 000	50 000							**100 000**
1.3.1.	Training of the experts from the chromatographic laboratories of the laboratory complex at EEA on the introduction in the routine work of the developed new methods for testing the POPs in the elements of the environment and in waste, including training in leading European reference laboratories.	MoEW (EEA)			25 000	25 000	20 000					**70 000**
1.3.2.	Training of the experts from the chromatographic laboratories in BSFA (CLChTC and CLVCE) on the application of the new methods for testing of the new POPs pesticides in raw materials, products and food of plant and animal origin, including training of the staff in leading European reference laboratories.	MoAF (BSFA CLChTC CLVCE)			40 000							**40 000**
1.3.3.	Training of the experts from the chromatographic laboratories on the application of the new methods for testing of the new POPs pesticides in drinking water and bottled water, including training in leading European reference laboratories.	MoH (NCPHA RHI)				20 000						**20 000**
2.3.2	Control of the compliance of new EEE placed on the market with respect to contents of polybrominated diphenyl ethers (PBDE) in EEE per documents and/or through sample testing. Strengthening the administrative capacity.	MoEET (SAMTS)	25 000	157 000	168 000	176 000	188 000	196 000	208 000	217 000	236 000	**1 571 000**
6.1.1.	Monitoring of POPs pesticides, incl. new POPs pesticides and PCB in soils from agricultural land and in soils in the vicinity of warehouses for obsolete pesticides.	MoEW (EEA)	85 000	90 000	95 000	95 000	95 000	100 000	100 000	100 000	100 000	**860 000**

No.	Activities	Source of Financing/ Responsible institutions	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total Estimated Costs, BGN
6.1.2.	Monitoring of POPs, incl. new POPs in surface water.	MoEW (EEA)	120 000	125 000	125 000	125 000	125 000	125 000	130 000	130 000	130 000	**1 135 000**
6.1.3.	Monitoring of POPs, incl. new POPs in ground water.	MoEW (EEA)	22 000	24 000	26 000	28 000	30 000	32 000	32 000	32 000	32 000	**258 000**
6.1.4.	Identification of locations and industrial sites polluted with POPs (pesticides and industrial POPs).	MoEW (EEA)		25 000	90 000	95 000	95 000	95 000	100 000	100 000	100 000	**700 000**
6.1.5.	Monitoring of POPs pesticides, including the new POPs pesticides in drinking water and bottled water intended for drinking.	MoH (NCPHA RHI)		60 000	180 000	300 000	210 000	210 000	90 000	90 000	90 000	**1 230 000**
6.2.1.	Monitoring of POPs pesticides residues, incl. new POPs pesticides in raw materials and products of plant origin during harvesting.	MoAF (BSFA CLChTC)		76 000	76 000	76 000	76 000	76 000	76 000	76 000	76 000	**608 000**
6.2.2.	Monitoring of POPs pesticides residues, incl. new POPs pesticides and PCB in raw materials and food of animal origin during primary production	MoAF (BSFA, CLVCE)		100 000	100 000	100 000	100 000	100 000	100 000	100 000	100 000	**800 000**
6.2.3.	Monitoring of POPs pesticides residues, incl. new POPs pesticides in food, which have already entered the distribution network.	MoAF (BSFA CLChTC CLVCE)		176 000	176 000	176 000	176 000	176 000	176 000	176 000	176 000	**1 408 000**
7.2.4.	Translation of the updated NIPPOPM into English language	MoEW	6 000									**6 000**
7.2.5.	Printing of the updated NIPPOPM in Bulgarian and English language	MoEW		12 000								**12 000**
7.3.1.	Training of the RIEW experts and the experts of other interested institutions taking part in the management of POPs on the implementation of the future measures and activities laid down in the U-NIPPOPM.	MoEW	6 000									**6 000**
	TOTAL		**264 000**	**895 000**	**6 061 000**	**1 646 000**	**1165 000**	**1160 000**	**1 062 000**	**1 071 000**	**1040 000**	**14 364 000**

Key

	Government Institution*	Necessary Funds, BGN	* Comment
	EEA at MoEW	4 823 000	The estimated costs for the implementation of U-NIPPOPM (in BGN) are indicatively allocated by years and are at the expense of the budgets of the responsible ministries for the respective years and the required funds for enhancing the laboratory infrastructure for testing and monitoring of the new POPs in certain targeted matrices and strengthening the administrative capacity will be provided after research of the needs for the development of the national laboratory infrastructure. Simultaneously, the possibilities for securing of external financing sources within the frameworks of the respective EU operational programmes or other donor programmes will be studied.
	BSFA, CLChTC, CLVCE at MoAF	6 016 000	
	MoEW	124 000	
	NCPHA and RHI, at MoH	1 830 000	
	SAMTS at MoEET	1 571 000	
	TOTAL	**14 364 000**	

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MINISTRY OF ENVIRONMENT AND WATER OF BULGARIA

“To preserve the natural resources of Bulgaria and secure healthy environment for the population”