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POPs emission in Belarus: sources, regulation, BAT implementation provision

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Included:

- Introduction (the list of POPs; requirements/obligations of Protocol on POPs);
- Main sources of POPs (PCDDs/PCDFs, PAHs, PCBs, HCB) emission in Belarus: contribution to total emissions, levels and trends;
- PCBs: stocks, distribution, environmental consequences (contaminated sites), not-rated sources of emission;
- POPs regulation: measurements, emission estimates, emission limits, abatement;
- BAT/BEP implementation;
- Conclusions

The list of POPs

Chemicals	Protocol on POPs	Stockholm Convention on POPs
Dioxins/furans	1998	2001
PAHs (enzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3_cd)pyrene)	1998	
Polychlorinated biphenyls	1998	2001
Hexachlorobenzene	1998	2001
Pentachlorobenzene	2009*	2009
Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	2009*	2009
Tetrabromodiphenyl ether and pentabromodiphenylether	2009*	2009
Hexabromodiphenyl ether and heptabromodiphenyl ether	2009*	2009
Hexachlorobutadiene	2009*	2015/2017
Polychlorinated naphthalenes (PCNs)	2009*	2015
Short-chain chlorinated paraffins	2009*	2017
Pesticides	1998	2001, 2009, 2011

* the Amendments are not in force

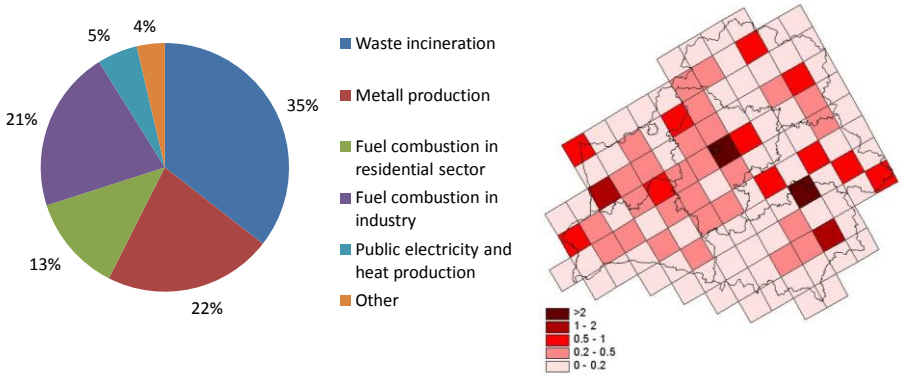
Protocol on POPs: basic obligations

- To take effective measures:
  - ❖to eliminate the production and use of the substances listed in annex I;
  - ❖to ensure that in case of destruction and disposal of substances listed in annex I the activities are undertaken in an environmentally sound manner;
  - ❖to restrict the substances listed in annex II for use;
- To develop appropriate strategies for identifying products that are still in use and wastes containing substances listed in annexes I, II or III
- To reduce total annual emissions of each substance listed in annex III
- To apply:
  - ❖ the best available techniques
  - ❖limit values
- To develop and maintain emission inventories
- To prepare the annual report within the geographical scope of EMEP, using as a minimum the methodologies and spatial and temporal resolution specified by the Steering Body of EMEP

Protocol on POPs: implementation requirements

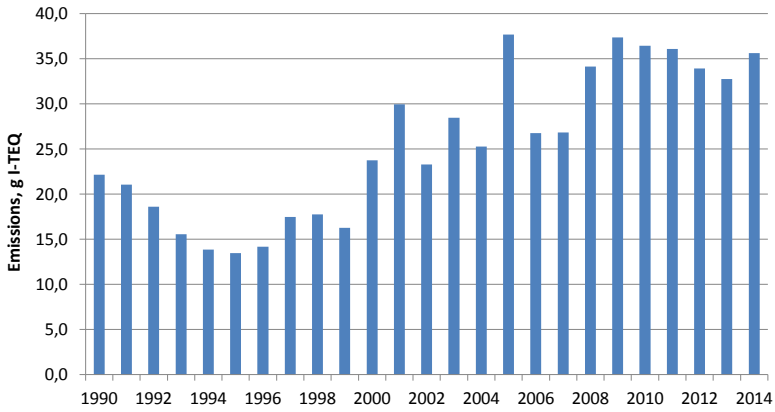
PCDDs/PCDFs, PAHs, HCB, PCBs – Annex III	Reduction of the total annual emissions (1990; or an alternative year from 1985 to 1995 inclusive, or for countries with economies in transition an alternative year from 1985 to the year of the Protocol for a Party entrance into force
PCBs – Annex II	The elimination of the use of PCBs in equipment (i.e. transformers, capacitors, etc.) containing PCBs in volumes greater than 5 dm^3 and having a concentration of 0.05% PCBs or greater, as soon as possible but no later than **3 December 2010**, or **31 December 2015** for countries with economies in transition

PCDDs/PCDFs emissions in Belarus: structure and spatial distribution



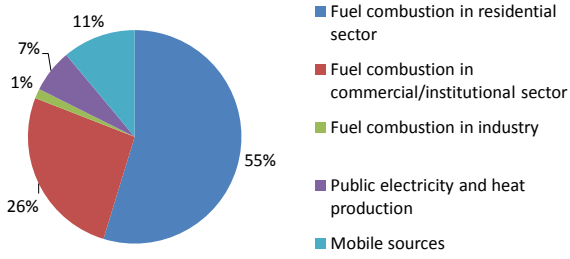
In 2014 total PCDDs/PCDFs emissions were 35.6 g I-TEQ. Main sources of PCDDs/PCDFs emissions are «Waste incineration» – 12.7 g I-TEQ (36% of total emissions), «Metal production» – 7.8 g I-TEQ (22%), «Fuel combustion in industry» – 7.5 g I-TEQ (21%) and «Fuel combustion in residential sector» – 4.5 g I-TEQ (13%).

PCDDs/PCDFs emissions in Belarus: dynamics

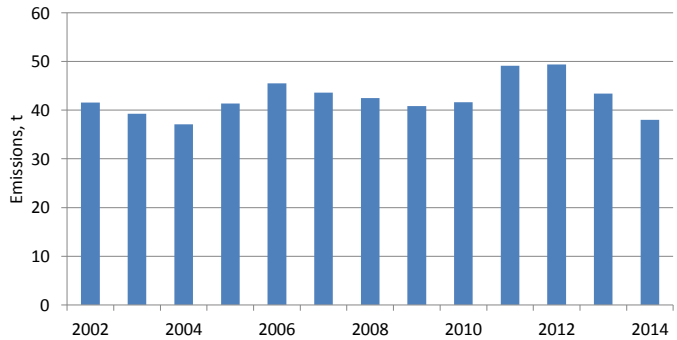


In 1990-2014 PCDDs/PCDFs emissions varied form 13.5 g I-TEQ to 37.7 g I-TEQ. The mean value was 25.6 g I-TEQ .

PAHs emissions in Belarus: structure and dynamics

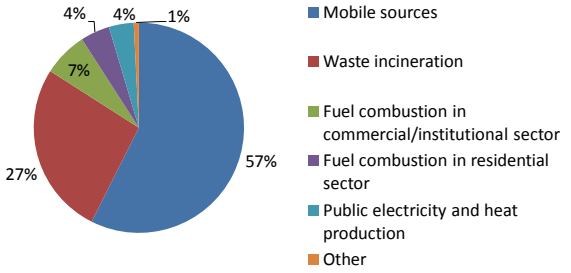


In 2014 total PAHs emissions were 38.0 t. Main sources of PAHs emissions are «Fuel combustion in residential sector» – 20.8 t (55% of total emissions), «Fuel combustion in commercial/institutional sector» – 9.9 t (26%) and «Mobile sources» – 4.2 t (11%).

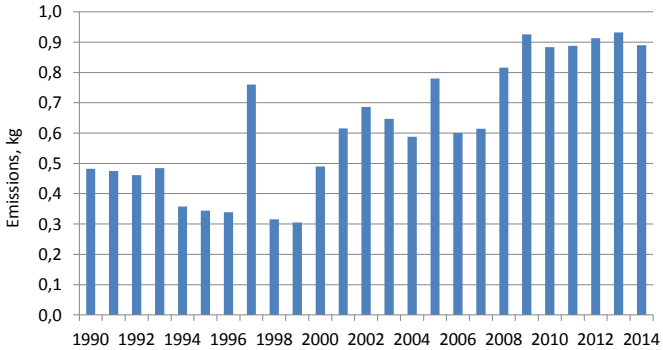


In 2002-2014 PAHs emissions varied from 37.1 t to 49.4 t. The mean value was 45.6 t.

HCB emissions in Belarus: structure and dynamics

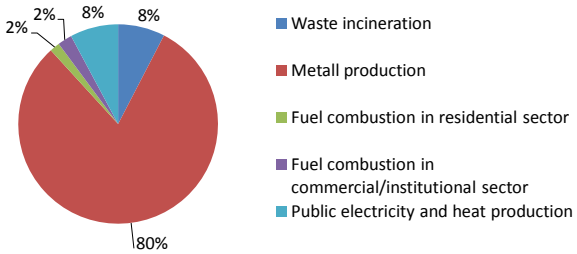


In 2014 total HCB emissions were 0.89 kg. Main sources of HCB emissions are «Mobile sources» – 0.5 kg (57% of total emissions) and «Waste incineration» – 0.2 kg (27%).

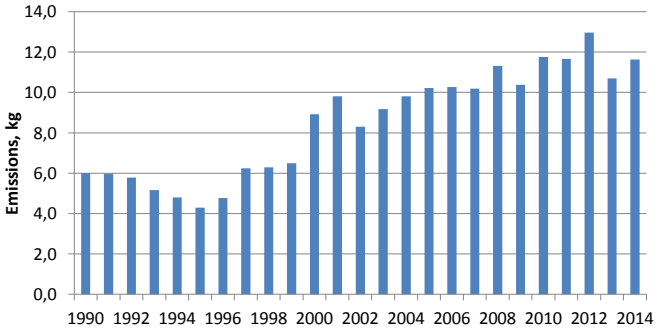


In 1990-2014 HCB emissions varied from 0.3 kg to 0.9 kg. The mean value was 0.6 kg

PCBs emissions in Belarus: structure and dynamics



In 2014 total PCBs emissions were 11.6 kg. Main source of PCBs emissions is «Metal production» – 9.4 kg (80% of total emissions).



In 1990-2014 PCBs emissions varied from 4.3 kg to 13 kg. The mean value was 8.5 kg.

The amount of PCB-containing equipment and volumes of PCBs in Belarus (2011)

Types of equipment	Amount/volumes	Phased out
Large capacitors, units	53 300	47%
Power transformers, units	302	13%
Small capacitors, units	40 000	?
Barrels with PCB, t	8	
The total volume of PCBs, t	1500	
The total volume of PCBs/gross weight, t	5000	

PCBs releases into environment from PCB-containing equipment; draft estimates for late 1990th (Kakareka S., Kukharchyk T. Expert estimates of PCDD/F and PCB emissions for some European countries. MSC-E Technical Note 2/2002):

- leakages – 1.14 tonnes/year;

- emissions – 0.426 tonnes/year;

Current release rates are lower, but still significant.

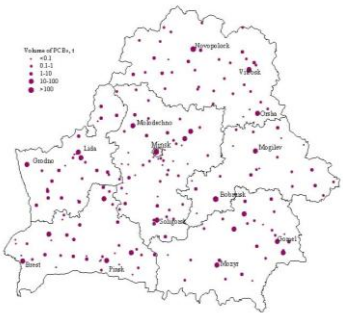
PCBs emissions from stationary sources – 9-10 kg/year

PCB-contaminated sites

PCBs content in soils of the territories, where electrical equipment is used and stored, makes up to milligrams or sometime grams per kilogram. Maximum concentrations of PCBs (2-105 g/kg) were found in the soil near destroyed capacitors and transformers as a consequence of PCB leakage.

About 80% of investigated substations have so-called “hot spots”, where cleaning and remediation measures should be undertaken.

Distribution of PCB-containing equipment



PCBs: implemented measures in Belarus

During the last years considerable effort has been made to improve the organization of the PCB-containing equipment storage: PCB-containing capacitors stored in the open air were transported to storehouses; more than 4,500 damaged capacitors were packed into containers.
The priority measures for soil remediation at a few substations including excavation of the most polluted soil and its package into containers for temporary storage were undertaken; about 40 tons of polluted soil have been excavated.
In 2012 13.5 thousand pieces of capacitors, 23 transformers and 27 containers with liquid PCBs were exported for disposal to France. The total mass of PCB-containing equipment and waste exported from the country amounted to 823 tons (gross). This work was performed as a part of a full-scale international technical assistance project "Management of Persistent Organic Pollutants" (Component C with a Comprehensive Project for the Treatment of Municipal Solid Waste in the Republic of Belarus). As a result, the total amount of PCBs in the country decreased by 17% and now it is about 1.3 thous. tonnes

http://www.popsbelarus.by/ru/main/pops_rb.html

POPs regulation: measurements

Standards, methods:

- STB 17.13.05-03-2008/ISO 11338-1:2003 Protection of the environment and nature. Environmental monitoring. Emissions from stationary sources. Determination of PAHs in gases and particles. Part 1. Sampling
- STB 17.13.05-04-2008/ISO 11338-2:2003 Protection of the environment and nature. Environmental monitoring. Emissions from stationary sources. Determination of PAHs in gases and particles. Part 2. Samples preparation, treatment, measures
- STB EN 1948-1-2006. Emissions from stationary sources. Determination of mass concentration of PCDD/PCDF and dioxin-like PCBs. Part 1. Sampling of PCDD/PCDF
- STB EN 1948-2-2007. Emissions from stationary sources. Determination of mass concentration of PCDD/PCDF and dioxin-like PCBs. Part 2. Extraction and purification of PCDD / PCDF
- Methods for PCB determination in soil/water

Investigations/monitoring:

- PAHs content in black carbon from fuel combustion in residential sectors;
- PCBs in soils;
- pesticides content in soils/water/food;
- no investigations of PCDDs/PCDFs content in flue gases;
- no investigations regarding new POPs content in the environment

POPs regulation: emission/releases estimates

Methodological provisions:

- elaboration of emission factors for different types of sources;
- development of TCP 17.08-13-2011 Protection of the environment and natural resources. Atmosphere. Emissions of pollutants into the air. Rules for emissions calculation of persistent organic pollutants. Ordinance of the Ministry of Natural Resources and Environmental Protection 19.08.2011;
    - The EMEP/EEA Air Pollutant Emission Inventory Guidebook
    - Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs. 2005, 2013

Results:

- POPs emission data is reported to UNECE annually;
- forecast of POPs emission (PCDDs/PCDFs, PCBs, HCB) up to 2020 has been elaborated for 3 scenarios;
- database of PCDDs/PCDFs releases into different media (air, water, soil, residue, products) as well as PCBs and HCB emission has been created for 2007–2013 and annually updated;

Problems:

- estimates of all POPs are carried out by calculation; no measures of POPs in flue gases;
- estimates of PCDDs/PCDFs emissions are mostly complete, but there are gaps in PCBs and HCB emission estimates due to lack of methodological framework elaborating;
- PCBs emissions from PCBs use (mainly from electrical equipment) and contaminated soils are not estimated ; it is likely that these sources are of priority for this group of substances (included in category 2F);
- no reporting about PCBs stocks in the frame of the CLRTAP (Protocol on POPs); the system of reporting in the frame of the Stockholm convention doesn't allow to assess the progress in PCBs management

POPs regulation: emission limits, abatements

PCDDs/PCDFs content in flue gases from medical waste incineration: 0.1 ng TEQ/m^3 (Instruction on the rules and methods of disposal of waste pharmaceuticals, medical devices and medical equipment Approved by the Ministry of Health of the Republic of Belarus of November 22, 2002 № 81;2002); according to the Protocol – 0.5 ng TEQ/m^3

PAHs content in flue gases from municipal waste incineration: 0.1 mg/m^3 (The requirements in the field of environmental protection in places of setting and operation of the facilities carrying out the sorting and recycling of municipal waste. Regulation of the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus and the Ministry of Environment of the Republic of Housing and Municipal Services of Belarus 20.12.2004 №38 / 37)

PMs content in flue gases from fuel combustion at large facilities (STB 1626.1-2006, 1626.2-2006);

Implementation/reconstruction of abatement systems for PMs (metallurgical plant, cement plants) leads to the reduction of PMs content in flue gases

POPs regulation: PCBs management

Done
- Revealing
- Recording
- Labeling
- Dismantling (partially)
- Packaging (partially)
- Temporary storage development

Should be done
- Dismantling
- Packaging/ repackaging?
- Temporary storage development
- Destruction

Deadlines:
by Protocol – 2020
by Convention – 2025/2028

BAT implementation in Belarus

Legislation and National Plans	✓the Law of the Republic of Belarus "On Environmental Protection", 30.12. 2015, № 341-3 (pp.1, 4, 32) ✓the Law of the Republic of Belarus "On Ambient Air Protection", 16.12.2008, N2-3 (pp.1, 23…) (definition, principles of nature protection, requirements for human activity) ✓The National Plans of the Republic of Belarus for the implementation of its Obligations under the Stockholm Convention on Persistent Organic Pollutants for the period of 2007–2010 and until 2028; for the period of 2011 – 2015 *(Decrees of the President of the Republic of Belarus No. 271 of 12 June 2007)No. 271 of 27 June 2011)*
Information base	Centre for BAT was established in 2009; http://www.ndtm.by/): ❑the establishment, improvement and maintenance of the BAT database; ❑selection and adaptation of handbooks on BAT of the EU; ❑coordination of the development of national guides on BAT; ❑provision of technical and expert support
Normative technical provision	➢implementation of integrated environmental permits ➢development of manuals on BAT, 2016-2020; ➢creation and updating of the Russian-language database of BAT by type of activity, 2016-2018; ➢development of emissions reduction program in air based on BAT in relation to emissions of heavy metals, POPs, NOx, NH3, VOCs, PM and SO2, 2016 (Plans in accordance to the recommendation of the 3rd Environmental Performance Review of Belarus UNECE; approved by the Deputy Prime Minister, 6.01.2016)

Guidance Document on BAT regarding POPs

Reduction of unintentional releases of persistent organic pollutants: the best available technology

- Guidelines on best available techniques and provisional guidance on best environmental practices relevant to Article 5 and Annex C of the Stockholm Convention on Persistent Organic Pollutants, Geneva, 2006
- Guidance document on best available techniques to control emissions of persistent organic pollutants from major stationary sources, ECE/EB.AIR/2009/14.

- Rules for management of PCB-containing equipment and wastes, 2008. Ordinance of the Ministry of Natural Resources and Environmental Protection N62, 24.06.2008. [in Russian].
- Recommendation for Prevention of Environment Pollution with Polychlorinated Biphenyls/Kukharchyk T., Kakareka S. and V. Khomich; the Ministry of Natural Resources and Environmental Protection. Minsk, 2006 (In Russian)

Technical guidelines on POPs: the latest and under review

- General technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants. UNEP/CHW.12/5/Add.2/Rev.1
- Technical guidelines on the environmentally sound management of wastes containing or contaminated with unintentionally produced polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans, hexachlorobenzene, polychlorinated biphenyls or pentachlorobenzene. UNEP/CHW.12/5/Add.4/Rev.1
- Technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with polychlorinated biphenyls, polychlorinated terphenyls or polybrominated biphenyls including hexabromobiphenyl. UNEP/CHW.12/5/Add.5/Rev.1
- Technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with hexabromodiphenyl ether and heptabromodiphenyl ether, or tetrabromodiphenyl ether and pentabromodiphenyl ether UNEP/CHW.12/5/Add.6/Rev.1

Document	Chapter / Section
Guidelines on best available techniques and guidance on best environmental practices relevant to Article 5 and Annex C	Part II Source category (b): Cement kilns firing hazardous waste
	Part III Source category (e): Firing installations for wood and other biomass fuels
Guidance on best available techniques and best environmental practices for the use of perfluorooctane sulfonic acid (PFOS) and related chemicals	3.1 Photo-imaging
	3.2 Semiconductor industry
	3.4 Metal Plating
	3.10 Carpets
	3.10 Textiles and Upholstery
	3.10 Leather and Apparel
Guidance on best available techniques and best environmental practices for the recycling and waste disposal of articles containing polybrominated diphenyl ethers (PBDEs)	

Before concluding

PCB: 1.5 mln t ⟶ 20 mln t ?

PCB: global estimates - some facts and figures (according to UNEP Chemicals and Waste Branch, DTIE, DECEMBER 2015)

- "It is estimated that between **1 and 1.5** million tonnes of technical grade PCB **have been produced** by a small number of countries (12) and companies (17) since the late 1920s".
- "Ca. 5.4 million tonnes or between **2.3 and 8.5 million tonnes have been destroyed** to date. Expert judgement suggests that the actual amounts destroyed are in the upper part of the range or possibly even beyond".
- "**The total mass of PCB equipment and materials that still needs to be eliminated is estimated at *ca*. 11.1 million tonnes**. Transformers account for the largest share, namely almost half of the total mass".
- "**Approximately 88 % of the total mass of equipment and materials containing or contaminated with PCB has been reported by the Asia-Pacific Region**, followed by the GRULAC Region at *ca*. 4 %, the WEOG (ca. 3 %), CEE (ca. 3 %) and the African Region (*ca*. 2 %)"

- In decision SC-7/3 on PCB, the COP requested the Secretariat to consolidate the preliminary assessment, taking into consideration any additional third national reports submitted and any other relevant information, in accordance with the framework for the effectiveness evaluation of the Stockholm Convention.

Conclusions

System of POPs management was elaborated in Belarus including:

- methodological and legislative provision of inventory of stock and unintentional releases of POPs;
- significant amount of PCB-containing equipment was phased out and removed for destruction or temporary storage; it can be considered that PCBs emission is decreased;
- certain measures for reduction of POPs releases were undertaken; system of POPs monitoring in the environment was created (pesticides and PCBs);
- certain basis for BAT implementation was elaborated.

Tasks :

- case study of POPs measurements in flue gases;
- updating of emission factors taking into account the current technological issues;
- forecast of POPs emission up to 2030;
- wider BAT/BEP implementation (especially for waste management)

Needs:

Lack of methodological basis for estimation of POPs releases from stocks (equipment, wastes), polluted soils

Assessment of progress in POPs protocol (and Stockholm convention) implementation (unintentional releases, phasing out and destruction of PCBs and pesticides): not trivial task taking into account the latest estimates (such as estimates of PCB by UNEP, 2015); trends of releases of PCBs into environment ?

Improvement of POPs reporting; include stocks (in equipment, wastes, soils)

Further BAT improvement with focus on temporary/long storage of damaged PCB-containing equipment;

Update of Guidance document on best available techniques to control emissions of persistent organic pollutants from major stationary sources, ECE/EB.AIR/2009/14.

Thank you very much

for you attention