Republic of Macedonia

Ministry of Environment and

Physical Planning – POPs Unit

National implementation plan for reduction and elimination of Persistent Organic Pollutants in the Republic of Macedonia – NIP Update

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National implementation plan for reduction and elimination of Persistent Organic Pollutants in the Republic of Macedonia – NIP Update

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ABBREVIATIONS

APCs – Air Pollution Control system

BAT- Best Avalable Techniques

BEP- Best Environnemental Practices

CAS RN- Registry number of chemicals

CRT – Cathode Ray Tubes

DDE - Dichlorodiphenyl Dichloroethylene

DDT - Dichlorodiphenyl Trichloroethane

EC- European Commission

EF – Emmision factor

EU – European Union

EEC - European Economic Committee

ELV – End of life vehicles

EAF – Electric Arc Furnace

EEO – Electrical and electronic equipment

GDP - Gross Domestic Product

GEF - Global Environment Facility

HCB - Hexachlorobenzene

HCH - Hexachloro Cyclohexane

HFO – Heavy Fuel Oil

ILO - International Labour Organization

IPPC - Integrated Prevention and Pollution Control

LE - Law on Environment

LEAP - Local Environmental Action Plan

LQAA - Law on Quality of Ambient Air

LWM - Law on Waste Management

MAFWE - Ministry of Agriculture, Forestry and Water Economy

MEPP - Ministry of Environment and Physical Planning

MH - Ministry of Health

MONET-CEEC - Monitoring Network for the Central and Eastern European Countries

NEAP- National Environment Action Plan

NGOs - Non-Governmental Organizations

NIP- National Implementation Plan

NPCU -National POPs Coordinating Unit

OCPs - Organochlorine pesticides

PM - Project Manager

PCB - Polychlorinated biphenyl

PBDE – Polybrominated diphenyl ethers

PFOS - Perfluorooctanesulfonic acid or perfluorooctane sulfonate

PCDD/PCDF-Polychlorinated dibenzo-p-dioxins and dibenzofurans

POPs- Persistent Organic Pollutants

PPPs - Plant Protection Products

PVC - Polyvinyl chloride

PeCB – pentachlorobenzene

RECETOX – Research Center for Toxic Compounds

TC - Technical Committee

TEQ -Toxic Equivalent

UN - United Nations

UNIDO -United Nations Industrial Development Organization

UNEP- United Nations Environment Programme

WEEE – Waste from electrical and electronic equipment

WHO - World Health Organization

µg - микрограми

g - grams

KJ - kilojoules

m^3 - cubic meters

mg - milligrams

MJ – mega joules

MTO - million tonnes of oil equivalent

MW – Mega Watts

NA - not applicable

ND - indefinite

ng - nanograms

Nm3 - normal cubic meters (standard temperature (0°C) and pressure (101.3 kPa))

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NON-TECHNICAL SUMMARY

1.1. INTRODUCTION

The Stockholm Convention is an international obligation to all Member states regarding regulation of Persistent organic pollutants (POPs) globally, taking into consideration their characteristics, use and the adverse effects to human health and the environment. The aim of the convention is through regulation - a total ban, restricted use, reduction and / or elimination of their production, use, import and export globally to help mitigate the negative impact of POPs chemicals on the environment. They remain unchanged in the environment, are easily distributed geographically, accumulate in the fatty tissue of humans and animals and exposure to very low doses of some compounds classified as POPs (which are among the most toxic substances ever synthesized) can cause cancer, damage to central and peripheral nervous system, diseases of the immune system, disorders of the reproductive system, disorders of the development of infants and children.

Exposure to these chemicals (Persistent Organic Pollutants (POPs)) may lead to serious health effects including specific types of cancer, congenital defects, and dysfunction of the immune and reproductive system, enormous sensitivity and predisposition for diseases and damaging of the central and peripheral nervous system.

Fast spreading and mobility of POPs chemicals in the world, represents a global problem that all Member states try to solve. The Stockholm Convention was adopted in Macedonia in 2001 and ratified in 2004. It obligates Member states to propose and implement measures to reduce and eliminate quantities of POPs chemicals that are deposited in the environment.

At its Fourth Conference of member states in May 2009, the Convention renewed the initial list of 12 chemicals with 9 new one with Decision SC-2/7, as follows: alpha hexachlorocyclohexane; beta hexachlorocyclohexane; chlordecone; hexabrombiphenyl; hexabromdiphenyl ether and heptabromdiphenyl ether; perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride; and tetrabromdiphenyl ether and pentabromdiphenyl ether.

At the Fifth Conference of the Parties in April 2011, Decision SC-5/3 was adopted adding technical endosulfane and its isomers to the list of the previous 21 substances.

The following table shows the old and new POPs within the Stockholm Convention

POPs Groups	Old 12 POPs	New 10 POPs
POPs Pesticides	Aldrin, DDT, Endrin, Dieldrin, Chlordane, Mirex, Toxafene, Heptachlor, Hexachlorobenzene	Lindane, Chlordecon, Pentachlorobenzene, α-HCH, β HCH δ HCH, Endosulfane
Industrial POPs	PCBs	PFOS, PBDE (hexabromobiphenyl, hexabromodiphenyl ether and heptabromodiphenyl ether, Tetrabromodiphenyl ether и Pentabromodiphenyl ether)
Unintentional POPs	PCDDs, PCDFs, PCBs, HCBs	α-HCH, β HCH, δ HCH, PeCB Pentachlorobenzene

The new POPs chemicals are now part of the Annexes to the Convention, including pesticides, industrial chemicals (including flame retardants) and unintentionally produced (generated) chemicals. Most of them are in Annex A requiring of the member states to eliminate the production and use of said substances (except in cases where specific exemption was requested): alpha hexachlorocyclohexane; beta hexachlorocyclohexane; chlordecone; hexabrombiphenyl; hexabromdiphenyl ether and heptabromdiphenyl ether; perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride; and tetrabromdiphenyl ether and pentabromdiphenyl ether.

One of the new substances (Lindane) was added to Annex B, and its production and use is permitted only for specific "acceptable purposes" in accordance with the specific exemptions.

In order to ensure the protection and improvement of the environment and ensure a healthy and long lasting quality of life of its citizens, R. Macedonia is involved in solving the global problem of POPs chemicals.

The Stockholm Convention was ratified by Republic of Macedonia in 2004, and Macedonia along with 156 countries worldwide contributed to reduction and elimination of the adverse effects of POPs chemicals.

POPs Unit of the Ministry of Environment and Physical Planning was established in May 2002, one year after the signing of the Stockholm Convention (May 2001) when in fact the Republic of Macedonia acquired the right to use funding from the Global Environment Facility (GEF), as temporary financial mechanism of the Convention.

According to the Convention, in 2005 Republic of Macedonia prepared the first POPs inventory with quantities of chemicals derived from different sectors to contribute to the global actions to reduce and eliminate the 12 initial POPs chemicals and measures were proposed to overcome the challenges in prevention and reduction of adverse effects of POPs chemicals to human beings and environment.

The National Implementation Plan on Reduction and Elimination of POPs was adopted at the Ninth Session of the Government of Republic of Macedonia on 24.01.2005. Pursuant to this Decision, the Government of Republic of Macedonia designated the Ministry of Environment and Physical Planning, through its POPs Unit, as coordinator of the activities for implementation of the actions of the National Implementation Plan for Reduction and Elimination of POPs.

The document includes specific projects for identification, management, control, reduction, and elimination of these hazardous chemicals. On one hand, their implementation means tackling the obligations from the Stockholm Convention, and on the other hand, it means cleaner environment for the future generations.

Since 2005 until now carried much of the planned measures to eliminate, reduce and reduce of POPs chemicals, the processes or processes that use them are already implemented.

In the period 2012-2013, the Republic of Macedonia acceded to update the National Implementation Plan for POPs chemicals for already implemented activities and preliminary identification of 9 new POPs chemicals. The main findings of the research conducted to update the document are presented in the following text.

1.2. NEW INDUSTRIAL POPS CHEMICALS

The following 5 chemicals have been identified by the Stockholm Convention as new industrial POPs chemicals with:

- Tetrabromodiphenyl ether and pentabromodiphenyl ether (commercial pentabromo-diphenyl ether),
- Pentachlorobenzene (PeCB),
- Hexabromodiphenyl ether and heptabromodiphenyl ether (commercial octabromodiphenyl ether),
- Hexabromobiphenyl,
- Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOS-F)

These chemical are among the most toxic substances ever created – can lead to cancer, damage to the central and peripheral nervous systems, diseases of the immune system, reproductive disorders, and interference with normal infant and child development. But this doesn't mean that these products are dangerous for everyday use. Their improper management during the entire life cycle of the product especially wastes management can lead to POPs emissions and accumulation of the chemicals in human body, animals and the environment.

The main focus of the NIP regarding the new industrial POPs was identification and assessment of POP-PBDEs and PFOS chemicals groups.

1.2.1. BACKGROUND INFORMATION ON PBDES (C-PENTABDE, C-OCTABDE)

Polybromodiphenyl ethers (PBDEs) are a group of brominated industrial chemicals which have been widely used since 1970s as flame retardants in the form of additives in consumer articles such as plastics in electronics, upholstery in transport and furniture or textiles.

Largest quantities of PBDEs production was in period 1970-2005 (1.3-1.5 Mt). Production stopped in EU in 1997 and in USA in 2004.

An approximate distribution of global c-PentaBDE use of 36% in transport, 60% in furniture and a 4% residual in other articles is considered to be reasonable.

It is considered that the largest use of c-PentaBDE (90-95%) was for the treatment of polyurethane foam (PUR). These foams were mainly used for the production of automotive and upholstery applications. The automotive industry has also indicated that 4% would be the most realistic figure for concentration of PentaBDE in PUR foam used in cars in agreement with information from industry. The 'other' minor uses included e.g. textiles, printed circuit boards, insulation foam, cable sheets, conveyer belts, lacquers and drilling oils.

The main historic use of c-OctaBDE was in Acrylonitrilebutadiene-styrene (ABS) polymers, e.g. 95% of c-OctaBDE supplied in the EU was used in ABS. The ABS in turn was mainly used for housings/casings of Electrical and Electronic Equipment (EEE), particularly in Cathode Ray Tube (CRT) housings and office equipment such as copying machines and business printers, typically office equipment and business machines. Other minor uses were High Impact Polystyrene (HIPS), polybutylene terephthalate (PBT), Polyamide Polymers also mainly used in electronics and to some extent in the transport sector.

The main focus of the NIP regarding the new industrial POPs was identification and assessment of POP-PBDEs and PFOS chemicals groups.

Related to POP -PBDEs the main applications that were analyzed are:

a) Electrical and electronic equipment and WEEE and

b) Transport sector

The expert's team has identified the sources, on stock quantities in households and public institutions and business sector using CRT TV and PC monitors and waste from EEE produced before 2004 since they hold the main concentration of these chemicals in the sector for Electrical and electronic equipment.

In the transport sector these chemicals were used in production until 2004 so the relevant data for identifying quantities imported, on stock and in the waste stream were considered all cars, busses and trucks, their country of origin, their year of production and registration in Macedonia, whether they are still in use or have entered the waste stream as end of life vehicles.

1.2.2. BACKGROUND INFORMATION ON PFOS

Perfluorooctane sulphonate (PFOS), its salts, and perfluorooctane sulfonyl fluoride (PFOSF) were listed in Annex A and B in the Stockholm Convention, with an obligation to the Parties of the Convention to develop an action plan for PFOS and its related substances.

Perfluorooctane sulfonate (PFOS) is a fully fluorinated anion, which is commonly used as a salt in some applications or incorporated into larger polymers.

PFOS related substances have been manufactured for more than 50 years. Their unique physical properties, being both fat and water repelling, have made them popular in several of products. They are typically used for surface treatment, and are common in non-stick products, stain-resistant fabrics and all- weather clothing. Due to its surface-active properties, it has historically been used in a wide variety of applications, typically including fire fighting foams and surface resistance/repellence to oil, water, grease or soil.

The scope of the POP- PFOS inventory was to identify the presence and use of PFOS chemicals in the industrial sector and products we use every day in the Republic of Macedonia. The aim was to prioritize industrial sectors and applications in Macedonia to obtain preliminary and possibly detailed quantities on stock, in use and in the waste stream following the "life cycle" of the chemicals, to identify potential contaminated hot spots in Macedonia, to determine whether there are PFOS present in our country.

1.2.3. PBDES INVENTORY

The initial Inventory of c-OctaBDE and related POP-PBDE (hepta-BDE, hexa-BDE and octaBDE homologues) was done based on the comparison with other countries, countries in development, utilizing the inventory guidance of the new industrial chemicals and based on the assumptions of the expert's observation. The main input data for initial calculation of the POP-BDEs from EEE and WEEE based on per capita amount of CRTs are: a) number of citizens in R. of Macedonia, b) average weight of CRT monitor, c) average content of polymer in CRT monitor, d) average content of c-OctaBDE that was added in the polymer to improve the polymer's characteristics and e) number of CRT monitors in use by households, public administration, business sector, hotels and other public institutions. The waste

of electrical and electronic equipment was not taken into account as there was no information during this phase of the project.

The aim of the inventory is to calculate the concentrations of c-OctaBDE in CRT monitors and TV monitors with cathode ray tubes, many important data are part of the polymers (in% by weight of these categories within EEE). These analyzes were made by the expert team through calculations of relevant available data and assumptions about the current situation in which there was no specific figures.

Parallel to the calculations, thematic questionnaires were prepared and were distributed to the appropriate data sources.

The analysis of the received answers from 13 EEE Importers and 1 Company dealing with WEEE, show that no second hand TV units and PCs were imported in the period 2007-2012 and no second hand in the imported units in the period 2002-2007. The valuable information was taken from their answers related to the lifetime of the CRT monitor (PC) – 5 years and for CRT monitors (TV) – 6 years. Unfortunately, no data were presented by the WEEE collectors and exporters related to the collected WEEE from TV and/or PCs units or the data on exported quantities.

Republic of Macedonia has no production of vehicles so all vehicles forming the transport sector in Macedonia comes from import of vehicles which increases every year. With these vehicles large part of c-PentaBDE used within the transport sector with major use in flexible PUR foams (automotive seating; head rests; car ceilings, acoustic management systems) and minor use in back-coating of textiles on car seat is entering the country and ends up like waste.

For simplification in calculation of the inventory the total c-PentaBDE amount is considered for PUR foam and textile. The use of c-OctaBDE in the plastic fraction (dashboard etc.) is not considered in this inventory since it's total use in transport sector is considered of minor importance compared to c-PentaBDE (in the PUR foam/textile fraction) and is excluded from the inventory for reasons of simplification.

POP-BDEs have been produced and used in the period from approximately 1975 to 2004. Therefore only vehicles produced in this period are inventoried for POP-BDEs considerations. In Macedonia the expert has estimated that the lifespan of e.g. cars is approximately 15-20 years, also a large amount of second-hand vehicles are being imported in Macedonia each year. Since these old vehicles at the end of their life cycle remain in Macedonia, it is assumed that large quantity of c-PentaBDE is stockpiled in Macedonia.

The experts were facing lack of relevant and reliable data related to the number of the vehicles according to the categories (cars, buses and trucks) in the Republic of Macedonia as well as data of new and old vehicles imported in the period relevant for the preparation of the inventory of c-PentaBDE s. Particular efforts were made to obtain the relevant information – a comprehensive database which will be of used in the initial stage as well as in the process of detailed inventory. The preliminary inventory contains the estimate of the c-pentaBDE in the transportation sector according to the categories and the total amount for the year of inventory.

Using the calculation methodology, the distribution of c-PentaBDE in transport sector in Macedonia is expected to be 87% in cars, 10% in busses and 3% in trucks.

With the aim to properly manage these chemicals, the full life cycle of vehicles especially cars needs to be monitored and noted, so when each vehicle is to enter the waste stream, the management of c-pentaBDE would be a lot easier.

All vehicles imported in Macedonia before 2004 contain PBDEs. The Ministry of internal affairs and Customs office provided the information that more than 85% per each year of all imported vehicles in Macedonia are old (second hand vehicles) and expert assumption is that 50% of this amount of vehicles are containing c-PentaBDE.

1.2.4. PFOS INVENTORY

In the update of the NIP, the expert team was focused on designing preliminary and if possible detailed inventory of POPs PFOS from manufacturers and importers of construction materials/building supplies, firefighting foams, paper and pulp, and galvanization and coated materials and products treated with PFOS substances in order to improve their characteristics and resistance to marks, dirt, moisture, erosion, etc.

In order to obtain relevant data for preliminary, and later a detailed analysis, on the amount of POPs PFOS substances on the territory of Republic of Macedonia, several questionnaires were designed for all major sectors, aimed towards manufacturers and importers of products relevant for each particular sector.

The Expert group has identified and prioritized the companies which might provide relevant data and might assist in providing a more realistic picture about the existence of POPs PBDEs and PFOS chemicals in Macedonia.

The leading expert and the Working Group discussed the obtained data and calculation results from the preliminary and detailed inventory conducted in the previous period. Within the Working Group, the expert and the members also discussed the challenges they faced for collecting the data, the lack of legal coverage of this type of chemicals in Macedonia, emission limit values, the lack of control of import of PBDE containing EEE equipment and vehicles, management of waste of electrical and electronic equipment (WEEE) and end-of-life vehicles(ELV) and came up with the following prior challenges which require developing control measures and taking actions defined in the Action Plan of this Document.

The team developed measures to overcome these challenges for the new industrial POPs chemicals and together with the other teams (Pesticides and unintentional POPs) and the synergy between the working groups they have developed an Action Plan. The proposed activities and measures to overcome these challenges on national level are presented in the Action Plan.

The full analysis of the situation with the new POPs industrial chemicals, quantities and manner of their current management is provided in Chapter 9.

1.3. INVENTORY OF PCB (POLYCHLORINATED BIPHENYL)

As regulated by the Law on Organization of the State Administration, a number of Government institutions are responsible for different aspects of Chemical management in Macedonia. The PCBs are a subject to the below mentioned structure. Mainly, the general aspect of PCBs management is responsibility of the Ministry of Environment and Physical Planning.

None of the laboratories in Macedonia have accredited methods for the analysis of PCBs.

Some laboratories do have equipment that could be used for PCBs analysis, but there is lack of skilled staff to undertake analysis.

There is no monitoring programme for PCBs whether in environmental media (water, soil and air); animals, food, feed, or of people.

Historically, PCBs have never been produced in the Republic of Macedonia. Most of the PCB electrical equipment (transformer, capacitors) were purchased from the former Yugoslav manufacturers (Minel-Serbia, Rade Koncar-Croatia and Iskra-Slovenia) until 1985. Also, the total amount of insulating oils is imported.

In the Republic of Macedonia, most of the equipment and the total amount of insulating oils are imported. Preliminary inventory was carried out based on the total amount of equipment in the country, the age and the type of equipment. Based on the field analyses there are indicators that approximately 45-50% of the equipment is contaminated or cross contaminated with PCBs. Further actions require identification, detailed analysis and inventory of the transformers oils quantities of liquid dielectric. It must be considered that stocks of PCB containing spare oils still exist. Their quantities should be determined during the implementation of the NIP.

The NIP PCB preliminary inventory was an excellent starting point for generation of a detailed database for PCB presence in the Republic of Macedonia.

It was obvious that only a complete inventory including visual checks and sampling of all electrical units and a strict analytical investigation can result in a comprehensive database about the actual PCB situation in Macedonia.

The procedure for PCB identification and inventory was describe comprehensively in the special toolkits (handbooks and manuals) produced in the period from 2004 – 2010. The toolkits also contain instruction for personal protection of the professionals directly exposed to PCBs.

In 2005, special software was developed in order to establish a contemporary and sophisticated database for PCBs in the country. From 2005 till today the inventory has been filled on daily basis.

The inventory shows that approximately 5-7% of the transformers are contaminated. Unintentional cross-contamination by transformer maintenance shops and manufacturers, oil regeneration facilities or during topping-up of the online transformers with unlabelled or used PCB transformer oils could be the reason for this high percentage. Furthermore, PCB contamination could have been caused by the use of cisterns or drums wherein PCBs had been stored earlier. The same applies to pumps, hoses and other equipment that were once used for PCBs.

During NIP preparation, there were no secure PCB storage locations identified in the country. Some utility companies stored decommissioned electrical equipment; however, such were not considered as meeting international standards for secure and safe storage of PCB equipment and materials.

In the framework of the post NIP activities, in order to treat and temporarily store the PCB-containing transformers and waste, within Rade Koncar – Servis a state-of-the-art facility that meets the highest safety standards was built and sophisticated technology was installed for treatment of PCB-contaminated transformers, which is in compliance with Best Available Techniques (BAT) and Best Environmental Practices (BEP) principles.

As a result of the construction of the temporary storage and the installation of the PCB treatment technology: a. the national capacities in PCB management are strengthened; b. the cycle of environmentally sound PCB management is completed, and as a result the negative effects caused by PCBs on human health and the environment are either eliminated or reduced; c. the owners of PCB-containing transformers are enabled to meet the requirements emerging from the legislation, as well as to avoid larger expenses in case of treatment abroad.

One hundred and sixty seven tons of PCB containing transformers and waste oils were treated by using the installed PCB chemical de-chlorination process.

In 2007, Republic of Macedonia took part in the Monitoring Network for the Central and Eastern European Countries (MONET-CEEC) project supported from the budget of the Central and Eastern European POPs Centre, RECETOX and national sources.

The main objective of this monitoring program is to evaluate whether the POPs actually were reduced or eliminated, which means that information on environmental levels of the chemicals categorized as POPs should enable detection of trends over time.

Macedonia is a country with slightly elevated PCB levels in the atmosphere. Lowest median PCB concentration was determined at Lazaropole mountain site (2 ng filter-1), while there were more than one order of magnitude higher in Skopje (28 ng filter-1). A characteristic seasonal trend can be clearly observed at most sites. PCB pattern is dominated by volatile PCB 28 and 52, although PCB 101 and 153 were also present at considerable levels. The soil level of PCBs was highest in Skopje (3.3 ng g-1) and lowest at Lazaropole mountain site (0.6 ng g-1). In soils, PCB 153 prevailed.

During the NIP preparation, low level of knowledge related to PCBs among different groups was detected. Progress in understanding the PCB issues has been attained through organization of awareness raising campaigns on health and environmental hazards posed by POPs/PCBs, and on regulatory requirements among different target groups (government institutions, i.e. policy makers and enforcement structure: custom, inspectorate, then companies managerial structure, i.e. decision makers, workers i.e. directly exposed groups, through the media and NGOs the general public, especially the vulnerable population).

Increased awareness and knowledge among different target groups will result in changing of the their attitude and behaviour towards the PCB issue, which at the end point will result in preventing, reducing and eliminating the introduction of PCB in the environment and consequently exposure.

The full inventory of PCB, analysis and management of the quantities of these chemicals is given in Chapter 10.

1.4. UNINTENTIONAL POPS (PCDDS, PCDFS)

This report presents the findings of the process of review and update of the existing PCDD/PCDF Inventory and the preliminary inventory of the national presence of new POPs (PCB, HCB, PeCB). The report refers to the period of 2005-2011 (review and update of the existing PCDD/PCDF inventory and preliminary works on PCB, HCB, PeCB, 2005-2011).

The activities for inventory review and update are part of the “Enabling activities to review and update the national implementation plan for the Stockholm convention on persistent organic pollutants (POPs) in Macedonia, GF/MCD/11/X01”, MOEPP and UNIDO project. This project is a continuation of the work on PCDD/PCDF inventarization performed within the project “Enabling activities to facilitate early action on the implementation of the Stockholm Convention on persistent organic pollutants

in the Republic of Macedonia"(April, 2002 – April, 2004) and Implementation and ratification of Protocol on Heavy Metals, Protocol on POPs and Gothenburg Protocol – First Phase.

The review and update of the initial PCDD/PCDF inventory was conducted under the directions and recommendations of *the Toolkit for Identification and Quantification of Releases of Dioxins, Furans, and Other Unintentional POPs*[1]*, UNEP, January 2013*. According to the methodology recommended in the UNEP Toolkit, the PCDD/PCDF inventory review and update was done in 9 main categories:

1. Waste Incineration
2. Ferrous and Non-Ferrous Metal Production
3. Power Generation and Heating
4. Mineral Products
5. Transport
6. Uncontrolled Combustion Processes
7. Production of Chemicals and Consumer Goods
8. Miscellaneous
9. Disposal/Landfill

The inventory review and update was done according to the scope of work determined in the Project ToR, i.e. WG assignment, which includes only desk analysis – gathering and analyzing information and data already available (national strategic documents, official statistic data etc.). In order to upgrade the process of review and update, additional data were provided by establishing contacts with the sources/installations by questionnaires. Questionnaires were sent to the Metal and Mineral sector with a return rate of more than 80%. In subcategories where the return rate was 100% the questionnaires were considered as data source, otherwise they were taken as indicative helping to form an expert judgment.

The process of data gathering and comparison (SSO and questionnaire data), some inconsistency was identified. Namely, in several cases the SSO reports showed less annual rates (quantities) then the one collected by the sources.

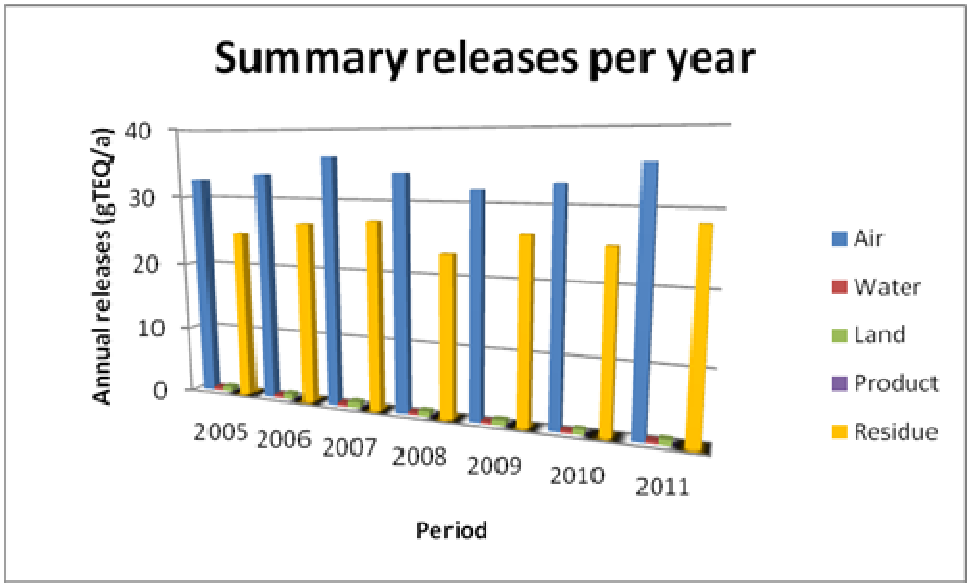
An inventory can provide valuable information on the magnitude of releases to each environmental medium and in products and residues. It can highlight sources for possible impacts but it cannot provide an accurate guide to the relative impact of these releases on human or ecosystem exposure since the fate of PCDD/PCDF varies considerably from one release source to another. The main purpose is to **identify** sources of unintentional POPs, characterize and quantify, **prioritize** them and undertake measures to prevent the formation and reduce or eliminate releases of unintentional POPs. Furthermore, measures taken to address PCDD/PCDF releases are equally suitable for other unintentional POPs.

The table 1 below gives an overall overview of the overall annual PCDD/PCDF emissions per potential release route (Air, Water, Land, Product and Residue) and total per year.

[1] The Toolkit was first published in 2003 by the Chemicals Branch of the United Nations Environment Programme's Division of Technology, Industry and Economics (UNEP Chemicals) and subsequently revised in 2005.

Table Summary table of annual emissions of dioxins and furans per release (TEQ)[2] route during the period of 2005-2011.

Year	Annual releases per route (g TEQ/a)					Total per year
	Air	Water	Land	Product	Residue	
2005	32.7	0.5	0.8	0	24.8	58.8
2006	33.6	0.4	0.8	0	26.6	61.4
2007	36.1	0.4	0.8	0	27.3	64.6
2008	34	0.4	0.8	0	23.1	58.3
2009	31.8	0.4	0.8	0	26.2	59.2
2010	32.9	0.4	0.8	0	25.1	59.2
2011	35.6	0.4	0.8	0	28.3	65.1



Summary of annual releases of PCDD/PCDF for period 2005-2011

A detailed inventory of unintentional POPs chemicals is given in chapter 11.

1.5. POPs-Pesticides

Almost the totality of the Gross Agricultural Output (70%) is generated by crop production, where vegetables are the main contributors. Tomatoes, peppers and melons dominate the vegetable production and make the Republic of Macedonia a net exporter of processed vegetables. Other important agricultural products are fruit, cereals, tobacco and grapes for wine production as well as for

[2] Toxic Equivalent

direct consumption. Livestock output has a lesser importance; dairy farming with cow milk production dominates this sub sector.

The agriculture sector plays an important role in the country's economy, its contribution to GDP accounts for nearly 10% and is relatively stable; together with food processing the percentage increases to 16%. Nearly half the population lives in rural areas. Officially, almost one fifth of the working force is employed in agriculture. Agriculture has always served as a shock absorber for the socio economic and structural changes in industry and other sectors of the economy. The agri-food processing industry has always played an important role in the Republic of Macedonia.

According to data from the Statistical Office of the European Union (EUROSTAT) for the period 2009 – 2011, the Republic of Macedonia was amongst the biggest exporters of vegetables to the EU (14th biggest in 2009; 12th biggest in 2010 and 10th biggest in 2011). During this period, the volume of imports of vegetables varied between 63 800 and 91 800 tonnes, mainly edible brassicas and tomatoes. Regarding the imports of fruit, in the same time period, the imported quantities varied between 32 900 and 53 000 tonnes, mainly pome fruit (apples, pears and quinces), table grapes, melons and watermelons.

Despite the fact that usage of the majority of organochlorine pesticides in the Republic of Macedonia has been forbidden since the seventies of the previous century, as well as in a vast number of countries in the world, its presence in unchanged form or in some metabolic forms in different matrixes, water, sediment or animal tissue should be considered as a serious problem for the environment as a whole, as indicated in the study on organochlorine pesticide residues in water, sediment and fish tissue in lake Ohrid (2011). The analyses undertaken during this study for detection of organochlorine pesticides in different matrixes (water, sediment and muscle tissue of barbell) collected in Lake Ohrid represent the first round of a systematic research taking place in our laboratory. They are a prerequisite with regards to a thorough and long-term study of the persistent organic pollutants in the region of Ohrid and are a solid starting point for indication of the risks associated with this group of compounds upon the entire living world. From the study results, a conclusion can be made that higher content of organochlorine pesticides was found in fish muscle tissue than in sediment samples as a result of the bioaccumulation and the lipophilic character of this group of pollutants.

During the preparation of the inventory report on POPs pesticides an indicative methodology has been applied (FAO Pesticide Disposal Series – Preparation of inventories). It was used mainly to identify POPs pesticide issues, how pesticides are being used, and pesticides life cycle in the environment and opportunities for prevention of further accumulations. This information enables prioritization for further surveys and establishment of action plans. The methodology applied does not provide detailed information in level required for undertaking field actions. It is based on desk research of existing information and focus group meetings. The existing information was researched in following forms:

- reports of surveys and inventories undertaken previously;
- reports of ministry officials (MoEPP and MAFWE)
- reports from manufacturers and importers; and
- customs import records.

The chemicals covered by this inventory include:

- Lindane (gamma-hexachlorocyclohexane), alpha-hexachlorocyclohexane and beta-hexachlorocyclohexane,
- Technical endosulfan and its isomers and
- Hlordekon.

Alternatives and recommended actions proposed in the inventory of POPs pesticides are:

1. POPs chemicals inventory data base – including organochlorine pesticides
2. Public awareness on POPs chemicals, application of alternative chemicals in agricultural production.
3. Implementation of Integrated Pest Management practices - The Code for Good Agricultural Practices (CGAP) as an important tool of the agri-environment policy in the EU was defined in 2011. The compliance with defined codes of GAP as a precondition for payments within AEM will be mandatory for the farmers. In this regard, Macedonian standards for farm management need to be enforced by thematic trainings so that farmers should apply them based on present knowledge of agriculture practises and technologies that are normally used in Macedonia and in respecting as a minimum requirement the national legislation concerned.
4. Decontamination of Lindane landfill site – According to the latest study, carried out in 2010, a great soil remediation effort is needed for all contaminants detected at the OHIS site (i.e. HCH isomers and Hg) at least for the superficial layer (0-1 m bgl), while limited groundwater remediation is needed for organic contaminants (i.e. HCH and CHC) to ensure residential use of the site and to reduce the risk related to irrigation. Lower remediation targets are required in case commercial destination is chosen for the OHIS site. In any case, the required abatement of the current concentrations will not be lower than three orders of magnitude, requiring very efficient remediation systems.

Therefore, due to the considerable amounts of waste/contaminated soils estimated and the stringent remediation targets, and in order to allow for future splitting of Project costs, a phased CD has been developed, considering different/subsequent steps to complete the site remediation. Furthermore, the use of a risk-based phased approach allows detailing, for each remediation step, possible applicable technologies, site use constraints based on residual risk for human receptors and remediation costs. In such way a clear picture of any possible solution and its possible consequences is made available for present site owners, potential site buyers and/or public Authorities and Planners.

The following phased remediation strategy is envisaged for the OHIS site:

Phase 1: Removal of primary contamination sources (i.e. HCH dumps and contaminated buildings) and on site/off site treatment;

Phase 2: Buildings demolition and on-site treatment of hazardous materials;

Phase 3: Removal of the superficial soil layer (from ground level to 1 m depth) from almost the whole OHIS site and soil remediation to reach safe residual levels for residential or commercial on site receptors;

Phase 4: Excavation and on site or in situ treatment of the deep soil sections exceeding the SSTLs calculated for residential or commercial scenario. In this case the intervention can be limited to the hot-spots only, and the lower abatement needs allow the use of in situ techniques or mobile systems; and

Phase 5: Installation of a hydraulic barrier and extraction and subsequent on-site treatment of contaminated groundwater (Pump and Treat system).

Chapter 12 presents the detailed analysis and inventory on POPs Pesticides.

1.6. SOCIO-ECONOMIC ANALYSIS

The purpose of the Analysis is to show the potential social impacts of the economic and other activities, as well as the management of persistent organic pollutants in all sectors of the society (including local communities and groups, the civil sector, the private sector, and the Government). The social impacts are comprised of the changes among the individuals or in the communities where the people lived, work, socialize with one another, organize in order to meet their needs and generally be members of the society. In this context, the social and economic impacts may include: vulnerability related to exposure to persistent organic pollutants; deterioration or improvement of the health; changes in life expenses; changes in the employment, revenues and protection at work; changes in the wealth distribution; opportunities for development of the enterprises; and changes in the demand for public services, such as health, education, and infrastructure (United Nations, 2007).

The focus of the Analysis is the impact of both groups of persistent organic pollutants in the Republic of Macedonia: unintentional persistent organic pollutants (dioxins and furans) and PBDE and PFOS persistent organic pollutants. The Analysis was conducted pursuant to the information provided by the three working groups within the Project and additionally from relevant international studies on the social and economic impact of the persistent organic pollutants, due to lack of respective investigations in the country.

1.6.1. SOCIO-ECONOMIC ASPECTS OF DIOXINS AND FURANS

The socio-economic impact of unintentional persistent organic pollutants in the Republic of Macedonia is as follows: deterioration of human health; reduction of the standard of living; reduction of revenues and protection at work; expenses for the enterprises and the public sector for prevention, management or inspection.

Dioxins and furans may be introduced in the human body by breathing polluted air, drinking contaminated water, or ingesting contaminated food. Generally, 90% of the exposure to dioxins and furans is a result of ingesting contaminated food, since the dioxins and furans enter the fatty tissues of the animals within the food chain (Agency for toxic substances and diseases, 2003).

From a point of view of enterprises or the public sector, the social and economic impact may include the following:

- loss or reduced human capital;
- expenses related to healthcare or social contributions;
- investments for introducing measure for prevention and control of emissions of persistent organic pollutants (decommissioning of non-compliant municipal landfills and commissioning of new regional landfills);
- increased fees for municipal waste management for the purpose of establishing a sustainable integrated waste management system;
- potentially increased costs for the operation of IPPC installations due to introduction of BAT/BEP measures (Best Available Techniques/Best Environmental Practice);
- expenses for strengthening the institutional capacities of competent bodies (at municipal and regional level).

There are no studies in Republic of Macedonia estimating the number of exposed population to emissions of unintentional persistent organic pollutants. Nevertheless, the fact that there are industrial capacities in the country, and 54 non-compliant municipal landfills scattered on the whole territory and releasing unintentional persistent organic pollutants attests to the seriousness of the problem.

1.6.2. SOCIO-ECONOMIC ASPECTS OF PBDE AND PFOS

The strongest socio-economic impact is caused by the import of old second-hand vehicles. The import of old vehicles increased significantly as of 2010. The problem is caused by vehicles manufactured until 2004, as the new industrial POPs chemicals were used up to that point. The average emission of new industrial POPs chemicals from a single vehicle generally differs from one country of origin to another.

There are no studies in Republic of Macedonia documenting the impact of PBDE and PFOS persistent organic pollutants on the human health, analysing the increased traffic risks or estimating the economic effects of reduced income of individual persons or companies due to import of old vehicles. One of the reasons thereof is the short period of observation. Nevertheless, the total quantity of PBDE persistent organic pollutants due to import and use of old vehicles is expected to increase in the upcoming period as these products become waste materials. Finally disposed at illegal landfills (near rivers, roads, on agricultural land), they represent a potential risks for pollution of underground waters, the soil, and the agricultural crops, thus having a direct impact on the human health. Additionally, the problem is compounded by the impact of the electrical and electronics equipment containing persistent organic pollutants.

The positive economic effects of the import of old vehicles are only enjoyed by the state, the companies that recycle them, and the importers of old vehicles. The state generates significant revenues for the budget from the import duties.

The implementation of these measures in this assessment will significantly reduce the negative social impact: improve human health, especially in the urban areas where the air pollution is highest, and of the persons mostly exposed to the processes for recycling of old vehicles and equipment; improve health and safety at work; and reduce the costs for sick leave, and absence from work. Additionally, it will mean creation of new jobs, opening of centres for waste treatment and processing, as well as increased revenues for the companies, manufacturing equipment for the centres for waste treatment and processing.

Chapter 13 gives an overview of the overall socio-economic analysis.

1.7. THE IMPORTANCE OF EMBEDDING GENDER IN NIP UPDATE PROJECT IN MACEDONIA

As part of the socio-economic assessment regarding the NIP Update in Macedonia, gender considerations are also embedded into the design and the implementation of the project. The sound management of persistent organic pollutants (POPs) is inextricably linked to economic and social development. In many occasions, the world's poorest people consistently face the highest risk of exposure to hazardous chemicals, due to their occupation, physical properties, living conditions, as well as lack of knowledge regarding safe handling practices etc (UNDP 2012). As it outlined in various studies conducted by the World Health Organization (WHO), the improper management of hazardous chemicals could be immediate and catastrophic, like for instance in case of oil spills, large releases of industrial chemicals and acute pesticide poisoning (UNDP 2011; WHO 2010). Furthermore, over a long

term, continuous exposure to toxic chemicals in water, food, air and soil could cause various health issues, including damage to the reproductive and the neurological systems.

It is important to note that numerous social and biological factors determine the level of exposure to toxic chemicals, as well as the resulting impacts on human health. Here, particular attention ought to be given to the connections between gender concerns and chemicals. Namely, women, men and children differ in their physiological susceptibility to the effects of exposure to toxic chemicals (UNDP 2011: 5). Furthermore, women are particularly influenced by the adverse impact of the hazardous chemicals due to the structure of their reproductive systems (Rosche 2006). Additionally, given that women have a generally higher proportion of body fat it is more likely environmental pollutants to be stored into their body tissues (UNDP 2011). Women are also particularly vulnerable to hazardous chemicals in certain periods of their life, such as pregnancy, lactation, menopause etc. Furthermore, fetuses, infants and children are especially vulnerable to the Persistent Organic Pollutants (POPs). As it is outlined in a study by the World Health Organization (WHO), exposure to POPs during early life stages may result in neurodevelopmetal and endocrine effects not only in utero and childhood, but also at later stages (WHO 2010). Additionally, children's intake of proportionally greater amounts of environmental chemicals via water, air and food (relative to body size) additionally strengthens the risks (UNDP 2011). Women's health concerns should be particularly taken into consideration when managing chemicals also because the maternal breast milk accumulates and harbors persistent organohalogens including POPs. Pollutants including hexachlorobenzene, dieldrin, heptachlor, chlordane and PCBs are commonly found in the breast milk of women (Solomon 2002 in WHO 2010). Furthermore, lipophilic POPs are transferred into human milk due to its high fat content. An infant breastfeeding for 6 months may receive as much as 14% of her or his cumulative lifetime exposure to dioxins and PCBs, and "this exposure may contribute significantly to the body burden when the infant attains adulthood and reproductive years" (Patandin 1999a in WHO 2010). Hence, the monitoring of breast milk is an important function in detecting exposure to toxic contaminant at early stages and gives an opportunity to take measures before adverse health impact appear (ibid).

Despite the biological factors that determine the susceptibility to the effects of exposure to toxic chemicals, factors connected to workplaces exposures and household responsibilities also influence the amount of chemical exposure. Thus, the level of chemical exposure is often determined by gender because women and men often perform different occupational tasks. The International Labour Organization (ILO) notes that hazardous chemicals kill about 438.000 workers annually and 10% of all skin cancers are estimated to be a result of workplace exposure to hazardous chemicals (ILO 2005 in UNDP 2011). Furthermore, due to their occupational activities, women are dominantly exposed to chemicals in the health care sector (nurses, pharmacy workers), and in the textile industry. It is important to note that making the project gender-sensitive also means being equally concerned with the needs of men. For instance, in agricultural communities in developing countries men may be more directly exposed to chemical pesticides during application, whereas women may be more exposed to chemicals during the processes of planting and harvesting. Furthermore, men may be at greater risk of exposure to toxic chemicals in artisanal gold mining operations, tannery operations and mechanical workshops (UNDP 2011:7).

Conclusively, women and men are exposed to different levels of toxic chemicals and have different biological features that determine the different susceptibility to the hazardous health effects of the chemicals. Hence, when creating policies and programs related to the sound management of

chemicals, gender implications have to be taken into consideration. Collecting epidemiological and sex-disaggregated data will serve as baseline information for the creation of programs and activities that will address the specific needs of both women and men.

The full analysis of gender involvement in the revised National Implementation Plan of the Republic of Macedonia is given in Chapter 14.

1.8. ACTION PLAN

Within the updating of the NIP document, members of the working groups and experts have identified key issues and challenges in the management of POPs chemicals in the Republic of Macedonia and defined actions and measures to overcome them. Action plan that spans the actions and measures proposed by all sectors was prepared. The Action Plan is an integral part of the document and is located in chapter 15.

Summary measures and activities necessary for the proper Management of POPs chemicals , processes that use them and the products that contain these types of chemicals are:

- Prevention of uncontrolled burning of waste in dumps;
- Raising awareness and capacity building of all stakeholders about the potential risk of product, processes and chemicals containing POPs on human health and the environment;
- Raising awareness and strengthening capacities to control the POPs emissions from the industry;
- Establishing a system for identification and detailed inventory of products obsolete, waste and contaminated sites containing POPs (PBDES, PFOS, pesticides, unintentional POPs);
- Establishment of control of import of old equipment and vehicles in relation to the content of chemicals POPs;
- Establishment and operation of collection centers, treatment and processing of end of life vehicles ELV;
- Establishment and functioning of appropriate collection point for undertaking WEEE
- Strengthening capacities of all stakeholders on the implementation of legal measures for managing with POPs chemicals;
- Cleanup and remediation of contaminated locations with POPs including their ultimate disposal;
- Implementing good agricultural practices to reduce emissions of unintentional POPs from agricultural activities;
- Establishment of a system for eco-bio monitoring;
- Establishment of national laboratory for monitoring and analysis of the POPs;
- Establishment of information system and submission of data on management with products containing pops and generated waste.

2. INTRODUCTION

2.1. STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS

The Stockholm Convention on persistent organic pollutants is a global treaty aimed at protecting the human health and the environment from chemicals that persist intact in the environment for long periods of time, become long-range transported, and bio accumulate in fatty human and animal tissues with adverse effects on the human health and the environment.

Exposure to these chemicals (Persistent Organic Pollutants (POPs)) may lead to serious health effects including specific types of cancer, congenital defects, and dysfunction of the immune and reproductive system, enormous sensitivity and predisposition for diseases and damaging of the central and peripheral nervous system.

Taking into account their capability for long-range transport, single country may not act individually at local level in order to protect its citizens and environment from POPs.

As a result of this global problem, the Stockholm Convention, which was adopted in 2001, and entered into force in 2004, on the ninetieth day following the signing of the fiftieth instrument for ratification, acceptance, approval or accession to the Convention requires of the member states to undertake measures for elimination or reduction of POPs emissions in the environment.

POPs Groups	Old 12 POPs	New 10 POPs
POPs Pesticides	Aldrin, DDT, Endrin, Dieldrin, Chlordane, Mirex, Toxafene, Heptachlor, Hexachlorobenzene	Lindane, Chlordecon, Pentachlorobenzene, α-HCH, β HCH, δ HCH, Endosulfane
Industrial POPs	PCBs	PFOS, PBDE (hexabromobiphenyl, hexabromodiphenyl ether and heptabromodiphenyl ether, Tetrabromodiphenyl ether и Pentabromodiphenyl ether)
Unintentional POPs	PCDDs, PCDFs, PCBs, HCBs	α-HCH, β HCH, δ HCH, PeCB (Pentachlorobenzene)

2.2. OBJECTIVES

Pursuant to Article 1, the purpose of the Stockholm Convention is to protect human health and the environment from persistent organic pollutants.

2.3. MAIN OBLIGATIONS

The countries signatories of the Stockholm Convention have an obligation to undertake measures for preventing production and use, import and export of intentionally produced POPs.

Special regulation is implemented for DDT, chemical on the list of POPs, since it is still used and needed in countries requiring malaria prevention.

By applying specific protective measure and under special conditions, the use of devices containing PCB is permitted until 2025, whereas all the equipment containing PCS must be disposed of not later than 2028.

Pursuant to Article 8, and by following a detailed procedure, the parties to the Convention have an obligation to include their capacities through the Old and New POPs Review Committee in order to identify new chemicals with similar or same properties as the initial 12 POPs.

2.4. ADOPTION OF DECISIONS FOR INCLUSION OF NEW CHEMICALS ON THE LIST OF THE INITIAL 12 POPS

At its Fourth Conference of member states in May 2009, the Convention renewed the initial list of 12 chemicals with 9 new one with Decision SC-2/7, as follows: alpha hexachlorocyclohexane; beta hexachlorocyclohexane; chlordecone; hexabrombiphenyl; hexabromdiphenyl ether and heptabromdiphenyl ether; perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride; and tetrabromdiphenyl ether and pentabromdiphenyl ether.

At the Fifth Conference of the Parties in April 2011, Decision SC-5/3 was adopted adding technical endosulfane and its isomers to the list of the previous 21 substances.

The new POPs chemical are now part of the Annexes to the Convention, including pesticides, industrial chemicals (including flame retardants) and unintentionally produced (generated) chemicals. Most of them are in Annex A requiring of the member states to eliminate the production and use of said substances (except in cases where specific exemption was requested): alpha hexachlorocyclohexane; beta hexachlorocyclohexane; chlordecone; hexabrombiphenyl; hexabromdiphenyl ether and heptabromdiphenyl ether; perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride; and tetrabromdiphenyl ether and pentabromdiphenyl ether.

One of the new substances (Lindane) was added to Annex B, and its production and use is permitted only for specific “acceptable purposes” in accordance with the specific exemptions.

The remaining POPs (pentachlorobenzene) are in Annex C requiring of the member states to reduce the unintentional emissions of these substances by application of best available techniques (BAT) and by promotion of best environmental practices (BEP).

The review of new POPs is stated below, including their respective Annexes, description of application and exemptions, if any.

2.5. REVIEW OF NEW POPS

Alpha hexachlorocyclohexane (α-HCH)

- Annex A. No exemptions.
- By-product of the production of the insecticide Lindane.
- Inactive isomer in the technical mixture of HCH insecticides globally eliminated.

Beta hexachlorocyclohexane (β- HCH)

- Annex A. No exemptions.
- By-product of the production of the insecticide Lindane.
- Inactive isomer in the technical mixture of HCH insecticides.

Chlordecone

- Annex A. No exemptions.
- Organochlorine pesticides, chemically related to Mirex.
- Used in 1950 and removed from use at the same time.

Hexabrombiphenyl (HBB)

- Annex A. No exemptions.
- Industrial chemicals used as flame retardant additives.
- Mostly used in the 1970s.

Hexabromdiphenyl ether (Hexa-BDE) and Heptabromdiphenyl ether (Hepta-BDE)

- Annex A with specific exemptions when used in recycling of products containing these substances. Member states that have listed these exemptions will have the right to use them for said purposes until 2030.
- The components of the commercial pentabromdiphenyl ether (Penta-BDE) and octabromdiphenyl ether (Octa-BDE) are used as flame retardant additives.

Lindane (γ-HCH)

- Annex A with specific exemptions when used as pharmaceutical preparation for control of lice and scabies as secondary treatment.
- The parties that have submitted notifications may continue using it in the next five years from the date the Lindane amendment enters into force.
- Historically, Lindane was used as insecticide with wide spectrum of treatment of seeds and soil, treatment of leaves, trees and other wooden materials against ecto-parasites in the veterinary and human practice.

Pentachlorbenzene (PeCB)

- Annexes A and C. No exemptions.
- Previously used in PHB products, as paint and coating agent, as fungicide, flame retardant additive, intermediate chemical for production of Quintozene. It may be produced or released unintentionally as a by-product.

Tetrabromdiphenyl ether (tetra-BDE) and Pentabromdiphenyl ether (penta-BDE)

- Annex with specific exemptions for recycling of articles containing these substances. Member state may continue using them until 2030.
- Components of commercially available Pentabromdiphenyl ether (Penta-BDE).
- Bromine-based flame retardants.

Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF)

Annex B for acceptable purpose and specific exemptions for production and use

- PFOS are still widely used in various sectors.
- Acceptable purposes which are permitted in the states that have registered for continued use and production thereof are as follows:
    - Photography, photo-resist and anti-reflection coating of semiconductors
    - Etching agent for production of semiconductors and ceramic filters
    - Hydraulic aviation fluids

- Closed system galvanisation only
- Specific medical devices, such as ethylene tetraflourethylene copolimer (ETFE), production of coatings and radiopaque coatings ETFE, medical devices for in-vitro diagnostics and colour filters (CCD)
- Fire-fighting foam
- Insect traps for ants feeding thereof of type Atta and Acromyrmex

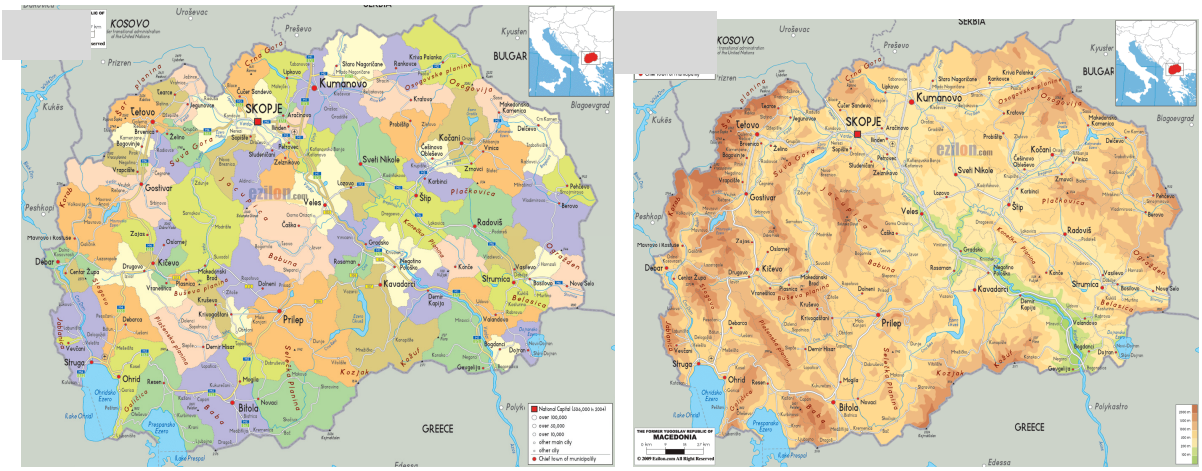
Specific exemption permitted to member states for a five-year period from date the amendment enters into force.

Photo-masks in semiconductors and liquid crystal display industries (LCD)

- Galvanisation (solid metals)
- Galvanisation (decorative)
- Electric and electronic parts of colour printers
- Insecticides for controlling red ants and termites
- Production of oil by using chemicals
- Carpets
- Leather and products thereof
- Textile and upholstery fabrics
- Food and packaging
- Coatings and coating agents
- Rubber and plastic

3. GENERAL INFORMATION ABOUT REPUBLIC OF MACEDONIA

3.1. GENERAL COUNTRY INFORMATION ON THE COUNTRY



Population: 2.061.044

Total surface area: 25,713km^2

Birth rate: 0.24%

No. of municipalities: 84

Towns: 34

3.1.1. GEOGRAPHY

Republic of Macedonia is situated in the centre of the Balkan Peninsula, South Europe, between 400 and 420 North Latitude, and 230 and 200 East Longitude. It is bordering Albania to the West, Serbia to the North, Bulgaria to the East, and Greece to the South.

The total area of the Republic of Macedonia is 25.713 km^2.

3.1.2. GEO- CHARACTERISTICS

Republic of Macedonia is mountainous country with numerous plains. The average altitude of the overall territory is 850 metres. As per the spatial plan of the country, 1,9% of the territory is covered by water (lakes), 19,1% are plains and valleys, and largest part or 79% are hills and mountains.

The plains and valleys in Macedonia take up 4.900 km^2. These areas vary by size, starting with 25 km^2 – Debarsko Pole, up to 1.200 km^2 Pelagonija or Bitolsko-Prilepsko Pole. These areas differ also in the altitude which range between 80m in the Gevegelija-Valandovo Region and 880m in the Prespansko Pole. Other significant plains and valleys are Skopsko Pole, Kumanovsko Pole, Tikveš, Polog and Ovče Pole.

3.1.3. POLITICAL PROFILE OF THE COUNTRY

Macedonia is a sovereign state and multi-party parliamentary democracy.

Its capital is Skopje with a population of 506.926 (est. 2004). Other larger towns are:

Bitola, Kumanovo, Prilep, Tetovo, Veles, Štip, Ohrid, Gostivar, Strumica, Kičevo, Kavadarci and Kočani. Macedonia spans on a total territory of 25.713 km^2 and has a population of 2.061.044 (est. 2012), of which majority are Macedonians. The official language is Macedonia, and the official currency is Macedonian denar.

The government in Macedonia is based on the principle of strict separation of functions and responsibilities among the legislative, executive and judicial branch of government.

The President of Republic of Macedonia represents the country and is also commander-in-chief of the state armed forces. The President is elected on general and direct elections, with a five-year term in office, for not more than two consecutive terms.

The Parliament (Assembly), as legislative body, is the central and most important institution of the State Government. The unicameral assembly is comprised of 120 members of parliament with four-year term in office. The MPs are elected on direct democratic elections, based on the percentage won by the parties from the overall number of votes in all 6 election units, with 20 parliamentary seats per unit.

The executive branch rests within the Government led by a Prime Minister. The Government Office is comprised of ministers appointed by the Prime Minister and approved with majority votes of the People's Assembly.

The Macedonian legal system is based on the civil law. The judiciary is comprised of basic and appellate courts, Supreme Court, Constitutional Court, and the Judicial Council of Republic of Macedonia. The judges serving in these courts are appointed by the Parliament.

3.1.4. INTERNATIONAL STATUS OF THE COUNTRY

European Union membership is one of the highest strategic interests and priorities for the Government, common also to the majority citizens of Republic of Macedonia and for all political parties. Macedonia was the first country in South-Eastern Europe that signed the Stabilisation and Association Agreement with the European Union in 2001 in Luxemburg. Recognising the progress Macedonia achieved with the fulfilment of the Copenhagen Criteria, the European Union recommended that Macedonia be awarded a candidate status for EU membership.

Republic of Macedonia is an aspirant country for the North Atlantic Treaty Organisation (NATO). In the Final Declaration of the NATO Summit in Riga 2006, Macedonia was included in the NATO's Membership Accession Plan (MAP).

3.1.5. ECONOMIC PROFILE OF THE COUNTRY

Gross domestic product (as of 2013/09/30) – As per the preliminary data, obtained from the annual reports of business entities and other sources, the gross domestic product (GDP) in 2012 was 458.621.000.000 denars, 0,3% nominal decreased compared to 2011. The real GDP growth compared to 2011 is -0,4%. The following sectors have the largest share of added value to the GDP structure in 2012 (G, H and I): wholesale and retail; servicing of motor vehicles and bikes, transport and storage; accommodation and food hospitality services (18,6%).

Compared to 2011, the final consumption in 2012 decreased by 0,4% in nominal sense, whereas its share in the GDP structure was 93,2%. In 2012, the GDP share of export of goods and services was 53,6%.

3.1.6. ECONOMIC INDICATORS

Table 1 Economic indicators

	2007	2008	2009	2010	2011	2012
Real GDP growth (%)	6.1	5.0	-0.9	2.9	3.1	0.2
Annual inflation rate (%)	2.3	8.3	-0.8	1.6	3.9	3.3
Budget balance (Balance of the Central budget and funds, % of GDP)	0.6	-0.9	-2.7	-2.4	-2.5	-
Export to import coverage ratio (%)	67.4	60.6	55.5	62.9	65.5	61.8
GDP per capita in EUR (current F/X rate)	2 919	3 283	3 269	3 434	3 630	/
Foreign direct investments (in million EUR)	506,0	399,9	145,0	160,0	336,8	72,0

Source: National Bank of Republic of Macedonia 2012

Figure 1 Review the movement of population and basic demographic indicators

Table 2 Prices

	2006	2007	2008	2009	2010	2011	2012
Sustenance expenses index	103.2	105.6	114.3	113.4	115.2	119.7	123.7

Table 3 Average paid gross salary per employee

	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total average monthly gross salary, in Macedonian denars	21.186	22.749	23.003	25.349	29.586	29.947	30.902	30.768	31.090

Table 4 Industrial production index

	2006	2007	2008	2009	2010	2011
All industrial sectors	105.90	103.90	105.10	91.30	95.20	103.29

Table 5 Index of the prices of industrial products in the domestic market

	2006	2007	2008	2009	2010	2011	2012
Total	85.77	86.87	95.81	89.46	96.04	110.14	115.72

Table 6 Active, and newly created enterprise deaths in the period 2004-2008, by sector of activity

	Number of active enterprises				
	2004	2005	2006	2007	2008
Mining and quarrying	74	92	91	108	104
Manufacturing Industry	7. 088	7. 783	7.957	8.825	9.041
Electricity, gas and water	81	77	81	82	88
Civil Engineering	2. 707	3. 078	3. 227	3 .628	3. 765
Wholesale and retail trade, repair of motor vehicles, motorcycles, personal and household goods	21. 181	24. 089	24. 068	26 .057	26. 405
Hotels and restaurants	2. 345	2. 662	2. 707	3 .017	3. 292
Transport, storage and communication	3. 777	4. 240	4. 994	5 .713	5. 699
financial mediation	99	106	111	143	145
Activities related to real estate, renting and business activities	2. 816	3. 142	3. 404	4 .190	4. 432
Education	787	805	806	874	881
Health and social work	1. 309	1. 335	1. 808	2 .428	3. 074
Other community, social and personal service activities	3. 547	3. 398	3. 449	3 .574	3. 299

3.1.7. *POPULATION AND EMPLOYMENT*

The population of Republic of Macedonia in 2013 is 2.061.044 inhabitants, with average population density of 80 persons per km2. Of the total population, 62% are living in urban areas, mainly in the five largest towns: Skopje, Bitola, Prilep, Kumanovo and Tetovo.

In regards to trend of aging population, in 2012, the young population (ages 0-14) represented 17,1% of the total population, whereas the elderly (age 65 or more) represented 11,9%.

Ethnic wise Republic of Macedonia is one of the more complex populations in Europe. The country is inhabited mostly by Macedonians (64,18%), and several ethnic minorities, including Albanians 25,7%, Turks 3,85%, Roma 2,6%, Serbs 1,78%, Bosniaks 0,84,%, Vlachs 0,48%, and others.

Since the end of the Second World War, the Macedonian population is constantly growing, most rapidly among the Albanian population. The Western part of the country, inhabited mostly be Albanians, is most densely populated with approximately 40% of the total population. As the population grows, most of the people are migrating to towns seeking employment. Between 1948 and 1994, the urban population has grown from 28,7% to 58,4% of the total population.

Table 7 Population aged 15 years and over, by economic activity and gender, 2012-2013

	Q2 2013		**Q2 2013 / Q2 2012**
	citizens	**gender structure**	
Active population			
Total	952 327	100.0	101.1
Male	572 611	60.1	99.5
Female	379 716	39.9	103.5
Employed			
Total	678 467	100.0	104.7
Male	404 297	59.6	103.2
Female	274 170	40.4	106.9
Unemployed			
Total	273 860	100.0	93.1
Male	168 315	61.5	91.5
Female	105 545	38.5	95.6
Inactive population			

	Q2 2013		Q2 2013 / Q2 2012
	citizens	gender structure	
Total	716 096	100.0	98.5
Male	264 703	37.0	102.0
Female	451 393	63.0	96.5

Table 8 Indicators of gender statistics in Republic of Macedonia

	2006		2007		2008		2009		2010		2011	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Life expec-tancy at birth	75.87	71.70	71.95	76.14	76.29	72.12	76.73	72.50	76.96	72.72	...	..

Table 9 Activity rates, employment and unemployment of the population

	2006	2007	2008	2009	2010
Middle age population	147 700	147 569	147 677	147 766	148 891
Activity ratio	55.1	55.7	56.3	56.7	56.9
Employment ratio	35.2	36.2	37.3	38.4	38.7
Unemployment ratio	36.0	34.9	33.8	32.2	32.0

4. REPUBLIC OF MACEDONIA AND THE ENVIRONMENT

4.1. ENVIRONMENTAL POLICIES AND MANAGEMENT, MANAGEMENT OF CHEMICALS

The Ministry of Environment and Physical Planning (MEPP) performs all tasks related to the process of legislation harmonisation; drafting of national strategies and action plans; inspection and implementation, including interventions at large polluters when necessary; and conducting all tasks related to monitoring, information systems and cadastres at national level.

MEPP determined the general framework for policies and legislation, extending certain level of freedom to the local self-government units in regards to the implementation, up to the moment when adequate attention is afforded to the specific local conditions.

The international coordination is managed at national level both concerning EU and international conventions, and the assistance provided by the international and bilateral donor community.

MEPP has achieved significant progress in the recent years in regards to human resources and capacities. Nevertheless, in order to have efficient implementation of the environmental legislation, suitable solutions for strengthening the administrative capacity of MEPP will have to be identified (particularly in the areas defined by the environmental laws, and ratified international agreements), and the same will have to done within the other ministries managing sectors which are closely related to the environment, and the protection and improvement of nature. This is especially related to the employment of new specialised staff and training for the employees focused on drafting of laws, projects and developing strategies and policies.

Since 01.01.2011, MEPP is responsible for the overall water management, including water basin management and the permit writing system.

Currently, MEPP is organised into nine departments or sectors which are further divided into units, and three bodies within the MEPP, as integral part thereof, namely, the State Environmental Inspectorate, the Office for Environment (Environmental Administration), and the Office of the Spatial Information System. These bodies are under the supervision of the MEPP and are operating in compliance with the legal regulations and the other legal acts regulating the issues related to the environment. While performing his/her duties, the Minister is additionally supported by a deputy minister, state secretary, and state advisors.

The EU Department (previously Legislation and Standardisation Department) is currently responsible for approximation, monitoring and reporting to the European Commission. The EU Sector is responsible for the coordination of all policies and legislative work within the MEPP, including the EU approximation. DEI (Department for European Integration) – Department for harmonisation with the EU Acquis and negotiations is responsible for the coordination of the MEPP activities related to drafting legislation aligned with that of EU. The EU coordination and monitoring activities are vested in the MEU - coordination of the monitoring and evaluation of the achieved progress.

Separate Department for cooperation and coordination of projects is responsible for the Instrument for Pre-accession Assistance (IPA) and international cooperation.

The Department for Sustainable Development and Investments is also actively involved in the preparation of technical documentation, and the further implementation of capital infrastructure

investments / IPA-supported projects. The new structure separates the funding for drafting policies / laws.

EU integration as main priority of the country puts a lot of stress on the production, as well as on legislation and policy harmonisation for the purpose of meeting the EU standards.

4.2. OTHER RESPONSIBLE GOVERNMENTAL INSTITUTIONS

Aside from the MEPP as a management body with the main role in regards to the environment, some state administrative bodies are also competent in regards to the management of the environment, as follows:

The Protection and Rescue Directorate is competent for the civil protection. The main responsibilities for preparation of emergency response plans for facilities/installations containing hazardous substances are vested in the operators of said facilities. These are under direct control of the Ministry of Health (MH) which is competent for the public health protection against contamination performed by monitoring the air, the water, the soil and obsolete products, for protection of the population against infectious diseases, the effects of hazardous gases, ionizing radiation, noise, and for the hygienic-epidemiological situation. It is also responsible for food safety, hence the safety of potable and bathing water. Additionally, the Ministry of Health is also responsible for the safety of pharmaceutical products.

Pursuant to the new Water Law, the Food and Veterinary Agency (FVA) shall conduct activities for identification and monitoring of water bodies intended for human consumption and monitoring of sanitary-protected zones surrounding these bodies.

The State Sanitary and Health Inspectorate (SSHI), within the Ministry of Health, monitors the surface water bodies and recreational swimming pools and bathing zones.

Pursuant to the Law on Sanitary and Health Inspections, the SSHI used to be in charge of task to monitor the sanitary-protected water bodies intended for human consumption. Presently, the FVA shall undertake these activities. Hence, the overall competence for monitoring is vested in the FVA, whereas the SSHI will, inter alia, monitor cases of identified conditions that may lead to threats against the human health.

The Law on Chemicals allocates the responsibilities for management of chemicals. The administrative and professional activities related to management of chemicals shall be carried out by the Chemicals Department within the Bureau for Medicines, an integral body of the Ministry of Health. The Chemicals Department is responsible for management of hazardous substances, issuing permits for import and export of chemicals, and for partaking in the decisions on which chemicals are suitable for marketing.

The Chemicals Committee is responsible for the registration of chemicals, whereas the Chemicals Department within the Bureau for Medicines is responsible for acceptance, reporting, risk assessment, and classification of chemicals. Risk assessment of hazards related to chemicals and their classification is within the competences of the inter-sectoral Chemicals Committee.

The Bureau for Medicines is also responsible for accepting notifications for new substances that have not been previously registered and for supervising the quantities of substances placed on the market. The Ministry of Health, upon approval from the MEPP and MAFWE, compiles the

national inventory of new and already classified substances that are placed on the market in the country.

The Ministry of Agriculture, Forestry and Water Economy (MAFWE) is competent for agriculture and forestry, as well as protection of water amelioration systems; use of agricultural land, forests, and other natural resources; hunting and fishing; animal and plant protection; and the meteorological and hydrological processes. MAFWE is responsible for the protection of plants, seeds, and new reproduction forms, and is authorised to prevent and the control the contamination with nitrates and other chemical preparations, including pesticides used in agriculture. Pursuant to the Law, MAFWE should focus its activities on raising the awareness among farmers on the need for undertaking steps to prevent contamination with nitrates and hazardous pesticides, by implementing specific measures or by implementing good agricultural practices.

Pursuant to the Law on Ratification of the Rotterdam Convention, MAFWE is responsible for controlling the import/export of the group of pesticides listed in the Convention. In this context, MAFWE is responsible for issuing approvals for import of pesticides regulated by the Convention. MAFWE is continuously working on the implementation of the Law on Plant Protection, performing all the tasks in the national and international legislation prescribing the management of pesticides, including the hazardous ones.

Ministry of Economy is competent for geologic investigations and exploitation of minerals and energy, but is also responsible for consumers' safety and issues related to the World Trade Organisation. The Ministry is generally responsible for the implementation of provisions referring to permitted values of pollution from motor vehicle exhaust systems and sold products.

The Ministry of Transport and Communications (MTC), among other responsibilities (internal transport; residential and municipal works, such as municipal infrastructure; issues such as water supply, sewage, waste water collection and treatment, noise abatement measures related to navigation and construction activities) is competent for the transport of hazardous substances in accordance with the ADR and RDI.

The Ministry of External Affairs is competent for cases of cross-border pollution and international cooperation in regards to management of the environment. Also, it acts as a coordination body for the implementation of Conventions related to chemicals, such as the Chemical Weapons Convention.

The Ministry of Interior is competent for the public safety system, control and prevention of production, trade, storage and protection against flammable liquids, gases, explosives, and other hazardous materials, including chemical weapons, and is tasked to assist in cases of natural disasters and epidemics.

5. REPUBLIC OF MACEDONIA AND THE IMPLEMENTATION OF THE STOCKHOLM CONVENTION

The POPs Unit within the Ministry of Environment and Physical Planning was established in May 2002, one year following the signing of the Stockholm Convention (May 2001), when Republic of Macedonia became eligible to use the financial assistance of the Global Environment Facility (GEF), as a provisional financial mechanism of the Convention.

The Unit's task was to coordinate and implement the overall activities aimed at the implementation of the Project "Enabling Activities to Facilitate Early Action on the Implementation of the Stockholm Convention on POPs". Accordingly, a Steering Committee, comprised of representatives from the involved ministries (Ministry of Environment and Physical Planning, Ministry of Agriculture, Forestry, and Water Economy, and Ministry of Health), the private and non-governmental sector, was established for project implementation purposes.

The purpose of this Project was to draft a strategic document, i.e. the National Implementation Plan for Reduction and Elimination of Persistent Organic Pollutants. Following the completion of the preliminary inventories and the analysis on the POPs situation in Republic of Macedonia, the Ministry of Environment and Physical Planning initiated the ratification of the Stockholm Convention on POPs. In March 2004, the Assembly of the Republic of Macedonia ratified this document ("Official Gazette of Republic of Macedonia" no. 17/2004).

The action plans contained in the second part of the document are based on the adopted priorities and obligations undertaken with the Stockholm Convention. Said plans include the specific activities to be undertaken at national level for reduction and elimination of POPs. Aside from this, a timeframe was set for the completion of envisaged activities and means required thereof.

The National Implementation Plan on Reduction and Elimination of POPs was adopted at the Ninth Session of the Government of Republic of Macedonia on 24.01.2005. Pursuant to this Decision, the Government of Republic of Macedonia designated the Ministry of Environment and Physical Planning, through its POPs Unit, as coordinator of the activities for implementation of the actions of the National Implementation Plan for Reduction and Elimination of POPs.

The drafting of the National Implementation Plan set the basis for further actions in this field. The document includes specific projects for identification, management, control, reduction, and elimination of these hazardous chemicals. On one hand, their implementation means tackling the obligations from the Stockholm Convention, and on the other hand, it means cleaner environment for the future generations.

In that context, after the adoption of the NIP, the Ministry of Environment and Physical Planning / POPs Unit immediately started with the implementation of the action plans contained in the document.

Numerous projects in the field of reduction and elimination of POPs were prepared, and most of them were submitted as proposals to several international financing institutions (GEF, QSP, Seco).

The continuous efforts of the POPs Unit and the demonstrated results point out to the fact that the Ministry of Environment and Physical Planning is fully preprared to take on the strict meas-

ures and obligations from the Stockholm Convention on POPs, and not only this Conventions, but all other conventions and international agreements and initiatives aimed at safe management of chemicals. (Rotterdam Convention, Basel, SAICM and other)

5.1. ACTIVITIES ON IMPLEMENTATION OF THE ACTION PLANS FROM THE FIRST NATIONAL IMPLEMENTATION PLAN IN PEPUBLIC OF MACEDONIA – POST-NIP PERIOD

5.1.1. COMPONENT IV WITHIN THE "PROGRAMME FOR EFFICIENT ENERGY DISTRIBUTION".

During the period 2004-2006, the POPs Unit within the Ministry of Environment and Physical Planning was involved in the implementation of Component IV of the "Programme for efficient energy distribution" where Republic of Macedonia managed to eliminate 40 tonnes of hazardous waste, i.e. low voltage capacitors containing PHBs (polychlorinated biphenyls) from the distribution grid of ESM (Macedonian Power Company) which were finally incinerated in Basel.

With the assistance of approved funding from the Swiss Government, it continued its activities for meeting the obligations from the Stockholm Convention, for implementation of the National Implementation Plan for Reduction and Elimination of Persistent Organic Pollutants in the Republic of Macedonia, and for one of the key experts contained in the plan, that is to say, the Detailed PHB Inventory.

In the previous period, the Ministry of Environment and Physical Planning, through its POPs Unit, continuously worked on compiling the inventory of equipment containing PHBs, thus getting closer to meeting the deadline obligation (2010 according to the European Union, and 2025 according to the Stockholm Convention) for complete elimination of equipment containing PHBs.

5.1.2. PROJECT FOR FINAL ELIMINATION OF HAZARDOUS WASTE STORED BY THE DDE (DISINFECTION, DESINSECTISATION, DERATISATION) SERVICE OF THE INSTITUTE FOR HEALTH PROTECTION

As a continuation of activities, by mobilising new means and cooperation with the Public Health Institute, the Unit implemented the Project for final elimination of stored hazardous waste (4 tonnes of organochlorine pesticides - DDT, MeBr, and hydrogen cyanide – Cyclone B), which used to be stored for 20 years in the DDE Service in Čair at the Institute for Health Protection – Skopje.

5.1.3. PROJECT: "NATIONAL CAMPAIGN FOR RAISING PUBLIC AWARENESS ON POPS AND PCBS" (SECO)

Aside from the activities for final packaging, interim storage, and organisation of transport of the equipment within Component 4 of the Project "Programme for efficient energy distribution", financed by the Swiss Government, the POPs Unit has undertaken steps for intensive campaign on raising the public awareness on POPs/PCBs.

This campaign envisaged the participation of all relevant stakeholders: Professionals managing and handling PCB-contaminated equipment on one side, and the NGO sector, the media, the healthcare workers, and the general public on the other side. The activities for raising public awareness were comprised of:

- Preparation of a brochure containing relevant information on PCBs and equipment containing PCBs
- Preparation and printing of posters on POPs and PCBs

- Dissemination of the brochure to all relevant stakeholders and the interested public
- Organisation of series of workshops at regional and national level for the actively involved stakeholders and general public
- Several lectures in the technical high schools
- Publication of articles in the electronic and printed media
- Participation in open programs on the National TV Service
- Production of half-our show on this topic

In October 2006, the English version of the brochure “Polychlorinated Biphenyls – Reduction and Elimination" was published, thus making it available for the colleagues in other contries.

The POPs Unit, as co-organiser of the regional TAIEX workshop “Management of PHB Waste” (Skopje, 16-17 November 2006), used the opportunity to elaborate on the successfully completed project for disposal of low voltage capacitors of ESM, promoting at the same time the English version of the brochure on polychlorinated biphenyls.

5.1.4. *PROJECT "ELIMINATION OF PCBS AND EQUIPMENT CONTAINING PCBS IN REPUBLIC OF MACEDONIA" (2008-2013)*

The initial preparatory work for this Project begun in 2003. The project proposal was for the first time submitted to GEF in 2004. After series of negotiations and requests for additional local contribution, the Project was approved in 2008.

With this Project, the POPs Unit, within the Ministry of Environment and Physical Planning, continued its activities aimed at meeting the obligations from the Stockholm Convention (Law on ratification of the Stockholm Convention, "Official Gazette of R. of Macedonia" no. 17/2004, March 2004), implementing the National Implementation Plan for Reduction and Elimination of Persistent Organic Pollutants in Republic of Macedonia (adopted at the Ninth Session of the Government of R. of Macedonia, 24.01.2005), and fulfilling one of the key tasks contained in the plan - detailed Inventory of PHBs in the country.

The Project ended in September 2013 with successful construction and commissioning of facility for provisional storage and treatment of PCB-contaminated equipment. 167 tonnes of PCB waste were eliminated with this Project.

5.1.5. *PROJECT: "DETERMINING POPS CONCENTRATIONS IN AMBIENT AIR IN THE COUNTRIES OF CENTRAL AND EASTERN EUROPE BY APPLICATION OF PASSIVE AIR SAMPLING TECHNIQUES"*

Responsible coordination body for the activities on the territory of Republic of Macedonia is the POPs Unit/MEPP.

In the period January-September 2007, the Regional POPs Centre was established by the countries of Central and Eastern Europe, and upon an initiative from the Research Centre for Toxic Compounds in the Environment RECETOX from Brno, Czech Republic, the regional Project "Determining POPs concentrations in ambient air in the countries of Central and Eastern Europe by application of passive air sampling techniques" was implemented.

Within the Project activities, air and soil samples were taken from six locations in the Republic of Macedonia, proposed by the Ministry of Environment and Physical Planning/Information Centre and Central Environmental Laboratory. The samples were then analysed in the RECETOX laboratory.

Workshop on application of passive air sampling techniques was organised, and the participants were informed and details on all stage of installation of samplers, collection of samples, and air sample analysis.

With this Project, Macedonia became part of the Regional network for POPs monitoring.

The results are shown in the inventory section and the assessment of the situation with old and new POPs.

5.1.6. ACTIVITIES OF POPS UNIT AIMED AT RESOLVING THE ISSUE WITH HCH WASTE IN OHIS (2006-2013)

During the period between February 2006 and April 2007, the POPs Unit initiated specific activities to resolve the problem with the HCH landfill in OHIS.

In the period 2006-2012, the POPs Unit, within the Ministry of Environment and Physical Planning, was in permanent direct communication with international organisation active in treatment of obsolete pesticides.

As a result thereof, in March 2007, the POPs Unit, upon recommendation from UNIDO, got in contact and had a preliminary meeting with representatives from the Italian Ministry of Environment, and the Spanish company "Aretech Solutions S.A.", who showed particular interest in the OHIS issue. During the first meeting, the representatives from the Italian Ministry voiced the need for several drilling in order to conduct qualitative and quantitative investigation of the landfill.

Meanwhile, the Czech Government approved 300.000$ for finding an integral resolution of the OHIS issue, thus announcing its direct involvement in the activities for final elimination of the HCH landfill within the plant's premises.

The landfill was visited on 8-9 May 2007 by representatives of UNIDO, the Italian Ministry of Environment, the Spanish company "Aretech Solutions S.A", representative from the Czech Ministry of Environment and domestic experts who have worked on previous studies on the HCH waste in OHIS, the POPs Unit, and senior officials from our Ministry of Environment.

As a last activity in the pursuit of possible solutions for OHIS, the POPs Unit, within the Ministry of Environment and Physical Planning, was involved in consultations with representative from Germany, the company K+S which, in collaboration the Romanian company SETCAR, offered to perform a demo cleaning of a smaller quantity (10 tonnes) of HCH waste and mercury contaminated waste.

This Pilot Project costing around EUR 50 000 was financed by the German company K+S and the Romanian company SETCAR which provided installation and transport of the mobile unit for decontamination of the HCH and mercury contaminated soil.

UNIDO, as an implementation agency, was a partner in the process of drafting a project proposal that the Ministry of Environment submitted in 2010 in order to resolve the problem with technical HCH waste (Lindane and its isomers) in OHIS.

Just recently, GEF approved this project, and it is expected to start with preparatory project activities in December 2013.

5.1.7. *PROJECT FOR REVIEWING AND UPDATING THE NIP ON REDUCTION AND ELIMINATION OF POPS (2011-2013)*

The Stockholm Convention at its Fourth Conference of the Parties in May 2009, renewed the initial list of 12 chemicals with 9 new chemicals with the Decision SC-2/7, as follows: alpha hexachlorocyclohexane; beta hexachlorocyclohexane; chlordecone; hexabrombiphenyl; hexabromdiphenyl ether and heptabromdiphenyl ether; perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride; and tetrabromdiphenyl ether and pentabromdiphenyl ether.

At the Fifth Conference of the Parties in April 2011, Decision SC-5/3 was adopted adding technical endosulfane and its isomers to the list of the previous 21 substances.

In February 2011, the Republic of Macedonia submitted a project proposal for updating the initial National Implementation Plan with the new group of chemicals that were additionally added to the list of POPs at the mentioned Conference of the Parties of the Stockholm Convention.

In February 2012, the Global Environment Facility (GEF) approved a financial support for implementation of the project. The implementing agency is the United Nations Industrial Development Organization (UNIDO), whereas the counterpart agency in Republic of Macedonia is the Ministry of Environment and Physical Planning. Republic of Macedonia was the first country that was approved with such financial support for Updating of the NIP for reduction and elimination of POPs.

The overall objective of the Enabling Activities (EA) project was to update and review the National Implementation Plan (NIP), and have it endorsed and submitted by the Government to the Stockholm Convention (SC) Conference of Parties (COP).

Participating stakeholders in this project became able to manage the additional POPs with newly developed technical skills, expertise and awareness. The activities of the proposed Enabling Activities Project were focused on filling the gaps required to review and update the NIP. This includes strengthening the national coordination mechansim by involving additional stakeholders on new POPs, establishing working groups with expertise on new POPs issues, updating and reviewing the original twelve POPs, conducting a preliminary inventory of new POPs, assessing the regulatory and policy framework and institutional capacities to manage new POPs, prioritizing and drafting relevant objectives and action plans for reducing and phasing out new POPs. Relevant stakeholders wereconsulted and involved throughout the project implementation process.

The updated, endorsed and submitted NIP will provide a basis to implement post-NIP projects in accordance with the requirements of the Stockholm Convention.

Specifically, the immediate objective of the project will be to:

i. Prepare the updated and reviewed NIP;
ii. Allow Macedonia to fulfill its obligation under Article 7 of the Stockholm Convention which is to review and update the NIP and submit it to the COP;
iii. Participating stakeholders become able to manage the additional POPs with newly developed technical skills, expertise and awareness.

6. ANALYSIS OF NATIONAL LEGISLATION REGARDING REQUIREMENTS OF THE STOCKHOLM CONVENTION

Article on the Stockholm Convention already transposed into national legislation of the Republic. Macedonia		National Legislation
Article 3 **Para 1 (a)(i)**	Prohibit and/or take the legal and administrative measures necessary to eliminate: (i) Its production and use of the chemicals listed in Annex A subject to the provisions of that Annex; and	Law on chemicals („Official Gazette“ No. 145/10, 53/11), Articles 52, 58, 59, 60, 61, 62, 63, 64; List of banning and restrictions for use of chemicals („Official Gazette“ No. 57/11, 67/12); Law on Plant protection products („Official Gazette“ No. 110/2007; 20/2009; 17/2011 и 53/2011) Article 3 paragraph 1, Article 26; Law on waste management , Article 69
Article 3 paragraph 1 (a)(ii)	(ii) Its import and export of the chemicals listed in Annex A in accordance with the provisions of paragraph 2;	Law on chemicals („Official Gazette of RM “ No. 145/10, 53/11), Articles 58, 59, 60, 61, 62, 63, 64; List of banning and restrictions for use of chemicals („Official Gazette“ No. 57/11, 67/12); Law on Plant protection products („Official Gazette of RM“ No. 110/2007; 20/2009; 17/2011 и 53/2011) Article 3 paragraph 1, Article 26; ; Law on waste management, Article 69
Article 3 paragraph 1 (b)	Restrict its production and use of the chemicals listed in Annex B in accordance with the provisions of that Annex.	Law on chemicals („Official Gazette of RM “ No 145/10, 53/11), член 52, 58, 59, 60, 61, 62, 63, 64; List of banning and restrictions for chemical use („Official Gazette of RM “ No . 57/11, 67/12); Law on Plant protection products („Official Gazette of RM“ No. 110/2007); 20/2009; 17/2011 и 53/2011) Article 3 paragraph 1, Article 26;
Article 3 paragraph 2 (a)(i)	Each Party shall take measures to ensure: a) That a chemical listed in Annex A or Annex B is imported only (i) For the purpose of environmentally sound disposal as set forth in paragraph 1 (d) of Article 6; or	Law on waste management chemicals („Official Gazette of RM “ No. 68/04, 107/07, 102/08, 143/08, 124/10, 51/11, 123/120), Article 103 paragraph 1
Article 3 paragraph2 (a)(ii)	(ii) For a use or purpose which is permitted for that Party under Annex A or Annex B;	Law on chemicals („Official Gazette of RM “ No 145/10, 53/11), Article 52, 58, 59, 60, 61, 62, 63, 64; List of banning and restrictions for chemical use („Official Gazette of RM “ No . 57/11, 67/12); Law on Plant protection products („Official Gazette of RM“ No. 110/2007; 20/2009; 17/2011 и 53/2011) Article 3 paragraph 1, Article 26; Law on waste management, Article 69
Article 3 paragraph 2 (b)(i)	That a chemical listed in Annex A for which any production or use specific exemption is in effect or a chemical listed in Annex B for which any production or use specifi c exemption or acceptable purpose is in effect,	Law on waste management („Official Gazette of RM. 68/04, 107/07, 102/08, 143/08, 124/10, 51/11, 123/120), Article 103 paragraph 1

	taking into account any relevant provisions in existing international prior informed consent instruments, is exported only:	
Article 3 paragraph 2 (b) (ii)	For the purpose of environmentally sound disposal as set forth in paragraph 1 (d) of Article 6;	Law on waste management („Official Gazette of RM. 68/04, 107/07, 102/08, 143/08, 124/10, 51/11, 123/120), Article 103 paragraph 1
Article 3 paragraph 2 (b) (iii,a,b,c)	To a State not Party to this Convention which has provided an annual certification to the exporting Party. Such certifi cation shall specify the intended use of the chemical and include a statement that, with respect to that chemical, the importing State is committed to: a. Protect human health and the environment by taking the necessary measures to minimize or prevent releases; б) Comply with the provisions of paragraph 1 of Article 6; and c) Comply, where appropriate, with the provisions of paragraph 2 of Part II of Annex B. The certifi cation shall also include any appropriate supporting documentation, such as legislation, regulatory instruments, or administrative or policy guidelines. The exporting Party shall transmit the certifi cation to the Secretariat within sixty days of receipt.	Law on chemicals („Official Gazette of RM " No 145/10, 53/11), Article 74, Article 75(2)
Article 3 paragraph 2 (c)	That a chemical listed in Annex A, for which production and use specific exemptions are no longer in effect for any Party, is not exported from it except for the purpose of environmentally sound disposal as set forth in paragraph 1 (d) of Article 6;	Law on waste management („Official Gazette of RM. 68/04, 107/07, 102/08, 143/08, 124/10, 51/11, 123/120), Article 104
Article 3 paragraph 2 (d)	For the purposes of this paragraph, the term "State not Party to this Convention" shall include, with respect to a particular chemical, a State or regional economic integration organization that has not agreed to be bound by the Convention with respect to that chemical.	No
Article 5 paragraph 1 (f)(i)	For the purposes of this paragraph and Annex C: (i) "Best available techniques" means the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for release limitations designed to prevent and, where that is not practicable, generally to reduce releases of chemicals listed in Part I of Annex C and their impact on the environment as a whole. In this regard:	Law on Environment, Article 45 paragraph 39

Article 5 paragraph 1 (f)(ii)	"Techniques" includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;	Law on Environment, Article 45 paragraph 39 subparagraph 1
Article 5 paragraph 1 (f)(iii)	"Available" techniques means those techniques that are accessible to the operator and that are developed on a scale that allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages; and	Law on Environment, Article 45 paragraph 39 subparagraph 2
Article 5 paragraph 1 (f)(iv)	"Best" means most effective in achieving a high general level of protection of the environment as a whole;	Law on Environment, Article 45 paragraph 39 subparagraph 3
Article 6 paragraph 1 (d)(i)	Take appropriate measures so that such wastes, including products and articles upon becoming wastes, are: (i) Handled, collected, transported and stored in an environmentally sound manner;	Law on the Waste Management, Chapter V
Article 6 paragraph 1 (d)(ii)	Disposed of in such a way that the persistent organic pollutant content is destroyed or irreversibly transformed so that they do not exhibit the characteristics of persistent organic pollutants or otherwise disposed of in an environmentally sound manner when destruction or irreversible transformation does not represent the environmentally preferable option or the persistent organic pollutant content is low, taking into account international rules, standards, and guidelines, including those that may be developed pursuant to paragraph 2, and relevant global and regional regimes governing the management of hazardous wastes;	Law on the Waste Management, Article 34, Article 35
Article 6 paragraph 1 (d)(iv)	Not transported across international boundaries without taking into account relevant international rules, standards and guidelines;	Law on the Waste Management, Article 105
Article 9 paragraph 1(a, b)	Each Party shall facilitate or undertake the exchange of information relevant to: (a) The reduction or elimination of the production, use and release of persistent organic pollutants; and (b) Alternatives to persistent organic pollutants, including information relating to their risks as well as to their economic and social costs.	Law on Environment, Article 56 Law on the Waste Managment, Article 118

Article 10 paragraph 2	Each Party shall, within its capabilities, ensure that the public has access to the public information referred to in paragraph 1 and that the information is kept up-to-date.	Law on Environment, Article 56 paragraph 1
Article 10 paragraph 5	Each Party shall give sympathetic consideration to developing mechanisms, such as pollutant release and transfer registers, for the collection and dissemination of information on estimates of the annual quantities of the chemicals listed in Annex A, B or C that are released or disposed of.	Law on Environment, Article 41
Article 11 paragraph 1(a, b, c, d, e, f, g)	The Parties shall, within their capabilities, at the national and international levels, encourage and/or undertake appropriate research, development, monitoring and cooperation pertaining to persistent organic pollutants and, where relevant, to their alternatives and to candidate persistent organic pollutants, including on their: (a) Sources and releases into the environment; (b) Presence, levels and trends in humans and the environment; (c) Environmental transport, fate and transformation; (d) Effects on human health and the environment; (e) Socio-economic and cultural impacts; (f) Release reduction and/or elimination; and (g) Harmonized methodologies for making inventories of generating sources and analytical techniques for the measurement of releases.	Law on Environment, Article 47
Annex A ELIMINATION **Part I Дел 1**	/	List of prohibitions and restrictions to the use of chemicals (OG of the RM no. 57/11, 67/12)
Annex A ELIMINATION **Part II**	Polychlorinated biphenyls	List of prohibitions and restrictions to the use of chemicals (OG of the RM no. 57/11, 67/12), Rulebook on the manner and condition for PCB handling (OG of the RM, no. 48/2007,130/2009, 52/2013)
Annex A ELIMINATION **Part III**	Definitions	/
Annex B	List of prohibitions and restrictions to the use of chemicals (OG of the RM no. 57/11, 67/12)	List of prohibitions and restrictions to the use of chemicals (OG of the RM no. 57/11,

RESTRICTION **Part I**	DDT (1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane)	67/12)
Annex C UNINTENTIONAL PRODUCTION **Part II**	Source categories	Law on Ambient Air Quality, Article 13; Rulebook on the limit values for allowed emission levels and different types of polluting substances in the waste gases and vapors emitted by the stationary sources in the air
Annex C UNINTENTIONAL PRODUCTION **Part III**	Source categories	Law on Ambient Air Quality, Article 13; Rulebook on the limit values for allowed emission levels and different types of polluting substances in the waste gases and vapors emitted by the stationary sources in the air
Annex C UNINTENTIONAL PRODUCTION **Part V**	General guidance on best available techniques and best environmental practices	Law on Environment, Article 135 paragraph 10, Law on Chemicals, Article 52, 58, 59, 60, 61, 62, 63, 64; List of prohibitions and restrictions to the use of chemicals; Law on Plant Protection Products, Article 3 paragraph 1, Article 26; Law on the Waste Management, Article 69
Members of the Stockholm Convention which are partially transposed into national legislation and will be transposed by 2015		
Article 3 paragraph 3	Each Party that has one or more regulatory and assessment schemes for new pesticides or new industrial chemicals shall take measures to regulate with the aim of preventing the production and use of new pesticides or new industrial chemicals which, taking into consideration the criteria in paragraph 1 of Annex D, exhibit the characteristics of persistent organic pollutants.	Law on chemicals („Official Gazette of RM " No 145/10, 53/11), Article 22,); Law on Plant protection products („Official Gazette of RM" No 110/2007; 20/2009; 17/2011 и 53/2011),Article 7
Article 3 paragraph 4	Each Party that has one or more regulatory and assessment schemes for pesticides or industrial chemicals shall, where appropriate, take into consideration within these schemes the criteria in paragraph 1 of Annex D when conducting assessments of pesticides or industrial chemicals currently in use.	Law on chemicals („Official Gazette of RM " No 145/10, 53/11), Article 83, 84; Law on Plant protection products („Official Gazette of RM" No 110/2007; 20/2009; 17/2011 и 53/2011), Article 14, Article 17, Article 36.

Article 3 paragraph 5	Except as otherwise provided in this Convention, paragraphs 1 and 2 shall not apply to quantities of a chemical to be used for laboratory-scale research or as a reference standard.	Law on chemicals („Official Gazette of RM " No 145/10, 53/11), Article 6, paragraph 3(1)
Article 3 paragraph 6	Any Party that has a specifi c exemption in accordance with Annex A or a specifi c exemption or an acceptable purpose in accordance with Annex B shall take appropriate measures to ensure that any production or use under such exemption or purpose is carried out in a manner that prevents or minimizes human exposure and release into the environment. For exempted uses or acceptable purposes that involve intentional release into the environment under conditions of normal use, such release shall be to the minimum extent necessary, taking into account any applicable standards and guidelines.	Law on chemicals („Official Gazette of RM " No 145/10, 53/11), Article 83, 84; Law on Plant protection products („Official Gazette of RM" No 110/2007; 20/2009; 17/2011 и 53/2011), Article 14, article 17, article 36.
Article 5 paragraph 1 (a)(i, ii, iii, iv, v, vi))	Each Party shall at a minimum take the following measures to reduce the total releases derived from anthropogenic sources of each of the chemicals listed in Annex C, with the goal of their continuing minimization and, where feasible, ultimate elimination: (a) Develop an action plan or, where appropriate, a regional or subregional action plan within two years of the date of entry into force of this Convention for it, and subsequently implement it as part of its implementation plan specifi ed in Article 7, designed to identify, characterize and address the release of the chemicals listed in Annex C and to facilitate implementation of subparagraphs (b) to (e). The action plan shall include the following elements: (i) An evaluation of current and projected releases, including the development and maintenance of source inventories and release estimates, taking into consideration the source categories identified in Annex C; (ii) An evaluation of the effi cacy of the laws and policies of the Party relating to the management of such releases; (iii) Strategies to meet the obligations of this paragraph, taking into account the evaluations in (i) and (ii); (iv) Steps to promote education and training with regard to, and awareness of, those strategies; (v) A review every five years of those strategies and of their success in meeting the obligations of this paragraph; such reviews shall be included in reports submitted pursuant to Article 15; (vi) A schedule for implementation of the action plan, including for the strategies and measures identifi ed	Law on Ambient Air Quality, Article 25, Article 26 (OG of the RM no. 67/2004, 92/2007, 35/10, 47/11, 59/12), Law on Environment, Article 104 (7)

	therein;	
Article 5 paragraph 1 (b)	Promote the application of available, feasible and practical measures that can expeditiously achieve a realistic and meaningful level of release reduction or source elimination;	Law on Ambient Air Quality, Article 13 (OG of the RM no. 67/2004, 92/2007, 35/10, 47/11, 59/12); Rulebook on the limit values for allowed emission levels and different types of polluting substances in the waste gases and vapors emitted by the stationary sources in the air (OG of the RM no.141/10), Annex 1 Tab. 15; Law on Environment, Article 104 (7)
Article 5 paragraph (c)	Promote the development and, where it deems appropriate, require the use of substitute or modifi ed materials, products and processes to prevent the formation and release of the chemicals listed in Annex C, taking into consideration the general guidance on prevention and release reduction measures in Annex C and guidelines to be adopted by decision of the Conference of the Parties;	/
Article 5 paragraph 1 (d)	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 identifi ed as warranting such action in its action plan, with a particular initial focus on source categories identifi ed 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 that Annex shall 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 the identifi ed categories, Parties shall promote the use of best environmental practices. When applying best available techniques and best environmental practices, Parties should take into consideration the general guidance on prevention and release reduction measures in that Annex and guidelines on best available techniques and best environmental practices to be adopted by decision of the Conference of the Parties;	Law on Environment, Article 104 (7), Article 106 paragraph 3, Article 107 paragraph 1, paragraph 4 sub- paragraph 6, paragraph 5, paragraph 8
Article 5 paragraph 1 (f)(vi)(g)	Release limit values or performance standards may be used by a Party to fulfill its commitments for best available techniques under this paragraph.	Rulebook on the limit values for allowed emission levels and different types of polluting substances in the waste gases and vapors emitted by the stationary sources in the air, Annex 1 Tab. 15
Article 6 paragraph 1 (a)(i, ii)	In order to ensure that stockpiles consisting of or containing chemicals listed either in Annex A or Annex B and wastes, including products and articles upon becoming wastes, consisting of, containing or contaminated with a chemical listed in Annex A, B or C, are managed in a manner protective of human health and the environment, each Party shall: (a) Develop appropriate strategies for identifying:	Law on Plant Protection Products (OG of the RM no. 110/2007; 20/2009; 17/2011 и 53/2011), Article 10 paragraph 3; Law on the Waste Management (OG of the RM no. 68/04, 107/07, 102/08, 143/08, 124/10, 51/11, 123/12), Article 15 paragraph 1(5)

	(i) Stockpiles consisting of or containing chemicals listed either in Annex A or Annex B; and (ii) Products and articles in use and wastes consisting of, containing or contaminated with a chemical listed in Annex A, B or C;	
Article 6 paragraph 1 (b)	Identify, to the extent practicable, stockpiles consisting of or containing chemicals listed either in Annex A or Annex B on the basis of the strategies referred to in subparagraph (a);	Law on Plant Protection Products, Article 10 paragraph 3; Law on the Waste Management, Article 15 paragraph 1(5)
Article 6 paragraph 1 (c)	Manage stockpiles, as appropriate, in a safe, effi cient and environmentally sound manner. Stockpiles of chemicals listed either in Annex A or Annex B, after they are no longer allowed to be used according to any specifi c exemption specifi ed in Annex A or any specifi c exemption or acceptable purpose specifi ed in Annex B, except stockpiles which are allowed to be exported according to paragraph 2 of Article 3, shall be deemed to be waste and shall be managed in accordance with subparagraph (d);	Law on Plant Protection Products, Article 10 paragraph 3;
Article 6 paragraph 1 (d)(iii)	Not permitted to be subjected to disposal operations that may lead to recovery, recycling, reclamation, direct reuse or alternative uses of persistent organic pollutants; and	Law on the Waste Management, Article 69 paragraph 1(2)
Article 6 paragraph 1 (e)	Endeavour to develop appropriate strategies for identifying sites contaminated by chemicals listed in Annex A, B or C; if remediation of those sites is undertaken it shall be performed in an environmentally sound manner.	Law on Environment, Article 130
Article 10 paragraph 1(a, b, c, d, e, f, g)	Each Party shall, within its capabilities, promote and facilitate: (a) Awareness among its policy and decision makers with regard to persistent organic pollutants; (b) Provision to the public of all available information on persistent organic pollutants, taking into account paragraph 5 of Article 9; (c) Development and implementation, especially for women, children and the least educated, of educational and public awareness programmes on persistent organic pollutants, as well as on their health and environmental effects and on their alternatives; (d) Public participation in addressing persistent organic pollutants and their health and environmental effects and in developing adequate responses, including opportunities for providing input at the national	Law on Environment, Article 56

	level regarding implementation of this Convention; (e) Training of workers, scientists, educators and technical and managerial personnel; (f) Development and exchange of educational and public awareness materials at the national and international levels; and (g) Development and implementation of education and training programmes at the national and international levels.	
Article 10 paragraph 3	Each Party shall, within its capabilities, encourage industry and professional users to promote and facilitate the provision of the information referred to in paragraph 1 at the national level and, as appropriate, subregional, regional and global levels.	Law on Environment, Article 56
Article 10 paragraph 4	In providing information on persistent organic pollutants and their alternatives, Parties may use safety data sheets, reports, mass media and other means of communication, and may establish information centres at national and regional levels.	Law on Environment, Article 56
Article 11 paragraph 1(a, b, c, d, e, f, g)	The Parties shall, within their capabilities, at the national and international levels, encourage and/or undertake appropriate research, development, monitoring and cooperation pertaining to persistent organic pollutants and, where relevant, to their alternatives and to candidate persistent organic pollutants, including on their: (a) Sources and releases into the environment; (b) Presence, levels and trends in humans and the environment; (c) Environmental transport, fate and transformation; (d) Effects on human health and the environment; (e) Socio-economic and cultural impacts; (f) Release reduction and/or elimination; and (g) Harmonized methodologies for making inventories of generating sources and analytical techniques for the measurement of releases.	Law on Environment, Article 47
Annex A ELIMINATION **Part IV**	Hexabromodiphenyl ether and heptabromodiphenyl ether	List of prohibitions and restrictions to the use of chemicals (OG of the RM no. 57/11, 67/12)
Annex A	Tetrabromodiphenyl ether and pentabromodiphenyl ether	List of prohibitions and restrictions to the use of chemicals (OG of the RM no. 57/11,

ELIMINATION **Part V**		67/12)
Annex B **RESTRICTION** **Part III**	Perfluorooctane sulfonic acid, its salts, and perfluorooctane sulfonyl fluoride	List of prohibitions and restrictions to the use of chemicals (OG of the RM no. 57/11, 67/12)
Annex C **UNINTENTIONAL PRODUCTION** **Part I**	Persistent organic pollutants subject to the requirements of Article 5	Law on Ambient Air Quality, Article 13; Rulebook on the limit values for allowed emission levels and different types of polluting substances in the waste gases and vapors emitted by the stationary sources in the air
Annex C **UNINTENTIONAL PRODUCTION** **Part IV**	Definitions	Law on the waste management Law on the Waste Management (OG of the RM no. 68/04, 107/07, 102/08, 143/08, 124/10, 51/11, 123/12), Article 6 paragraph 10
Articles of the Stockholm Convention which are not transposed into national legislation of the Republic. Macedonia		
These articles and stories of the Stockholm Convention are not transposed into the Macedonian national legislation : Article 1 , Article 2, paragraph 1 (a) , Article 2, paragraph 1 (b) , Article 2, paragraph 1 (c) , Article 3, paragraph 2 (e) , Article 4, paragraph 1 , Article 4, paragraph 2 (a) , Article 4, paragraph 2 (b) , Article 4, paragraph 2 (c) , Article 4, paragraph 3 , Article 4, paragraph 4 , Article 4, paragraph 5 , Article 4, paragraph 6 , Article 4, paragraph 7 , Article 4, paragraph 8 , Article 9 , paragraph 4 , Article 5, paragraph 1 (c) , Article 5 § 1 (f) (v), Article 5 § 1 (f) (vi) (a, b) , Article 7 paragraph 1 (a , b , c) , Article 7, paragraph 2 , Article 7, paragraph 3 , Article 8, paragraph 1 , Article 8, paragraph 2 , Article 8, paragraph 3 , Article 8, paragraph 4 (a , b) , Article 8, paragraph 5 , Article 8 , paragraph 6 , Article 8, paragraph 7 (a , b) , Article 8, Paragraph 8 , Article 9 , paragraph 8 , Article 9, paragraph 2 , Article 9, paragraph 3 , Article 9, paragraph 4 , Article 9, paragraph 5 , Article 11, paragraph 2 (a , b , c , d , e , f) , Article 12 paragraph 1 , Article 12, paragraph 2 , Article 12, paragraph 3 , Article 12, paragraph 4 , Article 12, paragraph 5 , Article 13, paragraph 1 , Article 13, paragraph 2 , Article 13, paragraph 3 , Article 13, paragraph 4 , Article 13, paragraph 5 , Article 13, paragraph 6 , Article 13, paragraph 7 (a , b , c , e , g) , Article 13, paragraph 8 , Article 14 , Article 15, paragraph 1 , Article 15 paragraph 2 (a) , Article 15, paragraph 2 (b) , Article 15, paragraph 3 , Article 16, paragraph 1 , Article 16, paragraph 2 (a , b , c) , Article 16, paragraph 3 (a , b , c) , Article 17 , Article 18, paragraph 1 , Article 18, paragraph 2 (a) , Article 18, paragraph 2 (b) , Article 18, paragraph 3 , Article 18 , paragraph 4 , Article 18, paragraph 5 , Article 18, paragraph 6 , Article 19, paragraph 1 , Article 19 paragraph 2 , Article 19, paragraph 3 , Article 19, paragraph 4 , Article 19, paragraph 5 (a) , Article 19, paragraph 5 (b) , Article 19, paragraph 5 (c) , Article 19, paragraph 5 (d) , Article 19, paragraph 6 (a) Article 19, paragraph 6 (b) , Article 19, paragraph 6 (c) , Article 19, paragraph 7 , Article 19, paragraph 8 , Article 20, paragraph 1 , Article 20, paragraph 2 (a) , Article 20, paragraph 2 (b) Article 20, paragraph 2 (c) , Article 20, paragraph 2 (d) , Article 20 paragraph 2 (g) , Article 20, paragraph 2 (f) , Article 20, paragraph 3 , Article 21, paragraph 1 , Article 21, paragraph 2 , Article 21, paragraph 3 , Article 21, paragraph 4 , Article 21, paragraph 5 , Article 22, paragraph 1 , Article 22, paragraph 2 , Article 22, paragraph 3 (a) , Article 22, paragraph 3 (b) , Article 22, paragraph 3 (c) , Article 22, paragraph 4 , Article 22, paragraph 5 (a) , Article 22, paragraph 5 (b) , Article 22, paragraph 5 (c) , Article 22, paragraph 6 , Article 23, paragraph 1 , Article 23, paragraph 2 , Article 24 , Article 25, paragraph 1 , Article 25 paragraph 2 , Article 25, paragraph 3 , Article 25, paragraph 4 , Article 26, paragraph 1 , Article 26, paragraph 2 , Article 26, paragraph 3 , Article 27 , Article 28, paragraph 1 , Article 28, paragraph 2 , Article 29 , Article 30		

7. INSTITUTIONAL FRAMEWORK OF POPS MANAGEMENT IN MACEDONIA

Institution	Sector / Unit	Contribution to the management of POPs chemicals in Macedonia
Ministry of environment and physical planning	Macedonian Information Centre for Environment	Implementation of the POPs Protocol to the Convention on long-range transboundary air pollution. The activities are aimed at monitoring the emissions of POPs in all environmental media.
	Department of industrial pollution and risk management Department of chemicals and industrial accidents	Provides permanent participation in the management of chemicals including the group of POPs. Among other activities, the following can be treated as a priority of the Department: control the import / export of certain groups of chemicals, initiating the ratification of international agreements in the field of chemicals, implementation of the provisions of international and national legislation in the field of chemicals by the Ministry of Environment and Physical Planning, Prevention of accidents involving dangerous substances.
	Department of industrial pollution and risk management Department for Integrated Pollution Prevention and Control Pollution	Control of reduction and elimination of emissions and application / exemptions of POPs in IPPC applications. Special attention is given to the application of VAT / Ware among potential generators and emitters of unintentional POPs.
	National Environmental Inspectorate	Field control of POPs management in the area of environmental protection and enforcement of legal provisions for managing POPs.
Ministry of health	Bureau of Drugs	Transposition of EU legislation (REACH Regulation 1907/2006, Regulation 1272/2008 on classification, labeling and packaging of substances and mixtures, etc.) into national legislation and implementation. In terms of transposition of the REACH Regulation provided ban and restrictions on POPs.
	Institute of Public Health in R. Macedonia	Detection of the impact of POPs on human health including limited analysis of POPs in human samples and other media that potentially affect health. Analysis of pesticide residues in agricultural primary products after harvest.
	Food and Veterinary	Monitoring program to monitor pesticide residues, secondary

Institution	Sector / Unit	Contribution to the management of POPs chemicals in Macedonia
	Directorate	level (primary agricultural products after harvest)
Ministry of Agriculture, Forestry and Water Management	Phytosanitary authority	Phytosanitary Administration as a national body within the Ministry of Agriculture , Forestry and implement phytosanitary policy is governed by three laws: the Law on Plant Health (Official Gazette no. 29 / 05 , 81 / 08 , 20 / 09) 57/10 , 17/11 , Law on Products plant Protection (Official Gazette no. 110 / 07 , 20 / 09 , 17/11 , 53 /11) and Law on fertilizers (Official Gazette No. . 110 / 07 , 20 / 09 , 17/11) . As the institution responsible for the circulation and use of products for plant protection implements control of POPs and pesticides . Control the import of pesticides / permitting import of pesticides.
	National agricultural inspectorate	To supervise the supply of products for plant protection, including POPs pesticides. Control of supply of pesticides, including POPs pesticides.
	National Phutisanitary laboratory	Laboratory quality control of products for plant protection at the State Phytosanitary Laboratory testing of the content of the active substance in products for plant protection, physical and chemical properties in products to protect plants, which directly connects with the analytics of POPs pesticides
Customs Office	Department of Customs Tariff, laboratory value, origin and TARIC	Control of import / export pestidici the borders of the Republic of Macedonia. POPs at border crossings in the Republic of Macedonia. As a practical and effective tool for the movement of goods, including chemicals system is exim. Allowing electronic filing and obtaining licenses for import and export reduced the duration of the procedure and provides fast communication with the applicant.

8. WHAT ARE PERSISTENT ORGANIC POLLUTANTS (POPs)?

A growing body of scientific evidence indicates that exposure to very low doses of certain POPs – which are among the most toxic substances ever created – can lead to cancer, damage to the central and peripheral nervous systems, diseases of the immune system, reproductive disorders, and interference with normal infant and child development.

Another concern is the growing accumulation of unwanted and obsolete stockpiles of pesticides and toxic chemicals, particularly in developing countries. Dump sites and toxic drums from the 1950s, '60s, and '70s are now decaying and leaching chemicals into the soil and poisoning water resources, wildlife, and people. A great deal of infrastructure and equipment such as electrical transformers and capacitors are also at or near the end of their useful lives and may leak dangerous chemicals such as PCBs.

8.1. GENERAL CHARACTERISTICS:

Man-made -POPs are either used as pesticides, consumed by industry, or generated unintentionally as by-products of various industrial processes.

Toxic - Of all the pollutants released into the environment every year by human activity, persistent organic pollutants, or POPs, are among the most dangerous. They are highly toxic, causing an array of adverse effects, notably death, disease, and birth defects among humans and animals.

Persistent - These highly stable compounds can last for years or decades before breaking down.

Mobile - They circulate globally through a process known as the "grasshopper effect". POPs released in one part of the world can, through a repeated (and often seasonal) process of evaporation, deposit, evaporation, deposit, be transported through the atmosphere to regions far away from the original source.

Bioaccumulative - In addition, POPs concentrate in living organisms through another process called bioaccumulation. Though not soluble in water, POPs are readily absorbed in fatty tissue, where concentrations can become magnified by up to 70,000 times the background levels.

8.2. THE 12 POPS

Recognized as requiring the most urgent action are: aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, toxaphene, PCBs and dioxins and furans.

- **Aldrin** - Aldrin and dieldrin are man-made insecticides that are similar in structure. Aldrin breaks down into dieldrin in the body and in the environment. These chemicals are used to control soil insects, such as termites, corn rootworm, wireworms, rice water weevil and grasshoppers. From 1950 to 1970, aldrin and dieldrin were used on crops such as corn, cotton and potatoes. Aldrin and dieldrin are defined as hazardous solid waste. Aldrin and dieldrin bind tightly to soil and slowly evaporate into the air. Plants take in these chemicals from the soil and store them. Dieldrin is also stored in animal fat and leaves the body slowly. Dieldrin now exists everywhere in the environment, but at very low levels. Aldrin and dieldrin are both known endocrine disruptors. Human studies predict that levels above 0.20 milligrams of dieldrin in a liter of blood may result in harmful effects, such as convulsions or uncontrollable muscle movements. Aldrin treated rice is thought to have been the cause of

deaths of waterfowl, shorebirds and passerines along the Texas Gulf Coast, both by direct poisoning by ingestion of aldrin treated rice and indirectly by consuming organisms contaminated with aldrin. Residues of aldrin were detected in all samples of bird casualties, eggs, scavengers, predators, fish, frogs, invertebrates and soil.Ingesting high levels of these chemicals results in convulsions and death. Ingesting moderate levels over a longer period of time may also cause convulsions, because these chemicals build up in our bodies over time Other effects from long-term exposure include headaches, dizziness, vomiting, irritability and uncontrolled muscle movements.

- **Chlordane** - Chlordane is a broad spectrum contact insecticide that has been used on agricultural crops including vegetables, small grains, maize, other oilseeds, potatoes, sugarcane, sugar beets, fruits, nuts, cotton and jute. It has also been used extensively in the control of termites. Adheres strongly to soil particles and is not likely to enter groundwater, but can stay in soil for more than 20 years because it is slow to break down. It does not dissolve easily in water but does evaporate into the air. Builds up in the tissues of fish, birds and mammals. Chlordane is a known endocrine disruptor. Exposure by: Eating crops grown in contaminated soil, such as corn, root crops, citrus; eating fish or shellfish caught in water contaminated by chlordane; breathing air or touching soil near homes treated for termites with chlordane; breathing air or touching soil near waste sites or landfills that contain chlordane.. The U.S. Environmental Protection Agency ranks chlordane in the top 10 percent of the most toxic chemicals for human health. High levels of chlordane can cause damage to the nervous system or liver. People who breathed air containing high concentrations of chlordane or who accidentally swallowed small amounts of it have experienced headaches, irritability, confusion, weakness, vision problems, vomiting, stomach cramps, diarrhea and jaundice People and animals who ingested large amounts of chlordane have suffered convulsions and died. Japanese workers who used chlordane over a long period of time suffered minor liver damage. The International Agency for Research on Cancer has classified chlordane as a possible human carcinogen. Action to ban the use of chlordane has been taken in many countries
- **DDT** - DDT was widely used during the Second World War to protect the troops and civilians from the spread of malaria, typhus and other vector borne diseases. After the war, DDT was widely used on a variety of agricultural crops and for the control of disease vectors as well. It is still being produced and used for vector control. Growing concern about adverse environmental effects, especially on wild birds, led to severe restrictions and bans in many developed countries in the early 1970s. The largest agricultural use of DDT has been on cotton, which accounted for more than 80% of the US use before its ban there in 1972. DDT is still used to control mosquito vectors of malaria in numerous countries. DDT is highly insoluble in water and is soluble in most organic solvents. It is semi-volatile and can be expected to partition into the atmosphere as a result. Its presence is ubiquitous in the environment and residues have even been detected in the arctic. It is lipophilic and partitions readily into the fat of all living organisms and has been demonstrated to bioconcentrate and biomagnify. The breakdown products of DDT, 1,1-dichloro-2,2-bis(4-chlorophenyl)ethane (DDD or TDE) and 1,1-dichloro-2,2bis(4-chlorophenyl)ethylene) (DDE), are also present virtually everywhere in the environment and are more persistent than the parent compound. DDT enters the body through food such as fruits, vegetables, meat, fish, and poultry, especially imported foods. DDT is found in soil, and can be transferred to crops grown on this

soil. Root and leafy vegetables contain the highest amounts. DDT primarily affects the nervous system. People more susceptible to the toxic effects of DDT are individuals with diseases of the nervous system, liver or blood. Ingestion or exposure may cause excitability, tremors, seizures, rashes, confusion, convulsions and parethesia (paralysis) of the tongue and lips. Long-term, low doses have caused changes in levels of liver enzymes, harmful effects on reproduction, and an increased occurrence of liver tumors. Its continuing presence raises serious concerns regarding potential effects on developing infants.

- **Dieldrin**- Dieldrin has been used in agriculture for the control of soil insects and several insect vectors of disease but this latter use has been banned in a number of countries due to environmental and human health concerns. Principle contemporary uses are restricted to control termites and wood borers and against textile pests. As aldrin is readily and rapidly converted to dieldrin in the environment and in organisms, the levels of dieldrin detected likely reflect the total concentrations of both compounds Dieldrin binds strongly to soil particles and hence is very resistant to leaching into groundwater. Volatilization is an important mechanism of loss from the soil and, because of its persistent nature and hydrophobicity, dieldrin is known to bioconcentrate. The half life of dieldrin in temperate soils is approximately 5 years. This persistence, combined with high lipid solubility, provides the necessary conditions for dieldrin to bioconcentrate and biomagnify in organisms. It is likely that dieldrin is bioconcentrated by aquatic organisms rather than bioaccumulated. Dairy products, such as milk and butter, and animal meats were the primary sources of exposure.
- **Endrin -** Can contaminate surface water from soil runoff. Doesn't dissolve well in water. Clings to the bottom sediments of rivers, lakes and other bodies of water. Generally not found in the air except when applied to fields during agricultural applications. May stay in the soil for more than 10 years. Endrin is a foliar insecticide used mainly on field crops such as cotton and grains. It has also been used as a rodenticide to control mice and voles. It is rapidly metabolised by animals and does not accumulate in fat to the same extent as other compounds with similar structures. Endrin is highly toxic to fish. The chemical properties of endrin (low water solubility, high stability in the environment, and semi-volatility) favour its long range transport, and it has been detected in arctic freshwater. The main source of endrin exposure to the general population is residues in food however, contemporary intake is generally below the acceptable daily intake.
- **Heptachlor** - Insoluble in water, Heptachlor binds to aquatic sediments and bioconcentrates in the fat of living organisms. It evaporates slowly in air. The half life of Heptachlor in temperate soil is up to two years. An insecticide used primarily to kill soil insects and termite, it has also been used to control cotton insects, grasshoppers, and some crop pests, especially for corn. In addition, it has been used to combat malaria. Heptachlor is metabolised in animals to heptachlor epoxide, whose toxicity is similar to that of heptachlor, and which may also be stored in animal fat. WHO suggests that food is the major source of exposure of heptachlor to the general population, as well as: ingestion of residues in food, i.e., eating crops grown in soil that contains Heptachlor or eating fish, dairy products, and fatty meats from animals exposed to Heptachlor in their food, inhalation in homes treated for termite control, drinking contaminated water, or skin contact with soil near waste sites or landfills, breast milk from mothers who had high exposures. IARC has classified heptachlor as a

possible human carcinogen. It has been banned in more than 50 countries and severely restricted in seven.

- **Hexachlorobenzene (HCB)** - Hexachlorobenzene is a fungicide that was first introduced in 1945 for seed treatment, especially for control of bunt of wheat. HCB is also a byproduct of the manufacture of industrial chemicals including carbon tetrachloride, perchlorethylene, trichloroethylene and pentachlorbenzene. Also a by-product of manufacturing industrial chemicals. Used to make fireworks, ammunition, wood preservatives, dyes and synthetic rubber. Processes that form HCB as byproducts are: manufacture of other chemicals, chemical interactions in waste streams of chloralkali and wood-preserving plants and burning of municipal waste. HCB is toxic to humans and animals when long-term exposure occurs (consuming dairy products or meat from cattle grazing on contaminated pastures, eating low levels in contaminated food, eating or touching contaminated soil, or drinking small amounts in contaminated water, breathing low levels in contaminated air, For babies, drinking contaminated breast milk from exposed mothers, working in a factory that uses or produces HCB unintentionally. Unintentional production is possible since HCB is formed as a byproduct of chemical manufacture and waste incineration). Its main health effect is liver disease. HCB was determined to be a probable human carcinogen.
- **Mirex** - Considered one of the most stable and persistent pesticides, with a half life of up to 10 years. Does not dissolve easily in water, but it easily sticks to soil and sediment particles. It is not likely to travel far through the soil and into underground water but can build up in fish or other organisms that live in contaminated water or that eat other contaminated animals. It has been used to combat termites and ants. It is also used as a flame retardant in plastics, rubber, paint, paper and electrical goods. Exposure: touching or ingesting contaminated soil near hazardous waste sites or ingesting contaminated fish or other animals living near hazardous waste sites. IARC has concluded that while there is inadequate evidence for the carcinogenicity of Mirex in humans, there is sufficient evidence in experimental animals. IARC has classified Mirex as a possible human carcinogen. Crustaceans are the most sensitive aquatic organisms, with larval and juvenile stages being the most sensitive. Delayed mortality is typical of Mirex poisoning in crustaceans.
- **Toxaphene** - Used primarily to control insect pests on cotton, cereal grains, fruits, nuts and vegetables. It has also been used to control ticks and mites in livestock. A solid or gas. In its original form it is a yellow to amber waxy solid that smells like turpentine. It may enter the air by evaporation. It does not dissolve well in water, so it is more likely to be found in air, soil, or sediment at the bottom of lakes or streams. Has a half life in soil of up to 12 years, has been shown to bioconcentrate in aquatic organisms and undergoes long-range transport. Exposure of the general population is most likely through food, however levels detected are generally below maximum residue limits. while there is inadequate evidence for the carcinogenicity of Toxaphene in humans, there is sufficient evidence in animals. Brook trout exposed to Toxaphene for 90 days experienced a 46% reduction in weight at 0.039 µg/L, the lowest concentration tested. Egg viability in female trout was significantly reduced upon exposure to a concentration of 0.075 µg/L or more. Long term exposure to 0.5 µg/L reduced egg viability to zero. IARC has classified Toxaphene as a possible human carcinogen. It is banned in 37 countries and severely restricted in 11 others.
- **Polychlorinated biphenyls (PCBs)** - PCBs are used in a variety of industrial uses, including as dielectrics in transformers and large capacitors, as heat exchange fluids, as paint additives, in

carbonless copy paper and in plastics. The degradation of PCBs in the environment depends largely on the degree of chlorination of the biphenyl, with persistence increasing as the degree of chlorination increases. Half-lives for PCBs undergoing photodegradation range from approximately 10 days to 1.5 years. There is growing evidence linking persistent halogenated aromatic hydrocarbons such as PCBs to reproductive and immunotoxic effects in wildlife. The main source of PCB exposure to the general population is through food, especially fish. Children born seven to twelve years after maternal exposure experienced mildly delayed development, but no differences in behaviour. Effects observed in these children is likely a result of the persistence of PCBs in the human body, resulting in prenatal exposure long after the exposure took place. there is limited evidence for the carcinogenicity of PCBs in humans, and there is sufficient evidence in experimental animals. PCBs are therefore classified as probable humans carcinogens.

- **Polychlorinated dibenzo-para-dioxins (dioxins) and polychlorinated dibenzofurans (furans)** - are two groups of planar tricyclic compounds that have very similar chemical structures and properties. Neither dioxins nor furans are produced commercially, and they have no known use. They are by-products resulting from the production of other chemicals. Dioxins may be released into the environment through the production of pesticides and other chlorinated substances. Furans are a major contaminant of PCBs. Both dioxins and furans are related to a variety of incineration reactions, and the synthesis and use of a variety of chemical products. Dioxins and furans have been detected in emissions from the incineration of hospital waste, municipal waste, hazardous waste, car emissions, and the incineration of coal, peat and wood. Dioxins and furans are considered to be very stable and persistent, as illustrated by the half life of TCDD in soil of 10-12 years. As with most other organochlorines, food is a major source of dioxins and furans in the general population, with food of animal origin contributing the most to human body burdens. IARC has concluded that while there is inadequate evidence for the carcinogenicity of 2,3,7,8-TCDD in humans, there is sufficient evidence in experimental animals. IARC has classified 2,3,7,8-TCDD as a possible human carcinogen.

9. INVENTORY OF NEW INDUSTRIAL POPs CHEMICALS

9.1. INTRODUCTION

The National Implementation Plan for the Stockholm Convention in the Republic of Macedonia regarding POPs chemicals need to be updated with amended list of POPs chemicals with additional 9 new persistent organic pollutants (including new industrial POPs, pesticides and unintentional POPs).

The following 5 chemicals have been identified by the Stockholm Convention as new industrial POPs chemicals with:

- Tetrabromodiphenyl ether and pentabromodiphenyl ether (commercial pentabromo-diphenyl ether),
- Pentachlorobenzene (PeCB),
- Hexabromodiphenyl ether and heptabromodiphenyl ether (commercial octabromodiphenyl ether),
- Hexabromobiphenyl,
- Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOS-F)

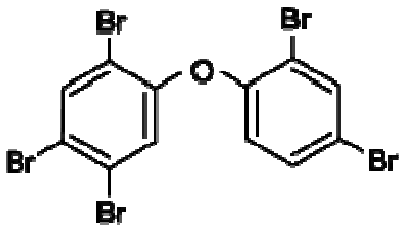
These chemical are among the most toxic substances ever created – can lead to cancer, damage to the central and peripheral nervous systems, diseases of the immune system, reproductive disorders, and interference with normal infant and child development. But this doesn't mean that these products are dangerous for everyday use. Their improper management during the entire life cycle of the product especially wastes management can lead to POPs emissions and accumulation of the chemicals in human body, animals and the environment.

9.1.1. TETRABROMODIPHENYL ETHER AND PENTABROMODIPHENYL ETHER (COMMERCIAL PENTABROMODIPHENYL ETHER)

The chemical is listed under Annex A to the Stockholm Convention with a specific exemption for use as articles containing these chemicals for recycling in accordance with the provision in Part IV of Annex A to the Convention.

Tetrabromodiphenyl ether and pentabromodiphenyl ether are the main components of commercial pentabromodiphenyl ether.

- *Structural formula*



- *POPs characteristics of tetraBDE and pentaBDE*

Commercial mixture of pentaBDE is highly persistent in the environment, bioaccumulative and has a high potential for long-range environmental transport. These chemicals have been detected in

humans in all regions. There is evidence of its potential for toxic effects in wildlife, including mammals.

- *Replacement of tetraBDE and pentaBDE*

Alternatives are available and used to replace these substances in many countries, although they might also have adverse effects on human health and the environment. Alternatives might not be available for use in military airplanes. The identification and also handling of equipment and wastes containing brominated diphenyl ethers is considered a challenge.

Polybromodiphenyl ether congeners including tetraBDE, pentaBDE, hexaBDE, and heptaBDE inhibitor suppress combustion in organic materials and therefore are used as additive flame retardants.

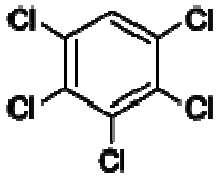
9.1.2. PENTACHLOROBENZENE (PECB)

The chemical is listed under Annex A and under Annex C to the Stockholm Convention.

- *Chemical identity and properties*

PeCB belongs to a group of chlorobenzenes that are characterized by a benzene ring in which the hydrogen atoms are substituted by one or more chlorines.

- *Structural formula*



- *Use and production*

PeCB was used in PCB products, in dyestuff carriers, as a fungicide, a flame retardant and as a chemical intermediate e.g. previously for the production of quintozene. PeCB might still be used as an intermediate. PeCB is also produced unintentionally during combustion, thermal and industrial processes. It also present as impurities in products such as solvents or pesticides.

- *POPs characteristics of PeCB*

PeCB is persistent in the environment, highly bio accumulative and has a potential for long-range environmental transport. It is moderately toxic to humans and very toxic to aquatic organisms.

- *Replacement of PeCB*

The production of PeCB ceased some decades ago in the main producer countries as efficient and cost-effective alternatives are available. Applying Best Available Techniques and Best Environmental Practices would significantly reduce the unintentional production of PeCB.

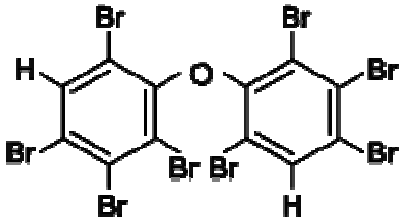
9.1.3. HEXABROMODIPHENYL ETHER AND HEPTABROMODIPHENYL ETHER (COMMERCIAL OCTABROMODIPHENYL ETHER)

The chemical is listed under Annex A to the Stockholm Convention with a specific exemption for use as articles containing these chemicals for recycling in accordance with the provision in Part IV of Annex A to the Convention.

- *Chemical identity and properties*

Hexabromodiphenyl ether and heptabromodiphenyl ether are the main components of commercial octabromodiphenyl ether.

- *Structural formula*



- *POPs characteristics of hexaBDE and heptaBDE*

Commercial mixture of octaBDE is highly persistent, has a high potential for bioaccumulation and food-web biomagnification, as well as for long-range transport. The only degradation pathway is through debromination and producing other bromodiphenyl ethers.

- *Replacement of hexaBDE and heptaBDE*

Alternatives generally exist and there is no information about any current production. However, it is reported that many articles in use still contain these chemicals.

- *Debromination and precursors*

Polybromodiphenyl ethers can be subject to debromination, i.e. the replacement of bromine on the aromatic ring with hydrogen.

Higher bromodiphenyl ether congeners may be converted to lower, and possibly more toxic, congeners. The higher congeners might therefore be precursors to the tetraBDE, pentaBDE, hexaBDE, or heptaBDE.

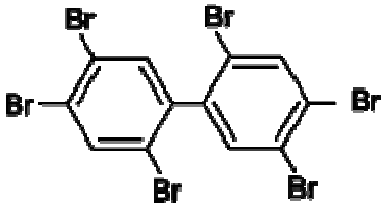
9.1.4. HEXABROMOBIPHENYL

The chemical is listed under Annex A to the Stockholm Convention.

- *Chemical identity and properties*

Hexabromobiphenyl belongs to the group of polybrominated biphenyls, which are brominated hydrocarbons formed by substituting hydrogen with bromine in biphenyl.

- *Structural formula*



- *Use and production*

Hexabromobiphenyl is an industrial chemical that has been used as a flame retardant, mainly in the 1970s. According to available information, hexabromobiphenyl is no longer produced or used in most countries.

- *POPs characteristics of hexabromobiphenyl*

The chemical is highly persistent in the environment, highly bioaccumulative and has a strong possibility for long-range environmental transport. As hexabromobiphenyl is classified as a possible human carcinogen and has other chronic toxic effects, the Committee recommended its listing as a POP.

- *Replacement of hexabromobiphenyl*

Alternatives are available for all uses of hexabromobiphenyl, so prohibiting its use and production is feasible and inexpensive. This chemical is already subject to several national and international regulations, restricting its use and production.

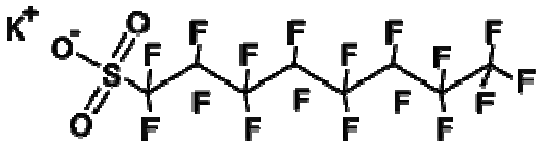
9.1.5. PERFLUOROOCTANE SULFONIC ACID (PFOS), ITS SALTS AND PERFLUOROOCTANE SULFONYL FLUORIDE (PFOS-F)

The chemical is listed under Annex B to the Stockholm Convention with acceptable purposes and specific exemptions

- *Chemical identity and properties*

PFOS is a fully fluorinated anion, which is commonly used as a salt or incorporated into larger polymers. PFOS and its closely related compounds, which may contain PFOS impurities or substances that can result in PFOS, are members of the large family of perfluoroalkyl sulfonate substances.

- *Structural formula*



- *Use and production*

PFOS is both intentionally produced and an unintended degradation product of related anthropogenic chemicals. The current intentional use of PFOS is widespread and includes: electric and electronic parts, fire fighting foam, photo imaging, hydraulic fluids and textiles. PFOS is still produced in several countries.

- *POPs characteristics of PFOS*

PFOS is extremely persistent and has substantial bio accumulating and biomagnifying properties, although it does not follow the classic pattern of other POPs by partitioning into fatty tissues but instead binds to proteins in the blood and the liver. It has a capacity to undergo long-range transport and also fulfils the toxicity criteria of the Stockholm Convention.

Replacement of PFOS

While alternatives to PFOS are available for some applications, this is not always the case in developing countries where existing alternatives may need to be phased in. For some applications like photo imaging, semi-conductor or aviation hydraulic fluids, technically feasible alternatives to PFOS are not available to date.

- *Acceptable purposes:*

Photo-imaging, photo-resist and anti-reflective coatings for semi-conductor, etching agent for compound semi-conductor and ceramic filter, aviation hydraulic fluids, metal plating (hard metal plating) only in closed-loop systems, certain medical devices (such as ethylene tetrafluoroethylene 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 exemptions:*

Photo masks in the semiconductor and liquid crystal display (LCD) industries, metal plating (hard metal plating, decorative plating), electric and electronic parts for some colour printers and colour copy machines, insecticides for control of red imported fire ant, and termites, chemically driven oil production, carpets, leather and apparel, textiles and upholstery, paper and packaging, coatings and coating additives, rubber and plastics.

9.2. BACKGROUND INFORMATION ON PBDEs (C-PENTABDE, C-OCTABDE)

Polybromodiphenyl ethers (PBDEs) are a group of brominated industrial chemicals which have been widely used since 1970s as flame retardants in the form of additives in consumer articles such as plastics in electronics, upholstery in transport and furniture or textiles. The acronym PBDEs is used for the generic term polybromodiphenyl ether, covering all congeners of the family of brominated diphenyl ethers. PBDEs were produced at three different degrees of bromination, in particular commercial Pentabromodiphenyl ether (c-PentaBDE), and commercial Octabromodiphenyl ether (c-OctaBDE).

For the first time brominated flame retardants (BFRs) have been added to Annex A of the Convention. Group of polybrominated diphenyl ethers (PBDEs) are industrial aromatic chemicals that were used as additive flame retardants in a consumer products. In this group are included commercial mixtures of:

- commercial Pentabromodiphenyl ether (c-PentaBDE)
- commercial Octabromodiphenyl ether (c-OctaBDE)
- Hexabromobiphenyls (HBB)

Following industrial sectors were using PBDEs:

- Organobromine industry
- Electrical and electronics industry

- Transport industry
- Furniture industry
- Textiles and carpet industry
- Construction industry
- Recycling industry

The main articles that contain POP-BDEs are:

- plastics from imported electronics;
- plastics in electronics produced in the country;
- polyurethane in imported cars and cars in the country;
- Polyurethane imported with other goods (mattresses, furniture, etc.)

Largest quantities of PBDEs production was in period 1970-2005 (1.3-1.5 Mt). Production stopped in EU in 1997 and in USA in 2004.

They are still in use by the products that are produced in that period (plastic materials in electronic equipment, furniture material for vehicles) that will soon become waste and are main sources of contamination with POP-BDEs. The main sources of contamination with PBDEs are presented on Figure 2.

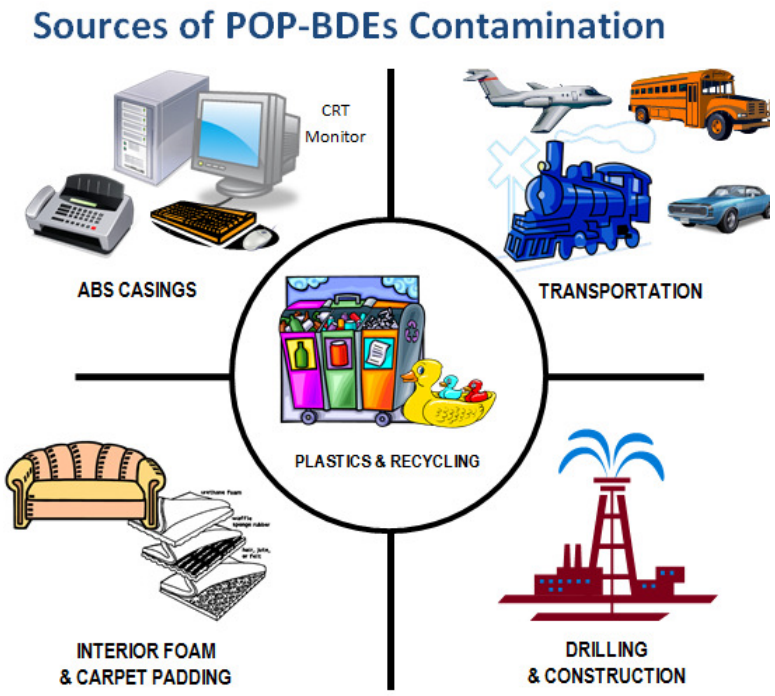


Figure 2 Sources of POP-BDE contamination

Source: "Guidance for the Inventory of Polybrominated Diphenyl Ethers (PBDEs) listed under the Stockholm Convention on Persistent Organic Pollutants"

9.2.1. FORMER USE OF COMMERCIAL PENTABDE (C-PENTABDE)

An approximate distribution of global c-PentaBDE use of 36% in transport, 60% in furniture and a 4% residual in other articles is considered to be reasonable. The average content of c-PentaBDE in PUR foam is around 3-5% for upholstery, cushions, mattresses and carpet padding. The main challenge for their elimination is the identification of existing stockpiles and articles containing PBDEs

and their disposal at end of life. The schematic diagram of the life-cycle of products containing c-pentaBDE (during their production, in use and waste management) is presented on following Figure 3.

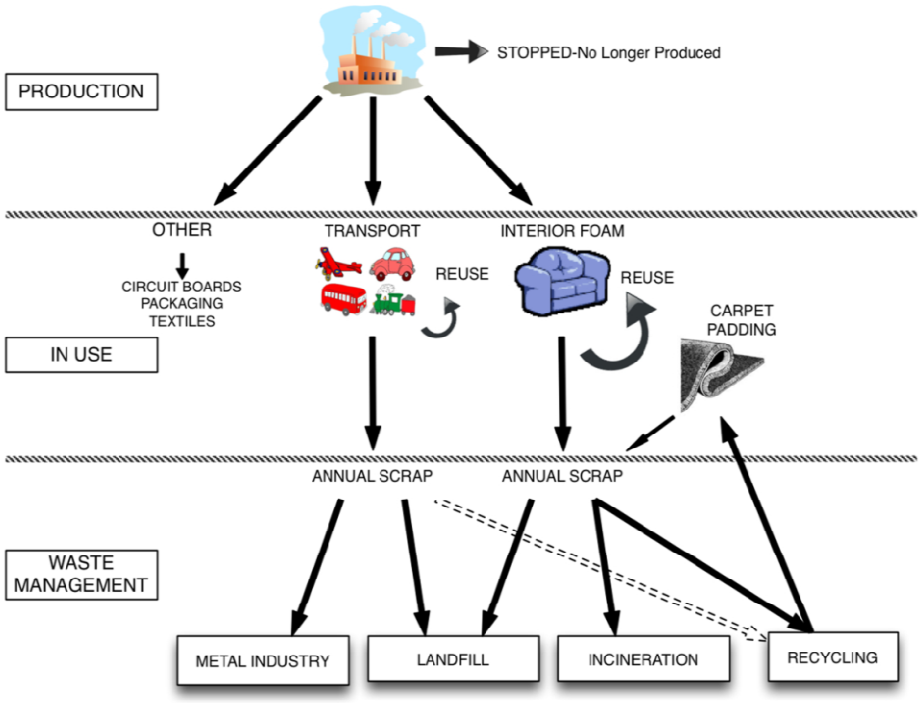


Figure 3 Schematic diagram of the life cycle of c-PentaBDE and potential for emissions

Source: "Guidance for the Inventory of Polybrominated Diphenyl Ethers (PBDEs) listed under the Stockholm Convention on Persistent Organic Pollutants"

It is considered that the largest use of c-PentaBDE (90-95%) was for the treatment of polyurethane foam (PUR). These foams were mainly used for the production of automotive and upholstery applications. The automotive industry has also indicated that 4% would be the most realistic figure for concentration of PentaBDE in PUR foam used in cars in agreement with information from industry. The 'other' minor uses included e.g. textiles, printed circuit boards, insulation foam, cable sheets, conveyer belts, lacquers and drilling oils. The following table summarizes the Use of c-PentaBDE in polymers/resins, the applications and commercial commodities.

Table 10 Use of c-PentaBDE in polymers/ resins, the applications and commercial commodities

Materials/polymers/resins	Applications	Commercial commodities for the applications
Polyurethane (PUR)	Cushioning materials, packaging, padding, construction	Furniture, transportation. sound insulation, packaging, padding panels, rigid PUR foam construction
Textiles	Coatings	Back coatings and impregnation for carpets, automotive seating, furniture in

Materials/polymers/resins	Applications	Commercial commodities for the applications
		homes and official buildings, aircraft, underground.
Epoxy resins	Circuit boards, protective coatings	Computers, ship interiors, electronic parts.
Rubber	Transportation	Conveyor belts, foamed pipes for insulation.
Polyvinylchloride (PVC)	Cable sheets	Wires, cables, floor mats, industrial sheets.
Unsaturated (Thermoset) polyesters (UPE)	Circuit boards, coatings	Electrical equipment, coatings coatings for chemical processing plants moldings, military and marine applications: construction panels.
Paints/lacquers	Coatings	Marine and industry lacquers for protection of containers
Hydraulic oils	Drilling oils, hydraulic fluids	Off shore, coal mining

The total amount of these other minor uses is estimated to account for 5% or less of the total usage of c-pentaBDE.

9.2.2. FORMER USE OF C-OCTABDE

The main historic use of c-OctaBDE was in Acrylonitrilebutadiene-styrene (ABS) polymers, e.g. 95% of c-OctaBDE supplied in the EU was used in ABS. The ABS in turn was mainly used for housings/casings of Electrical and Electronic Equipment (EEE), particularly in Cathode Ray Tube (CRT) housings and office equipment such as copying machines and business printers, typically office equipment and business machines. Other minor uses were High Impact Polystyrene (HIPS), polybutylene terephthalate (PBT), Polyamide Polymers also mainly used in electronics and to some extent in the transport sector.

The schematic diagram of the life-cycle of products containing c-pentaBDE (during their production, in use and waste management) is presented on following Figure 4.

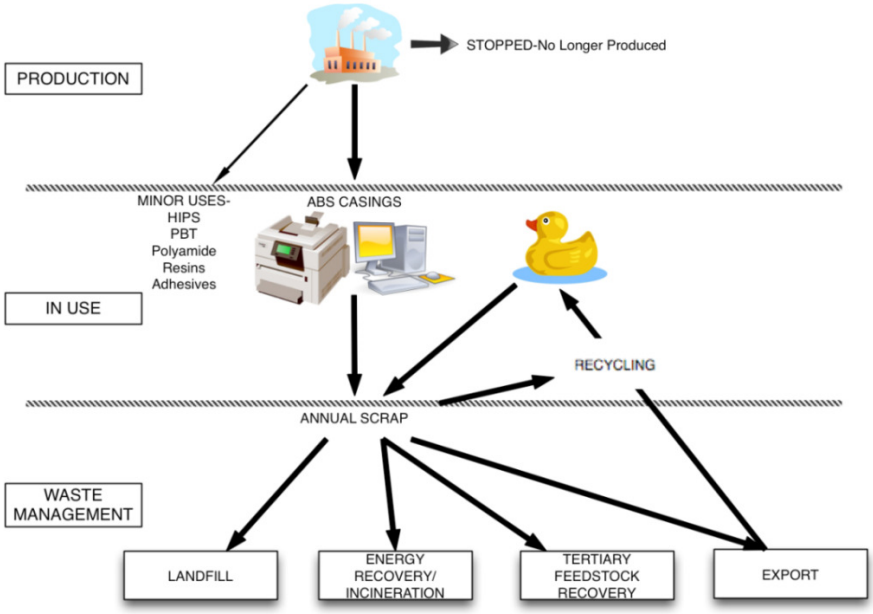


Figure 4 Schematic diagram of the life cycle of c-OctaBDE and potential for emissions

Source: "Guidance for the Inventory of Polybrominated Diphenyl Ethers (PBDEs) listed under the Stockholm Convention on Persistent Organic Pollutants"

Typical use concentrations in the main use areas were between 12 to 15 %. Therefore, the historic production of c-OctaBDE treated polymers can be estimated to approximately 800,000 tones. The main applications and product containing c-OctaBDE is presented in the following table.

Table 11 Historic main uses of c-OctaBDE in polymers/ materials, the applications and products

Polymers/materials	Application	Products
Acrylonitrile-Butadiene-Styrene (ABS)	Polymer casings/parts in Electric and Elec-tronic appliances	Computer- and TV casings (CRTs); office equipment; (other electronic equipment)
High Impact Polystyrene (HIPS)	Polymer casings/parts in Electric and Elec-tronic appliances	Computer- and TV casings (CRTs); office equipment;
	Cold-resistant layer	Refrigerator
Polybutylen-Terephtalate (PBT)	Polymer casings	Electronic appliances
	Transport sector	Connectors in vehicles
	Household	Iron
Polyamide-Polymers	Textiles	Furniture
	Construction	Pipes and Plastic foil

Other minor uses found in literature were nylon, low density polyethylene, polycarbonate, phenol formaldehyde resins, unsaturated polyesters, adhesives and coatings.

9.3. BACKGROUND INFORMATION ON PFOS

Perfluorooctane sulphonate (PFOS), its salts, and perfluorooctane sulfonyl fluoride (PFOSF) were listed in Annex A and B in the Stockholm Convention, with an obligation to the Parties of the Convention to develop an action plan for PFOS and its related substances.

Perfluorooctane sulfonate (PFOS) is a fully fluorinated anion, which is commonly used as a salt in some applications or incorporated into larger polymers.

9.3.1. FORMER USE OF PFOS AND RELATED CHEMICALS

PFOS related substances have been manufactured for more than 50 years. Their unique physical properties, being both fat and water repelling, have made them popular in several of products. They are typically used for surface treatment, and are common in non-stick products, stain-resistant fabrics and all- weather clothing. Due to its surface-active properties, it has historically been used in a wide variety of applications, typically including fire fighting foams and surface resistance/repellence to oil, water, grease or soil. The following table presents the use of PFOS and related chemicals in different industrial sectors worldwide.

Table 12 Different uses of PFOS and related substances in the world

Main Category	Applications
Surface Treatment	Textile mills, leather tanners, finishers, fiber production, carpet manufacturers Apparel and leather, upholstery, carpet, automobile interiors.
Paper production	Food contact applications (plates, food containers, bags, wraps), nonfood contact applications (folding cartons, containers, carbonless forms, masking paper)
Performance chemicals	Firefighting foams, Mining, acid mist suppressants for metal plating, electronic etching baths, photolithography, electronic chambers, hydraulic fluid additives, alkaline cleaners, shampoo, coating additives, carpet spot cleaner, insecticide

Uses of PFOS listed the Stockholm Convention is restricted. The acceptable purposes should be phased out when suitable alternative substances or methods are available, while the other uses listed in the Convention as specific exemptions have a time-limit of 5 years.

9.4. MAIN OBJECTIVES OF THE NEW INDUSTRIAL POPS INVENTORY

The main aim and objectives of the updated National Inventory with new industrial chemicals POPs in Macedonia are:

- Organization of the industrial POPs Working Group which members together with the national expert will make the analysis, prioritization and agreed on the quantities obtained,

- Identification of the possible presence, current use and management of industrial chemicals and products containing POPs in Macedonia;
- Prioritization of industrial PFOS applications (due to the variety of applications) in relation to the application in the Republic of Macedonia and the expected current quantities;
- Raising public awareness of the importance and application of new industrial chemicals;
- Determination of the stocked quantities of industrial chemicals by using the approach - "life cycle" of products;
- Identification of contaminated areas (hot spots);
- Gap analysis for the legal and institutional framework in relation to the control of production, use, import, export of industrial chemicals and products potentially containing these products;
- Preparation of leaflets to raise public awareness
- Following previous knowledge in the preparation of the inventories
- Identifying as much as possible sources of new industrial POPs
- Start up with the Initial Assessment with possibility to go further as much as possible with Preliminary Assessment

9.5. METHODOLOGY AND SCOPE OF THE NEW INDUSTRIAL CHEMICALS POPS INVENTORY

The NIP updating process has been developed using the tools and techniques proposed within the UNIDO's "Guidance for the Inventory of Polybrominated Diphenyl Ethers (PBDEs) listed under the Stockholm Convention on Persistent Organic Pollutants" and "Guidance for the Inventory of Perfluorooctane Sulfonic Acid (PFOS) and related Chemicals under the Stockholm Convention on Persistent Organic Pollutants".

Several workshops were organized with stakeholders in the period November 2012 – June 2013 in order to establish the Working Group on new industrial chemicals POPs, to review the methodology for updating the NIP with additional new 5 industrial chemicals, to discuss which of these chemicals are still in use in Macedonia, what is the import-export regime, what could be the main sources of information and data for quantities of chemicals, products containing POPs chemicals or processes that use these chemicals in order to calculate the quantities of new industrial chemicals. What types of consumer products are on the market containing new industrial POPs (PBDEs and PFOS) on stock and is there data available about the waste management of this type of products containing new industrial POPs. The members of Working Group also perform the prioritization among the processes, industrial sectors and services in Macedonia where the new industrial chemicals could be found in order to approach those sectors first. The members of the Working Group for new industrial chemicals POPs are presented in ANNEX.

The Inventory was developed using several tools and techniques: a) organization of the Workshops with all relevant institutions which is also source of information and data of new chemicals POPs, b) review and analysis of the national data officially submitted or publicly available through institution's web site (e.g. Custom Office, State Statistical Office, Ministry of Environment and Physical Planning- Environmental Administration and State Inspectorate), c) review and analysis of the data received by other projects in Macedonia (e.g. data on vehicle fleet, import/export of vehicles and country of origin), d) preparation of the thematic questionnaires focused on importers

of EEE, companies dealing with collection, transport and treatment of WEEE and companies which belong to the prioritized sectors which could be potential source of PFOS.

The main focus on the Working group for new industrial POPs was concentrated on identification and assessment of POP-PBDEs and PFOS groups of chemicals.

Related to POP -PBDEs the main applications that were analyzed are:

a**) Electrical and electronic equipment and WEEE and**

b) Transport sector

The following figure shows the scope of the Inventory for new POP-PBDEs in Republic of Macedonia.

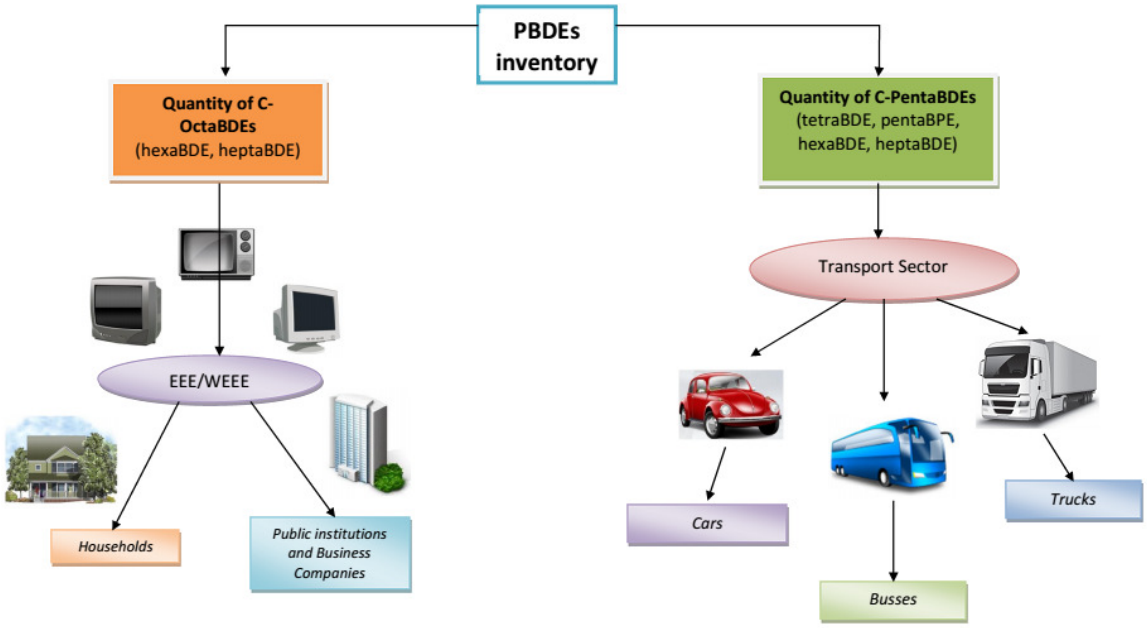


Figure 5 Scope of Preliminary PBDEs Inventory for R. of Macedonia

The Working Group members started to identify the sources, on stock quantities in households and public institutions and business sector using CRT TV and PC monitors and waste from EEE produced before 2004 since they hold the main concentration of these chemicals in the sector for Electrical and electronic equipment.

In the transport sector these chemicals were used in production until 2004 so the relevant data for identifying quantities imported, on stock and in the waste stream were considered all cars, busses and trucks, their country of origin, their year of production and registration in Macedonia, whether they are still in use or have entered the waste stream as end of life vehicles.

The scope of the **POP- PFOS inventory** was to identify the presence and use of PFOS chemicals in the industrial sector and products we use every day in the Republic of Macedonia. The aim was to prioritize industrial sectors and applications in Macedonia to obtain preliminary and possibly detailed quantities on stock, in use and in the waste stream following the “life cycle” of the chemicals, to identify potential contaminated hot spots in Macedonia, to determine whether there are PFOS present in our country.

The main challenge was to provide suitable data sources to obtain this kind of information. The Working Group identified that from 25 applications of PFOS all over the world, **in Macedonia there are only 15 potential applications of PFOS, setting the priority on the 4 most relevant industrial sectors** where application of this type of chemicals could take place. For the preliminary inventory the 4 priority industrial sectors were taken into account:

- Production of pulp and paper
- Firefighting foams
- Metal plating industry, and
- Production of construction and insulation materials

For the following sectors (shown on Figure 5) questionnaires were prepared and distributed to 100 relevant companies form all 4 sectors in order to prepare the preliminary POP-PFOS inventory for R. of Macedonia.

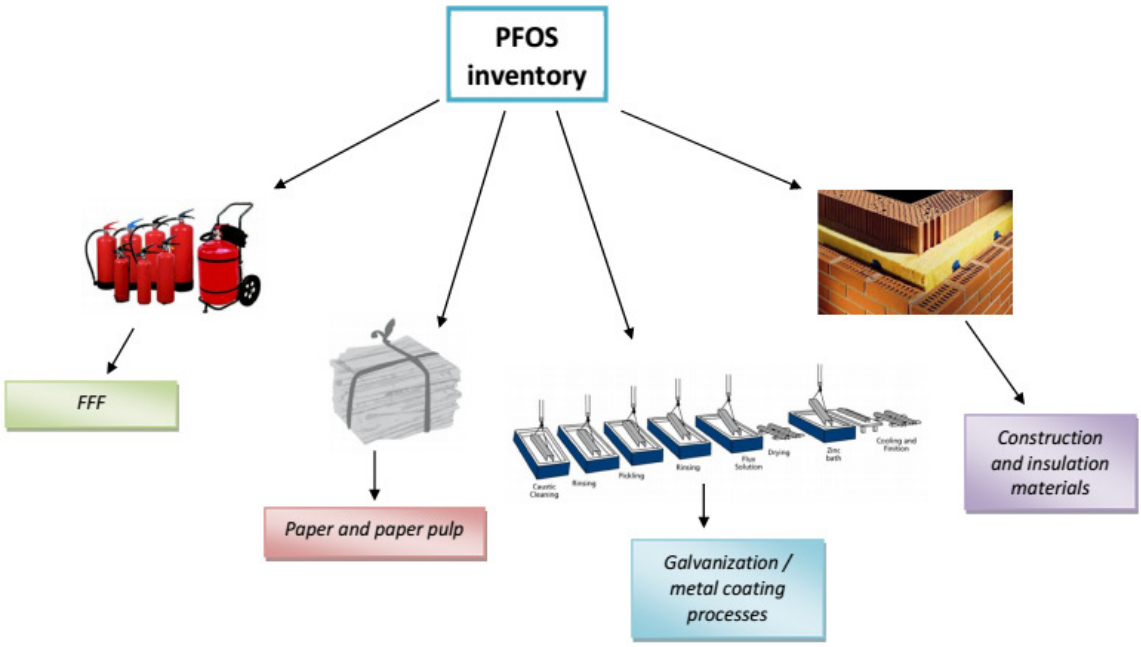


Figure 6 Scope of Preliminary POP-PFOS Inventory for R. of Macedonia

9.5.1. 8.5.1 *Collecting and analyzing the national data in order to prepare the preliminary and detailed inventory of c-octaBDE in the Republic of Macedonia*

Based on the conclusions of the workshop, the Working Group became focused on development of the initial and possibly more detailed/comprehensive inventory of POPs PBDEs in electrical and electronic equipment and related waste, and the transport sector. Due to the data available the focus was put on the EEE and WEEE from Category 4 (TV units (black & white) CRTs, TV units (color) and PC CRTs (WEEE Category 3 IT Equipment). The basic data, assumptions and information used during the calculations of EEE stocks, EEE entering the waste stream (WEEE) are given below:

Total population in 2012 is 2.069.794*.

General information about Macedonia	2006	2007	2008	2011
Number of households	510.369	515.420	528.730	547.650
Number of household members	3,99	3,96	3,87	3,78

**Official Census in 2002 shows total population of 2.022.547, this number is based on the Census data plus the vital statistic of population since 2002 till 2012.*

According the "Guidance for the inventory of polybrominated diphenyl ethers (PBDEs) listed under the Stockholm Convention on Persistent Organic Pollutants" (draft), the PBDEs stopped with production in 2004 in EU, USA, Japan, UK, Pacific countries. The Expert's assumption is that the already produced EEE containing PBDEs till 2004 and imported in Macedonia till 2008, still is containing PBDEs as after stopped production period there were EEE stock on the warehouses and in private and public use.

The answers from send questionnaires to the importers of EEE show that there is no second hand EEE import in the reporting year.

The number of EEE stock at households for the years 2006/2007/2008 and 2011 (there are no this kind of data for the year 2009/2010) for the three sub-categories of electronic units (TV units (black & white) CRTs, TV units (color) and PCs) is presented on the following table where is shown that in total EEE stock from households for reporting year is 820,438 units. How to discover which part of the total EEE stock is an EEE stock containing PBDEs when no details about year of production/country of origin/PBDEs content are provided?

Table 13 EEE stock at households in reporting year for TV units (black and white), TV units (colour) and PCs

EEE category / year	2006	2007	2008	2011
TV units (black & white) CRTs	19.394	24.740	16.919	15.897
TV units (color) CRTs	491.485	497.380	510.224	527.444
PCs	102.584	100.507	146.458	277.097
Total EEE units at households	**613.463**	**622.627**	**673.601**	**820.438**

Source: State Statistical Office of R. of Macedonia (2006/2007/2008/2011)

The Expert's assumptions are:

- all 15.897 TV units with CRTs (black & white) reported in the official statistical data that were used in 2011 are on EEE stock (PBDEs contained) in 2012;
- 80% of the TV units (color) which were in use in 2008 (510.224 units)are units containing PBDEs and are EEE stock in 2012 – 408.179 units; The assumption was made based on the lifetime of the TV units (color) reported by the EEE importers – 8 years; The number of TV units (color) use at the hospitals, summer houses, retirement homes, schools, kindergartens need to be added as well, so if we multiply the number of units at households with 1.5, the total number of EEE stock at reporting year for TV units (color) containing PBDEs is 612.269 units;

- 20% of the PCs which were in use in 2008 (146.458 units) are units containing PBDEs and are EEE stock in 2012 – 29.292 units; The assumption was made based on the lifetime of the PCs reported by the EEE importers – 3 years.

Table 14 EEE stock (PBDEs contained) in reporting year 2012 in Macedonia

EEE category	At households	Households + summerhouses/hospitals, hotels, etc.
TV units (black & white) CRTs	15.897	15.897
TV units (color) CRTs	408.179	612.269
PCs	29.292	29.292
Total EEE units (PBDEs containing)	453.368	657.457

In order to calculate the waste EEE (WEEE) quantities the few assumptions were made by the Expert:

- The difference between the number of TV units (black & white) used in 2008 and those used in 2011 is the electronic unit became waste; the waste quantity is 1.022 TV units (black &white);
- As the 80% of the TV units (color) used in 2008 are still in use 2011, the rest (20%) became waste; the quantity is 102.045 TV units (color) waste;
- The 80% of the used PCs in 2008 due to their lifetime period of 3 years became waste and the quantity is 117.166 PCs waste;
- Due to the fact that in the period 2008-2011 no companies dealing with WEEE were registered in Macedonia and taking into account the interest in buying the WEEE to export from Macedonia, the assumption is that the all quantity of waste containing PBDEs from TV (black &white) went to landfill, 95% of the waste from TV units containing PBDEs (color) went to the landfill and 5% was exported out of Macedonia; the 85% of the waste from PCs containing PBDEs went to landfill and 15% was exported out of the country. The quantities of WEEE containing PBDEs is given on the following table:

Table 15 Generated WEEE from households

WEEE per category from households	Total WEEE	Disposal on landfills	Exported out of Macedonia
Waste from TV units (black & white) CRTs	1.022	1.022	0
Waste from TV units (color)	102.045	96.943	5.102
Waste from PCs units	117.166	99.591	17.575
Total WEEE units from households, disposed on landfills and exported	220.233	197.556	22.677

The important group of customer for IT and electronics units beside the households are the commercial sector and institutions which use mainly PCs, so the baseline data from the State statistical Office (about the number of business companies in Macedonia) were taken into account and analyzed using a few assumptions regard the number of PCs in each company.

The official data contain information about the total number of business companies in 5 categories according the number of employees. The approximation was made by the Expert on the total PCs in each group of category and the number of PCs at business sector is given in the following table. The assumption is that maximum 20% of the PCs are containing PBDEs (the business sector is changing the PCs very often) due to the lifetime period for PCs.

Table 16 Total business companies and number of PCs at reporting year 2012

Number of employees	Number of business companies*	Број на компании
1-9 employees	60.620	121.240
10-19 employees	2.754	24.786
20-49 employees	1.698	30.564
50-249 employees	1.187	148.375
upon 250 employees	185	27.750
Total	73.118	352.715
EEE stock with PCs units containing PBDEs at reporting year 2012		**70.543**

**Source: State Statistical Office of R. of Macedonia (number of business companies by categories of employees)*

The following table presents the total number of PCs at governmental and local governmental institutions made by assumption provided by an Expert (80 municipalities – 6.000 PCs, Government – 1.500 PCs, Ministries – 56.500 PCs, governmental and local self-governmental institutions – 36.000 PCs; the assumption is that 30% of reported units are old and contained PBDEs (the public administration bodies do not change the PCs so often as business sector).

Table 17 Number of PCs in the institutions in Macedonia and PCs containing PBDEs

Governmental institutions	Number of PCs at reporting year 2012	PCs containing PBDEs
Municipalities /City of Skopje/Government/Ministries/Institutions	100.000	30.000

Total number of PCs containing PBDEs coming from business sector and institutions is given in table below taking into account that on annual basis the 1/5 of the total PCs becomes a WEEE stream of which 33% goes to landfill and the rest has been recycled. In the case of public

administration and commercial sector, the quantity of waste stream disposed on landfills is 89.637 units and to be recycled 181.991 units.

Table 18 PCs containing PBDEs from public administration and business sector at reporting year 2012

Public administration and business sector	Total PCs	EEE stock on PCs containing PBDEs
Commercial sector and institutions	352.715	70.543
Municipalities/City of Skopje/Government/Ministries/Institutions	100.000	30.000
Total	452.715	100.543

From total amount of PCs at public administration and business sector on annual base the quantity of 90 543 units of PCs are becoming a WEEE, the EEE stock on PCs containing PBDEs is approx. 100.543 PCs units. It means that WEEE contains PBDEs coming from old PCs from public administration and business sector is 271.629 PCs units. The assumption is that on the landfill went 1/3 of the quantity and the rest was collected and exported by WEEE collector companies to other countries (Bulgaria, Greece). The quantities of WEEE from PCs coming from the public administration are given on table below:

Table 19 WEEE generated by PCs used in Public administration and business sector

Public administration and business sector	Number of PCs units
Annual bases WEEE generation from PCs at public administration and commercial sector	90.543
EEE stock of PCs at reporting year 2012	100.000
WEEE from PCs generated	271.629
WEEE from PCs disposed on landfills	89.638
WEEE exported and recycled out of Macedonia	181.991

No E-waste inventory was available in Macedonia and now first E-waste activities were initiated by the collection of CRT data.

All these official data, realistic expert's assumptions and information collected by the EEE importers and WEEE collector companies were an input data for the calculation of the PBDEs (c-OctaBDE, hepta-BDE, hexa-BDE) quantity in Macedonia by two categories:

a) CRT PC monitors and

b) TV CRT monitors

as EEE stock at reporting year (2012) at households, public administration and commercial sector, WEEE disposed on landfills from the same sources and WEEE exported and recycled.

9.5.2. *PRELIMINARY INVENTORY OF POP-PBDES OF ELECTRICAL AND ELECTRONIC EQUIPMENT BASED ON PER CAPITA AMOUNT OF CRTS (TIER 1)*

The initial Inventory of c-OctaBDE and related POP-PBDE (hepta-BDE, hexa-BDE and octaBDE homologues) was done based on the comparison with other countries, countries in development, utilizing the inventory guidance of the new industrial chemicals and based on the assumptions of the expert's observation. The main input data for initial calculation of the POP-BDEs from EEE and WEEE based on per capita amount of CRTs are: a) number of citizens in R. of Macedonia, b) average weight of CRT monitor, c) average content of polymer in CRT monitor, d) average content of c-OctaBDE that was added in the polymer to improve the polymer's characteristics and e) number of CRT monitors in use by households, public administration, business sector, hotels and other public institutions. The waste of electrical and electronic equipment was not taken into account as there was no information during this phase of the project. It was calculated in the Tier 2 Preliminary Inventory.

The input data are presented on Table 20.

Table 20 Input data for the Preliminary Inventory of POP-PBDEs of EEE for 2012 for R. Macedonia

Input data for estimation of quantity of c-OctaBDE in EEE in use in 2012 in Macedonia	**unit**
Population of R. of Macedonia in 2012	2.069.794
Number of CRTs older than 2004 in use in 2012 (without those become waste)	1.211.358
CRTs/capita ratio	0,5853
Weight of the CRTs (kg per device) as an average weight of a CRT monitor, either TV or PC monitors	25 kg
Polymer content of the CRTs (estimated average)	30%
Average c-OctaBDE content for these polymers in CRT monitors	0.15%

The initial estimation of the amount of industrial POP-PBDE chemicals (c-OctaBDE) in EEE in 2012 in the Republic of Macedonia based on per capita amount of CRTs is presented on Table 21.

Table 21 Preliminary Inventory assessment of POP-PBDES of electrical and electronic equipment in 2012

No. of CRTs/capita		**population**		**weight of GRT monitor (kg)**		**Content of polymer in CRT monitors (30%)**		**Average content of c-OctaBDE in polymers (0, 1%)**		**Quantity of c-OctaBDE (kg)**
0,5853	X	2.069.794	X	25	X	0,3	X	0,001	=	9.086

POP-PBDEs (heptaBDE и hexaBDE) can be calculated by knowing the concentration of the homolog in EEE: a) heptaBDE homologue is 43% of the total c–OctaBDE quantity, b) hexaBDE homologue is 11% of the total c-OctaBDE quantity and the rest is OctaBDE homologue (35%).

The estimations are provided on Table 22.

Table 22 Preliminary Inventory for c-OctaBDE homologues (heptaBDE, hexaBDE and OctaBDE) in EEE in use in R. Macedonia based on CRTs per capita calculations

Homologues (kg)	Distribution homologues c-OctaBDE	POP-PBDEs in stock based on CRTs per capita at inventory year 2012 (kg)
		∑c-OctaBDE
		9.086 kg
hexaBDE	**11%**	**999 kg**
hexaBDE	**43%**	**3.906 kg**
hexaBDE	**35%**	**3.180 kg**

9.5.1. *PRELIMINARY INVENTORY OF POP-PBDES OF ELECTRICAL AND ELECTRONIC EQUIPMENT AND RELATED WASTE BASED ON PER CAPITA AMOUNT OF CTS (TIER 2)*

The expert perceived the need of detailed analysis (Step 2 and 3 from the Guidance received from UNIDO) and for that purpose, a plan for the required data and its analysis was developed and the main data are provided under chapter "COLLECTING AND ANALYZING THE NATIONAL DATA IN ORDER TO PREPARE THE PRELIMINARY AND DETAILED INVENTORY OF C-OCTABDE IN THE REPUBLIC OF MACEDONIA". The data from the National Center for Statistics of the Republic of Macedonia for the period of 2006-2012 was utilized (population of the country, number of households, number of the members in the household, number of CRT-TVs, black and white and color television sets, and CRT monitors from personal computers (a total of three categories or category 3 and 4 from the UNIDO Guidance). The amount of household waste for all three categories of products which contain PBDEs was calculated. In order to analyze the stockpiles in the corporate and public sectors, data from the State Administration for Statistics for the year 2012 was utilized (the total of business organizations divided in 5 categories according to the number of employees and estimated number of computers in the corporate sector as well as in the public sector). Based on the life-span of the products, the amount of waste from CRT monitors from the public sector was calculated.

The detailed analysis of C-OctaBDE s has been done utilizing data related to the content of polymer fraction in every product separately and the concentration of C-OctaBDE s in the polymer fraction. Data according to the UNIDO Guidance has been used. Based on the detailed calculation of the concentration of this industrial chemical in the relevant products, the expert team managed to calculate the fractions of heptaBDE and hexaBDE concentration in these products for the inventory of POPs PBDEs in the year of 2012.

In order to calculate the quantities of c-OctaBDE in CRT PC monitors and TV CRT monitors, very important data is average polymer fraction (in % per weight of these categories within the EEE) – shown on Table 23 and the total concentration of c-OctaBDE in the total polymer fraction used provided on Table 24.

Table 23 Total polymer fraction in the relevant EEE/WEEE

Category/item	Total polymer fraction [in % per weight]		
	Minimum	Maximum	Average
Computer equipment-without monitors	26%	58%	**42%**
Consumer equipment-without monitors	21%	26%	**24%**
CRT monitors	13%	38%	**30%**
CRT-TVs	15%	38%	**30%**

Table 24 Concentration of c-OctaBDE in the total polymer fraction used in the relevant EEE

Category/item	Content of c-OctaBDE in the total polymer fraction in [kg/metric ton]		
	Minimum	Maximum	Average
Computer equipment- without monitors	0,05	0,4	0,225
CRT monitors	0,14	10,6	2,54
Consumer equipment- without monitors (1 composite sample)	-	-	0,15
CRT-TVs	0,05	3,54	0,87

The Preliminary Inventory (Tier 2) of c-OctaBDE in R. of Macedonia for inventory year 2012 was made based on the calculations according the Guidance for the inventory of polybrominated diphenyl ethers (PBDEs) prepared by UNIDO and the main results are given below separately per above mentioned categories:

- Quantity of c-OctaBDE in CRT PC monitors and CRT-TV screens at Private consumers (households) presented on
- Table 25.

Table 25 Average quantity of c-Octa BDE in EEE in Republic of Macedonia for the inventory year in households

Private consumers (households)					
Monitors	number	weight (kg)	weight (t)	Quantity of plastic in monitor (30%)(tones)	Average quantity of c-OctaBDE (kg)
CRT PC monitors	29.292	413.017	413	124	315
CRT-TV screens	424.076	13.400.808	13.401	4.020	3.498

Private consumers (households)					
Monitors	number	weight (kg)	weight (t)	Quantity of plastic in monitor (30%)(tones)	Average quantity of c-OctaBDE (kg)
Total	**453.368**	**13.813.825**	**13.814**	**4.144**	**3.812**

- Quantity of c-OctaBDE in CRT-PC monitors and CRT-TV screens at Public administration and business sector presented on Table 26.

Table 26 Average quantity of c-Octa BDE in EEE in Republic of Macedonia for the inventory year in Public administration and business entities

Public administration and business					
Monitors	number	weight (kg)	weight (t)	Quantity of plastic in monitor (30%) (t)	Average quantity of c-OctaBDE (kg)
CRT PC monitors	100.543	1.417.656	1.418	425	1.080
CRT-TV screens	204.090	6.449.231	6.449	1.935	1.683
Total	**304.633**	**7.866.888**	**7.867**	**2.360**	**2.764**

- Quantity of c-OctaBDE in WEEE disposed on landfills presented on Table 27.

Table 27 Average quantity of c-Octa BDE in EEE in Republic of Macedonia for the inventory year on landfills

WEEE – landfill					
Monitors	number	weight (kg)	weight (t)	Quantity of plastic in monitor (30%) (t)	Average quantity of c-OctaBDE (kg)
CRT PC monitors	189.229	2.668.129	2.668	800	2.033
CRT-TV screens	97.965	3.095.680	3.096	929	808
Total	**287.194**	**5.763.809**	**5.764**	**1.729**	**2.841**

- Quantity of c-OctaBDE in WEEE exported to other countries for recycling is presented on Table 28

Table 28 Average quantity of c-Octa BDE in WEEE exported form Republic of Macedonia for the inventory to other countries for recycling

WEEE - exported					
Monitors	**number**	**weight (kg)**	**weight**	**Quantity of plastic in**	**Average quantity of c-OctaBDE**

			(t)	monitor (30%) (t)	(kg)
CRT PC monitori	199.566	2.813.886	2.814	844	2.144
TV CRT monitori	5.102	161.231	161	48	42
Total	**204.669**	**2.975.117**	**2.975**	**893**	**2.186**

The Summary Table with quantity of c-OctaBDE (kg) on stock in R. of Macedonia in 2012 is presented on the following table.

Table 29 Summary Table with quantity of c-OctaBDE (kg) on stock in R. of Macedonia in 2012

Total C-OctaBDE quantities on stock in EEE (households, Public administration and business sector) and WEEE disposed on landfills	
Total quantity of c-OctaBDE (kg) on stock in Private consumers (households)	3.812
Total quantity of c-OctaBDE (kg) on stock in Public administration and business	2.764
Total quantity of c-OctaBDE (kg) in WEEE disposed on landfills	2.841
Total C-OctaBDE in Macedonia on stock (kg)	**9.417**

Calculation of POP-PBDES present in EEE/WEEE to the specified homologue of POP-PBDEs (hexaBDE, heptaBDE, c-OctaBDE) for the relevant phases of the life-cycle. The following table shows the homologues in EEE/WEEE.

Table 30 Distribution of Homologues of POPs BDE (kg) on stock in R. of Macedonia in 2012

Homologues (kg)	**Distribution homologues c-OctaBDE**	**POP-PBDEs in stock at end of inventory year 2012 (kg)**	**POP-PBDEs which became waste in 2012 (kg)**
Inventory of c-OctaBDE		c-OctaBDE	c-OctaBDE
		6.576	5.027
hexaBDE	11%	723	553
heptaBDE	43%	2828	2162
octaBDE	35%	2.302	1.760

Parallel to the detailed analyses two questionnaires were designed:

- Questionnaire for import companies of EEE (electrical and electronic equipment) aimed towards companies which import and distribute new / old equipment (CRT monitors for computers and TVs), searching for data of imports in the period from 2002 to 2007 and 2007-2012 for imported, old equipment according to the categories.

- Questionnaire for Licensed managers of WEEE, aimed towards companies which collect, dismantle, select or in any other way manage the waste of electrical and electronic equipment (with an emphasis on CRT monitors and CRT-TVs). The survey questions are related to the collected amount of WEEE, the manner of dealing with the same, whether the domestic collectors do the treatment and / or where it is exported.

The analysis of the received answers from 13 EEE Importers and 1 Company dealing with WEEE, show that no second hand TV units and PCs were imported in the period 2007-2012 and no second hand in the imported units in the period 2002-2007. The valuable information was taken from their answers related to the lifetime of the CRT monitor (PC) – 5 years and for CRT monitors (TV) – 6 years. Unfortunately, no data were presented by the WEEE collectors and exporters related to the collected WEEE from TV and/or PCs units or the data on exported quantities. The following Figure 7 shows quantity of C-OctaBDE in EEE/WEEE in R. Macedonia for the 2012.

Figure 7

Figure 7 Quantity of C-OctaBDE in EEE/WEEE in R. Macedonia for the 2012

9.5.2. *METHODOLOGY, DATA MANAGEMENT, EVALUATION AND REPORT ON C-PENTABDE IN TRANSPORTATION SECTOR*

The transport sector is one of the large material flows of goods in Macedonia and finally also a large waste and recycling flow. Cars and other vehicles (trucks and busses) make the largest share of transport sector. The end-of-life management of the transport sector has a highly relevant material flow in respect to recovery of materials and of managing pollutants.

Republic of Macedonia has no production of vehicles so all vehicles forming the transport sector in Macedonia come from import of vehicles which increases every year. With these vehicles large part of c-PentaBDE used within the transport sector with major use in flexible PUR foams (automotive seating; head rests; car ceilings, acoustic management systems) and minor use in back-coating of textiles on car seat is entering the country and ends up like waste.

For simplification in calculation of the inventory the total c-PentaBDE amount is considered for PUR foam and textile. The use of c-OctaBDE in the plastic fraction (dashboard etc.) is not considered in this inventory since it's total use in transport sector is considered of minor importance compared to c-PentaBDE (in the PUR foam/textile fraction) and is excluded from the inventory for reasons of simplification.

POP-BDEs have been produced and used in the period from approximately 1975 to 2004. Therefore only vehicles produced in this period are inventoried for POP-BDEs considerations. In Macedonia the expert has estimated that the lifespan of e.g. cars is approximately 15-20 years, also a large amount of second-hand vehicles are being imported in Macedonia each year. Since these old vehicles at the end of their life cycle remain in Macedonia, it is assumed that large quantity of c-PentaBDE is stockpiled in Macedonia.

The experts were facing lack of relevant and reliable data related to the number of the vehicles according to the categories (cars, buses and trucks) in the Republic of Macedonia as well as data of new and old vehicles imported in the period relevant for the preparation of the inventory of c-PentaBDE s. Particular efforts were made to obtain the relevant information – a comprehensive database which will be of used in the initial stage as well as in the process of detailed inventory. The

preliminary inventory contains the estimate of the c-pentaBDE in the transportation sector according to the categories and the total amount for the year of inventory.

9.5.3. *COLLECTING AND ANALYZING OF NATIONAL DATA ACCORDING TO THE CALCULATIONS AND ANALYSIS OF THE INITIAL INVENTORY OF C-PENTABDE S AMOUNT IN THE REPUBLIC OF MACEDONIA.*

The lack of relevant data and information for conducting the preliminary and detailed inventory calculations has been surpassed by using the data from previous projects implemented in R. of Macedonia where official data received by the Ministry of Internal Affair and Customs Office were used. During the preparation of this Inventory, the official data were received by the Customs Office for import of vehicles per all three relevant categories (cars, trucks and buses) grouped in two categories: a) new vehicles and b) old, second hand vehicles (unfortunately, no information about the year of production was provided) for 2010, 2011 and the first quarter of 2012. The expert team on new industrial POPs has conducted detailed analysis during the estimation of the c-PentaBDE s content in the vehicles of various categories (cars, trucks or buses) in various stages of their life-span.

The existing data useful for the development of the Inventory are: a) number of vehicles (all three category) manufactured before 1990, b) number of vehicles manufactured per year in the period 1991-2004/2005 (vehicles produced in 2004 – containing c-pentaBDE were still selling in 2005 and were imported in R. of Macedonia), c) number of registered and used vehicles in the period till 1990 and for each year in the period 1991-2004/2005, d) number of registered vehicles with country of origin USA, e) number of registered vehicles with country of origin in EU and other regions, e) number of imported vehicles on annual basis for the period 2006 – 2012 with country of origin. Taking into account the lifespan of the vehicles, the amount of vehicles produced before 2005 became the end-of-life-vehicles were calculated as well.

The team analysed the country of origin and production, whether they are manufactured in the USA and other regions before 2005 for all three categories as there is a difference of average amount of c-PentaBDE that was added during the manufacturing of a vehicles before 2005.

The Inventory is based on the amounts of c-PentaBDE s in the following categories:

- Vehicles in use in the year of inventory – 2012 in RM;
- Imported vehicles in the year of inventory – 2012 in RM;
- ELV (end of life vehicles) and vehicles taken to the landfill and/or for recycling.

In summary we have calculated the contents of all monomers in polyurethane foam (tetraBDE, pentaBDE, hexaBDE, heptaBDE). The data from the comprehensive analysis is presented in the detailed analyses and calculations below.

9.5.4. *PRELIMINARY INVENTORY OF POP-PBDES IN TRANSPORTATION SECTOR AND RELATED WASTE (TIER 1)*

Data from the Ministry of Internal affairs and Customs Office are used as input data for the preliminary assessment of quantity of c-pentaBDE in Macedonia, on Table 31, the existing vehicles containing PBDEs still in use in the Republic of Macedonia are presented:

Table 31 Existing vehicles in Republic of Macedonia imported, registered and still in use in R. Macedonia

Number of vehicles containing c-pentaBDE still in use in 2012 in Macedonia	
Cars	269.425
Busses	4.664
Trucks	9.752
Total	**283.841**

The preliminary assessment of c-pentaBDE in vehicles still in use in Macedonia in the inventory year (2012) for calculating the quantity imbedded in vehicles is done by using UNIDO Guidance and recommendations. The team included the following input data and assumptions:

- Number of vehicles registered and in use (produced before 2004) for the category (car, bus or truck),
- All vehicles produced in the period 1992-2004 are still in use,
- 85% of all imported vehicles in the period 2005-2012 are second hand vehicles
- 50% of this amount of vehicles is considered containing c-PentaBDE (older than 2004)
- The amount of c-PentaBDE for each category of vehicle (car, bus and truck) used for treating vehicles (which varies from 0,16 kg for cars and trucks to 1 kg for busses)
- And the regional vehicle factor F, for U.S. / North America: F=0.5 (50% of vehicles are impacted) and Factor of 0.05 is suggested as a factor for regional adaptation for Europe (5% of vehicles produced in the region between 1975 and 2004 is estimated to be impacted by c-pentaBDE).

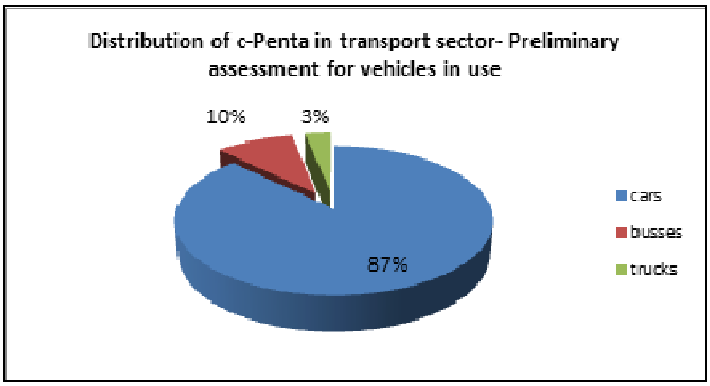
Table 32 presents the obtained results from the preliminary assessment of the Quantity of c-PentaBDE in vehicles still in use in the Republic of Macedonia.

Table 32 Preliminary distribution of quantity of c-pentaBDE in the transport sector in Macedonia for 2012

Preliminary distribution of quantity of c-pentaBDE in the transport sector in Macedonia for 2012	
Cars	2.155kg
Busses	233kg
Trucks	78kg
Total	**2.467kg**

Using the calculation methodology, the distribution of c-PentaBDE in transport sector in Macedonia is expected to be 87% in cars, 10% in busses and 3% in trucks. The following figure shows the initial assessment for distribution of c-pentaBDE in the transport sector in Macedonia.

Figure 8 Distribution of quantity of c-pentaBDE in the transport sector in Macedonia



The figure shows that the main concentration of c-pentaBDE in Macedonia is contained in cars (87%). Therefore to properly manage these chemicals, the full life cycle of vehicles especially cars needs to be monitored and noted, so when each vehicle is to enter the waste stream, the management of c-pentaBDE would be a lot easier.

9.5.5. *PRELIMINARY INVENTORY OF POP-PBDES IN TRANSPORTATION SECTOR AND RELATED WASTE – DETAILED ANALYSIS (TIER 2)*

The input data for the detailed analysis show difference from the preliminary analyses in distinction of vehicles according to country of origin (USA and EU&other regions of the world). Table 343 shows the input data used for the detailed assessment of c-pentaBDE in Transport sector in Macedonia in 2012.

Table 33 Input data for the detailed inventory assessment of c-PentaBDE quantities in Transport sector in use in Macedonia for 2012

Vehicles in use in 2012 treated with c-pentaBDE		**Vehicles produced in USA (4% of total vehicles)**	**Vehicles produced in EU&other regions (96% of total vehicles)**
cars	269.425	10.777	258.648
busses	4.664	187	4.478
trucks	9.752	390	9.362
Total amount vehicles in use in 2012	283.841	11.354	272.488

According to UNIDO Guidance and based on calculations obtained for Macedonia, vehicles produced in USA and imported in our country takes up to 4% of the total imported vehicles in all categories, cars, busses and trucks in Macedonia. For the detailed inventory assessment the expert and the Working Group performed calculations which give us more precise quantity of POPs-PBDEs in transport sector in the inventory year. The distinction of vehicles on USA produced vehicles and produced in EU & other regions in the world is important because the concentration of added in PUF foams in USA vehicles is 10 times greater than other regions in the world, so considering the 4% imported USA vehicles in Macedonia the calculations using the formulas above in the detailed inventory change.

The team included the following input data and assumptions:

- Number of vehicles registered and in use (produced before 2004) for the category (car, bus or truck),
- Number of vehicles registered and in use (produced before 2004) with country of origin for all three categories of vehicles (USA origin vehicles and vehicles manufactured in EU and other regions),
- All vehicles produced in the period 1992-2004 are still in use,
- 85% of all imported vehicles in the period 2005-2012 are second hand vehicles,
- 50% of imported second hand vehicles are considered vehicles containing c-PentaBDE,
- The amount of c-PentaBDE for each category of vehicle (car, bus and truck) used for treating vehicles (which varies from 0,16 kg for cars and trucks to 1 kg for busses)
- And the regional vehicle factor F, for U.S. / North America: F=0.5 (50% of vehicles are impacted) and Factor of 0.05 is suggested as a factor for regional adaptation for Europe (5% of vehicles produced in the region between 1975 and 2004 is estimated to be impacted by c-pentaBDE).

C-PentaBDE in the major PUR foam fraction in transport (seats, head and arm rests) has been applied to 0.5 to 1% by weight. For headliners, up to 15% of c-pentaBDE has been used. Considering an average use of 1% c-PentaBDE by weight in PUR foam in transport, the following estimates can be made:

- Cars: POP-PBDEs treated cars with approximately 16 kg of PUR foam contain approximately 160 g c-pentaBDE.
- Trucks: The amount of PUR foam is estimated to be similar as for a passenger car and therefor 160 g c-pentaBDE per impacted truck;
- Buses: An average PUR foam use is estimated at approximately 100 kg. With a similar average application rate of c-pentaBDE an impacted "average" bus is estimated to contain 1 kg c-pentaBDE.

All vehicles imported in Macedonia before 2004 contain PBDEs. The Ministry of Internal Affairs and Customs Administration provided the information that more than 85% per each year of all imported vehicles in Macedonia are old (second hand vehicles) and expert assumption is that 50% of this amount of vehicles are containing c-PentaBDE.

The obtained results for the Quantities of c-PentaBDE in Transport sector (vehicles in use in 2012) is presented in Table 34.

Table 34 Quantities of c-PentaBDE in vehicles in use in 2012

Vehicles containing c-pentaBDE still in use in 2012 in Macedonia	**Cars +trucks (have the same amount of PUR foam)**	**Busses**
Total (before 2004 and 2004-2012) containing PBDEs	279.177	4.664
Vehicles produced in USA	11.167	187
Vehicles produced in EU&other Regions	268.010	4.478

Vehicles containing c-pentaBDE still in use in 2012 in Macedonia	**Cars +trucks (have the same amount of PUR foam)**	**Busses**
Quantity of c-pentaBDE in vehicles still in use in 2012 in Macedonia		
Amount of c-penta PBDEs contained in USA vehicles in Macedonia for the inventory year	893kg	93kg
Amount of c-penta PBDEs contained in EU & other region vehicles in Macedonia for the inventory year	2.144kg	2.144kg
Total amount of c-pentaBDE in vehicles in use in Macedonia in 2012		**3.355 kg**

The expert made the same calculation for the vehicles imported only in the inventory year and came to a conclusion that in Macedonia for 2012 we have imported vehicles with total content of c-PentaBDE s of 165kg. The data used for the calculations are imported vehicles distinguished by year of production as well as country of origin. The calculations include vehicles:

- Produced before 1990
- Produced in 1990
- Produced in 1991
- Produced between 1992-2002
- 4% of imported vehicles in Macedonia are produced in USA

The following table shows the quantity of c-pentaBDE in Transport sector in imported vehicles Macedonia in 2012.

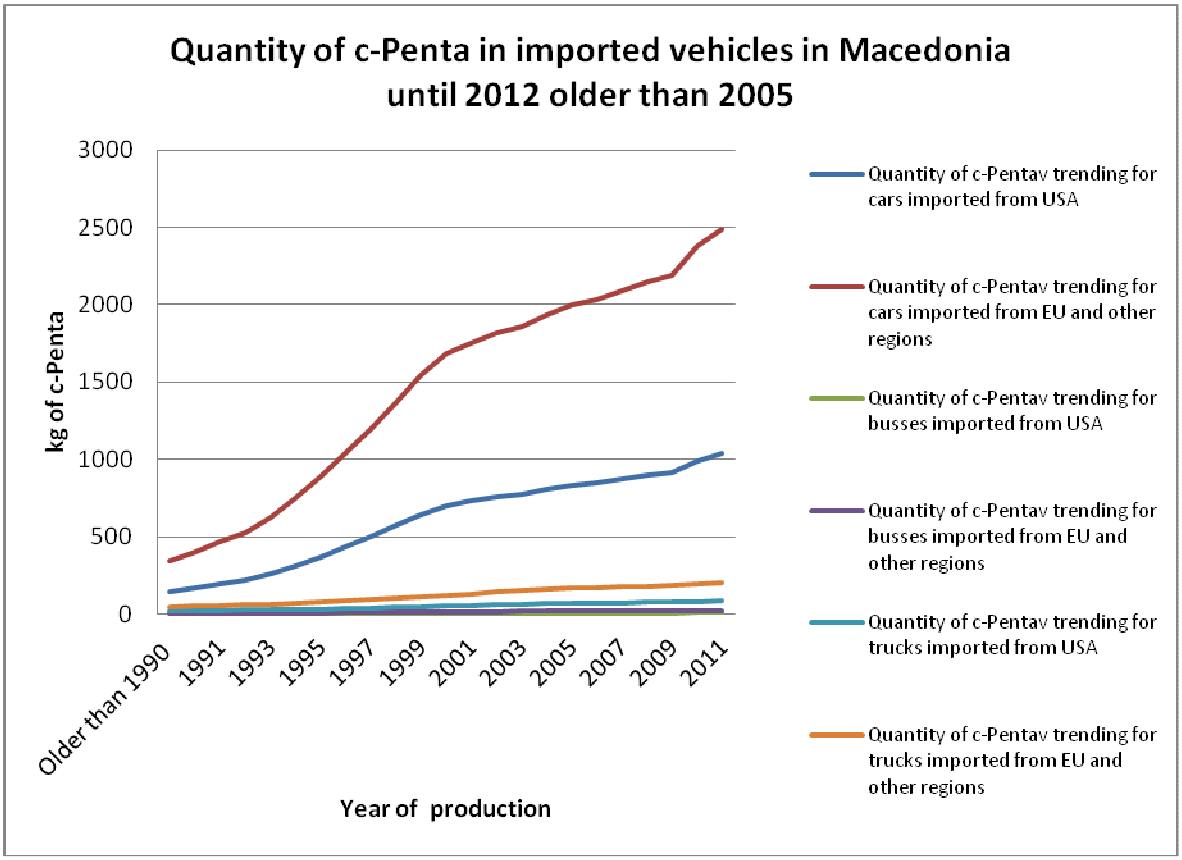
Table 35 Quantity of c-pentaBDE in Transport sector in imported vehicles Macedonia in 2012

Vehicles containing c-pentaBDE imported in 2012 in Macedonia	**Cars +trucks (have the same amount of PUR foam)**	**Busses**
Total imported vehicles in R. Macedonia in the inventory year	35.504	269
Vehicles imported in Macedonia older than 2005 and containing POPs-BDEs	14.965	94
Vehicles produced in USA	598	4
Vehicles produced in EU&other Regions	14.366	90
Quantity of c-pentaBDE in imported vehicles in 2012 in Macedonia		
Amount of c-penta PBDEs contained in USA vehicles imported in Macedonia in the inventory year	48 kg	2 kg

Amount of c-penta PBDEs contained in EU & other region vehicles imported in Macedonia in the inventory year	110kg	5 kg
Total quantity of c-pentaBDE in Transport sector in imported vehicles Macedonia in 2012		**165 kg**

The following figure shows the trend of increasing cumulative quantity of c-pentaBDE in vehicles imported in R. Macedonia every year. This means that this is the potential quantity of c-PentaBDE piling in ELV in R. Macedonia.

Figure 9 Trend of increasing cumulative quantity of c-pentaBDE in vehicles imported in R. Macedonia until 2012



When calculating c-PentaBDE s in waste streams from transportation sector, the expert relied on the assumption and the entire working group opinion that in Macedonia all cars imported 20 years ago are now end-of-life-vehicles, for busses and trucks this line is set on 10 years. This means all vehicles older than 1992/2002 (data for cars before 1990, 1990, 1991, 1992 and for busses and trucks +period 1992-2002), the following numbers are presented in the following table.

Table 36 End-of-life vehicles in the inventory year

ELV- End of life vehicles	Cars	Busses	Trucks	Total
Produced before 1990	44.656	730	6.057	51.443
Produced in 1990	7.812	100	606	8.518
Produced in 1991	8.509	46	708	9.263
Produced between 1992-2002	/	1.259	11.098	
Total	60.977	2.135	18.469	81.581
USA vehicles	2.439	85	739	3.263
EU&other regions	58.538	2.050	17.730	78.318

The total amount of c-pentaBDE in End-of-life vehicles in Macedonia in the inventory year calculated according to formulas and data from Table 13 is 868kg.

Until today, in R. Macedonia most of the polymer fraction from end-of-life vehicles are disposed in landfills/dumps or incinerated and are not recycled. The country has no capacity to conduct recycling of ELVs. However, recycling of PUR foam and plastic from end-of-life vehicles might be performed by specialized companies or by the informal sector. According to Waste management Companies in Macedonia, whose representatives are members of this working work, until the inventory year, 369 kg of PUR foam have been recycled from Macedonia. Recycling is not being performed in Macedonia; waste has been dismantled from the EL vehicle and exported for recycling to other countries. The following table shows number of vehicles exported from Macedonia and handled for recycling.

Table 37 Recycled End-of-life vehicles from R. Macedonia in 2012

(ELV) End of Life Vehicles	cars	busses	trucks
Recycled USA vehicles for 2012	732	77	665
Recycled EU&Other region vehicles for 2012	17.561	1.845	15.957

The number of vehicles handled for recycling/exported form Macedonia has been calculated as the difference between existing identified ELV in Macedonia and ELV disposed on landfills.

Quantity of POP-PBDEs present in the transport sector to the listed homologues of POP-PBDEs (tetraBDE, pentaBDE, hexaBDE and heptaBDE) for the relevant phases of the life-cycle is presented in Table 38.

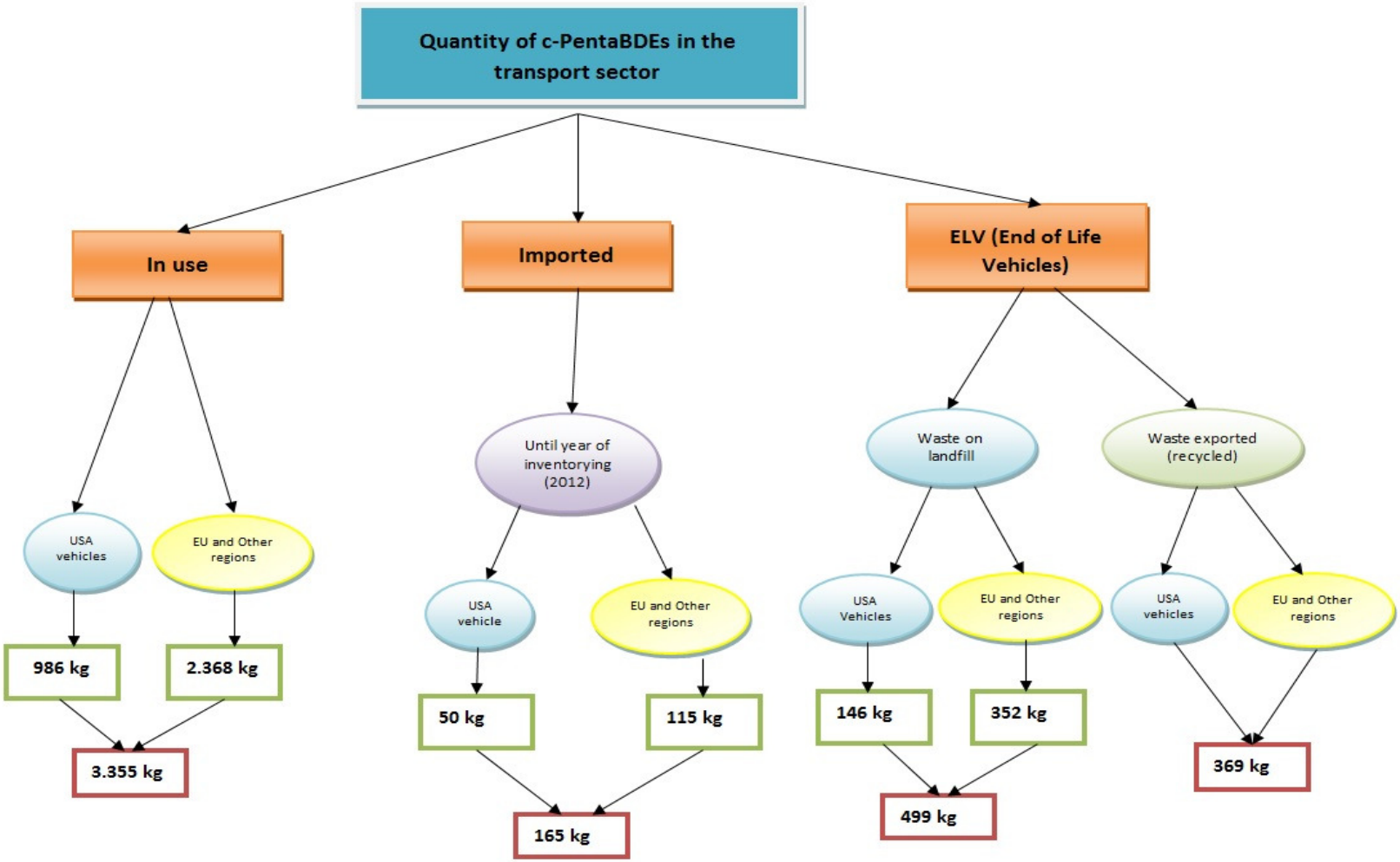
Table 38 Quantity of POP-PBDEs present in the transport sector to the listed homologues of POP- PBDEs

Distribution homologues c-PentaBDE		POP-PBDEs in vehicles which are in use in the year of inventory 2012	POP-PBDEs imported in vehicles in the year of inventory 2012	POP-PBDEs in used-up vehicles in the year of inventory 2012	POP-PBDEs disposed on landfill in past to transport sector*
		(kg)	(kg)	(kg)	(kg)
Inventory on c-PentaBDE		c-PentaBDE	c-PentaBDE	c-PentaBDE	c-PentaBDE
		3.355	165	868	499
tetraBDE	33%	1.107	54	286	165
pentaBDE	58%	1.946	96	503	289
hexaBDE	8%	268	13	69	40
hexaBDE	0.50%	17	1	4	2

*369kg of POP-PBDEs are exported from R. Macedonia

The following figure shows summarized calculations of C-PentaBDE in transport sector in Republic of Macedonia

Figure 10 Total amount of C-pentaBDE from Transport Sector in Macedonia in 2012



9.5.6. *PRELIMINARY INVENTORY ON PFOS*

Collecting and analyzing of national data for calculation and analysis of the preliminary inventory of PFOS content in the Republic of Macedonia. Based on the conclusions of the workshop conducted in November 2012, the Working Group focused on designing preliminary and if possible detailed inventory of **PFOS from manufacturers and importers of construction materials/building supplies, firefighting foams, paper and pulp, and galvanization and coated materials** and products treated with PFOS substances in order to improve their characteristics and resistance to marks, dirt, moisture, erosion, etc.

Questionnaire design

In order to obtain relevant data for preliminary, and later a detailed analysis, on the amount of PFOS substances on the territory of Republic of Macedonia, several questionnaires were designed for all major sectors, aimed towards manufacturers and importers of products relevant for each particular sector:

- Questionnaire for companies which manufacture civic construction and insulation materials, looking for data for the period of 2000-2011 year for imported and / or manufactured quantity, the quantities that they have in stock-pile, what is the percentage of PFOS substances they use in the process of manufacturing, and whether they still use these kind of chemicals.
- Questionnaire for the galvanization industry, looking for the data from the companies that work with galvanization, what kind of coating and which kind of materials they use, which chemicals are used for the procedure of superficial treatment whether they have ever used PFOS in their process and whether it continues to be used, and do they have stock-piles of these substances in their company. The data for the usage of these chemicals from 2003-2012 year were searched for, since the use of PFOS has been prohibited since the year 2003.
- Questionnaire for paper and pulp production, designed for the manufacturers of these products in the period from 2003-2012 year, their present usage, and whether in their production they have stockpiles from the use of these substances.
- Questionnaire for manufacturers and retailers of firefighting foams; this questionnaire was aimed towards companies that manufacture and import PPP which contain or do not contain PFOS substances up until which year these substances were imported, do they have stockpiles of PPP which contain these kind of substances which were manufactured or imported by 2003, or 2012 in particular.

The Expert group has identified and prioritized the companies which might provide relevant data and might assist in providing a more realistic picture about the existence of POPs PBDEs and PFOS chemicals in Macedonia.

The prepared questionnaires were sent to the identified and selected companies (manufactures and importers) with purpose to obtain relevant data and relevant numbers of the POPs PBDEs and PFOS which are present in stock-pile in the Republic of Macedonia. Also, they were asked to provide data on chemicals which are used daily and / or are converted into waste, piled at the local land-fills in our country or exported for additional treatment, as well as assist in the updating of a more successful inventory of the new industrial chemicals. Approximately 60

companies were contacted with request to fulfill the questionnaire for the purposes of developing Inventory of PFOS related substances. Only 8 companies responded with fulfilled questionnaire: 5 companies with galvanization activities, 2 companies from construction sector responded on the questionnaire with answers that they did not use PFOS related substances in their production process, no stock of PFOS related substances are in their storage buildings. The company TAV Makedonija dooel owner of the main Airport in Skopje (Aleksandar the Great) answered that they used in the period 1993-2005 the fire-fighting foam FFFP Petroseal 6% - Angus fire (UK) and starting form 2005 they are using FFFP 6% Foamousse – Dr Sthamer (Gernmany).On the stock they have 4800 lit of FFFP 6% Foamousse and on annual basis they use 300-400 lit.

No other data and information are provided in order to prepare the Preliminary Inventory of POP-PFOS related substances in R. of Macedonia.

9.6. DEVELOPMENT OF CONTROL MEASURES, PRIORITY SETTING AND DRAFTING ACTION PLAN

During the second inventory workshop, the leading expert and the Working Group discussed the obtained data and calculation results from the preliminary and detailed inventory conducted in the previous period. Within the Working Group, the expert and the members also discussed the challenges they faced for collecting the data, the lack of legal coverage of this type of chemicals in Macedonia, emission limit values, the lack of control of import of PBDE containing EEE equipment and vehicles, management of waste of electrical and electronic equipment (WEEE) and end-of-life vehicles(ELV) and came up with the following prior challenges which require developing control measures and taking actions defined in the Action Plan. The main challenges dealing with new industrial chemicals POPs are the following:

- Lack of system for informing and data delivery form households, public administration and commercial sector, collectors, transporters and waste treatment operators for EEE and Transportation sector;
- Lack of awareness and capacity among all stakeholders on the content of components in consumer products / vehicles / EEE and others, and potential risks of PBDEs on human health and the environment;
- Lack of information about the exact content of bromine compounds contained in CRT monitors and other small house appliances (to accurately calculate quantities);
- Other house appliances (refrigerators, cooling devices, small kitchen appliances, etc.) Are not included in the inventory for 2012;
- Lack of control on import of old vehicles and equipment although import of such equipment and vehicles containing PBDEs is legally defined and prohibited;
- Lack of collection centers for treatment and processing of End of life Vehicles (ELV)
- Lack of information about the adverse effects of handling, use of equipment, products containing new industrial POPs chemicals on human health and workers, lack of laboratories for eco-biological monitoring;
- Lack of collection centers for treatment and processing of WEEE;
- Lack of resources to implement legal measures to manage EEE/WEEE and End of life vehicles (ELV);
- Lack of guidelines and limit values of emissions in the environment of new industrial POPs chemicals (PBDEs I PFOS).

The team developed measures to overcome these challenges for the new industrial POPs chemicals and together with the other teams (Pesticides and unintentional POPs) and the synergy between the working groups they have developed an Action Plan. The proposed activities and measures to overcome these challenges on national level are presented in the Action Plan.

10. INVENTORY ON PCBs (POLYCHLORINATED BIPHENYLS)

10.1. PCB COUNTRY SITUATION

10.1.1. INSTITUTIONAL AND LEGAL FRAMEWORK FOR PCB MANAGEMENT

Institutional Framework

As regulated by the Law on Organization of the State Administration, a number of Government institutions are responsible for different aspects of Chemical management in Macedonia. The PCBs are a subject to the below mentioned structure. Mainly, the general aspect of PCBs management is responsibility of the Ministry of Environment and Physical Planning:

PCB general management

According to the Decision for NIP on POPs Reduction and Elimination adopted by the Macedonian Government on 25.01.2005 the Ministry of Environment and Physical Planning through its POPs Unit to conduct activities for NIP on POPs Reduction and Elimination implementation.

PCB Waste

According to the Law on Waste Management the Ministry of Environment and Physical Planning is responsible for hazardous waste management including Chapter V on Handling of Special types of hazardous waste (Article 69, Handling of PCB/PCT).

PCB export/import

According to the Decision for Classification of Goods to Import and Export (OG of the RM no. 8/10) the import and export of the mixtures and preparations, as well as waste containing PCBs could be performed with prior issued permit by the Ministry of Environment and Physical Planning. Also, the procedure of the Rotterdam Convention related to PCB external trade will be responsibility of the MoEPP.

The Ministry of Health (MH) is responsible for coordination Implementation of the Law on Chemicals (OG of the RM no. 113/07). The MH/Bureau for Medicinal Products together with other involved institutions (MoEPP, MAFWE) gives the conditions and the method or placing chemicals on the market, the conditions of production of chemicals, the rights and obligations of the legal entities which produce and market chemicals or use, test, assess, classify, mark and package chemicals, as well as supervise, with the objective of protecting the health of people and the environment.

Ministry of Transport and Communication (MTC) Through implementation of the Law on Transport of the Hazardous Substances the MTC (together with MH and Ministry of Interior) controls the conditions and manner for transport of hazardous substances in road and railway traffic, the conditions to be met in regard packaging and vehicles, duties of the persons participating in the transport of hazardous substances, etc.

Ministry of Finance/Customs Administration The Customs Administration is in charge to control overall import/export of the goods including PCBs/PCB waste external trade. The control also means control of the PCBs in the border entry points.

Ministry of Foreign Affairs (MFA) MFA provides assistance in fulfillment the obligations from the international treaties (including the Stockholm Convention on POPs) ratified by the Macedonian Parliament and facilitate the communication with the international bodies governing the global treaties.

Legal Framework

The legal framework for the PCB control is mainly given in two legal acts framework Law on Waste Management (Official Gazette of the Republic of Macedonia no. 68/04, 71/04, 107/07, 102/08, 134/08) and Rulebook on the manner and conditions for handling with PCBs, manner and conditions to be fulfilled by the installations and facilities for disposal and decontamination of PCBs, used PCBs and manner of labeling the equipment containing PCBs (Official Gazette of the Republic of Macedonia, no. 48/2007, 130/2009, 52/2013) and the Rulebook on the procedures and manner of collection, transportation, processing, storage, treatment and disposal of waste oil and for keeping records and submitting data (Official Gazette of the Republic of Macedonia, no 156/2007). The following table shows the analysis of the national legislation in regard to Stockholm Convention PCB provisions implementation.

Table 39 ***Analysis of the national legislation in regard to Stockholm Convention PCB provisions implementation***

Stockholm Convention on POPs **Annex A, Part II related to PCB management**	**Existing national legislation**	**Fully in accordance? (yes/no/partially)**	**If not or partially, foreseen year of full transposition**	**Responsible institution**
With regard to the elimination of the use of polychlorinated biphenyls in equipment (e.g. transformers, capacitors or other receptacles containing liquid stocks) by 2025, subject to review by the Conference of the Parties, take action in accordance with the following priorities: (i) Make determined efforts to identify, label and remove from use equipment containing greater than 10 per cent polychlorinated biphenyls and volumes greater than 5 litres;	Law on the Waste Management (Official Gazette of the Republic of Macedonia, no. 68/04, 71/04, 107/07) Article 69 para 1, 2, 3, 4, 5, Rulebook on the manner and conditions for handling with PCBs, manner and conditions to be fulfil by the installations and facilities for disposal and decontamination of PCBs, used PCBs and manner of labelling the equipment containing PCBs(Official Gazette of the Republic of Macedonia, no. 48/2007, 130/2009, 52/2013) Article 3 para 1, Article 5, Article 8 para 1 (1),Article 12-a, Article 13, Article 14, Article 15 and the Rulebook on the procedures and manner of collection, transportation, processing, storage, treatment and disposal of waste oil and for keeping records and submitting data (Official Gazette of the Republic of Macedonia, no 156/2007) Article 8 para 1, Article 10 para 3, Article 15 para 5 (2), Article 17	Yes	/	MoEPP/Administration for Environment/POPs Unit
With regard to the elimination of the use of polychlorinated biphenyls in equipment (e.g. transformers, capacitors or other receptacles containing liquid stocks) by 2025, subject to review by the Conference of the Parties, take action in accordance with the following priorities: (ii) Make determined efforts to identify, label and remove from use equipment containing greater than 0.05 per cent polychlorinated biphenyls and volumes	Law on the Waste Management (Official Gazette of the Republic of Macedonia, no. 68/04, 71/04, 107/07) Article 69 para 1, 2, 3, 4, 5 ; Rulebook on the manner and conditions for handling with PCBs, manner and conditions to be fulfil by the installations and facilities for disposal and decontamination of PCBs, used PCBs and manner of labelling the equipment containing PCBs Official Gazette of the Republic of Macedonia, no.	Yes	/	MoEPP/Administration for Environment/POPs Unit

Stockholm Convention on POPs Annex A, Part II related to PCB management	Existing national legislation	Fully in accordance? (yes/no/partially)	If not or partially, foreseen year of full transposition	Responsible institution
greater than 5 litres	48/2007, 130/2009,52/2013) Article 3 para 1, Article 5, Article 8 para 1 (1), Article 13, Article 14, Article 15 ; and the Rulebook on the procedures and manner of collection, transportation, processing, storage, treatment and disposal of waste oil and for keeping records and submitting data Article 8 para 1, Article 10 para 3, Article 15 para 5 (2), Article 17			
With regard to the elimination of the use of polychlorinated biphenyls in equipment (e.g. transformers, capacitors or other receptacles containing liquid stocks) by 2025, subject to review by the Conference of the Parties, take action in accordance with the following priorities: (iii) Endeavour to identify and remove from use equipment containing greater than 0.005 percent polychlorinated biphenyls and volumes greater than 0.05 litres	Law on the Waste Management (Official Gazette of the Republic of Macedonia, no. 68/04, 71/04, 107/07) Article 69 para 2, para 3, para 4, para 5 Rulebook on the manner and conditions for handling with PCBs, manner and conditions to be fulfil by the installations and facilities for disposal and decontamination of PCBs, used PCBs and manner of labelling the equipment containing PCBs (Official Gazette of the Republic of Macedonia, no. 48/2007, 130/2009, 52/2013) Article 3 para 1, Article 5, Article 8 para 1 (1), Article 12-a, Article 13, Article 14, Article 15 and the Rulebook on the procedures and manner of collection, transportation, processing, storage, treatment and disposal of waste oil and for keeping records and submitting data (Official Gazette of the Republic of Macedonia, no 156/2007) Article 8 para 1, Article 10 para 3, Article 15 para 5 (2), Article 17	Partially	/	MoEPP/Administration for Environment/POPs Unit
Consistent with the priorities in subparagraph (a), promote the following measures to reduce exposures and risk to control the use of polychlorinated biphenyls:	Law on the Waste Management (Official Gazette of the Republic of Macedonia, no. 68/04, 71/04, 107/07)Article 69 para 5 Rulebook on the manner and conditions for handling	Yes	/	MoEPP/State Environmental Inspectorate

Stockholm Convention on POPs Annex A, Part II related to PCB management	Existing national legislation	Fully in accordance? (yes/no/partially)	If not or partially, foreseen year of full transposition	Responsible institution
(i) Use only in intact and non-leaking equipment and only in areas where the risk from environmental release can be minimised and quickly remedied	with PCBs, manner and conditions to be fulfiled by the installations and facilities for disposal and decontamination of PCBs, used PCBs and manner of labelling the equipment containing PCBs (Official Gazette of the Republic of Macedonia, no. 48/2007, 130/2009,52/2013) Article 9			
Consistent with the priorities in subparagraph (a), promote the following measures to reduce exposures and risk to control the use of polychlorinated biphenyls: (ii) Not use in equipment in areas associated with the production or processing of food or feed	Law on Environment (Official Gazette of the Republic of Macedonia, no. 53/05, 24/07)Article 20 para 1 (3), Article 21	Partially	2014	MoEPP/Administration for Environment/POPs Unit
Consistent with the priorities in subparagraph (a), promote the following measures to reduce exposures and risks, to control the use of polychlorinated biphenyls:(iii) When used in populated areas, including schools and hospitals, all reasonable measures to protect from electrical failure which could result in a fire, and regular inspection of equipment for leaks	Law on the Waste Management (Official Gazette of the Republic of Macedonia, no. 68/04, 71/04, 107/07) Article 69 para 5. Rulebook on the manner and conditions for handling with PCBs, manner and conditions to be fulfil by the installations and facilities for disposal and decontamination of PCBs, used PCBs and manner of labelling the equipment containing PCBs(Official Gazette of the Republic of Macedonia, no. 48/2007, 130/2009, 52/2013) Article 3 para 1, Article 5, Article 8 para 1 (1),Article 12-a, Article 13, Article 14, Article 15 and the Rulebook on the procedures and manner of collection, transportation, processing, storage, treatment and disposal of waste oil and for keeping records and submitting data (Official Gazette of the Republic of Macedonia, no 156/2007)Article 8 para 1, Article 10 para 3, Article 15 para 5 (2), Article 17 Article 9	Yes	/	MoEPP/State Environmental Inspectorate

Stockholm Convention on POPs **Annex A, Part II related to PCB management**	**Existing national legislation**	**Fully in accordance? (yes/no/partially)**	**If not or partially, foreseen year of full transposition**	**Responsible institution**
Notwithstanding paragraph 2 of Article 3, ensure that equipment containing polychlorinated biphenyls, as described in subparagraph (a), shall not be exported or imported except for the purpose of environmentally sound waste management	Law on the Waste Management (Official Gazette of the Republic of Macedonia, no. 68/04, 71/04, 107/07), Article 69 para 1 (1), Article 105, Rulebook on the form and content of the Notification for Transboundary Movement of Waste (Official Gazette of the Republic of Macedonia, no. 37/03)	Yes	/	MoEPP/Administration for Environment
Except for maintenance and servicing operations, not allow recovery for the purpose of reuse in other equipment of liquids with polychlorinated biphenyls content above 0.005 per cent	Law on the Waste Management (Official Gazette of the Republic of Macedonia, no. 68/04, 71/04, 107/07) Article 69 para 1 (2), (3)	Yes	/	MoEPP/State Environmental Inspectorate
Make determined efforts designed to lead to environmentally sound waste management of liquids containing polychlorinated biphenyls and equipment contaminated with polychlorinated biphenyls having a polychlorinated biphenyls content above 0.005 per cent, in accordance with paragraph 1 of Article 6, as soon as possible but no later than 2028, subject to review by the Conference of the Parties	Law on the Waste Management (Official Gazette of the Republic of Macedonia, no. 68/04, 71/04, 107/07) Article 69 para 5 Rulebook on the manner and conditions for handling with PCBs, manner and conditions to be fulfil by the installations and facilities for disposal and decontamination of PCBs, used PCBs and manner of labelling the equipment containing PCBs (Official Gazette of the Republic of Macedonia, no. 48/2007, 130/2009, 52/2013) Article 8 para 1 (1), Article 14 para 4	Yes	/	MoEPP /Administration for Environment/State Environmental Inspectorate/POPs Unit
In lieu of note (ii) in Part I of this Annex, endeavour to identify other articles containing more than 0.005 per cent polychlorinated biphenyls (e.g. cable-sheaths, cured caulk and painted objects) and manage them in accordance with paragraph 1 of Article 6	Law on the Waste Management (Official Gazette of the Republic of Macedonia, no. 68/04, 71/04, 107/07) Article 69 para 1, 2, 3, 4, 5 Rulebook on the manner and conditions for handling with PCBs, manner and conditions to be fulfilled by the	Yes	/	MoEPP /Administration for Environment/State Environmental Inspectorate/POPs Unit

Stockholm Convention on POPs Annex A, Part II related to PCB management	Existing national legislation	Fully in accordance? (yes/no/partially)	If not or partially, foreseen year of full transposition	Responsible institution
	installations and facilities for disposal and decontamination of PCBs, used PCBs and manner of labelling the equipment containing PCBs(Official Gazette of the Republic of Macedonia, no. 48/2007, 130/2009, 52/2013) Article 5, Article 10, Article 11			
Provide a report every five years on progress in eliminating polychlorinated biphenyls and submit it to the Conference of the Parties pursuant to Article 15	Law on Ratification of the Stockholm Convention on POPs (Official Gazette of the Republic of Macedonia, no. 48/2007)	Yes	/	MoEPP / POPs Unit
The reports described in subparagraph (g) shall, as appropriate, be considered by the Conference of the Parties in its reviews relating to polychlorinated biphenyls. The Conference of the Parties shall review progress towards elimination of polychlorinated biphenyls at five year intervals or other period, As appropriate, taking into account such reports.	Not to be scored			

10.2. TECHNICAL CAPACITIES FOR PCB MANAGEMENT

10.2.1. ANALYTICAL CAPACITIES

None of the laboratories in Macedonia have accredited methods for the analysis of PCBs.

Some laboratories do have equipment that could be used for PCBs analysis, but there is lack of skilled staff to undertake analysis.

There is no monitoring programme for PCBs whether in environmental media (water, soil and air); animals, food, feed, or of people.

10.3. PCBS INVENTORY

10.3.1. NIP PRELIMINARY INVENTORY

Historically, PCBs have never been produced in the Republic of Macedonia. Most of the PCB electrical equipment (transformer, capacitors) were purchased from the former Yugoslav manufacturers (Minel-Serbia, Rade Koncar-Croatia and Iskra-Slovenia) until 1985. Also, the total amount of insulating oils is imported.

The NIP Chapter 2.3.2 on Assessment with respect to Annex A, Part II chemicals (PCBs) concludes that "In the Republic of Macedonia, most of the equipment and the total amount of insulating oils are imported. Preliminary inventory was carried out based on the total amount of equipment in the country, the age and the type of equipment. Based on the field analyses there are indicators that approximately 45-50% of the equipment is contaminated or cross contaminated with PCBs. Further actions require identification, detailed analysis and inventory of the transformers oils quantities of liquid dielectric. It must be considered that stocks of PCB containing spare oils still exist. Their quantities should be determined during the implementation of the NIP."

Due to the limited financial and technical capacities, the preliminary inventory data obtained during the original NIP preparation were insufficient in order to make reliable assessment of the PCB quantities in the country.

10.3.2. DETAILED PCB INVENTORY

The NIP PCB preliminary inventory was an excellent starting point for generation of a detailed database for PCB presence in the Republic of Macedonia.

It was obvious that only a complete inventory including visual checks and sampling of all electrical units and a strict analytical investigation can result in a comprehensive database about the actual PCB situation in Macedonia.

The procedure for PCB identification and inventory was describe comprehensively in the special toolkits (handbooks and manuals) produced in the period from 2004 – 2010. The toolkits also contain instruction for personal protection of the professionals directly exposed to PCBs.

In 2005 a special software was developed in order to establish a contemporary and sophisticated database for PCBs in the country. From 2005 till today the inventory has been filled on daily basis.

The inventory shows that approximately 5-7% of the transformers are contaminated. Unintentional cross-contamination by transformer maintenance shops and manufacturers, oil regeneration facilities or during topping-up of the online transformers with unlabelled or used PCB transformer oils could be the reason for this high percentage. Furthermore, PCB contamination could have been caused by the use of cisterns or drums wherein PCBs had been stored earlier. The same applies to pumps, hoses and other equipment that were once used for PCBs.

Табела 1 Резултати од деталниот инвентар

Description		No. of units	Oil weight (kg)	Total weight (kg)
Estimated quantity of transformers		9.500	12.000.000	43.000.000
Inventoried transformers		8.000	10.105.000	36.200.000
Screened transformers		8.000	10.105.000	36.200.000
Equipment containing greater than 10% PCBs and volumes greater than 5 litres	transformers	12	8.000	28.100
	capacitors	409	2.460	24.600
Equipment containing greater than 0.05% PCBs and volumes greater than 5 litres - transformers		312	140.000	600.200
Equipment containing greater than 0.005% PCBs and volumes greater than 0.05 litres	transformers	58	33.300	135.800
	capacitors	1.691	6.890	68.900
Out of service equipment	transformers	113	34.600	148.600
	capacitors	1499	6.470	64.700
In service equipment	transformers	269	146700	615.500
	capacitors	601	2.870	28.700
Screened barrels		179	45.200	45.200
Barrels with PCB-containing oil		59	16.000	16.000
Total quantity of identified PCBs	transformers	382	181.300	764.100
	capacitors	2.100	9.350	93.500
	used oil in barrels	59	16.000	16.000
	Total:		**206.650**	873.600
Treated transformers		123	40.240	167.250
Disposed capacitors		801	3.120	31.200

Description	No. of units	Oil weight (kg)	Total weight (kg)
PCB Transformers remaining for disposal	**250**	**141.060**	**596.850**
PCB Capacitors remaining for disposal	**1.299**	**6.140**	**61.400**
PCB waste oil remaining for disposal	59	16.000	16.000

10.3.3. PCB STORAGE/TREATMENT

During NIP preparation, there were no secure PCB storage locations identified in the country. Some utility companies stored decommissioned electrical equipment; however, such were not considered as meeting international standards for secure and safe storage of PCB equipment and materials.

In the framework of the post NIP activities, in order to treat and temporarily store the PCB-containing transformers and waste, within Rade Koncar – Servis a state-of-the-art facility that meets the highest safety standards was built and sophisticated technology was installed for treatment of PCB-contaminated transformers, which is in compliance with Best Available Techniques (BAT) and Best Environmental Practices (BEP) principles.

As a result of the construction of the temporary storage and the installation of the PCB treatment technology: a. the national capacities in PCB management are strengthened; b. the cycle of environmentally sound PCB management is completed, and as a result the negative effects caused by PCBs on human health and the environment are either eliminated or reduced; c. the owners of PCB-containing transformers are enabled to meet the requirements emerging from the legislation, as well as to avoid larger expenses in case of treatment abroad.

One hundred and sixty seven tons of PCB containing transformers and waste oils were treated by using the installed PCB chemical dechlorination process.

10.4. MONITORING

In 2007, Republic of Macedonia took part in the Monitoring Network for the Central and Eastern European Countries (MONET-CEEC) project supported from the budget of the Central and Eastern European POPs Centre, RECETOX and national sources.

The main objective of this monitoring program is to evaluate whether the POPs actually were reduced or eliminated, which means that information on environmental levels of the chemicals categorized as POPs should enable detection of trends over time.

As a tool for atmospheric POPs monitoring on the global and regional levels, Passive Air Samples (PAS) using polyurethane foam were applied.

Average sampling rate was estimated to be 3.5 m3 / day which roughly correspond to 100 m3 of air during four weeks of deployment.

Six sampling sites ranged from industrial to rural backgrounds, were defined. Soil samples were also collected from the air sampling sites.

Table 40 Sampling location

SAMPLING SITE	CHARACTERISTICS, POLLUTION SOURCE	CODE	Northern latitude	Eastern longitude
Lazaropole	Rural site located on a hill opposite of the village. The surrounding area is generally open and comprises of meadows and residential homes. 1 333 m a.s.l.	MKD-1	41.5400833	20.6958611
Skopje-Ohis	Urban residential site, surrounding area is generally open and comprises of meadows and residential houses. 236 m a.s.l.	MKD-2	41.9842306	21.4755000
Skopje – MEPP	Urban site located at the university grounds, open area, small trees. The nearest road with a high traffic density is only 5 m away. 200 m a.s.l.	MKD-3	41.9984167	21.4460556
Refinery	MEPP Bujkovci. 312 m a.s.l.	MKD-4	42.0055556	21.6525000
Bitola	Sampling site located 250 m from the nearest road, open area with residence facilities. The nearest factory 350 m away. 600 m a.s.l.	MKD-5	41.0471944	21.3557778
Strumica	MEPP Background monitoring site. 232 m a.s.l.	MKD-6	41.4419444	22.6652778

The following picture shows the sampling locations.

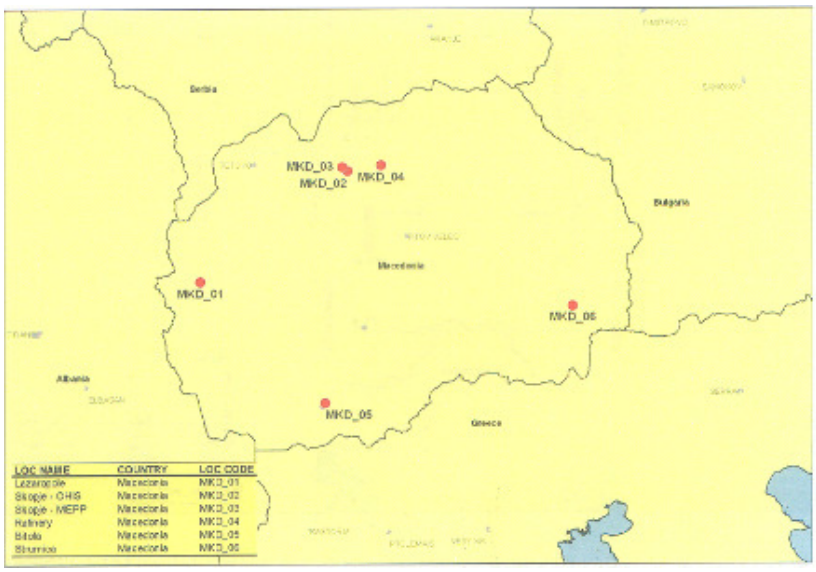


Figure 11Sampling sites

Table 41 Temporal variation of PCB in the ambient air (ng filter-1)

MONET-CEEC – Passive air sampling 2007 - Macedonia **Concentration ng filter-1**								
Sampling site	**Lazaropole**				**Skopje - OHIS**			
Sample code	MK 01-02	MK 01-03	MK 01-04	MK 01-05	MK 02-02	MK 02-03	MK 02-04	MK 02-05
Collection date	14.5-11.06.07	11.6-9.7.07	9.7-6.8.07	6.8-3.9.07	14.5-11.06.07	11.6-9.7.07	9.7-6.8.07	6.8-3.9.07
PCB 28	0.7	0.9	0.9	0.6	13.2	9.9	10.8	10.3
PCB 52	0.6	0.9	0.8	0.6	6.5	5.6	4.8	6.2
PCB 101	<LOQ	0.3	0.3	0.3	3.1	2.4	3.4	2.7
PCB 118	<LOQ	<LOQ	0.2	<LOQ	2.0	1.6	1.9	1.6
PCB 153	0.2	0.7	<LOQ	<LOQ	1.5	1.7	1.8	2.5
PCB 138	<LOQ	<LOQ	<LOQ	<LOQ	1.5	0.7	1.6	1.7
PCB 180	<LOQ	<LOQ	<LOQ	<LOQ	0.9	<LOQ	0.5	<LOQ
Total PCB	**1.5**	**2.8**	**2.2**	**1.6**	**28.7**	**22.0**	**24.8**	**25.0**

MONET-CEEC – Passive air sampling 2007 - Macedonia **Concentration ng filter-1**								
Sampling site	**Skopje - MoEPP**				**OKTA Rafinery**			
Sample code	MK 03-02	MK 03-03	MK 03-04	MK 03-05	MK 04-02	MK 04-03	MK 04-04	MK 04-05
Collection date	14.5-11.06.07	11.6-9.7.07	9.7-6.8.07	6.8-3.9.07	14.5-11.06.07	11.6-9.7.07	9.7-6.8.07	6.8-3.9.07
PCB 28	10.2	10.9	10.8	10.6	8.4	7.0	9.0	7.6
PCB 52	7.7	7.3	7.1	6.5	3.5	3.3	3.7	4.2
PCB 101	2.9	3.4	3.6	3.2	0.3	2.5	1.5	1.4
PCB 118	1.4	3.0	2.1	5.4	1.5	1.4	1.7	2.1
PCB 153	1.3	2.4	1.2	1.5	1.2	1.1	1.4	1.5
PCB 138	1.0	1.5	1.6	1.3	0.6	0.7	0.8	0.9
PCB 180	<LOQ	0.6	<LOQ	<LOQ	<LOQ	0.6	<LOQ	0.3
Total PCB	24.6	29.1	26.5	28.6	15.4	16.6	18.1	18.0

MONET-CEEC – Passive air sampling 2007 - Macedonia **Concentration ng filter-1**								
Sampling site	**Bitola**				**Strumica**			
Sample code	MK 05-02	MK 05-03	MK 05-04	MK 05-05	MK 06-02	MK 06-03	MK 06-04	MK 06-05
Collection date	14.5-11.06.07	11.6-9.7.07	9.7-6.8.07	6.8-3.9.07	14.5-11.06.07	11.6-9.7.07	9.7-6.8.07	6.8-3.9.07
PCB 28	2.1	2.5	2.8	2.6	2.8	3.4	3.0	3.6
PCB 52	2.0	2.4	2.1	1.5	1.7	1.7	2.2	2.2
PCB 101	0.7	0.9	1.4	0.9	0.6	<LOQ	0.8	1.0
PCB 118	<LOQ	0.4	0.7	0.7	0.3	0.6	0.5	1.0
PCB 153	0.6	1.2	0.7	0.9	0.6	0.5	0.6	1.2
PCB 138	0.5	0.3	0.2	0.5	0.2	<LOQ	0.2	0.3
PCB 180	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
Total PCB	**5.9**	**7.7**	**7.9**	**7.1**	**6.2**	**6.2**	**7.3**	**9.4**

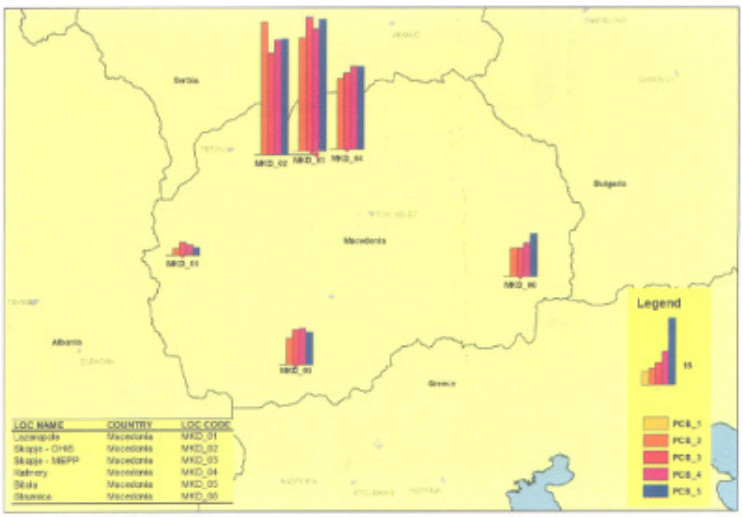


Figure 12 PCB levels (7 indicators) in the ambient air (PAS, ng filter-1), March-August, 2007

Table 42 PCB concentrations in soil (ng g-1)

MONET-CEEC – Passive air sampling 2007 - Macedonia **Concentration ng filter-1**						
Sampling site	Lazaropole	Skopje-OHIS	Skopje MoEPP	Rafinery	Bitola	strumica
Sample code	MKD 01	MKD 02	MKD 03	MKD 04	MKD 05	MKD 06
Collection date						
PCB 28	0.1	0.2	0.1	0.1	0.1	0.1

MONET-CEEC – Passive air sampling 2007 - Macedonia **Concentration ng filter-1**						
PCB 52	0.2	0.1	0.1	0.1	0.1	0.1
PCB 101	0.1	0.1	0.2	0.2	0.1	0.1
PCB 118	<LOQ	<LOQ	0.1	0.2	0.0	0.1
PCB 153	0.1	0.3	1.0	0.4	0.2	0.2
PCB 138	0.1	0.1	0.6	0.1	0.2	0.2
PCB 180	<LOQ	<LOQ	1.1	0.2	<LOQ	0.2
Total PCB	0.6	0.9	3.3	1.3	0.6	1.0

Figure 13 PCB levels (7 indicators) in soil (PAS, ng g-1), August, 2007

Macedonia is a country with slightly elevated PCB levels in the atmosphere. Lowest median PCB concentration was determined at Lazaropole mountain site (2 ng filter-1), while there were more than one order of magnitude higher in Skopje (28 ng filter-1). A characteristic seasonal trend can be clearly observed at most sites. PCB pattern is dominated by volatile PCB 28 and 52, although PCB 101 and 153 were also present at considerable levels. The soil level of PCBs was highest in Skopje (3.3 ng g-1) and lowest at Lazaropole mountain site (0.6 ng g-1). In soils, PCB 153 prevailed.

10.5. AWARENESS AND KNOWLEDGE

During the NIP preparation, low level of knowledge related to PCBs among different groups was detected. Progress in understanding the PCB issues has been attained through organization of awareness raising campaigns on health and environmental hazards posed by POPs/PCBs, and on regulatory requirements among different target groups (government institutions, i.e. policy makers and enforcement structure: custom, inspectorate, then companies managerial structure, i.e. decision makers, workers i.e. directly exposed groups, through the media and NGOs the general public, especially the vulnerable population).

As a part of the awareness raising campaigns, awareness raising materials (brochures, leaflets), then a web page were prepared and published, and the PCB issue in media through interviews was presented as well.

Moreover, technical guidelines on sound PCB management were developed and trainings of the companies' technical personnel organized.

Increased awareness and knowledge among different target groups will result in changing of the their attitude and behavior towards the PCB issue, which at the end point will result in preventing, reducing and eliminating the introduction of PCB in the environment and consequently exposure.

10.6. ANALYSIS OF PCBS/ STATE OF ART

Despite of the fact that many activities are already performed in the Republic of Macedonia in sense of PCB reduction and final elimination, the need for further action still exists. For the purpose of recognition of the activities to be considered for the future the SW analysis was prepared and the following was recognized:

STRENGTHS	**WEAKNESES**
• Adopted Law on Ratification Stockholm Convention on POPs (2004) • Existence of the Law on Chemicals (harmonized with Directive 67/548) • PCB issue considered in the national legislation: - Law on Waste Management (harmonized with EU legislation exists), article 69 - Rulebook on the manner and conditions for handling with PCBs, manner and conditions to be fulfil by the installations and facilities for disposal and decontamination of PCBs, used PCBs and manner of labelling the equipment containing PCBs - Rulebook on the procedures and manner of collection, transportation, processing, storage, treatment and disposal of waste oil and for keeping records and submitting data (Official Gazette of the Republic of Macedonia, no 156/2007) • The Law on Environment harmonized with EU legislation exists. • National implementation Plan for Reduction and Elimination of POPs in the Republic of Macedonia exists • Post-enabling activities for implementation of NIP on POPs implemented: - Established a basis for final PCB elimination in Macedonia - Existence of a detailed PCB inventory for more than 90% of the equipment and waste potentially containing PCB - Existence of significant quantity of data for PCB presence (transformers, capacitors, oil)	• National legislation on POPs management not fully harmonized with EU regulations • Complete inventory of PCB equipment and oils not? establishment • Lack of data related to the PCBs in open applications • Lack of analytical capacities and permanent system for PCB monitoring • Lack of institutional set-up for adequate PCB management • Lack of systematic control of eventual PCB oil/equipment import • Lack of systematic control of certain PCBs effects to human health and environment as well as lack of systematic control of the fulfilment of prescribed risk reduction measures • Insufficient intersectoral connection between departments competent for different phases in life cycle of PCBs • Lack of financial resources for enforcement of new legislations • More attention should be paid on raising awareness of the professionals and the public in general in order to protect the population of the harmful effects while handling the el. Equipment and on the personal decommissioning buildings containing sealants (1950s to approx. 1975) • Additional activities related to the remediation of contaminated sites with PCB.

- Existing software for PCB inventory - Handbooks and manuals on PCB management and handling - Relatively raised awareness of the professionals and public in general	

11. UNINTENTIONAL POPs (PCDDs, PCDFs)

11.1. INTRODUCTION

One of the major goals of the Stockholm Convention on Persistent Organic Pollutants (POPs) is the continuing minimization and, where feasible, ultimate elimination of unintentionally produced POPs. Parties are required to identify, characterize, quantify and prioritize sources of releases of unintentionally produced POPs, and develop strategies with concrete measures, timelines and goals to minimize or eliminate these releases.

Under the Stockholm Convention on Persistent Organic Pollutants (POPs), Macedonia (as a Party to the Convention) is required to reduce total releases from anthropogenic sources of the chemicals listed in Annex C with the goal of continually minimizing and, where feasible, ultimately eliminating releases of these unintentionally produced chemicals. Under the National Implementation Plans of Republic of Macedonia[3], PCDD/PCDF basic inventory was developed to identify, characterize and address the releases of unintentional POPs listed in Annex C.

According to the obligations set up in article 7 of the Convention, Macedonia started a process for update and review of the National Implementation Plan (NIP) within a **Project** "Enabling activities to facilitate early action on the implementation of the Stockholm Convention on persistent organic pollutants in the Republic of Macedonia".

Both, the initial inventory and its review, was done following the directions and recommendations of the *Toolkit for Identification and Quantification of Releases of Dioxins, Furans, (and Other Unintentional POPs[4]), UNEP*", aimed to support Parties in preparing PCDD/PCDF inventories that are consistent in format and content, ensuring that it is possible to compare results, identify priorities, mark progress and follow changes over time at the country level, and at the regional and global levels.

PCDD/PCDF releases are accompanied by releases of other unintentional POPs, which can be minimized or eliminated by the same measures that are used to address PCDD/PCDF releases. When a comprehensive inventory of PCDD/PCDF is elaborated, it allows the identification of priority sources, setting of measures, and development of action plans to minimize releases of all unintentionally produced POPs. It is thus recommended (by the Toolkit methodology) for practical reasons that inventory activities **focus on PCDD/PCDF**, as these substances are indicative of the presence of other unintentional POPs.

According to the Convention, Macedonia as a Party has a responsibility to take measures to reduce the total releases derived from anthropogenic sources of each of the chemicals listed in Annex C, with the goal of their continuing minimization and, where feasible, ultimate elimination**.**

11.2. SCOPE AND OBJECTIVES

The overall objective of the Project is to update and review the National Implementation Plan (NIP), and have it endorsed and submitted by the Government to the Stockholm Convention (SC) Conference of Parties (COP). The project activities will fill the gaps required to review and update the NIP. This will include strengthening the national coordination mechanism by involving additional

[3] National implementation plan on reduction & elimination of persistent organic pollutants in the Republic of Macedonia, 2004
[4] The Toolkit was first published in 2003 by the Chemicals Branch of the United Nations Environment Programme's Division of Technology, Industry and Economics (UNEP Chemicals) and subsequently revised in 2005.

stakeholders on new POPs, establishing working groups with expertise on new POPs issues, updating and reviewing the original twelve POPs, conducting a preliminary inventory of new POPs, assessing the regulatory and policy framework and institutional capacities to manage new POPs, prioritizing and drafting relevant objectives and action plans for reducing and phasing out new POPs.

The specific objective of the Working group on unintentional POPs is to conduct review and update on the previous PCDD/PCDF inventory and prepare preliminary inventory on the new POPs which will result with setting action plans.

11.3. PREVIOUS PCDD/PCDF INVENTORY ACTIVITIES

This report presents the findings of the process for review and update of the existing PCDD/PCDF Inventory and the preliminary inventory of the national presence of new POPs (PCB, HCB, PeCB). The report refers to the period of 2005-2011 (review and update of the existing PCDD/PCDF inventory and preliminary works on PCB, HCB, PeCB, 2005-2011). The activities on inventory review and update are continuation of the work on PCDD/PCDF inventarisation performed within the project "Enabling activities to facilitate early action on the implementation of the Stockholm Convention on persistent organic pollutants in the Republic of Macedonia"(April, 2002 – April, 2004) and Implementation and ratification of Protocol on Heavy Metals, Protocol on POPs and Gothenburg Protocol – First Phase.

The review and update of the initial PCDD/PCDF inventory was conducted under the directions and recommendations of the Toolkit for Identification and Quantification of Releases of Dioxins, Furans, and Other Unintentional POPs5, UNEP, January 2013.

11.4. BACKGROUND INFORMATION ON UNINTENTIONAL POPS (PCDD, PCDF, PCB, HCB, PECB)

11.4.1. DIOXINS AND FURANS (PCDDS, PCDFS)

11.4.1.1 General

Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) are environmental contaminants detectable in almost all compartments of the global ecosystem in trace amount. These compound classes in particular have caused major environmental concern. PCDD/PCDF never was produced intentionally. They are formed as by-products of numerous industrial activities and all combustion processes. The term "dioxins" refers to 75 congeners of polychlorinated dibenzo-p-dioxin (PCDD) and 135 congeners of polychlorinated dibenzofurans (PCDF). Amongst these 210 compounds, 17 congeners can have chlorine atoms at least in the positions 2, 3, 7, an 8 of the parent molecule. These 17 2,3,7,8-substituted congeners are toxic to many laboratory animals, resistant towards chemical, biological, and physical attack, and thus many accumulate in the environment and in organisms, such as animals and humans. The 2,3,7,8-TCDD (2,3,7,8-Cl4DD) also named "Seveso-dioxin" is considered to be the most toxic man-made compound. Besides the anthropogenic sources, an enzyme-mediated formation of PCDD and PCDF from 2,4,5- and 3,4,5-trichlorophenol has been demonstrated in vitro.

First risk assessments only focused on the most toxic congener, the 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-Cl4DD). Soon it was recognized, though, that all PCDD/PCDF

5 The Toolkit was first published in 2003 by the Chemicals Branch of the United Nations Environment Programme's Division of Technology, Industry and Economics (UNEP Chemicals) and subsequently revised in 2005

substituted at least in position 2,3,7 or 8 are highly toxic and thus, major contributors to the overall toxicity of the dioxin mixture. In addition, despite the complex composition of many PCDD/PCDF containing "sources", only congeners with substitution in the lateral positions of the aromatic ring, namely the carbon atoms 2,3,7, and 8, persist in the environment and accumulate in food-chains.

Almost all 210 individual congeners have been identified in emissions from thermal and industrial processes and consequently PCDD/PCDF are found as mixtures of individual congeners in environmental matrices such as soil, sediment, air, and plants and lower animals. PCDD/PCDF, particularly the higher chlorinated, are poorly soluble in water, have a low volatility, and adsorb strongly to particles and surfaces. Thus, PCDD/PCDF can hardly be identified in water and are immobile in soils. Especially, the 2,3,7,8-chlorine substituted PCDD/PCDF are extremely stable in the environment and bioacumulate in fatty tissues of animals and humans.

11.4.1.2 Formations and Release of PCDD and PCDF

PCDDs/PCDFs are formed as unintentional by-products in a wide range of processes. They are widely dispersed in the environment and may be manufacturing processes as raw materials or products. Consequently, releases or transfer of PCDD/PCDF can occur even where the PCDD/PCDF is not formed in the process under consideration.

PCDD/PCDF are persistent in the environment and transfers can occur between media (e.g., run –off from soil to water). Such transfers may an important contribution to human exposure to PCDD/PCDF but quantification of releases from this so- called reservoir sources will not be addressed in this toolkit. Releases from reservoir sources are controlled by site specific environmental factors. This Toolkit is focused on activities under direct human control.

The Toolkit addresses direct releases and transfers of PCDD/PCDF to the following five routes:

- Air
- Water (fresh, ocean, estuarine; then subsequently into sediments)
- Land (soil)
- Waste (including liquid, sludge, and solid residues, whish are handled and disposed of as waste or mainly recycled)
- Products (such as chemical formulations or consumer goods such as paper, textiles, etc.).

Highly contaminated reservoir sites having the potential to act as a "reservoir" source are addressed in a separate category. Since all sources and transfers are of relevance to a decision-maker addressing PCDD/PCDF, releases and transfers to all five compartments should be addressed.

11.4.1.3 Determination of Potential PCDD/PCDF Release Routes

PCDD and PCDF emissions arise from four types of sources. Three are process related:

- Chemical production which can generally be addressed and controlled by modifications to the process or by product substitution;
- Thermal and combustion processes – including incineration of wastes, the combustion of solid and liquid fuels and the thermal processing of metals;

- Biogenic processes, which may from PCDD/PCDF from precursors – there is some evidence of this occurring in compost:

  The fourth is related to previous formation:

- Reservoir sources such as historic dumps of contaminated wastes and soils and sediments, which accumulated PCDD/PCDF over extended periods.

11.4.1.4 Direct Releases of PCDDs/PCDFs

Release to Air. Releases of PCDD/PCDF into the atmosphere occur either from stationary sources, which are mostly associated with industrial activities such as manufacturing or from diffuse or dispersed sources, which are mostly related to the use and application of PCDD/PCDF – containing products. PCDD/PCDF emitted from either of these two source categories can undergo long-range transport and thus, PCDD/PCDF can be detected in air at locations far from the origin of its release.

Release to Water. PCDD/PCDF releases to water can occur with the discharge of wastewater, run-off from contaminated sites or application of dioxin-contaminated chemical/products, e.g., direct application of pesticides, dumping of wastes, etc. PCDD/PCDF may be present in a discharge if the PCDD/PCDF formed in the industrial production process, entered the industrial process with the feed material, or leached from a repository.

Release to Land. Sources releasing PCDD/PCDF to land can be divided into two classes: PCDD/PCDF contaminated product "applied" to land directly or PCDD/PCDF deposits onto land via environmental processes. In all cases, land serves as a sink for the PCDD/PCDF from which they can be released into the food chain through uptake by plants and/or animals.

Release in Products. Major sources of environmental contamination with PCDD/PCDF in the past were due to production and use of chlorinated organic chemicals and use of elemental chlorine in the pulp and paper industry. In processes, there are four factors, which favor the formation of PCDD/PCDF:

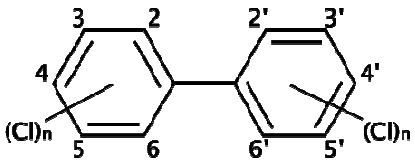
- Elevated temperatures;
- Alkaline media;
- Presence of UV-light, and
- Presence of radicals in the reaction mixture/chemical process.

Release in Residues. An almost infinite number of processes can transfer PCDD/PCDF to wastes or residues. However, the most likely types of wastes can be classified according to their origin, since PCDDs/PCDFs are always a by-product.

11.5. POLYCHLORINATED BIPHENYLS, HEXACHLOROBENZENE, PENTACHLOROBENZENE

11.5.1. POLYCHLORINATED BIPHENYLS (PCB)

PCBs are a group of synthetic organic chemicals that can cause a number of different harmful effects. There are no known natural sources of PCBs in the environment. PCBs are either oily liquids or solids and are colorless to light yellow. Some PCBs are volatile and may exist as a vapor in air. They have no known smell or taste. PCBs enter the environment as mixtures containing a variety of individual chlorinated biphenyl components, known as congeners, as well as impurities.

CAS number 1336-36-3 Molecular Formula: $C_{12}H_{10-x}Cl_x$.	

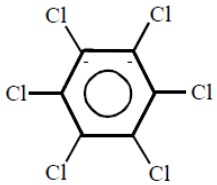
PCB congeners are odorless, tasteless, clear to pale-yellow, viscous liquids (highly chlorinated mixtures are more viscous and deeper yellow). They are formed by electrophilic chlorination of biphenyl with chlorine gas. PCBs have low water solubilities — 0.0027-0.42 ng/L for Aroclors, and low vapor pressures at room temperature, but they have high solubilities in most organic solvents, oils, and fats. They have high dielectric constants, very high thermal conductivity,[9] high flash points (from 170 to 380 °C) and are chemically fairly inert, being extremely resistant to oxidation, reduction, addition, elimination, and electrophilic substitution. The density varies from 1.182 to 1.566 kg/L. Other physical and chemical properties vary widely across the class. As the degree of chlorination increases, melting point and lipofillcity increase, and vapour pressure and water solubility decrease.

The toxicity of PCBs varies considerably among congeners. The coplanar PCBs, known as nonortho PCBs because they are not substituted at the ring positions ortho to (next to) the other ring, (i.e. PCBs 77, 126, 169, etc.), tend to have dioxin-like properties, and generally are among the most toxic congeners. Because PCBs are almost invariably found in complex mixtures, the concept of toxic equivalency factors (TEFs) has been developed to facilitate risk assessment and regulatory control, where more toxic PCB congeners are assigned higher TEF values on a scale from 0 to 1. One of the most toxic compounds known, 2,3,7,8-tetrachlorodibenzo[p]dioxin, is assigned a TEF of 1.

PCBs also have shown toxic and mutagenic effects by interfering with hormones in the body. PCBs, depending on the specific congener, have been shown to both inhibit and imitate estradiol, the main sex hormone in females. Imitation of the estrogen compound can feed estrogen-dependent breast cancer cells, and possibly cause other cancers, such as uterine or cervical. Inhibition of estradiol can lead to serious developmental problems for both males and females, including sexual, skeletal, and mental development issues.

11.5.2. HEXACHLOROBENZENE (HCB)

Hexachlorobenzene, also known as HCB, is a white crystal-looking solid. It is not found naturally in the environment but is developed as a by-product, a result of making other chemicals.

CAS Registry Number: 118-74-1 Molecular Formula: C_6Cl_6	

Hexachlorobenzene was widely used as a pesticide to protect the seeds of onions and sorghum, wheat, and other grains against fungus until 1965, It was also used to make fireworks, ammunition, and synthetic rubber, Currently, hexachlorobenzene is not used commercially, Hexachlorobenzene is a white crystalline solid, that does not occur naturally in the environment, It is

formed as a by-product during the manufacture of other chemicals, Small amounts can also be produced during combustion of municipal waste,

A study of people who ate, over a long time, bread accidentally contaminated with hexachlorobenzene suffered from a liver disease, This disease can cause red-colored urine, skin sores, change n skin color, arthritis, and problems of the liver, nervous system, and stomach, Studies in animals show that eating hexachlorobenzene for a long time can damage the liver, thyroid gland, nervous system, bones, kidneys, blood, and immune and endocrine systems, Studies in humans have provided inconclusive evidence of carcinogenicity for hexachlorobenzene, The International Agency for Research on Cancer (IARC) has determined that hexachlorobenzene is possibly carcinogenic to humans, The EPA has concluded that hexachlorobenzene is a probable human carcinogen,

Because of the lack of information and Toolkit, HCB emissions are not included in the inventory quantitative data about the HCB emission in the Republic of Macedonia, Data obtained by measurements of the presence of HCB in the air at 6 sampling points in the country using passive polyurethane filters (Holoubek et al,, 2008) show very low values (Table 65) which are similar to those obtained for the other countries from the region.

There is no systematic measurement of hexachlorobenzene in the environment in the Republic of Macedonia and only few data are present up to now. Namely, in the frame of the EU project “Improvement of Management of Transboundary Water Resources” (Project No: 03/MAC01/10/104) realized by the Arcadis Euroconsult, European Agency for Reconstruction in Macedonia and the Ministry of Environment & Physical Planning of the Republic of Macedonia (as a beneficiary) a survey of the quality of the Vardar River Basin was performed. About 20 locations were studied with the analysis of various chemical substances in water and sediment samples. It was found that at the 20 locations the concentration of HCB in water samples from Vardar River and its main tributaries ranges from 0.1 to 145 ng/L and in the sediment from 0.1 to 31 μg/kg while in fish samples it was not detected.

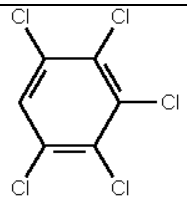
Improvement of Management of Transboundary Water Resources” (Project No: 03/MAC01/10/104) realized by the Arcadis Euroconsult, European Agency for Reconstruction in Macedonia and the Ministry of Environment & Physical Planning of the Republic of Macedonia, Annex II, Skopje, 2006-2007.

T. Stafilov, Z. Levkov, Summary of Vardar River Basin Field Survey, European Agency for Reconstruction; Ministry of Environment & Physical Planning, Republic of Macedonia, Skopje, 2007.

11.5.3. PENTACHLOROBENZENE PECB

PeCB belongs to the group of chlorobenzenes, which are characterised by a benzene ring in which the hydrogen atoms are substituted by one or more chlorines. The chlorobenzenes are neutral, thermally stable compounds with increasing stability and higher melting and boiling points with increasing chlorine substitution. PeCB has a very low solubility in water (Rossberg et al., 2006).

IUPAC Name: benzene, pentachloro- *CAS Chemical Name:* *Synonyms*: 1,2,3,4,5-pentachlorobenzene;	1,2,3,4,5-Pentachlorobenzene

Pentachlorobenzene; PCB; PeCB; QCB; quintochlorobenzene *CAS Registry Number*: 608-93-5 *EINECS Number*: 210-172-0	

PeCB is identified as a priority substance within the European Water Framework Directive (2000/60/EC). Within the list of these priority substances so-called priority hazardous substances are identified which are of particular concern for the freshwater, coastal and marine environment. These substances will be subject to cessation or phasing out of discharges, emissions and losses within 20 years after adoption of the Directive.

Pentachlorobenzene (PeCB) can be photo-oxidized in the atmosphere, largely through reactions with hydroxyl (OH) radicals (CEPA, 1993). There are no experimental data on atmospheric degradation, but the estimated half-life of PeCB is 45 to 467 days. For PeCB, the calculated half-life in air based on reaction with OH-radicals is 277 days (EPISUITE, US EPA, 2007b). Vulykh et al. (2005) estimate a half-life in air of 65 days based on modelling data. This estimate is the result of degradation as well as dry and wet deposition and gaseous exchange with various surfaces. The atmospheric half life of PeCB due to the degradation process only is estimated to be 155 days.

Pentachlorobenzene is a chlorinated organic compound. According to available data, pentachlorobenzene should be considered as persistent given the considerable number of estimated and experimental half-lives in atmosphere, soils, sediments, and water. Persistence in the environment depends on the rate of photo-oxidation, the presence of oxygen and organic matter. Pentachlorobenzene meets the criterion on bioaccumulation. BCF values for pentachlorobenzene range from 1085 – 23 000 L/kg for fish, 833 – 4 300 L/kg for mollusca, and 577 – 2258 L/kg for crustacean. Biomagnification may be expected due to the high logKow and the fact that biotransformation is insignificant. However, data on the biomagnification of pentachlorobenzene are lacking.

The available data support the potential for long range transport of pentachlorobenzene. The physical and chemical characteristics are within the range of the other POPs. Model estimations on the transport distance resulted in distances of 8 000 km, while estimates based on air measurements suggested 13 338 km. Monitoring data also indicate that PeCB is subject to long range transport. PeCB was detected in air and precipitation at various locations in the world, many of those far from its sources. The small spatial variability across the Northern Hemisphere observed in some studies also indicate that PeCB has a very long atmospheric residence time, which allows it to become widely distributed in the global hemisphere.

A large quantity of monitoring data exists on PeCB detected in abiotic matrices as well as in biota in temperate zones, mainly originating from developed countries. In general, concentrations of PeCB in the temperate zones of the world seem to be decreasing. This pattern is representative for most POPs. For the Arctic and Antarctic area, only recent data are available which do not enable a trend to be derived.

Case reports of adverse effects in individuals, or epidemiological studies of populations exposed to PeCB have not been identified. The only risk phrase for pentachlorobenzene in the European ESIS database is R22, harmful if swallowed. Lowest LD50 observed for acute exposure was

250 mg/kg bw. Repeat-dose mammalian toxicity tests result in evidence of hepatic, nephric, hematological, and developmental toxicity for this chemical. According to the American Hazardous Substances Data Bank pentachlorobenzene is not classifiable as to human carcinogenicity because there are no human data and no animal data available. PeCB is moderately toxic to humans. Pentachlorobenzene is very toxic to aquatic organisms and may cause long-term adverse effects in the aquatic environment. Data on soil and sediment organisms are limited or lacking.

Bioavailability of pentachlorobenzene is inversely proportional to the organic carbon content of the soil or sediment. However, experiments suggest that hydrophobic chemicals bound to the sediment or suspended sediment may act as a reservoir and result in continuous uptake. There are limited quantitative data on this process for pentachlorobenzene.

In the frame of the same EU project *("Improvement of Management of Transboundary Water Resources", Project No: 03/MAC01/10/104) pentachlorobenzene was also analyzed in water, sediment and fish samples from the different location along the Vardar River and its main tributaries. It was found that the concentration of PCB in water samples from Vardar River Basin is very low in the most of the samples with some higher values after the Polog Valley and the city of Skopje and Veles (from 103 to 145 ng/L), as well as from the Bregalnica River (74 ng/L). The concentration of PeCB was below the detection limit (<0.1 μg/kg) in all sediment and fish samples except for the sediment sample collected near the city of Gevgelija (25 μg/kg).

11.6. METHODOLOGY

To support Parties in meeting these obligations set out in the Stockholm Convention, a methodology has been developed to ensure that source inventories and release estimates are complete, transparent, as well as consistent in format and content. The methodology was developed in a form of a standardized Toolkit allowing Parties to compare results, identify priorities, mark progress and follow changes over time at the national, regional and global levels.

11.6.1. STANDARDIZED TOOLKIT FOR IDENTIFICATION AND QUANTIFICATION OF DIOXIN AND FURAN RELEASES

The Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases was first published in 2003 and revised in 2005. In 2006, the Conference of the Parties to the Stockholm Convention welcomed the second Toolkit edition and recognized its usefulness. At the same time, Parties acknowledged the need for its ongoing revision and updating, placing emphasis on key sources for which limited data were available and on providing support to developing countries in their efforts to verify their emission factors. Parties also requested overall improvement of the usefulness and user friendliness of the Toolkit. Within an open and inclusive revision process, involving experts, nongovernmental organizations and industry associations, and in cooperation with UNEP Chemicals, a revised version of the Toolkit was published in January 2013.

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* Improvement of Management of Transboundary Water Resources" (Project No: 03/MAC01/10/104) realized by the Arcadis Euroconsult, European Agency for Reconstruction in Macedonia and the Ministry of Environment & Physical Planning of the Republic of Macedonia, Annex II, Skopje, 2006-2007.

T. Stafilov, Z. Levkov, Summary of Vardar River Basin Field Survey, European Agency for Reconstruction; Ministry of Environment & Physical Planning, Republic of Macedonia, Skopje, 2007.

The Toolkit is the most comprehensive available compilation of emission factors for all relevant PCDD/PCDF sources. It is useful particularly in countries where measurement data are limited, enabling the elaboration of source inventories and release estimates by using the default emission factors.

The last inventory activities were done using Standardized toolkit for identification and quantification of dioxin and furan releases, UNDP, Edition 2.1, from December 2005.

The review and update of the initial PCDD/PCDF inventory was conducted under the directions and recommendations of the Toolkit for Identification and Quantification of Releases of Dioxins, Furans, and Other Unintentional POPs[6] , UNEP, January 2013.

11.6.2. INVENTORY SCOPE

To assist Parties in identifying PCDD/PCDF sources at the national level, the Toolkit includes source categories as described in Annex C of the Stockholm Convention.

- Waste Incineration
- Ferrous and Non-Ferrous Metal Production
- Power Generation and Heating
- Mineral Products
- Transport
- Uncontrolled Combustion Processes
- Production of Chemicals and Consumer Goods
- Miscellaneous
- Disposal/Landfill

The source categories listed in the Toolkit are divided into ten source groups each of the divided in several sub categories.

A country or region can begin identifying its PCDD/PCDF sources by determining the presence or absence within its borders of the PCDD/PCDF sources currently listed in the Toolkit.

11.6.3. METHODS TO ESTABLISH POPS INVENTORIES

The data on POPs emission, compiled in this report are based on a multitude of sources. In this report, concentrations of dioxins and furans are given in International Toxity Equivalents (TEQ) The PCDD/PCDF emission per year is given in grams TEQ per year. Namely, the annual flux is calculated by multiplying the release of PCDD/PCDF (e.g. in µg I-TEQ) per until of feed material processed or produced (e.g. ton or liter) with the amount of feed material processed or produced (ton per year).

In order to make a source emission estimate, information is required for:

- Representative dioxin measurements for a given source. In many cases, these estimates are very uncertain as emissions are deduced from a few test results only and extrapolated to a nation-wide basis. In other cases there are no data existing and

[6] The Toolkit was first published in 2003 by the Chemicals Branch of the United Nations Environment Programme's Division of Technology, Industry and Economics (UNEP Chemicals) and subsequently revised in 2005

thus, either numbers from the literature were taken or emissions derived from similar processes.

- The total amount of feed material processed or produced. Very often, there is a high degree of certainty for such information, e.g. all fields of waste disposal, paper production, fuel consumed, etc.

A second approach to calculate annual PCDD.PCDF emissions is to multiply measured concentrations with annual operational hours of a plant and total volume of exhaust gases emitted.

11.6.4. EMISSION FACTORS

For each source category and/or source, it is necessary to obtain basic information about the design, operation, and other related factors that can substantially influence the magnitude of PCDD/PCDF releases. Based on this information, each source will be classified and placed in one of the several classes to which default emission factors are assigned.

The default emission factors presented in the Toolkit are drawn from a variety of data sources, ranging from laboratory experiments, peer reviewed literature, dedicated experimental projects, to governmental or institutional reports. The emission factors for each class are best estimates based where possible on data measured at well-documented sources taking into account technology, process characteristics and operating practices, or otherwise estimates based on expert judgment. For the purpose of defining a default emission factor, results/processes with similar characteristics are aggregated into one emission factor. As such, the Toolkit's default emission factors are approximations intended to represent order of magnitude release estimates.

The preliminary inventory of new POPs was done according to the recommendations of the Toolkit which sets emission factor only for PCB and HCB.

11.6.5. ACTIVITY RATES

Activity rates are values in unit per year of product manufactured (e.g., steel, sinter, cement, pulp, compost, etc.) or feed material processed (e.g., municipal waste, hazardous waste, coal, diesel fuel, bodies cremated, etc.), or annual quantities of material released (e.g., m^3 of flue gas, liters of wastewater, kilograms or tons of sludge generated, etc.).

Values for activity rates may be found in centralized statistical information assembled by state, provincial, national or international agencies, and they may be obtained from trade associations and owner/operators of facilities. Potential sources of information on activity rates include the following:

- National statistics;
- National energy balance;
- Regional economic activity records including national production and import/export data;
- International statistics such as EUROSTAT, OECD, FAO, World Bank etc.
- Local operating and permitting records of industrial facilities;
- Industry association data;
- Historical production and industry data;

- Other release inventories such as the inventory of criteria pollutants and or greenhouse gases;
- Questionnaires;
- Pollution Release and Transfer Registers (PRTRs).

For the purpose of inventory review and update, the State Statistical Office remains to be a main data source. Significant efforts were made for a direct contact with a relevant number of sources, especially in category 2 – Ferrous and Non-Ferrous Metal Production installations. Thus, a number of questionnaires were sent to these installations in order to obtain information regarding the quality and quantity of the production. Other necessary data were obtained from existing national strategic documents for waste, water, air management.

11.6.6. RELEASE ESTIMATES

Once PCDD/PCDF sources are identified and classified, emission factors selected and national or regional activity rates determined, the estimation of the total annual releases by source group, source category and class is relatively simple and straightforward. **The estimations are made using a standardized tool (predetermined excel).**

The Toolkit simplifies and expedites the calculations described above by providing an Excel spreadsheet that includes a list of the source categories addressed in the Toolkit, along with their associated classes and accompanying default emission factors. Once the activity rates for all classes within the source categories that have been determined to be present within a country or region are entered into the spreadsheet, annual PCDD/PCDF releases are automatically calculated for each source category. A summarizing worksheet provides an overview of all releases according to vectors (air, water, land, product, residue) and source groups.

11.6.7. REVIEW AND UPDATE OF INVENTORY: METHODOLOGY

The inventory review and update was done according to the scope of work determined in the Project ToR, i.e. WG assignment, which includes only desk analysis – gathering and analyzing information and data already available (national strategic documents, official statistic data etc.). In order to upgrade the process of review and update, additional data were provided by establishing contacts with the sources/installations. More than 35 questionnaires were sent (with a return rate of more than 80%) primarily to the installations in the metal and mineral production sector as identified as most relevant.

The Toolkit gives a simple working methodology bases on several steps:

- Identify sources;
- Select emission factors for the sources;
- Assign activity rates for each of the sources;
- Multiply the emission factor with the activity rate;
- Compile the inventory.

The work was organized into a working group consisted of stakeholders relevant to the activities for review and update and lead by external national consultants

11.6.8. DATA QUALITY AND QUALITY ASSURANCE AND QUALITY CONTROL

During the inventory activities, the WG made all possible efforts to follow the QA/QC recommendations of the Toolkit in the respect of:

- Activity Rates
- Emission Factors
- Completeness of Data
- Additional Considerations for Assessment of Inventory Results

11.7. PCDDs/PCDFs INVENTORY FOR THE PERIOD OF 2005-2011

This chapter gives an overview of the reviewed and updated PCDDs/PCDFs inventory.

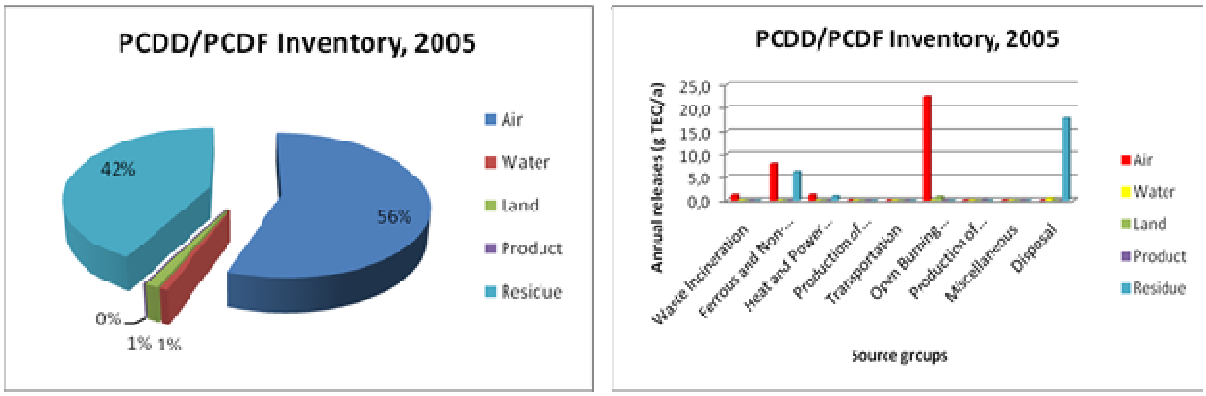

Figure 14 Annual reelases in 2005

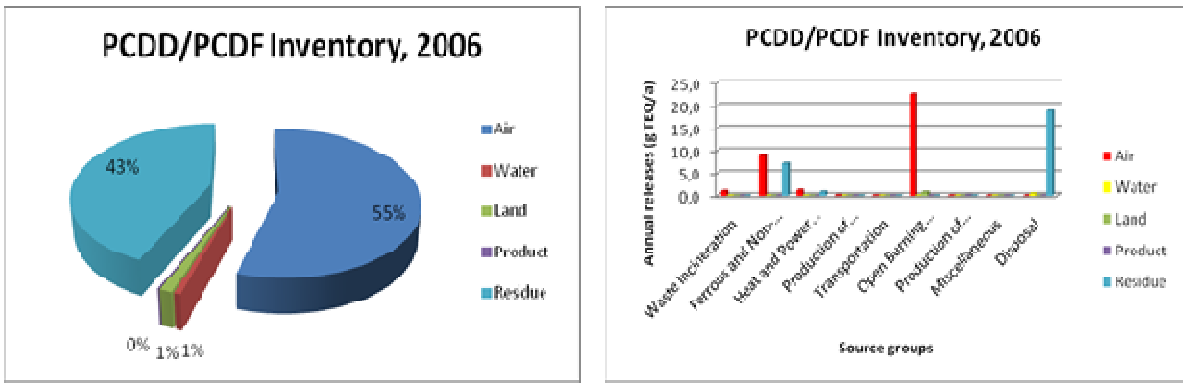

Figure 15 Annual reelases in 2006

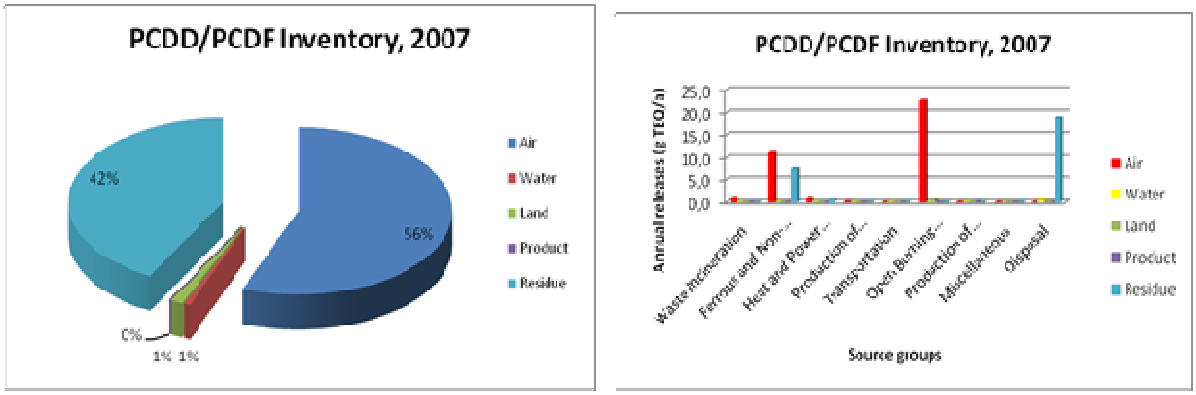

Figure 16 Annual reelases in 2007

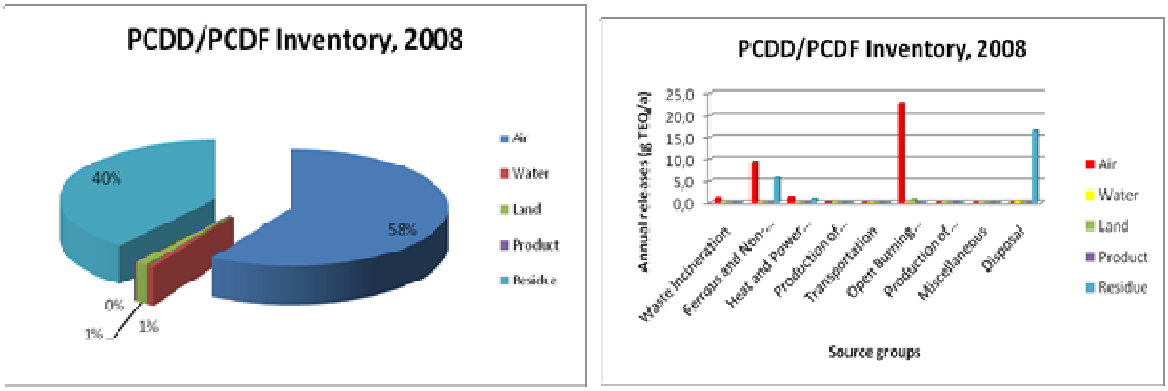

Figure 17 Annual reelases in 2008

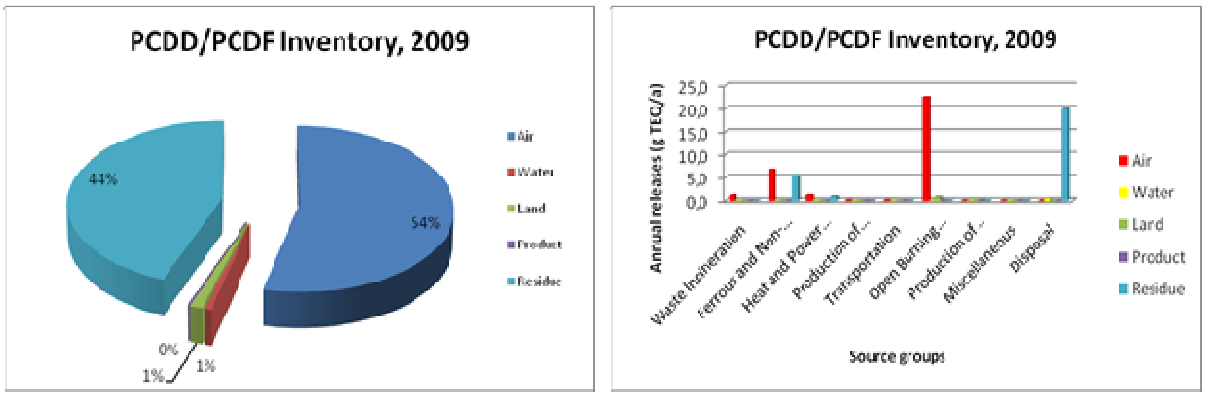

Figure 18 Annual reelases in 2009

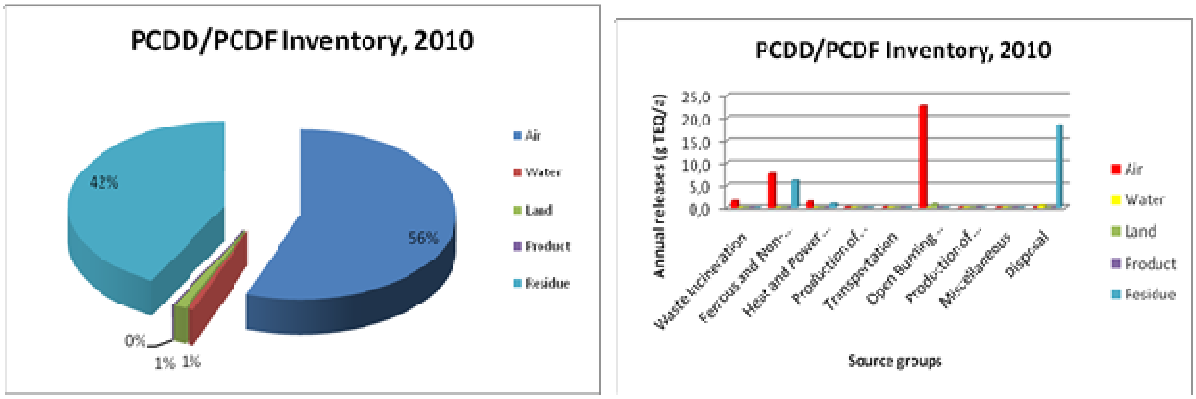

Figure 19 Annual reelases in 2010

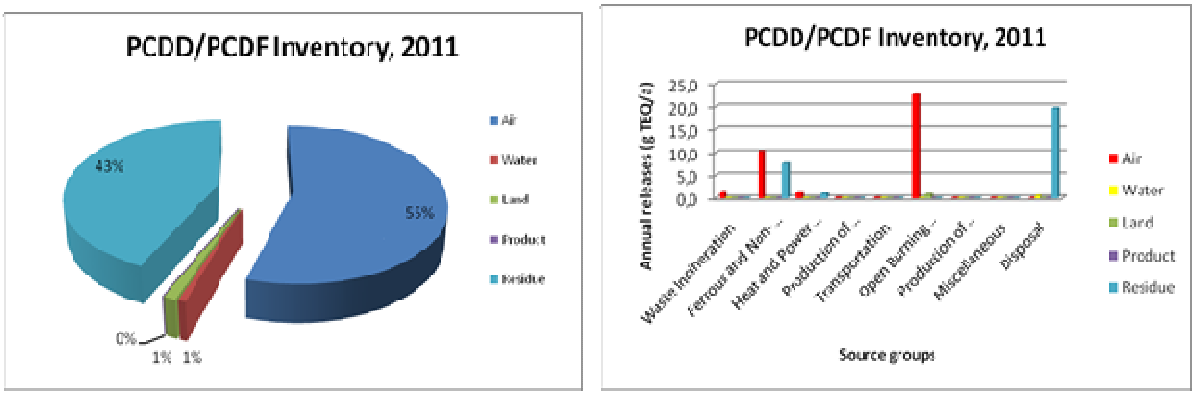

Figure 20 Annual reelases in 2011

Using the procedures recommended in the Toolkit, the activities of review and update identified the sources of PCDD/PCDF within the prescribed scope of work. Further one, each of the sub chapters bellow gives an overview of the annual releases within its category and the identified sources.

11.7.1. WASTE INCINERATION (CATEGORY 1)

Waste incinerators (including co-incinerators of municipal, hazardous or medical waste or of sewage sludge) are recognized in Annex C, Part II, of the Stockholm Convention as having the potential for comparatively high formation and release of PCDD/PCDF. For the purposes of identifying sources of PCDD/PCDF and estimating their releases, the Toolkit defines source categories of waste incinerators according to the type of waste incinerated, as indicated in table 3 below.

Table 43 Overview of source categories included in category 1 - Waste Incineration

1	**Waste inceneration**	**Potentional release route**				
	Source categories	**Air**	**Water**	**Land**	**Product**	**Residue**
a	Municipal solid waste inceneration	x	(x)			x
b	Hazardous waste inceneration	x	(x)			x
c	Medical waste inceneration	x	(x)			x
d	Light-fraction shredder waste incinera-tion	x				x
e	Sewage sludge inceneration	x	(x)			x
f	Waste wood and waste biomas incinera-tion	x				x
g	Destruction of animal varcasses	x				x

There is only one sub category relevant for Republic of Macedonia within category I and that is subcategory C (Medical waste incineration) - class 2 *Controlled, batch, no or minimal APCS.* There is only one indentified incineration source intended for incineration of medical waste. The incinerator is located at the landfill Drisla. The incinerator works with capacity of 200 kg per hour and at the temperature of 750°C different infectious, toxic solid waste materials are burnt. Between 1 to 1.5 t of waste is burnt every day (it works 12 hours daily). The public enterprise Drisla organizes the collection of medical waste from medical institutions in Skopje, The activities consists of: collection and transport of the medical waste (black and yellow plastic bags, containers for needles and other blades, containers for blood) with a frequency of at least twice a week per hospital. The waste collected in the yellow bags is burnt immediately after the arrival in Drisla. The waste is collected by specially marked vehicles (colored yellow with a sign biohazard).

Although there are rumors about burning of waste oils for heating purposes, no relevant official data were identified on the sources or the quantities. Also, no waste incineration permit is issued by the relevant authority (MOEPP).

Although waste agriculture biomass has a certain calorific value and can be used for power production, there are no such facilities in the country.

Regarding the WWTP sludge, the information is that it is being spread on agricultural land.Further studies are needed for more data.

There is no facility for incineration of municipal waste in the country.

Table 44 PCDD/PCDF emission factors for source category 1c Medical Waste Incinerator

1c	**Medical waste incinerators**	**Emission factors (µg TEQ/t MW incinerated)**	
	Clasification	**Air**	**Residue**
1	Uncontrolled burning of shipment without APCS	40 000	200*
2	Controlled combustion of shipment, with or without min. APCS	3 000	20*
3	Controlled combustion of shipment, good APCS	525	920*
4	High technology, continuously controlled combustion sophisticated APCS	1	150*

Table 45 The calculated annual emission of PCDD/Fs

Waste incineration	**Annual release, g TEQ/a**						
Year/Release route	**Air**	**Water**	**Land**	**Product**	**Fly ash**	**Bottom Ash**	**Total**
2005	1.127	0	0	0	0.000	0.008	1.135
2006	0.981	0	0	0	0.000	0.007	0.988
2007	1.065	0	0	0	0.000	0.007	1.072
2008	1.077	0	0	0	0.000	0.007	1.084
2009	1.249	0	0	0	0.000	0.008	1.257
2010	1.375	0	0	0	0.000	0.009	1.384
2011	1.410	0	0	0	0.000	0.009	1.419

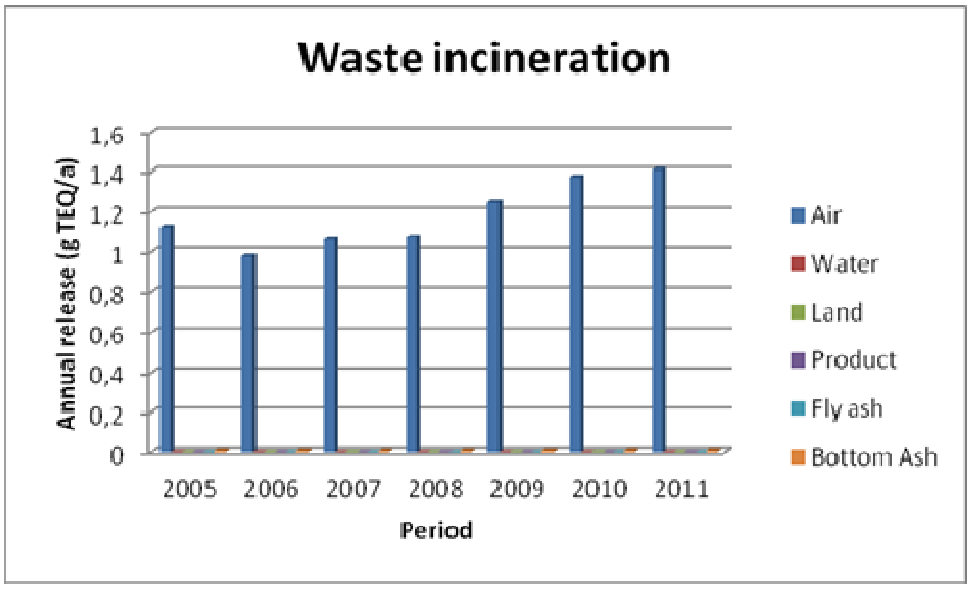

Figure 21 Annual release for Waste incineration category

11.7.2. FERROUS AND NON-FERROUS METAL PRODUCTION (CATEGORY 2)

The iron and steel industry and the non-ferrous metal industry are highly material and energy intensive industries. Considerable amounts of the mass input become outputs in the form of releases to air and residues. The most relevant emissions are those to air. Further, secondary materials and reuse and recycling of solid residues constitute a large part of the industries' activities. Ores and concentrates contain quantities of metals other than the prime target metal, and processes are designed to obtain pure target metal and recover other valuable metals as well. These other metals tend to concentrate in the residues from the process, and in turn, these residues form the raw material for other metal recovery processes. Lastly, filter dusts can be recycled within the same plant or used for the recovery of other metals at other non-ferrous metal installations, by a third party or for other applications.

Table 46 Overview of source categories included in category 2 - Ferrous and Non-Ferrous Metal Production

2	**Ferrous and Non-ferous Metal Production**	**Potentional release route**				
	Source categories	**Air**	**Water**	**Land**	**Product**	**Residue**
a	Iron ore sintering	x				x
b	Coke production	x	x	x	x	x
c	Iron and steel production and foundries	x				x
d	Copper production	x	x			x
e	Aluminum production	x				x
f	Lead production	x				x

2	Ferrous and Non-ferous Metal Production	Potentional release route				
	Source categories	Air	Water	Land	Product	Residue
g	Brass and bronze production	x				x
H	Magnezium production	x	x			x
I	Other non0ferous metal production	x	x			x
J	Shredder	x				x
k	Thermal wire reclamation	x	(x)	x		x

The iron and steel industry as well as the non-ferrous metal and alloys industry represent a significant part of the total industry in Macedonia and as well a significant source of POPs emissions. Identified sources/installations within this category:

a) Iron ore sintering (Low waste use, well controlled plant) -Skopski Leguri Skopje, Feni industry Kavadarci;

b) Iron and steel production plants and foundries

- Dirty scrap, scrap preheating, limited controls (“Maksil” Skopje, Zeleznik D.Hisar),
- Blast furnaces with APC (FeSi - Silmak Jegunovce, FeMnSi - Skopski leguri Skopje, FeNi - Feni industry Kavadarci)
- Foundries (MZT Learnica Skopje, Ideal Karbinci, Zeleznik D.Hisar)
- Hot-dip galvanizing plants (Mittal Skopje, Prototip Cinkarna, FZC 11 Oktomvri),

c) Copper production

- Smelting and casting of Cu/Cu alloys - unknown small casting capacities (Statistical data, 2005-2008);

d) Aluminum production

- Scrap treatment, well controlled, good APCS - Algreta Resen, TEAL Tetovo, RZ Institut, Ideal Karbinci;

e) Lead production

- Sec, from PVC/Cl2 free scrap, some APCS unknown small casting capacities (Statistical data, 2005-2008);
- Sec, Lead, PVC/Cl_2 free scrap in modern furnaces, with scrubber - TAB-MAK Probistip-VESNA Sap);

f) Zinc production – Algreta Resen,

g) Shreders – Makstil AD Skopje

The Table 47 gives a summary of the emissions of dioxins and furans from category 2 Ferrous and Non-Ferrous Metal Production, for the period of 2005–2011.

Table 47 Summary of the emissions of dioxins and furans from category 2 (Ferrous and Non-Ferrous Metal Production) for the period of 2005–2011 (in g TEQ/a)

Year	Annual Releases (g TEQ/a)					
	Air	Water	Land	Products	Residue	Total/a
2005	7.848	0.000	0.000	0.000	6.237	14.085
2006	8.898	0.000	0.000	0.000	7.059	15.957
2007	10.968	0.000	0.000	0.000	7.581	18.549
2008	9.116	0.000	0.000	0.000	5.875	14.991
2009	6.728	0.000	0.000	0.000	5.468	12.196
2010	7.758	0.000	0.000	0.000	5.966	13.724
2011	10.232	0.000	0.000	0.000	7.654	17.886

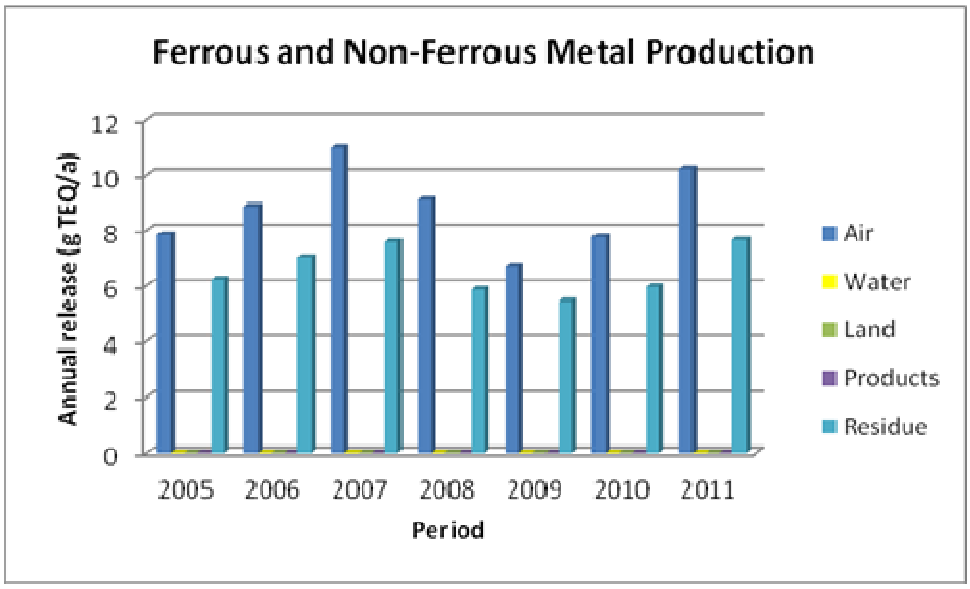

Figure 22 Annual release for Ferrous and Non-Ferrous Metal Production

11.7.3. HEAT AND POWER GENERATION (CATEGORY 3)

This source group includes power stations, industrial firing places (furnaces) and installations for providing space heating, which are fired with fossil fuels (including up to 1/3 co-combustion of waste), biogas including landfill gas, and biomass only. Table 48 outlines the five categories within this source group. The main release vectors are air and residue. Land is considered as a release vector only in the case of domestic heating and cooking using either biomass (mostly wood) or fossil fuels. Releases to land can occur if residues are dumped on the ground.

Table 48 Review of source categories included in category 3 – Power generation and heating

3	Power generaton and heating	Potentional release route				
	Source categories	Air	Water	Land	Product	Residue
a	Fosil fuel power plants (coal, oil, gas, shale oil, and co-combustion of waste)	x				x
b	Biomass power plants (wood, straw, other biomass)	x				x
c	Landfill, Biogas combustion	x				x
d	Household heating and cooking with biomas (wood, other, biomass)	x		(x)		x
e	Household heating and cooking with focil fuels (coal, oil, gas)	x		(x)		x

Four categories are defined for this subcategory according to the type of fuel used (coal, heavy fuel oil, light oil, natural gas). In all cases “Air” and “Residue” are the only two release vectors. The main combustion facilities in the Republic of Macedonia are thermal power plants using lignite, REK “Bitola” – Bitola and REK “Oslomej” – Kicevo,

Heavy oil consumers are mainly metallurgical plants and heating facilities. Light oil is fired mainly in industry for heating production (metallurgy, food production etc,) and in small heating boilers for space heating. Natural pipe-line in the Republic of Macedonia is in use for about 10 years and it is being used mainly by the large combustions units within the district heating installations and some industrial installations.

Very small number of companies uses wood for power and heat production. Two categories are defined for this subcategory according to the type of fuel used (coal, heavy fuel oil, light oil, natural gas). In all cases, air and residue is the only two-release vector. Heating and cooking in the residential households with wood is common practice in the Republic of Macedonia. This is very specific for the villages and cities without district heating plants.

Table 49 Summary of emission of dioxins and furans from category III for the period of 2005-2011

Year	Annual Releases (g TEQ/a)					
	Air	Water	Land	Products	Residue	Total/a
2005	1.160	0	0	0	0.8	1.96
2006	1.151	0	0	0	0.8	1.951
2007	1.082	0	0	0	0.8	1.882

Year	Annual Releases (g TEQ/a)					
	Air	Water	Land	Products	Residue	Total/a
2008	1.229	0	0	0	0.9	2.129
2009	1.266	0	0	0	0.9	2.166
2010	1.214	0	0	0	0.8	2.014
2011	1.324	0	0	0	1.0	2.324

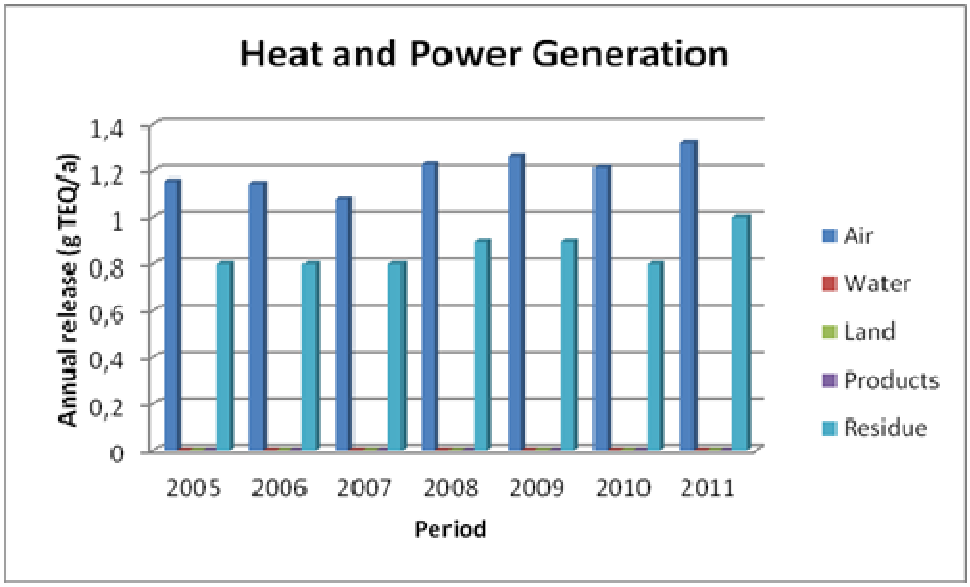

Figure 23 Annual releases for Heat and Power Generation

11.7.4. PRODUCTION OF MINERAL PRODUCTS (CATEGORY 4)

This section summarizes high-temperature processes in the mineral industry. Raw materials or fuels that contain chlorides may potentially cause the formation of PCDD/PCDF at various steps of the processes, e.g., during the cooling phase of the gases or in the heat zone. Due to the long residence time in kilns and the high temperatures needed for the product, emissions of PCDD/PCDF are generally low in these processes. The categories shown in Table II.4.1 will be included into the dioxin and furan inventory.

There is an outdated data base of IPPC installations that includes installations for brick, ceramics, and asphalt production. This data base included only those installation covered by the IPPC system (beyond the IPPC thresholds) which makes it incomplete, also. Additional survey is necessary in order to provide accurate data.

Table 50 Overview of source categories included in group 4 - Mineral Products

4	Power Generation and Heating	Potentional release route

	Source categories	Air	Water	Land	Product	Residue
a	Production of cement	x				x
b	Lime production	x				x
c	Brick production	x				x
d	Glass production	x				x
e	Ceramic production	x				x
f	Asphal mixing	x			x	x
g	Oil shale pyrolisis	x				x

The identified sources of emissions belong with the cement, brick, ceramics and asphalt production. The cement production industry in Macedonia is represented by one cement factory "Cementarnica Usje" Skopje, a plant with a good system for purification of waste gases and monitoring system of emitted dust. But, in the course of recharging, such as the bituminous shale or rubber waste, a control of the emission of PCDD/F should take place, especially because of fact that it is situated in an urban settled zone, which could highly affect the local environment.

Table 51 Summary table of emission of dioxins and furans from cat.4 for the period of 2005 – 2011

Year	Annual Releases (g TEQ/a)					
	Air	Water	Land	Products	Residue	Total/a
2005	0.057	0	0	0	0.005	0.062
2006	0.062	0	0	0	0.003	0.065
2007	0.061	0	0	0	0.002	0.063
2008	0.061	0	0	0	0.003	0.064
2009	0.056	0	0	0	0.002	0.058
2010	0.048	0	0	0	0.001	0.049
2011	0.056	0	0	0	0.000	0.056

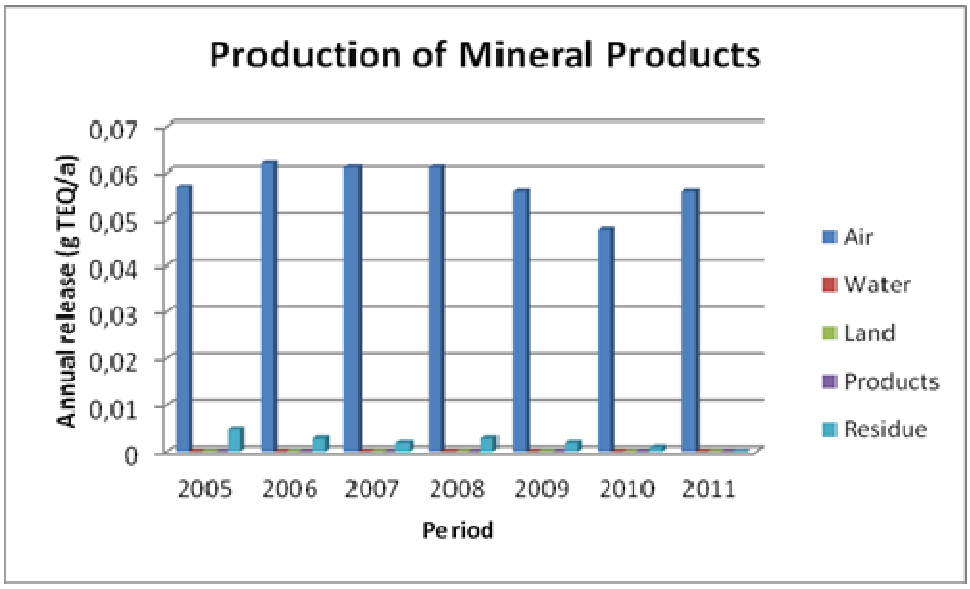

Figure 24 Annual releases for Mineral Products

11.7.5. TRANSPORT (CATEGORY 5)

POPs emissions from transport (road and off-road vehicles) result from incomplete combustion of fuel in engines. Levels of PCDD/PCDF and other unintentional POPs in exhaust gases from vehicles depend on many factors including the type of engine, its maintenance condition and age, technologies of emission reduction applied (catalysts), type and quality of fuel, driving conditions, ambient conditions etc.

Four source categories are included in this group (Table X): 4-stroke engines (gasoline fueled engines with spark ignition), 2-stroke engines (gasoline fueled engines with spark ignition), Diesel engines (Diesel fueled engines with compression ignition), and heavy oil fueled engines (mostly turbines). These types of engines are dominant in the transport sector.

Table 52 Overview of source categories included in cat. 5 - Transport

5	**Transport**	**Potentional release route**				
	Source categories	**Air**	**Water**	**Land**	**Product**	**Residue**
a	4-Stroke engines	x				
b	2-Stroke engines	x				
c	Diesel engines	x				(x)
d	Heavy oil fired engines	x				(x)

A basic review on official statistic data shows that there is no significant change on the number of the fleet in Macedonia. With an average sale of 10,000 new vehicles per year, the age structure of vehicles is consisted of approximately 50% of vehicles with catalysts. On other side, the statistical data shows that the consumption of diesel fuel represents a significantly bigger part of the total fuel consumption in Macedonia.

Table 53 Summary table of emission of dioxins and furans from category V for the period of 2005 – 2011

Year	Annual Releases (g TEQ/a)					
	Air	Water	Land	Products	Residue	Total/a
2005	0.024	0	0	0	0	0.024
2006	0.025	0	0	0	0	0.025
2007	0.028	0	0	0	0	0.028
2008	0.029	0	0	0	0	0.029
2009	0.031	0	0	0	0	0.031
2010	0.031	0	0	0	0	0.031
2011	0.031	0	0	0	0	0.031

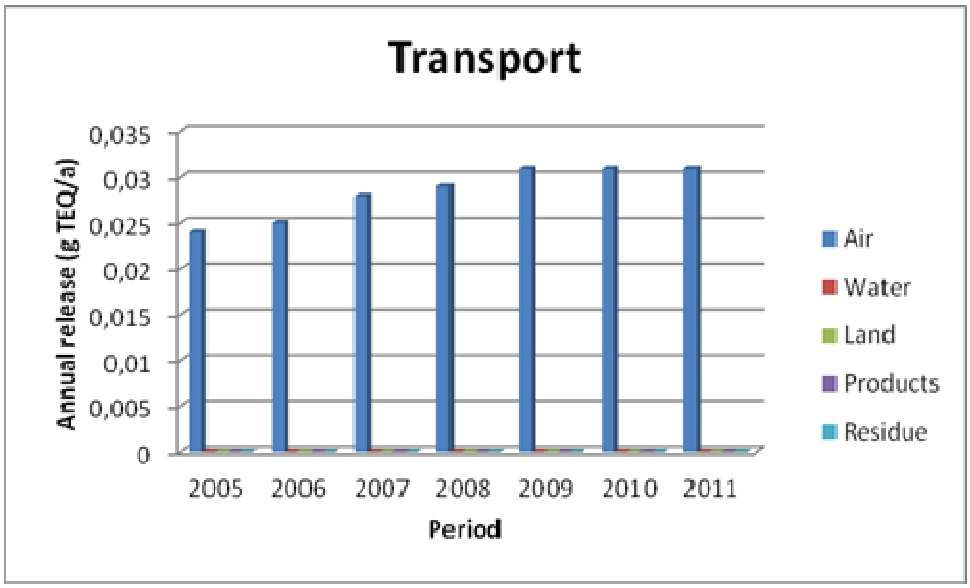

Figure 25 Annual releases for Transport

11.7.6. OPEN BURNING PROCESSES (CATEGORY 6)

This source group comprises two source categories of open burning (i.e.. combustion with no equipment or containment present) of the following materials. as indicated in Table 14:

- Biomass (forests, savannahs, grasslands, agricultural crop residues, including sugarcane), and
- Waste (mainly domestic or municipal solid waste burned in official landfills, other dumps or private backyards; vehicles, buildings and factories burned in accidental fires; and construction/demolition waste).

None of these combustion processes and fires occurs under defined or optimized conditions. Aeration occurs by natural ventilation. In the first source category, burning conditions vary from poor

to highly efficient depending on the type of fuel, fuel arrangement and the ambient conditions such as humidity, temperature, fuel moisture and wind speed. In the second group, burning conditions are commonly poor due to heterogeneous composition, compacted and poorly mixed fuel materials. Further, moisture and lack of oxygen may contribute to additional complexity. Typically, there is no intervention to select the fuels or to improve the combustion conditions. In certain jurisdictions, some of these processes are not authorized and are therefore un-documented. Consequently the releases from these processes tend to be underestimated because of difficulties in assessing the overall national activity.

Table 54 Overview of source categories included in cat. 6 - Open Burning Processes

6	Open burning processes	Potentional release route				
	Source categories	Air	Water	Land	Product	Residue
a	Biomass burning	x	(x)	x		(x)
b	Waste burning and accidential fires	x	(x)	x		(x)

In the past couple of years, the issue on forest fires has been elevated a level higher by the state authorities since it poses negative economic, environmental and health impact. Thus, more effective and efficient fire protection measures were implemented resulting in decrease of the number of fires and the damage. According to the official records from the Public enterprise in charge of national forest management “Makedonski sumi”, the quantities of burnt wood mass are given in Table 15.

Table 55 Official data on burnt waste wood over the period 2005-2012

Year	Burnt wood mass (m^3)
2005	3,207.80
2006	12,978.00
2007	617,678.67
2008	37,362.50
2009	1,551.00
2010	3,443.00
2011	55,743.00
2012	16,716.00

The national strategic documents on waste management identify landfill Drisla as only landfill in Macedonia that operates most closely to the landfill criteria set in the national legislation. The latest developments and the restructuring of the public enterprise Drisla into a limited liability company with a foreign investment is expected to improve significantly the operation of this landfill

and the waste management in the region of Skopje. All other communal landfills in Macedonia are identified as non compliant where a non selected waste (even together with hazardous components) is deposited on open dumps with no engineered containment or pollution control techniques and without any standard landfill operational practices. This results in usual occurrence of fires by accident and on purpose with expected emissions of PCDDs/PCDFs. According to the Waste Management Plan and the State Statistical Office, approximately 70 % of the population in Macedonia is using services from municipal enterprises for collecting of communal waste7. Also, according to SSO the average amount of communal waste annually produced per capita is 0.357 t (2011), thus approximately 735.250 t of communal waste is produced per year on a national level out of which 543.954 has been collected. Although there are legal obligations for reporting, only few of the communal enterprises submit reports on the waste management and operation of the communal landfills8. The operation of these non compliant landfills and the issue of their closure was subject of project "Capacity building for implementation of EU-landfill directive – closure of non-compliant landfills and inspections"9. This Project covered the existing 54 municipal landfills, categorizing them according to the assessment of their environmental risk. According to the finding of this Project, none of the municipal landfills meet the requirements for sanitary operation and environmental protection. However, this project does not cover the issue of burning of waste on landfill sites.

Because of lack of relevant and reliable data on waste burning on non compliant landfills, the position of the WG was to remain the quantities concerning category 6.b.1 (Landfill fires) given in the previous inventories.

All municipal landfills are covered by the IPPC permitting system and according to the national waste management strategy these landfills are going to be closed as regional landfill are constructed. According to the national strategic waste management documents, all regional landfills should be operational until 2020 that sets up a timeline of appropriate step-by-step closure of non compliant landfills, region by region. However, until then, these sites remain to be a significant source of PCDD/PCDF emissions (the biggest one in the inventory).

Table 56 Summary table of emission of dioxins and furans from cat. VI for the period of 2005 – 2011

Year	Annual Releases (g TEQ/a)					
	Air	Water	Land	Products	Residue	Total/a
2005	22.516	0	0.751	0	0.000	23.267
2006	22.522	0	0.752	0	0.000	23.274
2007	22.885	0	0.806	0	0.000	23.691
2008	22.537	0	0.754	0	0.000	23.291
2009	22.515	0	0.751	0	0.000	23.266

[7] According to the latest report on communal waste issued by the State Statistical Office, in 2011 the percentage is 73,98%.
[8] According to the communication with the relevant authority – MOEPP, MEIC.
[9] MOEPP and Swedish Environmental Protection Agency.

Year	Annual Releases (g TEQ/a)					
	Air	Water	Land	Products	Residue	Total/a
2010	22.516	0	0.751	0	0.000	23.267
2011	22.548	0	0.755	0	0.000	23.303

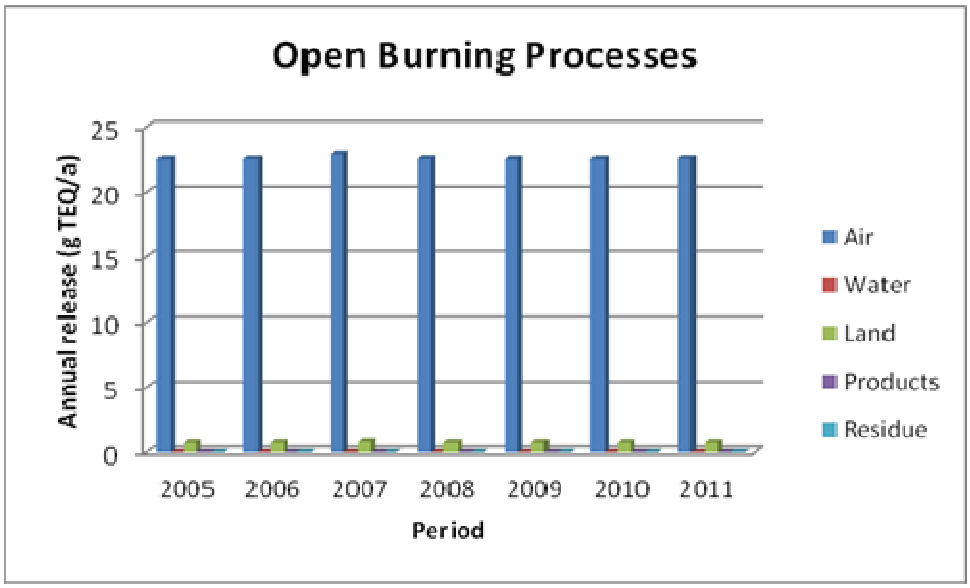

Figure 26 Annual releases for Open Burning Processes

11.7.7. PRODUCTION OF CHEMICALS AND CONSUMER GOODS (CATEGORY 7)

This source group addresses chemicals and consumer goods that are associated with potential formation and release of PCDD/PCDF during their production and/or use. PCDD/PCDF formation takes place only in processes that involve some form of chlorine. However, PCDD/PCDF may be found in other processes in which PCDD/PCDF-contaminated feedstocks and raw materials are used. While no global assessment is available, the production of chemicals is estimated to account for 34% of total PCDD/PCDF releases in the European Union, with a strong decreasing trend (BiPRO 2005).

The production and use of chemicals and consumer goods is divided into eight source categories that have the potential for PCDD/PCDF releases to air, water, land, residues, and products.

Table 57 Overview of source categories included in cat. 7 - Production and Use of Chemicals and Consumer Goods

7		**Potentional release route**				
	Source categories	**Air**	**Water**	**Land**	**Product**	**Residue**
7a	Pulp and paper production	x	x		x	x
7b	Chlorinated Inorganic Chemicals	x	x		x	x

7		Potentional release route				
	Source categories	Air	Water	Land	Product	Residue
7c	Chlorinated Aliphatic Chemicals	x	x	(x)	x	x
7d	Chlorinated Aromatic Chemicals	x	x	(x)	x	x
7e	Other Chlorinated and non-Chlorinated Chemicals	x	x	(x)	x	x
7f	Petroleum production	x	x			x
7g	Textile Production	x	x		x	x
7h	Leather refining		x		x	x

The dioxin/furan emissions from this category has a very small input in the total emission because of the small number of sources within this category and even more because of the reduced production over the years (closure due to old technology or low competitiveness). This is a case of paper production in Paper factory in Kocani closing old technology and lately - recycling pulp/paper company Komuna Skopje ceasing its activities in 2011 (the emissions refer to operational period of the company).

Table 58 Summary table of emission of dioxins and furans from category VII for the period of 2005 – 2011

Year	Annual Releases (g TEQ/a)					
	Air	Water	Land	Products	Residue	Total/a
2005	0.000	0.059	0.000	0.034	0.000	0.093
2006	0.000	0.000	0.000	0.035	0.000	0.035
2007	0.000	0.000	0.000	0.034	0.000	0.034
2008	0.000	0.000	0.000	0.036	0.000	0.036
2009	0.000	0.000	0.000	0.030	0.000	0.030
2010	0.000	0.000	0.000	0.033	0.000	0.033
2011	0.000	0.000	0.000	0.000	0.000	0.000

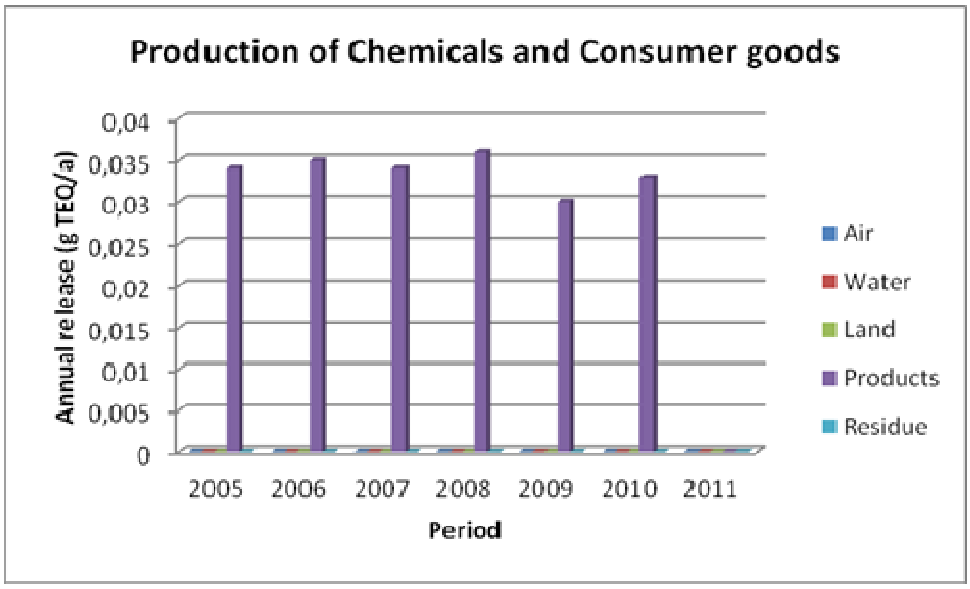

Figure 27 Annual releases for Production of Chemicals and Consumer Goods

11.7.8. MISCELLANEOUS

This category comprises five processes, shown in Table II.8.1, that were not placed in other source groups for various reasons. For example, two of the processes – drying of green fodder and smoke houses – are included here even though they are combustion processes that might be considered to be similar to processes addressed in source category 1f Waste wood combustion or source category 3d Household heating and cooking. These are shown in Table 59.

Table 59 Overview of source categories included in group 8 – Miscellaneous

8	**Other**	**Potentional release route**				
	Source categories	**Air**	**Water**	**Land**	**Product**	**Residue**
a	Drying od Biomass	x			x	x
b	Crematoria	x				x
c	Smoke houses	x			x	x
d	Dry cleaning		x		x	x
e	Tobacco smoking	x				x

There are no relevant sources of PCDDs/Fs from sub-categories listed in this category, except for the emissions from tobacco smoking. Estimates are that there are approximately 700 000 smokers in Macedonia, Although the number is big, these emissions represents extremely small input in the emission of dioxins and furans in the country (0.000001 g/a).

No relevant data source was identified regarding Dry Cleaning.

11.7.9. DISPOSAL

Non-thermal waste disposal processes are addressed in this source group. Except in certain cases, these processes are only routes of PCDD/PCDF release, not sources of PCDD/PCDF formation and release. PCDD/PCDF that are already present in the wastes being treated become concentrated or released to one or more vectors by these treatment and disposal processes (Table 60).

These processes are used to dispose of PCDD/PCDF-contaminated wastes, many of which are residues of processes that have been addressed in other source groups. The management of these residues, e.g. physical, biological, chemical, or thermal treatment or containment in secure landfills, burial in dumps and pits, spreading on land, or direct discharge of untreated effluents into rivers, lakes or oceans, can result in PCDD/PCDF releases to the environment.

Table 60 Overview of source categories included in cat. 9 – Disposal / Landfill

9	**Disposal / Landfill**	**Potentional release route**				
	Source categories	**Air**	**Water**	**Land**	**Product**	**Residue**
a	Landfills, Waste Dumps and Landfill Mining		x	x		
b	Sewage/sewage treatment	(x)	x	x	x	x
c	Open water dumping		x	x*		
d	Composting			x	x	
e	Waste oil treatment (non-Thermal)	x	x	x	x	x

Landfills and waste dumps are sites where waste is buried in engineered landfills and unlined pits or deposited in surface piles (open dumps). An engineered landfill is a constructed waste storage site where the wastes are contained and controlled by liners and caps. In contrast, pits, dumps and piles have no engineered containment or pollution control techniques and are largely unregulated and uncontrolled.

In landfills and dumps, biodegradable wastes decompose with the formation of gases (with methane as a major constituent when the degradation proceeds anaerobically) and leachate. The passage of rain and other water through the waste in landfills and dumps generates contaminated leachate and runoff. Where no collection systems are installed, landfill gases and leachate escape from the dump in an uncontrolled manner. While PCDD/PCDF have not been quantified/reported in landfill gases, they are known to occur in landfill leachate or seepage and, in some cases, nearby soils.

The Toolkit prescribes PCDD/PCDF emission factors for three source classes listed below. The classification and the emission factors were subject of the latest revision of the Toolkit.

Class 1 (Hazardous waste) applies to landfills where wastes from source groups 1 to 8 are deposited.

Class 2 (Mixed wastes) applies to landfilling of waste which may contain some hazardous components. A typical situation is in cases when no waste management is in place.

Class 3 (Domestic wastes) applies to landfilling of non-hazardous wastes.

There is no hazardous waste landfill in Macedonia. According to the Law on waste management, such landfill can be established only by the Government of Republic of Macedonia in accordance to the National waste management plan. According to the national strategic waste management document, there is only one compliant landfill in Macedonia – Drisla in Skopje. All other 54 communal waste landfills are identified as non compliant. Table 61 gives an overview of the annual quantities of deposited wastes.

Table 61 Annually produced and collected waste quantities

Year	2005	2006	2007	2008	2009	2010	2011
Waste deposited in Drisla	158215	147438	154891	145618	149663	138217	147804
Deposited waste quantities (without Drisla)	411785[1]	432252[2]	434654[2]	384522[3]	455480[3]	424893[3]	451382[3]
Total deposited waste quantities[10]	570000	579690	589544,7	530141	552230	545763	543954

[1] Acc.NPWM, [2] Forecast, [3] Statistics

Category 9.a (Landfills, Waste Dumps and Landfill Mining) refers to waste quantities deposited in Macedonia, divided into two categories relevant for the situation in the country. Category “Domestic wastes” includes wastes deposited only in Drisla as they fulfill the Toolkit criteria “landfilling of non-hazardous wastes” (declared as such landfill). The next category “Mixed wastes” includes all other waste quantities collected and deposited on other 54 municipal landfills in the country as it fits the criteria “landfilling of waste which may contain some hazardous components”. This sub category does not include the quantities of burnt wastes counted in category 6.1.b. Thus, the inventory review considers the Toolkit recommendation for “no double counting”.

Sewage is waste that is dissolved and/or suspended in water. Sewage, also called wastewater, typically includes human feces and urine, bathwater, water used in washing clothes and other items, and, in some cases, storm water run-off and industrial wastewater. This category addresses municipal sewage that is collected and transported to sewage treatment facilities. This sub category refers to quantities of waste water treated in the WW treatment plants in Kumanovo, Ohrid, Sv.Nikole, Dojran, Makedonski Brod and Resen. The Toolkit gives PCDD/PCDF emission factors for three source classes listed below.

Class 1 should be applied where, besides normal domestic effluents, industrial effluents with a potential to contain PCDD/PCDF as described for categories 1 to 8 are collected in the same sewer system.

[10] Collected waste quantities equal to deposited waste.

Class 2 should be applied for urban, industrial areas without specific potential to contain PCDD/PCDF.

Class 3 should be applied to remote areas with no known PCDD/PCDF sources and urban areas with only domestic inputs.

According to the available data for the existing WWTPs and the class definitions, they fall into the sub category 9.b.2 “With sludge removal”.

Open water dumping is the practice of discharging untreated wastewater or other wastes directly into surface waters, i.e. rivers, ground water, lakes or oceans.

Class 1 should be applied if the wastewater being discharged includes both domestic and industrial wastewater with a potential to contain PCDD/PCDF as described for source group 1 to 8 or storm water runoff from urban, peri-urban or industrialized areas.

Class 2 should be applied for urban and peri-urban areas with little or no industries.

Class 3 includes remote areas with no known PCDD/PCDF sources.

All other communal waste waters produced from the municipalities not covered by the existing WWTPs are considered in this category.

No official data are available for composting of waste.

Table 62 Summary table of emission of dioxins and furans from category IX for the period of 2005–2011

Year	Annual Releases (g TEQ/a)					
	Air	Water	Land	Products	Residue	Total/a
2005	0.000	0.402	0	0.000	17.74792	18.14992
2006	0.000	0.412	0	0.000	18.71739	19.12939
2007	0.000	0.413	0	0.000	18.87475	19.28775
2008	0.000	0.388	0	0.000	16.32184	16.70984
2009	0.000	0.423	0	0.000	19.88991	20.31291
2010	0.000	0.408	0	0.000	18.30333	18.71133
2011	0.000	0.421	0	0.000	19.67572	20.09672

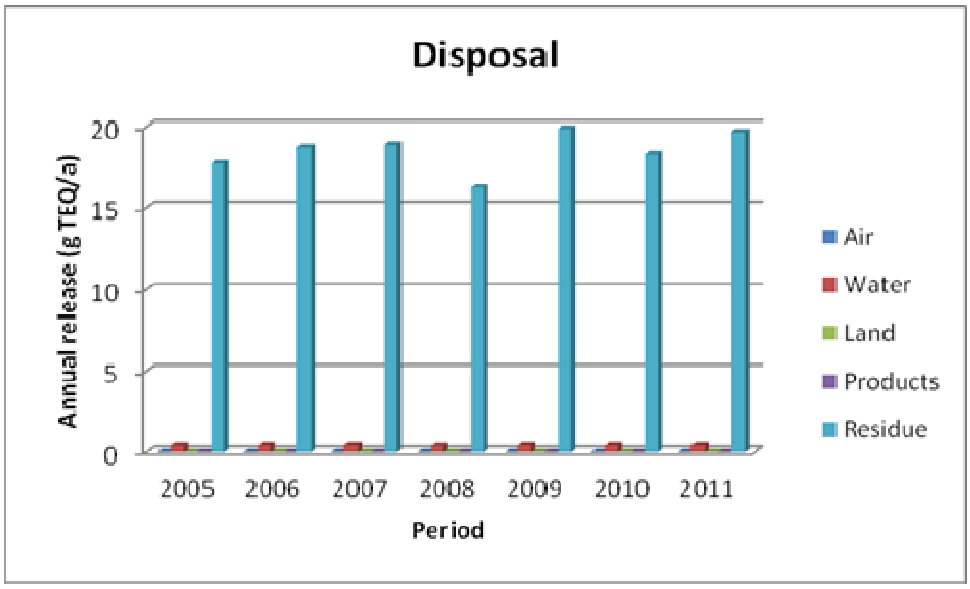

Figure 28 Annual releases for Disposal

11.8. PRELIMINARY INVENTORY ON PCBS, HCBS, PECBS FOR THE PERIOD OF 2005 – 2011

11.8.1. POLYCHLORINATED BIPHENYLS (PCB)

Source groups

- Ferrous and Non-Ferrous Metal Production
- Heat and Power Generation
- Production of Mineral Products
- Transportation
- Open Burning Processes
- Production of Chemicals and Consumer Goods

Table 63 Annual releases in 2005

	PCB;	Annual Releases (g TEQ/a)				
Group	**Source Groups**	**Air**	**Water**	**Land**	**Product**	**Residue**
1	**Waste Incineration**					
2	**Ferrous and Non-Ferrous Metal Production**	0.3	0.0	0.0	0.0	0.000
3	**Heat and Power Generation**	498.4	0.0	0.0	0.0	0.019
4	**Production of Mineral Products**	0.0	0.0	0.0	0.0	0.000
5	**Transportation**	0.0	0.0	0.0	0.0	0.000
6	**Open Burning Processes**	2.3	0.0	0.0	0.0	0.000
7	**Production of Chemicals and Consumer Goods**	0.0	0.0	0.0	0.0	0.000

	PCB;	Annual Releases (g TEQ/a)				
Group	Source Groups	Air	Water	Land	Product	Residue
8	Miscellaneous					
9	Disposal					
10	Identification of Potential Hot-Spots					
1-10	Total	500.96	0.00	0.00	0.00	0.02
	Grand Total	500.98				

Table 64 Summary of annual releases per year

	PCB, Annual Releases (g TEQ/a)					
Year	Air	Water	Land	Product	Residue	Total per year
2005	500.96	0	0	0	0.02	500.98
2006	529.71	0	0	0	0.02	529.73
2007	447.61	0	0.04	0	0.02	447.67
2008	551.99	0	0	0	0.02	552.01
2009	623.57	0	0	0	0.02	623.59
2010	613.4	0	0	0	0.02	613.42
2011	593.07	0	0	0	0.02	593.09

11.8.2. HEXACHLOROBENZENE (HCB)

Source groups

- Ferrous and Non-Ferrous Metal Production
- Heat and Power Generation
- Production of Mineral Products
- Transportation
- Production of Chemicals and Consumer Goods

Table 65 Annual releases in 2005

	HCB	Annual Releases (g TEQ/a)				
Group	Source Groups	Air	Water	Land	Product	Residue
1	Waste Incineration					
2	Ferrous and Non-Ferrous Metal Production	1690.6	0.0	0.0	0.0	0.000
3	Heat and Power Generation	49.8	0.0	0.0	0.0	0.019
4	Production of Mineral Products	15313.8	0.0	0.0	0.0	0.000
5	Transportation	0.0	0,0	0.0	0.0	0.000
6	Open Burning Processes					
7	Production of Chemicals and Consumer Goods	0.0	0.0	0.0	0.0	0.000
8	Miscellaneous					
9	Disposal					
10	Identification of Potential Hot-Spots					
1-10	Total	**17054.25**	**0.00**	**0.00**	**0.00**	**0.02**
	Grand Total	**17054.27**				

Table 66 Summary of releases per year

	Annual Releases (g TEQ/a)					
Year	Air	Water	Land	Product	Residue	Total per year
2005	17054.25	0	0	0	0.02	17054.27
2006	18175.79	0	0	0	0.02	18175.81
2007	16924.96	0	0	0	0.02	16924.98
2008	17748.6	0	0	0	0.02	17748.62
2009	14617.23	0	0	0	0.02	14617.25
2010	8829.41	0	0	0	0.02	8829.43
2011	8912.1	0	0	0	0.02	8912.12

11.8.3. PENTACHLOROBENZENE (PECB)

There are no available emission factors for PeCB in the Toolkit.

11.9. REVIEW OF THE EXISTING NIP, CONTROL MEASURES AND PRIORITY SETTING, LEGAL AND INSTITUTIONAL FRAMEWORK

11.9.1. REVIEW OF THE IMPLEMENTATION OF THE EXISTING NIP

Proposed Operational Measures to reduce releases from intentional production

Proposed NIP measures	**Status**
Promotion of selective waste collection;	To some extent.
Gradual substitution of wood and coal with other energy sources (natural gas, renewable energy sources);	To some extent – introduction of natural gas in north part of the country.
Establishment of a system for control of stubble field burning;	No data.
Established systems for risk reduction in respect to forest fires;	Done.
Introduction of protection and technical measures concerning existing installations;	No data.
Establishment of a national body for long-term permanent monitoring and reporting on the Annex C POPs;	No.
Definition and adoption of maximum permitted levels of Annex C POPs releases.	Ordinance for limit values za allowed levels of emissions and types of polluting substances in the waste gases and vapors emited by stationary sources (Official Gazzette 141/10) (table 15, LV for Ferrous metal production)

11.9.2. DEVELOPMENT OF CONTROL MEASURES, PRIORITY SETTING AND DRAFTING ACTION PLANS

Draft Criteria for priority setting

I. Effects on Environment and Human health

II. Socioeconomical conditions

III. Economical feasibility

IV. Technical feasibility

V. Time Frames

VI. Included in the existing legislation

Appraisal of the priorities

5 Very high priority

4 High priority

3 Moderate priority

2 Low priority

1 No priority

0 No available data

11.9.3. PRIORITY MEASURES

According to the identified emission sources, priority measures have been proposed. For each of the priority measures, action plans shall be developed.

- Prevention of uncontrolled burning of waste on non standard landfill
- Raising awareness and strengthening the capacities for control of POPs emission arising from the industry
- Clean up and remediation of POPs contaminated locations
- Good agricultural practices in order to limit the unintentional POPs emissions from agricultural activities
- Establishment of national POPS laboratory
- Establishment of data base of sources of intentional POPs emissions

11.9.4. LEGAL AND INSTITUTIONAL FRAMEWORK

Legal framework

POPs group	Legislation (Law, ordinance)	Chapter/article of the legislation
PCDDs/PCDFs	Law on ambient air quality Ordinance on limit values for allowed emission levels and types of pollutions substances in waste gases and vapors emitted by stationary sources (Official Gazette 141/2010);	Table 15, LV for Ferrous metal production
PCDDs/PCDFs	Law on ambient air quality Ordinance on the form and content of the template for submitting air emission data from stationary sources, manner and timeline for submission according to the capacity of the installation, content and manner of running a journal of ambient air emissions (Official Gazette 79/2011);	Attachment 3 Data on measurement of polluting substances - PCDD/PCDF

POPs group	Legislation (Law, ordinance)	Chapter/article of the legislation
PCDDs/PCDFs	Law on ambient air quality Ordinance on emissions from waste combustion	Article 35, 37, 39 and 41

Institutional framework – POPs management

POPs group	Institution	Sector/Unit	Responsibilities connected to POPs mgmt
HCH, HCB, PAHs, PCDDs/PCDFs & PCBs	MOEPP	Macedonian environment information center	UNECE-CORINAIR inventory reporting (acc. Art.7 LAAW)
PCDDs/PCDFs	MOEPP	POPs Office	POPs protocol reporting
PCDDs/PCDFs	MOEPP	IPPC Unit	IPPC Permit conditions

12. PRELIMINARY INVENTORY ON POPS-PESTICIDES

12.1. AGRICULTURAL PROFILE OF THE REPUBLIC OF MACEDONIA

About 39% of the total area of the Republic of Macedonia, or 1.01 million hectares, is agricultural land, split almost evenly between cultivated land (arable land orchards, vineyards and meadows) and permanent pastures. Another 37% of the land is upland or mountainous forestland, while the rest includes lakes and urban areas (or not used for agricultural purposes). The majority of the cultivated land is arable land, permanent crops represent 7% (35 000 ha) and meadows 58 000 ha. The country is largely hilly and mountainous; the combination of Continental and SubMediterranean climate, characterized by long, warm summers and short, not too severe winters, and fertile soil provide generally excellent conditions for production of a range of food products.

The structure of the agricultural sector is characterised by small-sized family farms - around 80% of agriculture holdings are estimated to be 2.5 – 2.8 ha on average; they are owned or leased, and are highly fragmented into small parcels. The state firms, generally much larger, are mostly not operating or in difficulties often due to not finalized state of privatisation. The majority of pastures is still owned by the state and managed by the Public Enterprise of Pastures.

Almost the totality of the Gross Agricultural Output (70%) is generated by crop production, where vegetables are the main contributors. Tomatoes, peppers and melons dominate the vegetable production and make the Republic of Macedonia a net exporter of processed vegetables. Other important agricultural products are fruit, cereals, tobacco and grapes for wine production as well as for direct consumption. Livestock output has a lesser importance; dairy farming with cow milk production dominates this sub sector.

The agriculture sector plays an important role in the country's economy, its contribution to GDP accounts for nearly 10% and is relatively stable; together with food processing the percentage increases to 16%. Nearly half the population lives in rural areas. Officially, almost one fifth of the working force is employed in agriculture. Agriculture has always served as a shock absorber for the socio economic and structural changes in industry and other sectors of the economy. The agri-food processing industry has always played an important role in the Republic of Macedonia.

According to data from the Statistical Office of the European Union (EUROSTAT) for the period 2009 – 2011, the Republic of Macedonia was amongst the biggest exporters of vegetables to the EU (14th biggest in 2009; 12th biggest in 2010 and 10th biggest in 2011). During this period, the volume of imports of vegetables varied between 63 800 and 91 800 tonnes, mainly edible brassicas and tomatoes. Regarding the imports of fruit, in the same time period, the imported quantities varied between 32 900 and 53 000 tonnes, mainly pome fruit (apples, pears and quinces), table grapes, melons and watermelons.

12.2. LEGAL AND INSTITUTIONAL FRAMEWORK ON PLANT PROTECTION PRODUCTS (PPPS)

12.2.1. LEGAL FRAMEWORK

The Plant Protection Products Act (PPPA) (Official Gazette No 110/2007), last amended in 2011 (Official Gazette No 53/2011) provides the legal framework for the authorisation, manufacturing, placing on the market and use of PPPs and active substances, as well as for official controls on PPPs, enforcement measures and sanctions to be applied in the case of non-compliances

identified. In addition, the PPPA sets out the legal requirements for the packaging and labelling of PPPs and for the application equipment.

Secondary legislation with regard to PPPs is in place. The set of rulebooks in force facilitates the implementation of the PPPA and provides more detailed requirements and procedures for the authorisation of PPPs, evaluation of active substances and PPPs, biological testing for efficacy, packaging and labelling of PPPs, testing and certification of application equipment and the use of bio agents.

The PPPA and the secondary legislation in place were adopted aiming at transposing the Council Directive 91/414/EEC. This Directive was repealed by Regulation (EC) No 1107/2009.

The Food Safety Act (FSA) (Official Gazette No 157/2010) was published on 08 December 2010 and entered into force on 01 January 2011. The FSA provides the legal framework for food safety, also covering issues related to pesticide residues in food of non-animal origin (FNAO) and is the legal basis for the establishment of the FVA. In addition, procedures for official controls are set up in the FSA, as well as measures to be undertaken and sanctions to be applied in the case of noncompliance identified.

The secondary legislation in place regarding pesticide residues includes the following rulebooks:

- The Rulebook on the general requirements for food safety (Official Gazette No 118/2005) sets out the requirements for official controls in the area of food safety, including pesticide residue controls for FNAO; Annex II to the Rulebook provides the list of MRLs; however, some of the MRLs listed in the Annex are higher than the applicable EU MRLs; this is due to the fact that EU MRLs laid down in EU legislation repealed by Regulation (EC) No 396/2005 have been introduced as national MRLs in the Republic of Macedonia;
- The Rulebook on official controls (Official Gazette No 133/2007) providing more detailed instructions on the control methods to be applied (including surveillance, audit, monitoring and sampling), procedures to be followed for the purposes of official controls and measures to be undertaken in the case of non-compliance identified; these instructions provided are related to food safety controls in general, for all types of food;
- The Rulebook on sampling for pesticide residues for the purposes of official controls of food of plant and animal origin (Official Gazette No 133/2011) transposing Commission Directive 002/63/EC.

12.2.2. INSTITUTIONAL FRAMEWORK

The Phytosanitary Directorate at the MAFWE (in particular, the Plant Protection Unit at the Agro-Chemistry Sector) is the CA in charge of developing the policy and drafting legislation in the area of PPPs. A further responsibility of the PD is the authorisation of PPPs. The SAI is the CA in charge of the implementation of official controls on the marketing and use of PPPs.

The Sector for Phytosanitary Inspection at the SAI is responsible for official controls in the area of plant health. Within this sector, there are two units. The Border Phytosanitary Inspection Unit is in charge of border controls, which also includes controls on imports of PPPs. There are 23

phytosanitary inspectors, located at nine Border Inspection Posts (BIPs). The Internal Phytosanitary Inspection Unit has recently been established. This Unit is responsible for controls on the use of PPPs. However, official controls on the use of PPPs are at a very early stage of implementation and the appointment of staff is in progress.

The Sector for Inspection of seed, planting material, PPPs, flowers and ornamental plants, wine and vineyards, fruit and vegetables, among other activities, is also in charge of official controls on the marketing of PPPs (pesticide retailers and wholesalers). There are eight agricultural inspectors at eight different locations, who are directly involved in these controls.

The FVA was established on 01 January 2011 by merging the Food Directorate at the Ministry of Health (MoH) and the Veterinary Directorate at the MAFWE. It is an independent body under the direct supervision of the Prime Minister. The FVA is the CA responsible for the implementation of official controls in the area of food and feed safety, including pesticide residues controls in and on FNAO. It is also in charge of surveillance and monitoring within the scope of their responsibilities. The total number of staff of the FVA is about 300. An estimate was provided by its representatives, stating that about 50 % of the staff members are involved in activities in the area of food safety, including FNAO. Fifteen members of staff work at central level (the Unit for safety of FNAO), another 15 inspectors are allocated at nine BIPs and 45 food inspectors are appointed at 34 different locations around the country.

12.3. LABORATORIES FOR PESTICIDE RESIDUE ANALYSIS

There are three laboratories that are currently involved in pesticide residue analysis in food of plant origin.

The Residues and Contaminants unit at the Faculty of Veterinary medicine (FVM), located in Skopje, has good facilities with qualified and trained staff. The laboratory has eleven staff in total - one Head of Department, five analytical staff and five technicians. All analytical staff have a minimum of a university degree or higher. The laboratory dealing with pesticides is equipped with one GC-MS, one GC-MS/MS and one LCMS/ MS, which is purchased in November 2011.

The Phytosanitary laboratory at the Institute of Agriculture in Skopje is situated in an older building where space is limited; however, it is adequate for existing requirements. There is six staff in total - one Head of Department, three analytical staff and two technicians. All analytical staff have a minimum of a university degree or higher. This laboratory is equipped with GC-ECD and GC-NPD detection systems. There is no mass spectrometry detection in the laboratory.

The laboratory at the PHC in Bitola currently has limited facilities. The laboratory has four staff in total – three analysts and one administrator who is responsible for sample reception. All analytical staff have a minimum of a university degree or higher. The laboratory is equipped with one GC, which has dual detectors, ECD and NPD. Staff in all laboratories receives training related to pesticide residue analysis. Staff working with instruments also receives specialized training. Staff competencies are checked annually as part of the accreditation process.

Analytical spectrum and methods, status of accreditation - All three laboratories use multi-residue methods as the primary extraction source. No single residue methods are used for food of non-animal origin. The laboratory at the FVM does not have ISO 17025 accredited methods for the analysis of pesticides in FNAO. The laboratory staff met buy the audit team explained that there are

plans to extend the scope of accreditation to include pesticide residue analysis in FNAO; however, this will depend on the availability of funding.

One non-accredited method, based on QuEChERS is currently used for the determination of pesticides in samples of produce of non-animal origin. This method can screen for approximately 25 pesticides consisting of organochlorine (OCs) and organophosphorus pesticides (OPs), pyrethroids and carbamates, using GC-MS/MS. The use of LC-MS/MS has not yet been introduced for the routine analysis of pesticides in foodstuffs. The existing multi-residue screen has a limit of quantification ranging between 10-50 parts per billion (ppb).

The number of samples of plant origin tested for pesticides in 2010, 2011 and 2012 (to date) is 272, 155 and 13 respectively. Samples are sent directly to the laboratory where they are electronically registered. Laboratory staff members are not involved in any part of the sampling process. Sample preparation and extraction procedures are fully documented. Sub samples are taken and stored at -20^{o}C under controlled conditions. The turn-around time for routine samples is 10 working days.

The Phytosanitary laboratory is ISO 17025 accredited for the following methods: determination of OPs in foodstuffs of plant origin by GC-NPD using EN-12393 (1-3) and the determination of OCs pesticides in fats and oils by GC-ECD using EN-1528 (1-3). The current scope of accreditation is for five OPs (in fruit and vegetables) and nine OCs (in plant oils), including metabolites. The total number of pesticides currently being tested for is 51 (both OP's and OC's). It has been recently accredited by the national accreditation body, the Institute for Accreditation of the Republic of Macedonia.

The number of samples tested for pesticide residues in 2010 was 2 830, and in 2011, 1 920. Samples are electronically registered upon arrival then immediately transferred to the pesticide laboratory. Procedures for sample processing and extraction are fully documented. Fruit and vegetable samples are not cryogenically processed and all samples are stored frozen under controlled conditions. The turn-around time for routine samples is 10-15 days. The laboratory at the PHC in Bitola is ISO 17025 accredited for the determination of OPs in food of non-animal origin by GC-NPD using EN-15662 (QuEChERS). The current scope is for five OPs. Additionally, up to 25 more pesticides (OCs and organo-nitrogen) can be analyzed by this method; however, these are not included in the scope of accreditation. The number of samples sent to the laboratory is approximately two per month, mainly as official control samples taken at BIPs. No samples are sent by the FVA for analysis. No samples have been received in the last two to three months. Sampling and extraction procedures are fully documented. The period between sample reception and reporting is two days.

12.4. NEW POPS PESTICIDES

Persistent organic pollutants (POPs) are organic compounds that have long half-lives in the environment and undergo slow physical, chemical, and biological degradation. They are able to pass through ecosystems and can travel great distances, both locally and globally. Examples of POPs pesticides are aldrin, chlordane, DDT, dieldrin, endrin, mirex, heptachlor and toxaphene that have been subject to the initial NIP on POPs (2004). There is also a growing concern over the effects of the newly included pesticides such as chlordecone, endosulfan and lindane with the buy-products alpha

and beta hexachlorhexane. All of them are organochlorine (OC) compounds used mainly as insecticides.

POPs persist for a very long time in the environment. POPs tend to have high lipid solubility and therefore bioaccumulate in the fatty tissues of living organisms. They too have long half-lives in the body and can be measured several months to several years after exposure. These characteristics mean that they can pose a special threat to the environment and human health. They pose a special risk to human health and the environment. Sometimes, they mimic the function of steroid compounds such as hormones potentially leading to disruption of the endocrine system. Human exposures to POPs occur via diet, occupation, accidents and the indoor environment, particularly in countries where POPs are used in intensive agriculture.

Despite the fact that usage of the majority of organochlorine pesticides in the Republic of Macedonia has been forbidden since the seventies of the previous century, as well as in a vast number of countries in the world, its presence in unchanged form or in some metabolic forms in different matrixes, water, sediment or animal tissue should be considered as a serious problem for the environment as a whole, as indicated in the study on organochlorine pesticide residues in water, sediment and fish tissue in lake Ohrid (2011). The analyses undertaken during this study for detection of organochlorine pesticides in different matrixes (water, sediment and muscle tissue of barbell) collected in Lake Ohrid represent the first round of a systematic research taking place in our laboratory. They are a prerequisite with regards to a thorough and long-term study of the persistent organic pollutants in the region of Ohrid and are a solid starting point for indication of the risks associated with this group of compounds upon the entire living world. From the study results, a conclusion can be made that higher content of organochlorine pesticides was found in fish muscle tissue than in sediment samples as a result of the bioaccumulation and the lipophilic character of this group of pollutants.

12.5. METHODOLOGY – POPS-PESTICIDES

During the preparation of the inventory report on POPs pesticides an indicative methodology has been applied (FAO Pesticide Disposal Series – Preparation of inventories). It was used mainly to identify POPs pesticide issues, how pesticides are being used, and pesticides life cycle in the environment and opportunities for prevention of further accumulations. This information enables prioritization for further surveys and establishment of action plans. The methodology applied does not provide detailed information in level required for undertaking field actions. It is based on desk research of existing information and focus group meetings. The existing information was researched in following forms:

- reports of surveys and inventories undertaken previously;
- reports of ministry officials (MoEPP and MAFWE)
- reports from manufacturers and importers; and
- customs import records.

12.6. CHLORDECONE

Chlordecone was previously used as an insecticide to control agricultural pests, including slugs, snails, and fire ants. Chlordecone was first produced in the United States in the early 1950s; however, production in the United States ended in 1975 due to intoxication from industrial exposure in employees who worked at a chlordecone manufacturing plant. Its registration was cancelled in

1976. Chlordecone is very resistant to degradation in the environment. It is expected to adsorb to soil and to stick to suspended solids and sediments in water. Very small amounts of chlordecone will evaporate from soil or water surfaces, and chlordecone in the air is likely to be removed by deposition of particles. Chlordecone has a high potential for bioaccumulation in fish and other aquatic organisms.

Chlordecone is highly persistent in the environment, has a high potential for bioaccumulation and biomagnification and based on physico-chemical properties and modelling data, chlordecone can be transported for long distances. It is classified as a possible human carcinogen and is very toxic to aquatic organisms. Chlordecone is well absorbed following oral exposure. Once absorbed, it is widely distributed and eventually concentrates in the liver. It is metabolized by humans and some animal species to chlordecone alcohol.

No use or production of the chemical is reported in the Republic of Macedonia.

12.7. TECHNICAL ENDOSULFAN AND ITS RELATED ISOMERS

According to the risk management evaluation on endosulfan, adopted by the POPRC, endosulfan is an insecticide that has been used since the 1950s to control crop pests, tsetse flies and ectoparasites of cattle and as a wood preservative. As a broad-spectrum insecticide, endosulfan is currently used to control a wide range of pests on a variety of crops including coffee, cotton, rice, sorghum and soy.

A total of between 18,000 and 20,000 tons of endosulfan are produced annually in Brazil, China, India, Israel and South Korea. Colombia, the United States of America and several countries in Europe that used to produce endosulfan have stopped its production.

The largest users of endosulfan (Argentina, Australia, Brazil, China, India, Mexico, Pakistan and the United States) use a total of about 15,000 tons of endosulfan annually. Additional 21 countries reported using endosulfan. The use of endosulfan is banned or will be phased out in 60 countries that, together, account for 45 per cent of current global use.

According to the risk profile on endosulfan, adopted by the POPRC, endosulfan is persistent in the atmosphere, sediments and water. Endosulfan bioaccumulates and has the potential for long-range transport. It has been detected in air, sediments, water and in living organisms in remote areas, such as the Arctic, that are distant from areas of intensive use.

Endosulfan is toxic to humans and has been shown to have adverse effects on a wide range of aquatic and terrestrial organisms. Exposure to endosulfan has been linked to congenital physical disorders, mental retardations and deaths in farm workers and villagers in developing countries in Africa, Asia and Latin America. Endosulfan sulfate shows toxicity similar to that of endosulfan.

In the Republic of Macedonia, endosulfan was lastly recommended in the Review of registered pesticides (annex 1) as non-systemic insecticide (acaricide). However, it was permitted for control of wide range of pests (Aphidae, Aleuridae, Thripidae, Psylidae) on even wider range of crops, mostly vegetables and fruit orchards. Latest registrations for endosulfan have been issued for the following companies under trade names as follows:

- Bevaticid, product of Jiagsu Flag Chemical Industry, Ltd – China, importer for Macedonia – Herba Hem Skopje;

- Methophan, product of Makhteshim–Agan - Izrael, importer for Macedonia Magan Mak;
- Thiodan E-35, product of BAYER Crop Science AG – Germany, importer for Macedonia Agropin, Skopje;
- Thiocid E-35, product of Makhteshim–Agan – Israel, importer for Macedonia Magan Mak
- Thiocid E-35, product of AD Zupa Chemical Industry Kragujevac – Serbia, importer for Macedonia Mak Trade, Skopje

According to informal information from the Phytosanitary Directorate (MAFWE) there are no registered importers in the exim system for the year 2009. Threre are hard copies for 4000 l of endosulfan. The previous years, 2007 and 2008 the imported quantities are recorded to be 19500 l and 10400 l respectively. The countries of origin according to the information from the State Office for Statistics (under tariff code 3808912000 for organochlorine pesticide) are Serbia, China and Israel. As of 2009 this tariff code is withdrawn.

Detailed inventory in historical use of endosulfan needs to be carried out in order to determine the intensity and possible stockpiles and sources of contamination.

Prior to the ban on organochlorine pesticides in the Republic of Macedonia, endosulfan application was reduced due to new more efficient and less hazardous insecticides. With the Plant Protection Products Act (PPPA) (Official Gazette No 110/2007), organochlorine pesticides are banned for import, export and use, as of 2009. The list of registered plant protection products is harmonized with Annex 1 to the EU Directive 1272/2008. The list with active substances, trade names and registered distributors.

Chemical and non-chemical alternatives to endosulfan are available in many geographical situations both in developed and developing countries. Some of these alternatives are being applied in countries where endosulfan has been banned or is being phased-out. However, in some countries, it may be difficult and/or costly to replace endosulfan for specific crop-pest complexes. Some countries also prefer to use endosulfan in pollinator management, insecticide resistance management, integrated pest management systems and because it is effective against a broad range of pests. Some countries want to continue to use endosulfan to allow time for the phase-in of alternatives.

12.8. LINDANE (GAMMA HEXACHLOROCYCLOHEXANE), ALFA HEXACHLOROCYCLOHEXANE AND BETA HEXACHLOROCYCLOHEXANE

Lindane is the common name for the gamma isomer of hexachlorocyclohexane (HCH). Technical HCH is an isomeric mixture that contains mainly five forms, namely alpha-, beta-, gamma-, delta- and epsilon-HCH. Lindane has been used as a broad-spectrum insecticide for seed and soil treatment, foliar applications, tree and wood treatment and against ectoparasites in both veterinary and human applications. The production of lindane has decreased rapidly in the last few years and only few countries are still known to produce lindane. It is listed under Annex A with a specific exemption for use as a human health pharmaceutical for control of head lice and scabies as second line treatment.

The main issue with OCPs in the Republic of Macedonia is the existing landfill with HCHs – technical products (mixture of HCH) at the premises of OHIS company (app. 38.000 tons). Starting

from 2002 the POPs Office has produced sufficient documentation about the status and available alternatives and solutions. The working group will make a recommendation for the most viable and environmentally friendly solution.

The OHIS site is an organic chemical industrial factory nowadays partially dismissed and interested by old environmental burdens due to the historical production of pesticides, particularly lindane, monochloroacetic acid and chlorine. The OHIS Plant was founded in 1964 through the union of two factories for production of synthetic textile fibers and acetylene products, i.e. the Naum Naumovski Borce and the Electro-Chemical Combine (UNEP, 2001). The first units in operation produced detergents and pesticides (including lindane or gamma-hexachlorocyclohexane). Later, a polyvinylchloride plant was built and put into operation. The complex grew to become one of the country's leading industrial manufacturers. The Lindane complex was gradually put into function since 1964 and was functioning until 1977, when lindane production ceased due to changing market conditions and due to environmental reasons.

In the period of Plant operation the Hexachlocyclohexane (HCH), whose gamma-isomer is the active component of the insecticide lindane, was produced by the process of photochlorination of benzene. The produced mixture contained also other HCH-isomers, i.e. alfa-, beta- and delta-HCH. The gamma isomer was separated by extraction in methanol and by further concentration process whereas the remaining HCH-isomers, forming the 86-88% of the batch mixture, were treated as a waste and about 38000 t were 'temporary' stockpiled in dumpsites. After site closure, in the 1980s the lindane plant's equipment was dismantled, leaving behind two empty buildings. In the same year, a wastewater treatment system was built.

12.9. ALTERNATIVES AND RECOMMENDED ACTIONS

5. POPs chemicals inventory data base – including organochlorine pesticides
6. Public awareness on POPs chemicals, application of alternative chemicals in agricultural production.
7. Implementation of Integrated Pest Management practices - The Code for Good Agricultural Practices (CGAP) as an important tool of the agri-environment policy in the EU was defined in 2011. The compliance with defined codes of GAP as a precondition for payments within AEM will be mandatory for the farmers. In this regard, Macedonian standards for farm management need to be enforced by thematic trainings so that farmers should apply them based on present knowledge of agriculture practises and technologies that are normally used in Macedonia and in respecting as a minimum requirement the national legislation concerned.
8. Decontamination of Lindane landfill site – According to the latest study, carried out in 2010, a great soil remediation effort is needed for all contaminants detected at the OHIS site (i.e. HCH isomers and Hg) at least for the superficial layer (0-1 m bgl), while limited groundwater remediation is needed for organic contaminants (i.e. HCH and CHC) to ensure residential use of the site and to reduce the risk related to irrigation. Lower remediation targets are required in case commercial destination is chosen for the OHIS site. In any case, the required abatement of the current concentrations will not be lower than three orders of magnitude, requiring very efficient remediation systems.

Therefore, due to the considerable amounts of waste/contaminated soils estimated and the stringent remediation targets, and in order to allow for future splitting of Project costs, a phased CD

has been developed, considering different/subsequent steps to complete the site remediation. Furthermore, the use of a risk-based phased approach allows detailing, for each remediation step, possible applicable technologies, site use constraints based on residual risk for human receptors and remediation costs. In such way a clear picture of any possible solution and its possible consequences is made available for present site owners, potential site buyers and/or public Authorities and Planners.

The following phased remediation strategy is envisaged for the OHIS site:

Phase 1: Removal of primary contamination sources (i.e. HCH dumps and contaminated buildings) and on site/off site treatment;

Phase 2: Buildings demolition and on-site treatment of hazardous materials;

Phase 3: Removal of the superficial soil layer (from ground level to 1 m depth) from almost the whole OHIS site and soil remediation to reach safe residual levels for residential or commercial on site receptors;

Phase 4: Excavation and on site or in situ treatment of the deep soil sections exceeding the SSTLs calculated for residential or commercial scenario. In this case the intervention can be limited to the hot-spots only, and the lower abatement needs allow the use of in situ techniques or mobile systems; and

Phase 5: Installation of a hydraulic barrier and extraction and subsequent on-site treatment of contaminated groundwater (Pump and Treat system).

13. SOCIO-ECONOMIC ANALYSIS

The purpose of the Analysis is to show the potential social impacts of the economic and other activities, as well as the management of persistent organic pollutants in all sectors of the society (including local communities and groups, the civil sector, the private sector, and the Government). The social impacts are comprised of the changes among the individuals or in the communities where the people lived, work, socialize with one another, organize in order to meet their needs and generally be members of the society. In this context, the social and economic impacts may include: vulnerability related to exposure to persistent organic pollutants; deterioration or improvement of the health; changes in life expenses; changes in the employment, revenues and protection at work; changes in the wealth distribution; opportunities for development of the enterprises; and changes in the demand for public services, such as health, education, and infrastructure (United Nations, 2007).

The focus of the Analysis is the impact of both groups of persistent organic pollutants in the Republic of Macedonia: unintentional persistent organic pollutants (dioxins and furans) and PBDE and PFOS persistent organic pollutants. The Analysis was conducted pursuant to the information provided by the three working groups within the Project and additionally from relevant international studies on the social and economic impact of the persistent organic pollutants, due to lack of respective investigations in the country.

13.1. DIOXINS AND FURANS

Dioxins and furans are a family of toxic substances with similar chemical structure. They are known as unintentional persistent organic pollutants, since they are not produced intentionally, but are formed in two ways: through the production process of certain pesticides, protection agents, disinfectants and paper products; during incineration of materials, such as household waste and toxic waste (hospital waster, lead gasoline, plastic, paper, wood containing dioxins).

Dioxins and furans may be found in very small amounts in the environment, including the air, the water, and the soil. As a result of their presence in the environment, they may be found in the food as well.

The exposure to dioxins and furans may be connected to a wide spectrum of negative health effects on the animals and the people. The type and occurrence of these effects is generally dependent on the extent and duration of the exposure (Health Canada, 2013).

13.1.1. MAIN SOURCES

The emission of unintentional persistent organic pollutants from the existing municipal non-standard landfills, and the industry are their main sources in the Republic of Macedonia. Detailed data on the areas and geographic distribution of the municipal non-compliant landfills and information of the hazardous waste created by the Macedonian industrial facilities may be obtained from the Plan on decommissioning of non-compliant landfills within the Project for Capacity building for implementation of the EU Landfill Directive - decommissioning of non-compliant landfills and the 2009-2015 National Waste Management Plan of Republic of Macedonia.

The 2009-2015 National Waste Management Plan of the Republic of Macedonia emphasizes that the existing practices of waste disposal are not compliant with the technical and environmental

standards. Additional problem for the environment is also the traditional burning of municipal waste, plant fabric and plastic materials from the green houses or silage covers in the open space.

13.1.2. SOCIO-ECONOMIC IMPACT

The socio-economic impact of unintentional persistent organic pollutants in the Republic of Macedonia is as follows: deterioration of human health; reduction of the standard of living; reduction of revenues and protection at work; expenses for the enterprises and the public sector for prevention, management or inspection.

Dioxins and furans may be introduced in the human body by breathing polluted air, drinking contaminated water, or ingesting contaminated food. Generally, 90% of the exposure to dioxins and furans is a result of ingesting contaminated food, since the dioxins and furans enter the fatty tissues of the animals within the food chain (Agency for toxic substances and diseases, 2003).

There are numerous international studies analysing the health factors of dioxins and furans, and the following may be mentioned as representative thereof: Van der Heijden (1982), World Health Organization (1989), WHO Regional Office for Europe, (1987), McLachlan (1993), Van den Berg, et al. (1994), US Environmental Protection Agency (1994), Carrier, et al (1995) and Van Leeuwen and Younes (2000). Basically, the studies examine the effects dioxins and furans have on animals in laboratories or analyse the health effects on people exposed to dioxins and furans by industrial accidents, contaminated food, and unprotected work places or similar. These studies show that the dioxins and furans have a potential to create range of various effects among animals and humans. Health effects of human exposure include the following:

- skin disorders,
- liver issues,
- damage to the immune system, the endocrine system, and the reproductive functions,
- weakening of the nervous system and developmental issues,
- certain types of cancer.

Additionally, as is the case with other toxic substances, the health risks to humans are dependent on may factors, as follows: manner of human exposure (through food, water, air, etc.); quantity and frequency of human exposure (for instance, high exposure during single event, or daily exposure to lower quantities); health status of the person, and the exposure of the person to other substances which are related to health effects. Even though this compounds the problem, the science unequivocally agrees that the exposure to dioxins and furans should as low as possible.

It is important to stress that the negative human effects are then reflected in the economic sphere of societal living, as follows:

- loss of family income due to death;
- reduced revenues due to reduced work ability as a result of illness; and
- medical expenses.

From a point of view of enterprises or the public sector, the social and economic impact may include the following:

- loss or reduced human capital;

- expenses related to healthcare or social contributions;
- investments for introducing measure for prevention and control of emissions of persistent organic pollutants (decommissioning of non-compliant municipal landfills and commissioning of new regional landfills);
- increased fees for municipal waste management for the purpose of establishing a sustainable integrated waste management system;
- potentially increased costs for the operation of IPPC installations due to introduction of BAT/BEP measures (Best Available Techniques/Best Environmental Practice);
- expenses for strengthening the institutional capacities of competent bodies (at municipal and regional level).

There are no studies in Republic of Macedonia estimating the number of exposed population to emissions of unintentional persistent organic pollutants. Nevertheless, the fact that there are industrial capacities in the country, and 54 non-compliant municipal landfills scattered on the whole territory and releasing unintentional persistent organic pollutants attests to the seriousness of the problem.

13.1.3. PROPOSED MEASURES

A. Implementation of the country's strategic commitments to establish an integrated waste management system. The 2009-2015 National Waste Management Plan envisages decommissioning of most of the existing landfills, having in mind that the conditions at the sites and their impact on the environment precludes them to be upgraded in a cost-efficient manner and become compliant with the EU standards. The state strategy is to regionalise the waste management, that is to say, establish regional centres and commission regional landfills for municipal waste -5 to 7 regional landfills (per statistical region). PPP procedures have been already initiated for two regional landfills.

The typical investment expenses for a new landfill and decommissioning of a non-compliant landfill are provided in Table 67, where the costs of the plan implementation include the following:

- investment for decommissioning of existing landfills – EUR 28,3 million;
- construction of 3 regional landfills – EUR 37,3 million;
- procurement of new furnace for incineration of medical waste (between EUR 2,5 and 5 million), subject of the PPP (City of Skopje and Drisla);
- investments in public infrastructure for waste management – EUR 82,3 million;
- strengthening of human resources and technical assistance – EUR 6 million; and
- private investments in waste management infrastructure (excl. IPPC requirements) – EUR 101 million.

Table 67 Typical investment costs for a new landfill and decommissioning of a non-compliant landfill

Investment in civil engineering works and construction of a new landfill	**Typical investments for municipal waste landfill (EUR/ha)**	**Investments for decommissioning of a non-compliant landfill**	**Decommissioning (rehabilitation) of existing non-compliant landfills for municipal waste (in EUR/ha)**

Civil engineering works and surface preparation of the new landfill	750.000	Provisioning of the required materials and civil engineering works to decommission the landfill	250.000
Investment in landfill infrastructure, including water management	83.000	Investment in rainfall management	40.000
Water treatment plant for filtrate and other waste waters	125.000	Investment in system for collection of waste waters for the water treatment plant	30.000
Installation of collectors of active landfill gas and pre-treatment	21.000	Installation (probable) of collectors of passive landfill gas and venting	10.000
Total	**979.000**		**3330.000**

Source: 2009-2015 National Waste Management Plan

B. Implementation of the integrated pollution prevention and control system and implementation of BAT/BEP measures in the sectors identified as sources of persistent organic pollutants.

The implementation of the measures for reduction and control of emissions of persistent organic pollutants will not only reduce or prevent their negative social effects, but will also create opportunities for creation of new businesses (SME) connected to the utilisation of certain waste flows, and will create opportunities for opening new jobs at the regional landfills.

13.2. PBDE AND PFOS –NEW PERSISTENT ORGANIC POLLUTANTS

The new industrial chemicals - persistent organic pollutants, group of PBDE – cPentaBDEs, c-OctaBDEs, were used in the industrial processes for improving the properties of low flammability for the products from the following sectors: chemical industry, electrical and electronics industry, transport, furniture manufacturing, curtains and carpets manufacturing, waste recycling industry, and construction industry.

The highest quantities of these chemicals were produced in the period 1970-2005 (1.3 – 1.5 Mt). The production of these chemical in EU terminated in 1997, whereas in the USA it terminated in 2005. These chemicals are still used through the products that have been manufactured in that period (plastic materials in electronic devices, upholstery fabric for the means of transport, etc.) and will soon become waste.

The group of perfluorooctane acid and its derivatives (PFOs) are used as surface active components in various processes for production of: fire-fighting foam, packing paper and packaging materials, lining and adhesives, hydraulic fluids and galvanisation, textile, hides, household and industry cleaning products, pesticides and insecticides, photography and photolithography and semiconductors industry.

13.2.1. MAIN SOURCES

The group of PBDE and PFOS –new persistent organic pollutants conducted a survey among the key stakeholders on the main sources of PBDE and PFOS in Republic of Macedonia. The survey results show that the main source of new industrial POPs chemicals in the country is their existence

in consumer products – electrical and electronics equipment and old vehicles. These products have been manufactured in the EU, the USA and other countries, where the new industrial POPs chemicals have been added in order to improve the technical specifications of the housing of CRT TVs/PC monitors, small household appliances (refrigerators, mixers, irons, etc.) and in the plastic materials in vehicles.

Furthermore, the survey showed that the new industrial POPs chemicals are not used in the production processes in the country. Also, the fire extinguishers in the airport Alexander the Great in Skopje do not contain these type of chemicals and are compliant with the EU Directive 757/2007/EEC.

13.2.2. SOCIO-ECONOMIC IMPACT

The strongest socio-economic impact is caused by the import of old second-hand vehicles. The import of old vehicles increased significantly as of 2010. The following table shows the number of imported old vehicles in the period 2007-2011, based on the calculations of the working group for PBDE and PFOS persistent organic pollutants (using the data from the Ministry of Interior and the Customs Administration of the Republic of Macedonia). Additionally, the working group on PBDE and PFOS persistent organic pollutants estimates that approximately 13 thousand scrap vehicles are generated each year in the country. Part of them are recycled for parts, part are exported in the neighbouring countries for recycling, and the remaining are waste that stays in the Republic of Macedonia. The estimation was based on the data from the Project of the World Bank "Achieving green growth in Macedonia - Transport sector" and from the Customs Administration of Republic of Macedonia.

Table 68 Number of imported old vehicles, 2007-2011

	2007	2008	2009	2010	2011	Вкупно
Cars	17.266	18.118	13.153	58.379	33.846	140.762
Buses	38	65	82	588	269	1.042
Trucks	2.160	2.449	2.550	3.501	1.658	12.318
Total	19.464	20.632	15.785	62.468	35.773	154.122

Source: Calculated by the working group for PBDE and PFOS persistent organic pollutants.

The problem is caused by vehicles manufactured until 2004, as the new industrial POPs chemicals were used up to that point. The average emission of new industrial POPs chemicals from a single vehicle generally differs from one country of origin to another. More precisely, the emission of new industrial POPs chemicals in a vehicle from Europe or Asia is 160 grams for cars and trucks, and 1000 grams for buses, whereas the vehicles from America contain up to 10 times of said quantities, since these chemicals were added in much higher concentrations there (UNIDO, 2012).

The negative impact of use of and import of old vehicles is significantly intensive in regards to environmental pollution, threats to human health, and reduction of income for individual persons and enterprises that are using them, due to the following reasons:

- higher fuel consumption compared to new vehicles;
- older type engines – EURO 1, 2, 3 whose emissions of NOx, SO2, CO2, and PM10 are much higher than the emissions of the vehicles compliant with the new EURO standards;
- reduced safety of the drivers and the passengers;
- frequent defects, disruption of operations which have a direct impact on the efficiency of the enterprises;
- more frequent lubricant changes, servicing;
- expenses for preventive maintenance;
- impact on the air pollution and reduction of ambient air quality, especially in the urban areas;
- impact on the respiratory diseases and incidence of allergies as a result of air pollution; and
- increased waste of old obsolete vehicles.

There are no studies in Republic of Macedonia documenting the impact of PBDE and PFOS on the human health, analysing the increased traffic risks or estimating the economic effects of reduced income of individual persons or companies due to import of old vehicles. One of the reasons thereof is the short period of observation. Nevertheless, the total quantity of PBDE due to import and use of old vehicles is expected to increase in the upcoming period as these products become waste materials. Finally disposed at illegal landfills (near rivers, roads, on agricultural land), they represent a potential risks for pollution of underground waters, the soil, and the agricultural crops, thus having a direct impact on the human health. Additionally, the problem is compounded by the impact of the electrical and electronics equipment containing persistent organic pollutants.

The positive economic effects of the import of old vehicles are only enjoyed by the state, the companies that recycle them, and the importers of old vehicles. The state generates significant revenues for the budget from the import duties. If one assumes that the import fees for an old vehicle are EUR 600 on average, it means that the import of 10 thousand old vehicles generates EUR 6 million additional revenue in the budget. There are significant positive effects also for the companies that recycle old vehicles and the metal industry that recycles obsolete vehicle containing c-PentaBDE. It is estimated that 81560 obsolete vehicle have been generated by 2009, of which 30% were disposed to the metal industry for recycling. The buying-in price per kilogram of obsolete vehicle is 20 denars/kilogram. Assuming that the average weight of a car is 1200 kilograms, of a bus is 9000 kilograms, and of a truck is 6000 kilograms, then the recycling of 10 thousand cars means EUR 3,9 million income for the metal industry. The revenues of the importers are dependant on several factors. Nevertheless, these positive economic effects are incomparably lower than the afore said negative social effects.

13.2.3. PROPOSED MEASURES

A. Prevention measures:

- Ban on import of old vehicles containing PBDE.
- Establishing inspection of import of old equipment and vehicles.
- Raising public awareness and increasing the capacities of all interested parties on the content and potential risk of PBDEs on the human health and the environment.

B. Problem mitigation measures:

- Establishing a system for notification and submission of data on management of products containing industrial POPs chemicals and the waste created thereby.
- Establishing a system for detailed PBDEs inventory.
- Establishing and operations of collection centres, and centre for treatment and processing of obsolete vehicles.
- Strengthening the capacities of all interested parties on the implementation of legal measures for management of electrical and electronics equipment and obsolete vehicles.
- Implementing the recommendations for emission limit values of new POPs chemical (PBDEs and PFOS) in the environment.

The working groupd estimates that the implementation of the first group of measures would cost EUR 600 thousand, whereas the second group of measures would require EUR 6300 thousand - the most expensive item being the establishing and operations of centres for collection centres, and centres for treatment and processing of obsolete vehicle (EUR 5 million).

The implementation of these measures will significantly reduce the negative social impact: improve human health, especially in the urban areas where the air pollution is highest, and of the persons mostly exposed to the processes for recycling of old vehicles and equipment; improve health and safety at work; and reduce the costs for sick leave, and absence from work. Additionally, it will mean creation of new jobs, opening of centres for waste treatment and processing, as well as increased revenues for the companies, manufacturing equipment for the centres for waste treatment and processing.

14. THE IMPORTANCE OF EMBEDDING GENDER IN NIP UPDATE PROJECT IN MACEDONIA

As part of the socio-economic assessment regarding the NIP Update in Macedonia, gender considerations are also embedded into the design and the implementation of the project. The sound management of persistent organic pollutants (POPs) is inextricably linked to economic and social development. In many occasions, the world's poorest people consistently face the highest risk of exposure to hazardous chemicals, due to their occupation, physical properties, living conditions, as well as lack of knowledge regarding safe handling practices etc (UNDP 2012). As it outlined in various studies conducted by the World Health Organization (WHO), the improper management of hazardous chemicals could be immediate and catastrophic, like for instance in case of oil spills, large releases of industrial chemicals and acute pesticide poisoning (UNDP 2011; WHO 2010). Furthermore, over a long term, continuous exposure to toxic chemicals in water, food, air and soil could cause various health issues, including damage to the reproductive and the neurological systems.

It is important to note that numerous social and biological factors determine the level of exposure to toxic chemicals, as well as the resulting impacts on human health. Here, particular attention ought to be given to the connections between gender concerns and chemicals. Namely, women, men and children differ in their physiological susceptibility to the effects of exposure to toxic chemicals (UNDP 2011: 5). Furthermore, women are particularly influenced by the adverse impact of the hazardous chemicals due to the structure of their reproductive systems (Rosche 2006). Additionally, given that women have a generally higher proportion of body fat it is more likely environmental pollutants to be stored into their body tissues (UNDP 2011). Women are also particularly vulnerable to hazardous chemicals in certain periods of their life, such as pregnancy, lactation, menopause etc. Furthermore, fetuses, infants and children are especially vulnerable to the Persistent Organic Pollutants (POPs). As it is outlined in a study by the World Health Organization (WHO), exposure to POPs during early life stages may result in neurodevelopmetal and endocrine effects not only in utero and childhood, but also at later stages (WHO 2010). Additionally, children's intake of proportionally greater amounts of environmental chemicals via water, air and food (relative to body size) additionally strengthens the risks (UNDP 2011). Women's health concerns should be particularly taken into consideration when managing chemicals also because the maternal breast milk accumulates and harbors persistent organohalogens including POPs. Pollutants including hexachlorobenzene, dieldrin, heptachlor, chlordane and PCBs are commonly found in the breast milk of women (Solomon 2002 in WHO 2010). Furthermore, lipophilic POPs are transferred into human milk due to its high fat content. An infant breastfeeding for 6 months may receive as much as 14% of her or his cumulative lifetime exposure to dioxins and PCBs, and "this exposure may contribute significantly to the body burden when the infant attains adulthood and reproductive years" (Patandin 1999a in WHO 2010). Hence, the monitoring of breast milk is an important function in detecting exposure to toxic contaminant at early stages and gives an opportunity to take measures before adverse health impact appear (ibid).

Despite the biological factors that determine the susceptibility to the effects of exposure to toxic chemicals, factors connected to workplaces exposures and household responsibilities also influence the amount of chemical exposure. Thus, the level of chemical exposure is often determined by gender because women and men often perform different occupational tasks. The International

Labour Organization (ILO) notes that hazardous chemicals kill about 438.000 workers annually and 10% of all skin cancers are estimated to be a result of workplace exposure to hazardous chemicals (ILO 2005 in UNDP 2011). Furthermore, due to their occupational activities, women are dominantly exposed to chemicals in the health care sector (nurses, pharmacy workers), and in the textile industry. It is important to note that making the project gender-sensitive also means being equally concerned with the needs of men. For instance, in agricultural communities in developing countries men may be more directly exposed to chemical pesticides during application, whereas women may be more exposed to chemicals during the processes of planting and harvesting. Furthermore, men may be at greater risk of exposure to toxic chemicals in artisanal gold mining operations, tannery operations and mechanical workshops (UNDP 2011:7).

Conclusively, women and men are exposed to different levels of toxic chemicals and have different biological features that determine the different susceptibility to the hazardous health effects of the chemicals. Hence, when creating policies and programs related to the sound management of chemicals, gender implications have to be taken into consideration. Collecting epidemiological and sex-disaggregated data will serve as baseline information for the creation of programs and activities that will address the specific needs of both women and men.

14.1. Mainstreaming Gender in the NIP Update in Macedonia – Main Features and Implications

The term **"gender**" refers to the attributes and opportunities associated with being male and female and the relationship between women and men and girls and boys, as well the relationships between women and those between men. These attributes, opportunities and relationships are socially constructed and learned through socialization processes, thereby making them context and time specific, and changeable. Gender therefore determines what is expected, allowed and valued in a given situation (UNIDO 2009).

Gender Mainstreaming on the other hand can be defined as "...the process of assessing the implications for men and women of any planned actions, including legislation, policies or programmes, in all areas and at all levels. It is a strategy for making women's as well as men's concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of policies and programmes in all political, economic and societal spheres, so that women and men benefit equally and inequality is not perpetuated" (UNECOSOC, 1997). Furthermore, the goal of the gender mainstreaming process is to reach gender equality, which is defined by UN Women as having equal rights, responsibilities and opportunities of women and men and girls and boys. Gender equality implies that the interests, needs and priorities of both women and men are taken into consideration, recognizing the diversity of different groups of women and men. Furthermore, gender equality is not women's issue, but should concern and fully engage men as well as women.

The steps of gender mainstreaming will be embedded throughout all parts of the NIP Update project cycle – Preparation, Formulation, Implementation and Monitoring and Evaluation.

Regarding the Preparation process of the gender-mainstreaming activities, conducting a **gender analysis** is the most important part of the process of preparation. Gender Analysis refers to the variety of methods used to understand the relationships between men and women, their access to resources, their activities, and the constraints they face relative to each other. By systematically

examining the differences between men and women, as well as by examining their situation in a given context, the analysis will help decide whether particular actions need to be included into the project activities.

The Gender Analysis is consisted of the following elements:

- Collection of relevant data - sex disaggregated information for analysis. For a gender analysis, all data should be separated by sex in order to allow differential impacts on men and women to be measured. Sex disaggregated data is quantitative statistical information on differences and inequalities between women and men. (Reeves and Baden 2000).
- Analysis of data to identify relevant gender issues: understand the institutional, economic, social and political contexts;
- Integration of considerations into design and implementation of the proposed interventions.

Furthermore, the **gender analysis** will be conducted on three levels:

- **Gender context analysis of a country -macro level** - analysis of the policy frameworks (international and national polices; analysis of access to education and education attainment; analysis of economic, legal, political and social empowerment; analysis of access to finance);
- **Gender sector analysis - meso level (when applicable)** – collection and analysis of disaggregated data that will illustrate the current gender inequalities in the targeted sector(s);
- **Mapping potential partners, counterparts and stakeholders** – identification and inclusion of gender sensitive partners and stakeholders during the preparatory phase.

Based on the analysis on macro level, meso level and on the level of the stakeholders, various gender - related activities can be formulated. Throughout the implementation of the National Implementation Plan, the gender interventions will be categorized in three main groups:

14.1.1. AWARENESS RAISING ACTIVITIES

Raising awareness of the linkages between chemical exposures, the effects on human health and the gender differences in risks and impacts is of a vital importance. Raising the awareness regarding the immediate health risks of toxic chemicals used in agriculture is the focal intervention that will enable the creation of all subsequent levels of the project. Thus, the following activities will be implemented: developing and dissemination of guidelines that contain information regarding chemicals, health and gender differences, as well information regarding social factors that influence human exposure to chemicals, like for instance division of labour; inclusion of health and gender information throughout the envisaged thematic trainings; dissemination of awareness-raising materials to all involved stakeholders, as well as updating the current website with information regarding POPs and health impacts based on gender differences.

14.1.2. ENSURING A MULTI – STAKEHOLDER PARTICIPATION

Given that the management of POPs is a cross-sectoral issue, ensuring a multi-stakeholder approach is essential for the implementation of the project in a gender-sensitive manner. Among the key stakeholders, ministerial gender focal points, laboratories, universities, research centers and non-governmental organizations will take an active participation into the project.

14.1.3. EMBEDDING OF GENDER-SENSITIVE CONSIDERATIONS THROUGHOUT THE ACTION PLANS OF THE PROJECTS

Gender considerations are taken as an integral part of the envisaged action plans. Therefore, whenever applicable, the envisaged project actions were created in a gender-sensitive manner. Furthermore, the success-measuring indicators are sex-disaggregated.

The overall shortcoming concerning the creation of gender interventions is the lack of sex-disaggregated data, as well as the lack of a monitoring system for a thorough assessment regarding the influence of POPs on human health. Therefore, additional sex-disaggregated data will be collected throughout the implementation of the NIP Update, and as part of the project action plans, creation of a monitoring system is envisaged. The collected sex-disaggregated data will serve as baseline information for the creation of the subsequent gender interventions.

14.1.4. INCOUNTRY GENDER CONTEXT

Gender Equality in Macedonia is guaranteed in the Constitution and included in subsequent laws. Throughout the 1990s, the advancement regarding gender equality was dominantly in the sphere of economic and social rights. In 1997 the Unit for the Promotion of Gender Equality was formed, and in 1999 the First National Gender Equality Plan was enacted (European Commission 2011: 3). Furthermore, the country has made a major step forward in terms of gender equality with the adoption of the Law on Equal Opportunities of Women and Men. The gender equality in the country has been also fostered throughout the process of approximation of the Macedonian legislation with the EU acquis, particularly in the area of labour relations where Macedonia incorporated directive addressing issues of equal pay and equal treatment of women and men at work (Law on Labour Relations, Official Gazette, No 62, July 28, 2005 in CRPM 2008). Renewed National Action Plan for Gender Equality was adopted in May 2007, and it was in part developed from the Law on Equal Opportunities (European Commission 2011: 4).

Regarding the international gender commitments – Macedonia is a signing country of the Beijing Platform and Action Plan - which are strategic documents adopted at the International Conference on Women held in Beijing in 1995. Furthermore, the Convention on Elimination of All Forms of Discrimination (CEDAW) was put in effect in 1991, and additionally, the Optional Protocol to the Convention was ratified. With the ratification of the Optional Protocol, the country recognized the competence of the CEDAW Committee, and in that way enabled its citizens to refer to the Committee in case of an infringement of the rights established in the Convention. Additionally, Macedonia ratified the European Convention for the Protection of Human Rights and Fundamental Freedoms. Hence, tailoring the NIP Update in a gender sensitive manner is aligned to the overall national plans and priorities regarding gender equality.

14.2. GENDER MAINSTREAMING ON A SECTOR LEVEL – AGRICULTURE

Gender, agriculture and sound management of chemicals are inextricable connected. Women represent about 70% of the agriculture labour force in developing countries, and although in many instance women are not part of the official agriculture statistics, they are over presented in unpaid, seasonal and part time work (UNDP 2011; FAO 2011). As it was previously outlined, exposure to low levels of pesticides in agriculture can also cause long term effects like cancer or damage to the reproductive system. Furthermore, according to the Food and Agricultural Organization of the United Nations, conventional agricultural chemicals cause about 20.000 deaths per year (FAO 2007 in UNDP 2011). Given that in Macedonia 40% of the women live in rural areas, it is vital the socio-economic activities related to chemical management to be gender-sensitive.

Regarding the overall gender situation in the agricultural sector, it is important to note that the agricultural sector in Macedonia is not gender sensitive, despite the fact that several governmental activities and projects organized by non-governmental organizations attempted to increase the gender balance in the sector (Kostovska et. al 2008). Furthermore, one of the strategic goals of the National Plan for Gender Equality is to improve the social status and the living conditions of women living in rural areas (ibid). However, women are in unfavorable position in the agricultural sector and although they are very much involved in the farming activities of their families, their contribution is not recognized. Thus, they are often not invited at trainings and insufficiently involved decision making bodies and activities (ibid).

The creation of gender interventions regarding gender and management of POPs is vital, particularly given the high number of women involved into agricultural activities. Although the number of women employed in agricultural companies is low compared to men (27, 1%), the number of women working in individual of in family type agricultural businesses is much higher (42, 9 %). Furthermore, companies that perform agricultural activities engage more women as seasonal workers than men - 63, 4% (Statistical Yearbook 2007, State Statistical Office of R. Macedonia). Therefore, the project action plans regarding the agricultural sector are tailored in a gender – sensitive manner. In practice, it means that the different impacts the POPs pesticides might have on men and women are taken into consideration and reflected into practical measures.

15. ACTION PLAN

15.1. PREVENTION OF UNCONTROLLED BURNING OF WASTE IN DUMPS

Key priority challenge No . 1

Inventory of POPs emissions shows that the majority (70%) of emissions of dioxins and furans in the air belong to the category 'Processes of open air burning' or burning of waste in dumps. Although the activities of the establishment of a national integrated system for sound waste management and construction of regional landfills have already started, dumps are expected to pose a serious threat to the environment and in the next 10 to 15 years, until the full implementation of a regional approach to waste management. Therefore, of paramount importance is to raise awareness on the impact of landfills and risk on human health and environment regarding POPs and taking appropriate measures to prevent and control.

Goal: Reduction of unintentional POPs emissions

In compliance with the Stockholm Convention: Article 5 and Annex C

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
Raising awareness among local self government units and enterprises managing with waste	Education/ raising awareness	2017	MoEPP	300,000.00	Raised awareness of Local Self Government and public communal enterprises	Ongoing process of taking appropriate measures	Quarterly	POPs Unit
Preparing a form for regular annual reporting on the situation with fires and relevant measures	Management with data and information	Regular , annual basis	LSG	Self funding	Available relevant information	Regular submission of data for the fire status and measures taken	Annualy	Macedonian information centar for environment (MICE), POPs Unit
Undertaking technical activities for prevention and control of fires (guard, fencing alarm system, alarming system. Means for urgent actions, etc)	Technical cooperation	Annual	LSG, Public communal enterprises		Initiated regular activities for better control over landfills	Reduced number of fires	Quarterly	MoEPP/ Directorate for protection and rescue (DPR)
Performing selection of	Legal framework	Permanent	LSG, Public	In the frames	Reduced	Recorded quantities	Annualy	Waste management

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
waste and divert hazardous waste from landfills	and enforcement inspection		communal enterprises	of the LSG Budget	disposal of hazardous components of the waste on dumps designed for communal waste	of hazardous waste, collected and disposed		sector, Macedonian information centar for environment (MICE),
Promoting actions to reduce waste generation, waste selection, recording and preparation and implementation of programs for waste management (LSG and enterprises)	Legal framework and inspection enforcement	Annual	LSG/MoEPP	In the frames of the LSG Budget,Legal entities	Reduced amounts of waste deposited, initiated / enhanced processes selection waste	Developed programs for waste management and their implementation, smaller amounts deposited waste recorded	Annualy	Waste management sector, Macedonian information centar for environment (MICE),
Enhanced control of the operation of communal enterprises managing with local landfills (formation of Nat. / Regional Authority control, information gathering and sharing information)	Institutional strengthening, Legal Framework and inspection enforcement	Annual	MoEPP	Self-funding	Awareness raised , improved management with ladfills. Decreased number of fires	Regular and complete reporting to the competent authority	Annualy	Waste management sector
Preparation of plans for closing of waste dumps	Legal framework and inspection enforcement	Annual	Communal enterprises	52x300.000	Grounds for closure of dumps	Prepared Plan, initiated processes for providing funds for closing dumps	Annualy	Waste management sector

15.1. RAISING AWARENESS AND CAPACITY BUILDING OF ALL STAKEHOLDERS ABOUT THE POTENTIAL RISK OF PRODUCT, PROCESSES AND CHEMICALS CONTAINING POPS ON HUMAN HEALTH AND THE ENVIRONMENT

Key priority challenge No. 2

Exposure to very low doses of the chemical compounds classified as POPs (which are among the most toxic substances ever synthesized) can cause cancer, damage to the central and peripheral nervous system, the immune system diseases , disorders of the reproductive system, development disorders of infants and children.

Considering the harmful effects of POPs chemicals on human health and the environment, as well as establishing a system for appropriate management, the strengthening of public awareness regarding proper management of products containing POPs, chemicals and waste products containing POPs chemicals,in order to reduce the risk of exposure to chemicals and environmental pollution. A wide range of products (a large number of consumer products - irons, refrigerators, air conditioners, TVs, etc.) containing POPs chemicals at the end of their life cycle would represent a potential source of pollution.

Especially important is the strengthening of national capacities of government institutions and local authorities to successfully respond to the challenges associated with proper management and control of chemicals POPs.

Goal: To raise awareness of all stakeholders on the potential risk of POPs chemicals

In compliance with the Stockholm Convention: Article 10

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
Preparing a strategy to strengthen national capacities in terms of POPs chemicals Defining the purpose of strengthening the capacity and scope of the Strategy Mapping of stakeholders who can contribute to better management of POPs chemicals Identification of themes and messages to be transmitted to all interested parties Preparation of an action plan with specific actions to strengthen capacity The Strategy and Action Plan	Strengthen capacity by implementing the actions defined in the Action Plan of the Strategy	2018	MoEPP	1,000,000	Transmited main messages to all interested parties for products, processes and chemicals containing POPs and potential risk to human health and environmental media Raised public awareness about the harmful effects of POPs chemicals and how to properly manage the product throughout the entire life cycle. Strengthened national capacities in	Developed Strategy to strengthen national capacities in terms of POPs chemicals Preparation of application for approval of funding. Funds provided for its implementation.	Monthly	MoEPP

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
separate chapters will be dedicated to different POPs chemicals with already defined stakeholders					terms of POPs chemicals			
Implementation of the strategy to strengthen the national capacities in terms of POPs chemicals through the implementation of the Action Plan Development of plans for public involvement Defining logo, trademark and key messages to be transmitted to interested parties Preparation of training materials, organizing trainings, preparation of manuals, preparation of educational materials, organization of events, etc.).	Strengthening capacity through the implementation of the activities defined in the Action Plan of the Strategy	2018-2019	MoEPP	3,000,000	Certain stakeholders to implement the activities and key messages Attendance and active participation in trainings and events in many of the stakeholders Accessibility and transparency of events and opportunities for active participation Strengthened national capacities in terms of POPs chemicals Citizens informed on their obligations arising from national legislation and EU and worldwide best practices	Developed plan for public inclusion in the process of implementation of the Action Plan Number of conducted training and participants trained (list for Evaluation of training and a list of participants) Number, type and scope of events (number of visits and active participation of participants) Media coverage of events and information about setting up events to electronic portals, newspapers, TV and radio stations Preparation of reports conducted Strategy and	Annualy	Monitoring Group established to monitor progress in the implementation of the Action Plan

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
						Action Plan		
Establishing monitoring body to monitor the implementation and reporting on the success of activities within the strategy to strengthen the capacities of the risks of POPs chemicals	Monitoring	2018-2019	MoEPP/ Ministry of Economy /Customs Administration /Ministry of Health/ Ministry of Agruiculture Forestry and Water Management	50,000	Monitoring body is established and defined the structure, method of work, responsibilities and manner of reporting Report on successfully implemented activities	Level of implementation of activities conducted and evaluation ofcapacities. Final report submitted to MoEPP for implementation of strategy and the activities under the Action Plan	Annualy	MoEPP

15.1. RAISING AWARENESS AND STRENGTHENING CAPACITIES TO CONTROL THE POPS EMISSIONS FROM THE INDUSTRY

Key priority challenge No. 2 (a)

About 25 of the total POPs emissions into the air and as the total emissions are accounted osloboduvaaat through residues of industrial activities as a source, and a preponderance of the metal industry. Activities are needed for raising of the low level of awareness on the importance and impact of POPs emissions and strengthen the capacity to implement appropriate control measures in industry and the authorities. In order to reduce these emissions, with the aim to comply with Article 5 of the Convention text, it should be emphasized the availability of the mechanism and the UNEP Chemicals instructions relating to the application of best available techniques and best environmental practices (BAT / BEP). These guidelines contain specific recommendations for reductions and are intended for authorities, especially industries as sources of emissions and all those directly affected, and in terms of implementation of the Stockholm Convention at the national level.

Goal: Developed national capacities to implement the obligations of the Stockholm Convention

In compliance with the Stockholm Convention: Articles 5 and 10

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
Preparation and implementation of the campaign to raise public awareness on way of generating of POPs and their impacts (target groups - industry, LGUs, NGOs, general public)	Education / Raising awareness	2018-2019	MoEPP		Awareness raised on importance of POPs on human health	Initiated processes for implementation of the measures for POPs Reduction	Annualy	POPs Unit
(Project activities)Improving Capacities on Management with unintentional POPs in MoEPP and industry , familiarization with BAT and BEP for U-POPs in the industry, tranings for the industrial sector, applying BAT/BEP measures, trainings of MoEPP (implementation/control) Preparation of the national Guidances on BAT/BEP developing stimulative measures etc.)	Technical Cooperation, Strengthening Institutional Capacity	2018-2020	MoEPP		Implemented specific measures Reduced POPs emissions	Implementation of specific measures for control of POPs emissions in the industry	Annualy	Administration for Environment Sector on industrial pollution and risk control, POPs Unit

15.2. ESTABLISHING A SYSTEM FOR IDENTIFICATION AND DETAILED INVENTORY OF PRODUCTS OBSOLETE, WASTE AND CONTAMINATED SITES CONTAINING POPS (PBDES, PFOS, PESTICIDES, UNINTENTIONAL POPS)

Key priority challenge No.3

The initial inventory of new POPs chemicals and updating the inventory of pesticides and unintentional POPs chemicals showed that nationally there is a system that will promptly identify, record, keep data on their existence and way of managing products, processes and chemicals containing POPs throughout theentire lifecycle of the products. There is a lack of information on imports, exports, consumer products and chemicals containing POPs,

quantities of waste from products and processes containing POPs and how to manage them. There are also missing information about contaminated sites containing POPs chemicals and products containing POPs.

Goal: Proper management of products, processes and chemicals containing POPs throughout their lifecycle in order to avoid, reduce and / or mitigate the negative impact on the environment and human health.

In compliance with Stockholm Convention: Articles 3, 5, 6 and 9

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
Establishing the institutional framework for recording EEO, other products containing POPs, ELV(end of life vehicles), areas contaminated with pesticides and unintentional POPs) Procedure for provision and processing the data Establishing the institutional framework for recording EEO, other products containing POPs, ELV, areas contaminated with pesticides and unintentional POPs)	Institutional strengthening / data updating	2018-2020	MoEPP Ministry of transportation and communication Ministry of Economy, Ministry of Health Ministry of Agriculture, Forestry and Water management Customs Administration State Statistical Office	300,000	Established institutional framework, the tasks defined in the system institutions involved Efficient implementation of the activities under the action plan of the project Task defined, consultants selected, evaluation of appropriate computer support (hardware and software) and its installation	Level of realization of the defined tasks by the institutions involved in the system	Annualy	Monitoring Group established by the MEPP to monitor progress and implementation of the Action Plan of the inventory of POPs chemicals in Macedonia
Establishment of inter ministerial body review, analysis and amendment of the legal framework to smoothly run the delivery of data in the system of records	Institutional strengthening/ Legal Framework	2018-2020	MoEPP	100,000	Established inter ministerial body analysis of the legal framework and the need to establish certain means of communication between all	Adopted normative acts of the established system of records with defined roles of all institutions	Annual level	MoEPP and memebrs of the Montoring group

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
					institutions involved in the system of records			
Identification of applications in the country (manufacturing processes and services and products containing PFOS) System of questionnaires and interviews, trainings and data entry system	Capacity building /Data update	2018-2020	MoEPP	1,000,000	Identified applications in manufacturing processes and other services and products containing PFOS Trainings conducted Entered data into the system	Number of questionnaires completed, Training successfully organized Number of data entered into the system	Annualy	Monitoring Group established by the MEPP to monitor progress and implementation of the Action Plan of the inventory of POPs chemicals in Macedonia
Continuously updating data	Strengthening capacities / Data Update	2017-2023	MoEPP with other institutions	/	Updated database	Number of New PFOS chemicals in RM introduced in the database	Permanent	Monitoring Group
Procedure for submission of information by competent authorities to interministerial body	Capacity building /Data update	2018-2019	MoEPP	/	Functionally operating the procedure for submission of information by competent authorities to interministerial body	Regular provision of information of competent authorities to the interministerial body	Permanent	Monitoring Group established by the MEPP to monitor progress and implementation of the Action Plan of the inventory of POPs chemicals in Macedonia
Preparation of questionnaires as development tools for the identification and detailed inventories of imports, stocks of products containing PBDEs, and its waste	Capacity building /Data update	2018-2020	MoEPP/State Statistical office	100,000	Obtaining reliable data on the situation with these products and their numerical representation Delivery of training	Number of products containing PBDES	During the activity or during the process of inventory	Monitoring group

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
management (As supplementary question during the inventory) Delivery of training								
Preparation of questionnaires for ELV type of vehicle), year of production, country of origin and other relevant data (Emphasis in companies dealing with import processing and export of used vehicles,)	Capacity building /Data update	2017-2023	MoEPP State Statistical office Ministry of internal affairs	100,000	Obtaining reliable data on the situation with these products and their numerical representation	Obtained number of ELV	During the activity	Monitoring group
Preparation of questionnaires for other products containing POPs	Capacity building /Data update	2018-2019	MoEPP	50,000	Obtaining reliable data on the situation with these products and their numerical representation	Number of products containing POPs	Annualy	Monitoring group
Pilot operation period of the database and the system of records	Operational activities	2018-2020	MoEPP	/	Pilot period Succesfully conducted	Operation of the database and the system of record	Twice a year	Monitoring group
Conduct a detailed inventory and quantification of the amounts of POPs chemicals	Operational activities	2017-2023	MoEPP	300,000	Conducted detailed inventory (all sources located, the entire life cycle of products analyzed, chemicals and quantification of the amounts of POPs chemicals)	Activities for collecting data from all relevant stakeholders in order to implement a detailed inventory and quantification of the amounts of POPs chemicals	Each two years	Monitoring group
Identification of areas contaminated with	Operational activities / Data updating on contami-	2018-2022	MoEPP Local and re-	500,000	Identified areas contaminated with	Number of contaminated areas,	Annualy	Monitoring group

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
pesticides and unintentional POPs - mapping, Assessment and analysis of surface soil, groundwater and waste composition in accredited laboratories, Proposed measures for remediation of contaminated areas in accordance with BAT	nated sites throughout the country		gional landfills Municipal Inspectorates(communal and inspectors for environment)		(pesticides and unintentional POPs), an analysis of soil and groundwater remediation measures proposed on contaminated area according to BAT	the degree of contamination of soils, Application of proposed measures for remediation of contaminated areas in accordance with BAT		
Updating the inventory of POPs chemicals in RM	Operational activity / update data	2019-2020	MoEPP	30,000	Updated inventory of POPs chemicals in RM	Number of new sources of POPs chemicals in RM identified and calculated their volumes included in the inventory of POPs chemicals in RM	Permanent	Monitoring group

15.3. ESTABLISHMENT OF CONTROL OF IMPORT OF OLD EQUIPMENT AND VEHICLES IN RELATION TO THE CONTENT OF CHEMICALS POPS

Key priority challenge No. 4

The preliminary analysis has identified a lack of data and information on the import of used electrical and electronic equipment and waste electrical and electronic equipment, used cars and other items containing POPs chemicals. Missing data if the used equipment and / or vehicles which are imported containing POPs in quantity because legally regulated ban on entry of equipment / products containing hazardous substances and equipment is limited to the maximum content of POPs chemicals in products. It is important to know the amount of this type of product, type of product, purpose, and content of POPs chemicals because these products at the end of its lifespan will become waste containing POPs chemicals and should appropriately (correctly, in accordance with best practices) to manage it.

Goal: To reduce the number of vehicles and products containing POPs chemicals in the country.

In compliance with the Stockholm Convention: Article 3

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
Purchase of equipment for rapid identification of PBDEs and presence in products, record keeping Trainings for handling with the equipment	Strengthening Capacity / Modernization of technical performance	2017-2023	MoEPP	6,000,000	Accurate data on the content of POPs chemicals in old vehicles Traininings conducted to handle new equipment	Reduced number of vehicles that contain POPs Successful training to handle the new equipment	Annualy	Monitoring group
Analysis of legal regulations related to the import of old vehicles and equipment and import regimes	Strengthening Capacity	2017-2018	MoEPP	/	Analyzed legislation related to import of old vehicles and equipment and import regimes	Capacities strengthened of the responsible institutions	Annually	Monitoring group
Strengthening the capacity of the competent authorities (Customs MEPP) recognition of signs and codes related equipment and vehicles that contain hazardous substances and declarations from manufacturers according to the regulations for the transport of waste and the relevant legislation	Strengthening Capacity / Educational	2018-2020	MoEPP	3,000,000	Trained staff that will contribute to the efficient operation and recognition of the declaration, labels and codes for equipment and vehicles	All vehicles and products containing POPs chemicals are successfully identified and recorded in inventory when entering the country.	Annually	Monitoring group
Enhanced control the import of old vehicles and equipment, control of the import of PFOS chemicals with an evidence of their purpose	Strengthening capacity / increased number of efficient customs control on importation of old vehicles and equipment	2018-2024	Government of Republic of Macedonia/Customs Administration Ministry of Internal Affairs	/	Successful, effective and timely detection of POPs chemicals contained in old vehicles including PFOS chemicals	Reduced import of vehicles containing POPs chemicals	Annually	Monitoring group

15.4. ESTABLISHMENT AND OPERATION OF COLLECTION CENTERS, TREATMENT AND PROCESSING OF END OF LIFE VEHICLES

Key priority challenge No.5

The need for appropriate treatment and processing of used vehicles raises the establishment and operation of collection and treatment centers, in line with the national legislation and the Stockholm Convention. The establishment of collection points and centers for treatment of old vehicles will contribute to the proper management of used vehicles and appropriate notification to the competent authorities and the MEPP. Number of used vehicles registered in these collection and treatment centers will represent an excellent basis for the inventory of POPs - PBDEs in end of life vehicles and inventory waste.

Goal: To reduce the amount of waste used vehicles that are improperly managed and finally removed.

In compliance with the Stockholm Convention: Article 3

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
Strengthening the capacity of local selfgovernment in the RM Establishmentof collection points for proper collection and temporary storage of used vehicles ,their materials and components Establishment of centers for treatment, where selection, storage and treatment is performed (Public Private Partnership approach)	Strengthening capacities / legal provision	2019-2023	Municipalities in RM/City of Skopje	6,000,000	Capacities strengthened for ELV waste management at local level Collection points established Collection centers established	Reduced quantity of this type of waste that is improperly managed	Annualy	MoEPP
Issuing permits/ Authorization of collectors of vehicles	Legal provision	2018-2024	MoEPP	/	Collectors and operators authorized for operating with this type of waste	Implementation of the national legislation	Annually	Monitoring group
Selection of the most appropriate location for ELV disposal	Legal provision	2018-2024	Municipalities in RM /MoEPP	/	Established collection centers	Successful operation of collection centers (quantities of collected waste from used vehicles)	Anually	Monitoring group
-Strengthening capacities of	Strengthening	2018-2024	MoEPP	500,000	Manufacturers,	Successfully	Annually	Monitoring group

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
distributors for sound management of used vehicles and ELV; -Organizing trainings for producers, owners and other entities dealing with used vehicles and undertaking proper measures for environment protection; -Trainings for recognizing the materials for recycling; -Trainings for sound management of used vehicles and ELV and their materials; -Establishement of a system for identification and reporting on the content of POPs chemicals in used vehicles; - Keeping database on vehicles category, year of production and country of origin ;	capacities / Educational				owners and entities dealing with used vehicles take appropriate measures to protect the environment	conducted training on proper management of ELV by authorized operators /Implementation of legislation		
- Establish a system for records-records of used vehicles before treatment, life cycle and its sound management -Establish a system of reporting by the centers for handling used vehicles to MoEPP and the body managing the system records the entities acting dilapidated vehicles	Strengthening capacities	2018-2021	Manager of the Collection center/ MoEPP	/	Proper labeling of the products	Tracking product throughout its life cycle Submitted annual reports to EBRD for quantity and manner of handling used vehicles	Annually	Monitoring group
-Raising public awareness on collection sites and centers for the treatment of used vehicles of citizens in local and regional programs and involvement in waste management in municipalities	Education, Advertisement, media campaigns Promotional materials (brochures, leaflets)	2018-2021	Municipalities/City of Skopje	500,000	Raised public awareness on collection sites and centers for the treatment of used vehicles	Operation of collection centers and collection points for treatment of used vehicles Citizens will receive information about where to send their	Annually	Monitoring group

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
						used vehicle and how to properly manage this type of waste		
- Strengthen inspection on newly established collection points and centers for waste management of used vehicles	Supervision	2018-2024	Local self government inspector	/	Inspection	Number of inspection control	Monthly	Monitoring group
- Conduct a detailed inventory and quantification of the POPs chemicals content in waste of used vehicles (imports, supplies, contaminated sites, waste)	Strengthening capacities/Updating data	2018-2024	MoEPP	10,000,000	Conducted detailed inventory and quantification of the amounts of POPs chemicals in used vehicles	Activities for collecting data from all relevant stakeholders in order to implement a detailed inventory and quantification of the amounts of POPs chemicals content	Each two years	Monitoring group
- Identification of contaminated areas-Mapping - Draft measures for remediation of contaminated areas in accordance with BAT	Strengthening Capacity / update data	2018-2024	MoEPP	15,000,000	Identified areas contaminated with POPs Analysis conducted on soil and groundwater remediation measures proposed on contaminated area according to BAT	Number of identified contaminated areas, the degree of contamination of soils, Application of proposed measures for remediation of contaminated areas in accordance with BAT	Annualy	Monitoring group
Updating the inventory of POPs chemicals in old vehicles in RM	Strengthening Capacity / update data	2019-2020	MoEPP	2,000,000	Updated inventory of POPs chemicals dilapidated vehicles in RM	Number of new POPs chemicals RM Used vehicles entered in the inventory of POPs chemicals in RM	Permanent	Monitoring group

15.5. ESTABLISHMENT AND FUNCTIONING OF APPROPRIATE COLLECTION POINT FOR UNDERTAKING WEEE

Key priority challenge No. 6

A prerequisite for the proper management of waste electrical and electronic equipment (WEEE) is the existence of locations / stations and the users of this equipment to know where to dispose the equipment in order and handle with it properly.

With the records received from the collected data on the production and / or years of use, will enabe the identification of waste equipment containing POPs chemicals. According to the national legislation (Law on Electric and electronic equipment and its waste OG of the RM No. 6/12) the obligation of the Local Government is establishment of the and operating of the collection centers for WEEE undertaking (One collection center per 30 000 citizens). Information on further waste management (treatment, processing, export) will facilitate the POPs Inventory and its update in the future in the Republic of Macedonia

Goal: To reduce the quantity of WEEE that is improperly handled and finaly disposed

In compliance with the Stockholm Convention: Article 3

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
Strengthening Capacity of the Local self Government in the Republic of Macedonia	Strengthening Capacity / Educational	2018-2024	Municipalities in the Republic of Macedonia		Conduct trainings for the municipal administration to strengthen their capacity	Successfully conducted training for municipal administration	Annualy	Monitoring group
Strengthening the capacity of distributors for appropriate management of old equipment / training delivery for treatment of WEEE equipment	Strengthening Capacity / Educational	2018-2024	Distributors	300,000	Trainings for distributors to introduce them with their legal obligations	Успешно извршени обуки за соодветно управување со стара опрема за дистрибутерите на истата	Annually	Monitoring group
Authorization of collectors of WEEE (content of POPs chemicals in products, their proper management, selection of appropriate location for storage)	Strengthening Capacity	2018-2024	MoEPP	/	Issuing permits/authorisation	Implementation of the relevant national legilastion	Annually	Monitoring group

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
Selection of an appropriate location for WEEE Disposal in cooperation with the municipalities and the private enterprises (Private Public partnership)	Legal obligation	2018-2024	Entities licenced/authorised for treatment of WEEE equipment	/	Establishment of the collection centers	Successful operation of collection centers (amount of WEEE waste collected)	Annually	Monitoring group
-Establish a system for evidence – Evidence of reception of WEEE before treatment, its life cycle and way of disposal - Establish a system of reporting by companies dealing with WEEE to the MEPP and the body which manages the system for records of entities handling WEEE equipment	Regular Monitoring	2018-2024	Manager with waste collecting center	/	Apropriate labeling of products	Tracking product throughout its life cycle	On a daily basis	Monitoring group
- Raising public awareness of citizens in local and regional programs and involvement in waste management in municipalities on WEEE collection centers	Education Banners Promotional materials (brochures, leaflets)	2018-2024	Municipalities/ City of Skopje	300,000	Awareness raised among the citizens on the collection centers for WEEE	Operation of collection centers (delivering of WEEE equipment from citizens)	Annualy	Monitoring group
Strengthening of the inspections for the licenced WEEE operators	Supervision	2018-2024	Local Government Inspectors	/	Inspection visits	Number of the inspection controls	Monthly	Monitoring group

15.6. STRENGTHENING CAPACITIES OF ALL STAKEHOLDERS ON THE IMPLEMENTATION OF LEGAL MEASURES FOR MANAGING WITH POPS CHEMICALS

Key priority challenge No. 7

The analysis made in the last years of the adoption of the first National Implementation Plan for the reduction and elimination of POPs concluded that there is no single system for managing the group where hazardous substances would include all involved institutions, organizations, industry, NGOs.

Strengthening the capacities of the aforementioned factors including development of strategic action documents would ensure adequate implementation of the Stockholm Convention on POPs, national legislation that emerges from it and European law, and sustainability of the system operation.

In the same manner and in accordance with modern international trends, ensuring synergy in the implementation of the provisions of the Stockholm, Basel and Rotterdam Convention are moving element of the same system.

Goal: To establish a strong and sustainable national system for managing POPs

In accordance with the Stockholm Convention: Articles 3,5 and 6

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
Adoption of Rulebook on the handling of persistent organic pollutants	Completion of the national legal framework in managing POPs	2019	MOEPP	/	Adoption and implementation of the law on the treatment of persistent organic pollutants	Rulebook for the manner and handling of persistent organic pollutants	Permanent	MOEPP/MH/ MAFWE
Institutional strengthening for the implementation of the provisions of the Stockholm Convention on POPs and national legislation in this area	Strengthening capacities	2018-2024	MOEPP	7,200,000	Strengthening of capacities of MOEPP opn POPs management	Three persons permanently involved in the POPs management and control of POPs chemicals	Permanent	MOEPP
Establishing a scheme for synergy between the Stockholm, Basel and Rotterdam Convention	Strengthening capacities in integrated management of POPs - chemicals and waste	2018-2019	MOEPP	6,750,000	An integrated approach to the management of POPs - chemicals and waste	Established pattern of synergy between the Stockholm, Basel and Rotterdam Convention	Permanent	MOEPP/ MH / MAFWE/CA/MT/ ME
Strengthening of laboratories in the country for analysis of POPs in different media	Staff training and provision of equipment	2018-2024	MOEPP/ MH / MAFWE/CA	7,200,000	Accredited laboratories for POPs analysis	Trained persons in laboratories for POPs analysis, equipped and accredited laboratories for analysis of POPs	Permanent	MOEPP/ MH / MAFWE /CA
Strengthening the capacity of customs control illegal import /	Strengthening capacities	2018-2024	MOEPP/ MH / MAFWE/CA	500,000	Enhanced control of import / export of chemicals at	Number of trained customs officers	Permanent	MOEPP/ CA

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
export of POPs					border points of Macedonia			

15.7. CLEANUP AND REMEDIATION OF CONTAMINATED LOCATIONS WITH POPS INCLUDING THEIR ULTIMATE DISPOSAL

Key priority challenge No. 8

According to the inventory, dumps with about 70% of total annual emissions are the largest source of emissions related to POPs residues. This is due to the absence of protective measures in these landfills, improper waste management, hazardous components deposited etc. These landfills that are part of the IPPC permitting system in line with the national strategic documents for waste management should be closed once the regional centers for waste management or regional landfills start to operate. According to the strategic goals, all regional facilities should be operational by 2020, which gives a timeline for 'step-by-step' closure of dumps, region by region. However, until then the landfill operators will have to take all necessary measures to control the impacts to the environment and the human environment.

Goal: Developed national capacity to implement the obligations of the Stockholm Convention

In compliance with the Stockholm Convention under Article 5 and 10

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
Clean up and remediation of the lindane production and storage site (OHIS)	Legal obligation	2018-2020	OHIS Management, Company offering the most appropriate technology	6,000,000	Realization of the obligations undertaken by the Stockholm Convention	Removed and destroyed quantities of landfill mixture of HCH	Quarterly	POPs Unit , MoEPP
Preparation of plans for closure of dumps/ illegal landfills	Strengthening capacities	2018-2024	Dumps operators	52x300,000	Guidelines set for secure closure and remediation of dumps	Developed plans and identified measures	Annualy	MoEPP, Waste management Sector

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
Implement standard operating activities for the disposal of waste	Strengthening capacities	2018-2024	Dumps / landfills operators	Self financing	Control and reduce the risk of contamination	Regular implementation of standard operating activities	Annualy	MoEPP, Waste management Sector

15.8. IMPLEMENTING GOOD AGRICULTURAL PRACTICES TO REDUCE EMISSIONS OF UNINTENTIONAL POPS FROM AGRICULTURAL ACTIVITIES

Key priority challenge No. 9 (Integrated plant and animal production)

In 2010, Republic of Macedonia introduced the Code of Good Agricultural Practice and the Guidelines for its implementation. Both documents contain extensive section on the proper use of products for plant protection and veterinary medicine.

They comprise over 20 laws and regulations and also directives on water are transposed, regulations for plants protection products and their application, as well as animal welfare.

Due to the complexity of the content and non-existent support system, and because of poor awareness of farmers, the realization of an integrated agricultural production as a basis for decreased use of agents for protection and veterinary medicine, is not introduced in practice.

The planned activities are aimed to strengthen the capacity of both the relevant ministries (MAFWE, MOEPP), and through education / public awareness to ensure more direct contact with farmers through demonstration trials, training and practical manuals.

Goal: Reduced emissions of POPs from agricultural activities

In compliance with the Stockholm Convention: Article 5 and 10

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
Setting up demonstration trials	Strengthening capacities	2018-2024	Scientific institutions, NGOs, MAFWE MEPP	300,000	Better acceptance of good agricultural practice in a wide range of farmers	Number of demonstration farms	Annualy	POPs Unit
Preparation of manuals for different crops and animals	Strengthening capacities	2018-2019	Scientific institutions, NGOs, MAFWE MEPP	50,000	Wider implementation of the Code and Handbook for Good Agricultural Practice	Number of farmers who have adopted good agricultural practice	Quarterly	POPs Unit
Training for plant	Education /	2018-2022	Scientific institutions,	100,000	Effective and safe use of	Number of farmers	Quarterly	POPs Unit

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
protection	public awareness		NGOs		health products plant	trained in the safe use of health products		
Introduce agri-environmental measures	Institutional Strengthening	2018-2024	MAFWE MEPP,NGOs, Scientific institutions,	1,500,000	Introduction of production and processing systems in agriculture to protect the environment	Number of farmers willing to apply agri-environmental measures	Annualy	POPs Unit

15.9. ESTABLISHMENT OF A SYSTEM FOR ECO-BIO MONITORING

Key priority challenge No. 10 (Evaluation of the adverse effects on women and men farmers exposed to old and new POPs)

Environmental bio monitoring should be the starting point for the evaluation of hot spots and programming activities of protection of human health and the environment. Up to now, there were no conditions for the implementation of comprehensive action to assess the impact of POPs chemicals on human health. In part, the direct exposure is difficult to estimate because of the historical use of these chemicals, but attention must be given to their metabolites which are still present in the working and living environment. Thus, the proposed activities relating to strengthening the capacity of health organizations will need to develop a specific approach and methodology (preferably institution / agency) to assess and monitor the effects of POPs on human health and the environment. Considering the fact that farmers are among the most vulnerable and most exposed group, initial activities are foreseen to be implemented in regions (nationaly) with intensive agricultural production.

Goal: To protect human health and the environment from the effects of the use of POPs

In compliance with the Stockholm Convention: Article 9 and 10

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
Assessing the risk of various diseases and comparing the effects in individuals who are in direct contact directly at POPs.	Strengthening capacity	2018-2024	Scientific institutions, MH, MoEPP	300,000	Achieving a higher level of knowledge on health and educating farmers about the negative consequences of the POPs use on their health	Number of farmers who will be familiar and ready to use all measures to protect and promote the good health	Quarterly	POPs Unit

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
Screening for the most common diseases in the population exposed to the most frequent contact with POPs	Strengthening capacity	2018-2024	Scientific institutions, MH, MoEPP	300,000	Preventing the emergence and evolution of common acute and chronic diseases caused by the use of POPs	Number of farmers who will appear on the regular medical checks and examinations	Quarterly	POPs Unit
Monitoring the number of hospitalizations compared to exposure in the areas contaminated with persistent organic pollutants	Strengthening capacity	2018-2024	Scientific institutions, MH, MoEPP	1.000.000	Reducing the number of hospitalizations and treatment costs resulting from the use of POPs	Achieved reduced number of hospitalizations, temporary or permanent disabilities at farmers, for diseases directly or indirectly caused by the harmful effects of POPs	Annualy	POPs Unit
Assessing the risk of disease in the population living near the site where these substances are being produced and disseminated	Strengthening capacity	2018-2024	Scientific institutions, MH, MoEPP	1,000,000	Achieving a higher level of health culture and education in the protection against possible harmful effects of POPs on human health	Number of population that will be familiar and ready to use all measures to protect and improve their health, performing medical checks and examinations.	Annualy	POPs Unit

15.10. ESTABLISHMENT OF NATIONAL LABORATORY FOR MONITORING AND ANALYSIS OF THE POPS

Key priority challenge No.11 (Establish a monitoring program for POPs pesticides residues in agricultural products, accreditation of laboratory)

Although dioxins and furans have been identified as high risk and one of the most dangerous substances on human health, there is currently no national mechanism for monitoring of emissions and environmental quality in relation to the POPs substances , especially dioxins and furans are not analysed at all. The availability of methods for monitoring emissions and environmental quality in terms of POPs emissions plays a key role in defining the strategies in relation to the management of POPs substances. Therefore it is necessary to establish a monitoring system for the analysis of these compounds in the laboratory that will equip itself with the necessary equipment (including equipment for sampling procedure), staff training, validation of methods, etc..).

Goal: Monitoring and control of the POPs emission impacts

In compliance with the Stockholm Convention: Article 11

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
- Determining the condition of existing equipment of laboratories in the RepublicMacedonia and their opportunities for analysis of POPs - Completion of laboratories with the necessary equipment for analysis of POPs - Provision of the laboratory equipment needed for sampling for analysis of POPs, training staff to use the equipment - Completion of the laboratory with the necessary equipment for sampling for analysis of POPs - Training of the staff handling and operating with the equipment - Introduction of specific methods for different POPs analysis - Establishment of laboratory network and startup with regular POPs analysis	Data Management and Information/ Institutional Strengthening	2018-2021	MoEPP/MH	App.500,000 EUR	Quantification of impacts / emissions from identified sources / Analysis of the situation of POPs in the environment	Available relevant information on the state of the environment	According to the work programme	MoEPP POPs Unit

15.11. ESTABLISHMENT OF INFORMATION SYSTEM AND SUBMISSION OF DATA ON MANAGEMENT WITH PRODUCTS CONTAINING POPS AND GENERATED WASTE

Key priority challenge No.12

The aim of this priority is to provide reliable and accurate data on POPs sources, emissions and the impact of emissions on the environment including human health. The implementation of the priority need to provide integrated management of data related to POPs - which in turn should set up relevant database on the situation of POPs, implementation of country obligations towards the Conventions provisons, and of course the extremely high level of environmental protection.

The implementation of the system for data management in terms of quantities of POPs chemicals, their sources and their lifespan will set the basis for proper and regular communication among all stakeholders to ensure communication of POPs data, and their regular update. Successful implementation of the Protocol for data management and preparation of periodic reports will contribute to the elimination of the identified weaknesses of existing inventories of POPs sources of emissions.

The process of data management should be based on systematic, interrelation and logical order in setting parameters (type of data that have to be followed), the development of tools for data collection, their verification, based on statistical analysis methodology, their representation and preparation of periodical reports.

Goal: To have reliable information system containing all necessary data on POPs chemicals

In compliance with the Stockholm Convention: Article 9

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
Establish a protocol for data management in terms of sources of POPs chemicals, quantities of POPs chemicals by monitoring the life cycle of products containing POPs chemicals and production processes or practices that still use POPs chemicals. Key elements of this action are: - Defining the scope of the data management system - Appointment of a body to manage with the data management system - Defining the users of the system and the	Managing data and information related to the identification of sources of POPs chemicals, quantities and method of management	Regular on annual basis	Macedonian information center for environment /MoEPP	5,000,000	Protocol established for data management in terms of sources of POPs chemicals, quantities of POPs chemicals Established database with regularly updated information related to POPs chemicals Overcome the shortcomings of existing inventories on sources and	Established data management system Number of institutions and companies in the real sector that regularly provide data and information Number of questionnaires sent and / Forms Timely submission of required data Time required for analysis of the data and information	Annualy	POPs Unit

Action	Type of Action	Period of realisation	Responsible institution	Planned budget (MKD)	Expected results	Indicators of success	Frequency of monitoring	Responsible institutions/ responsible persons for monitoring
establishment of security measures for access - Identification of data sources (institutions, real sector, etc..) that need to provide data and frequency of data collection - Developing tools for collecting data (thematic questionnaires). - Define the types of data required for submission, submission procedures, methods and details for submitting data - Define the types and structure of periodic reports from the system and where they need to be submitted					emissions of POPs chemicals Situation reports on POPs chemicals prepared (identified sources, quantities, manner of POPs management) Establishment of the verification body to verify the obtained data and information Basis for updating the national inventories on POPs	Number (%) of answered questions/questionaires and appropriateness of responses Number of prepared statements		

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