

P o l a n d ' s
Informative Inventory Report 2010

Submission under UN ECE Convention
on Long-range Transboundary Air Pollution

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Contents

Summary	5
1. Introduction	6
1.1 National Inventory Background	6
1.2 Institutional arrangements	6
1.3 Inventory preparation process	8
1.4 Methods and data sources	8
1.5 Key Categories	9
1.6 QA/QC and Verification methods	9
1.7 General uncertainty evaluation	10
1.8 General Assessment of Completeness	10
2. Explanation of key trends	20
3. Sectoral Methodologies	30
3.1. Combustion In Energy And Transformation Industries (SNAP 01)	32
3.2. Non-Industrial Combustion Plants (SNAP 02)	39
3.3 Combustion In Manufacturing Industry SNAP 03)	47
3.4 Production Processes (SNAP 04)	56
3.5 Extraction And Distribution Of Fossil Fuels And Geothermal Energy (SNAP 05)	61
3.6 Solvent And Other Product Use (SNAP 06)	63
3.7 Road Transport (SNAP 07)	64
3. 8 Other Mobile Sources And Machinery (SNAP 08)	70
3.9 Waste Treatment And Disposal (SNAP 09)	74
3.10 Agriculture (SNAP 10)	77
3.11 Other Sources And Sinks (SNAP 11)	79
4. Recalculations and Improvements	80
5. Projections	81
Appendix 1. Key category analysis	82
Appendix 2. National energy balance for 2008 in EUROSTAT format	92
Abbreviations	98
References	99

Summary

Emission estimates in Poland account for sulphur dioxide, nitrogen oxides, ammonia, carbon monoxide, particulate matter (PM_{2.5}, PM₁₀ and total suspended particulates - TSP), non-methane volatile organic compounds (NMVOCs), heavy metals (HMs) and persistent organic pollutants (POPs) including dioxins and furans (PCDD/F), HCB, PCB and PAH.

The Poland's *Informative Inventory Report* (IIR) 2010 contains information on the Poland's inventories for the years 1990 to 2008, including descriptions of methods, data sources, carried out QA/QC activities and a trend analysis.

Due to methodology changes for energy sectors (SNAP 01-03), data for 2007-2008 are not fully compatible with data trends before 2007. Suitable recalculations are being performed but have not been completed yet.

Already performed recalculations were usually limited to the last two years (2005-2006, 2007-2008) as a result of corrections of energy statistics, methodology changes and including additional emission sources. Most of changes have no significant implications for the inventory totals and trends, with the exemptions of PCB emissions (from 2007) and HCB emissions (from 2001). Detailed description of recalculations performed will be included in the IIR report as they are completed for the entire period from 1990.

Planned programme of improvement is focused on the following tasks:

recalculations of emissions resulting from corrections of activity data (energy statistics, production statistics)

recalculations of emissions resulting from methodology changes (updating of emission factors and including additional emission sources)

applying higher tier of estimation methodology, especially for key sources.

1. Introduction

The Poland's Informative Inventory Report (IIR) 2010 contains information on the Poland' inventories for the years 1990 to 2008, including descriptions of methods, data sources, carried out QA/QC activities, key categories analysis and a trend analysis.

Detailed methodology descriptions generally apply to 2007-2008 estimates of pollutants emissions made and submitted in the tables of Annex IV reporting template for the UNECE/EMEP 2009 Guidelines For Reporting Emission Data (version 30092009).

Due to methodology changes for energy sectors (SNAP 01-03), data for 2007-2008 are not fully compatible with data trends before 2007; suitable recalculations are being performed but have not been completed yet.

Emission estimates in Poland account for sulphur dioxide, nitrogen oxides, ammonia, carbon monoxide, particulate matter (PM_{2.5}, PM₁₀ and total suspended particulates - TSP), non-methane volatile organic compounds (NMVOCs), heavy metals (HMs) and persistent organic pollutants (POPs) including dioxins (PCDD/F), HCB, PCB and PAH.

By means of this report Poland fulfils its obligation for preparing IIR Report under UN ECE Convention on Long-range Transboundary Air Pollution, signed in November 1979 in Geneva. Structure of the report follows the latest template for an Informative Inventory Report to LRTAP. The report includes inter alia for each pollutant or group of pollutants :

- key categories analysis
- national totals trends
- methodology of emission estimates.

1.1 National Inventory Background

Emission estimates are mainly based on official Polish statistics, e.g. energy statistics, agricultural statistics, transport statistics, industry statistics and emission factors (nationally developed factors as well as internationally recommended ones).

Poland generally observes the Guidelines for Estimating and Reporting Emission Data for reporting to the Convention on Long-Range Transboundary Air Pollution (CLRTAP) and to the Economic Commission for Europe (UNECE).

Some parts of the methodologies are taken directly from the EMEP/EEA Emission Inventory Guidebook, EMEP/CORINAIR Emission Inventory Guidebook, other international studies and some are nationally developed.

1.2 Institutional arrangements

The inventory system currently existing in Poland is presented in Figure 1.1. The Polish Ministry of Environment takes the overall responsibility and submits the inventory report to CLRTAP.

Since 2000 the National Emission Centre has been commissioned by the MoE to carry out inventories for air pollutants and the GHG gases. The National Emission Centre (NEC), located at the Institute of Environmental Protection, from 2006 has been the part of the National Administration for Emission Trading System. From 2010, following the

Current system of air emission inventories

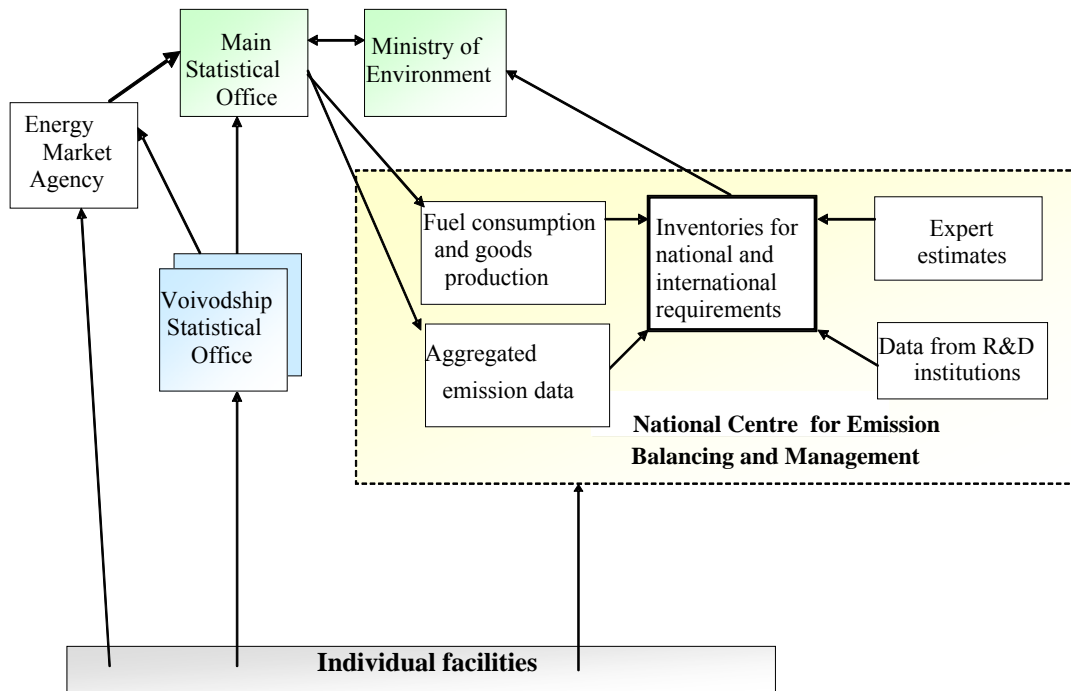


Figure 1.1 Current system of air emission inventories

Current system of data flow on air pollutants

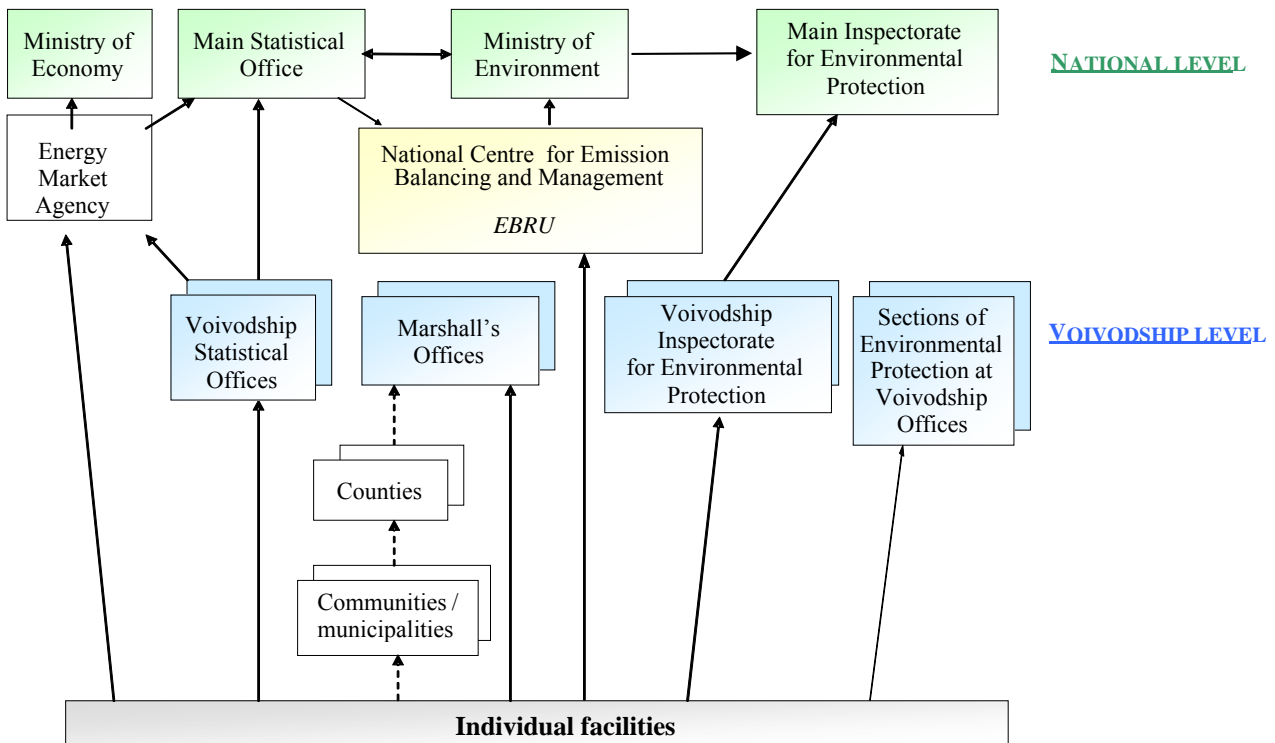


Figure 1.2 Data flow in the inventory system

organizational changes introduced¹, the inventory team was constituted as Emission Balancing and Reporting Unit (EBRU) located in the National Centre for Emission Balancing and Management (NCEBM). EBRU develops the inventory reports and is also responsible for the final quality control and quality assurance (QA/QC) of the data submitted.

1.3 Inventory preparation process

Basic information on activity data regarding particular emission source categories, are mostly taken from various official public statistics and Polish data in EUROSTAT database.

The activity data that are not available in public statistics, are worked out by experts through studies commissioned by the Ministry of Environment or by the Institute of Environmental Protection specifically for emission inventory purposes. Other input data are received upon request.

To prepare the LRTAP inventory EBRU collaborates with a number of institutions as well as individual experts. Among the collaborating institutions are: *Central Statistical Office (GUS)*, *Institute of Ecology of Industrial Areas in Katowice (IETU)*, *Motor Transport Institute in Warsaw (ITS)*, *Energy Market Agency (ARE)*, *Institute for Land Reclamation and Grassland Farming (IMUZ)*.

1.4 Methods and data sources

Emission factors for the emission sources are mostly taken from EMEP Inventory Guidebooks or reports on domestic research. The sources of particular emission factors are given below in the sectoral chapters.

The inventory team (*Emission Balancing and Reporting Unit*), as a subunit of the NAETS-NCEBM, has access to the individual data of entities participating in the *European Union Emission Trading Scheme (EU-ETS)*. This ensures availability of data for major sources in emissions from stationary combustion sectors (NFR 1.A.1, 1.A.2) as well as from specific industrial processes. Such data are after verification successively included into emission inventory where possible.

Table 1.1 Main sources of information on activities

Emission source category	Main sources of information - Publications	Institution
Energy	Energy Statistics	GUS
	Statistical Yearbook of Poland	GUS
	OECD Energy Balance for Poland	ARE
	Information on transport emissions	ITS
Industrial processes	Statistical Yearbook of Industry	GUS
	Statistical Yearbook of Poland	GUS
	Production of industrial goods	GUS
	G-03 Questionnaire aggregates	ARE
Use of chemical products	Import/export data	GUS
	Statistical Yearbook of Industry	GUS
Agriculture	Statistical Yearbook of Poland	GUS

¹ The Act of 17 July 2009 on the System to Manage the Emissions of Greenhouse Gases and Other Substances

Emission source category	Main sources of information - Publications	Institution
	Agriculture Yearbook	GUS
Forestry	Forestry Yearbook	GUS
	Environment Yearbook	GUS
Waste	Environment Yearbook	GUS
	Statistical Yearbook of Poland	GUS
	Municipal infrastructure	GUS

1.5 Key Categories

Key categories are sources that together contribute with 95 % of the level of reported emissions in Poland. In this Report level assessments have been carried out for the following pollutants: NO_x, CO, SO₂, NH₃, NMVOC, TSP, Heavy metals and POPs. The level assessment was performed for 2008. The results of the key source category analysis are presented in Appendix 1.

1.6 QA/QC and Verification methods

The programme for Quality Assurance and Quality Control has been elaborated to improve and assure high quality of the Polish annual greenhouse gas inventory. Rules of the program apply also to the emissions inventory prepared for the UN ECE Convention on Long-range Transboundary Air Pollution. The QA/QC programme contains tasks, responsibilities as well as time schedule for performance of the QA/QC procedures. In 2009 QA/QC plan has been extended by automated back-up of inventory databases on separate server in a different location.

The Polish inventory is generated in two main steps. First calculations are produced approximately 9–11 months after the end of the inventoried year (n–1) depending primarily on the availability of required activity data. Initial check of activity data and estimation procedures is then done. When the official statistics are available the revision of data is made and final inventory is produced.

The calculated emissions figures for a given year, are compared to the respective figures from previous years (time series), and outliers are scrutinized in more detail. After the checking stage is completed, the final inventory files are prepared together with the accompanying reports.

After completing of the inventory it is reviewed by the Ministry of Environment (MoE) and Chief Inspectorate for Environmental Protection (GIOS). Then inventory data are officially approved by MoE.

The national inventory team – Emission Balancing and Reporting Unit (EBRU) – which is responsible for preparation of emission inventories, is also responsible for coordination and implementing the QA/QC activities.

Present QA/QC programme has been elaborated in parallel to QA/QC programme for GHG inventories in line with the IPCC Good Practice Guidance and Uncertainty Management in National GHG Inventories 2000 and is under implementation. It is planned to update QA/QC

program according to new guidelines: EMEP EEA Emission Inventory Guidebook 2009: "Inventory management, Improvement and QA/QC (TFEIP-endorsed draft, May 2009).

Data management and archiving

All activity data, emission factors and resulting emission data are stored in inventory databases, which are constantly updated and extended to meet the ever changing requirements for emission reporting, with respect to UNFCCC and LTRAP as well as their protocols.

Access to data for selected years, sectors and pollutants is possible via Internet. Inventory data and reports for downloading are presented at NAETS-NCEBM website:

<http://www.kashue.pl/index.php?page=pozostale-zanieczyszczenia-powietrza>

Inventory databases are automatically archived on separate server in a different location.

1.7 General uncertainty evaluation

Polish inventory team is planning to implement larger scope of uncertainty analysis for CLRTAP inventory in the next submission. At this moment information on uncertainties of activity data and emission factors are collected from sectoral experts and literature. In the second stage a simulation model based on probability distribution functions and Monte Carlo analysis will be developed, also some experiences and conclusions from GHG uncertainty analysis will be taken into account. During this analysis the highest priority will be given to SO₂, NO_x, NMVOC and NH₃. Uncertainties of activity data (especially energy data) are of similar level as estimated for GHG inventory.

Most uncertain values of activity were assigned for burning of agricultural wastes (30 %). Lowest uncertainty values were assigned to 1.A.1 Energy Industries (solid and liquid fuels 2 %, gaseous 1 %). In general Polish energy sector is covered with detailed national statistics, which allows to keep overall uncertainty of inventory at low level.

1.8 General Assessment of Completeness

General assessment of the completeness presented in this chapter applies to the emission estimates in Poland. The completeness for each pollutant and major sources are discussed briefly below.

Sulphur dioxide emissions

Estimated emissions are considered to be complete for most key sources. Emissions from the sectors: *Extraction and distribution of fossil fuels and Geothermal Energy* (SNAP 05), *Solvent and other product use* (SNAP 06), *Agriculture* (SNAP 10) and *Other sources and sinks* (SNAP 11) are considered to be negligible. The major source of emissions is the *Stationary combustion of fuels for energy production* (SNAP 01). The disaggregation of SO₂ emissions in NFR is given below in Table 1.2.

Table 1.2. SO₂ emissions in 2008 according to NFR classification

NFR	Emission [Gg]
Total	998.56
1 A 1 a	542.170
1 A 1 b	25.724
1 A 1 c	4.620
1 A 2 a	2.920
1 A 2 b	7.035
1 A 2 f i	170.881
1 A 2 f ii	0.014
1 A 3 b i	0.515
1 A 3 b ii	0.176
1 A 3 b iii	0.457
1 A 3 b iv	0.003
1 A 3 c	0.013
1 A 3 d ii	0.016
1 A 4 a i	21.889
1 A 4 b i	184.100
1 A 4 b ii	0.019
1 A 4 c i	32.850
1 A 4 c ii	0.132
1 A 4 c iii	0.327
2 B 5 a	4.360
2 C 1	0.270
6 C a	0.034
6 C b	0.006
6 C c	0.016
6 C d	0.014

Nitrogen oxides (as NO₂) emissions

Estimated emissions are considered to be complete for key sources. The major source of emissions is stationary combustion of fuels for energy production in public power plants. Emissions from the sectors: *Extraction and distribution of fossil fuels and Geothermal Energy* (SNAP 05), *Solvent and other product use* (SNAP 06), *Agriculture* (SNAP 10) and *Other sources and sinks* (SNAP 11) are considered to be negligible. A new category has been recently added, namely *Open burning of agricultural wastes* (SNAP 0907). The disaggregation of NO_x emissions in NFR is given below in Table 1.3.

Table 1.3. NO_x emissions in 2008 according to NFR classification

NFR	Emission [Gg]
Total	831.225
1 A 1 a	260.827
1 A 1 b	8.170
1 A 1 c	5.030
1 A 2 a	0.164
1 A 2 b	0.314
1 A 2 d	0.042
1 A 2 f i	99.721
1 A 2 f ii	8.460
1 A 3 a ii	0.335

NFR	Emission [Gg]
1 A 3 b i	96.998
1 A 3 b ii	31.595
1 A 3 b iii	127.477
1 A 3 b iv	0.160
1 A 3 c	6.750
1 A 3 d ii	0.317
1 A 4 a i	16.045
1 A 4 b i	60.974
1 A 4 b ii	6.560
1 A 4 c i	8.434
1 A 4 c ii	69.986
1A 4 c iii	1.810
2 A 1	0.018
2 B 4	0.191
2 B 5 a	15.824
2 C 1	1.594
2 C 2	0.446
2 D 1	0.820
6 C a	0.034
6 C b	0.108
6 C c	0.073
6 C d	0.008
6 C e	1.938

Carbon monoxide emissions

Estimated emissions are considered to be complete for key sources. The most important of them is combustion of fuels in households. Emissions from the sectors: *Extraction and distribution of fossil fuels and Geothermal Energy* (SNAP 05), *Solvent and other product use* (SNAP 06), *Agriculture* (SNAP 10) and *Other sources and sinks* (SNAP 11) are considered to be negligible. For the category *Open burning of agricultural wastes* (SNAP 0907) a new methodology was adopted. The disaggregation of CO emissions in NFR is given below in Table 1.4.

Table 1.4. CO emissions in 2008 according to NFR classification

NFR	Emission [Gg]
Total	2 673.53
1 A 1 a	37.518
1 A 1 b	1.051
1 A 1 c	10.401
1 A 2 a	0.414
1 A 2 b	0.110
1 A 2 d	0.017
1 A 2 f i	77.032
1 A 2 f ii	5.640
1 A 3 a ii	3.351
1 A 3 b i	536.315
1 A 3 b ii	98.551
1 A 3 b iii	72.517
1 A 3 b iv	13.908

NFR	Emission [Gg]
1 A 3 c	3.688
1 A 3 d ii	0.166
1 A 4 a i	12.884
1 A 4 b i	1 410.625
1 A 4 b ii	47.328
1 A 4 c i	255.221
1 A 4 c ii	61.155
1A 4 c iii	0.248
2 A 1	0.006
2 A 2	19.087
2 B 4	0.003
2 B 5 a	0.933
2 C 1	1.417
2 C 2	1.841
2 D 1	0.164
6 C e	1.938

Ammonia emissions

Estimated emissions are considered to be complete for key sources. The major source of emissions is manure management in agriculture. The major source of emissions is *Agriculture* (98 %), of which manure management amounts for 70 %. Emissions from the combustion of fuels in residential plants, industrial processes, solvents use and road transport are not significant. The disaggregation of NH₃ emissions in NFR is given below in Table 1.5.

Table 1.5. NH₃ emissions in 2008 according to NFR classification

NFR code	Emissions [Gg]
Total	285.294
1 A 3 b i	0.665
1 A 3 b ii	0.092
1 A 3 b iii	0.069
1 A 3 b iv	0.002
1 A 3 c	0.001
1 A 4 b i	0.461
1 A 4 c ii	0.011
2 A 4	1.282
2 B 1	0.025
3 C	0.006
4 B 1 a	59.056
4 B 1 b	43.066
4 B 3	0.473
4 B 4	0.199
4 B 6	3.163
4 B 8	70.962
4 B 9	18.579
4 D	83.983
6 B 2	3.200

Particulate matter emissions

The main source of TSP emissions in Poland are the combustion processes (SNAP 01, 02, 03) with the share of 59 % in the national totals.

Category *Non-industrial combustion plants* (SNAP 02) has the highest share in the emission of TSP within the group of stationary sources (SNAP categories 01 ÷ 05 + 09 + 11).

Means of transport and machines with combustion engines (categories SNAP 07 and SNAP 08) have 19.4 % share in the total national emission. Large part of this emission comes from Automobile tire and brake wear.

Estimated emissions are considered to be complete for key sources. Tables 1.6 shows the respective emission estimates in NFR classification.

Table 1.6. TSP, PM10 and PM2.5 emissions in 2008 according to NFR classification

	TSP	PM10	PM2.5
NFR	Gg	Gg	Gg
Total anthropogenic	421.3058	263.3879	130.8400
1 A 1 a	26.2055	17.3894	8.8981
1 A 1 b	1.3177	0.6997	0.3908
1 A 1 c	2.1608	1.1820	0.4453
1 A 2 a	6.3054	2.8061	1.9344
1 A 2 b	0.8963	0.7187	0.5312
1 A 2 f i	38.7611	25.8286	12.8446
1 A 2 f ii	0.7332	0.7332	0.7332
1 A 3 a ii	0.0001	0.0001	0.0001
1 A 3 b i	3.9276	3.9276	3.9276
1 A 3 b ii	2.3332	2.3332	2.3332
1 A 3 b iii	11.4402	11.4402	11.4402
1 A 3 b iv	0.0003	0.0003	0.0003
1 A 3 b vi	55.0189	3.9906	1.5144
1 A 3 c	0.5875	0.5875	0.5875
1 A 3 d ii	0.0303	0.0303	0.0303
1 A 4 a i	5.8490	2.9316	0.8223
1 A 4 b i	139.8395	109.0116	48.6196
1 A 4 b ii	0.5384	0.5384	0.5384
1 A 4 c i	26.2703	20.4417	9.0685
1 A 4 c ii	6.8536	6.8536	6.8536
1 A 4 c iii	0.3400	0.3400	0.3400
1 B 1 a	32.7784	14.7689	1.4811
1 B 1 b	1.9661	1.9661	0.9831
2 B 5 a	4.9992	3.9906	2.9905
2 C 1	9.7227	7.9418	5.0281
2 C 3	0.3738	0.2991	0.1308
4 B 1 a	2.4917	1.1224	0.0249
4 B 1 b	2.6196	1.1800	0.0262
4 B 6	0.2818	0.1268	0.0028
4 B 8	9.2925	4.1800	0.0929
4 B 9 a	0.4215	0.1897	0.0422
4 B 9 b	0.6487	0.2920	0.0649
4 B 9 d	9.2562	4.1770	0.0926
4 F	0.3333	0.2340	0.2000
6 C b	12.3818	7.4291	4.3336

	TSP	PM10	PM2.5
NFR	Gg	Gg	Gg
6 C c	0.0041	0.0041	0.0041
6 C e	2.0928	1.4694	1.2557
7	2.2328	2.2328	2.2328
11 B	0.5337	0.3747	0.3202

NMVOCs emissions

The total emission of non-methane volatile organic compounds from the anthropogenic sources in 2008 was 582.6 thousand Mg. Estimated emissions are considered to be complete for most sources.

Category *Solvent and other product use* (SNAP 06) has the highest (34 %) share in the emission of NMVOCs from the group of stationary sources (SNAP categories 01÷06 + 09 + 10). 198 Gg of NMVOCs have been emitted from processes included in this group.

The second large category of stationary sources in national emissions includes combustion processes in municipal and housing sectors (category SNAP 02 – 18.4 %). These processes emitted 107 Gg of NMVOCs to the air.

Means of transport and machines with combustion engines (categories SNAP 07 and SNAP 08) emitted 142 Gg of NMVOCs, i.e., 24.5 % of the total national emission.

Finally, the natural sources, classified as category SNAP 11, have emitted over 311 Gg of NMVOCs. Emissions from the natural sources (NFR category 7) are not included in the country total.

Table 1.7. NMVOC emissions in 2008 according to NFR classification

NFR	Emission [Gg]
Total anthropogenic	582.623
1 A 1 a	15.612
1 A 1 b	0.134
1 A 1 c	0.407
1 A 2 f i	7.922
1 A 2 f ii	1.706
1 A 3 a ii	0.095
1 A 3 b i	49.453
1 A 3 b ii	11.666
1 A 3 b iii	31.177
1 A 3 b iv	5.958
1 A 3 c	1.588
1 A 3 d ii	0.084
1 A 4 a i	1.241
1 A 4 b i	89.164
1 A 4 b ii	28.658
1 A 4 c i	16.571
1 A 4 c ii	11.177
1 A 4 c iii	1.080
1 B 1 a	8.435
1 B 1 b	4.881
1 B 2 a i	0.075
1 B 2 a iv	18.932
1 B 2 a v	22.519

NFR	Emission [Gg]
1 B 2 b	7.412
2 A 5	4.437
2 B 5 a	22.853
2 C 1	5.094
2 D 1	1.838
2 D 2	11.027
3 A 1	23.546
3 A 2	59.300
3 A 3	4.360
3 B 1	29.613
3 B 2	5.720
3 C	22.061
3 D 2	45.763
3 D 3	7.938
4 D 1 a	0.00001
4 F	0.447
6 C a	0.181
6 C b	0.916
6 C c	0.360
6 C d	0.330
6 C e	0.891
7 B	309.718
11 B	1.782

Heavy metal emissions

Combustion processes for energy production purposes (SNAP 01÷03) have the biggest share in the emission of HM in Poland within the considered SNAP.

Non-industrial combustion plants (SNAP 02) has the highest (62.5 %) share in the emission of Cadmium. *Combustion in energy and transformation industries* (SNAP 01) is the biggest source (56 %) of mercury emissions and for lead the biggest source (51 %) is *Combustion in manufacturing industry* (SNAP 03).

Second large source of HM emissions are *Production processes* (SNAP 04) with the share of ; 15.3 %, 26.2 % and 11.7 % for lead, chrome and zinc respectively. The dominant sub-sectors are *Processes in iron and steel industries* and *Processes in non-ferrous metal industries* while for mercury emissions the main source (41.6 %) of emission from industry is the production of cement.

Estimated emissions are considered to be complete for key sources. Table 1.8 below includes emissions estimates for Cd, Hg, Pb, As, Cr, Cu, Ni and Zn according to NFR classification.

Table 1.8. Heavy metals emissions in 2008 according to NFR classification

NFR	Cd	Hg	Pb	As	Cr	Cu	Ni	Zn
	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg
Total	41.771	15.687	550.661	44.176	49.178	348.556	173.748	1 444.419
1 A 1 a	2.236	8.699	22.769	4.000	5.066	15.617	13.407	76.015
1 A 1 b	0.742		0.927	0.742	0.896	2.101	20.207	0.742
1 A 1 c	0.398	0.109	2.398	0.254	0.333	1.394	1.735	9.659
1 A 2 b	2.872	1.341	238.228	18.005		204.783		491.853
1 A 2 f i	6.187	3.290	43.194	4.142	8.914	18.990	46.987	137.859
1 A 2 f ii	0.007					0.042	0.071	

NFR	Cd	Hg	Pb	As	Cr	Cu	Ni	Zn
	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg
1 A 3 a ii						0.009	0.015	
1 A 3 b i	0.073		15.872		1.846	1.546	2.576	
1 A 3 b ii	0.061		2.310		0.269	0.529	0.882	
1 A 3 b iii	0.229					1.372	2.286	
1 A 3 b iv			0.123		0.014	0.009	0.014	
1 A 3 c	0.006					0.038	0.063	
1 A 3 d ii	0.000					0.002	0.003	
1 A 4 a i	1.532	0.230	9.688	0.975	1.262	5.600	5.009	38.771
1 A 4 b i	19.384	0.951	109.090	12.471	14.765	64.949	62.530	438.041
1 A 4 b ii	0.005		0.377		0.044	0.057	0.095	
1 A 4 c i	5.190	0.182	20.147	2.608	2.895	12.179	10.719	81.484
1 A 4 c ii	0.066					0.395	0.659	
1A 4 c iii	0.004					0.026	0.043	
1 B 1 b	0.492	0.295	2.163	0.197	1.671	0.885	0.639	2.163
2 B 5 a	0.274	0.028						
2 C 1	1.887	0.519	81.541	0.781	6.708	17.912	5.801	166.969
2 C 2			0.013		4.482			
2 C 3	0.005						0.005	0.007
2 C 5 e			0.393					
6 C c	0.122	0.045	1.429	0.002	0.012	0.122	0.004	0.857

PCDD/F emissions

The main sources (50.4 %) of PCDD/F emissions comes from *Combustion processes in Non-industrial combustion plants* (SNAP 02). Within this category the dominant source is *Residential* (SNAP 0202), which covers combustion processes in household boilers and furnaces, where commercial fuels are frequently co-combusted with household waste.

Important contribution (27.8 %) to national total of PCDD/F emissions in 2008 are in category *Other sources and sinks* (SNAP 11) and include fires of: landfills, buildings (public, private and industrial), road vehicles and forests as well as cigarette smoking. In this category the dominant source are landfill fires.

Estimated emissions are considered to be complete for all sources. Tables 1.9 shows the respective emission estimates in NFR classification.

Table 1.9. PCDD/F emissions in 2008 according to NFR classification

NFR	PCDD/F [mg TEQ]
Total	399 284
1 A 1 a	8 791.25
1 A 1 b	771.61
1 A 1 c	51.43
1 A 2 a	8 513.60
1 A 2 b	13 209.42
1 A 2 f i	15 583.18
1 A 3 b i	446.71
1 A 3 b ii	108.58
1 A 3 b iii	196.63

	PCDD/F
NFR	[mg TEQ]
1 A 3 b iv	2.98
1 A 3 c	5.38
1 A 3 d ii	0.25
1 A 3 e ii	13.56
1 A 4 a i	844.95
1 A 4 b i	198 991.07
1 A 4 c i	1 411.90
1 A 4 c ii	56.67
1 A 4 c iii	1.33
1 B 1 b	2 949.22
2 C 1	13 660.59
2 C 3	93.46
2 D 2	2 062.00
4 F	81.54
6 C a	342.28
6 C b	13 023.48
6 C c	34.93
6 C d	254.02
6 C e	6 790.38
6 D	110 992.06

HCB emissions

The largest (66.0 %) contribution to the national total of HCB emissions comes from category *Combustion in manufacturing industry* (SNAP 03). Large emissions occur in secondary copper production and in sinter plants. Category *Combustion processes in Non-industrial combustion plants* (SNAP 02) is the second largest sector accounting for 17.1 % of national total. Also important is *Waste treatment and disposal sector* (SNAP 09) that contributes 8.5 % to the national total. Among those sectors significant contributions come from residential plants and from waste incineration both in industry and hospitals at installations equipped with merely basic APCs. Estimated emissions are considered to be complete for key sources. Tables 1.10 shows the respective emission estimates in NFR classification.

Table 1.10. HCB emissions in 2008 according to NFR classification

NFR	HCB
	[kg]
Total	9.728
1 A 1 a	0.752
1 A 1 b	0.000
1 A 1 c	0.007
1 A 2 a	0.883
1 A 2 b	5.024
1 A 2 f i	0.514
1 A 3 b i	0.010
1 A 3 b ii	0.008
1 A 3 b iii	0.025
1 A 3 b iv	0.000
1 A 4 a i	0.034
1 A 4 b i	1.535

1 A 4 c i	0.097
2 C 1	0.016
6 C a	0.105
6 C b	0.711
6 C c	0.006

PCB emissions

The dominant source of PCB emissions (59.4 %) are *Non-industrial combustion plants* (SNAP 02). The other important source is *Combustion in energy and transformation industries* (18.5 %). Estimated emissions are considered to be complete for key sources. Tables 1.11 shows the respective emission estimates in NFR classification.

Table 1.11. PCB emissions in 2008 according to NFR classification

NFR	PCB
	[kg]
Total	668.15
1 A 1 a	122.73
1 A 1 b	0.46
1 A 1 c	0.21
1 A 2 a	0.41
1 A 2 b	0.42
1 A 2 f i	7.86
1 A 3 b i	1.05
1 A 3 b ii	0.83
1 A 3 b iii	104.93
1 A 3 b iv	0.00
1 A 4 a i	1.29
1 A 4 b i	393.17
1 A 4 c i	2.41
2 C 1	31.55
6 C a	0.08
6 C b	0.74
6 C c	0.01

PAH emissions

The main sources of PAHs emission (85.5 %) in Poland are *Non-industrial combustion plants* (residential plants and plants in agriculture, forestry and aquaculture). The second large source of national emissions is *Production processes* with coke production as the dominant sub-sector. Estimated emissions are considered to be complete for key sources. Table 1.12 shows the respective emission estimates in NFR classification.

Table 1.12. PAH emissions in 2008 according to NFR classification

NFR	BaP	BbF	BkF	I_P	PAH
	[kg]	[kg]	[kg]	[kg]	[kg]
Total	47 059.78	48 628.33	14 205.87	50 012.95	159 906.91
1 A 1 a	1.63	42.87	42.87	2.82	90.19
1 A 1 b	2.65	1.40	2.18	5.28	11.50
1 A 1 c	0.38	12.54	12.56	9.53	35.00

NFR	BaP	BbF	BkF	I_P	PAH
	[kg]	[kg]	[kg]	[kg]	[kg]
1 A 2 f i	49.92	220.88	221.91	134.35	627.05
1 A 3 b i	473.50	0.66	0.28	0.47	474.92
1 A 3 b ii	369.84	0.52	0.22	0.37	370.95
1 A 3 b iii	1 358.12	1.90	0.81	1.36	1 362.20
1 A 3 b iv	0.31	0.00	0.00	0.00	0.31
1 A 3 c	37.13	0.05	0.02	0.04	37.24
1 A 3 d ii	1.74	0.00	0.00	0.00	1.74
1 A 4 a i	2.20	33.00	33.46	22.54	91.21
1 A 4 b i	30 658.95	36 964.71	7 962.10	39 306.22	114 891.97
1 A 4 b ii	31.63	0.04	0.02	0.03	31.73
1 A 4 c i	5 779.81	7 011.78	1 591.78	7 344.55	21 727.93
1 A 4 c ii	391.45	0.55	0.23	0.39	392.62
1 A 4 c iii	9.21	0.01	0.01	0.01	9.24
1 B 1 b	7 373.06	2 457.69	2 457.69	2 949.22	15 237.65
2 C 3	514.03	1 877.61	1 877.61	233.65	4 502.90
3 A 3	4.23	2.11	2.11	2.11	10.57

2. Explanation of key trends

The description below applies to trends of emissions of several pollutants, mostly in the period 1980-2008. Despite some time series inconsistencies of energy data between 2007-2008 and the previous years (due to methodology changes, described below) it seems that emissions trends have not been affected in a significant way.

Volumes of emissions obtained in 2007 and 2008 for the particular sectors and subsectors differ in their structure in relation to the inventories for the year 2006 and earlier due to methodological changes applied:

- change of the data source for SNAP 01-03 from the sectoral tables of the Energy Statistics [GUS] for the Polish Energy balance in the Eurostat format (last year) and EUROSTAT energy database (earlier years);
- harmonization of other activity data (SNAP 04-11) with an inventory of greenhouse gases;
- changes in the allocation of fuels consumption for the selected subsectors of SNAP classification to be consistent with the definitions used in SNAP and NFR classifications and EUROSTAT database, such as:
 - aggregation of combustion processes with contact and without contact (SNAP 0302 and SNAP 0303)
 - transfer of district/public heating plants from SNAP 0201 to SNAP 0102
 - transfer of industry heating plants from SNAP 0301 to SNAP 0102
 - transfer of heating plants from the SNAP 0202 to the services sector (SNAP 0201)
 - transfer of the fuel use in Energy sector for Consumption - electricity generation from SNAP 0105 to SNAP 0101

The appropriate recalculation for the years 1990-2006 is under preparation and is planned to be completed for the next submission.

SO₂ emissions

Emissions of SO₂ decreased by 76 % between 1980 and 2008, and by 69 % between 1990 and 2008. Most of the reductions were caused by the decline of the heavy industry in the late 1980s and early 1990s. In late 1990s the emissions decreased because of the diminished share of coal (hard and brown) among fuels used for power and heat generation.

The trend of sulphur dioxide emissions is influenced mainly by the combustion processes in the sectors SNAP 01÷03.

In 2008 emission of SO₂ decreased by 17.9 % compared to the respective figure for the year 2007. The most significant decrease for sulphur dioxide emissions was in *Public power plants* (category 0101) by 216 Gg.

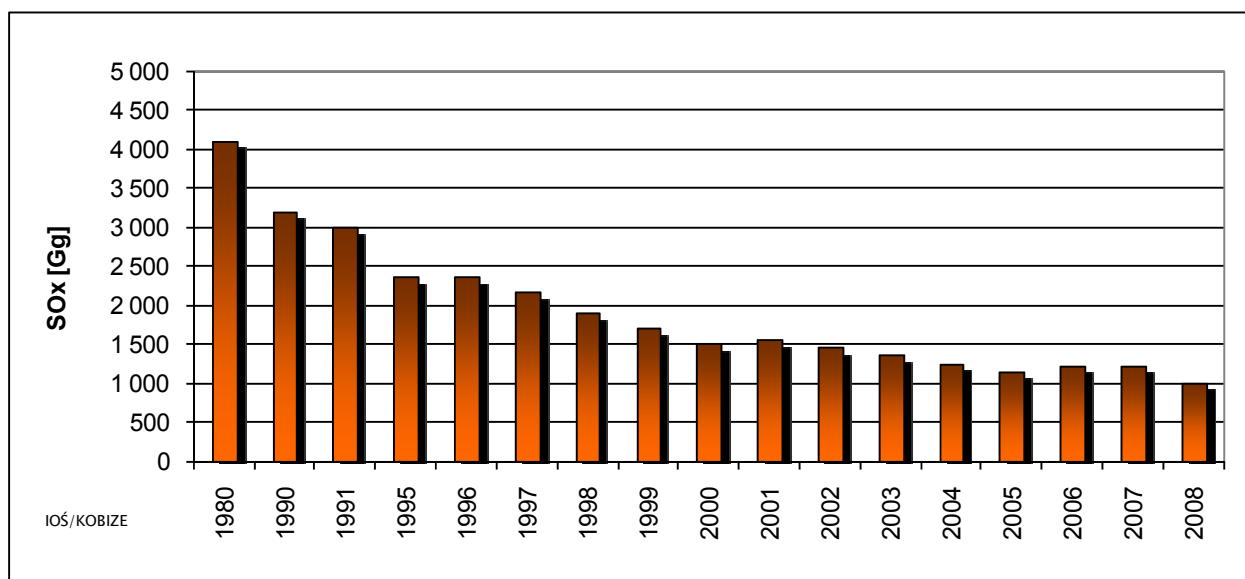


Figure 2.1 Emissions trend of SO₂

NO_x emissions

Emissions of NO_x decreased by 32 % between 1980 and 2008, and by 35 % between 1990 and 2008. Similarly to sulphur dioxide, most of the reductions were caused by the decline of the heavy industry and lower share of coal in the late 1980s and early 1990s. Increasing emissions from road traffic contribute to the national total, and cause comparatively lower emission reductions than in case of SO₂.

Compared to the year 2007, in 2008 NO₂ emissions decreased by 3.4 %. The highest decrease of NO_x emissions was noted in the *Combustion in Energy and Transformation Industries* (SNAP 01) by 7.2 %. The decrease in this sector was caused by lower consumption of hard coal in *Public power plants*.

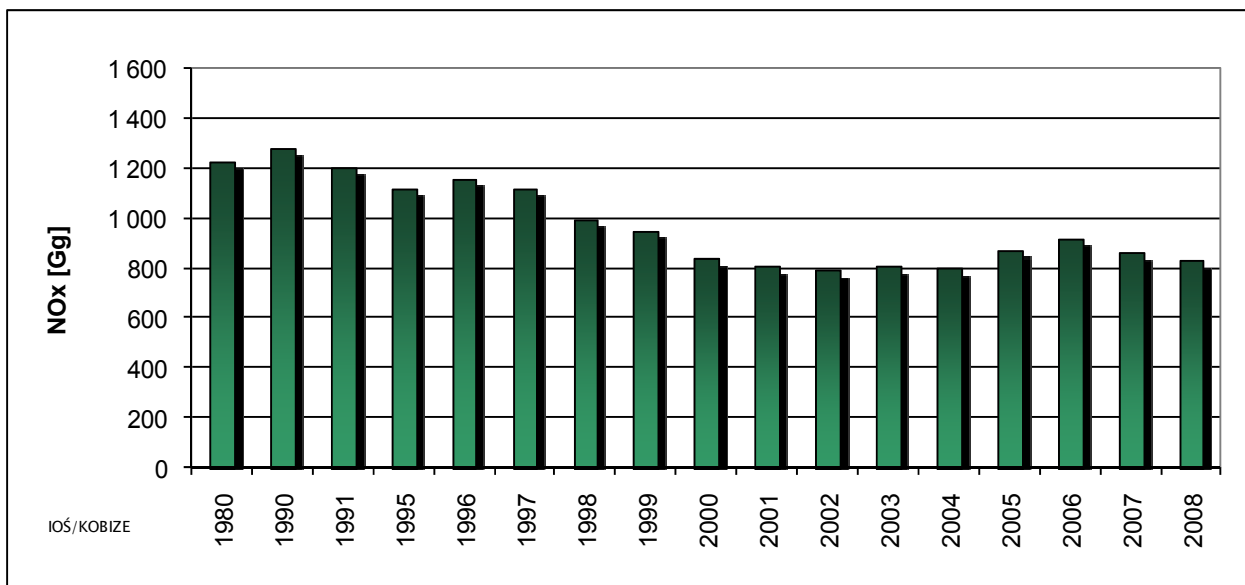


Figure 2.2 Emissions trend of NO_x

CO emissions

From 1990 to 2008 the emissions of CO have decreased by 64 per cent, mainly because of the same reasons as the described above decline in emissions of SO₂ and NO_x.

Compared to the year 2007, in 2008 emission of CO increased by 4.7 %. The significant increase (7.4 %) was in the category *Non-industrial combustion plants* (SNAP 02) due to a higher volume of coal used and more fuel wood used in residential sector.

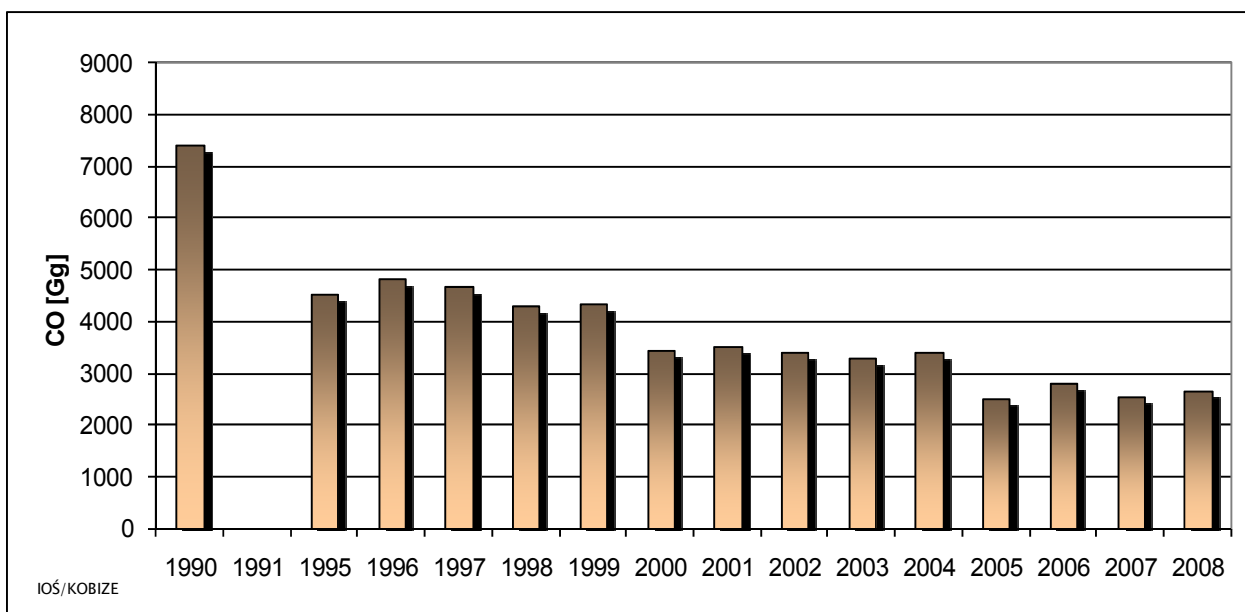


Figure 2.3 Emissions trend of CO

Ammonia emissions

The trend of ammonia emissions is influenced mainly by the agriculture sector, namely by a number of animals and volume of N fertilizers applied. A slight decrease (1.4 %) of NH₃ emissions in 2008 (285 Gg) compared to 2007 (289 Gg) is caused by the decrease of the number of animals raised.

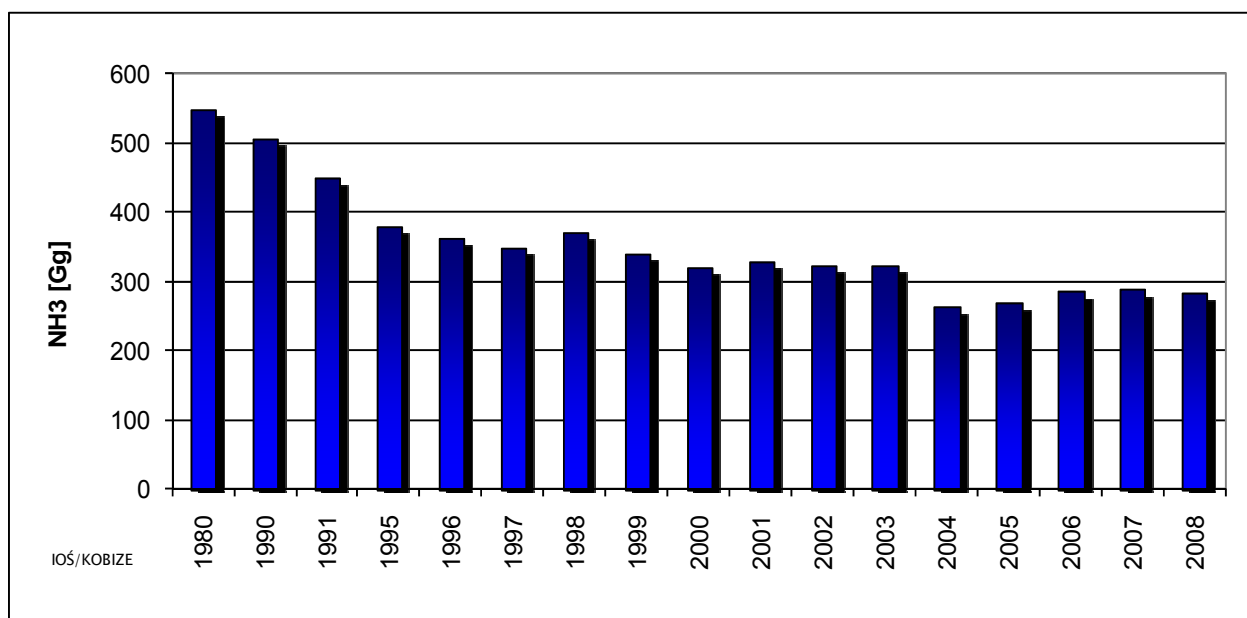


Figure 2.4 Emissions trend of NH₃

PM emissions

Compared to estimates for the year 2007, emissions of TSP in 2008 decreased by about 2 %. The significant decreases were:

- in the category *Combustion in Energy and Transformation Industries* (SNAP 01) by 31 % due to a lower volume of coal used and better dedusting efficiency,
- in the category *Combustion in Manufacturing Industry* (SNAP 03) by 10.9 %, caused by lower consumption of fuels.

The volume of 2008 TSP emissions (421 Gg) is much smaller than the level of TSP emissions estimated for 1990s (eg. 835 Gg for the year 1999). New PM inventories for the years 2000 - 2008 have been carried out basing on improved and extended methodology and as a result present estimates are incomparable with the earlier ones. In the years 2004-2005 partial recalculation for the period 1993-1999 has been developed and in the near future the recalculation for the whole period 1990-1999 is planned.

Figure 2.5 shows emission trend of TSP, PM₁₀ and PM_{2.5} in the years 2001-2008. The volume of emissions in this period remained stable with small increases in 2001 and 2006, caused by a higher volume of combusted fuels.

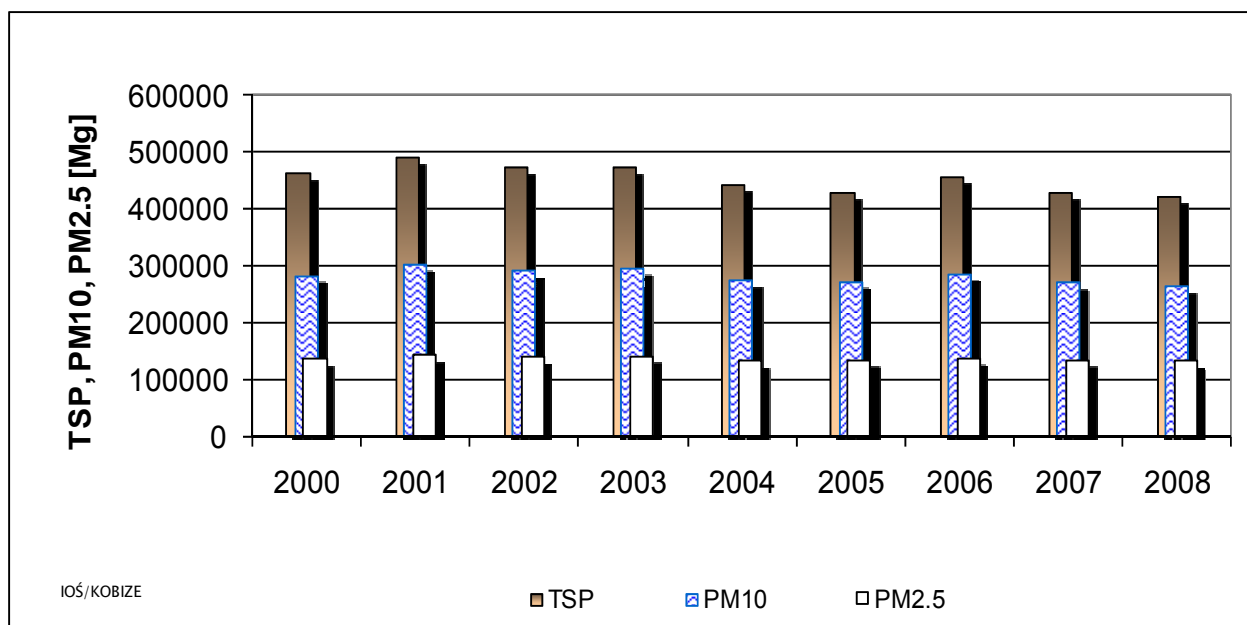


Figure 2.5 Emissions of particulate matter

NMVOC emissions

Emissions of NMVOC decreased by 30 % between 1990 and 2008. In 1981, there was a drop of NMVOC emission compared to 1980, but already in 1983 emissions began to grow and reached the maximum in 1988 - 1989. In 1990, there was a significant decrease of emissions, followed by a period of fairly stable emissions until 1999. Then the emissions began to fall again.

According to calculations, the national total anthropogenic emission of NMVOCs in Poland in 2008 was nearly 583 Gg. The assessed amount is higher by 2.6 % compared to the respective figure for the year 2007. The highest increase occurred in the category *Other mobile sources and machinery* (SNAP 08) due to higher volume of fuel used in gasoline engines.

The highest decrease occurred in the category *Combustion in Manufacturing Industry* (SNAP 03) by 16.9 %, caused by lower consumption of coal and fuel wood.

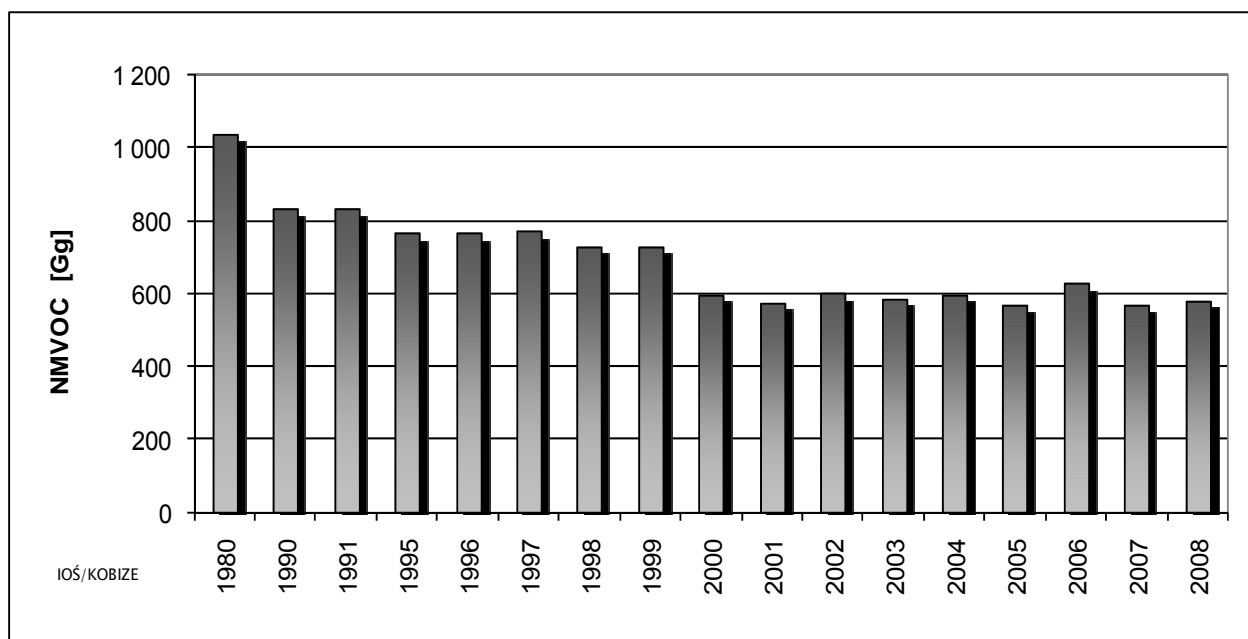


Figure 2.6 Emissions of NMVOC

Heavy metals emissions

Figures 2.7 and 2.8 show yearly emissions of heavy metals in the years 1980 - 2008. There was a decrease of emission during 1980-1983 and an increase of emission during 1984-1985 for most of the heavy metals, due to change of activities. From 1986-1987 a downward trend has started, which has been caused by drop in economic activity. Downward trend has stopped in 1993, but the volumes of emission continued to decrease in the following years.

The assessed national emission totals in 2008 for most of heavy metals are lower than the values calculated for the previous year. Among the seven source categories considered in the inventory (SNAP 01-04, 07-09), combustion processes for energy production purposes have the biggest share in the emission of HM in Poland within the considered SNAP groups. The most significant decrease was noted for Ni – 6.9 % while the increase was noted for Cd – 3.5 %. The differences in the emissions in 2007 and 2008 are different for the individual metals but small (few per cent).

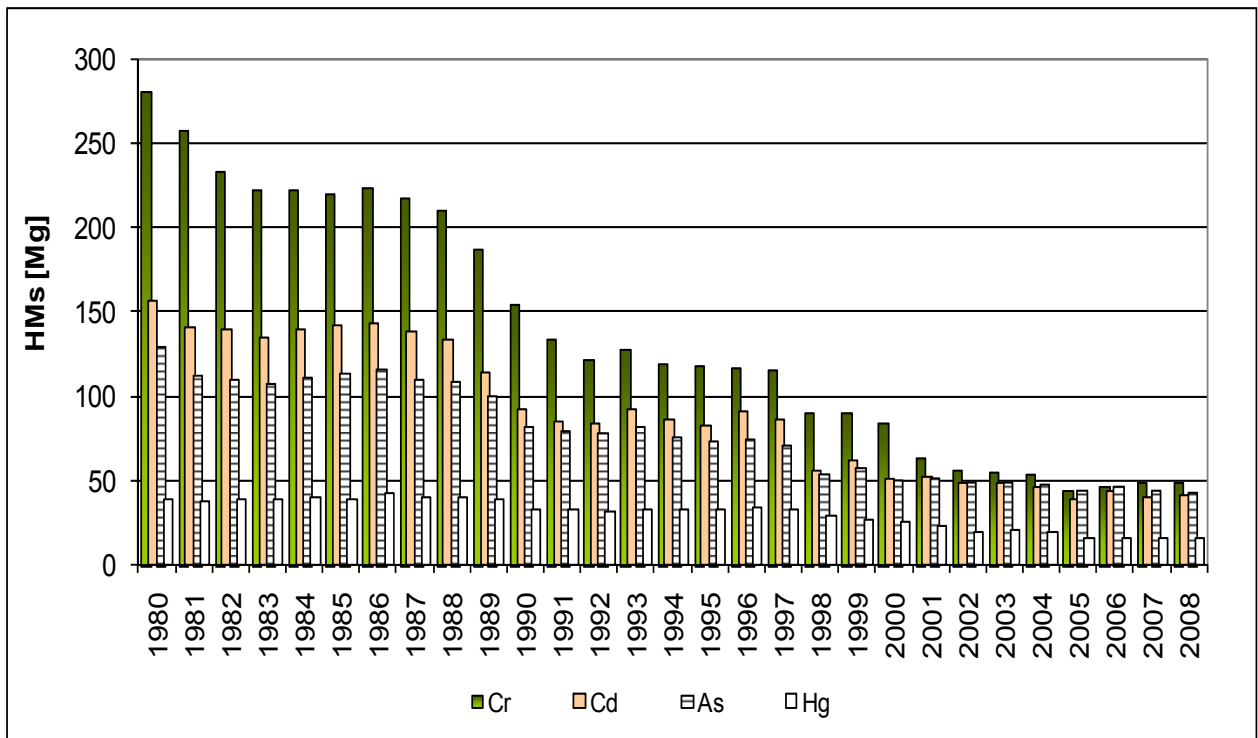


Figure 2.7 Emissions of chrome, cadmium, arsenic and mercury

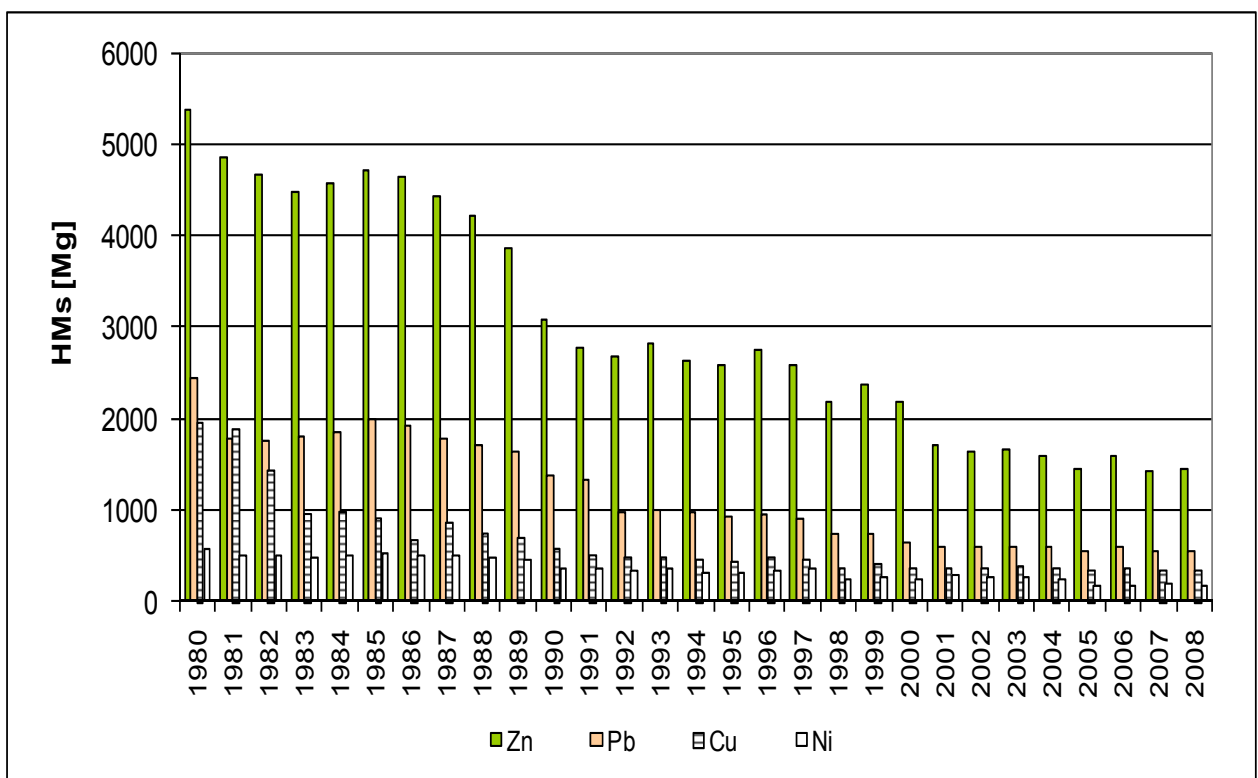


Figure 2.8 Emissions of zinc, lead, copper and nickel

PCDD/F emissions

Figure 2.9 shows changes of dioxin emissions in the years 1990-2008. Noticeable increase of emissions from 2001 is a result of including new categories of sources in the inventory (eg. incineration of municipal and industrial wastes, landfill fires, forest fires, secondary production of metals). The trend of PCDD/F emissions is influenced mainly by the combustion processes in residential and commercial installations (SNAP 02), wastes incineration and landfill fires. Compared to the year 2007, in 2008 emission of PCDD/F increased by 1.0 %. The reason for this change was the higher volume of coal used in *Residential plants* (SNAP 0202).

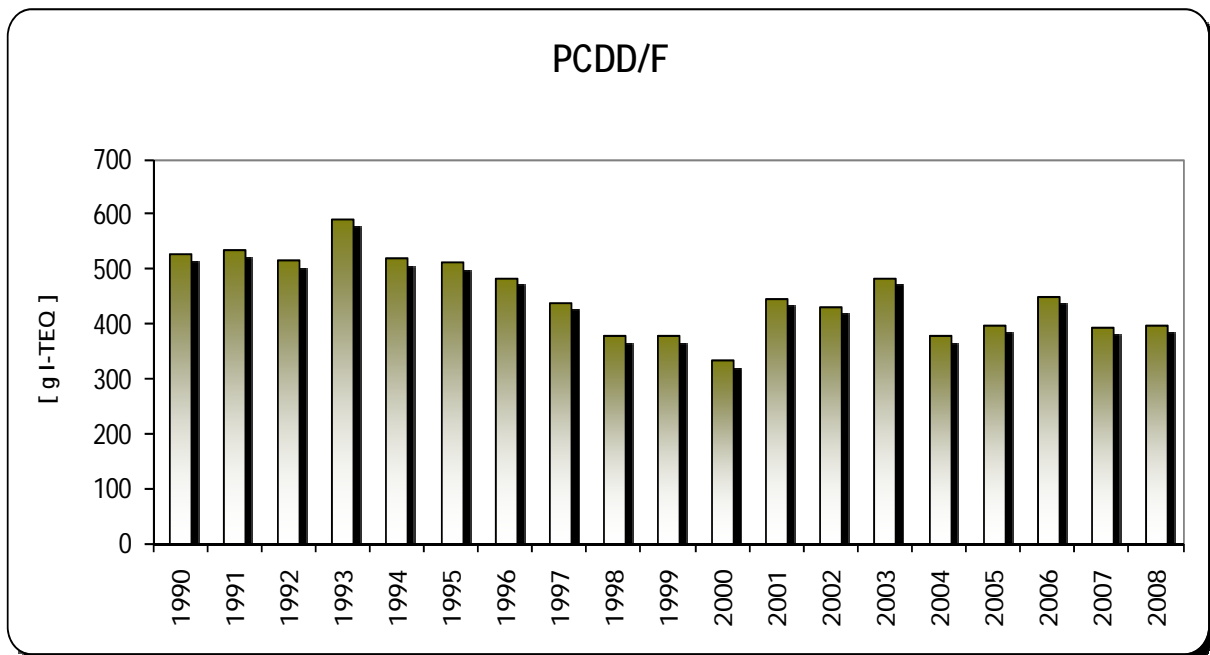


Figure 2.9 Emissions of dioxins

HCB emissions

Figure 2.10 shows changes of HCB emissions in the years 1990-2008. Noticeable decrease of emissions from 2001 is a result of the use of the new much smaller emission factor for the iron sintering plants. The appropriate recalculation is planned. Compared to the year 2007, in 2008 emission of HCB decreased by 1.8 %. The reason for this drop was the change of volume of secondary copper production in *Combustion in manufacturing industry* (SNAP 03).

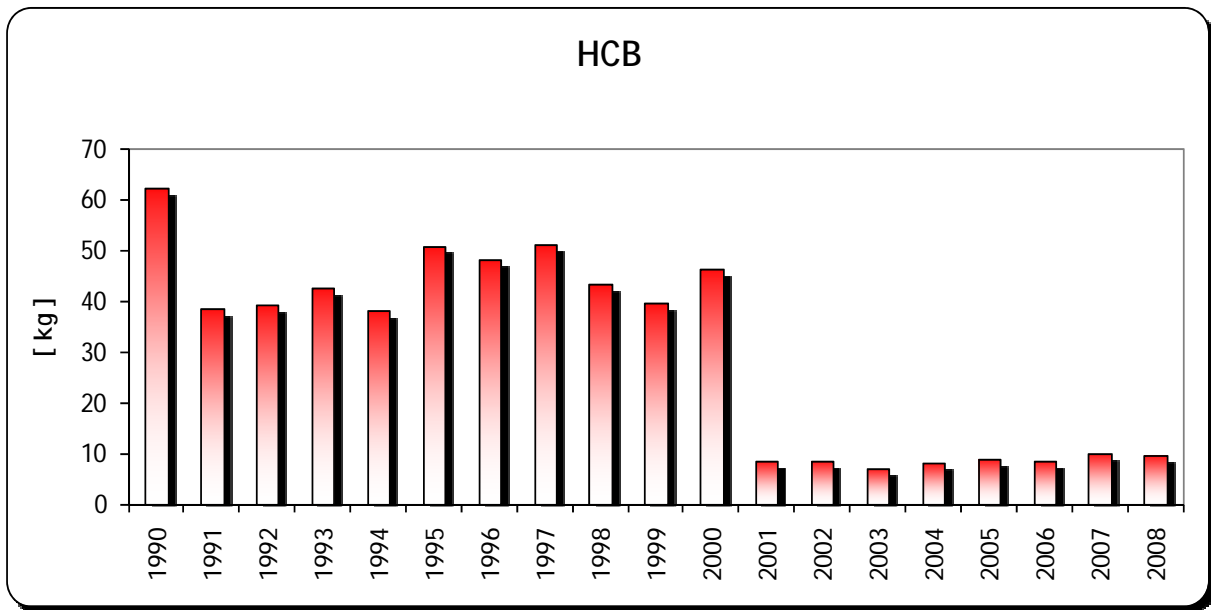


Figure 2.10 Emissions of HCB

PCB emissions

Figure 2.11 shows changes of PCB emissions in the years 1990-2008. New categories of sources were included from 2001 in the inventory (eg. transport and incineration of municipal and industrial wastes) but with minor impact on total emissions. Compared to 2006, emissions in 2007 and 2008 increased by 4.2 %. The reason for this change was the higher volume of coal used in *Residential plants* (SNAP 0202).

PCBs emissions for 2007 and 2008 are significantly lower than for previous years, what is caused by exclusion of SNAP 060507 *Electrical equipments - Transformers and capacitors* from PCB emission sources. This decision is based on analysis from the study [Czarnomski K., 2009] on the inventory of equipments containing PCBs (mainly Transformers and capacitors). The appropriate recalculation is planned.

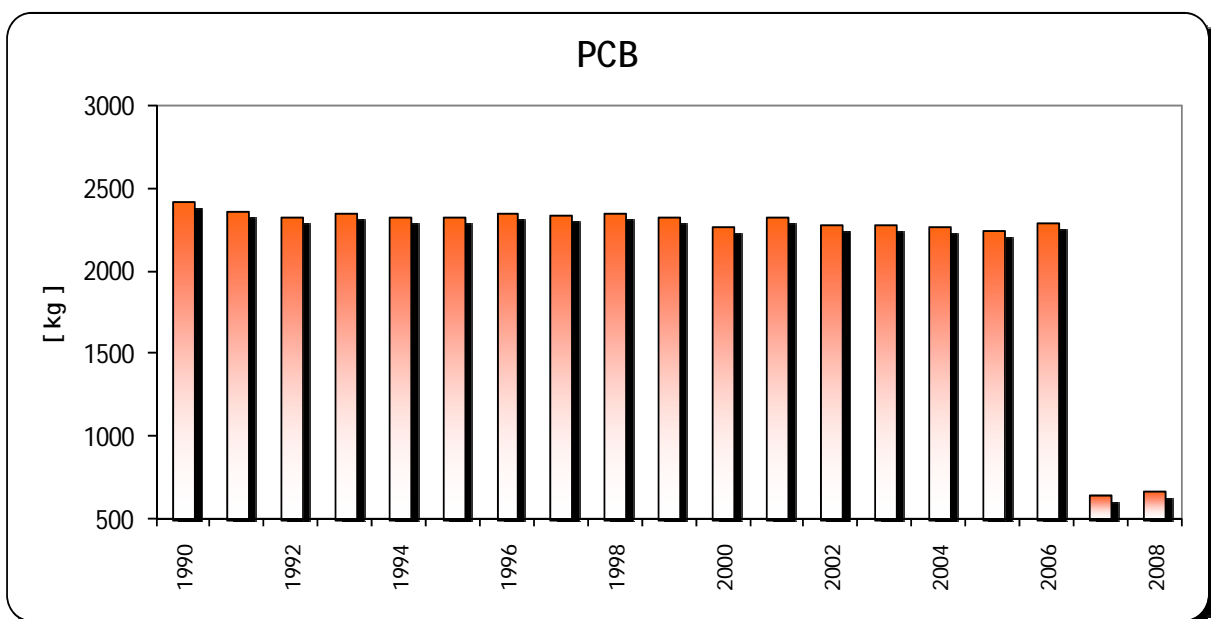


Figure 2.11 Emissions of PCB

PAH emissions

Figure 2.12 shows changes of PAH emissions in the years 1990-2008. From 1995 a downward trend has started. Changes in volume of PAH emissions are usually a result of changes in the amount of combusted fuels. The 2008 emissions are 4 % higher than the estimate for 2007. The reason for this change was the higher volume of wood and coal used in *Residential plants* (SNAP 0202).

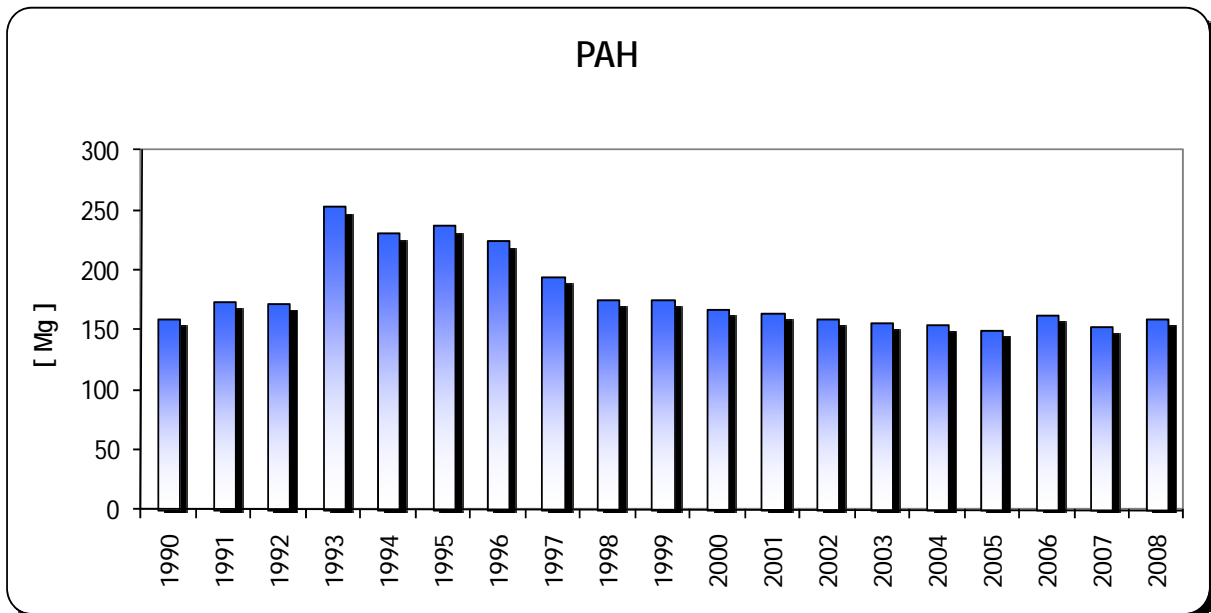


Figure 2.12 Emissions of PAH

3. Sectoral Methodologies

Estimation of main (including SO₂, NO_x, NH₃ and CO) and other pollutant emissions is based on various activity data obtained mainly from the Central Statistical Office. They are as follows:

- national fuel consumption balance,
- data on air pollutants emissions from large app. 1700 enterprises particularly hazardous for environment; the data on emission concerning SNAP 01 - combustion in energy and transformation industries are adopted as reported by individual plants,
- data on production of goods and products and fuel consumption for their production,
- data on number of husbandry animal heads and consumption of fertilizers in agriculture, as well as plant production,
- data on industrial and municipal waste water and accumulated and generated solid wastes,
- other statistical data concerning industry, agriculture or forestry.

The estimated values of emissions for main pollutants have been obtained from calculations based on national and international (EMEP, CORINAIR, RADIANT, TNO, etc.) emission factors.

Individual data of entities participating in the *European Union Emission Trading Scheme* (EU-ETS) i.e. major sources in emissions from stationary combustion sectors (1.A.1, 1.A.2) as well as from specific industrial processes were included into emission inventory where possible after verification.

Sulphur dioxide emissions

Estimation of SO₂ emission from combustion processes in stationary sources was based on reported values of sulphur contents in solid and liquid fuels. Estimation of SO₂ emission from mobile sources was based on standard concentration values for sulphur in liquid fuels.

Carbon oxide; Nitrogen oxides

For the category *Open burning of agricultural wastes* (SNAP 0907) a new methodology was adopted. Emissions from burning of agricultural residues in fields were estimated based in general on methodology described in EMEP/Corinair Inventory Guidebook. For domestic purposes 43 crops were selected for which residues can potentially be burned². Within this group certain plants were excluded for which residues can be composted or used as forage. So finally there were selected 38 crops containing cereals, pulses, tuber and root, oil-bearing plants, vegetables and fruits which residues could be burned on fields. Activity data concerning crop production was taken from GUS³. Factors applied for emissions calculation were taken from country study², where experimental and literature data as well as default emission factors were used.

² Łoboda (1994). Łoboda T., Pietkiewicz S. Estimation of amount of CH₄, CO, N₂O and NO_x released to atmosphere from agricultural residues burning in 1992, Warsaw Agricultural University, 1994 (in Polish).

³ GUS (2009). Production of agricultural and horticultural crops in 2008 r. Source materials. GUS, Warsaw, 2009.

PM emissions

Following the increased scope of reporting requirements, Poland as Party to the *Convention on Long-range Transboundary Air Pollution*, has developed in 2000 the inventory of particulate matter emissions, including fine fractions PM10 and PM2.5. The emission estimates are based on various activity data obtained mainly from the Central Statistical Office, including national fuel consumption balance, data on manufacturing of products and fuel consumption for their production, data on number of husbandry animal heads, data on industrial wastes utilization.

The estimated values of emissions are a result of calculations based on national activity data and appropriate emission factors. The emission factors were partly derived from TNO and IIASA PM inventories but also some emission factors have been verified and adapted to Polish conditions based on Polish studies and surveys. The main source for these changes were the results of research done by the Institute for Ecology of Industrial Areas in Katowice in co-operation with the Institute for Chemical Processing of Coal in Zabrze.

POPs emissions

Estimation of emissions of dioxins/furans – PCDD/F, hexachlorobenzene - HCB, polychlorinated biphenyls - PCBs, and four polyaromatic hydrocarbons PAHs indicators was based on national activity data including fuel statistics as well as on emission factors taken from literature and domestic measurements.

The dominant source in category *Other sources and sinks* (SNAP 11) are landfill fires but emission estimate here is very uncertain as it is very difficult to estimate mass of burned waste and also the number of spontaneous fires is also very approximate.

NMVOC emissions

Statistical data on production, consumption of fuels and raw materials and land use data, worked out by the Central Statistic Office, were used for national NMVOCs emission assessment.

For some emission sources, default emission factors published in EMEP/CORINAIR Atmospheric Emission Inventory Guidebook were applied. For other sources emission factors specific for processes in Poland were used. Since 2004 NMVOCs inventory contains two additional processes from SNAP 09 – incinerating of sludges and corps cremation.

HM emissions

The presented HM emission assessments were produced on the basis of the Polish Central Statistical Office (GUS) data on goods and materials production as well as on raw materials consumption in Poland. The natural HM emission sources were not considered in the presented emission inventory.

For the HM emission assessments the emission factors used in the report were based on:

- data presented in the "EMEP Emission Inventory Guidebook" and
- the emission factors specific for processes in Poland.

Significant part of emission factors have been modified in the last few years; in 2003 emission factors for coal combustion in power plants and heating plants have been modified, taking into account the impact of existing desulphurization installations.

Emissions factors for the particular pollutants and emission source categories are presented in the tables below following SNAP classification.

3.1. Combustion In Energy And Transformation Industries (SNAP 01)

Activity data (fuel use) for this sector come from energy statistics. For some pollutants and subcategories aggregated emission data from plants reports are included in the inventory, without use of emission factors. Emission factors for the particular pollutants with their source are presented in the tables below.

Table 3.1 SO₂ emission factors applied for SNAP 01

SO2 emission source	Emission factor *	EF unit
01. Combustion in Energy and Transformation Industries		
0102 District heating plants		
Hard coal	0.0174	Mg/Mg
Coke	0.0174	Mg/Mg
Fuel oils	0.006	Mg/Mg

* emission factors applied for SNAP 0102 are country specific, based on sulphur content; for *Public plants* (SNAP 0101), *Petroleum refining plants* (SNAP 0103), *Solid fuel transformation plants* (SNAP 0104) and *Coal mining, oil/gas extraction* (SNAP 0105) aggregate emission data from plants reports were included.

Table 3.2 NO_x emission factors applied for SNAP 01

NO2 emission source	Emission factor	EF unit
01. Combustion in Energy and Transformation Industries		
0102 District heating plants		
Hard coal	0.27	Mg/TJ
Fuel oils	0.2	Mg/TJ
Natural gas	0.125	Mg/TJ

* emission factors applied for SNAP 0102 come from Corinair; for *Public plants* (SNAP 0101), *Petroleum refining plants* (SNAP 0103), *Solid fuel transformation plants* (SNAP 0104) and *Coal mining, oil/gas extraction* (SNAP 0105) aggregate emission data from plants reports were included.

Table 3.3 CO emission factors applied for SNAP 01

CO emission source	Emission factor *	EF unit
01. Combustion in Energy and Transformation Industries		
0102 District heating plants		
Hard coal	0.0325	Mg/TJ

CO emission source	Emission factor *	EF unit
Fuel oils	0.015	Mg/TJ
Natural gas	0.019	Mg/TJ

* emission factors applied for SNAP 0102 come from Corinair; for *Public plants* (SNAP 0101), *Petroleum refining plants* (SNAP 0103), *Solid fuel transformation plants* (SNAP 0104) and *Coal mining, oil/gas extraction* (SNAP 0105) aggregate emission data from plants reports were included.

Table 3.4 PM emission factors applied for SNAP 01

PM emission source	Emission factor			EF unit	EF reference
	TSP	PM10	PM2.5		
01. Combustion in Energy and Transformation Industries					
0101 Public power					
Hard coal	0,0162	0,0108	0,0054	Mg/TJ	PL(ARE) *
Brown coal	0,0171	0,0114	0,0057	Mg/TJ	PL(ARE)
Fuel oils	0,0400	0,0200	0,0100	Mg/TJ	CEPMEIP
Natural gas	0,0002	0,0002	0,0002	Mg/TJ	CEPMEIP
Industrial gases	0,0050	0,0050	0,0050	Mg/TJ	CEPMEIP
0102 District heating plants					
Hard coal	0,0162	0,0108	0,0054	Mg/TJ	PL(ARE)
Coke	0,0162	0,0108	0,0054	Mg/TJ	PL(ARE)
Fuel oils	0,0400	0,0200	0,0100	Mg/TJ	CEPMEIP
Natural gas	0,0002	0,0002	0,0002	Mg/TJ	CEPMEIP
0103 Petroleum refining plants					
Hard coal	0,1400	0,0700	0,0170	Mg/TJ	CEPMEIP
Coke	0,1400	0,0700	0,0170	Mg/TJ	CEPMEIP
Fuel oils	0,0400	0,0200	0,0100	Mg/TJ	CEPMEIP
Natural gas	0,0002	0,0002	0,0002	Mg/TJ	CEPMEIP
Industrial gases	0,0050	0,0050	0,0050	Mg/TJ	CEPMEIP
0104 Solid fuel transformation plants					
Hard coal	0,1400	0,0700	0,0170	Mg/TJ	CEPMEIP
Fuel oils	0,0400	0,0200	0,0100	Mg/TJ	CEPMEIP
Natural gas	0,0002	0,0002	0,0002	Mg/TJ	CEPMEIP
Industrial gases	0,0050	0,0050	0,0050	Mg/TJ	CEPMEIP
0105 Coal mining, oil / gas extraction, pipeline compressors					
Hard coal	0,1400	0,0700	0,0170	Mg/TJ	CEPMEIP
Brown coal	0,1600	0,0800	0,0200	Mg/TJ	CEPMEIP
Coke	0,1400	0,0700	0,0170	Mg/TJ	CEPMEIP
Fuel oils	0,0400	0,0200	0,0100	Mg/TJ	CEPMEIP
Natural gas	0,0002	0,0002	0,0002	Mg/TJ	CEPMEIP
Industrial gases	0,0050	0,0050	0,0050	Mg/TJ	CEPMEIP
Crude oil	0,0400	0,0200	0,0100	Mg/TJ	CEPMEIP

* emission factors come from ARE surveys

Table 3.5 NMVOC emission factors applied for SNAP 01

Emission source	EF	EF unit	EF Reference
01. Combustion in energy and transformation industries			
0101 Public power			
hard coal	0.008	Mg/TJ	PL (IETU) *

Emission source	EF	EF unit	EF Reference
brown coal	0.008	Mg/TJ	PL (IETU)
residual oil	0.003	Mg/TJ	CORINAIR
wood	0.1	Mg/TJ	CORINAIR
natural gas	0.001	Mg/TJ	CORINAIR
industrial gases	0.0025	Mg/TJ	CORINAIR
0102 District heating plants			
hard coal	0.006	Mg/TJ	PL (IETU)
coke	0.01	Mg/TJ	CORINAIR
residual oil	0.003	Mg/TJ	CORINAIR
wood	0.1	Mg/TJ	CORINAIR
natural gas	0.001	Mg/TJ	CORINAIR
industrial gases	0.0025	Mg/TJ	CORINAIR
0103 Petroleum refining plants			
residual oil	0.003	Mg/TJ	CORINAIR
natural gas	0.001	Mg/TJ	CORINAIR
industrial gases	0.0025	Mg/TJ	CORINAIR
0104 Solid fuel transformation plants			
hard coal	0.02	Mg/TJ	CORINAIR
coke	0.01	Mg/TJ	CORINAIR
residual oil	0.003	Mg/TJ	CORINAIR
natural gas	0.001	Mg/TJ	CORINAIR
industrial gases	0.0025	Mg/TJ	CORINAIR
0105 Coal mining, oil/gas extraction			
hard coal	0.02	Mg/TJ	CORINAIR
brown coal	0.02	Mg/TJ	CORINAIR
coke	0.01	Mg/TJ	CORINAIR
residual oil	0.003	Mg/TJ	CORINAIR
natural gas	0.001	Mg/TJ	CORINAIR
industrial gases	0.0025	Mg/TJ	CORINAIR

* emission factors come from IETU surveys

Table 3.6 Main Heavy Metals emission factors applied for SNAP 01

Emission source	Emission factors			Unit	EF Reference
	Cd	Hg	Pb		
01. Combustion in energy and transformation industries					
0101 Public power					
Hard coal	0.00012	0.0064	0.00896	kg/TJ	PL (IETU) *
Brown coal	0.00013	0.004	0.00384	kg/TJ	PL (IETU)
Fuel oil	0.0024		0.003	kg/TJ	PL (IETU)
0102 District heating plants					
Hard coal	0.01638	0.0064	0.1024	kg/TJ	PL (IETU)
Brown coal	0.00013	0.004	0.00384	kg/TJ	PL (IETU)
Fuel oil	0.024		0.03	kg/TJ	PL (IETU)
0103 Petroleum refining plants					
Hard coal	0.027	0.008	0.17	kg/TJ	PL (IETU)
Brown coal	0.0007	0.005	0.022	kg/TJ	PL (IETU)

Emission source	Emission factors			Unit	EF Reference
	Cd	Hg	Pb		
Coke	0.023	0.0006	0.13	kg/TJ	PL (IETU)
Fuel oil	0.024		0.03	kg/TJ	PL (IETU)
0104 Solid fuel transformation plants					
Hard coal	0.027	0.008	0.17	kg/TJ	PL (IETU)
Brown coal	0.0007	0.005	0.022	kg/TJ	PL (IETU)
Coke	0.023	0.0006	0.13	kg/TJ	PL (IETU)
Fuel oil	0.024		0.03	kg/TJ	PL (IETU)
0105 Coal mining, oil/gas extraction					
Hard coal	0.027	0.008	0.17	kg/TJ	PL (IETU)
Brown coal	0.0007	0.005	0.022	kg/TJ	PL (IETU)
Coke	0.023	0.0006	0.13	kg/TJ	PL (IETU)
Fuel oil	0.024		0.03	kg/TJ	PL (IETU)

* emission factors from IETU surveys

Table 3.7 Additional Heavy Metals emission factors applied for SNAP 01

Emission source	Unit	Emission factors *				
		As	Cr	Cu	Ni	Zn
01. Combustion in energy and transformation industries						
0101 Public power						
Hard coal	kg/TJ	0.00134	0.0025	0.00704	0.00576	0.01792
Brown coal	kg/TJ	0.00282	0.00192	0.00384	0.0009	0.01664
Fuel oil	kg/TJ	0.0024	0.0029	0.0068	0.0654	0.0024
0102 District heating plants						
Hard coal	kg/TJ	0.01024	0.01408	0.0576	0.0512	0.416
Brown coal	kg/TJ	0.00282	0.00192	0.00384	0.0009	0.01664
Fuel oil	kg/TJ	0.024	0.029	0.068	0.654	0.024
0103 Petroleum refining plants						
Hard coal	kg/TJ	0.017	0.022	0.095	0.085	0.69
Brown coal	kg/TJ	0.018	0.011	0.024	0.005	0.11
Coke	kg/TJ	0.002	0.017	0.086	0.076	0.53
Fuel oil	kg/TJ	0.024	0.029	0.068	0.654	0.024
0104 Solid fuel transformation plants						
Hard coal	kg/TJ	0.017	0.022	0.095	0.085	0.69
Brown coal	kg/TJ	0.018	0.011	0.024	0.005	0.11
Coke	kg/TJ	0.002	0.017	0.086	0.076	0.53
Fuel oil	kg/TJ	0.024	0.029	0.068	0.654	0.024
0105 Coal mining, oil/gas extraction						
Hard coal	kg/TJ	0.017	0.022	0.095	0.085	0.69
Brown coal	kg/TJ	0.018	0.011	0.024	0.005	0.11
Coke	kg/TJ	0.002	0.017	0.086	0.076	0.53
Fuel oil	kg/TJ	0.024	0.029	0.068	0.654	0.024

* all Additional Heavy Metals emission factors applied for SNAP 01 are country specific – PL (IETU) surveys

Table 3.8 PCDD/F emission factors applied for SNAP 01

SNAP	Activity	EF	Unit	EF Reference
0101-0105	Hard coal	0.06	mg TEQ/ Gg	Grochowalski A. (2001): <i>Estimation and analysis of emission factors for PCDD/F and PAHs from selected sources for emission inventor purposes, 2001 (in Polish)</i>
0101-0105	Lignite	0.06	mg TEQ/ Gg	EF for hard coal was applied
0101-0105	Hard coal briquettes (patent fuels)	0.06	mg TEQ/ Gg	EF for hard coal was applied
0101-0105	Brown coal briquettes	0.06	mg TEQ/ Gg	EF for hard coal was applied
0101-0105	Fuel wood and wood waste	1	mg TEQ/ Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0101-0105	Fuel oil	1	mg TEQ/ Gg	NILU (1999): <i>Environmental Cycling of Selected Persistent Organic Pollutants (POPs) in the Baltic Region (POPCYCLING-Baltic), 1999</i>

Table 3.9 Emission factors of PCBs applied for SNAP 01

SNAP	Activity	EF	Unit	EF Reference
0101-0105	Hard coal	0.31	g/Gg	EF applied in Bulgaria
0101-0105	Lignite	1.8	g/Gg	Parma at al. (1995): <i>Atmospheric emission inventory guidelines for persistent organic pollutants (POPs)</i>
0101-0105	Hard coal briquettes (patent fuels)	0.31	g/Gg	EF for hard coal was applied
0101-0105	Brown coal briquettes	1.8	g/Gg	EF for lignite was applied
0101-0105	Fuel wood and wood waste	0.9	g/Gg	Parma at al. (1995): <i>Atmospheric emission inventory guidelines for persistent organic pollutants (POPs)</i>
0101-0105	Fuel oil	0.6	g/Gg	Parma at al. (1995): <i>Atmospheric emission inventory guidelines for persistent organic pollutants (POPs)</i>

Table 3.10 HCB emission factors applied for SNAP 01

SNAP	Activity	EF	Unit	EF Reference
0101-0105	Hard coal	0.013	g/Gg	Bailey (2001): <i>Global hexachlorobenzene emission, Chemosphere 43 (2001), 167-182</i>
0101-0105	Hard coal briquettes (patent fuels)	0.013	g/Gg	EF for hard coal was applied
0101-0105	Fuel wood and wood waste	0.06	g/Gg	Bailey (2001): <i>Global hexachlorobenzene emission, Chemosphere 43 (2001), 167-182</i>

Table 3.11 Benzo(a)pyrene emission factors applied for SNAP 01

SNAP	Activity	EF	Unit	EF Reference
0101-0102	Hard coal	0.00352	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0101-0102	Lignite	0.00352	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0101-0102	Hard coal briquettes (patent fuels)	0.00352	g/Gg	EF for hard coal was applied

SNAP	Activity	EF	Unit	EF Reference
0101-0102	Brown coal briquettes	0.00352	g/Gg	EF for lignite was applied
0101-0105	Fuel wood and wood waste	0.095	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0101-0102	Fuel oil	4.68	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0103-0105	Hard coal	0.586	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0103-0105	Lignite	0.586	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0103-0105	Hard coal briquettes (patent fuels)	0.586	g/Gg	EF for hard coal was applied
0103-0105	Brown coal briquettes	0.586	g/Gg	EF for lignite was applied
0103-0105	Fuel oil	3.43	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>

Table 3.12 Benzo(b)fluoranthene emission factors applied for SNAP 01

SNAP	Activity	EF	Unit	EF Reference
0101-0102	Hard coal	0.00732	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0101-0102	Lignite	0.00732	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0101-0102	Hard coal briquettes (patent fuels)	0.00732	g/Gg	EF for hard coal was applied
0101-0102	Brown coal briquettes	0.00732	g/Gg	EF for lignite was applied
0101-0105	Fuel wood and wood waste	19	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0101-0102	Fuel oil	3.98	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0103-0105	Hard coal	23.4	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0103-0105	Lignite	23.4	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0103-0105	Hard coal briquettes (patent fuels)	23.4	g/Gg	EF for hard coal was applied
0103-0105	Brown coal briquettes	23.4	g/Gg	EF for lignite was applied
0103-0105	Fuel oil	1.81	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>

Table 3.13 Benzo(k)fluoranthene emission factors applied for SNAP 01

SNAP	Activity	EF	Unit	EF Reference
0101-0102	Hard coal	0.00732	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0101-0102	Lignite	0.00732	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0101-0102	Hard coal briquettes (patent fuels)	0.00732	g/Gg	EF for hard coal was applied
0101-0102	Brown coal briquettes	0.00732	g/Gg	EF for lignite was applied
0101-0105	Fuel wood and wood waste	19	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0101-0102	Fuel oil	3.98	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0103-0105	Hard coal	23.4	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0103-0105	Lignite	23.4	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0103-0105	Hard coal briquettes (patent fuels)	23.4	g/Gg	EF for hard coal was applied
0103-0105	Brown coal briquettes	23.4	g/Gg	EF for lignite was applied
0103-0105	Fuel oil	2.83	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>

Table 3.14 Indeno(1.2.3-cd)pyrene emission factors applied for SNAP 01

SNAP	Activity	EF	Unit	EF Reference
0101-0102	Hard coal	0.00703	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0101-0102	Lignite	0.00703	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0101-0102	Hard coal briquettes (patent fuels)	0.00703	g/Gg	EF for hard coal was applied
0101-0102	Brown coal briquettes	0.00703	g/Gg	EF for lignite was applied
0101-0105	Fuel wood and wood waste	0.17	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0101-0102	Fuel oil	7.57	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0103-0105	Hard coal	17.6	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0103-0105	Lignite	17.6	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0103-0105	Hard coal briquettes (patent fuels)	17.6	g/Gg	EF for hard coal was applied

SNAP	Activity	EF	Unit	EF Reference
0103-0105	Brown coal briquettes	17.6	g/Gg	EF for lignite was applied
0103-0105	Diesel oil	6.84	g/Gg	EF for fuel oil was applied
0103-0105	Fuel oil	6.84	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995

3.2. Non-Industrial Combustion Plants (SNAP 02)

Activity data (fuel use) for this sector come from energy statistics. For some pollutants and subcategories aggregated emission data from plants reports are included in the inventory, without use of emission factors. Emission factors for the particular pollutants with their source are presented in the tables below.

Table 3.15 SO₂ emission factors applied for SNAP 02

SO ₂ emission source	Emission factor *	EF unit
02. Non-Industrial Combustion Plants		
0201 Commercial and institutional plants		
Hard coal	0.0174	Mg/Mg
Fuel oils	0.006	Mg/Mg
0202 Residential plants		
Hard coal	0.02	Mg/Mg
Brown coal	0.006	Mg/Mg
Coke	0.02	Mg/Mg
Fuel oils	0.006	Mg/Mg
0203 Plants in agriculture, forestry and aquaculture		
Hard coal	0.02	Mg/Mg
Coke	0.02	Mg/Mg
Fuel oils	0.006	Mg/Mg

* emission factors applied for SNAP 0102 are country specific, based on sulphur content

Table 3.16 NO_x emission factors applied for SNAP 02

NO _x emission source	Emission factor *	EF unit
02. Non-Industrial Combustion Plants		
0201 Commercial and institutional plants		
Hard coal	0.15	Mg/TJ
Brown coal	0.15	Mg/TJ
Coke	0.15	Mg/TJ
Fuel wood	0.2	Mg/TJ
Fuel oils	0.18	Mg/TJ
Natural gas	0.1	Mg/TJ
Industrial gases	0.1	Mg/TJ

NO_x emission source	Emission factor *	EF unit
0202 Residential plants		
Hard coal	0.155	Mg/TJ
Fuel wood	0.07	Mg/TJ
Fuel oils	0.18	Mg/TJ
Natural gas	0.1	Mg/TJ
LPG	0.1	Mg/TJ
0203 Plants in agriculture, forestry and aquaculture		
Hard coal	0.155	Mg/TJ
Fuel wood	0.07	Mg/TJ
Fuel oils	0.17	Mg/TJ
Natural gas	0.1	Mg/TJ
LPG	0.1	Mg/TJ

* emission factors applied for SNAP 02 come from Corinair

Table 3.17 CO emission factors applied for SNAP 02

CO emission source	Emission factor *	EF unit
02. Non-Industrial Combustion Plants		
0201 Commercial and institutional plants		
Hard coal	0.12	Mg/TJ
Brown coal	0.12	Mg/TJ
Coke	0.12	Mg/TJ
Fuel wood	1.5	Mg/TJ
Fuel oils	0.015	Mg/TJ
Natural gas	0.02	Mg/TJ
Industrial gases	0.02	Mg/TJ
0202 Residential plants		
Hard coal	3.095	Mg/TJ
Fuel wood	6.615	Mg/TJ
Fuel oils	0.015	Mg/TJ
Natural gas	0.05	Mg/TJ
LPG	0.05	Mg/TJ
0203 Plants in agriculture, forestry and aquaculture		
Hard coal	3.095	Mg/TJ
Fuel wood	6.615	Mg/TJ
Fuel oils	0.05	Mg/TJ
Natural gas	0.05	Mg/TJ
LPG	0.05	Mg/TJ

* emission factors applied for SNAP 02 come from Corinair

Table 3.18 NH₃ emission factors applied for SNAP 02

SNAP	Emission source	EF	EF unit	EF reference
0202	Residential plants			
	hard coal, brown coal, coke	0.3	kg/TJ	EMEP/EEA (2009): <i>EMEP/EEA emission inventory guidebook 2009</i>
	biomass	3.8	kg/TJ	EMEP/EEA (2009): <i>EMEP/EEA emission inventory guidebook 2009</i>

Table 3.19 PM emission factors applied for SNAP 02

PM Emission source	Emission factor			EF unit	EF reference
	TSP	PM10	PM2.5		
02. Non-Industrial Combustion Plants					
0201 Commercial and institutional plants					
Hard coal	0,1400	0,0700	0,0170	Mg/TJ	CEPMEIP
Brown coal	0,1600	0,0800	0,0200	Mg/TJ	CEPMEIP
Coke	0,1400	0,0700	0,0170	Mg/TJ	CEPMEIP
Fuel wood	0,1600	0,0800	0,0200	Mg/TJ	CEPMEIP
Fuel oils	0,0400	0,0200	0,0100	Mg/TJ	CEPMEIP
Natural gas	0,0002	0,0002	0,0002	Mg/TJ	CEPMEIP
LPG	0,0002	0,0002	0,0002	Mg/TJ	CEPMEIP
Industrial gases	0,0050	0,0050	0,0050	Mg/TJ	CEPMEIP
0202 Residential plants					
Hard coal	0,5000	0,3750	0,1250	Mg/TJ	PL *
Brown coal	0,5000	0,3750	0,1250	Mg/TJ	PL *
Coke	0,1000	0,0400	0,0200	Mg/TJ	PL **
Fuel wood	0,2000	0,1900	0,1800	Mg/TJ	CEPMEIP
Fuel oils	0,0600	0,0500	0,0400	Mg/TJ	CEPMEIP
Natural gas	0,0002	0,0002	0,0002	Mg/TJ	CEPMEIP
LPG	0,0002	0,0002	0,0002	Mg/TJ	CEPMEIP
Industrial gases	0,0002	0,0002	0,0002	Mg/TJ	CEPMEIP
0203 Plants in agriculture, forestry and aquaculture					
Hard coal	0,5000	0,3750	0,1250	Mg/TJ	PL *
Brown coal	0,5000	0,3750	0,1250	Mg/TJ	PL *
Coke	0,1000	0,0400	0,0200	Mg/TJ	PL **
Fuel wood	0,2000	0,1900	0,1800	Mg/TJ	CEPMEIP
Fuel oils	0,0600	0,0500	0,0400	Mg/TJ	CEPMEIP
Natural gas	0,0002	0,0002	0,0002	Mg/TJ	CEPMEIP
LPG	0,0002	0,0002	0,0002	Mg/TJ	CEPMEIP

* emission factors are country specific from IChPW & IETU surveys; ** emission factors are country specific from IETU surveys

Table 3.20 NMVOC emission factors applied for SNAP 02

Emission source	EF	EF unit	EF Reference
02. Non-industrial combustion plants			
0201 Commercial and institutional plants			
hard coal	0.02	Mg/TJ	PL (IETU) *
brown coal	0.02	Mg/TJ	PL (IETU)
coke	0.01	Mg/TJ	CORINAIR

Emission source	EF	EF unit	EF Reference
wood	0.1	Mg/TJ	CORINAIR
residual oil	0.003	Mg/TJ	CORINAIR
natural gas	0.001	Mg/TJ	CORINAIR
LPG	0.0035	Mg/TJ	CORINAIR
industrial gases	0.0025	Mg/TJ	CORINAIR
biogas	0.0025	Mg/TJ	CORINAIR
0202 Residential plants			
hard coal	0.2	Mg/TJ	CORINAIR
brown coal	0.2	Mg/TJ	CORINAIR
coke	0.02	Mg/TJ	CORINAIR
wood	0.4	Mg/TJ	CORINAIR
residual oil	0.003	Mg/TJ	CORINAIR
natural gas	0.005	Mg/TJ	CORINAIR
LPG	0.0035	Mg/TJ	CORINAIR
industrial gases			
0203 Agriculture, forestry and other	0.2	Mg/TJ	CORINAIR
hard coal	0.2	Mg/TJ	CORINAIR
brown coal	0.02	Mg/TJ	CORINAIR
wood	0.4	Mg/TJ	CORINAIR
residual oil	0.003	Mg/TJ	CORINAIR
natural gas	0.005	Mg/TJ	CORINAIR
LPG	0.0035	Mg/TJ	CORINAIR

* emission factors are country specific from IETU surveys

Table 3.21 Main Heavy Metals emission factors applied for SNAP 02

Emission source	Emission factors			Unit	EF Reference
	Cd	Hg	Pb		
02. Non-industrial combustion plants					
0201 Commercial and institutional plants					
Hard coal	0.052	0.008	0.33	kg/TJ	PL (IETU) *
Brown coal	0.0007	0.005	0.022	kg/TJ	PL (IETU)
Coke	0.023	0.0006	0.13	kg/TJ	PL (IETU)
0202 Residential plants					
Hard coal	0.073	0.004	0.46	kg/TJ	PL (IETU)
Brown coal	0.71	0.005	0.217	kg/TJ	PL (IETU)
Coke	0.066	0.0006	0.359	kg/TJ	PL (IETU)
Fuel oil	0.024		0.03	kg/TJ	PL (IETU)
0203 Plants in agriculture, forestry and aquaculture					
Hard coal	0.073	0.004	0.46	kg/TJ	PL (IETU)
Brown coal	0.71	0.005	0.217	kg/TJ	PL (IETU)
Coke	0.066	0.0006	0.359	kg/TJ	PL (IETU)
Fuel oil	0.024		0.03	kg/TJ	PL (IETU)

* emission factors come from IETU surveys

Table 3.22 Additional Heavy Metals emission factors applied for SNAP 02

Emission source	Emission factors *					Unit
	As	Cr	Cu	Ni	Zn	
02. Non-industrial combustion plants						
0201 Commercial and institutional plants						
Hard coal	0.034	0.043	0.19	0.17	1.32	kg/TJ
Brown coal	0.018	0.011	0.024	0.005	0.11	kg/TJ
Coke	0.002	0.017	0.086	0.076	0.53	kg/TJ
0202 Residential plants						
Hard coal	0.05	0.06	0.27	0.23	1.85	kg/TJ
Brown coal	0.168	0.11	0.22	0.048	1.07	kg/TJ
Coke	0.005	0.045	0.237	0.209	1.45	kg/TJ
Fuel oil	0.024	0.029	0.068	0.654	0.024	kg/TJ
0203 Plants in agriculture, forestry and aquaculture						
Hard coal	0.05	0.06	0.27	0.23	1.85	kg/TJ
Brown coal	0.168	0.11	0.22	0.048	1.07	kg/TJ
Coke	0.005	0.045	0.237	0.209	1.45	kg/TJ
Fuel oil	0.024	0.029	0.068	0.654	0.024	kg/TJ

* all Additional Heavy Metals emission factors applied for SNAP 02 are country specific – PL (IETU) surveys

Table 3.23 PCDD/F emission factors applied for SNAP 02

SNAP	Activity	EF	Unit	EF Reference
0201 & 0203	Hard coal	0.06	mg TEQ/ Gg	Grochowalski A. (2001): <i>Estimation and analysis of emission factors for PCDD/F and PAHs from selected sources for emission inventor purposes, 2001 (in Polish)</i>
0201 & 0203	Lignite	0.06	mg TEQ/ Gg	EF for hard coal was applied
0201 & 0203	Hard coal briquettes (patent fuels)	0.06	mg TEQ/ Gg	EF for hard coal was applied
0201 & 0203	Brown coal briquettes	0.06	mg TEQ/ Gg	EF for hard coal was applied
0201 & 0203	Fuel wood and wood waste	1	mg TEQ/ Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0201-0203	Fuel oil	1	mg TEQ/ Gg	NILU (1999): <i>Environmental Cycling of Selected Persistent Organic Pollutants (POPs) in the Baltic Region (POPCYCLING-Baltic), 1999</i>
0202	Hard coal	18	mg TEQ/ Gg	Grochowalski A. (2001): <i>Estimation and analysis of emission factors for PCDD/F and PAHs from selected sources for emission inventor purposes, 2001 (in Polish)</i>
0202	Lignite	10	mg TEQ/ Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0202	Hard coal briquettes (patent fuels)	18	mg TEQ/ Gg	EF for hard coal was applied
0202	Brown coal briquettes	10	mg TEQ/ Gg	EF for lignite was applied
0202	Fuel wood and wood waste	5	mg TEQ/ Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>

SNAP	Activity	EF	Unit	EF Reference
0202	Coke	0.61	mg TEQ/ Gg	LUA-NRW (1997): <i>Identification of Relevant Industrial Sources of Dioxins and Furans in Europe – The European Dioxin Inventory</i> , Essen 1997

Table 3.24 Emission factors of PCBs applied for SNAP 02

SNAP	Activity	EF	Unit	EF Reference
0201 & 0203	Hard coal	0.413	g/Gg	EF applied in Bulgaria
0201 & 0203	Lignite	1.8	g/Gg	Parma at al. (1995): <i>Atmospheric emission inventory guidelines for persistent organic pollutants (POPs)</i>
0201 & 0203	Hard coal briquettes (patent fuels)	0.413	g/Gg	EF for hard coal was applied
0201 & 0203	Brown coal briquettes	1.8	g/Gg	EF for lignite was applied
0201 & 0203	Fuel wood and wood waste	0.9	g/Gg	Parma at al. (1995): <i>Atmospheric emission inventory guidelines for persistent organic pollutants (POPs)</i>
0201 & 0203	Coke	3.6	g/Gg	NILU (1999): <i>Environmental Cycling of Selected Persistent Organic Pollutants (POPs) in the Baltic Region (POPCYCLING-Baltic)</i> , 1999
0201 & 0203	Fuel oil	0.6	g/Gg	Parma at al. (1995): <i>Atmospheric emission inventory guidelines for persistent organic pollutants (POPs)</i>
0202	Hard coal	31.6	g/Gg	Parma at al. (1995): <i>Atmospheric emission inventory guidelines for persistent organic pollutants (POPs)</i>
0202	Lignite	183.2	g/Gg	EMEP/CORINAIR (1994) <i>EMEP/CORINAIR atmospheric emission inventory guidebook</i> .
0202	Hard coal briquettes (patent fuels)	31.6	g/Gg	EF for hard coal was applied
0202	Brown coal briquettes	183.2	g/Gg	EF for lignite was applied
0202	Fuel wood and wood waste	9	g/Gg	EF applied in Czech
0202	Coke	9.7	g/Gg	EF applied in Czech
0202	Fuel oil	3.6	g/Gg	NILU (1999): <i>Environmental Cycling of Selected Persistent Organic Pollutants (POPs) in the Baltic Region (POPCYCLING-Baltic)</i> , 1999

Table 3.25 HCB emission factors applied for SNAP 02

SNAP	Activity	EF	Unit	EF Reference
0201 & 0203	Hard coal	0.013	g/Gg	Bailey (2001): <i>Global hexachlorobenzene emission, Chemosphere 43 (2001), 167-182</i>
0201 & 0203	Hard coal briquettes (patent fuels)	0.013	g/Gg	EF for hard coal was applied
0201-0203	Fuel wood and wood waste	0.06	g/Gg	Bailey (2001): <i>Global hexachlorobenzene emission, Chemosphere 43 (2001), 167-182</i>
0202	Hard coal	0.125	g/Gg	EF applied in Czech www.recetox.muni.cz
0202	Hard coal briquettes (patent fuels)	0.125	g/Gg	EF for hard coal was applied

Table 3.26 Benzo(a)pyrene emission factors applied for SNAP 02

SNAP	Activity	EF	Unit	EF Reference
0201	Hard coal	0.586	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0201	Lignite	0.586	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0201	Hard coal briquettes	0.586	g/Gg	EF for hard coal was applied
0201	Brown coal briquettes	0.586	g/Gg	EF for lignite was applied
0201	Fuel wood and wood waste	0.095	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0201-0203	Fuel oil	3.43	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0202 – 0203	Hard coal	1500	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0202 – 0203	Lignite	845	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0202 – 0203	Hard coal briquettes (patent fuels)	1500	g/Gg	EF for hard coal was applied
0202 – 0203	Brown coal briquettes	845	g/Gg	EF for lignite was applied
0202 - 0203	Fuel wood and wood waste	2480	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995

Table 3.27 Benzo(b)fluoranthene emission factors applied for SNAP 02

SNAP	Activity	EF	Unit	EF Reference
0201	Hard coal	23.4	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0201	Lignite	23.4	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0201	Hard coal briquettes (patent fuels)	23.4	g/Gg	EF for hard coal was applied
0201	Brown coal briquettes	23.4	g/Gg	EF for lignite was applied
0201	Fuel wood and wood waste	19	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0201-0203	Fuel oil	1.81	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0202 – 0203	Hard coal	1600	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0202 – 0203	Lignite	1150	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0202 – 0203	Hard coal briquettes (patent fuels)	1600	g/Gg	EF for hard coal was applied
0202 - 0203	Brown coal briquettes	1150	g/Gg	EF for lignite was applied

SNAP	Activity	EF	Unit	EF Reference
0202 - 0203	Fuel wood and wood waste	3260	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995

Table 3.28 Benzo(k)fluoranthene emission factors applied for SNAP 02

SNAP	Activity	EF	Unit	EF Reference
0201	Hard coal	23.4	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0201	Lignite	23.4	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0201	Hard coal briquettes (patent fuels)	23.4	g/Gg	EF for hard coal was applied
0201	Brown coal briquettes	23.4	g/Gg	EF for lignite was applied
0201	Fuel wood and wood waste	19	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0201-0203	Diesel oil	2.83	g/Gg	EF for fuel oil was applied
0201-0203	Fuel oil	2.83	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0202 – 0203	Hard coal	50	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0202 – 0203	Lignite	525	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0202 – 0203	Hard coal briquettes (patent fuels)	50	g/Gg	EF for hard coal was applied
0202 – 0203	Brown coal briquettes	525	g/Gg	EF for lignite was applied
0202 - 0203	Fuel wood and wood waste	1080	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995

Table 3.29 Indeno(1.2.3-cd)pyrene emission factors applied for SNAP 02

SNAP	Activity	EF	Unit	EF Reference
0201	Hard coal	17.6	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0201	Lignite	17.6	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0201	Hard coal briquettes (patent fuels)	17.6	g/Gg	EF for hard coal was applied
0201	Brown coal briquettes	17.6	g/Gg	EF for lignite was applied
0201	Fuel wood and wood waste	0.17	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0201-0203	Fuel oil	6.84	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995

SNAP	Activity	EF	Unit	EF Reference
0202 – 0203	Hard coal	3000	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0202 – 0203	Lignite	1110	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
0202 – 0203	Hard coal briquettes (patent fuels)	3000	g/Gg	EF for hard coal was applied
0202 – 0203	Brown coal briquettes	1110	g/Gg	EF for lignite was applied
0202 - 0203	Fuel wood and wood waste	1760	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995

3.3 Combustion In Manufacturing Industry (SNAP 03)

Activity data on fuel use for this sector come from energy statistics. For process emissions activity data come from production statistics [GUS; *Production of industrial products*]. Emission factors for the particular pollutants with their source are presented in the tables below.

Table 3.30 SO₂ emission factors applied for SNAP 03

SO ₂ emission source	Emission factor *	EF unit
03. Combustion in Manufacturing Industry		
0302-03 Process furnaces		
Hard coal	0.016	Mg/Mg
Brown coal	0.006	Mg/Mg
Coke	0.016	Mg/Mg
Fuel wood	0.006	Mg/Mg
0303 Process furnaces with contact		
030301 Sinter and pelletizing plants (agglomeration)	0.463	kg/Mg
030304 Primary lead production	6.192	kg/Mg
030305 Primary zinc production	5.292	kg/Mg
030306 Primary copper production	10.276	kg/Mg
030307 Secondary lead production	2.203	kg/Mg
030308 Secondary zinc production	12.232	kg/Mg
030309 Secondary copper production - converters	1.225	kg/Mg
030309 Secondary copper production - other furnaces	1.225	kg/Mg
030310 Secondary aluminium production	0.603	kg/Mg
030311 Clinker	0.374	kg/Mg
030312 Lime	1.414	kg/Mg
030313 Asphalt concrete plants	0.0177	kg/Mg
030314 Glass - flat	1.962	kg/Mg
030319 Bricks and tiles	0.166	kg/Mg
030320 Fine ceramic materials	0.247	kg/Mg

* emission factors applied for combustion of fuels are country specific, based on sulphur content; for

process emissions emission factors were taken from EMEP/EEA (2009) Guidebook
 Table 3.31 NO_x emission factors applied for SNAP 03

NO2 emission source	Emission factor *	EF unit
03. Combustion in Manufacturing Industry		
0301 Comb. in boilers, gas turbines and stationary engines		
Hard coal	0.2174	Mg/TJ
Brown coal	0.2174	Mg/TJ
Coke	0.2174	Mg/TJ
Fuel wood	0.2	Mg/TJ
Fuel oils	0.2244	Mg/TJ
Natural gas	0.1368	Mg/TJ
Industrial gases	0.09	Mg/TJ
0302-03 Process furnaces with and without contact		
Hard coal	0.2174	Mg/TJ
Brown coal	0.2174	Mg/TJ
Coke	0.2174	Mg/TJ
Fuel wood	0.2	Mg/TJ
Fuel oils	0.2244	Mg/TJ
Natural gas	0.1368	Mg/TJ
Industrial gases	0.09	Mg/TJ
0303 Process furnaces with contact		
030204 Plaster furnaces	1.058	kg/Mg
030301 Sinter and pelletizing plants (agglomeration)	0.003	Mg/TJ
030301 Sinter and pelletizing plants (blast furnace pig iron)	0.0003	Mg/TJ
030302 Gray iron foundries	0.06	Mg/TJ
030302 Steel casting	0.06	Mg/TJ
030304 Primary lead production	0.062	Mg/TJ
030306 Primary copper production	0.125	Mg/TJ
030308 Secondary zinc production	0.062	Mg/TJ
030311 Clinker	1.55	kg/Mg
030312 Lime	2.236	kg/Mg
030314 Glass - flat	2.931	kg/Mg
030321 Paper-mill industry	0.22	Mg/TJ

* emission factors applied for combustion of fuels come from Corinair; for process emissions EFs per energy unit are old average emission factors which will be replaced in the next inventory submission while EFs per mass unit were taken from EMEP/EEA (2009) Guidebook

Table 3.32 CO emission factors applied for SNAP 03

CO emission source	Emission factor *	EF unit
03. Combustion in Manufacturing Industry		
0301 Comb. in boilers, gas turbines and stationary engines		
Hard coal	0.0058	Mg/TJ
Brown coal	0.0058	Mg/TJ
Coke	0.0058	Mg/TJ

CO emission source	Emission factor *	EF unit
Fuel wood	1.5	Mg/TJ
Fuel oils	0.0156	Mg/TJ
Natural gas	0.02	Mg/TJ
Industrial gases	0.02	Mg/TJ
0302-03 Process furnaces		
Hard coal	0.0058	Mg/TJ
Brown coal	0.0058	Mg/TJ
Coke	0.0058	Mg/TJ
Fuel wood	1.5	Mg/TJ
Fuel oils	0.0156	Mg/TJ
Natural gas	0.02	Mg/TJ
Industrial gases	0.02	Mg/TJ
0303 Process furnaces with contact		
030301 Sinter and pelletizing plants (agglomeration)	0.016	Mg/TJ
030302 Gray iron foundries	0.15	Mg/TJ
030302 Steel casting	0.15	Mg/TJ
030304 Primary lead production	0.05	Mg/TJ
030306 Primary copper production	0.05	Mg/TJ
030308 Secondary zinc production	0.012	Mg/TJ
030311 Cement (clinker wet method)	0.3	Mg/TJ
030311 Cement (clinker dry method)	0.3	Mg/TJ
030314 Glass - flat rolled	0.006	Mg/TJ
030314 Glass - flat drawn	0.006	Mg/TJ
030321 Paper-mill industry	0.09	Mg/TJ

* emission factors applied for combustion of fuels come from Corinair; for process emissions EFs per energy unit are old average emission factors which will be replaced in the next inventory submission

Table 3.33 PM emission factors applied for SNAP 03

PM Emission source	Emission factor			EF unit	EF reference
	TSP	PM10	PM2.5		
03. Combustion in Manufacturing Industry					
0301 Comb. in boilers, gas turbines and stationary engines					
Hard coal	0,1400	0,0700	0,0170	Mg/TJ	CEPMEIP
Brown coal	0,1600	0,0800	0,0200	Mg/TJ	CEPMEIP
Coke	0,1400	0,0700	0,0170	Mg/TJ	CEPMEIP
Fuel wood	0,1600	0,0800	0,0200	Mg/TJ	CEPMEIP
Fuel oils	0,0400	0,0200	0,0100	Mg/TJ	CEPMEIP
Natural gas	0,0002	0,0002	0,0002	Mg/TJ	CEPMEIP
LPG	0,0002	0,0002	0,0002	Mg/TJ	CEPMEIP
Industrial gases	0,0050	0,0050	0,0050	Mg/TJ	CEPMEIP
0302-03 Process furnaces with and without contact					
Hard coal	0,1000	0,0600	0,0350	Mg/TJ	CEPMEIP
Brown coal	0,1000	0,0600	0,0350	Mg/TJ	CEPMEIP
Coke	0,1000	0,0600	0,0350	Mg/TJ	CEPMEIP
Fuel wood	0,1000	0,0600	0,0350	Mg/TJ	CEPMEIP

PM Emission source	Emission factor			EF unit	EF reference
	TSP	PM10	PM2.5		
Fuel oils	0,0500	0,0400	0,0350	Mg/TJ	CEPMEIP
Natural gas	0,0002	0,0002	0,0002	Mg/TJ	CEPMEIP
LPG	0,0002	0,0002	0,0002	Mg/TJ	CEPMEIP
Industrial gases	0,0050	0,0050	0,0050	Mg/TJ	CEPMEIP
030204 Plaster furnaces	0,1	0,04	0,01	kg/Mg	CEPMEIP
030301 Sinter and pelletizing plants	0,85	0,4	0,3	kg/Mg	CEPMEIP
030303 Gray iron production	2	0,6	0,09	kg/Mg	CEPMEIP
030304 Primary lead production	0,6	0,5	0,3	kg/Mg	CEPMEIP
030305 Primary zinc production	0,5	0,4	0,3	kg/Mg	CEPMEIP
030306 Primary copper production	0,5	0,4	0,3	kg/Mg	CEPMEIP
030307 Secondary lead production	0,1	0,08	0,04	kg/Mg	CEPMEIP
030308 Secondary zinc production	0,1	0,08	0,04	kg/Mg	CEPMEIP
030309 Secondary copper production	1,0	0,8	0,6	kg/Mg	CEPMEIP
030311 Cement	0,6	0,51	0,18	kg/Mg	CEPMEIP
030312 Lime (no or minimal APCs)	0,5	0,2	0,04	kg/Mg	CEPMEIP
030314 Flat glass	0,5	0,45	0,4	kg/Mg	CEPMEIP

Table 3.34 NMVOC emission factors applied for SNAP 03

Emission source	EF	EF unit	EF Reference
03. Combustion in manufacturing industry			
0301 Combustion in boilers, gas turbines and stationary engines			
hard coal	0.02	Mg/TJ	CORINAIR
wood	0.1	Mg/TJ	CORINAIR
residual oil	0.003	Mg/TJ	CORINAIR
natural gas	0.001	Mg/TJ	CORINAIR
industrial gases	0.0025	Mg/TJ	CORINAIR
biogas	0.0025	Mg/TJ	CORINAIR
0302 Process furnaces without contact			
hard coal	0.02	Mg/TJ	CORINAIR
brown coal	0.02	Mg/TJ	CORINAIR
coke	0.01	Mg/TJ	CORINAIR
wood	0.1	Mg/TJ	CORINAIR
residual oil	0.003	Mg/TJ	CORINAIR
natural gas	0.001	Mg/TJ	CORINAIR
industrial gases	0.0025	Mg/TJ	CORINAIR
biogas	0.0025	Mg/TJ	CORINAIR
LPG	0.0035	Mg/TJ	CORINAIR

Table 3.35 Main Heavy Metals emission factors applied for SNAP 03

Emission source	Emission factors *			Unit
	Cd	Hg	Pb	
03. Combustion in manufacturing industry				
0301 Combustion in boilers, gas turbines and stationary				

Emission source	Emission factors *			Unit
	Cd	Hg	Pb	
engines				
Hard coal	0.027	0.008	0.17	kg/TJ
Brown coal	0.0007	0.005	0.022	kg/TJ
Coke	0.023	0.0006	0.13	kg/TJ
Fuel oil	0.024		0.03	kg/TJ
0302 and 0302 Process furnaces without contact and with contact				
Hard coal	0.027	0.008	0.17	kg/TJ
Brown coal	0.0007	0.005	0.022	kg/TJ
Coke	0.023	0.0006	0.13	kg/TJ
Fuel oil	0.024		0.03	kg/TJ
030304 Primary lead production	9.8	3	560	kg/Gg
030305 Primary zinc production	2.5	8	113	kg/Gg
030306 Primary copper production	0.42	0.1	230	kg/Gg
030307 Secondary lead production	0.3		40	kg/Gg
030308 Secondary zinc production	14	0.02	85	kg/Gg
030309 Secondary copper production	2		110	kg/Gg
030311 Cement	0.008	0.11	0.216	kg/Gg
030314 Other glass	0.15	0.05	10	kg/Gg

* all Main Heavy Metals emission factors for combustion of fuels applied for SNAP 03 are country specific – PL (IETU) surveys; for process emissions EFs for Pb (metal production) and Hg (cement production) are country specific – PL (IETU) surveys while for other emission sources EFs were taken from international publications

Table 3.36 Additional Heavy Metals emission factors applied for SNAP 03

Emission source	Unit	Emission factors *				
		As	Cr	Cu	Ni	Zn
03. Combustion in manufacturing industry						
0301 Combustion in boilers, gas turbines and stationary engines						
Hard coal	kg/TJ	0.017	0.022	0.095	0.085	0.69
Brown coal	kg/TJ	0.018	0.011	0.024	0.005	0.11
Coke	kg/TJ	0.002	0.017	0.086	0.076	0.53
Fuel oil	kg/TJ	0.024	0.029	0.068	0.654	0.024
0302 Process furnaces without contact						
Hard coal	kg/TJ	0.017	0.022	0.095	0.085	0.69
Brown coal	kg/TJ	0.018	0.011	0.086	0.005	0.11
Coke	kg/TJ	0.002	0.017	0.068	0.076	0.53
Fuel oil	kg/TJ	0.024	0.029	0.024	0.654	0.024
0303 Processes with contact						
Hard coal	kg/TJ	0.017	0.022	0.095	0.085	0.69
Brown coal	kg/TJ	0.018	0.011	0.086	0.005	0.11
Coke	kg/TJ	0.002	0.017	0.068	0.076	0.53
Fuel oil	kg/TJ	0.024	0.029	0.024	0.654	0.024
030304 Primary lead production	kg/Gg	10		7.5		100

030305 Primary zinc production	kg/Gg					294
030306 Primary copper production	kg/Gg	32		334		300
030307 Secondary lead production	kg/Gg	0.2				6
030308 Secondary zinc production	kg/Gg	10				1089
030309 Secondary copper production	kg/Gg	2		75		500
030311 Cement	kg/Gg	0.012	0.105		0.111	0.293
030314 Glass	kg/Gg	0.1	2.5	0.5	2	10

* Additional Heavy Metals emission factors applied for fuels combustion in SNAP 03 are country specific – PL (IETU) surveys; for process emissions EFs were taken from international publications

Table 3.37 PCDD/F emission factors applied for SNAP 03

SNAP	Activity	EF	Unit	EF Reference
0301-0303	Hard coal	0.06	mg TEQ/ Gg	Grochowalski A. (2001): <i>Estimation and analysis of emission factors for PCDD/F and PAHs from selected sources for emission inventor purposes, 2001 (in Polish)</i>
0301-0303	Lignite	0.06	mg TEQ/ Gg	EF for hard coal was applied
0301-0303	Hard coal briquettes (patent fuels)	0.06	mg TEQ/ Gg	EF for hard coal was applied
0301-0303	Brown coal briquettes	0.06	mg TEQ/ Gg	EF for hard coal was applied
0301-0303	Fuel wood and wood waste	1	mg TEQ/ Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0301-0303	Fuel oil	1	mg TEQ/ Gg	NILU (1999): <i>Environmental Cycling of Selected Persistent Organic Pollutants (POPs) in the Baltic Region (POPCYCLING-Baltic), 1999</i>
030301	Sinter and pelletizing plants	1.35	mg TEQ/Gg	<i>Opportunities for reduction of dioxin emissions from the metallurgical sector in Poland; Danish Environmental Protection Agency and Ministry of the Environment, 2005</i>
030307	Secondary lead production	8	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>
030308	Secondary zinc production (basic APCs)	100	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>
030309	Secondary copper production in converter furnaces	0.01	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>
030310	Secondary aluminium production (including scrap processing; minimal treatment of inputs, simple dust removal)	150	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>
030310	Secondary aluminium production (including scrap processing, well-controlled fabric filter, lime)	4	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>

SNAP	Activity	EF	Unit	EF Reference
	injection)			
030311	Cement	0.07	mg TEQ/Gg of cement clinker production	GF/POL/01/004 <i>Enabling activities to facilitate early action on the implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs Convention) in Poland</i>
030312	Lime (no or minimal APCs)	10	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>
030312	Lime (good APCs)	0.07	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>
030313	Asphalt mixing (no APCs)	0.07	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>
030313	Asphalt mixing (scrubbers, fabric filters)	0.007	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>
030314	Flat glass (no or minimal APCs)	0.2	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>
030315	Container glass (no or minimal APCs)	0.2	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>
030319	Bricks and tiles (no or minimal APCs)	0.2	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>
030319	Bricks and tiles (good APCs)	0.02	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>
030320	Ceramics (no or minimal APCs)	0.2	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>
030320	Ceramics (good APCs)	0.02	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>

Table 3.38 Emission factors of PCBs applied for SNAP 03

SNAP	Activity	EF	Unit	EF Reference
0301-0303	Hard coal	0.31	g/Gg	EF applied in Bulgaria
0301-0303	Lignite	1.8	g/Gg	Parma at al. (1995): <i>Atmospheric emission inventory guidelines for persistent organic pollutants (POPs)</i>
0301-0303	Hard coal briquettes (patent fuels)	0.31	g/Gg	EF for hard coal was applied
0301-0303	Brown coal briquettes	1.8	g/Gg	EF for lignite was applied
0301-0303	Fuel wood and wood waste	0.9	g/Gg	Parma at al. (1995): <i>Atmospheric emission inventory guidelines for persistent organic pollutants (POPs)</i>
0301-0303	Coke	3.6	g/Gg	NILU (1999): <i>Environmental Cycling of Selected Persistent Organic Pollutants (POPs) in the Baltic Region (POPCYCLING-Baltic), 1999</i>
0301-0303	Diesel oil	0.6	g/Gg	EF for fuel oil was applied
0301-0303	Fuel oil	0.6	g/Gg	Parma at al. (1995): <i>Atmospheric emission inventory guidelines for persistent organic pollutants (POPs)</i>
030301	Sinter and pelletizing plants	0.065	g/Gg	GF/POL/01/004 <i>Enabling activities to facilitate early action on the implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs Convention) in Poland</i>

SNAP	Activity	EF	Unit	EF Reference
030309	Secondary copper production	2.6	g/Gg	NILU (1999): <i>Environmental Cycling of Selected Persistent Organic Pollutants (POPs) in the Baltic Region (POPCYCLING)</i>
030310	Secondary aluminium production	2.6	g/Gg	NILU (1999): <i>Environmental Cycling of Selected Persistent Organic Pollutants (POPs) in the Baltic Region (POPCYCLING)</i>
030311	Cement	0.007	g/Gg	GF/POL/01/004 <i>Enabling activities to facilitate early action on the implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs Convention) in Poland</i>

Table 3.39 HCB emission factors applied for SNAP 03

SNAP	Activity	EF	Unit	EF Reference
0301-0303	Hard coal	0.013	g/Gg	Bailey (2001): <i>Global hexachlorobenzene emission, Chemosphere 43 (2001), 167-182</i>
0301-0303	Hard coal briquettes (patent fuels)	0.013	g/Gg	EF for hard coal was applied
0301-0303	Fuel wood and wood waste	0.06	g/Gg	Bailey (2001): <i>Global hexachlorobenzene emission, Chemosphere 43 (2001), 167-182</i>
030301	Sinter and pelletizing plants	0.14	g/Gg	GF/POL/01/004 <i>Enabling activities to facilitate early action on the implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs Convention) in Poland, 2002</i>
030309	Secondary copper production	39	g/Gg	Bailey (2001): <i>Global hexachlorobenzene emission, Chemosphere 43 (2001),</i>
030311	Cement	0.021	g/Gg of cement clinker production	GF/POL/01/004 <i>Enabling activities to facilitate early action on the implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs Convention) in Poland, 2002</i>

Table 3.40 Benzo(a)pyrene emission factors applied for SNAP 03

SNAP	Activity	EF	Unit	EF Reference
0301-0303	Hard coal	0.586	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0301-0303	Lignite	0.586	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0301-0303	Hard coal briquettes (patent fuels)	0.586	g/Gg	EF for hard coal was applied
0301-0303	Brown coal briquettes	0.586	g/Gg	EF for lignite was applied
0301-0303	Fuel wood and wood waste	0.095	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0301-0303	Fuel oil	3.43	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>

Table 3.41 Benzo(b)fluoranthene emission factors applied for SNAP 03

SNAP	Activity	EF	Unit	EF Reference
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0301-0303	Hard coal	23.4	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0301-0303	Lignite	23.4	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0301-0303	Hard coal briquettes (patent fuels)	23.4	g/Gg	EF for hard coal was applied
0301-0303	Brown coal briquettes	23.4	g/Gg	EF for lignite was applied
0301-0303	Fuel wood and wood waste	19	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0301-0303	Fuel oil	1.81	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>

Table 3.42 Benzo(k)fluoranthene emission factors applied for SNAP 03

SNAP	Activity	EF	Unit	EF Reference
0301-0303	Hard coal	23.4	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0301-0303	Lignite	23.4	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0301-0303	Hard coal briquettes (patent fuels)	23.4	g/Gg	EF for hard coal was applied
0301-0303	Brown coal briquettes	23.4	g/Gg	EF for lignite was applied
0301-0303	Fuel wood and wood waste	19	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0301-0303	Fuel oil	2.83	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>

Table 3.43 Indeno(1.2.3-cd)pyrene emission factors applied for SNAP 03

SNAP	Activity	EF	Unit	EF Reference
0301-0303	Hard coal	17.6	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0301-0303	Lignite	17.6	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0301-0303	Hard coal briquettes (patent fuels)	17.6	g/Gg	EF for hard coal was applied
0301-0303	Brown coal briquettes	17.6	g/Gg	EF for lignite was applied
0301-0303	Fuel wood and wood waste	0.17	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
0301-0303	Fuel oil	6.84	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>

3.4 Production Processes (SNAP 04)

Activity data for this sector come mainly from official production statistics [GUS; *Production of industrial products*]. Emission factors for the particular pollutants with their source are presented in the tables below.

Table 3.44 SO₂ emission factors applied for SNAP 04

SO ₂ emission source	Emission factor *	EF unit
04. Production Processes		
0402 Processes in iron and steel industries and collieries		
040207 Electric furnace steel plant	0.06	kg/Mg
0404-05 Processes in inorganic and organic chemical industries		
040401 Sulfuric acid	2	kg/Mg
040409 Carbon black	22	kg/Mg

* emission factor applied for sulfuric acid production is country specific; for other process emissions EFs were taken from EMEP/EEA (2009) Guidebook

Table 3.45 NO_x emission factors applied for SNAP 04

NO _x emission source	Emission factor *	EF unit
04. Production Processes		
0402 Processes in iron and steel industries and collieries		
040206 Basic oxygen furnace steel plant	0.01	kg/Mg
040207 Electric furnace steel plant	0.13	kg/Mg
040208 Rolling mills - hot	0.06	Mg/TJ
040208 Rolling mills - cold	0.06	Mg/TJ
040208 Rolling mills (seamless steel pipes)	0.06	Mg/TJ
040208 Rolling mills (other steel pipes)	0.06	Mg/TJ
0403 Processes in non-ferrous metal industries		
040302 Ferrosilicon	0.4	Mg/TJ
0404 Processes in inorganic chemical industries		
040407 NPK fertilisers	1.52	Mg/TJ
040407 Fertilisers	1.52	Mg/TJ
040409 Carbon black	15	kg/Mg
040410 Titanium dioxide	0.1	kg/Mg
040412 Calcium carbide production	0.89	Mg/TJ
0405 Proc. in organic chemical industries (bulk production)		
040501 Ethylene	0.16	Mg/TJ
040501 Caprolactam	0.16	Mg/TJ
040512 Styrene butadiene	0.16	Mg/TJ
0406 Processes in wood, paper pulp, food, drink and other		
040602 Paper pulp	1	kg/Mg
040612 Cement	0.043	Mg/TJ

* emission factors per energy unit are old average emission factors which will be replaced in the next

inventory submission while EFs per mass unit were taken from EMEP/EEA (2009) Guidebook
Table 3.46 CO emission factors applied for SNAP 04

CO emission source	Emission factor *	EF unit
04. Production Processes		
0402 Processes in iron and steel industries and collieries		
040206 Basic oxygen furnace steel plant	0.837	Mg/TJ
040207 Electric furnace steel plant	0.09	Mg/TJ
040208 Rolling mills - hot	0.02	Mg/TJ
040208 Rolling mills - cold	0.01	Mg/TJ
040208 Rolling mills (seamless steel pipes)	0.02	Mg/TJ
040208 Rolling mills (other steel pipes)	0.02	Mg/TJ
0403 Processes in non-ferrous metal industries		
040302 Ferrosilicon	1.65	Mg/TJ
0404 Processes in inorganic chemical industries		
040407 NPK fertilisers	0.02	Mg/TJ
040407 Fertilisers	0.015	Mg/TJ
040409 Carbon black	0.015	Mg/TJ
040410 Titanium dioxide	1.5	Mg/TJ
040412 Calcium carbide production	0.02	Mg/TJ
0406 Processes in wood, paper pulp, food, drink and other		
040602 Paper pulp	0.18	Mg/TJ
040612 Cement	0.015	Mg/TJ

* emission factors per energy unit are old average emission factors which will be replaced in the next inventory submission

Table 3.47 NH₃ emission factors applied for SNAP 04

SNAP	Emission source	EF	unit	reference
0404	Processes in inorganic chemical industries	0.01	Mg/Gg NH ₃	EMEP/EEA (2009): <i>EMEP/EEA emission inventory guidebook 2009</i>
0406	Processes in wood, paper pulp, food, drink	0.9	Mg/Gg prod. Na ₂ CO ₃	EMEP/EEA (2009): <i>EMEP/EEA emission inventory guidebook 2009</i>

Table 3.48 PM emission factors applied for SNAP 04

PM Emission source	Emission factor			EF unit	EF reference
	TSP	PM10	PM2.5		
04. Production Processes					
0402 Processes in iron and steel industries and collieries					
040201 Coke oven (door leakage and extinction)	0,5	0,2	0,1	kg/Mg	CEPMEIP
040203 Pig iron tapping	1,1	0,8	0,55	kg/Mg	PL *
040205 Open hearth furnaces	1	0,75	0,65	kg/Mg	CEPMEIP
040206 Basic oxygen furnace steel plant	0,15	0,17	0,15	kg/Mg	PL
040207 Electric furnace steel plant	0,78	0,69	0,34	kg/Mg	PL
0403 Processes in non-ferrous metal industries					
040301 Aluminium production	8	6,4	2,8	kg/Mg	PL
0404 Processes in inorganic chemical					

PM Emission source	Emission factor			EF unit	EF reference
	TSP	PM10	PM2.5		
industries					
040407 NPK Fertilisers	1	0,8	0,6	kg/Mg	PL
040409 Carbon black	0,56	0,5	0,45	kg/Mg	CEPMEIP
040414 Phosphate fertilizers	0,3	0,24	0,18	kg/Mg	CEPMEIP
0405 Processes in organic chemical industries					
040508 Polyvinylchloride	0,26	0,1	0,01	kg/Mg	CEPMEIP

* emission factors applied are country specific from domestic studies

Table 3.49 NMVOC emission factors applied for SNAP 04

Emission source	EF	EF unit	EF Reference
04. Production processes			
0401 Processes in petroleum industries			
040101 Petroleum products processing	0.9	Mg/Gg	PL (IETU) *
0402 Processes in iron and steel industries and collieries			
040201 Coke oven	0.0005	Mg/Mg	PL (IETU)
040202 Blast furnace charging	0.000237	Mg/Mg	PL (IETU)
040206 Basic oxygen furnace steel plant	0.000038	Mg/Mg	PL (IETU)
040207 Electric furnace steel plant	0.00074	Mg/Mg	PL (IETU)
040208 Rolling mills - hot	0.00003	Mg/Mg	PL (IETU)
040208 Rolling mills - cold	0.000126	Mg/Mg	PL (IETU)
0404 Processes in inorganic chemical industries			
040409 Carbon black	0.04	Mg/Mg	CORINAIR
0405 Processes in organic chemical industries (bulk production)			
040501 Ethylene	0.011	Mg/Mg	PL (IETU)
040502 Propylene	0.005	Mg/Mg	CORINAIR
040506 Polyethylene low density	0.026	Mg/Mg	PL (IETU)
040508 Polyvinylchloride	0.008	Mg/Mg	PL (IETU)
040509 Polypropylene	0.008	Mg/Mg	CORINAIR
040511 Polystyrene	0.00126	Mg/Mg	PL (IETU)
0406 Processes in wood, paper pulp, food, drink and other industries			
040601 Chipboard	0.0002	Mg/m3	PL (IETU)
040602 Paper pulp	0.001	Mg/Mg	PL (IETU)
040605 Bread	4.5	Mg/Mg	CORINAIR
040606 Wine	0.000034	Mg/Mg	CORINAIR
040607 Beer	0.00002	Mg/Mg	CORINAIR
040608 Spirits	0.0024	Mg/Mg	CORINAIR
040610 Roof covering with asphalt materials	0.05	Mg/thous. m2	CORINAIR

* emission factors come from IETU surveys

Table 3.50 Main Heavy Metals emission factors applied for SNAP 04

Emission source	Emission factors *			Unit
	Cd	Hg	Pb	
04. Production processes				
0402 Processes in iron and steel industries and collieries				
040201 Coke oven	0.05	0.03	0.22	kg/Gg
040202 Blast furnace charging			0.287	kg/Gg
040203 Sulphur recovery plants			4.5	kg/Gg
040205 Open hearth furnace steel plant	0.2		1.4	kg/Gg
040206 Basic oxygen furnace steel plant	0.025	0.001	0.1	kg/Gg
040207 Electric furnace steel plant	0.25	0.10	5.5	kg/Gg
040209 Sinter and pelletizing plants (excluding 030301)	0.1	0.01	5.4	kg/Gg
0403 Processes in non-ferrous metal industries				
040301 Aluminium production	0.1			kg/Gg
040302 Ferro alloys			0.24	kg/Gg
040309 Other (production of batteries)			5	kg/Gg
0404 Processes in inorganic chemical industries				
040413 Chlorine production		1.30		kg/Gg
040414 Phosphate fertilizers	0.6			kg/Gg

* EFs for Main Heavy Metals emission from *Coke oven plants*, Pb emissions from *production of batteries* and Hg emissions from *Chlorine production* are country specific – PL (IETU) surveys while for other emission sources EFs were taken from international publications

Table 3.51 Additional Heavy Metals emission factors applied for SNAP 04

Emission source	Unit	Emission factors *				
		As	Cr	Cu	Ni	Zn
04. Production processes						
0402 Processes in iron and steel industries and collieries						
040201 Coke oven	kg/Gg	0.02	0.17	0.09	0.065	0.22
040202 Blast furnace charging	kg/Gg					0.58
040203 Sulphur recovery plants	kg/Gg			0.003		0.021
040205 Open hearth furnace steel plant	kg/Gg	0.75	9.8	1.18		40.15
040206 Basic oxygen furnace steel plant	kg/Gg	0.015	0.06	0.03	0.05	0.6
040207 Electric furnace steel plant	kg/Gg	0.1	1	3.1	0.25	23.9
040209 Sinter and pelletizing plants (excluding 030301)	kg/Gg	0.04	0.3	0.6	0.7	8.9
0403 Processes in non-ferrous metal industries						
040301 Aluminium production	kg/Gg				0.1	0.15
040302 Ferro alloys	kg/Gg		80			

* Additional Heavy Metals emission factors applied in SNAP 04 for process emissions were taken from international publications

Table 3.52 PCDD/F emission factors applied for SNAP 04

SNAP	Activity	EF	Unit	EF Reference
040201	Coke production (APCs/flue gas burn out)	0.3	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases</i> , 2005
040203	Pig iron tapping	0.01	mg TEQ/Gg	<i>Opportunities for reduction of dioxin emissions from the metallurgical sector in Poland</i> ; Danish Environmental Protection Agency and Ministry of the Environment, 2005
040206	Basic oxygen furnace steel plants	0.02	mg TEQ/Gg	<i>Opportunities for reduction of dioxin emissions from the metallurgical sector in Poland</i> ; Danish Environmental Protection Agency and Ministry of the Environment, 2005
040207	Electric furnace steel plants	3	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases</i> , 2005
040301	Aluminium production (electrolysis)	2	mg TEQ/Gg	NILU (1999): <i>Environmental Cycling of Selected Persistent Organic Pollutants (POPs) in the Baltic Region (POPCYCLING-Baltic)</i> , 1999
040617	Other (smoke houses - clean fuel, no flue gas burn out)	6	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases</i> , 2005

Table 3.53 Emission factors of PCBs applied for SNAP 04

SNAP	Activity	EF	Unit	EF Reference
040203	Pig iron tapping	0.0064	g/Gg	<i>Opportunities for reduction of dioxin emissions from the metallurgical sector in Poland</i> ; Danish Environmental Protection Agency and Polish Ministry of the Environment, 2005
040205	Open heart furnace steel plants	2.6	g/Gg	NILU (1999): <i>Environmental Cycling of Selected Persistent Organic Pollutants (POPs) in the Baltic Region (POPCYCLING-Baltic)</i> , 1999
040206	Basic oxygen furnace steel plants	0.0048	g/Gg	<i>Opportunities for reduction of dioxin emissions from the metallurgical sector in Poland</i> ; Danish Environmental Protection Agency and Polish Ministry of the Environment, 2005
040207	Electric furnace steel plants	2.6	g/Gg	NILU (1999): <i>Environmental Cycling of Selected Persistent Organic Pollutants (POPs) in the Baltic Region (POPCYCLING)</i>
040208	Rolling mills	2.6	g/Gg	NILU (1999): <i>Environmental Cycling of Selected Persistent Organic Pollutants (POPs) in the Baltic Region (POPCYCLING)</i>

Table 3.54 HCB emission factors applied for SNAP 04

SNAP	Activity	EF	Unit	EF Reference
040203	Pig iron tapping	0.00146	g/Gg	<i>Opportunities for reduction of dioxin emissions from the metallurgical sector in Poland</i> ; Danish Environmental Protection Agency and Ministry of the Environment. Institute of Environmental Protection, 2005
040206	Basic oxygen furnace steel plants	0.00176	g/Gg	<i>Opportunities for reduction of dioxin emissions from the metallurgical sector in Poland</i> ; Danish Environmental Protection Agency and Ministry of the Environment. Institute of Environmental Protection, 2005

Table 3.55 Benzo(a)pyrene emission factors applied for SNAP 04

SNAP	Activity	EF	Unit	EF Reference
040201	Coke production (APCs/flue gas burn out)	0.75	kg/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
040301	Aluminium production	11	kg/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995

Table 3.56 Benzo(b)fluoranthene emission factors applied for SNAP 04

SNAP	Activity	EF	Unit	EF Reference
040201	Coke production (APCs/flue gas burn out)	0.250	kg/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
040301	Aluminium production	40.180	kg/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995

Table 3.57 Benzo(k)fluoranthene emission factors applied for SNAP 04

SNAP	Activity	EF	Unit	EF Reference
040201	Coke production (APCs/flue gas burn out)	0.250	kg/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
040301	Aluminium production	40.180	kg/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995

Table 3.58 Indeno(1.2.3-cd)pyrene emission factors applied for SNAP 04

SNAP	Activity	EF	Unit	EF Reference
040201	Coke production (APCs/flue gas burn out)	0.300	kg/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
040301	Aluminium production	5.000	kg/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995

3.5 Extraction And Distribution Of Fossil Fuels And Geothermal Energy (SNAP 05)

Activity data for this sector come mainly from official production statistics [GUS; *Production of industrial products*]. Emission factors for the particular pollutants with their source are presented in the tables below.

A specific methodology for *Extraction of Geothermal Energy* has not been prepared yet, however the contribution to total national emissions is thought to be currently insignificant, i.e. less than 1% of national emissions of any pollutant.

Table 3.59 NMVOC emission factors applied for SNAP 05

Emission source	EF	EF unit	EF Reference
05. Extraction and distribution of fossil fuels and geothermal energy			
0501 Extraction and 1st treatment of solid fossil fuels			
050102 Underground mining	0.1	kg/Mg prod	PL (IETU) *
0502 Extraction and 1st treatment and loading of liquid fossil fuels			
050201 Land-based activities	0.0001	Mg/Mg prod	CORINAIR
0503 Extraction, 1st treatment and loading of gaseous			
Land-based activities (high - methane natural gas)	0.068	Mg/hm3	PL (IETU)
Land-based activities (nitrogenous natural gas)	0.063	Mg/hm4	PL (IETU)
0504 Liquid fuel distribution (except gasoline distribution)			
050401 Marine terminals (tankers, handling and storage)	0.3	kg/Mg	CORINAIR
050402 Fuel oil distribution	0.02	kg/Mg	CORINAIR
0505 Gasoline distribution			
050501 Refinery dispatch station	0.31	kg/Mg	CORINAIR
050502 Transport and depots	0.72	kg/Mg	CORINAIR
050503 Service stations (including refueling of cars)	2.8	kg/Mg	CORINAIR
0506 Gas distribution networks			
natural gas (high - methane)	0.338	Mg/hm3	PL (IETU)
natural gas (nitrogenous)	0.784	Mg/hm3	PL (IETU)
coke oven gas	0.727	Mg/hm3	PL (IETU)

* emission factors come from IETU surveys

Table 3.60 PM emission factors applied for SNAP 05

PM Emission source	Emission factor			EF unit	EF reference
	TSP	PM10	PM2.5		
05. Extraction and Distribution of Fossil Fuels and Geothermal Energy					
0501 Extraction and 1st treatment of solid fossil fuels					
050101 Extraction of brown coal	0,10172	0,05	0,005	kg/Mg	CEPMEIP
050102 Extraction of hard coal	0,10172	0,05	0,005	kg/Mg	CEPMEIP
050102 Extraction of copper ores	0,10172	0,05	0,005	kg/Mg	CEPMEIP
050102 Extraction of zinc-lead ores	0,10172	0,05	0,005	kg/Mg	CEPMEIP
050103 Storage and transport of cement	0,01	0,005	0,0005	kg/Mg	CEPMEIP
050103 Storage and transport of coal	0,15	0,06	0,006	kg/Mg	CEPMEIP
050103 Storage and transport of coke	0,11	0,044	0,0044	kg/Mg	CEPMEIP
050103 Storage and transport of nitrogen fertilisers	0,1	0,032	0,004	kg/Mg	CEPMEIP
050103 Storage and transport of potassium fertilisers	0,1	0,032	0,004	kg/Mg	CEPMEIP
050103 Storage and transport of phosphate fertilisers	0,1	0,032	0,004	kg/Mg	CEPMEIP

3.6 Solvent And Other Product Use (SNAP 06)

Activity data for this sector come mainly from official production statistics [GUS; *Production of industrial products*]. Emission factors for the particular pollutants with their source are presented in the tables below.

Table 3.61 NH₃ emission factors applied for SNAP 06

SNAP	Source activity title	EF	unit	EF reference
0603	Chemical products manufacturing or processing	0.68	kg/Mg leather	EMEP/EEA (2009): <i>EMEP/EEA emission inventory guidebook 2009</i>

Table 3.62 NMVOC emission factors applied for SNAP 06

Emission source	EF	EF unit	EF Reference
06. Solvent and other product use			
0601 Paint application			
060102 Waterborne paints	0.03	Mg/Mg paints	PL (IETU) *
060102 Conventional solvent paint	0.5	Mg/Mg paints	PL (IETU)
0602 Degreasing, dry cleaning and electronics			
060201 Metal degreasing	1	Mg/Mg solvent	PL (IETU)
060202 Dry cleaning	0.15	Mg/thousand people	PL (IETU)
0603 Chemical products manufacturing or processing			
060302 Polyvinylchloride processing	0.0078	Mg/Mg	PL (IETU)
060304 Polystyrene foam processing	0.0508	Mg/Mg	PL (IETU)
060305 Rubber processing	0.016	Mg/Mg	PL (IETU)
060306 Pharmaceutical products manufacturing	0.014	Mg/thousand people	PL (IETU)
050307 Paints manufacturing	5	kg/Mg	PL (IETU)
0604 Other use of solvents and related activities			
060404 Fat, edible and non edible oil extraction	14	kg/Mg	PL (IETU)
060408 Domestic solvent use (other than paint application)	1.2	Mg/thousand people	PL (IETU)

* emission factors come from IETU surveys

Table 3.63 Benzo(a)pyrene emission factors applied for SNAP 06

SNAP	Activity	EF	Unit	EF Reference
060107	Wood preservation	0.5	kg/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>

Table 3.64 Benzo(b)fluoranthene emission factors applied for SNAP 06

SNAP	Activity	EF	Unit	EF Reference
060107	Wood preservation	0.250	kg/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>

Table 3.65 Benzo(k)fluoranthene emission factors applied for SNAP 06

SNAP	Activity	EF	Unit	EF Reference
060107	Wood preservation	0.250	kg/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995

Table 3.66 Indeno(1.2.3-cd)pyrene emission factors applied for SNAP 06

SNAP	Activity	EF	Unit	EF Reference
060107	Wood preservation	0.250	kg/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995

3.7 Road Transport (SNAP 07)

Activity data (fuel use) for this sector come from reports of the *Motor Transport Institute* [ITS] with estimations based on energy statistics [GUS]. Emission factors for the particular pollutants with their source are presented in the tables below.

Table 3.67 SO₂ emission factors applied for SNAP 07

SO ₂ emission source	Emission factor	EF unit	EF Reference
07. Road Transport			
0701 Passenger cars			
Gasoline passenger cars	0.1	kg/Mg	PL (ITS) *
Diesel passenger cars	0.1	kg/Mg	PL (ITS)
0702 Light duty vehicles <3.5 t			
Gasoline light - duty cars	0.1	kg/Mg	PL (ITS)
Diesel light - duty cars	0.1	kg/Mg	PL (ITS)
0703 Heavy duty vehicles >3.5 t			
Gasoline heavy duty vehicles	0.1	kg/Mg	PL (ITS)
Diesel heavy - duty cars	0.1	kg/Mg	PL (ITS)
Buses	0.1	kg/Mg	PL (ITS)
Tractors	0.1	kg/Mg	PL (ITS)
0704 Mopeds and motorcycles < 50 cm ³	0.1	kg/Mg	PL (ITS)
0705 Motorcycles > 50 cm ³	0.1	kg/Mg	PL (ITS)

* emission factors based on sulphur content come from ITS surveys

Table 3.68 NO_x emission factors applied for SNAP 07

NO _x emission source	Emission factor	EF unit	EF Reference
07. Road Transport			
0701 Passenger cars			
Gasoline passenger cars without catalyst	34.1	kg/Mg	PL (ITS) *
Gasoline passenger cars with catalyst	10.8	kg/Mg	PL (ITS)
Two-stroke passenger cars	9.7	kg/Mg	PL (ITS)
LPG passenger cars	38	kg/Mg	PL (ITS)

NO_x emission source	Emission factor	EF unit	EF Reference
LPG passenger cars - low emission	17	kg/Mg	PL (ITS)
Diesel passenger cars – old	13.2	kg/Mg	PL (ITS)
Diesel passenger cars – new	11.5	kg/Mg	PL (ITS)
0702 Light duty vehicles <3.5 t			
Gasoline light - duty cars without catalyst	31.7	kg/Mg	PL (ITS)
Gasoline light - duty cars with catalyst	10	kg/Mg	PL (ITS)
Diesel light - duty cars - old	18.8	kg/Mg	PL (ITS)
Diesel light - duty cars - new	14.4	kg/Mg	PL (ITS)
LPG light - duty cars	38	kg/Mg	PL (ITS)
LPG light - duty cars - low emission	18	kg/Mg	PL (ITS)
0703 Heavy duty vehicles >3.5 t			
Gasoline heavy duty vehicles	35.9	kg/Mg	PL (ITS)
Diesel heavy - duty cars - old	53	kg/Mg	PL (ITS)
Diesel heavy - duty cars - new	17.8	kg/Mg	PL (ITS)
Buses - old	57.1	kg/Mg	PL (ITS)
Buses - new	19	kg/Mg	PL (ITS)
Tractors	52	kg/Mg	PL (ITS)
0704 Mopeds and motorcycles < 50 cm ³	2.5	kg/Mg	PL (ITS)
0705 Motorcycles > 50 cm ³	6.5	kg/Mg	PL (ITS)

* emission factors come from ITS surveys

Table 3.69 CO emission factors applied for SNAP 07

CO emission source	Emission factor	EF unit	EF Reference
07. Road Transport			
0701 Passenger cars			
Gasoline passenger cars without catalyst	230	kg/Mg	PL (ITS) *
Gasoline passenger cars with catalyst	80	kg/Mg	PL (ITS)
Two-stroke passenger cars	250	kg/Mg	PL (ITS)
LPG passenger cars	150	kg/Mg	PL (ITS)
LPG passenger cars - low emission	110	kg/Mg	PL (ITS)
Diesel passenger cars – old	14	kg/Mg	PL (ITS)
Diesel passenger cars – new	6	kg/Mg	PL (ITS)
0702 Light duty vehicles <3.5 t			
Gasoline light - duty cars without catalyst	230	kg/Mg	PL (ITS)
Gasoline light - duty cars with catalyst	80	kg/Mg	PL (ITS)
Diesel light - duty cars - old	18	kg/Mg	PL (ITS)
Diesel light - duty cars - new	6.5	kg/Mg	PL (ITS)
LPG light - duty cars	135	kg/Mg	PL (ITS)
LPG light - duty cars - low emission	110	kg/Mg	PL (ITS)
0703 Heavy duty vehicles >3.5 t			
Gasoline heavy duty vehicles	337	kg/Mg	PL (ITS)
Diesel heavy - duty cars - old	32.5	kg/Mg	PL (ITS)
Diesel heavy - duty cars - new	6	kg/Mg	PL (ITS)

CO emission source	Emission factor	EF unit	EF Reference
Buses - old	55.7	kg/Mg	PL (ITS)
Buses - new	5	kg/Mg	PL (ITS)
Tractors	46.3	kg/Mg	PL (ITS)
0704 Mopeds and motorcycles < 50 cm3	500	kg/Mg	PL (ITS)
0705 Motorcycles > 50 cm3	480	kg/Mg	PL (ITS)

* emission factors come from ITS surveys

Table 3.70. NH₃ emission factors applied for SNAP 07

SNAP	Emission source	EF	unit	reference
0701	Passenger cars	0.173	g/kg gasoline	EMEP/EEA (2009): <i>EMEP/EEA emission inventory guidebook 2009</i>
0701	Passenger cars (diesel)	0.018	g/kg diesel	EMEP/EEA (2009): <i>EMEP/EEA emission inventory guidebook 2009</i>
0702	Light-duty vehicles < 3.5 t	0.140	g/kg gasoline	EMEP/EEA (2009): <i>EMEP/EEA emission inventory guidebook 2009</i>
0702	Light-duty vehicles < 3.5 t	0.014	g/kg diesel	EMEP/EEA (2009): <i>EMEP/EEA emission inventory guidebook 2009</i>
0703	Heavy-duty vehicles > 3.5 t and buses	0.015	g/kg diesel	EMEP/EEA (2009): <i>EMEP/EEA emission inventory guidebook 2009</i>
0704 0705	Mopeds and motorcycles	0.063	g/kg gasoline	EMEP/EEA (2009): <i>EMEP/EEA emission inventory guidebook 2009</i>

Table 3.71 PM emission factors applied for SNAP 07

PM Emission source	Emission factor			EF unit	EF reference
	TSP	PM10	PM2.5		
07. Road Transport					
0701 Passenger cars					
Diesel passenger cars - old	6,0000	6,0000	6,0000	kg/Mg	PL(ITS) *
Diesel passenger cars - new	1,9000	1,9000	1,9000	kg/Mg	PL(ITS)
Two-stroke passenger cars	0,0110	0,0110	0,0110	kg/Mg	PL(ITS)
Gasoline passenger cars without catalyts	0,0110	0,0110	0,0110	kg/Mg	PL(ITS)
Gasoline passenger cars with catalyts	0,0072	0,0072	0,0072	kg/Mg	PL(ITS)
0702 Light duty vehicles <3.5 t					
Diesel light - duty cars – old	6,0000	6,0000	6,0000	kg/Mg	PL(ITS)
Diesel light - duty cars – new	1,1000	1,1000	1,1000	kg/Mg	PL(ITS)
Gasoline light - duty cars without catalyts	0,0110	0,0110	0,0110	kg/Mg	PL(ITS)
Gasoline light - duty cars with catalyts	0,0071	0,0071	0,0071	kg/Mg	PL(ITS)
0703 Heavy duty vehicles >3.5 t					
Diesel heavy - duty cars - old	6,0000	6,0000	6,0000	kg/Mg	PL(ITS)
Diesel heavy - duty cars - new	1,0000	1,0000	1,0000	kg/Mg	PL(ITS)
Diesel heavy - duty cars - gasoline	0,0110	0,0110	0,0110	kg/Mg	PL(ITS)
Buses - old	6,0000	6,0000	6,0000	kg/Mg	PL(ITS)
Buses - new	1,0000	1,0000	1,0000	kg/Mg	PL(ITS)
Tractors	5,2000	5,2000	5,2000	kg/Mg	PL(ITS)
0704 Mopeds and motorcycles < 50 cm3	0,0110	0,0110	0,0110	kg/Mg	PL(ITS)
0705 Motorcycles > 50 cm3	0,0110	0,0110	0,0110	kg/Mg	PL(ITS)
0707 Automobile tyre and brake wear					
Passenger cars					
Tyre wear	0,069000	0,003450	0,000000	Mg/mln km	CEPMEIP
Brake wear	0,006000	0,006000	0,006000	Mg/mln km	CEPMEIP

PM Emission source	Emission factor			EF unit	EF reference
	TSP	PM10	PM2.5		
Road wear	0,145000	0,007250	0,000000	Mg/mln km	CEPMEIP
Light duty vehicles <3.5 t					
Tyre wear	0,090000	0,004500	0,000000	Mg/mln km	CEPMEIP
Brake wear	0,007500	0,007500	0,007500	Mg/mln km	CEPMEIP
Road wear	0,190000	0,009500	0,000000	Mg/mln km	CEPMEIP
Heavy duty vehicles >3.5 t					
Tyre wear	0,371250	0,018563	0,000000	Mg/mln km	CEPMEIP
Brake wear	0,032250	0,032250	0,032250	Mg/mln km	CEPMEIP
Road wear	0,738000	0,026900	0,000000	Mg/mln km	CEPMEIP
Mopeds and motorcycles < 50 cm3					
Tyre wear	0,034500	0,001725	0,000000	Mg/mln km	CEPMEIP
Brake wear	0,003000	0,003000	0,003000	Mg/mln km	CEPMEIP
Road wear	0,073000	0,003650	0,000000	Mg/mln km	CEPMEIP

* emission factors come from ITS surveys

Table 3.72 NMVOC emission factors applied for SNAP 07

Emission source	EF	EF unit	EF Reference
07. Road transport			
0701 Passenger cars			
Gasoline passenger cars without catalyst	44	kg/Mg	PL (ITS) *
Gasoline passenger cars with catalyst	4.4	kg/Mg	PL (ITS)
Two-stroke passenger cars	192	kg/Mg	PL (ITS)
LPG passenger cars	25	kg/Mg	PL (ITS)
LPG passenger cars - low emission	6.5	kg/Mg	PL (ITS)
Diesel passenger cars – old	3.5	kg/Mg	PL (ITS)
Diesel passenger cars – new	1.2	kg/Mg	PL (ITS)
0702 Light duty vehicles <3.5 t			
Gasoline light - duty cars without catalyst	45	kg/Mg	PL (ITS)
Gasoline light - duty cars with catalyst	5.5	kg/Mg	PL (ITS)
Diesel heavy - duty cars - old	4	kg/Mg	PL (ITS)
Diesel heavy - duty cars - new	1.8	kg/Mg	PL (ITS)
LPG light - duty cars	25	kg/Mg	PL (ITS)
LPG light - duty cars - low emission	6.5	kg/Mg	PL (ITS)
0703 Heavy duty vehicles >3.5 t			
Gasoline heavy duty vehicles		kg/Mg	PL (ITS)
Diesel heavy - duty cars - old	12.5	kg/Mg	PL (ITS)
Diesel heavy - duty cars - new	4.9	kg/Mg	PL (ITS)
Buses - old	15.8	kg/Mg	PL (ITS)
Buses - new	3	kg/Mg	PL (ITS)
Tractors	8	kg/Mg	PL (ITS)
0704 Mopeds and motorcycles < 50 cm3	300	kg/Mg	PL (ITS)
0705 Motorcycles > 50 cm3	180	kg/Mg	PL (ITS)

* emission factors come from ITS surveys

Table 3.73 Main Heavy Metals emission factors applied for SNAP 07

Emission source	Emission factors *			Unit
	Cd	Hg	Pb	
07. Road transport				
Unleaded gasoline			4.3	kg/Gg
Diesel oil	0.05			kg/Gg

* EFs were taken from international publications

Table 3.74 Additional Heavy Metals emission factors applied for SNAP 07

Emission source	Emission factors *					Unit
	As	Cr	Cu	Ni	Zn	
07. Road transport						
Unleaded gasoline		0.5	0.3	0.5		kg/Gg
Diesel oil			0.3	0.5		kg/Gg

* EFs were taken from international publications

Table 3.75 PCDD/F emission factors applied for SNAP 07

SNAP	Activity	EF	Unit	EF References
07	Gasoline	0.104	mg TEQ/Gg	LUA-NRW (1997): <i>Identification of Relevant Industrial Sources of Dioxins and Furans in Europe – The European Dioxin Inventory</i> , Essen 1997
07	Diesel oil	0.043	mg TEQ/Gg	LUA-NRW (1997): <i>Identification of Relevant Industrial Sources of Dioxins and Furans in Europe – The European Dioxin Inventory</i> , Essen 1997

Table 3.76 Emission factors of PCBs applied for SNAP 07

SNAP	Activity	EF	Unit	EF References
07	Motor gasoline	0.02	g/Gg	NILU (1999): <i>Environmental Cycling of Selected Persistent Organic Pollutants (POPs) in the Baltic Region (POPCYCLING)</i>
0701-0702	Diesel oil	0.67	g/Gg	EF has been computed based upon literature EF: 0.05 µ/km, assuming average fuel consumption 9 l/100 km and diesel oil density 0.84 kg/l; EF=0.05 µ/km - Parma at al. (1995): <i>Atmospheric emission inventory guidelines for persistent organic pollutants (POPs)</i>
0703	Diesel oil	24.5	g/Gg	EF has been computed based upon literature EF: 5.39 µ/km, assuming average fuel consumption 26 l/100 km and diesel oil density 0.84 kg/l; EF= 5.39 µ/km - Parma at al. (1995): <i>Atmospheric emission inventory guidelines for persistent organic pollutants (POPs)</i>

Table 3.77 HCB emission factors applied for SNAP 07

SNAP	Activity	EF	Unit	EF References
07	Motor gasoline	0.000368	g/Gg	EF has been computed based upon literature EF for unleaded gasoline 0.024 ng/km assuming average fuel consumption 8.8 litres per 100 km and gasoline density 0.74 kg/l; EF=0.024 ng/km - NILU (1999): <i>Environmental Cycling</i>

SNAP	Activity	EF	Unit	EF References
				<i>of Selected Persistent Organic Pollutants (POPs) in the Baltic Region (POPCYCLING)</i>
07	Diesel oil	0.006	g/Gg	EF has been computed based upon literature EF: 0.87 ng/km, assuming average fuel consumption 16.5 litres/100km and diesel oil density 0.84 kg/l (including buses and tractors) EF=0.87 ng/km - NILU (1999): <i>Environmental Cycling of Selected Persistent Organic Pollutants (POPs) in the Baltic Region (POPCYCLING)</i> ; (EF will be corrected because EF= 21 ng/km should be applied; EF=0.87 ng/km concerns leaded gasoline)

Table 3.78 Benzo(a)pyrene emission factors applied for SNAP 07

SNAP	Activity	EF	Unit	EF References
07	Motor gasoline	0.0107	kg/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
07	Diesel oil	0.297	kg/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>

Table 3.79 Benzo(b)fluoranthene emission factors applied for SNAP 07

SNAP	Activity	EF	Unit	EF References
07	Motor gasoline	0.01498	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
07	Diesel oil	0.41580	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>

Table 3.80 Benzo(b)fluoranthene emission factors applied for SNAP 08

SNAP	Activity	EF	Unit	EF References
08	Motor gasoline	0.01498	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
08	Diesel oil	0.41580	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>

Table 3.81 Benzo(k)fluoranthene emission factors applied for SNAP 07

SNAP	Activity	EF	Unit	EF References
07	Motor gasoline	0.00642	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>
07	Diesel oil	0.17820	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>

Table 3.82 Indeno(1.2.3-cd)pyrene emission factors applied for SNAP 07

SNAP	Activity	EF	Unit	EF References
07	Motor gasoline	0.0107	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy</i>

				<i>metals and persistent organic pollutants, 1995</i>
07	Diesel oil	0.2970	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants, 1995</i>

3.8 Other Mobile Sources And Machinery (SNAP 08)

Activity data for this sector are based on statistics from several sources:

- Eurostat database – use of fuels in the following activities: *air traffic, railways, inland waterways*
- Energy statistics [GUS] - fuel use estimation for the machinery and off-road vehicles in industry and other off-road vehicles
- Statistical Yearbook [GUS] – data on fishing used for fuel use estimation.

Emission factors for the particular pollutants with their source are presented in the tables below.

Table 3.83 SO₂ emission factors applied for SNAP 08

SO ₂ emission source	Emission factor	EF unit	EF Reference
08. Other Mobile Sources and Machinery			
0802 Railways			
080201 Diesel locomotives	0.1	kg/Mg	PL (ITS) *
0803 Inland waterways	0.1	kg/Mg	PL (ITS)
0804 Maritime activities			
080402 National sea traffic, diesel oil	0.1	kg/Mg	PL (ITS)
080402 National sea traffic, fuel oil	0.02	Mg/Mg	PL (ITS)
080403 National fishing, diesel oil	0.1	kg/Mg	PL (ITS)
080403 National fishing, fuel oil	0.006	Mg/Mg	PL (ITS)
0806 Agriculture			
Tractors	0.1	kg/Mg	PL (ITS)
Machinery	0.1	kg/Mg	PL (ITS)
0808 Industry			
Industry - oil engine powered machinery	0.1	kg/Mg	PL (ITS)
0810 Other machinery			
oil engines	0.1	kg/Mg	PL (ITS)
gasoline engines	0.1	kg/Mg	PL (ITS)

* emission factors based on sulphur content come from ITS surveys

Table 3.84 NO_x emission factors applied for SNAP 08

NO _x emission source	Emission factor	EF unit	EF Reference
08. Other Mobile Sources and Machinery			
0802 Railways			
080201 Diesel locomotives	54	kg/Mg	PL (ITS) *
0803 Inland waterways	54	kg/Mg	PL (ITS)
0804 Maritime activities			

NO_x emission source	Emission factor	EF unit	EF Reference
080402 National sea traffic, diesel oil	58.4	kg/Mg	PL (ITS)
080403 National fishing, diesel oil	58.4	kg/Mg	PL (ITS)
0805 Air traffic			
jet fuel	12.5	kg/Mg	PL (ITS)
aviation gasoline	3.52	kg/Mg	PL (ITS)
0806 Agriculture			
Tractors	52	kg/Mg	PL (ITS)
Machinery	63	kg/Mg	PL (ITS)
0808 Industry			
Industry - oil engine powered machinery	60	kg/Mg	PL (ITS)
0810 Other machinery			
oil engines	55	kg/Mg	PL (ITS)
gasoline engines	10	kg/Mg	PL (ITS)

* emission factors come from ITS surveys

Table 3.85 CO emission factors applied for SNAP 08

CO emission source	Emission factor	EF unit	EF Reference
08. Other Mobile Sources and Machinery			
0802 Railways			
080201 Diesel locomotives	29.5	kg/Mg	PL (ITS) *
0803 Inland waterways	29.5	kg/Mg	PL (ITS)
0804 Maritime activities			
080402 National sea traffic, diesel oil	8	kg/Mg	PL (ITS)
080403 National fishing, diesel oil	8	kg/Mg	PL (ITS)
0805 Air traffic			
jet fuel	5.2	kg/Mg	PL (ITS)
aviation gasoline	1034	kg/Mg	PL (ITS)
0806 Agriculture			
Tractors	46	kg/Mg	PL (ITS)
Machinery	50	kg/Mg	PL (ITS)
0808 Industry			
Industry - oil engine powered machinery	40	kg/Mg	PL (ITS)
0810 Other machinery			
oil engines	34	kg/Mg	PL (ITS)
gasoline engines	500	kg/Mg	PL (ITS)

* emission factors come from ITS surveys

Table 3.86 NH₃ emission factors applied for SNAP 08

SNAP	Emission source	EF	unit	EF reference
0802	Railways	0.007	kg/Mg diesel	EMEP/EEA (2009): <i>EMEP/EEA emission inventory guidebook 2009</i>
0806	Agriculture	0.008	kg/Mg diesel	EMEP/EEA (2009): <i>EMEP/EEA emission inventory guidebook 2009</i>

Table 3.87 PM emission factors applied for SNAP 08

PM Emission source	Emission factor			EF unit	EF reference
	TSP	PM10	PM2.5		
08. Other Mobile Sources and Machinery					
0802 Railways					
080201 Diesel locomotives	4,7000	4,7000	4,7000	kg/Mg	PL(ITS) *
Inland waterways					
0803 Inland waterways	4,7000	4,7000	4,7000	kg/Mg	PL(ITS)
0804 Shipping activities					
080402 National sea traffic, fuel oil					
080403 National fishing, diesel oil					
0805 Air traffic					
aviation gasoline	0,0300	0,0300	0,0300	kg/Mg	PL(ITS)
0806 Agriculture					
Tractors	5,2000	5,2000	5,2000	kg/Mg	PL(ITS)
Machinery	5,2000	5,2000	5,2000	kg/Mg	PL(ITS)
0808 Industry					
Industry - oil engine powered machinery	5,2000	5,2000	5,2000	kg/Mg	PL(ITS)
0809 Household and gardening					
Other machinery (gasoline engines)	5,2000	5,2000	5,2000	kg/Mg	PL(ITS)
Other machinery (oil engines)	0,0110	0,0110	0,0110	kg/Mg	PL(ITS)
Other machinery (LPG)	0,0000	0,0000	0,0000	kg/Mg	PL(ITS)

* emission factors come from ITS surveys

Table 3.88 NMVOC emission factors applied for SNAP 08

Emission source	EF	EF unit	EF Reference
08. Other mobile sources and machinery			
0802 Railways			
080201 Diesel locomotives	12.7	kg/Mg	PL (ITS) *
0803 Inland waterways	12.7	kg/Mg	PL (ITS)
080402 National sea traffic	12.7	kg/Mg	PL (ITS)
080403 National fishing	12.7	kg/Mg	PL (ITS)
0805 Air traffic			
jet fuel	0.78	kg/Mg	PL (ITS)
aviation gasoline	24	kg/Mg	PL (ITS)
0806 Agriculture			
Tractors	8	kg/Mg	PL (ITS)
Machinery	12.8	kg/Mg	PL (ITS)
0808 Industry			
Industry - oil engine powered machinery	12.1	kg/Mg	PL (ITS)
0810 Other machinery (gasoline engines)			
Other machinery (oil engines)	12.4	kg/Mg	PL (ITS)
Other machinery (gasoline)	300	kg/Mg	PL (ITS)
Other machinery (LPG)	25	kg/Mg	PL (ITS)

* emission factors come from ITS surveys

Table 3.89 Main Heavy Metals emission factors applied for SNAP 08

Emission source	Emission factors *			Unit
	Cd	Hg	Pb	
08. Other mobile sources and machinery				
Unleaded gasoline			4.3	kg/Gg
Diesel oil	0.05			kg/Gg

* EFs were taken from international publications

Table 3.90 Additional Heavy Metals emission factors applied for SNAP 08

Emission source	Emission factors *					Unit
	As	Cr	Cu	Ni	Zn	
08. Other mobile sources and machinery						
Unleaded gasoline		0.5	0.3	0.5		kg/Gg
Diesel oil			0.3	0.5		kg/Gg

* EFs were taken from international publications

Table 3.91 PCDD/F emission factors applied for SNAP 08

SNAP	Activity	EF	Unit	EF Reference
08	Gasoline	0.104	mg TEQ/Gg	LUA-NRW (1997): <i>Identification of Relevant Industrial Sources of Dioxins and Furans in Europe – The European Dioxin Inventory</i> , Essen 1997
08	Diesel oil	0.043	mg TEQ/Gg	LUA-NRW (1997): <i>Identification of Relevant Industrial Sources of Dioxins and Furans in Europe – The European Dioxin Inventory</i> , Essen 1997

Table 3.92 Benzo(a)pyrene emission factors applied for SNAP 08

SNAP	Activity	EF	Unit	EF Reference
08	Motor gasoline	0.0107	kg/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
08	Diesel oil	0.297	kg/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995

Table 3.93 Benzo(k)fluoranthene emission factors applied for SNAP 08

SNAP	Activity	EF	Unit	EF Reference
08	Motor gasoline	0.00642	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
08	Diesel oil	0.17820	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995

Table 3.94 Indeno(1.2.3-cd)pyrene emission factors applied for SNAP 08

SNAP	Activity	EF	Unit	EF Reference
08	Motor gasoline	0.0107	g/Gg	Berdowski et al. (1995): <i>Technical paper to the OSPARCOM-HELCOM-UNECE emission heavy metals and persistent organic pollutants</i> , 1995
08	Diesel oil	0.2970	g/Gg	

3.9 Waste Treatment And Disposal (SNAP 09)

Activity data for this sector were based on statistics from several sources:

- Population – number of population was taken from Statistical yearbook [GUS]
- Waste incineration volumes were estimated in a domestic case study [Wielgosiński 2009]
- Number of cremations was taken from branch organization.

Emission factors for the particular pollutants with their source are presented in the tables below.

Table 3.95 SO₂ emission factors applied for SNAP 09

SO ₂ emission source	Emission factor *	EF unit
09. Waste treatment and disposal		
0902 Waste incineration		
090201 Municipal waste incineration	0.4	kg/Mg
090202 Industrial waste incineration	0.047	kg/Mg
090205 Hospital waste incineration	1.4	kg/Mg
0909 Cremations	0.544	kg/body

* emission factors applied were taken from EMEP/EEA (2009) Guidebook

Table 3.96 NO_x emission factors applied for SNAP 09

NO _x emission source	Emission factor *	EF unit
09. Waste Treatment and Disposal		
0902 Waste incineration		
090201 Municipal waste incineration	1.8	kg/Mg
090202 Industrial waste incineration	0.87	kg/Mg
090207 Hospital waste incineration	1.4	kg/Mg
0907 Open burning of agricultural wastes	0.004	Mg/Mg
0909 Cremations	0.309	kg/body

* emission factors applied for Open burning of agricultural wastes is country specific while other emission factors applied were taken from EMEP/EEA (2009) Guidebook

Table 3.97 CO emission factors applied for SNAP 09

CO emission source	Emission factor	EF unit
09. Waste Treatment and Disposal		
0907 Open burning of agricultural wastes	0.064	Mg/Mg

* emission factor applied for *Open burning of agricultural wastes* is country specific

Table 3.98 NH₃ emission factors applied for SNAP 09

SNAP	Emission source	EF	unit	reference
091007	Latrines	1.6	[kg/person/year]	EMEP/EEA (2009): <i>EMEP/EEA emission inventory guidebook 2009</i>

Table 3.99 PM emission factors applied for SNAP 09

PM Emission source	Emission factor			EF unit	EF reference
	TSP	PM10	PM2.5		
09. Waste Treatment and Disposal					
0902 Waste incineration					
090201 Municipal waste incineration	0,0001	0,0001	0,0001	Mg/Mg	CEPMEIP
090202 Industrial waste incineration	0,1000	0,0600	0,0350	Mg/Mg	CEPMEIP
0907 Open burning of agricultural wastes	0,0047	0,0033	0,00282	Mg/Mg	CEPMEIP

Table 3.100 NMVOC emission factors applied for SNAP 09

Emission source	EF	EF unit	EF Reference
09. Waste treatment and disposal			
0902 Waste incineration			
090201 Municipal waste incineration	0.0074	Mg/Mg	CORINAIR
090202 Industrial waste incineration	0.0074	Mg/Mg	CORINAIR
090205 Sludge incineration	0.0074	Mg/Mg	CORINAIR
090205 Hospital waste incineration	0.0074	Mg/Mg	CORINAIR
0907 Open burning of agricultural wastes	0.002	Mg/Mg	CORINAIR
0909 Cremations	0.013	Mg/1000 body	CORINAIR

Table 3.101 Main Heavy Metals emission factors applied for SNAP 09

Emission source	Emission factors *			Unit
	Cd	Hg	Pb	
09. Waste treatment and disposal				
0902 Waste incineration	3	1	35	kg/Gg

* Main Heavy Metals emission factors applied in SNAP 09 were taken from international publications

Table 3.102 Additional Heavy Metals emission factors applied for SNAP 09

Emission source	Unit	Emission factors *				
		As	Cr	Cu	Ni	Zn
09. Waste treatment and disposal						
0902 Waste incineration	kg/Gg	0.05	0.3	3	0.1	21

* Additional Heavy Metals emission factors applied in SNAP 09 were taken from international publications

Table 3.103 PCDD/F emission factors applied for SNAP 09

SNAP	Activity	EF	Unit	EF Reference
090201	Municipal waste incineration (modern APCs)	0.5	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases</i> , 2005
090202	Industrial waste incineration (no APCs)	3500	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases</i> , 2005
090202	Industrial waste incineration (minimal APCs)	350	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases</i> , 2005
090202	Industrial waste incineration (good APCs)	30	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases</i> , 2005
090202	Industrial waste incineration (very good APCs)	0.5	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases</i> , 2005
090205	Sewage sludge incineration (with APCs)	4	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases</i> , 2005
090207	Hospital waste incineration (installations that comply with EU Directive)	1.38	mg TEQ/Gg	Grochowalski A. (2001): <i>Estimation and analysis of emission factors for PCDD/F and PAHs from selected sources for emission inventor purposes, 2001 (in Polish)</i>
090207	Hospital waste incineration (minimal APCs)	68	mg TEQ/Gg	GF/POL/01/004 <i>Enabling activities to facilitate early action on the implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs Convention) in Poland</i>
090207	Hospital waste incineration (no APCs)	453.3	mg TEQ/Gg	Grochowalski A. (2001): <i>Estimation and analysis of emission factors for PCDD/F and PAHs from selected sources for emission inventor purposes, 2001 (in Polish)</i>
0907	Open burning of agricultural wastes (excluding code 1003)	0.5	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases</i> , 2005
0907	Open burning of agricultural wastes (poor combustion conditions)	30	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases</i> , 2005
090901	Cremation of corpses	10	µg TEQ / cremation	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases</i> , 2005

Table 3.104 Emission factors of PCBs applied for SNAP 09

SNAP	Activity	EF	Unit	EF Reference
090201	Municipal waste incineration	0.2	g/Gg	NILU (1999): <i>Environmental Cycling of Selected Persistent Organic Pollutants (POPs) in the Baltic Region (POPCYCLING)</i>
090202	Industrial waste incineration (no APCs)	30.4	g/Gg	Parma et al. (1995): <i>Atmospheric emission inventory guidelines for persistent organic pollutants (POPs)</i>
090202	Industrial waste incineration (minimal APCs)	19.3	g/Gg	Parma et al. (1995): <i>Atmospheric emission inventory guidelines for persistent organic pollutants (POPs)</i>
090202	Industrial waste incineration (good and very good APCs)	0.38	g/Gg	GF/POL/01/004 <i>Enabling activities to facilitate early action on the implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs Convention) in Poland, 2002</i>
090207	Hospital waste incineration (installations that comply with EU Directive)	0.39	g/Gg	GF/POL/01/004 <i>Enabling activities to facilitate early action on the implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs Convention) in Poland, 2002</i>
090207	Hospital waste incineration (no or minimal APCs)	20	g/Gg	<i>EMEP/CORINAIR atmospheric emission inventory guidebook.</i>

Table 3.105 HCB emission factors applied for SNAP 09

SNAP	Activity	EF	Unit	EF Reference
090201	Municipal waste incineration	0.15	g/Gg	EF applied in Hungary
090202	Industrial waste incineration (no or minimal APCs)	19	g/Gg	Bailey (2001): <i>Global hexachlorobenzene emission, Chemosphere 43 (2001),</i>
090202	Industrial waste incineration (good and very good APCs)	0.139	g/Gg	GF/POL/01/004 <i>Enabling activities to facilitate early action on the implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs Convention) in Poland, 2002</i>
090207	Hospital waste incineration (installations that comply with EU Directive)	0.295	g/Gg	GF/POL/01/004 <i>Enabling activities to facilitate early action on the implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs Convention) in Poland, 2002</i>
090207	Hospital waste incineration (no or minimal APCs)	29	g/Gg	Bailey (2001): <i>Global hexachlorobenzene emission, Chemosphere 43 (2001),</i>

3.10 Agriculture (SNAP 10)

Activity data for this sector were based on statistics from several sources:

- Animal population was taken from *Statistical yearbook* [GUS]
- Amount of synthetic fertilizer nitrogen applied to agricultural fields was taken from *Statistical yearbook of agriculture and rural areas* [GUS].

Emission factors for the particular pollutants with their source are presented in the tables below.

Table 3.106 NH₃ emission factors applied for SNAP 1001

SNAP	Activity	EF	unit	EF reference
1001	Cultures with fertilisers	0.07	kg NH ₃ /kg N	Country specific EF based on: Grześkowiak 2001, Pietrzak 2006 * and EMEP/CORINAIR <i>Emission Inventory Guidebook - 2006</i>

* Grześkowiak A. 2001. Kierunki zmian w asortymencie nawozów mineralnych. (*Change tendencies in mineral fertilizers assortment*). Zakłady Chemiczne Police SA. <http://www.ppr.pl/arttykul.php?id=2905>
 Pietrzak S. 2006. Metoda inwentaryzacji emisji amoniaku ze źródeł rolniczych w Polsce i jej praktyczne zastosowanie. (*Inventory method for Ammonia emissions from agricultural sources in Poland and its practical application*). Woda – Środowisko – Obszary Wiejskie. IMUZ Institute for Land Reclamation and Grassland Farming, 2006: t.6 z.1 (16), s. 319-334.

Ammonia emissions from fertilizers use for crop cultivation was estimated on the basis of country specific factor elaborated on domestic structure of nitrogen fertilizers application in the years 1995–1997 [Grześkowiak 2001] and in 2000 [Pietrzak 2006] as well as using default ammonia loss factors characteristic for region B (mean air temperature for Spring season 6–13°C) [EMEP/CORINAIR *Emission Inventory Guidebook - 2006*]. The highest share in nitrogen fertilizers applied in Poland in 2000 had ammonium nitrate (45 %) and urea (25 %).

Table 3.107 NH₃ emission factors applied for SNAP 1005

SNAP	Activity	EF	unit	EF reference
1005	Manure management regarding organic compounds			
100501	Dairy cows	21.05	kg NH ₃ /animal/year	Country specific EF: Pietrzak 2006 *
100502	Other cattle	14.60	kg NH ₃ /animal/year	
100503	Fattening pigs	6.33	kg NH ₃ /animal/year	
100504	Sows	8.64	kg NH ₃ /animal/year	
100505	Sheep	1.46	kg NH ₃ /animal/year	
100506	Horses	9.73	kg NH ₃ /animal/year	
100507	Laying hens	0.29	kg NH ₃ /animal/year	
100508	Broilers	0.02	kg NH ₃ /animal/year	
100509	Other poultry	0.15	kg NH ₃ /animal/year	
100511	Goats	1.46	kg NH ₃ /animal/year	

* Pietrzak S. 2006. Metoda inwentaryzacji emisji amoniaku ze źródeł rolniczych w Polsce i jej praktyczne zastosowanie. (*Inventory method for Ammonia emissions from agricultural sources in Poland and its practical application*). Woda – Środowisko – Obszary Wiejskie. IMUZ Institute for Land Reclamation and Grassland Farming, 2006: t.6 z.1 (16), s. 319-334.

NH₃ emission factors from manure management are country specific and come from publication [Pietrzak 2006], where EFs were assessed based on country data on animal waste management systems and livestock breeding schemes.

Table 3.108 PM emission factors applied for SNAP 10

PM Emission source	Emission factor			EF unit	EF reference
	TSP	PM10	PM2.5		
10. Agriculture					
1003 Stubble burning	0,0047	0,0033	0,00282	Mg/Mg	CEPMEIP
1005 Manure management					
100501 Dairy cows	0,888000	0,400000	0,008880	kg/animal	CEPMEIP
100502 Other cattle	0,888000	0,400000	0,008880	kg/animal	CEPMEIP
100503 Fattening pigs	0,867000	0,390000	0,008670	kg/animal	CEPMEIP
100504 Sows	0,867000	0,390000	0,008670	kg/animal	CEPMEIP
100506 Horses	0,867000	0,390000	0,008670	kg/animal	CEPMEIP
100507 Laying hens	0,008310	0,003740	0,000831	kg/animal	CEPMEIP
100508 Broilers	0,008310	0,003740	0,000831	kg/animal	CEPMEIP
100509 Other poultry	0,554000	0,250000	0,005540	kg/animal	CEPMEIP

Table 3.109 NMVOC emission factors applied for SNAP 10

Emission source	EF	EF unit	EF Reference
10. Agriculture			
1001 Cultures with fertilizers	0.0059554	kg/Gg fertilizer	PL (IETU) *
1003 Stubble burning	0.0063	kg/kg of biomass	PL (IETU)

*estimated by IETU, based on EMEP/Corinair methodology

Table 3.110 PCDD/F emission factors applied for SNAP 10

SNAP	Activity	EF	Unit	EF Reference
1003	On-field burning of stubble and straw	5	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases</i> , 2005

3.11 Other Sources And Sinks (SNAP 11)

Activity data for this sector were based on statistics from several sources:

- Forests fires and number of cigarettes smoked – from Statistical yearbooks [GUS]
- Forests area – from Forestry yearbook [GUS]
- Number of fires (cars, houses and industry plants) - from statistics of State Fire Service.

Emission factors for the particular pollutants with their source are presented in the tables below.

Table 3.111 PM emission factors applied for SNAP 11

PM Emission source	Emission factor			EF unit	EF reference
	TSP	PM10	PM2.5		
11. Other Sources and Sinks					
1103 Forests fires	0,0047	0,0033	0,00282	Mg/Mg	CEPMEIP
1126 Other (cigarette smoking)	0,0400	0,0400	0,0400	Mg/Mg	CEPMEIP

Table 3.112 NMVOC emission factors applied for SNAP 11

Emission source	EF	EF unit	EF Reference
11. Other sources and sinks			
1101 Non managed broadleaf forests	10	kg/ha	PL (IETU)*
1102 Non managed coniferous forests	40	kg/ha	PL (IETU)*
1103 Forest and other vegetation fires	0.5	Mg/ha	PL (IETU)*

* emission factors come from ITS surveys

Table 3.113 PCDD/F emission factors applied for SNAP 11

SNAP	Activity	EF	Unit	EF Reference
1103	Forest and other vegetation fires	5	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>
1125	Other (landfill fires)	1000	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>
1125	Other (automobile fires)	94	µg TEQ / fire of vehicle	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>
1125	Other (houses and industry plants fires)	400	mg TEQ/Gg	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>
1125	Other (cigarette smoking)	0.000001	µg TEQ/ cigarette	UNEP Chemicals (2005): <i>Standardized Toolkit for Identification and Quantification of dioxin and Furan Releases, 2005</i>

4. Recalculations and Improvements

Emission inventory of air pollutants though generally complete still needs recalculations and improvements of the elements described below.

4.1 Recalculations

In the recent years several recalculations of emission inventory have been performed and some are planned for 2010.

Performed recalculations resulted from corrections of energy statistics, methodology changes and including additional emission sources. Recalculations were usually limited to the last two years (2005-2006, 2007-2008).

Most of changes (described shortly in methodology chapter above) have no significant implications for the inventory totals and trends, with the exemptions of PCB emissions (from 2007) and HCB emissions (from 2001).

Detailed description of recalculations performed will be included in the IIR report as they are completed for the whole period from 1990.

4.2 Planned improvements

Planned programme of improvement is focused on the following tasks:

recalculations of emissions resulting from corrections of activity data (energy statistics, production statistics)

recalculations of emissions resulting from methodology changes (updating of emission factors and including additional emission sources)
applying higher tier of estimation methodology, especially for key sources.

5. Projections

Description by source sector of general methods, data sources and assumptions used for estimating projected emissions and activity data for 2010 have been included in the Report on the Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants (NEC) submitted in December 2009.

Due to partial recalculations performed, volumes of emissions of SO₂ and NO_x submitted in LRTAP report are different than in NEC report. Therefore appropriate update of NEC report will be carried out in March 2010.

Appendix 1: Key category analysis

Key source categories are sources that together contribute with 95 % of the level of reported emissions in Poland. For this report level assessments were carried out for the following pollutants: NO_x, CO, NMVOC, SO₂, NH₃, TSP, Pb, Cd, Hg, As, Cr, Cu, Ni, Zn, dioxins and furans (PCDD/F), PCB, HCB and PAH. The level assessment was performed for the year 2008. The ten largest key sources from the level assessment are presented in the table A1.1. Detailed analysis for the particular pollutants is presented in the tables below.

Table A1.1 The ten largest key sources from the level assessment for 2008

Pollutant	Key sources in descending order									
SO ₂	1 A 1 a	1 A 4 b i	1 A 2 f i	1 A 1 a	1 A 4 c i	1 A 1 b				
NO _x	1 A 1 a	1 A 3 b iii	1 A 2 f i	1 A 3 b i	1 A 4 c ii	1 A 4 b i	1 A 3 b ii	1 A 4 a i	2 B 5 a	1 A 2 f ii
CO	1 A 4 b i	1 A 3 b i	1 A 4 c i	1 A 3 b ii	1 A 2 f i	1 A 3 b iii	1 A 4 c ii	1 A 4 b ii		
NH ₃	4 D 1 a	4 B 8	4 B 1 a	4 B 1 b	4 B 9					
TSP	1 A 4 b i	1 A 3 b vi	1 A 2 f i	1 B 1 a	1 A 4 c i	1 A 1 a	6 C b	1 A 3 b iii	2 C 1	4 B 8
NMVOC	1 A 4 b i	3 A 2	1 A 3 b i	3 D 2	1 A 3 b iii	3 B 1	1 A 4 b ii	3 A 1	2 B 5 a	1 B 2 a v
Cd	1 A 4 b i	1 A 2 f i	1 A 4 c i	1 A 2 b	1 A 1 a	2 C 1	1 A 4 a i	1 A 1 b		
Hg	1 A 1 a	1 A 2 f i	1 A 2 b	1 A 4 b i	2 C 1	1 B 1 b				
Pb	1 A 2 b	1 A 4 b i	2 C 1	1 A 2 f i	1 A 1 a	1 A 4 c i	1 A 3 b i			
As	1 A 2 b	1 A 4 b i	1 A 2 f i	1 A 1 a	1 A 4 c i	1 A 4 a i				
Cr	1 A 4 b i	1 A 2 f i	2 C 1	1 A 1 a	2 C 2	1 A 4 c i	1 A 3 b i	1 B 1 b	1 A 4 a i	
Cu	1 A 2 b	1 A 4 b i	1 A 2 f i	2 C 1	1 A 1 a	1 A 4 c i				
Ni	1 A 4 b i	1 A 2 f i	1 A 1 b	1 A 1 a	1 A 4 c i	2 C 1	1 A 4 a i	1 A 3 b i		
Zn	1 A 2 b	1 A 4 b i	2 C 1	1 A 2 f i	1 A 1 a	1 A 4 c i				
PCDD/F	1 A 4 b i	6 D	1 A 2 f i	2 C 1	1 A 2 b	6 C b	1 A 1 a	1 A 2 a		
HCB	1 A 2 b	1 A 4 b i	1 A 2 a	1 A 1 a	6 C b	1 A 2 f i				
PCB	1 A 4 b i	1 A 1 a	1 A 3 b iii	2 C 1						
PAH	1 A 4 b i	1 A 4 c i	1 B 1 b	2 C 3						

Sulphur dioxide emissions

Six source categories have been identified as key sources (level assessment) in SO₂ inventory for 2008 in Poland. The most of them are stationary combustion of fuels for energy production.

Table A1.2 Level Assessment for sulphur dioxide emission sources

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
1 A 1 a	0101	Public Electricity and CHP Production	448.4519	44.91%	44.91%
1 A 4 b i	0202	Residential: Stationary	184.1000	18.44%	63.35%
1 A 2 f i	0301+0302+0303+0808	Stationary Combustion in Manufacturing Industries and Construction: Other	170.8810	17.11%	80.46%

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
1 A 1 a	0102	Public Heat Production	93.7176	9.39%	89.84%
1 A 4 c i	0203	Agriculture/Forestry/Fishing: Stationary	32.8502	3.29%	93.13%
1 A 1 b	0103	Petroleum refining	25.7240	2.58%	95.71%

Carbon monoxide emissions

Eight source categories have been identified as key sources (level assessment) in CO inventory for 2008 in Poland. The most important of them are combustion of fuels in households and road transportation by passenger cars.

Table A1.3 Level Assessment for carbon monoxide emission sources

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
1 A 4 b i	0202	Residential: Stationary	1 410 624.7	52.76%	52.76%
1 A 3 b i	0701	Road Transport:, Passenger cars	536 315.0	20.06%	72.82%
1 A 4 c i	0203	Agriculture/Forestry/Fishing: Stationary	255 220.8	9.55%	82.37%
1 A 3 b ii	0702	Road Transport:, Light duty vehicles	98 550.5	3.69%	86.06%
1 A 2 f i	030311+030314+0301+0302+0808	Stationary Combustion in Manufacturing Industries and Construction: Other	77 031.8	2.88%	88.94%
1 A 3 b iii	0703	Road Transport:, Heavy duty vehicles	72 517.1	2.71%	91.65%
1 A 4 c ii	0806	Agriculture/Forestry/Fishing: Off-road Vehicles and Other Machinery	61 155.2	2.29%	93.94%
1 A 4 b ii	0810	Residential: Household and gardening (mobile)	47 328.3	1.77%	95.71%

Nitrogen oxides emission

Eleven source categories have been identified as key sources (level assessment) in NO_x inventory for 2008 in Poland. The most important of them are: stationary combustion of fuels for energy production in public power plants, road transportation and manufacturing industries.

Table A1.4 Level Assessment for nitrogen oxides emission sources

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
1 A 1 a	0101+0102	Public Electricity and Heat Production	260 826.92	31.38%	32.09%
1 A 3 b iii	0703	Road Transport:, Heavy duty vehicles	127 477.39	15.34%	62.96%
1 A 2 f i	0301+0302+030311+030314+0808	Other Stationary Combustion in Manufacturing Industries and Construction	99 721.14	12.00%	48.52%
1 A 3 b i	0701	Road Transport:, Passenger cars	96 997.60	11.67%	73.55%
1 A 4 c ii	0806	Agriculture/Forestry/Fishing: Off-road Vehicles and Other Machinery	69 985.80	8.42%	81.97%

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
1 A 4 b i	0202	Residential: Stationary	60 974.31	7.34%	88.31%
1 A 3 b ii	0702	Road Transport:, Light duty vehicles	31 595.46	3.80%	91.44%
1 A 4 a i	0201	Commercial / Institutional: Stationary	16 044.68	1.93%	94.88%
2 B 5 a	040407+040409+040410+040501+040512	Other chemical industry	15 824.27	1.90%	93.44%
1 A 2 f ii	0808	Mobile Combustion in manufacturing industries and construction	8 460.00	1.02%	
1 A 4 c i	0203	Agriculture/Forestry/Fishing: Stationary	8 434.03	1.01%	95.91%

Ammonia emissions

Five source categories have been identified as key sources (level assessment) in NH₃ inventory for 2008 in Poland. The most important of them are: manure management and use of fertilizers.

Table A1.5 Level Assessment for ammonia emission sources

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
4 D 1 a	1001	Direct Soil Emission - Synthetic N-fertilizers	83.983	29.44%	29.44%
4 B 8	100503	Manure management - Swine	71.634	25.11%	54.55%
4 B 1 a	100501	Manure management - Dairy	59.056	20.70%	75.25%
4 B 1 b	100502	Manure management - Non-Dairy	43.066	15.10%	90.34%
4 B 9	100507	Manure management – Poultry	18.579	6.51%	96.85%

Particulate matter emissions

Seventeen source categories have been identified as key sources (level assessment) in TSP inventory for 2008 in Poland. The most important of them are: stationary combustion of fuels (SNAP 01.02.03), road transportation (tyre and brake wear), extraction and distribution of fossil fuels, industrial waste incineration and manure management.

Table A1.6 Level Assessment for TSP emission sources

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
1 A 4 b i	0202	Residential: Stationary	139 839.5	33.19%	33.19%
1 A 3 b vi	0707	Road Transport:, Automobile tyre and brake wear	55 018.9	13.06%	46.25%
1 A 2 f i	0301+0302+0303	Stationary Combustion in Manufacturing Industries and Construction: Other	38 761.1	9.20%	55.45%
1 B 1 a	0501	Fugitive emission from solid fuels: Coal mining and handling	32 778.4	7.78%	63.23%
1 A 4 c i	0203	Agriculture/Forestry/Fishing: Stationary	26 270.3	6.24%	69.47%
1 A 1 a	0101+0102	Public Electricity and Heat Production	26 205.5	6.22%	75.69%
6 C b	090202	Industrial Waste Incineration	12 381.8	2.94%	78.63%

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
1 A 3 b iii	0703	Road Transport:, Heavy duty vehicles	11 440.2	2.72%	81.34%
2 C 1	040203	Iron and Steel Production	9 722.7	2.31%	83.65%
4 B 8	100503+100504	Manure management- Swine	9 292.5	2.21%	85.85%
4 B 9 d	100507-9	Manure management - poultry	9 256.2	2.20%	88.05%
1 A 4 c ii	0806	Agriculture/Forestry/Fishing: Off-road Vehicles and Other Machinery	6 853.6	1.63%	89.68%
1 A 2 a	0303 (Iron)	Stationary combustion in manufacturing industries and construction: Iron and steel	6 305.4	1.50%	91.18%
1 A 4 a i	0201	Commercial / Institutional: Stationary	5 849.0	1.39%	92.56%
2 B 5 a	040407+040409 +040414+040508	Other chemical industry	4 999.2	1.19%	93.75%
1 A 3 b i	0701	Road transport: Passenger cars	3 927.6	0.93%	94.68%
4 B 1 b	100502	Cattle non-dairy	2 619.6	0.62%	95.30%

NMVOCs emissions

Twenty four source categories have been identified as key sources (level assessment) in NMVOC inventory for 2008 in Poland. The most important of them are: paint application, stationary combustion of fuels in households, road transportation by passenger cars and domestic solvent use.

Table A1.7 Level Assessment for NMVOC emission sources

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
1 A 4 b i	0202	Residential: Stationary plants	89 164.3	15.30%	15.30%
3 A 2	0601	Industrial coating application	59 300.1	10.18%	25.48%
1 A 3 b i	0701	Road Transport: Passenger cars	49 452.7	8.49%	33.97%
3 D 2	0604	Domestic solvent use	45 763.2	7.85%	41.82%
1 A 3 b iii	0703	Road transport: Heavy duty vehicles	31 177.5	5.35%	47.18%
3 B 1	0602	Degreasing and dry cleaning	29 613.0	5.08%	52.26%
1 A 4 b ii	0809	Residential: Household and gardening (mobile)	28 658.5	4.92%	57.18%
3 A 1	0601	Decorative coating application	23 545.6	4.04%	61.22%
2 B 5 a	040409+0405	Other chemical industry - processes in organic chemical industries	22 852.6	3.92%	65.14%
1 B 2 a v	0505	Distribution of oil products	22 519.4	3.87%	69.01%
3 C	0603	Chemical products	22 061.4	3.79%	72.79%
1 B 2 a iv	0401	Refining/storage	18 932.5	3.25%	76.04%
1 A 4 c i	0203	Agriculture/Forestry/Fishing: Stationary	16 570.7	2.84%	78.89%
1 A 1 a	0101+0102	Public Electricity and Heat Production	15 612.3	2.68%	81.57%
1 A 3 b ii	0702	Road Transport: Light duty vehicles	11 666.3	2.00%	83.57%
1 A 4 c ii	0806	Agriculture/Forestry/Fishing: Off-road Vehicles and Other Machinery	11 176.6	1.92%	85.49%
2 D 2	040605-040608	Food and drink	11 027.1	1.89%	87.38%

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
1 B 1 a	0501	Fugitive emission from Solid Fuels: Coal Mining and Handling	8 434.5	1.45%	88.83%
3 D 3	060104	Other product use	7 938.0	1.36%	90.19%
1 A 2 f i	0301+0302+0303 reszta	Stationary Combustion in Manufacturing Industries and Construction: Other	7 921.9	1.36%	91.55%
1 B 2 b	0503 + 0506	Natural gas	7 411.9	1.27%	92.82%
1 A 3 b iv	0704 + 0705	Road Transport: Mopeds & Motorcycles	5 958.0	1.02%	93.84%
3 B 2	060602	Dry cleaning	5 720.4	0.98%	94.83%
2 C 1	040202+040206 +040207+040208	Iron and Steel Production	5 094.5	0.87%	95.70%

Heavy metal emissions

Tables below include emission Level Assessment estimates for Cd, Hg, Pb, As, Cr, Cu, Ni and Zn according to NFR classification.

Eight source categories have been identified as key sources (level assessment) in Cd inventory for 2008 in Poland. The most important of them are: stationary combustion of fuels in residential plants, combustion in manufacturing industry, combustion in agriculture and forestry.

Table A1.8 Level Assessment for Cd emission sources

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
1 A 4 b i	0202	Residential: Stationary plants	19.384	46.40%	46.40%
1 A 2 f i	0301.0302, 030311, 030314	Stationary Combustion in Manufacturing Industries and Construction: Electricity and Heat Production; cement and glass production	6.187	14.81%	61.21%
1 A 4 c i	0203	Agriculture/Forestry/Fishing: Stationary	5.190	12.43%	73.64%
1 A 2 b	030304 - 030309	Stationary Combustion in Manufacturing Industries and Construction: Non-ferrous Metals	2.872	6.88%	80.52%
1 A 1 a	0101, 0102	Public Electricity and Heat Production	2.236	5.35%	85.87%
2 C 1	040203-040209	Iron and Steel Production	1.887	4.52%	90.39%
1 A 4 a i	0201	Commercial / Institutional: Stationary	1.532	3.67%	94.05%
1 A 1 b	0103	Petroleum refining	0.742	1.78%	95.83%

Six source categories have been identified as key sources (level assessment) in Hg inventory for 2008 in Poland. The most important of them are: public power plants, combustion in manufacturing industry and district heating plants.

Table A1.9 Level Assessment for Hg emission sources

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
1 A 1 a	0101, 0102	Public Electricity and Heat Production	8.699	55.45%	55.45%

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
1 A 2 f i	0301.0302, 030311, 030314	Stationary Combustion in Manufacturing Industries and Construction: Electricity and Heat Production; cement and glass production	3.290	20.97%	76.42%
1 A 2 b	030304-030309	Stationary Combustion in Manufacturing Industries and Construction: Non-ferrous Metals	1.341	8.55%	84.97%
1 A 4 b i	0202	Residential: Stationary plants	0.951	6.06%	91.03%
2 C 1	040203-040209	Iron and Steel Production	0.519	3.31%	94.34%
1 B 1 b	040201	Fugitive emission from Solid Fuels: Solid fuel transformation	0.295	1.88%	96.22%

Seven source categories have been identified as key sources (level assessment) in Pb inventory for 2008 in Poland. The most important of them are: non-ferrous metals production, stationary combustion of fuels in residential plants and processes in iron and steel industries.

Table A1.10 Level Assessment for Pb emission sources

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
1 A 2 b	030304 - 030309	Stationary Combustion in Manufacturing Industries and Construction: Non-ferrous Metals	238.228	43.26%	43.26%
1 A 4 b i	0202	Residential: Stationary plants	109.090	19.81%	63.07%
2 C 1	040203-040209	Iron and Steel Production	81.541	14.81%	77.88%
1 A 2 f i	0301.0302, 030311, 030314	Stationary Combustion in Manufacturing Industries and Construction: Electricity and Heat Production; cement and glass production	43.194	7.84%	85.72%
1 A 1 a	0101, 0102	Public Electricity and Heat Production	22.769	4.13%	89.86%
1 A 4 c i	0203	Agriculture/Forestry/Fishing: Stationary	20.147	3.66%	93.52%
1 A 3 b i	0701	Road Transport:, Passenger cars	15.872	2.88%	96.40%

Six source categories have been identified as key sources (level assessment) in As inventory for 2008 in Poland. The most important of them are: non-ferrous metals production, stationary combustion of fuels in residential plants and combustion in manufacturing industry.

Table A1.11 Level Assessment for As emission sources

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
1 A 2 b	030304-030309	Stationary Combustion in Manufacturing Industries and Construction: Non-ferrous Metals	18.005	40.76%	40.76%
1 A 4 b i	0202	Residential: Stationary plants	12.471	28.23%	68.99%
1 A 2 f i	0301.0302, 030311, 030314	Stationary Combustion in Manufacturing Industries and Construction: Electricity and Heat Production; cement and glass production	4.142	9.38%	78.37%
1 A 1 a	0101, 0102	Public Electricity and Heat Production	4.000	9.05%	87.42%
1 A 4 c i	0203	Agriculture/Forestry/Fishing: Stationary	2.608	5.90%	93.32%
1 A 4 a i	0201	Commercial / Institutional: Stationary	0.975	2.21%	95.53%

Nine source categories have been identified as key sources (level assessment) in Cr inventory for 2008 in Poland. The most important of them are: stationary combustion of fuels in residential plants, combustion in manufacturing industries and processes in iron and steel industries.

Table A1.12 Level Assessment for Cr emission sources

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
1 A 4 b i	0202	Residential: Stationary plants	14.765	30.02%	30.02%
1 A 2 f i	0301.0302, 030311, 030314	Stationary Combustion in Manufacturing Industries and Construction: Electricity and Heat Production; cement and glass production	8.914	18.13%	48.15%
2 C 1	040203-040209	Iron and Steel Production	6.708	13.64%	61.79%
1 A 1 a	0101, 0102	Public Electricity and Heat Production	5.066	10.30%	72.09%
2 C 2	040302	Ferroalloys Production	4.482	9.11%	81.21%
1 A 4 c i	0203	Agriculture/Forestry/Fishing: Stationary	2.895	5.89%	87.09%
1 A 3 b i	0701	Road Transport:, Passenger cars	1.846	3.75%	90.85%
1 B 1 b	040201	Fugitive emission from Solid Fuels: Solid fuel transformation	1.671	3.40%	94.24%
1 A 4 a i	0201	Commercial / Institutional: Stationary	1.262	2.57%	96.81%

Six source categories have been identified as key sources (level assessment) in Cu inventory for 2008 in Poland. The most important of them are: non-ferrous metals production, stationary combustion of fuels in residential plants and combustion in manufacturing industry.

Table A1.13 Level Assessment for Cu emission sources

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
1 A 2 b	030304-030309	Stationary Combustion in Manufacturing Industries and Construction: Non-ferrous Metals	204.783	58.75%	58.75%
1 A 4 b i	0202	Residential: Stationary plants	64.949	18.63%	77.39%
1 A 2 f i	0301.0302, 030311, 030314	Stationary Combustion in Manufacturing Industries and Construction: Electricity and Heat Production; cement and glass production	18.990	5.45%	82.83%
2 C 1	040203-040209	Iron and Steel Production	17.912	5.14%	87.97%
1 A 1 a	0101, 0102	Public Electricity and Heat Production	15.617	4.48%	92.45%
1 A 4 c i	0203	Agriculture/Forestry/Fishing: Stationary	12.179	3.49%	95.95%

Eight source categories have been identified as key sources (level assessment) in Ni inventory for 2008 in Poland. The most important of them are: stationary combustion of fuels in residential plants, combustion in manufacturing industry and stationary combustion in petroleum refining industry.

Table A1.14 Level Assessment for Ni emission sources

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
1 A 4 b i	0202	Residential: Stationary plants	62.5296	35.99%	35.99%
1 A 2 f i	0301.0302, 030311, 030314	Stationary Combustion in Manufacturing Industries and Construction: Electricity and Heat Production; cement and glass production	46.9867	27.04%	63.03%
1 A 1 b	0103	Petroleum refining	20.2073	11.63%	74.66%
1 A 1 a	0101, 0102	Public Electricity and Heat Production	13.4066	7.72%	82.38%
1 A 4 c i	0203	Agriculture/Forestry/Fishing: Stationary	10.7191	6.17%	88.55%
2 C 1	040203-040209	Iron and Steel Production	5.8013	3.34%	91.89%
1 A 4 a i	0201	Commercial / Institutional: Stationary	5.0088	2.88%	94.77%
1 A 3 b i	0701	Road Transport:, Passenger cars	2.5762	1.48%	96.25%

Six source categories have been identified as key sources (level assessment) in Zn inventory for 2008 in Poland. The most important of them are: non-ferrous metals production, stationary combustion of fuels in residential plants, processes in iron and steel industries and combustion in manufacturing industries.

Table A1.15 Level Assessment for Zn emission sources

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [Mg]	Level Assessment	Cumulative Total of Emission
1 A 2 b	030304 - 030309	Stationary Combustion in Manufacturing Industries and Construction: Non-ferrous Metals	491.853	34.05%	34.05%
1 A 4 b i	0202	Residential: Stationary plants	438.041	30.33%	64.38%
2 C 1	040203-040209	Iron and Steel Production	166.969	11.56%	75.94%
1 A 2 f i	0301.0302, 030311, 030314	Stationary Combustion in Manufacturing Industries and Construction: Electricity and Heat Production; cement and glass production	137.859	9.54%	85.48%
1 A 1 a	0101, 0102	Public Electricity and Heat Production	76.015	5.26%	90.74%
1 A 4 c i	0203	Agriculture/Forestry/Fishing: Stationary	81.484	5.64%	96.39%

PCDD/F emissions

Eight source categories have been identified as key sources (level assessment) in PCDD/F inventory for 2008 in Poland. The most important of them are: stationary combustion of fuels in residential plants, landfill fires and industrial waste incineration.

Table A1.16 Level Assessment for PCDD/F emission sources

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [mg TEQ]	Level Assessment	Cumulative Total of Emission
1 A 4 b i	0202	Residential plants	198 991.07	49.84%	49.84%
6 D	11	Other	110 992.06	27.80%	77.63%
1 A 2 f i	0301+0302+0303+030311+030312+030313+030314+030315+030319+030320	Other Stationary Combustion in Manufacturing Industries and Construction	15 583.18	3.90%	81.54%

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [mg TEQ]	Level Assessment	Cumulative Total of Emission
2 C 1	040203-040209	Iron and Steel Production	13 660.59	3.42%	84.96%
1 A 2 b	030307+030308+030309+030310	Non-ferrous Metals	13 209.42	3.31%	88.27%
6 C b	090202	Industrial Waste Incineration	13 023.48	3.26%	91.53%
1 A 1 a	0101, 0102	Public Electricity and Heat Production	8 791.25	2.20%	93.73%
1 A 2 a	030301	Iron and Steel	8 513.60	2.13%	95.86%

HCB emissions

Six source categories have been identified as key sources (level assessment) in HCB inventory for 2008 in Poland. The most important of them are: non-ferrous metals production, stationary combustion of fuels in residential plants and processes in iron and steel industries.

Table A1.17 Level Assessment for HCB emission sources

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [kg]	Level Assessment	Cumulative Total of Emission
1 A 2 b	030309	Non-ferrous Metals	5.024292	51.65%	52.88%
1 A 4 b i	0202	Residential plants	1.535000	15.78%	67.48%
1 A 2 a	030301	Iron and Steel	0.882892	9.08%	77.24%
1 A 1 a	0101+0102	Public electricity and heat production	0.751873	7.73%	84.39%
6 C b	090202	Industrial Waste Incineration	0.710724	7.31%	90.89%
1 A 2 f i	0301+0302+030311	Other Stationary Combustion in Manufacturing Industries and Construction	0.514092	5.28%	96.81%

PCB emissions

Four source categories have been identified as key sources (level assessment) in PCB inventory for 2008 in Poland. The most important of them are: electrical capacitors filled with impregnating agents containing PCB and stationary combustion of fuels in residential plants.

Table A1.18 Level Assessment for PCB emission sources

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [kg]	Level Assessment	Cumulative Total of Emission
1 A 4 b i	0202	Residential plants	393.17	58.84%	58.84%
1 A 1 a	0101+0102	Public Electricity and Heat Production	122.73	18.37%	77.21%
1 A 3 b iii	0703	Road Transport, Heavy duty vehicles	104.93	15.70%	92.92%
2 C 1	040203-040209	Iron and Steel Production	31.55	4.72%	97.64%

PAH emissions

Four source categories have been identified as key sources (level assessment) in PAH inventory for 2008 in Poland. The most important of them are: stationary combustion of fuels in residential plants, stationary combustion in agriculture and forestry and coke production.

Table A1.19 Level Assessment for PAH emission sources

NFR code	SNAP'97 code	NFR Source Category	2008 Estimate [kg]	Level Assessment	Cumulative Total of Emission
1 A 4 b i	0202	Residential plants	114 891.97	71.85%	71.85%
1 A 4 c i	0203	Agriculture - Stationary	21 727.93	13.59%	85.44%
1 B 1 b	040201	Fugitive Emissions - Solid fuel transformation	15 237.65	9.53%	94.97%
2 C 3	040301	Aluminium Production	4 502.90	2.82%	97.78%

Appendix 2. National energy balance for 2008 in EUROSTAT format

Original units	Hard coal	Patent fuels	Coke	Total lignite	Old Lignite	Lignite recent	Brown coal briquettes	Tar, benzol	Coke-oven gas	Blast-furn. gas	Gasworks gas	Total Derived Gas	Natural gas
	1000 t							1000 t	TJ (GCV)				TJ (GCV)
Primary production	83 660			59 668		59 668							171 652
Recovered products	684												
Imports	10 331	9	85	20		20	8	11					425 945
Stock change	-3 547	-7	-509	-36		-36	0	8					-12 453
Exports	8 462	0	6 118	1		1		326					1 470
Bunkers													
Gross inland consumption	82 667	1	-6 542	59 651		59 651	8	-307					583 673
Transformation input	62 060		1 119	58 646		58 646	0		24 155	9 766		33 921	88 899
Classic thermal Power Stations	43 619			58 613		58 613			23 571	9 766		33 337	45 632
Public thermal power stations	42 442			58 613		58 613			11 952	7 595		19 547	43 044
Autoprod. thermal power stations	1 177								11 618	2 171		13 789	2 588
Nuclear power stations													
Patent fuel and briquetting plants													
Coke-oven plants	13 092		107										
Blast-furnace plants			1 008										
Gas works													
Refineries													31 442
District heating plants	5 349		4	33		33	0		585			585	11 825
Transformation output			9 831					534	82 273	28 551	106	110 930	
Classic thermal Power Stations													
Public thermal power stations													
Autoprod. thermal power stations													
Nuclear power stations													
Patent fuel and briquetting plants													
Coke-oven plants			9 831					534	82 273			82 273	
Blast-furnace plants										28 551		28 551	
Gas works											106	106	
Refineries													
District heating plants													
Exchanges and transfers, returns													
Interproduct transfers													
Products transferred													
Returns from petrochem. industry													
Consumption of the energy branch	547		23	197		197			44 007	8	7	44 021	29 389
Production and distribution of electricity	16		0	172		172			8			8	77
Pumped storage stations													
District heating plants	21								0			0	40
Extraction and aggl. of solid fuels	509		2	25		25			151			151	393
Coke-oven and gas works plants	0		21						43 847	8	7	43 862	5 115
Oil and Nat. Gas extraction plants			0										7 284
Oil & Gas pipelines													15 566
Oil refineries													915
Nuclear fuel fabrication plants													
Distribution losses									2 206			2 206	2 621
Available for final consumption	20 060	1	2 147	809		809	8	227	11 904	18 777	99	30 781	462 764
Final non-energy consumption	93		1	1		1		80					91 458
Chemical industry								80					91 458
Other sectors	93		1	1		1							
Final energy consumption	17 715	1	2 267	528		528	8	2	13 771	18 777	99	32 647	367 810
Industry	6 011	0	2 125	8		8	5	2	13 771	18 777		32 548	141 108
Iron & steel industry	191	0	1 709					2	11 300	18 777		30 077	22 553
Non-ferrous metal industry	0		233										7 269
Chemical industry	2 026		41						727			727	8 930
Glass, pottery & building mat. industry	1 623		94	7		7	2		1 692			1 692	44 120
Ore-extraction industry	23		0	0		0							1 441
Food, drink & tobacco industry	1 205		23										23 028
Textile, leather & clothing industry	60		1										2 174
Paper and printing	345		1										5 358
Engineering & other metal industry	171		11						52			52	14 844
Other industries	366		12	1		1	4						11 390
Transport													
Railways													
Road transport													
Air transport													
Inland navigation													
Households, commerce, pub. auth., etc.	11 705	1	142	520		520	3		0	0	99	99	226 703
Households	9 000		40								79	79	146 056
Agriculture	1 600	1	29	270		270	3						2 111
Fisheries	0												1
Other	1 105	0	73	250		250	0		0	0	20	20	78 536
Statistical difference	2 252		-121	280		280		145	-1 866		1	-1 866	3 496

Original units	Crude oil	Feedstock	Total pet. products	Refinery gas	LPG	Motor spirit	Kerosenes, jet fuels	Naphtha	Gas / diesel oil	Residua l fuel oil	Other pet. products	White spirit	Lubricants	Bitumen	Petroleum coke	
																1000 t
Primary production	755															
Recovered products		21	43										43			
Imports	20 787	994	5 589		2 124	665	1	12	2 279	33	80	44	90	204	54	
Stock change	-258		133		-2	-4	-2	-14	57	19	50	4	32	-7		
Exports	247		3 048		38	339	424	85	268	1 078	22	148	213	430	3	
Bunkers			-270						-37	-233						
Gross inland consumption	21 036	1 014	2 446		2 084	323	-425	-87	2 031	-1 259	108	-101	-48	-233	52	
Transformation input	20 803	1 661	561	25	3				23	510						
Classic thermal Power Stations			524	25					11	488						
Public thermal power stations			168						7	161						
Autoprod. thermal power stations			355	25					4	327						
Nuclear power stations																
Patent fuel and briquetting plants																
Coke-oven plants																
Blast-furnace plants																
Gas works			3		3											
Refineries	20 803	1 661														
District heating plants			34		0				12	22						
Transformation output			21 745	877	307	3 680	948	1 288	9 309	2 758	581	166	287	1 544		
Classic thermal Power Stations																
Public thermal power stations																
Autoprod. thermal power stations																
Nuclear power stations																
Patent fuel and briquetting plants																
Coke-oven plants																
Blast-furnace plants																
Gas works																
Refineries			21 745	877	307	3 680	948	1 288	9 309	2 758	581	166	287	1 544		
District heating plants																
Exchanges and transfers, returns		647	-647	-138	-33				-313	-28	-27	-66		-43		
Interproduct transfers																
Products transferred		70	-70		0					-27				-43		
Returns from petrochem. industry		577	-577	-138	-32				-313	-28	-66					
Consumption of the energy branch			1 185	327	1	1	0		46	767	27	0	9	8		
Production and distribution of electricity			23		0	0	0		20	1	0	0	1			
Pumped storage stations																
District heating plants			1		0				1					0		
Extraction and aqclo. of solid fuels			18		0	0			12	0	0	0	5			
Coke-oven and gas works plants			1						0	0	0		0			
Oil and Nat. Gas extraction plants			6		0	0			6				0			
Oil & Gas pipelines			2		0	0			1				0			
Oil refineries			1 134	327	0	0			6	766	27	0	1	8		
Nuclear fuel fabrication plants																
Distribution losses																
Available for final consumption	233	0	21 798	387	2 355	4 003	523	887	11 243	195	597	65	188	1 303	52	
Final non-energy consumption	0		2 844				0	878			351	65	227	1 323		
Chemical industry			1 142					878			235	24	6			
Other sectors			1 702				0				117	41	222	1 323		
Final energy consumption	0		18 915	387	2 467	4 003	522	0	11 243	239	2					52
Industry	0		1 310	387	150	5	2		508	203	2					52
Iron & steel industry			3		1	0	0		2	0						
Non-ferrous metal industry			9		1	0	0		4	4	0					
Chemical industry			581	387	92	0	0		86	16						
Glass, pottery & building mat. industry			172		8	0	0		51	60	0					52
Ore-extraction industry			67		4	0	0		63							
Food, drink & tobacco industry			218		22	1	0		145	49	0					
Textile, leather & clothing industry			11		2	0			8	1						
Paper and printing			49		1	0	0		7	41	0					
Engineering & other metal industry			50		10	1	2		33	3	1					
Other industries	0		150		9	2	0		110	29	1					
Transport			14 472		1 719	3 992	519		8 242							
Railways			125				0		125							
Road transport			13 819		1 719	3 989			8 111							
Air transport			522			3	519									
Inland navigation			6						6							
Households, commerce, pub. auth., etc.	0		3 133		598	5	1	0	2 493	36	0					0
Households			750		450				300							
Agriculture			1 837		51	5			1 749	31						
Fisheries			4			0			0	3						
Other	0		542		97		1	0	443	1	0					0
Statistical difference	233	0	39		-112		1	9	0	-44	243		-39	-20		

Original units	Nuclear heat	Total Renewables	Solar heat	Geothermal heat	Biomass	Wood	MSW	Biogas, biofuels	Wind energy	Hydro energy	Other fuels	Derive d heat	Electrical energy
	TJ				TJ				GWh		TJ	GWh	
Primary production		220 701	55	531	217 126	198 401	809	17 916	837	2 152	9 355		
Recovered products											13 677		
Imports		6 574			6 574			6 574					8 480
Stock change		37			37	500		-464			-95		
Exports		11			11			11					9 703
Bunkers													
Gross inland consumption		227 301	55	531	223 727	198 902	809	24 016	837	2 152	22 938		-1 223
Transformation input		41 672			41 672	38 251	385	3 037			4 710		
Classic thermal Power Stations		39 554			39 554	36 154	385	3 016			4 685		
Public thermal power stations		30 429			30 429	30 428	1				3 775		
Autoprod. thermal power stations		9 126			9 126	5 726	384	3 016			910		
Nuclear power stations													
Patent fuel and briquetting plants													
Coke-oven plants													
Blast-furnace plants													
Gas works													
Refineries													
District heating plants		2 118			2 118	2 097		21			26		
Transformation output												312 650	152 593
Classic thermal Power Stations												200 751	152 593
Public thermal power stations												187 795	145 727
Autoprod. thermal power stations												12 956	6 866
Nuclear power stations													
Patent fuel and briquetting plants													
Coke-oven plants													
Blast-furnace plants													
Gas works													
Refineries													
District heating plants												111 899	
Exchanges and transfers, returns		-2 989							-837	-2 152			2 989
Interproduct transfers													
Products transferred		-2 989							-837	-2 152			2 989
Returns from petrochem. industry													
Consumption of the energy branch		37			37	20		17			51	45 220	24 203
Production and distribution of electricity		0			0	0		0			0	15 643	14 902
Pumped storage stations													295
District heating plants		37			37	20		17				9 042	1 278
Extraction and aggl. of solid fuels												4 572	5 894
Coke-oven and gas works plants										51		6 545	761
Oil and Nat. Gat extraction plants												50	77
Oil & Gas pipelines													370
Oil refineries												9 367	627
Nuclear fuel fabrication plants													
Distribution losses													12 685
Available for final consumption		182 603	55	531	182 017	160 631	424	20 962			18 177	267 431	117 471
Final non-energy consumption													
Chemical industry													
Other sectors													
Final energy consumption		182 603	55	531	182 018	160 631	424	20 962			18 177	267 431	117 471
Industry		34 567			34 567	34 095	379	93			18 177	66 001	44 256
Iron & steel industry		1			1	1					993	7 025	6 741
Non-ferrous metal industry											1 252	2 524	2 962
Chemical industry		0			0		0				7 235	35 866	8 468
Glass, pottery & building mat. industry		602			602	223	379				7 400	1 191	4 087
Ore-extraction industry		0			0	0						3 426	1 421
Food, drink & tobacco industry		459			459	366		93				2 455	5 061
Textile, leather & clothing industry		1			1	1						559	782
Paper and printing		19 729			19 729	19 729					137	3 217	3 194
Engineering & other metal industry		41			41	41					6	7 435	6 241
Other industries		13 734			13 734	13 734					1 154	2 302	5 298
Transport		18 501			18 501			18 501					3 188
Railways													3 188
Road transport		18 501			18 501			18 501					
Air transport													
Inland navigation													
Households, commerce, pub. auth., etc.		129 534	55	531	128 949	126 537	45	2 367			0	201 430	70027
Households		102 902		402	102 500	102 500						175 000	27115
Agriculture		19 024			19 024	19 024						997	1626
Fisheries												3	2
Other		7 608	55	129	7 425	5 013	45	2 367			0	25 430	41284
Statistical difference													

Thousand tonnes of oil equivalent	Hard coal	Patent fuels	Coke	Total lignite	Old Lignite	Lignite recent	Brown coal briquettes	Tar, benzol	Coke-oven gas	Blast-furn. gas	Gasworks gas	Total Derived Gas	Natural gas
Primary production	47793			12727		12727							3690
Recovered products	391												
Imports	6416	5	57	4		4	3	10					9156
Stock change	-2078	-4	-341	-8		-8	0	7					-268
Exports	5684	0	4091	0		0		294					32
Bunkers													
Gross inland consumption	46837	1	-4375	12723		12723	3	-277					12547
Transformation input	34495		748	12448		12448	0		519	233		753	1911
Classic thermal Power Stations	22334			12439		12439			507	233		740	981
Public thermal power stations	21733			12439		12439			257	181		438	925
Autoprod. thermal power stations	601								250	52		302	56
Nuclear power stations													
Patent fuel and briquetting plants													
Coke-oven plants	9255		63										
Blast-furnace plants			682										
Gas works													
Refineries													676
District heating plants	2906			9		9	0		13			13	254
Transformation output			6557					488	1769	682	2	2453	
Classic thermal Power Stations													
Public thermal power stations													
Autoprod. thermal power stations													
Nuclear power stations													
Patent fuel and briquetting plants													
Coke-oven plants			6557					488	1769	682		1769	
Blast-furnace plants										682		682	
Gas works											2	2	
Refineries													
District heating plants													
Exchanges and transfers, returns													
Interproduct transfers													
Products transferred													
Returns from petrochem. industry													
Consumption of the energy branch	341		16	42		42			946	0	0	946	632
Production and distribution of electricity	1		0	37		37			0			0	2
Pumped storage stations													
District heating plants	20		0						0			0	1
Extraction and aggl. of solid fuels	320		1	6		6			3			3	8
Coke-oven and gas works plants	0		14						943	0	0	943	110
Oil and Nat. Gas extraction plants	0		0										157
Oil & Gas pipelines													335
Oil refineries													20
Nuclear fuel fabrication plants													
Distribution losses									47			47	56
Available for final consumption	12001	1	1419	233		233	3	211	256	448	2	707	9948
Final non-energy consumption	62		1	0		0		77					1966
Chemical industry								77					1966
Other sectors	62		1	0		0							
Final energy consumption	10583	1	1531	135		135	3		296	448	2	747	7907
Industry	3313	0	1437	2		2	2		296	448		745	3033
Iron & steel industry	107	0	1160						243	448		691	485
Non-ferrous metal industry	0		154										156
Chemical industry	997		27						16			16	192
Glass, pottery & building mat. industry	989		64	1		1	1		36			36	948
Ore-extraction industry	13		0	0		0							31
Food, drink & tobacco industry	690		15										495
Textile, leather & clothing industry	31		0										47
Paper and printing	181		0										115
Engineering & other metal industry	94		7						1			1	319
Other industries	211		8	0		0	1						245
Transport													
Railways													
Road transport													
Air transport													
Inland navigation													
Households, commerce, pub. auth., etc.	7270	1	94	134		134	1		0	0	2	2	4873
Households	5593		27								2	2	3140
Agriculture	994	1	19	69		69	1						45
Fisheries													0
Other	682	0	48	64		64	0		0	0	0	0	1688
Statistical difference	1356		-113	97		97	0	134	-40		0	-40	75

Thousand tonnes of oil equivalent	Crude oil	Feedstock	Total pet. products	Refinery gas	LPG	Motor spirit	Kerosenes, jet fuels	Naphtha	Gas / diesel oil	Residual fuel oil	Other pet. products	White spirit	Lubricants	Bitumen	Petroleum coke
	ktoe														
Primary production	771														
Recovered products		21	43										43		
Imports	21101	1008	5802	2334	699	2	13	2304	32	58	46	91	184	39	
Stock change	-262		118	-2	-4	-3	-15	58	18	36	4	32	-6		
Exports	252		3001	41	356	435	90	271	1031	16	156	215	388	2	
Bunk			-260						-38	-223					
Gross inland consumption	21357	1030	2702	2291	340	-436	-92	2053	-1204	78	-106	-48	-210	37	
Transformation input	21115	1704	544	30	3				23	487					
Classic thermal Power Stations			507	30					11	467					
Public thermal power stations			161						7	154					
Autoprod. thermal power stations			346	30					4	312					
Nuclear power stations															
Patent fuel and briquetting plants															
Coke-oven plants															
Blast-furnace plants															
Gas works			3		3										
Refineries	21115	1704													
District heating plants			33		0				12	21					
Transformation output			21900	1047	337	3868	973	1353	9412	2637	417	174	291	1391	
Classic thermal Power Stations															
Public thermal power stations															
Autoprod. thermal power stations															
Nuclear power stations															
Patent fuel and briquetting plants															
Coke-oven plants															
Blast-furnace plants															
Gas works															
Refineries			21900	1047	337	3868	973	1353	9412	2637	417	174	291	1391	
District heating plants															
Exchanges and transfers, returns		674	-674	-165	-36			-329	-28	-26	-47		-43		
Interproduct transfers															
Products transferred		69	-69		0					-26			-43		
Returns from petrochem. industry		605	-605	-165	-36			-329	-28	-26	-47				
Consumption of the energy branch			1207	390	1	1	0		47	733	20	0	9	7	
Production and distribution of electricity			23		0	0	0		21	1	0	0	1		
Pumped storage stations															
District heating plants			1		0				1				0		
Extraction and aggl. of solid fuels			18		0	0			12	0	0	0	5		
Coke-oven and gas works plants			1		0	0			0	0	0	0	0		
Oil and Nat. Gas extraction plants			6		0	0			6				0		
Oil & Gas pipelines			2		0	0			1				0		
Oil refineries			1156	390	0	0			6	732	19	0	1	7	
Nuclear fuel fabrication plants															
Distribution losses															
Available for final consumption	242	0	22178	462	2588	4207	537	932	11367	186	428	68	190	1174	37
Final non-energy consumption			2664				0	922			252	68	230	1192	
Chemical industry			1122					922			168	26	6		
Other sectors			1542				0				84	43	224	1192	
Final energy consumption			19550	462	2711	4207	536	0	11367	228	2				37
Industry	0		1382	462	165	6	2		514	194	2				37
Iron & steel industry			3		1	0	0		2	0	0				
Non-ferrous metal industry			9		1	0	0		4	4	0				
Chemical industry			666	462	101	0	0		87	15	0				
Glass, pottery & building mat. industry			156		9	0	0		52	57	0				37
Ore-extraction industry			68		4	0	0		64						
Food, drink & tobacco industry			220		25	1	0		146	47	0				
Textile, leather & clothing industry			11		2	0			8	1					
Paper and printing			47		1	1	0		7	39	0				
Engineering & other metal industry			51		11	1	2		34	3	1				
Other industries			151		10	2	0		111	28	0				
Transport	0		14950		1889	4196	533		8332	0	0				0
Railways			126			3	533		126	0	0				
Road transport			14282		1889	4193			8201	0	0				
Air transport			536												
Inland navigation			6						6						
Households, commerce, pub. auth., etc.			3218		657	5	1	0	2520	34	0				0
Households			798		495				303						
Agriculture			1860		56	5			1769	30					
Fisheries			3			0			0	3					
Other			557		107		1	0	448	1	0				0
Statistical difference	242	0	-37	-123			1	10	0	-42	174	0	-40	-18	0

Thousand tonnes of oil equivalent	Nuclear heat	Total Renewables	Solar heat	Geothermal heat	Biomass	Wood	MSW	Biogas, biofuels	Wind energy	Hydro energy	Other fuels	Derived heat	Electrical energy
ktoe													
Primary production		5457	1	13	5186	4739	19	428	72	185	223		
Recovered products											327		
Imports		157			157			157					729
Stock change		1			1	12		-11			-2		
Exports		0			0			0					834
Bunkers													
Gross inland consumption		5615	1	13	5344	4751	19	574	72	185	548		-105
Transformation input		995			995	914	9	73			113		
Classic thermal Power Stations		945			945	864	9	72			112		
Public thermal power stations		727			727	727	0				90		
Autoprod. thermal power stations		218			218	137	9	72			22		
Nuclear power stations													
Patent fuel and briquetting plants													
Coke-oven plants													
Blast-furnace plants													
Gas works													
Refineries													
District heating plants		51			51	50		0			1		
Transformation output												7468	13121
Classic thermal Power Stations													4795
Public thermal power stations													4485
Autoprod. thermal power stations													309
Nuclear power stations													
Patent fuel and briquetting plants													
Coke-oven plants													
Blast-furnace plants													
Gas works													
Refineries													
District heating plants												2673	
Exchanges and transfers, returns		-257							-72	-185			257
Interproduct transfers													
Products transferred		-257							-72	-185			257
Returns from petrochem. industry													
Consumption of the energy branch		1			1	0	0	0			1	1080	2081
Production and distribution of electricity		0			0	0	0	0			0	374	1281
Pumped storage stations													26
District heating plants		1			1	0	0	0				216	110
Extraction and aggro. of solid fuels												109	507
Coke-oven and gas works plants											1	156	65
Oil and Nat. Gas extraction plants												1	7
Oil & Gas pipelines													32
Oil refineries												224	54
Nuclear fuel fabrication plants													
Distribution losses													1091
Available for final consumption		4361	1	13	4347	3837	10	501			434	6387	10101
Final non-energy consumption													
Chemical industry													
Other sectors													
Final energy consumption		4361	1	13	4347	3837	10	501			434	6387	10101
Industry		826			826	814	9	2			434	1576	3805
Iron & steel industry		0			0	0					24	168	580
Non-ferrous metal industry											30	60	255
Chemical industry		0			0		0				173	857	728
Glass, pottery & building mat. industry		14			14	5	9				177	28	351
Ore-extraction industry		0			0	0						82	122
Food, drink & tobacco industry		11			11	9		2				59	435
Textile, leather & clothing industry		0			0	0						13	67
Paper and printing		471			471	471					3	77	275
Engineering & other metal industry		1			1	1					0	178	537
Other industries		328			328	328					28	55	456
Transport		442			442			442					274
Railways													274
Road transport		442			442			442					
Air transport													
Inland navigation													
Households, commerce, pub. auth., etc.		3094	1	13	3080	3022	1	57			0	4811	6021
Households		2458		10	2448	2448						4180	2331
Agriculture		454			454	454		0				24	140
Fisheries												0	0
Other		182	1	3	177	120	1	57			0	607	3550
Statistical difference													

Abbreviations

ARE	Energy Market Agency
CEPMEIP	Coordinated European Particulate Matter Emission Inventory Program
CORINAIR	EMEP/CORINAIR Emission Inventory Guidebook
EBRU	Emission Balances and Reports Unit
EMEP/LRTAP	European Monitoring and Evaluation Programme under the Convention on Long-range Transboundary Air Pollution
EPA	U.S. Environmental Protection Agency
EU	European Union
EUROSTAT	EUROSTAT database
GUS	Central Statistical Office
HCB	Hexachlorobenzene
HM	Heavy metals
ICHpW	Institute for Chemical Processing of Coal
IETU	Institute of Ecology of Industrial Areas in Katowice
IMUZ	Institute for Land Reclamation and Grassland Farming
ITS	Motor Transport Institute in Warsaw
MoE	Ministry of Environment
NFR	Nomenclature for Reporting
NH₃	Ammonia
NMVOC	Non-methane volatile organic compounds
NO₂	Nitrogen dioxide
NO_x	Nitrogen oxides
OECD	Organization for Economic Cooperation and Development
PAHs	Polycyclic aromatic hydrocarbons
Pb	Lead
PCB	Polychlorinated biphenyl
PCDD/F	Dioxins and furans
PM₁₀	particulate matter - particles of 10 µm or less in aerodynamic diameter
PM_{2.5}	particulate matter - particles of 2.5 µm or less in aerodynamic diameter
POP	Persistent organic pollutants
SNAP	Selected nomenclature for air pollution
SO₂	Sulphur dioxide
TSP	Total suspended particulates
UN ECE	United Nations Economic Commission for Europe

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