INSTYTUT OCHRONY ŚRODOWISKA – PAŃSTWOWY INSTYTUT BADAWCZY
INSTITUTE OF ENVIRONMENTAL PROTECTION – NATIONAL RESEARCH INSTITUTE

KRAJOWY OŚRODEK BILANSOWANIA I ZARZĄDZANIA EMISJAMI
THE NATIONAL CENTRE FOR EMISSIONS MANAGEMENT

POLAND'S NATIONAL INVENTORY REPORT 2017

Greenhouse Gas Inventory
for 1988-2015

Submission under
the UN Framework Convention on Climate Change
and its Kyoto Protocol

Warszawa, February 2017

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Reporting entity:

National Centre for Emission Management (KOBiZE)
at the Institute of Environmental Protection – National Research Institute

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EXECUTIVE SUMMARY

ES.1. Background information on greenhouse gas inventories, climate change and supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

ES.1.1. Background information on greenhouse gas inventories and climate change

Poland has been the signatory to the United Nations Framework Convention on Climate Change (UNFCCC) since 1994 and to its Kyoto Protocol since 2002 thus joining the international efforts aiming at combating climate change. One of the main obligations resulting from ratification of the Kyoto Protocol by Poland is to reduce the greenhouse gas emissions by 6% in 2008-2012 in relation to the base year and by 20% in 2013−2020 jointly with the European Union.

According to the provisions of Article 4.6 of the UNFCCC and decision 9/CP.2 Poland uses 1988 as the base year for the estimation and reporting of GHG inventories for the main gases (CO_2, CH_4 and N_2O). Different base years have been established for other groups of gases: 1995 for HFCs, PFCs and sulphur hexafluoride (SF_6) and 2000 for the nitrogen trifluoride (NF_3).

The underlying report, presenting the results of national greenhouse gas inventory for 2015, in line with the trend since 1988, has been prepared according to the *Revision of the UNFCCC reporting guidelines on annual inventories for Parties included in Annex I to the Convention* contained in the decision 24/CP.19.

The national inventory covers the emission of the following GHGs and groups of gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), nitrogen trifluoride (NF_3) which are reported in five categories: 1. Energy, 2. Industrial Processes and Product Use (IPPU), 3. Agriculture, 4. Land Use, Land Use Change and Forestry (LULUCF) and 5. Waste. This report contains also information on emissions of sulphur dioxide (SO_2) and the following GHG precursors: carbon monoxide (CO), nitrogen oxides (NO_x) and non-methane volatile organic compounds (NMVOC).

Methodologies used to calculate emissions and sinks of GHGs are those published by the Intergovernmental Panel on Climate Change (IPCC) in 2006, namely *Revised 2006 Guidelines for National Greenhouse Gas Inventories* what is in accordance with the provisions of the decision 24/CP.19. Pursuant to these guidelines, country specific methods have been used where appropriate giving more accurate emission data.

At the same time the underlying report has been elaborated for the purpose of Poland's obligations resulting from Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC as well as Commission Implementing Regulation (EU) No 749/2014 of 30 June 2014 on structure, format, submission processes and review of information reported by Member States pursuant to Regulation (EU) No 525/2013 of the European Parliament and of the Council.

The unit responsible for compiling the GHG inventory for the purpose of the European Union and the UNFCCC regulations, according to the provisions of the Act of 17 July 2009 on the system to manage the emissions of greenhouse gases and other substances *(Journal of laws Nr 130, position 1070 with further changes)*, is the National Centre for Emissions Management (KOBiZE) in the Institute of Environmental Protection - National Research Institute, supervised by the Minister of the Environment.

ES.1.2. Background information on supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

The European Union (EU) and its Member States, and Iceland have agreed (agreement under Article 4 of the Kyoto Protocol) to fulfil jointly their quantified emission limitation and reduction commitment (QELRC) for the second commitment period of the Kyoto Protocol. The joint QELRC for the EU is 80% (Annex I to the Doha Amendment) what relates to 20% emission reduction on a yearly average comparing to the base year during the period 2013 – 2020. So the assigned amount of the Parties of the agreement (EU, its Member States and Iceland) will be calculated jointly based on the sum of the base year or period emissions for the EU Member States and Iceland in accordance with Article 3, paragraphs 7bis, 8 and 8bis.

Poland's Assigned Amount is 1,583,938,824 tonnes CO_2eq and relates only to the non-ETS emissions (see chapter 2.3.6), as Poland is going to fulfil its emission reduction target jointly with the EU. Poland's AA is equal to the annual emission allocations (AEAs) as established under the EU Effort Sharing Decision (406/2009/EC) and determined in the Commission decisions 2013/162/EU and 2013/634/EU for 2013-2020.

The Poland's commitment period reserve (CPR), calculated as 90% of annual emission allocations given above, amounts to 1,425,544,942 tonnes CO_2eq.

ES.2. Summary of national emission and removal related trends. Emission and removals from KP–LULUCF activities

ES.2.1. Summary of national emission and removal related trends

The GHG emissions for the base year (see chapter ES.1) and for 2015, expressed as CO_2 equivalent, are presented in table S.1. In 2015 the total national emission of GHG amounted to 384.50 million tonnes of CO_2 eq., excluding GHG emissions and removals from category 4 (*Land use, land use change and forestry* – LULUCF). Compared to the base year, the 2015 emissions have decreased by 32.4%.

Table S.1. National emissions of greenhouse gases for the base year and 2015

Pollutant	Emission in CO_2 eq. [kt]		(2015-base)/base [%]
	Base year	2015	
CO_2 (with LULUCF)	453 921.17	281 122.76	-38.07
CO_2 (without LULUCF)	470 942.43	311 118.96	-33.94
CH_4 (with LULUCF)	68 555.14	45 483.29	-33.65
CH_4 (without LULUCF)	68 511.01	45 451.44	-33.66
N_2O (with LULUCF)	29 514.97	20 030.35	-32.13
N_2O (without LULUCF)	29 344.69	18 937.13	-35.47
HFCs	134.69	8 924.04	6 525.48
PFCs	171.97	13.90	-91.92
Unspecified mix of HFCs and PFCs	NA,NO	NA,NO	NA
SF_6	29.12	52.79	81.26
NF_3	NA,NO	NA,NO	NA,NO
TOTAL net emission (with LULUCF)	552 327.08	355 627.13	-35.61
TOTAL without LULUCF	569 133.91	384 498.27	-32.44

Carbon dioxide is the main GHG in Poland with the share of 80.92% in national emissions in 2015.Methane and nitrous oxide contribute respectively with: 11.8% and 4.9% share. All F-gases are responsible for 2.3% of total GHG emissions. Percentage share of GHG in national total emissions (excluding category 4. LULUCF) in 2015 is presented at figure S.1.

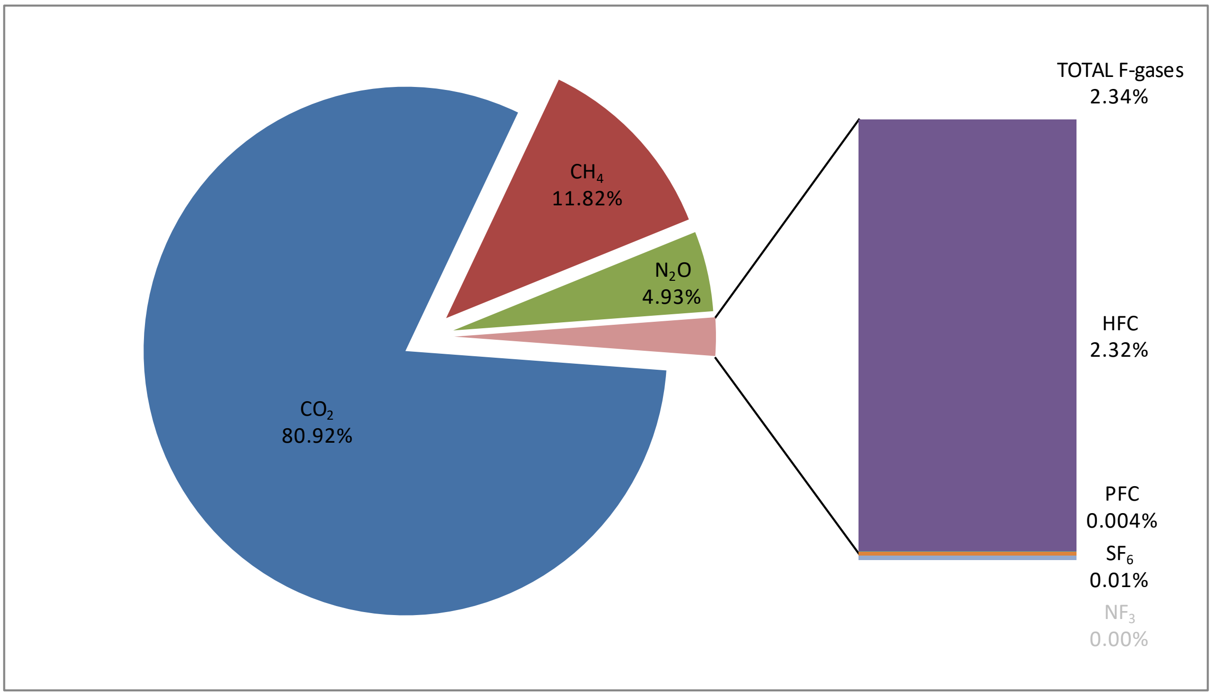

Figure S.1. Percentage share of greenhouse gases in national total emission in 2015 (excluding category 4. LULUCF)

The trend of aggregated GHG emissions follows the trend of emissions of CO_2 alone, which is the primary greenhouse gas emitted in Poland. The GHGs trend for period between 1988 and 1990 indicates dramatic decrease triggered by significant economic changes, especially in heavy industry, related to political transformation from centralized to market economy. This drop in emissions continued up to 1993 and then emissions started to rise with a peak in 1996 as a result of development in heavy industry and other sectors and dynamic economic growth. Slow decline in emissions (up to 2002) characterized the succeeding years, when still energy efficiency policies and measures were implemented, and then slight increase up to 2007 caused by animated economic development. Since 2008 stabilisation in emissions has been noted with distinct decrease in 2009 related to world economic slow-down (see table S.2 and figure S.2). Since 2010 GHG emissions in Poland have gradually decreased.

Since 2005 Poland has taken part in the European Union's Emission Trading System, being one of the flexible mechanisms supporting measures for limiting the greenhouse gas emissions. The share of emissions related to installations covered by EU ETS in the national emissions in 2005−2015 amounted to about 51% on average. One should notice, that since 2013 the scope of the EU ETS has expanded with new industries (like production of selected chemicals) and new greenhouse gases (nitrous oxide) (figure S.2).

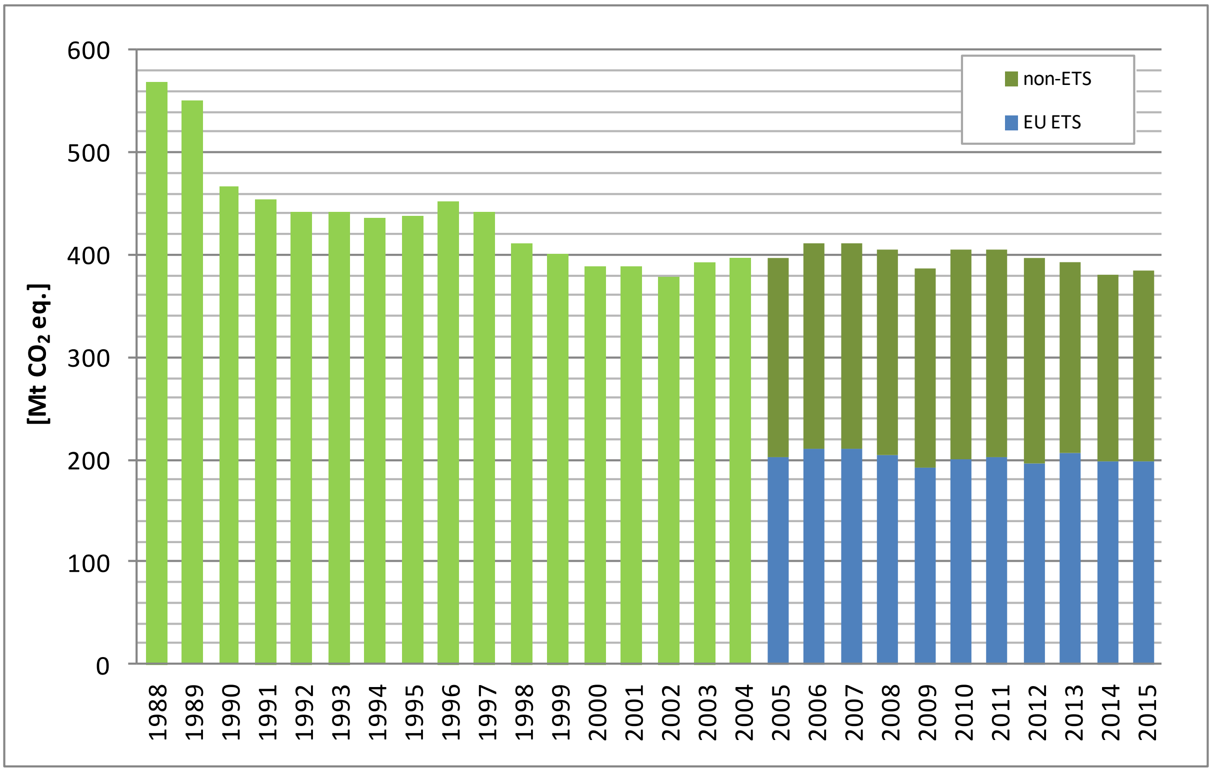

Figure S.2. Trend of aggregated GHGs emissions excluding category 4 for 1988–2015

Table S.2. National emissions of greenhouse gases for 1988–2015 by gases [kt CO_2 eq.]

GHG	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
CO_2 (with LULUCF)	453 921.17	429 928.69	350 306.88	355 353.87	367 720.79	361 612.05	355 938.73	346 552.89	341 749.32	332 983.25	297 158.87	280 779.19	285 295.89	291 026.95
CO_2 (without LULUCF)	470 942.43	451 306.17	376 264.35	373 578.14	363 874.95	364 065.96	359 822.35	361 559.67	375 337.12	366 599.30	337 358.47	327 681.81	317 174.18	313 617.87
CH_4 (with LULUCF)	68 555.14	68 243.84	62 958.55	58 324.86	56 571.46	54 887.85	54 226.47	52 807.66	52 121.26	51 998.46	50 274.23	49 341.27	48 080.62	49 912.88
CH_4 (without LULUCF)	68 511.01	68 199.81	62 914.49	58 279.86	56 526.95	54 845.63	54 185.53	52 761.75	52 084.87	51 960.53	50 239.89	49 304.17	48 048.07	49 880.30
N_2O (with LULUCF)	29 514.97	30 788.03	27 511.58	23 063.03	21 543.27	22 833.75	22 456.00	23 465.02	23 576.75	23 475.81	23 246.54	22 532.30	22 899.79	23 086.03
N_2O (without LULUCF)	29 344.69	30 576.58	27 328.61	22 857.84	21 283.45	22 247.23	22 141.09	23 117.36	23 240.05	23 141.45	22 882.21	22 158.99	22 517.17	22 672.42
HFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	134.69	335.49	481.02	569.32	780.47	1 366.50	1 925.34
PFCs	147.26	147.51	141.87	141.31	134.63	144.86	152.78	171.97	161.07	173.36	174.86	168.71	176.68	197.34
Unspecified mix of HFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
SF_6	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	13.27	29.12	23.80	22.91	23.94	23.50	23.07	22.86
NF_3	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
TOTAL (with LULUCF)	**552 138.55**	**529 108.07**	**440 918.88**	**436 883.06**	**445 970.15**	**439 478.51**	**432 787.25**	**423 161.35**	**417 967.70**	**409 134.81**	**371 447.74**	**353 625.44**	**357 842.54**	**366 171.40**
TOTAL (without LULUCF)	**568 945.38**	**550 230.07**	**466 649.33**	**454 857.16**	**441 819.99**	**441 303.68**	**436 315.02**	**437 774.57**	**451 182.42**	**442 378.56**	**411 248.68**	**400 117.65**	**389 305.67**	**388 316.12**

Table S.2. (cont.) National emissions of greenhouse gases for 1988–2015 by gases [kt CO_2 eq.]

GHG	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CO_2 (with LULUCF)	273 604.13	283 016.23	275 785.60	275 597.52	294 024.70	299 048.54	292 995.84	281 286.18	300 395.71	292 705.99	285 356.88	278 381.58	273 736.02	281 122.76
CO_2 (without LULUCF)	305 736.69	318 462.85	322 613.14	321 743.01	334 660.13	334 348.49	327 436.64	313 842.22	331 782.02	331 288.32	323 809.85	319 612.76	307 025.28	311 118.96
CH_4 (with LULUCF)	48 324.02	48 600.57	48 189.28	48 580.50	48 841.24	48 118.81	47 831.85	46 651.45	46 589.69	45 483.06	45 261.22	45 523.54	45 059.09	45 483.29
CH_4 (without LULUCF)	48 289.31	48 563.66	48 155.02	48 547.01	48 802.16	48 089.11	47 797.21	46 621.61	46 558.04	45 451.98	45 229.45	45 486.56	45 023.82	45 451.44
N_2O (with LULUCF)	21 971.51	22 197.90	22 715.37	22 897.60	23 411.96	24 238.48	23 683.47	20 560.92	20 291.90	20 635.52	20 783.62	20 894.86	20 820.98	20 030.35
N_2O (without LULUCF)	21 560.57	21 773.10	22 271.80	22 446.54	22 943.41	23 714.98	23 141.91	19 982.72	19 661.60	19 989.84	20 065.68	20 151.41	19 735.73	18 937.13
HFCs	2 505.93	3 078.00	3 733.23	4 556.73	5 226.22	5 827.97	6 153.06	6 107.84	6 824.53	7 453.97	7 799.33	8 202.70	8 836.19	8 924.04
PFCs	207.33	201.08	205.07	187.41	193.58	184.63	163.12	17.97	17.07	16.22	15.41	14.64	13.90	13.90
Unspecified mix of HFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
SF_6	23.29	20.72	22.36	26.80	33.20	31.16	32.87	37.60	35.37	39.02	41.92	47.54	52.79	52.79
NF_3	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
TOTAL (with LULUCF)	**346 636.21**	**357 114.49**	**350 650.90**	**351 846.55**	**371 730.89**	**377 449.58**	**370 860.20**	**354 661.95**	**374 154.27**	**366 333.78**	**359 258.37**	**353 064.85**	**348 518.97**	**355 627.13**
TOTAL (without LULUCF)	**378 323.10**	**392 099.40**	**397 000.61**	**397 507.50**	**411 858.70**	**412 196.34**	**404 724.80**	**386 609.96**	**404 878.63**	**404 239.35**	**396 961.63**	**393 515.60**	**380 687.71**	**384 498.27**

ES.2.2. KP-LULUCF activities

The emissions and removals balance of greenhouse gases for the period 2008-2015, to related activities of land use, land use change and forestry (LULUCF) under Article 3.3 and 3.4 of the Kyoto Protocol is presented in Table S.3. For activities related to afforestation/reforestation and forest management estimated balance is negative, what means the activity is considered as a net CO_2 sink.

Table S.3. The emissions and removals balance of greenhouse gases for the period 2008-2015 for selected activities of land use, land use change and forestry (LULUCF) [Mt CO_2 eq.]

Activity	2008	2009	2010	2011	2012	2013	2014	2015
4.KP.A.1. Afforestation/Reforestation	-2.37	-2.46	-2.58	-2.67	-2.78	-2.84	-2.82	-2.85
4.KP. A.2. Deforestation	0.25	0.25	0.26	0.23	0.25	0.20	0.32	0.30
4.KP. B.1. Forest Management	-38.22	-36.24	-35.01	-42.06	-42.03	-45.45	-38.11	-33.99
4.KP. B.2 Cropland management	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*
4.KP. B.3 Grazing land management	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*
4.KP. B.4 Revegetation	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*

ES.3. Overview of source and sink category emission estimates and trends, including KP-LULUCF activities

ES.3.1. GHG inventory

Total GHG emissions presented in CO_2 equivalent for the base year and for 2015 together with change between 2015 and 1988 by main categories are given in table S.4. In all categories emission reduction has been observed while in LULUCF sector increase in carbon sink has been noted. The highest drop in emissions has occurred in *3. Agriculture* (by 38.0%) what was caused by significant structural and economic changes after 1989 in this sector, including diminishing animal and crop production (i.e. cattle population drop from 10.3 million to 6.0 or sheep population from 4.4 million to 228 thousand in 1988-2015). Next category with high emission reduction in 1988-2015 is *1. Energy* (by about 33.4%) what was caused by transformation of heavy industry in Poland as well as by decreasing coal use and mining and energy efficiency measures implemented.

Table S.4. GHG emissions according to main sectors in base year and in 2015

	Total [kt eq. CO_2]		(2015-base)/base [%]
	Base year	2015	
TOTAL with LULUCF	552 327.08	355 627.13	-35.6
TOTAL without LULUCF	569 133.91	384 498.27	-32.4
1. Energy	475 027.06	316 373.50	-33.4
2. Industrial Processes and Product Use	31 400.35	28 483.57	-9.3
3. Agriculture	47 835.68	29 649.89	-38.0
4. Land-Use, Land-Use Change and Forestry	-16 806.83	-28 871.14	71.8
5. Waste	14 870.82	9 991.31	-32.8

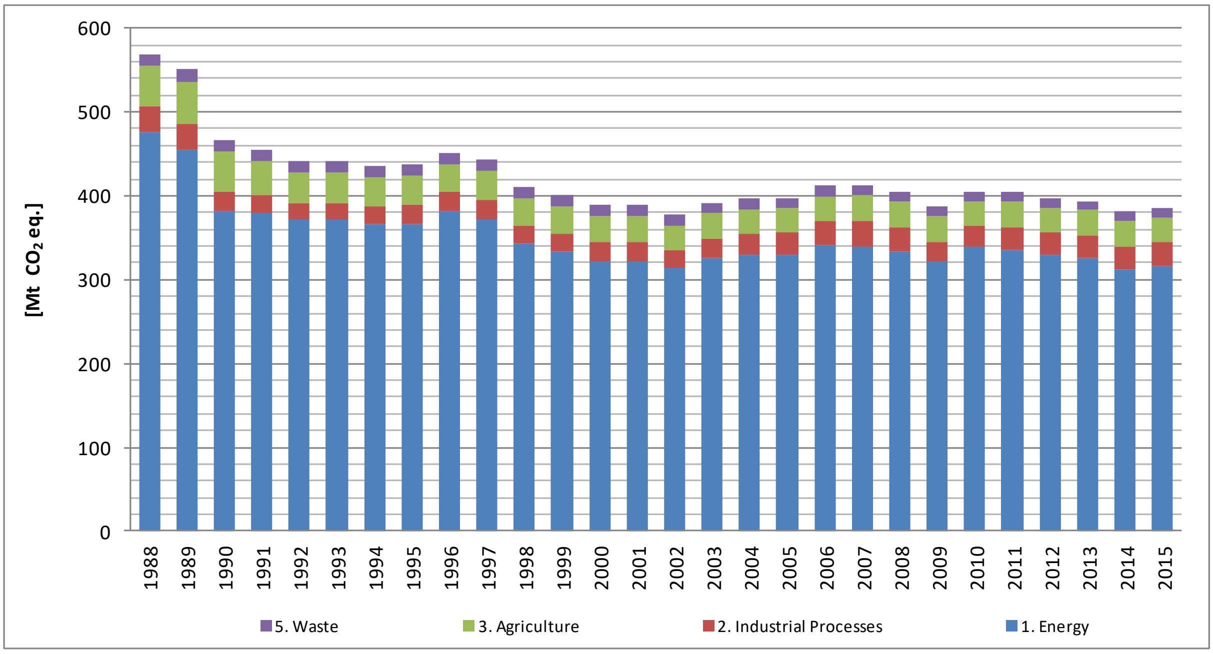

Figure S.3. Trend of aggregated GHGs emissions (excluding category 4) for 1988–2015 according to source categories

Table S.5. National emissions of greenhouse gases for 1988–2015 by source categories [kt CO_2 eq.]

IPCC sector	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
1. Energy	475 027.06	454 612.06	382 030.32	380 101.28	371 271.63	372 696.34	366 533.74	366 801.18	381 757.34	371 495.42	342 139.39	333 588.46	320 984.14	321 995.96
2. Industrial Processes	31 211.82	30 247.71	22 874.41	20 212.68	19 753.03	19 303.15	21 261.52	22 702.66	22 049.72	22 966.68	21 388.83	20 589.24	23 797.22	22 467.36
3. Agriculture	47 835.68	50 519.18	47 155.60	40 119.67	36 523.26	35 210.83	34 783.91	34 732.58	34 006.84	34 591.23	34 335.88	32 596.07	31 005.77	30 614.99
4. Land-Use, Land-Use Change and Forestry	-16 806.83	-21 121.99	-25 730.45	-17 974.09	4 150.16	-1 825.18	-3 527.77	-14 613.22	-33 214.72	-33 243.75	-39 800.94	-46 492.21	-31 463.13	-22 144.72
5. Waste	14 870.82	14 851.12	14 588.99	14 423.53	14 272.07	14 093.37	13 735.85	13 538.14	13 368.52	13 325.24	13 384.58	13 343.87	13 518.54	13 237.80
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
TOTAL (with LULUCF)	**552 138.55**	**529 108.07**	**440 918.88**	**436 883.06**	**445 970.15**	**439 478.51**	**432 787.25**	**423 161.35**	**417 967.70**	**409 134.81**	**371 447.74**	**353 625.44**	**357 842.54**	**366 171.40**
TOTAL (without LULUCF)	**568 945.38**	**550 230.07**	**466 649.33**	**454 857.16**	**441 819.99**	**441 303.68**	**436 315.02**	**437 774.57**	**451 182.42**	**442 378.56**	**411 248.68**	**400 117.65**	**389 305.67**	**388 316.12**

Table S.5. (cont.) National emissions of greenhouse gases for 1988–2015 by source categories [kt CO_2 eq.]

IPCC sector	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1. Energy	314 356.64	325 928.50	329 589.42	330 157.67	341 751.65	338 947.82	333 169.62	321 809.07	338 702.88	335 313.25	329 411.60	325 713.15	311 770.74	316 373.50
2. Industrial Processes	20 787.84	23 661.17	25 456.75	25 424.35	27 762.11	30 322.40	28 896.51	22 794.13	24 815.72	27 681.77	26 671.61	26 434.84	28 048.72	28 483.57
3. Agriculture	29 929.56	29 364.19	29 354.21	29 511.99	30 221.10	30 854.09	30 928.18	30 232.31	29 717.72	30 088.15	29 956.20	30 514.35	30 472.43	29 649.89
4. Land-Use, Land-Use Change and Forestry	-31 686.90	-34 984.91	-46 349.71	-45 660.94	-40 127.81	-34 746.75	-33 864.61	-31 948.01	-30 724.36	-37 905.56	-37 703.26	-40 450.75	-32 168.74	-28 871.14
5. Waste	13 249.07	13 145.55	12 600.24	12 413.48	12 123.84	12 072.03	11 730.49	11 774.45	11 642.31	11 156.18	10 922.23	10 853.27	10 395.82	9 991.31
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
TOTAL (with LULUCF)	**346 636.21**	**357 114.49**	**350 650.90**	**351 846.55**	**371 730.89**	**377 449.58**	**370 860.20**	**354 661.95**	**374 154.27**	**366 333.78**	**359 258.37**	**353 064.85**	**348 518.97**	**355 627.13**
TOTAL (without LULUCF)	**378 323.10**	**392 099.40**	**397 000.61**	**397 507.50**	**411 858.70**	**412 196.34**	**404 724.80**	**386 609.96**	**404 878.63**	**404 239.35**	**396 961.63**	**393 515.60**	**380 687.71**	**384 498.27**

Carbon dioxide emissions

The CO_2 emissions (excluding category 4) in 2015 were estimated as 311.12 million tonnes. This is 33.9% lower than in the base year. CO_2 emission (excluding category 4) accounted for 80.92% of total GHG emissions in Poland in 2015. The main CO_2 emission source is *Fuel Combustion* (1.A) subcategory. This sector contributed to the total CO_2 emission with 92.2% share in 2015. The shares of the main subcategories were as follows: *Energy industries* – 52.3%, *Manufacture Industries and Construction* – 9.1%, *Transport* – 14.5% and *Other Sectors* – 16.3%. *Industrial Processes* contributed to the total CO_2 emission with 6.0% share in 2015. *Mineral industry* (especially *Cement Production*) is the main emission source in this sector. The CO_2 removal in LULUCF sector in 2015, was calculated to be approximately 30.0 million tonnes. It means that app. 9.6% of the total CO_2 emissions are offset by CO_2 uptake by forests.

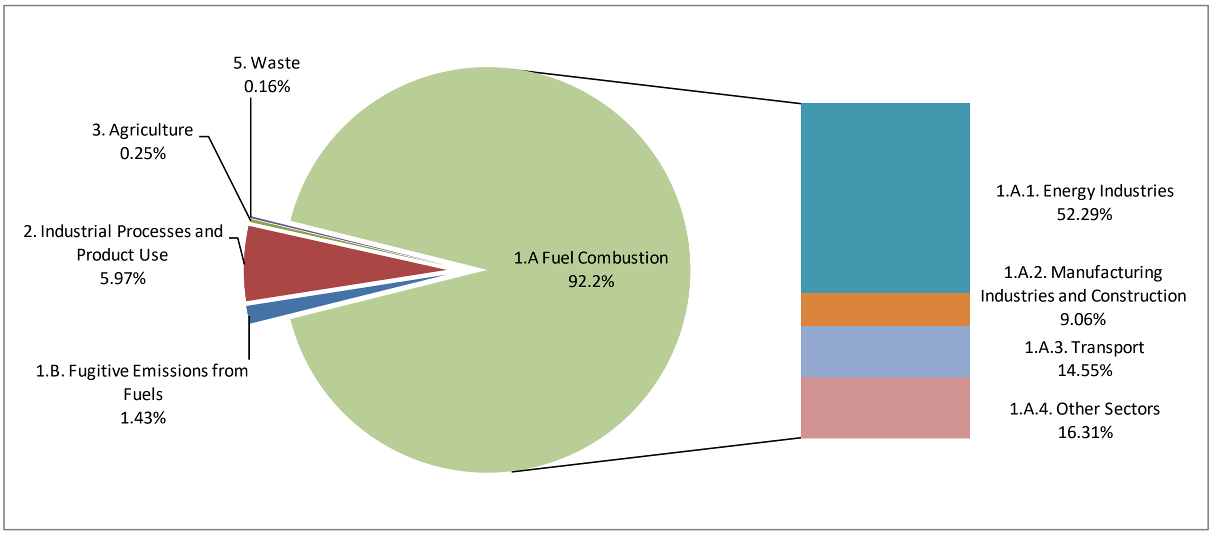

Figure S.4. Carbon dioxide emission (excluding category 4) in 2015 by sector

Methane emissions

The CH_4 emission (excluding category 4) amounted to 1 818.06 kt in 2015 i.e. 45.45 million tonnes of CO_2 equivalents. Compared to the base year, the emission in 2015 was lower by 33.7%. The contribution of CH_4 to the national total GHG emission amounted to 11.8% in 2015. Three of the main CH_4 emission sources include the following categories: *Fugitive Emissions from Fuels, Agriculture* and *Waste*. They contributed with 42.1%, 30.9% and 18.9% share to the national methane emission in 2015, respectively. The emission from the first mentioned sector came from underground mines (37.2% of total CH_4 emission) and Oil and Natural Gas system (4.9% of total CH_4 emission). The emission from *Enteric Fermentation* (3.A) dominated in *Agriculture* and amounted to app. 27.3% of total CH_4 emission in 2015. Waste disposal sites were responsible for 17.9% of the total methane emission and Wastewater Handling for 0.6% of total CH_4 emission.

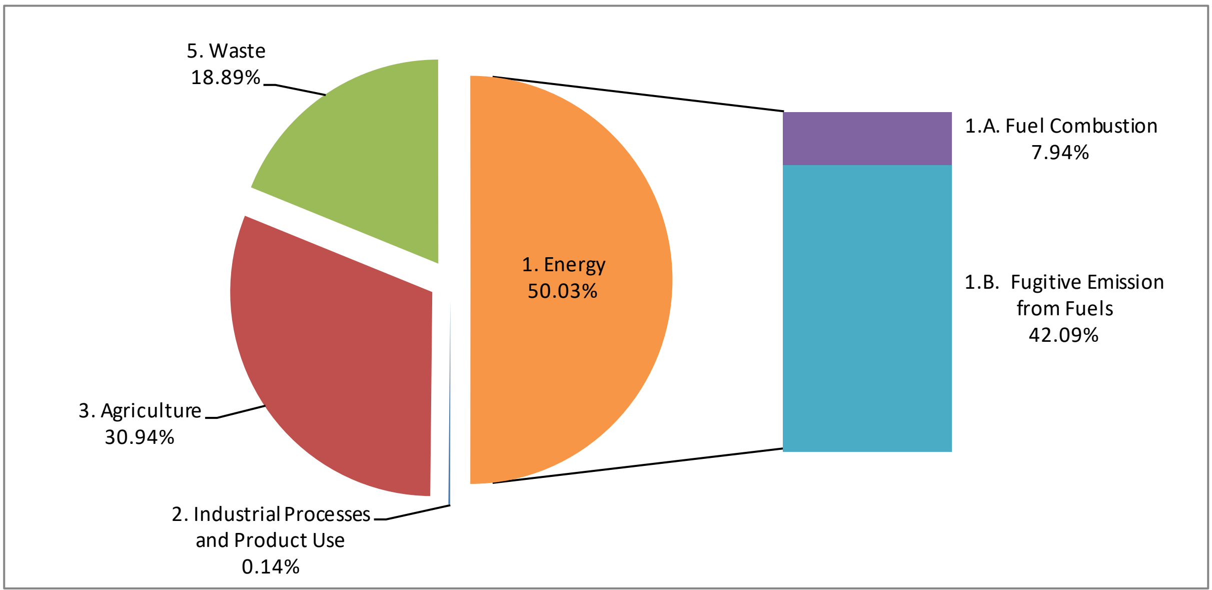

Figure S.5. Methane emission in 2015 by sector

Nitrous oxide emissions

The nitrous oxide emissions (excluding category 4) in 2015 amounted to 63.55 kt i.e. 18.94 million tonnes of CO_2 equivalent. The emission was app. 35.5% lower than the respective figure for the base year. N_2O emission constituted 4.9% of the national total GHG emission in 2015. The main N_2O emission sources and their shares in total N_2O emission in 2015 were as follows: *Agricultural Soils* – 67.2%, *Manure Management* – 11.0%, *Chemical Industry* – 4.0% and *Fuel Combustion* – 12.3%.

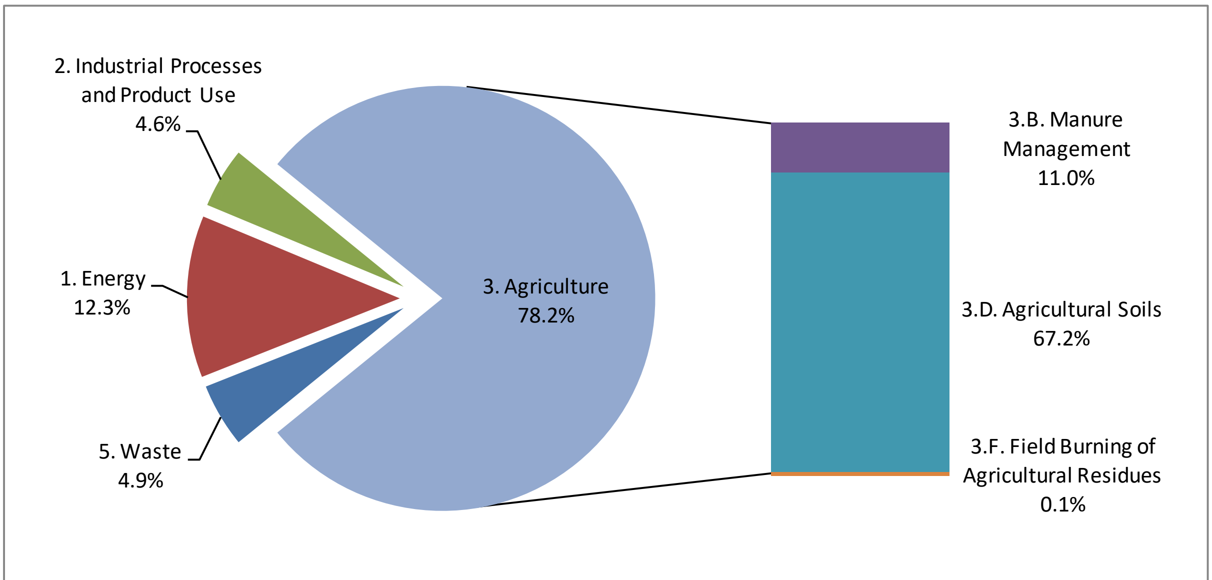

Figure S.6. Nitrous oxide emission (excluding category 4) in 2015 by sector

Emissions of Fluorinated gases

The total emission of industrial gases (HFCs, PFCs and SF_6) in 2015 was estimated at 8 990.73 kt CO_2 eq., and accounted for 2.3% of total GHG emissions in 2015. Industrial gases emissions were by 2577.5% higher comparing to the base year (table S.1). This significant growth in HFCs emission is mainly due to the increase in emission from refrigeration and air conditioning equipment. Shares of HFCs, PFCs and SF_6 emissions in total 2015 emission were respectively as follows: 2.32%, 0.004% and 0.014%. NF_3 emissions did not occur.

ETS and ESD (non-ETS) emissions

EU member states, being the Parties to the Kyoto Protocol, have reached the agreement to fulfil their commitments jointly in the second KP period. To meet the obligations, the EU legislation divided all the emission sources into two main sectors: EU ETS and so-called non-ETS. The emissions from sources included in EU ETS (electricity and heat production, heavy industry) are reported directly by installations by the end of March every year. The sum of all the reported emissions by installations in Poland constitutes the emission of the Polish part of EU ETS. Those reports show the emission of CO_2 mainly (a small part of N_2O emission is also included). Total emission in this sector from stationary installations amounted to 198.7 Mt of CO_2 eq. in 2015 (table S.7)

Poland (nor any other EU member state) does not have any specific reduction target for 2013-2020 imposed on emissions coming from sources included in EU ETS, as such a limit has only been imposed on the whole EU ETS on the EU level (*cap*). The installations are individually responsible for their own emissions within the overall limit.

The emissions from other sources than those included in EU ETS (including other GHG from EU ETS sources) constitute the non-ETS emissions. As already mentioned, Poland will fulfil its obligations jointly with other EU member states. Considering what was said above about EU ETS, this joint fulfilment has been operationalized by effort sharing decisions (ESD) adopted on the EU level, according to which Poland and other member states have specific emission targets imposed only on the non-ETS emissions. This has been regulated by *Decision No 406/2009/EC of the European Parliament and of the Council on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020* (ESD decision). Pursuant to the ESD decision, the European Commission adopted yearly emission limits for the EU member states in its decision 2013/162/EU of 26 March 2013 (Annex II). The limits have been corrected in the Commission implementing decision 2013/634/EU of 31 October 2013 (Annex II).

The emissions in ESD sector have been calculated and compared to ESD limits for 2015 in the table S.6. It can be seen that Poland overachieved its non-ETS emission targets in 2015 by about 10.5 Mt of CO_2 eq.

Table S.6. Non-ETS (ESD) sector emission estimation for 2015

Emission/emission limit [kt CO_2 eq.]	**2015**
1. Total emission (excluding category 4. LULUCF)	384 498.268
2. EU ETS	198 696.466
3. CO_2 from domestic aviation (1.A.3.a)	122.708
4. Non-ETS (ESD) (1-2-3)	**185 679.094**
5. ESD limit	196 128.269
6. Overachievement (5-4)	10 449.175

ES.3.2. KP-LULUCF activities

Estimated emissions and removals of greenhouse gases for the period 2008-2015, associated with the LULUCF activities under Article 3.3 and 3.4 of the Kyoto Protocol are presented in Table ES.4. in Section ES.2.2.

Estimated sink associated with the afforestation activity, increased by 20% as compared to 2008. The emissions associated with deforestation as compared to 2008, increased by 22%. Net emissions increase was caused by the higher area of forest land exclusions for non-forestry and non agricultural purposes. The size of net absorption for forest management activity for the year 2015 is approximately 11% lower than in 2008.

PART I:
ANNUAL INVENTORY SUBMISSION

1. INTRODUCTION

1.1. Background information on greenhouse gas inventories, climate change and supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

1.1.1. Background information on greenhouse gas inventories and climate change

Poland has been the signatory to the United Nations Framework Convention on Climate Change (UNFCCC) since 1994 and to its Kyoto Protocol since 2002 thus joining the international efforts aiming at combating climate change. One of the main obligations resulting from ratification of the Kyoto Protocol by Poland is to reduce the greenhouse gas emissions by 6% in 2008-2012 in relation to the base year and by 20% in 2013−2020 jointly with the European Union.

According to the provisions of Article 4.6 of the UNFCCC and decision 9/CP.2 Poland uses 1988 as the base year for the estimation and reporting of GHG inventories for the main gases (CO_2, CH_4 and N_2O). Different base years have been established for other groups of gases: 1995 for HFCs, PFCs and sulphur hexafluoride (SF_6) and 2000 for the nitrogen trifluoride (NF_3).

The underlying report presenting the results of national greenhouse gas inventory for 2015, in line with the trend since 1988, is prepared according to the *Revision of the UNFCCC reporting guidelines on annual inventories for Parties included in Annex I to the Convention* contained in the decision 24/CP.19.

The national inventory covers the following GHGs and groups of gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), nitrogen trifluoride (NF_3) and are reported in five categories: 1. Energy, 2. Industrial Processes and Product Use (IPPU), 3. Agriculture, 4. Land Use, Land Use Change and Forestry (LULUCF) and 5. Waste. Information on emissions of sulphur dioxide (SO_2) and the following GHG precursors is also reported: carbon monoxide (CO), nitrogen oxides (NO_x) and non-methane volatile organic compounds (NMVOC).

Methodologies used to calculate emissions and sinks of GHGs are those published by the Intergovernmental Panel on Climate Change (IPCC) in 2006, namely *Revised 2006 Guidelines for National Greenhouse Gas Inventories* what is in accordance with the provisions of the decision 24/CP.19. According to these guidelines country specific methods have been used where appropriate giving more accurate emission data

At the same time the underlying report has been elaborated for the for the purpose of Poland's obligations resulting from Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC as well Commission Implementing Regulation (EU) No 749/2014 of 30 June 2014 on structure, format, submission processes and review of information reported by Member States pursuant to Regulation (EU) No 525/2013 of the European Parliament and of the Council.

The unit responsible for compiling the GHG inventory for the purpose of the European Union and the UNFCCC regulations, according to the provisions of the Act of 17 July 2009 on the system to manage the emissions of greenhouse gases and other substances *(Journal of laws Nr 130, position 1070 as* *amended)*, is the National Centre for Emissions Management (KOBiZE) in the Institute of Environmental Protection - National Research Institute, supervised by the Minister of the Environment.

1.1.2. Background information on supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

The European Union (EU) and its Member States, and Iceland have agreed (agreement under Article 4 of the Kyoto Protocol) to fulfil jointly their quantified emission limitation and reduction commitment (QELRC) for the second commitment period of the Kyoto Protocol. The joint QELRC for the EU is 80% (Annex I to the Doha Amendment) what relates to 20% emission reduction on a yearly average comparing to the base year during the period 2013 – 2020. So the assigned amount of the Parties of the agreement (EU, its Member States and Iceland) will be calculated jointly based on the sum of the base year or period emissions for the EU Member States and Iceland in accordance with Article 3, paragraphs 7bis, 8 and 8bis.

Poland's Assigned Amount is 1,583,938,824 tonnes CO_2eq and relates only to the non-ETS emissions (see chapter 2.3.6), as Poland is going to fulfil its emission reduction target jointly with the EU. Poland's AA is equal to the annual emission allocations (AEAs) as established under the EU Effort Sharing Decision (406/2009/EC) and determined in the Commission decisions 2013/162/EU and 2013/634/EU for 2013-2020.

The Poland's commitment period reserve (CPR), calculated as 90% of annual emission allocations given above, amounts to 1,425,544,942 tonnes CO_2eq.

The detailed additional information required by the Kyoto Protocol is presented in Part II of the NIR.

1.2. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

The ***Act of 17 July 2009 on the system to manage the emissions of greenhouse gases and other substances*** (*Journal of Laws No 130 item 1070 as amended)* established a legal base to manage the national emissions cap for greenhouse gases or other substances in a way that should ensure that Poland complies with the EU and international commitments and will allow for cost-effective reductions of the emission. Pursuant to the above mentioned law, the National Centre for Emissions Management (Krajowy Ośrodek Bilansowania i Zarządzania Emisjami – KOBiZE) established in the Institute of Environmental Protection – National Research Institute in Warsaw:

- carries out tasks associated with functioning of the national system to balance and forecast emissions, including managing a national database on greenhouse gas emissions and other substances,
- elaborates methodologies to estimate emissions for individual types of installations or activities and methodologies to estimate emission factors per unit of produced good, fuel used or raw material applied,
- elaborates emission reports and projections for GHG and air pollutants,
- manages the national registry for Kyoto Protocol units,
- acts as the national EU Emission Trading Scheme administrator.

The Minister of the Environment supervises the activity and performance of the National Centre for Emissions Management.

According to Article 11 of above mentioned Act, the National Centre prepares and submits to the Minister of the Environment, 30 days before the deadlines established in the European Union law or international environmental agreements, annual greenhouse gas inventories carried out in accordance with the UNFCCC guidelines and annual inventories of the substances listed in the Convention on Long-range Transboundary Air Pollution (UNECE CLRTAP). Prior to the submission, the elaborated inventories undergo internal process of the official scrutiny and approval carried out by the Ministry of the Environment.

The emission calculation, choices of activity data, emission factors and methodology are performed by the Emission Inventory Unit in the National Centre for Emissions Management. The National Centre collaborates with a number of individual experts as well as institutions when compiling inventories. Among the latter are: Central Statistical Office (GUS), Agency of Energy Market (ARE), Institute of Ecology of Industrial Areas in Katowice (IETU), Motor Transport Institute (ITS), Polish Geological Institute - National Research Institute (PIG PIB), State Mining Authority (WUG) as well as Office for Forest Planning and Management (BULGiL). These institutions are mainly involved in providing activity data for inventory estimates.

The experts of the National Centre have access to different emission and activity data sources, among which the most important are:

- individual data of entities participating in the European Union Emission Trading System (EU-ETS). These independently verified data are included in the GHG inventory for some IPCC subcategories (e.g. in some subsectors in industrial processes);
- data submitted by entities to the E-PRTR database pursuant to Regulation (EC) no 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC;
- aggregated data collected by operators under Article 3(6) of Regulation (EC) No 842/2006;
- emission data submitted by individual entities to the National Database on Emissions – the biggest database with individual emission reports available in Poland.

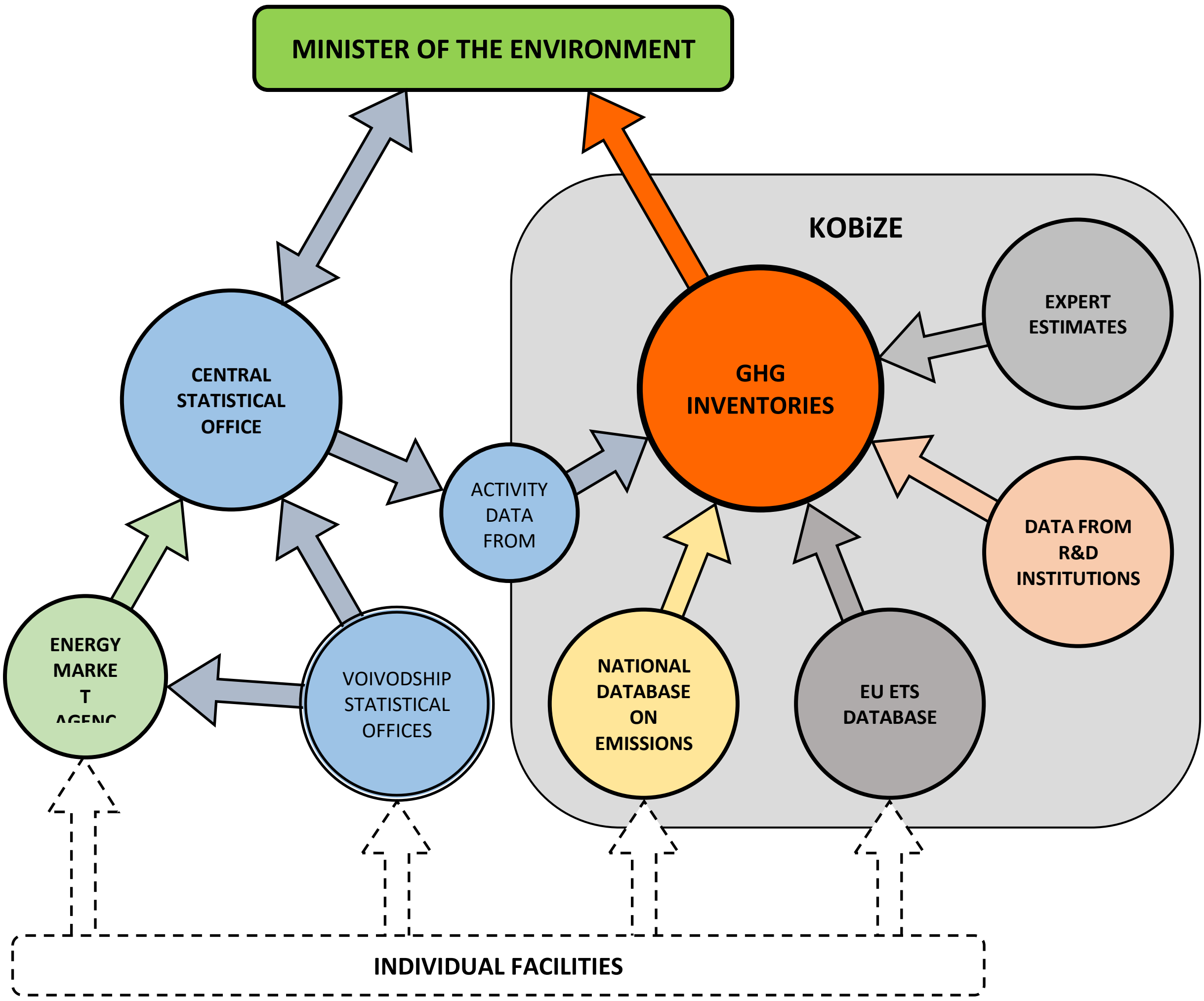

Figure 1.1. National GHG emissions inventory system scheme

Since early 2000s, data from individual entities in the EU member States are gathered and publicized in the European Pollutant Release and Transfer Register (E-PRTR, earlier called EPER – European Pollutant Emission Register). The usefulness of E-PRTR data for the inventory preparation needs is limited, as in most cases the register contains only fragmentary information based on part of the installations belonging to a given sector or emitting certain greenhouse gas. Nevertheless, they can be helpful to a certain extent in a process of data cross-checking, what is possible especially if the E-PRTR data cover a whole sector or gas. Polish national inventory system includes this database as a potential source of valuable data and the inventory team has been granted full access to the Polish PRTR reporting system.

Also the National Database on Emissions, that contains ca. 40 thousand reports yearly on about 80 different GHGs and pollutants, is helpful in the inventory preparation process, it cannot however replace the inventory assessments as such, as it doesn't cover all the emission sources (i.a. it doesn't contain individual transport and households) and the methodology for emission calculation is not homogenous.

The three existing independent emission databases mentioned above enable crosschecking of emission data and improving their quality. This is even more possible as two of them (the EU ETS database and the National Database on Emissions) are run by the same institution that also prepares the inventories (KOBiZE in the Institute of Environmental Protection) and – as was said – the third one (E-PRTR) is open to the public.

The National Centre for Emissions Management, as the entity directly responsible for GHG inventory preparation, is also in charge of co-ordination and implementation of QA/QC procedures within inventory. The QA/QC programme has been elaborated in line with the *2006 IPCC Guidelines* to assure high quality of the Polish annual greenhouse gas inventory. The QA/QC programme contains tasks, responsibilities as well as time schedule for performance of the QA/QC procedures. The following elements of the Quality Assurance and Quality Control system have been addressed:

- Inventory agency responsible for coordinating QA/QC activities,
- QA/QC plan,
- General QC procedures (*Tier 1* method),
- Source category-specific QC procedures (*Tier 2*),
- QA review procedures,
- Reporting, documentation and archiving procedures.

For more detailed information on QA/QC procedures see Annex 5.

1.3. Inventory preparation and data collection, processing and storage

The GHG emission estimates are based on methodologies elaborated by the Intergovernmental Panel on Climate Change (IPCC) and recommended by the UNFCCC, while emissions of indirect gases according to methodology elaborated by UNECE/EMEP. Wherever necessary and possible, domestic methodologies and emission factors have been developed to reflect country specific conditions. The most important features of the inventory preparation and archiving can be briefly summarized in the following way:

- activity data are mostly taken from official public statistics (GUS, EUROSTAT) or, when required data are not directly available, (commissioned) research reports or expert estimates are used instead; in very detailed categories, estimates made by individual industries or market players can be also useful if available,
- emission factors for the main emission categories are mostly taken from reports on domestic research; IPCC default data are used in cases where the emission factors are highly uncertain (e.g. CH_4 and N_2O emission from stationary combustion), or when particular source category contribution to national total is insignificant,
- all activity data, emission factors and resulting emission data are stored in a database in KOBIZE, which is constantly updated and extended to meet the ever changing requirements for emission reporting, with respect to UNFCCC and LTRAP as well as their protocols.

1.4. Brief general description of methodologies and data sources used

The GHG emissions and removals inventory presented in this report follow the recommended by decision 24/CP.19 the *2006 IPCC Guidelines for national inventories* [IPCC 2006]. According to these guidelines country specific methods have been used where appropriate giving more accurate emission data especially in case of key categories. For categories where emissions do not occur or are not estimated the abbreviations NO and NE were used in tables. More detail description of methodologies used in Polish GHG inventory is given in sections 3–7.

The non-CO_2 GHG emissions from fuel combustion (1.A. category) were estimated based on fuel consumption estimates and respective emission factors. Data on fuel consumption for stationary sources with disaggregation into fuel type and source category come from fuel balances elaborated by Central Statistical Office and reported to Eurostat.

One of the steps of emission inventorying from the 1.A. *Energy* category is preparation of energy budgets for main fuels (energy carriers). These budgets are prepared based on the national energy balances published by Central Statistical Office and Agency of Energy Market. The tables of the national energy balance include detailed information on the ins and outs of all the energy carriers used in Poland, as well as information on their conversions to other energy carriers and on their direct consumption. The data for international bunker are also assessed.

The example of evaluation of hard coal consumption is given in table 1.1. The examples of the fuel budgets for: lignite, natural gas, coke-oven gas and blast furnace gas are presented in Annex 4.

The data on quantity of coal combusted in whole country in a given year (tab. 1.1) is used for calculation of the average net calorific value of this fuel. This calculated net calorific value provides then the basis for the estimation of country specific CO_2 emission factor based on empirical formula that applies the relationship between net calorific value and elemental carbon content in fuel (see chapter 3.1.1). This factor can be used for estimation of the potential CO_2 emission from coal combustion. The amount of fuel combusted in a given year, calculated in fuel budget, can be compared with total consumption of this fuel in all sectors. It is one of the ways of verifying of sectoral approach.

Basic information on activity data regarding IPCC categories comes from Eurostat and Central Statistical Office (GUS) databases. The activity data that are not available in the GUS have been worked out in experts studies commissioned specifically for the GHG emission inventory purposes.

Table 1.1. Hard coal consumption in 2015

National fuel balance	Hard coal - Eurostat	
	kt	TJ
In	80 974	1 946 121
From national sources	72 686	1 740 381
1) Indigenous production	72 176	1 728 142
2) Transformation output or return	510	12 239
3) Stock decrease	0	0
Import	8 289	205 740
Out	80 974	1 946 121
National consumption	72 742	1 746 513
1) Transformation input	55 723	1 317 986
a) input for secondary fuel production	13 231	390 854
b) fuel combustion	42 492	927 133
2) Direct consumption	17 019	428 526
Non-energy use	164	4 533
Combusted directly	16 856	423 993
Combusted in Poland	59 348	1 351 126
Stock increase	-137	-3 670
Export	9 192	246 055
Losses and statistical differences	-822	-42 777
Net calorific value	MJ/kg	22.77

Eurostat database containing domestic data provided by GUS is the main source of activities for *Energy* sector (Annex 4). The data on fuel consumption in *Road Transportation* subcategory were also taken from the Eurostat database and next disaggregated on individual vehicle types based on methodology developed in the Motor Transport Institute.

1.5. Brief description of key categories

The source/sink categories in all sectors are identified to be *key categories* on the basis of their contribution to the total level and/or trend assessment established in accordance with 2006 IPCC GLs following quantitative Approach 1 and qualitative criteria. In 2015, 25 sources were identified as Poland's key categories excluding LULUCF and 29 including LULUCF while in 1988 22 and 25 respectively with the application of quantitative approach. Analysis with use of qualitative criteria identified no additional categories as key sources.

About 76.2% of GHG emissions in 2015 were generated in the sector 1.A *Energy,* of which four the biggest source categories: 1.A.1 *Energy Industries (Solid fuels)*, 1.A.3.b *Road Transportation (Fossil fuels)*, 1.A.4 *Other Sectors (Solid fuels)* and 1.A.2 *Manufacturing Industries and Construction (Solid fuels)* generate 63.1% of Poland's GHG emissions. This category is of significant influence on a country's total GHG emissions in terms of both: level and trend of emissions.

Table 1.2 presents the general information on identified key categories in the national inventory for 2015. Those categories contribute to 96.5% of the GHG emission (without LULUCF).

The complete tables with level and trend assessments for 1988 and 2015 are given in Annex 1.

Table 1.2. Key category analysis results in 2015 (without LULUCF)

No.	IPCC Source Categories	Greenhouse Gas	Identification criteria (Level, Trend, Qualitative)			Comments
1	1.A.1 Fuel combustion - Energy Industries - Liquid Fuels	CO2	L	T		
2	1.A.1 Fuel combustion - Energy Industries - Solid Fuels	CO2	L	T		
3	1.A.1 Fuel combustion - Energy Industries - Gaseous Fuels	CO2	L	T		
4	1.A.1 Fuel combustion - Energy Industries - Other Fossil Fuels	CO2		T		
5	1.A.2 Fuel combustion - Manufacturing Industries and Construction - Liquid Fuels	CO2	L	T		
6	1.A.2 Fuel combustion - Manufacturing Industries and Construction - Solid Fuels	CO2	L	T		
7	1.A.2 Fuel combustion - Manufacturing Industries and Construction - Gaseous Fuels	CO2	L	T		
8	1.A.2 Fuel combustion - Manufacturing Industries and Construction - Other Fossil Fuels	CO2	L	T		
9	1.A.3.b Road Transportation	CO2	L	T		
10	1.A.3.c Railways	CO2		T		
11	1.A.3.e Other Transportation	CO2		T		
12	1.A.4 Other Sectors - Liquid Fuels	CO2	L	T		
13	1.A.4 Other Sectors - Solid Fuels	CO2	L	T		
14	1.A.4 Other Sectors - Solid Fuels	CH4	L	T		
15	1.A.4 Other Sectors - Gaseous Fuels	CO2	L	T		
16	1.A.4 Other Sectors - Biomass	CH4		T		
17	1.B.1 Fugitive emissions from Solid Fuels	CO2	L			
18	1.B.1 Fugitive emissions from Solid Fuels	CH4	L	T		
19	1.B.2.c Fugitive Emissions from Fuels - Venting and flaring	CH4		T		
20	1.B.2.d Fugitive Emissions from Fuels - Other	CO2	L	T		
21	2.A.1 Cement Production	CO2	L	T		
22	2.A.2 Lime Production	CO2		T		
23	2.A.4 Other Process Uses of Carbonates	CO2	L	T		
24	2.B.1 Ammonia Production	CO2	L	T		
25	2.B.2 Nitric Acid Production	N2O		T		
26	2.C.1 Iron and Steel Production	CO2	L	T		
27	2.F.1 Refrigeration and Air conditioning	Aggregate F-gases	L	T		
28	3.A Enteric Fermentation	CH4	L	T		
29	3.B Manure Management	N2O	L			
30	3.D.1 Direct N2O Emissions From Managed Soils	N2O	L	T		
31	3.D.2 Indirect N2O Emissions From Managed Soils	N2O	L			
32	3.G Liming	CO2		T		
33	5.A Solid Waste Disposal	CH4	L	T		
34	5.D Wastewater Treatment and Discharge	CH4		T		

1.6. General uncertainty evaluation, including data on the overall uncertainty for the inventory totals

Uncertainty evaluation made for 2015 is based on calculations and national expert's judgments/ estimations as well as opinions expressed by international experts during the review led by UNFCCC Secretariat in the years 2007-2012. Calculations include simplified method for sector 4 and for fluorinated industrial gases.

The estimate of emission uncertainty for the year 2015 was made using *Tier 1* approach. The uncertainty ranges varied significantly among various source categories and are presented within sectoral chapters 3-7. More details, including sectoral information on uncertainty ranges, are given in Annex 8.

1.7. General assessment of the completeness

The Polish GHG emission inventory includes calculation of emissions from all relevant sources recommended by the mandatory guidelines. Only CO_2 from *Coal Mining and Handling* (1.B.1.a) is not considered due to the lack of data at this level of aggregation.

2. Trends in greenhouse gas emissions

2.1. Description and interpretation of emission trends for aggregated greenhouse gas emissions

For carbon dioxide, net emission is calculated by subtracting from the total CO_2 emission – the emissions and removals from category 4. *Land Use, Land Use Change and Forestry* (LULUCF). According to the IPCC methodology, CO_2 emissions are given with and without contributions from category 4. Also following IPCC, emission of CO_2 from biomass, is not included in the national total.

For non-CO_2 gases, the inventory results can also be presented (table 2.1) in units of CO_2 equivalents by applying values of the so called Global Warming Potentials - GWP. GWP for methane is 25, and for nitrous oxide 298. Carbon dioxide is the main GHG in Poland with the 80.92% (excluding category 4) share in 2015, while the methane contributes with 11.8% (excluding category 4) to the national total. Nitrous oxide contribution is 4.9% (excluding category 4) and all industrial GHG together contribute 2.3%. Percentage shares of individual GHGs in national total emissions in 2015 are presented in table 2.1. and figure 2.1.

Table 2.1. Greenhouse gas emissions in 2015 in CO_2 eq.

Pollutant	2015	
	Emission in CO_2 eq. [kt]	Share [%]
CO_2 (with LULUCF)	281 122.76	79.05
CO_2 (without LULUCF)	311 118.96	80.92
CH_4 (with LULUCF)	45 483.29	12.79
CH_4 (without LULUCF)	45 451.44	11.82
N_2O (with LULUCF)	20 030.35	5.63
N_2O (without LULUCF)	18 937.13	4.93
HFCs	8 924.04	2.32
PFCs	13.90	0.00
Mix HFC i PFC	NA,NO	NA,NO
SF_6	52.79	0.01
NF_3	NA,NO	NA,NO
TOTAL net emission (with LULUCF)	355 627.13	100.00
TOTAL without LULUCF	384 498.27	100.00

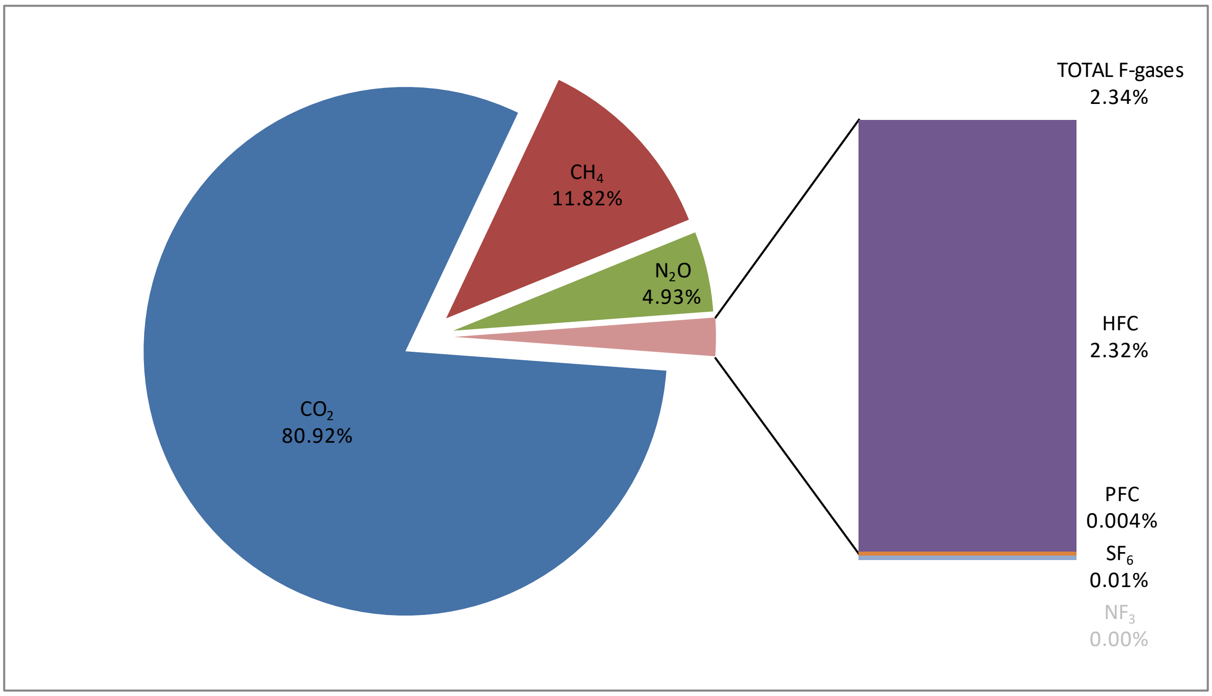

Figure 2.1. Percentage share of greenhouse gases in national total emission in 2015 (excluding category 4)

Emissions of main GHGs in 2015, disaggregated into main source sub-sectors, are given in table 2.2. Respective values for the fluorinated industrial gases are presented in table 2.3. Discussion of these results is given in the following sections.

Table 2.2. Emissions of CO_2, CH_4 and N_2O in 2015 [kt]

GHG	CO_2	CH_4	N_2O
TOTAL without LULUCF	311 118.96	1 818.06	63.55
TOTAL with LULUCF	281 122.76	1 819.33	67.22
1. Energy	291 301.91	909.56	7.83
A. Fuel Combustion	286 866.05	144.41	7.83
1. Energy Industries	162 679.76	4.70	2.59
2. Manufacturing Industries and Construction	28 180.03	4.26	0.59
3. Transport	45 267.65	4.33	1.64
4. Other Sectors	50 738.61	131.12	3.00
5. Other	IE, NO	IE, NO	IE, NO
B. Fugitive Emissions from Fuels	4 435.86	765.16	0.001
1. Solid Fuels	2 347.94	676.40	NA
2. Oil and Natural Gas	2 087.93	88.76	0.00
2. Industrial Processes and Product Use	18 558.88	2.62	2.91
A. Mineral Industry	10 088.56	NA	NA
B. Chemical Industry	5 141.13	2.02	2.51
C. Metal Industry	2 596.25	0.60	NA
D. Other Production	732.94	NE	NE
G. Other	NO	NO	0.4
3. Agriculture	770.57	562.50	49.72
A. Enteric Fermentation	NE	496.78	NE
B. Manure Management	NE	64.77	7.01
D. Agricultural Soils	NE	NA	42.68
F. Field Burning of Agricultural Residues	NE	0.95	0.04
G. Liming	373.84	NA	NA
H. Urea application	396.73	NA	NA
4. Land Use, Land-Use Change and Forestry	-29 996.20	1.27	0.02
A. Forest Land	-30 622.92	1.27	0.020
B. Cropland	362.12	IE, NO	0.001
C. Grassland	-568.12	0.00	0.00
D. Wetlands	4 526.55	0.00	0.00
E. Settlements	1 646.71	NA, NO	NA, NO
F. Other Land	NA, NO	NA, NO	NA, NO
G. HWP	-5 340.55	NA, NO	NA, NO
5. Waste	487.60	343.38	3.08
A. Solid Waste Disposal	NO,NA	326.02	NO,NA
B. Biological Treatment of Solid Waste	NO,NA	7.34	0.44
C. Incineration and Open Burning of Waste	487.60	0.00	0.18
D. Wastewater Treatment and Discharge	NO,NA	10.02	2.46

Table 2.3. Emissions of industrial gases: HFCs, PFCs and SF_6 in 2015 [kt eq. CO_2]

2015	HFCs	PFCs	SF_6	Total in eq. CO_2
Total Industrial gases [kt eq. CO_2]	8 924.04	13.90	52.79	8 990.73
C. Metal Industry	NE	NO	4.15	4.15
4. Magnesium production	NE	NO	4.15	4.15
F. Consumption of Halocarbons and SF_6	8 924.04	13.90	NO	8 937.95
1. Refrigeration and Air Conditioning Equipment	8 383.22	NO	NO	8 383.22
2. Foam Blowing	343.83	NO	NO	343.83
3. Fire Extinguishers	71.13	13.90	NA	85.03
4. Aerosols	125.45	NA	NA	125.45
G. Other product manufacture and use	NO	NO	48.64	48.64
1. Electrical equipment	NO	NO	48.64	48.64

As a supplement to the tables 2.2 and 2.3, table 2.4 includes percentage contributions of main source sectors to the national totals in 2015 for CO_2, CH_4 and N_2O.

Trend of aggregated greenhouse gases emissions follows the trend of emissions CO_2 alone which is the primary greenhouse gas emitted in Poland. The GHGs trend for period between 1988 and 1990 indicate dramatic decrease triggered by significant economic changes, especially in heavy industry, related to political transformation from centralized to market economy. This drop in emissions continued up to 1993 and then emissions started to rise with peak in 1996 as a result of development in heavy industry and other sectors and dynamic economic growth. Slow decline in emissions (up to 2002) characterized the succeeding years, when still energy efficiency policies and measures were implemented, and then slight increase up to 2007 caused by animated economic development. Since 2008 stabilisation in emissions has been noted with distinct decrease in 2009 related to world economic slow-down (figure 2.2 and tables 2.5 and 2.6). Since 2010 GHG emissions in Poland have gradually decreased.

Since 2005 Poland has taken part in the European Union's Emission Trading System, being one of the flexible mechanism supporting measures for limiting the greenhouse gas emissions. The share of emissions from installations covered by EU ETS in the national emissions in 2005−2015 amounted about 51% on average. One should notice that since 2013 the scope of the EU ETS has expanded with new industries (like production of selected chemicals) and greenhouse gases (nitrous oxide) (figure S.2).

Table 2.4. Percentage shares of individual source sectors in 2015 emissions

Percentage share of emissions of source sectors in current year without LULUCF	Share [%]		
	CO_2	CH_4	N_2O
TOTAL	100.00	100.00	100.00
1. Energy	93.63	50.03	12.32
A. Fuel Combustion	92.20	7.94	12.32
1. Energy Industries	52.29	0.26	4.08
2. Manufacturing Industries and Construction	9.06	0.23	0.93
3. Transport	14.55	0.24	2.58
4. Other Sectors	16.31	7.21	4.72
5. Other	IE, NO	IE, NO	IE, NO
B. Fugitive Emissions from Fuels	1.43	42.09	0.002
1. Solid Fuels	0.75	37.20	NA
2. Oil and Natural Gas	0.67	4.88	0.002
2. Industrial Processes and Product Use	5.97	0.14	4.59
A. Mineral Industry	3.24	NA	NA
B. Chemical Industry	1.65	0.11	3.96
C. Metal Industry	0.83	0.03	NA
D. Other Production	0.24	NE	NE
G. Other	NO	NO	0.63
3. Agriculture	0.25	30.94	78.24
A. Enteric Fermentation	NE	27.32	NE
B. Manure Management	NE	3.56	11.02
D. Agricultural Soils	NE	NA	67.16
F. Field Burning of Agricultural Residues	NE	0.05	0.06
G. Liming	0.12	NA	NA
H. Urea application	0.13	NA	NA
4. Land Use, Land-Use Change and Forestry	-	-	-
A. Forest Land	-	-	-
B. Cropland	-	-	-
C. Grassland	-	-	-
D. Wetlands	-	-	-
E. Settlements	-	-	-
F. Other Land	-	-	-
G. HWP	-	-	-
5. Waste	0.16	18.89	4.85
A. Solid Waste Disposal	NO,NA	17.93	NO,NA
B. Biological Treatment of Solid Waste	NO,NA	0.40	0.69
C. Incineration and Open Burning of Waste	0.16	0.00	0.29
D. Wastewater Treatment and Discharge	NO,NA	0.55	3.87

Table 2.5. National emissions of greenhouse gases for 1988–2015 by gases [kt CO_2 eq.]

GHG	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
CO_2 (with LULUCF)	453 921.17	429 928.69	350 306.88	355 353.87	367 720.79	361 612.05	355 938.73	346 552.89	341 749.32	332 983.25	297 158.87	280 779.19	285 295.89	291 026.95
CO_2 (without LULUCF)	470 942.43	451 306.17	376 264.35	373 578.14	363 874.95	364 065.96	359 822.35	361 559.67	375 337.12	366 599.30	337 358.47	327 681.81	317 174.18	313 617.87
CH_4 (with LULUCF)	68 555.14	68 243.84	62 958.55	58 324.86	56 571.46	54 887.85	54 226.47	52 807.66	52 121.26	51 998.46	50 274.23	49 341.27	48 080.62	49 912.88
CH_4 (without LULUCF)	68 511.01	68 199.81	62 914.49	58 279.86	56 526.95	54 845.63	54 185.53	52 761.75	52 084.87	51 960.53	50 239.89	49 304.17	48 048.07	49 880.30
N_2O (with LULUCF)	29 514.97	30 788.03	27 511.58	23 063.03	21 543.27	22 833.75	22 456.00	23 465.02	23 576.75	23 475.81	23 246.54	22 532.30	22 899.79	23 086.03
N_2O (without LULUCF)	29 344.69	30 576.58	27 328.61	22 857.84	21 283.45	22 247.23	22 141.09	23 117.36	23 240.05	23 141.45	22 882.21	22 158.99	22 517.17	22 672.42
HFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	134.69	335.49	481.02	569.32	780.47	1 366.50	1 925.34
PFCs	147.26	147.51	141.87	141.31	134.63	144.86	152.78	171.97	161.07	173.36	174.86	168.71	176.68	197.34
Unspecified mix of HFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
SF_6	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	13.27	29.12	23.80	22.91	23.94	23.50	23.07	22.86
NF_3	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
TOTAL (with LULUCF)	**552 138.55**	**529 108.07**	**440 918.88**	**436 883.06**	**445 970.15**	**439 478.51**	**432 787.25**	**423 161.35**	**417 967.70**	**409 134.81**	**371 447.74**	**353 625.44**	**357 842.54**	**366 171.40**
TOTAL (without LULUCF)	**568 945.38**	**550 230.07**	**466 649.33**	**454 857.16**	**441 819.99**	**441 303.68**	**436 315.02**	**437 774.57**	**451 182.42**	**442 378.56**	**411 248.68**	**400 117.65**	**389 305.67**	**388 316.12**

Table 2.5. (cont.) National emissions of greenhouse gases for 1988–2015 by gases [kt CO_2 eq.]

GHG	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CO_2 (with LULUCF)	273 604.13	283 016.23	275 785.60	275 597.52	294 024.70	299 048.54	292 995.84	281 286.18	300 395.71	292 705.99	285 356.88	278 381.58	273 736.02	281 122.76
CO_2 (without LULUCF)	305 736.69	318 462.85	322 613.14	321 743.01	334 660.13	334 348.49	327 436.64	313 842.22	331 782.02	331 288.32	323 809.85	319 612.76	307 025.28	311 118.96
CH_4 (with LULUCF)	48 324.02	48 600.57	48 189.28	48 580.50	48 841.24	48 118.81	47 831.85	46 651.45	46 589.69	45 483.06	45 261.22	45 523.54	45 059.09	45 483.29
CH_4 (without LULUCF)	48 289.31	48 563.66	48 155.02	48 547.01	48 802.16	48 089.11	47 797.21	46 621.61	46 558.04	45 451.98	45 229.45	45 486.56	45 023.82	45 451.44
N_2O (with LULUCF)	21 971.51	22 197.90	22 715.37	22 897.60	23 411.96	24 238.48	23 683.47	20 560.92	20 291.90	20 635.52	20 783.62	20 894.86	20 820.98	20 030.35
N_2O (without LULUCF)	21 560.57	21 773.10	22 271.80	22 446.54	22 943.41	23 714.98	23 141.91	19 982.72	19 661.60	19 989.84	20 065.68	20 151.41	19 735.73	18 937.13
HFCs	2 505.93	3 078.00	3 733.23	4 556.73	5 226.22	5 827.97	6 153.06	6 107.84	6 824.53	7 453.97	7 799.33	8 202.70	8 836.19	8 924.04
PFCs	207.33	201.08	205.07	187.41	193.58	184.63	163.12	17.97	17.07	16.22	15.41	14.64	13.90	13.90
Unspecified mix of HFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
SF_6	23.29	20.72	22.36	26.80	33.20	31.16	32.87	37.60	35.37	39.02	41.92	47.54	52.79	52.79
NF_3	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
TOTAL (with LULUCF)	**346 636.21**	**357 114.49**	**350 650.90**	**351 846.55**	**371 730.89**	**377 449.58**	**370 860.20**	**354 661.95**	**374 154.27**	**366 333.78**	**359 258.37**	**353 064.85**	**348 518.97**	**355 627.13**
TOTAL (without LULUCF)	**378 323.10**	**392 099.40**	**397 000.61**	**397 507.50**	**411 858.70**	**412 196.34**	**404 724.80**	**386 609.96**	**404 878.63**	**404 239.35**	**396 961.63**	**393 515.60**	**380 687.71**	**384 498.27**

Table 2.6. National emissions of greenhouse gases for 1988–2015 by source categories [kt CO_2 eq.]

IPCC sector	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
1. Energy	475 027.06	454 612.06	382 030.32	380 101.28	371 271.63	372 696.34	366 533.74	366 801.18	381 757.34	371 495.42	342 139.39	333 588.46	320 984.14	321 995.96
2. Industrial Processes	31 211.82	30 247.71	22 874.41	20 212.68	19 753.03	19 303.15	21 261.52	22 702.66	22 049.72	22 966.68	21 388.83	20 589.24	23 797.22	22 467.36
3. Agriculture	47 835.68	50 519.18	47 155.60	40 119.67	36 523.26	35 210.83	34 783.91	34 732.58	34 006.84	34 591.23	34 335.88	32 596.07	31 005.77	30 614.99
4. Land-Use, Land-Use Change and Forestry	-16 806.83	-21 121.99	-25 730.45	-17 974.09	4 150.16	-1 825.18	-3 527.77	-14 613.22	-33 214.72	-33 243.75	-39 800.94	-46 492.21	-31 463.13	-22 144.72
5. Waste	14 870.82	14 851.12	14 588.99	14 423.53	14 272.07	14 093.37	13 735.85	13 538.14	13 368.52	13 325.24	13 384.58	13 343.87	13 518.54	13 237.80
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
TOTAL (with LULUCF)	**552 138.55**	**529 108.07**	**440 918.88**	**436 883.06**	**445 970.15**	**439 478.51**	**432 787.25**	**423 161.35**	**417 967.70**	**409 134.81**	**371 447.74**	**353 625.44**	**357 842.54**	**366 171.40**
TOTAL (without LULUCF)	**568 945.38**	**550 230.07**	**466 649.33**	**454 857.16**	**441 819.99**	**441 303.68**	**436 315.02**	**437 774.57**	**451 182.42**	**442 378.56**	**411 248.68**	**400 117.65**	**389 305.67**	**388 316.12**

Table 2.6. (cont.) National emissions of greenhouse gases for 1988–2015 by source categories [kt CO_2 eq.]

IPCC sector	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1. Energy	314 356.64	325 928.50	329 589.42	330 157.67	341 751.65	338 947.82	333 169.62	321 809.07	338 702.88	335 313.25	329 411.60	325 713.15	311 770.74	316 373.50
2. Industrial Processes	20 787.84	23 661.17	25 456.75	25 424.35	27 762.11	30 322.40	28 896.51	22 794.13	24 815.72	27 681.77	26 671.61	26 434.84	28 048.72	28 483.57
3. Agriculture	29 929.56	29 364.19	29 354.21	29 511.99	30 221.10	30 854.09	30 928.18	30 232.31	29 717.72	30 088.15	29 956.20	30 514.35	30 472.43	29 649.89
4. Land-Use, Land-Use Change and Forestry	-31 686.90	-34 984.91	-46 349.71	-45 660.94	-40 127.81	-34 746.75	-33 864.61	-31 948.01	-30 724.36	-37 905.56	-37 703.26	-40 450.75	-32 168.74	-28 871.14
5. Waste	13 249.07	13 145.55	12 600.24	12 413.48	12 123.84	12 072.03	11 730.49	11 774.45	11 642.31	11 156.18	10 922.23	10 853.27	10 395.82	9 991.31
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
TOTAL (with LULUCF)	**346 636.21**	**357 114.49**	**350 650.90**	**351 846.55**	**371 730.89**	**377 449.58**	**370 860.20**	**354 661.95**	**374 154.27**	**366 333.78**	**359 258.37**	**353 064.85**	**348 518.97**	**355 627.13**
TOTAL (without LULUCF)	**378 323.10**	**392 099.40**	**397 000.61**	**397 507.50**	**411 858.70**	**412 196.34**	**404 724.80**	**386 609.96**	**404 878.63**	**404 239.35**	**396 961.63**	**393 515.60**	**380 687.71**	**384 498.27**

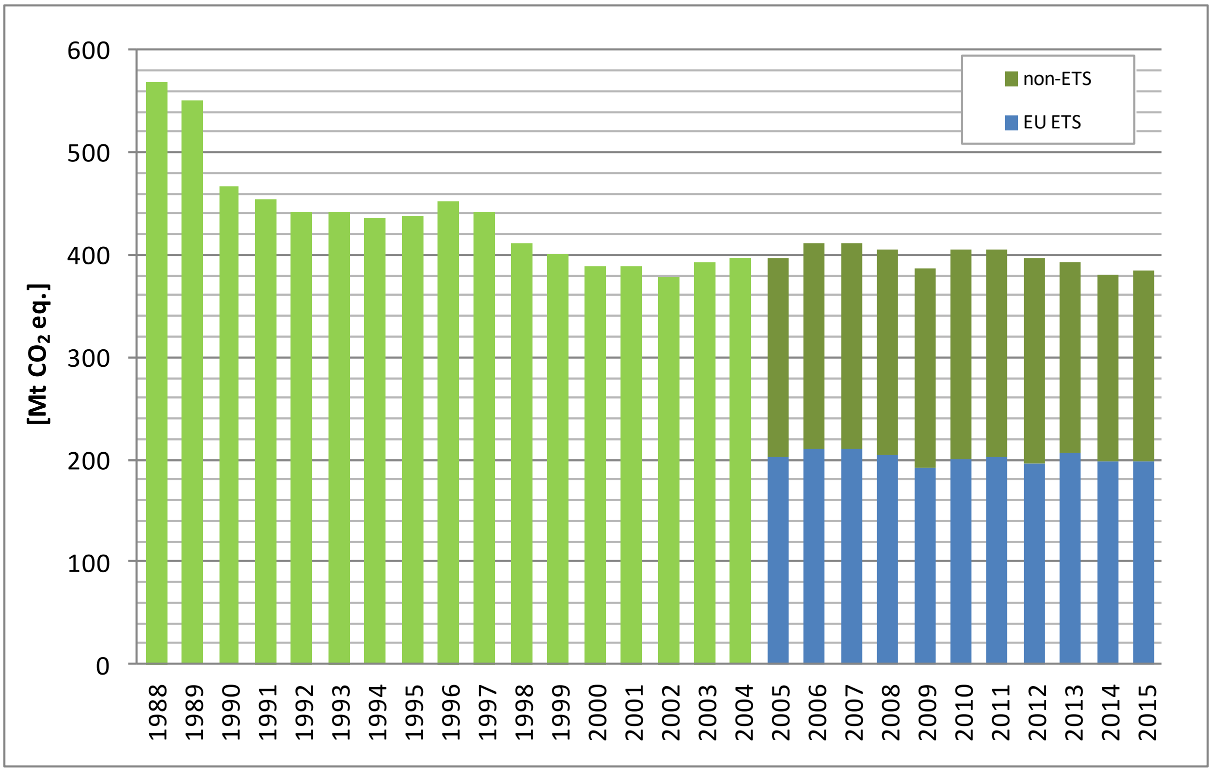

Figure 2.2. Trend of aggregated GHGs emissions (excluding category 4) for 1988–2015

2.2. Description and interpretation of emission trends by gas

Carbon dioxide (CO_2)

In 2015, the CO_2 emissions (without LULUCF) were estimated to be 311.12 million tonnes, while - when sector 4. LULUCF is included - the figure reaches 281.12 million tonnes (table 2.1). CO_2 share in total GHG emissions in 2015 amounted to 80.92%. The main CO_2 emission source is *Fuel Combustion* (1.A) subcategory. This sector contributed to the total CO_2 emission (without LULUCF) with 92.2% share in 2015 (fig. 2.3). The shares of the main subcategories in 1.A were as follows: *Energy industries* - 52.3%, *Manufacture Industries and Construction* – 9.1%, *Transport* – 14.5% and *Other Sectors* – 16.3%. Sector 2. *Industrial Processes* contributed to the total CO_2 emission with 6.0% share in 2015. *Mineral industry* (especially *Cement Production*) is the main emission source in this sector. The CO_2 emission/removal in LULUCF sector in 2015, was calculated to be approximately 30.0 million tonnes. It means that app. 9.6% of the total CO_2 emissions are offset by CO_2 uptake by forests.

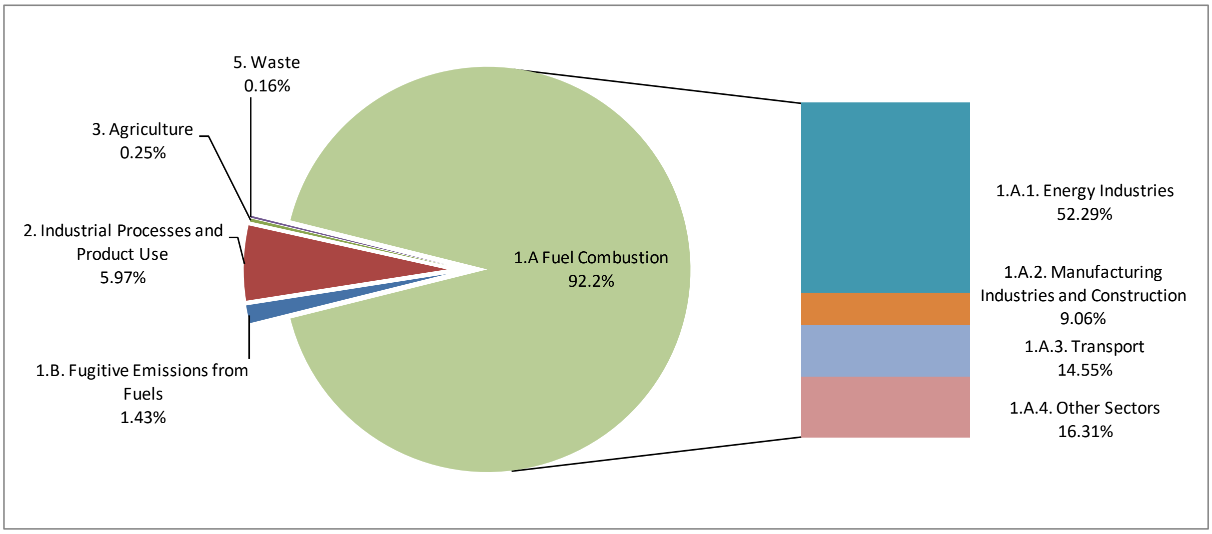

Figure 2.3. Carbon dioxide emission (excluding category 4) in 2015 by sector

Methane (CH_4)

The CH_4 emission (excluding category 4) amounted to 1 818.06 kt in 2015 i.e. 45.45 million tonnes of CO_2 equivalents (table 2.1). CH_4 share in total GHG emissions in 2015 amounted to 11.8%. Three of main CH_4 emission sources include the following categories: *Fugitive Emissions from Fuels, Agriculture* and *Waste*. They contributed with 42.1%, 30.9% and 18.9% shares to the national methane emission in 2015, respectively (fig. 2.4). The emission from the first mentioned sector was covered by emission from *Underground Mines* (app. 37.2% of total CH_4 emission) and *Oil and Natural Gas* system (about 4.9% of total emission). The emission from *Enteric Fermentation* dominated in *Agriculture* and amounted to app. 27.3% of total methane emission in 2015. *Disposal sites* contributed to 18.9% of the methane emission.

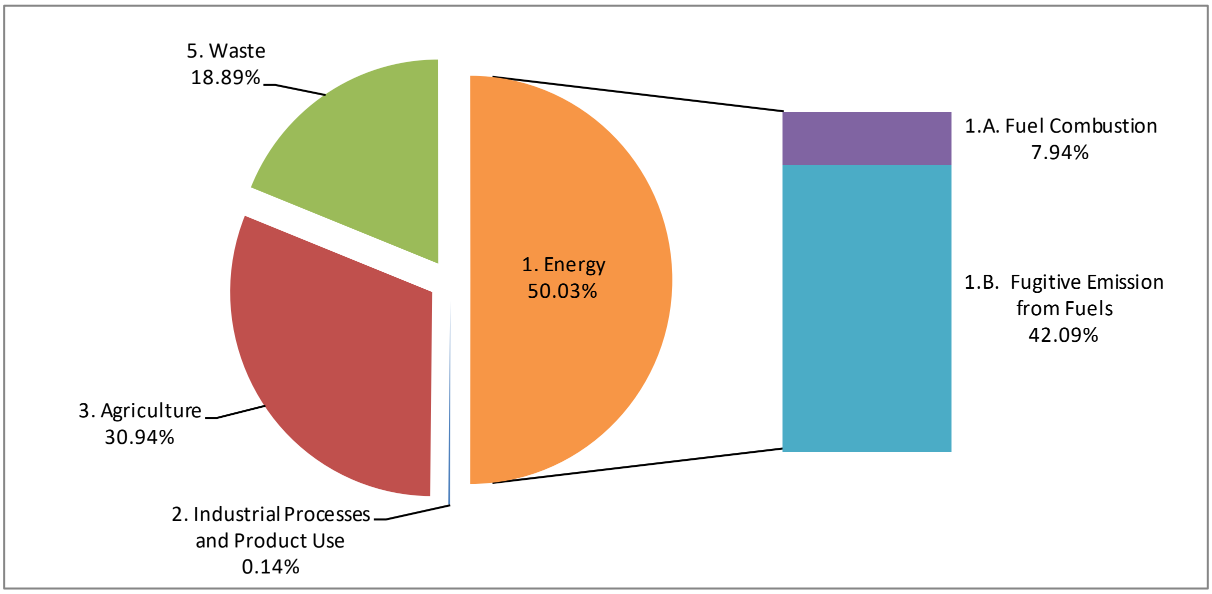

Figure 2.4. Methane emission in 2015 by sector

Nitrous oxide (N_2O)

The nitrous oxide emissions (excluding category 4) in 2015 were 63.55 kt i.e. 18.94 million tonnes of CO_2 equivalents (table 2.2). N_2O share in total GHG emissions in 2015 amounted to 4.9%. The main N_2O emission sources and their shares in total N_2O emission in 2015 are: *Agricultural Soils* – 67.2%, *Manure Management* – 11.0%, *Chemical Industry* – 4.6% and *Fuel Combustion* – 12.3% (fig. 2.5).

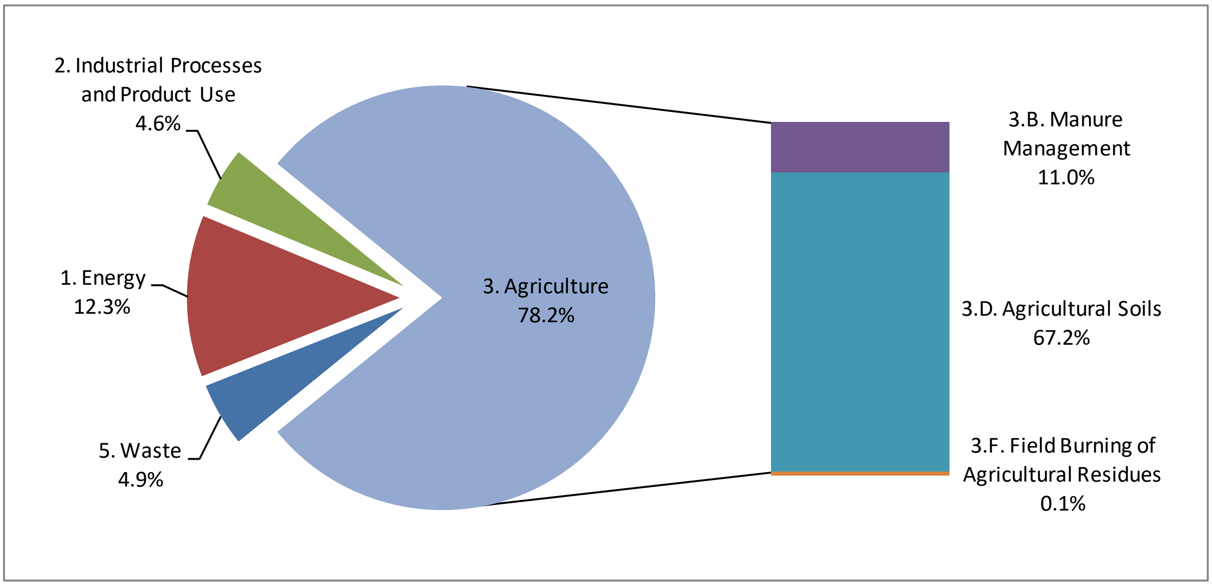

Figure 2.5. Nitrous oxide emission (excluding category 4) in 2015 by sector

Industrial gases

The total emission of industrial gases (HFCs, PFCs SF_6 and NF_3) in 2015 was 8 990.73 kt CO_2 equivalent what accounts for 2.3% of total GHG emissions share in 2015. This significant growth in HFCs emission is mainly due to the increase in emission from refrigeration and air conditioning equipment. Shares of HFCs, PFCs and SF_6 in total 2015 GHG emissions was respectively as follows: 2.32%, 0.004% and 0.014%. NF_3 emissions did not occur.

The total emissions in 2015 according to groups of industrial gases are as follows: HFCs – 8.92 million tonnes of CO_2 equivalents, PFCs – 0.01 million tonnes of CO_2 equivalents and SF_6 – 0.05 million tonnes of CO_2 equivalents.

Comparison of GHG emissions to the base year

Percentage share of individual GHGs to national total in the base year (1988/1995) is presented in figure 2.6. Compared to the base year, the percentage share of CO_2 (excluding category 4) in 2015 decreased slightly from 82.75% to 80.92%.

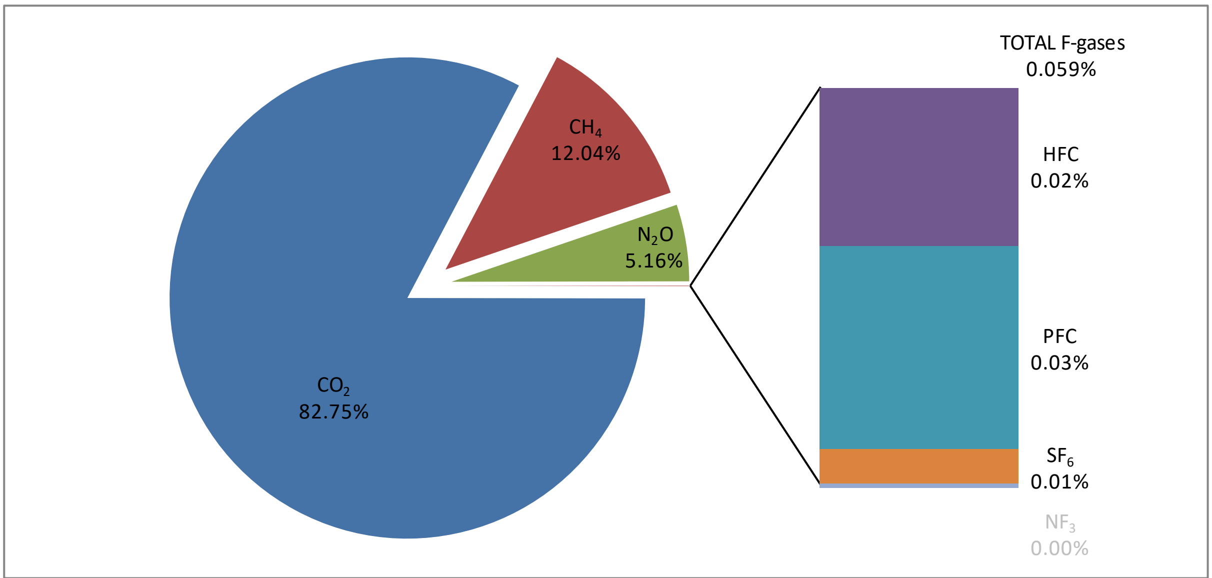

Figure 2.6. Percentage share of national greenhouse gas emissions in base year excluding emission from category 4

Table 2.7. Greenhouse gas emissions in 2015 with respect to base year (1988 and 1995 for F-gases)

Pollutant	Emission in CO_2 eq. [kt]		(2015-base)/base [%]
	Base year	2015	
CO_2 (with LULUCF)	453 921.17	281 122.76	-38.07
CO_2 (without LULUCF)	470 942.43	311 118.96	-33.94
CH_4 (with LULUCF)	68 555.14	45 483.29	-33.65
CH_4 (without LULUCF)	68 511.01	45 451.44	-33.66
N_2O (with LULUCF)	29 514.97	20 030.35	-32.13
N_2O (without LULUCF)	29 344.69	18 937.13	-35.47
HFCs	134.69	8 924.04	6 525.48
PFCs	171.97	13.90	-91.92
Unspecified mix of HFCs and PFCs	NA,NO	NA,NO	NA
SF_6	29.12	52.79	81.26
NF_3	NA,NO	NA,NO	NA,NO
TOTAL net emission (with LULUCF)	552 327.08	355 627.13	-35.61
TOTAL without LULUCF	569 133.91	384 498.27	-32.44

Comparison of GHG emissions in 2015 and the base year given in table 2.7 indicates significant drop in all gases, except HFCs and SF_6, especially in CO_2 and methane emissions, where decrease reached almost 34% in 1988-2015. This was mainly caused by significant changes in fuel mix as well as serious drop in coal mining livestock population.

Carbon dioxide

CO_2 emission (excluding category 4) decreased by app. 33.9% from the base year (1988) to 2015.

The following changes took place in the structure of fuel use:

- share of solid fuels decreased from 80.1% in the base year to 55.1% in 2015,
- share of liquid fuels increased from 11.7% in the base year to 23.4% in 2015,
- share of gaseous fuels increased from 6.2% in the base year to 12.8% in 2015.

Methane

CH_4 emission (excluding category 4) decreased by app. 33.7% from the base year (1988) to 2015. The reasons for that are as follows:

- the decrease in emission from *Enteric Fermentation* by 43.4%,
- the decrease in *Fugitive Emission* by 23.3%,
- the decrease in emission from *Waste* by 37.1%.

Nitrous oxide

The nitrous oxide emissions (excluding category 4) in 2015 were app. 35.5% lower than the respective figure for the base year (1988) what was caused mostly by diminishing agricultural production. At the same time the share of *Manure Management* increased from 10.7% in the base year 1988 to 11.0% in 2015, share of *Agricultural Soils* increased from 61.1% in the base year 1988 to 67.2% in 2015 and *Chemical Industry* decreased from 16.4% in the base year 1988 to 4.0% in 2015.

Industrial gases: HFCs, PFCs, NF_3 and SF_6

HFCs emissions in 2015 were 66.3 times higher than in base year (1995). This significant growth in HFCs emission is mainly due to the increase in emission from refrigeration and air conditioning equipment. PFCs emissions in 2015 were by 91.9% lower than in base year (1995). The PFCs emission changes between 2015 and the preceding years depend on the aluminium production levels (main PFC source) and the use of C_4F_{10} in fire extinguishers.

SF_6 emissions in 2015 were higher by about 81.3% than in base year (1995). Leakage from electrical equipment during its use and production is the main SF_6 emission. Large percentage increase of industrial gases emissions, compared to the base year (1995), does not influence significantly the national total GHG emission trend, because all the fluorinated industrial gases together contributed merely with app. 33.9% to the national total in 2015. NF_3 emissions did not occur.

2.3. Description and interpretation of emission trends by category

Table 2.8 includes emissions of greenhouse gases from all categories for the base year and for year 2015 by main categories. In 2015 total GHG emissions accounted for 384.50 million tonnes CO_2 eq. excluding sector 4. LULUCF. Comparing to the base year emissions in 2015 decreased by 32.4%.

Table 2.8. GHG emissions by main sector in the base year and in 2015

	Total [kt eq. CO_2]		(2015-base)/base [%]
	Base year	2015	
TOTAL with LULUCF	552 327.08	355 627.13	-35.6
TOTAL without LULUCF	569 133.91	384 498.27	-32.4
1. Energy	475 027.06	316 373.50	-33.4
2. Industrial Processes and Product Use	31 400.35	28 483.57	-9.3
3. Agriculture	47 835.68	29 649.89	-38.0
4. Land-Use, Land-Use Change and Forestry	-16 806.83	-28 871.14	71.8
5. Waste	14 870.82	9 991.31	-32.8

2.3.1. Energy

The emission of GHGs from *Energy* sector in 2015 was 316.4 million tonnes of CO_2 equivalent. CO_2 emission share amounted to 92.1% of the total GHG emissions within 1. *Energy* category (table 2.9). The most emission intensive category was 1.A.1. *Fuel combustion activities* related mostly to heavy energy sector, highly energy consuming.

Table 2.9. GHG emissions from sub-sectors in category 1. *Energy* in 2015

GHG emission categories	GHG emission [kt CO_2 eq.]	% share in the total emission from sector 1. *Energy*	% share in total GHG emission		
			CO_2	CH_4	N_2O
1. TOTAL ENERGY	316 373.50	100.0	92.1	7.2	0.7
A. Fuel Combustion	292 808.32	92.6	90.7	1.1	0.7
1. Energy Industries	163 570.59	51.7	51.4	0.0	0.2
2. Manufacturing Industries and Construction	28 463.12	9.0	8.9	0.0	0.1
3. Transport	45 863.70	14.5	14.3	0.0	0.2
4. Other Sectors	54 910.90	17.4	16.0	1.0	0.3
5. Other	0.00	0.0	0.0	0.0	0.0
B. Fugitive Emissions from Fuels	23 565.18	7.4	1.4	6.0	0.0
1. Solid Fuels	19 257.87	6.1	0.7	5.3	0.0
2. Oil and Natural Gas and other emissions from energy production	4 307.31	1.4	0.7	0.7	0.0

2.3.2. Industrial Processes and Product Use

Table 2.10 shows detailed information on emissions of CO_2, CH_4, N_2O as well as HFCs, PFCs, SF_6 in 2. *Industrial Processes and Product Use* sector in 2015. CO_2 is dominating among GHGs – it's contribution reaches 65.2%. The main GHG emission sources in this category were: production processes of cement, nitric acid and ammonia.

Table 2.10. The emissions of CO_2, CH_4 and N_2O from *Industrial Processes and Product Use* in 2015

GHG emission categories	GHG emission [kt CO_2 eq.]	% share in the total emission from sector 2. *IPPU*	% share in total GHG emission			
			CO_2	CH_4	N_2O	HFC, PFC and SF_6
2. TOTAL INDUSTRIAL PROCESSES AND PRODUCT USE	28 483.57	100.0	65.2	0.2	3.0	31.6
A. Mineral Industry	10 088.56	35.4	35.4	0.0	0.0	0.0
B. Chemical Industry	5 940.96	20.9	18.0	0.2	2.6	0.0
C. Metal Industry	2 615.32	9.2	9.1	0.1	0.0	0.0
D. Non-energy products from fuels and solvent use	732.94	2.6	2.6	0.0	0.0	0.0
F. Product uses as substitutes for ODS	8937.95	31.4	0.0	0.0	0.0	31.4
G. Other product manufacture and use	167.84	0.6	0.0	0.0	0.4	0.2

2.3.3. Agriculture

The main sources of GHG in category 3. *Agriculture* were: 3.D. *Agricultural Soils,* 3.A. *Enteric Fermentation* and 3.B. *Manure Management* (table 2.11). N_2O emission share was the largest in total GHG emission from 3. *Agriculture* in 2015 and came from both – direct (mineral and organic fertilization) and indirect (volatilization, leaching and runoff from applied synthetic fertilizer and animal manure) N_2O emissions from soils.

Table 2.11. GHG emissions from *Agriculture* in 2015

GHG emission categories	GHG emission [kt CO_2 eq.]	% share in the total emission from sector 3. *Agriculture*	% share in total GHG emission	
			CH_4	N_2O
3. TOTAL AGRICULTURE	29 649.89	100.0	47.4	50.0
A. Enteric Fermentation	12 419.47	41.9	41.9	0.0
B. Manure Management	3 706.80	12.5	5.5	7.0
D. Agricultural Soils	12 718.46	42.9	0.0	42.9
F. Field Burning of Agricultural Residues	34.59	0.1	0.1	0.0
G. Liming	373.84	1.3	0.0	0.0
H. Urea application	396.73	1.3	0.0	0.0

2.3.4. Waste

As it can be seen in table 2.12, the emission of CH_4 dominated in this sector in 2015 (with 85.9% share). The main part of GHG emissions came from 6.A. *Solid waste disposal*.

Table 2.12. GHG emissions from *Waste* in 2015

GHG emission categories	GHG emission [kt CO_2 eq.]	% share in the total emission from sector 5. *Waste*	% share in total GHG emission		
			CO_2	CH_4	N_2O
5. TOTAL WASTE	9 991.31	100	4.9	85.9	9.2
A. Solid Waste Disposal	8 150.45	81.6	0.0	81.6	0.0
B. Biological Treatment of Solid Waste	314.84	3.2	0.0	1.8	1.3
C. Incineration and Open Burning of Waste	542.25	5.4	4.9	0.0	0.5
D. Wastewater Treatment and Discharge	983.77	9.8	0.0	2.5	7.3

2.3.5. Emission from sources included in EU ETS system

The emissions from sources included in EU ETS (electricity and heat production, heavy industry) are reported directly by installations by the end of March every year. The sum of all the reported emissions by installations in Poland constitutes the emission of the Polish part of EU ETS. Those reports show the emission of CO_2 mainly (a small part of N_2O emission is also included). Total emission in this sector from stationary installations amounted to 198.7 Mt of CO_2 eq. in 2015 (table 2.13).

Poland (nor any other EU member state) does not have any specific reduction target for 2013-2020 imposed on emissions coming from sources included in EU ETS, as such a limit has only been imposed on the whole EU ETS on the EU level (*cap*). The installations directly are responsible for their individual emissions within the overall limit.

2.3.6. Emission from non-ETS (ESD) sources

The emissions from other sources than those included in EU ETS (including other GHG from EU ETS sources) constitute the non-ETS emissions. They amounted to 185.7 Mt of CO_2 eq. in 2015.

Poland will fulfil its obligations jointly with other EU member states. Considering what was said above about EU ETS, this joint fulfilment has been operationalized by effort sharing decisions (ESD) adopted on the EU level, according to which Poland and other member states have specific emission targets imposed only on the non-ETS emissions. This has been regulated by *Decision No 406/2009/EC of the European Parliament and of the Council on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020* (ESD decision). Pursuant to the ESD decision, the European Commission adopted yearly emission limits for the EU member states in its decision 2013/162/EU of 26 March 2013 (Annex II). The limits have been corrected in the Commission implementing decision 2013/634/EU of 31 October 2013 (Annex II).

The emissions in ESD sector have been compared to ESD limits for 2015 in the table below. The table shows that Poland overachieved in 2015 its non-ETS emission targets by about 10.5 Mt of CO_2 eq. The non-ETS emission has been calculated by deducting both: the emissions reported by installations (total EU ETS) and CO_2 from domestic aviation from the total GHG emission excluding LULUCF sector.

Table 2.13. Non-ETS (ESD) sector emission estimation for 2013-2015

Emission/emission limit [kt CO_2 eq.]	**2015**
1. Total emission (excluding category 4. LULUCF)	384 498.268
2. EU ETS	198 696.466
3. CO_2 from domestic aviation (1.A.3.a)	122.708
4. Non-ETS (ESD) (1-2-3)	**185 679.094**
5. ESD limit	196 128.269
6. Overachievement (5-4)	10 449.175

2.4. Description and interpretation of emission trends for KP-LULUCF inventory in aggregate, by activity and by gas

The emissions and removals balance of greenhouse gases for the period 2008-2015, to related activities of land use, land use change and forestry (LULUCF) under Article 3.3 and 3.4 of the Kyoto Protocol is presented in Table 2.14. For activities related to afforestation/reforestation and forest management estimated balance is negative, what means the activity is considered as a net CO_2 sink.

Table 2.14. The emissions and removals balance of greenhouse gases for the period 2008-2015 for selected activities of land use, land use change and forestry (LULUCF) [Mt CO_2]

Activity	2008	2009	2010	2011	2012	2013	2014	2015
4.KP. A.1. Afforestation/Reforestation	-2.368	-2.460	-2.582	-2.668	-2.783	-2.845	-2.818	-2.852
4.KP. A.2. Deforestation	0.245	0.255	0.263	0.226	0.248	0.203	0.316	0.301
4.KP. B.1. Forest Management	-38.247	-36.271	-35.037	-42.092	-42.065	-45.485	-38.142	-34.030
4.KP. B.2 Cropland management	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*
4.KP. B.3 Grazing land management	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*
4.KP. B.4 Revegetation	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*

Estimated sink associated with the afforestation activity, increased by 20% as compared to 2008. The emissions associated with deforestation as compared to 2008, increased by 22%. Net emissions increase was caused by the higher area of forest land exclusions for non-forestry and non agricultural purposes. The size of net absorption for forest management activity for the year 2015 is approximately 11% lower than in 2008.

Table 2.15. The emissions and removals balance of greenhouse gases for the period 2008-2015 for selected activities of land use, land use change and forestry (LULUCF) [kt CH_4]

Activity	2008	2009	2010	2011	2012	2013	2014	2015
4.KP.A.1. Afforestation/Reforestation	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
4.KP. A.2. Deforestation	NO	NO	NO	NO	NO	NO	NO	NO
4.KP. B.1. Forest Management	1.14	1.15	1.20	1.18	1.20	1.39	1.29	1.27
4.KP. B.2 Cropland management	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*
4.KP. B.3 Grazing land management	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*
4.KP. B.4 Revegetation	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*

Table 2.16. The emissions and removals balance of greenhouse gases for the period 2008-2015 for selected activities of land use, land use change and forestry (LULUCF) [kt N_2O]

Activity	2008	2009	2010	2011	2012	2013	2014	2015
4.KP.A.1. Afforestation/Reforestation	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
4.KP. A.2. Deforestation	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002
4.KP. B.1. Forest Management	0.01	0.01	0.01	0.01	0.02	0.00	0.01	0.01
4.KP. B.2 Cropland management	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*
4.KP. B.3 Grazing land management	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*
4.KP. B.4 Revegetation	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*	*Not applicable*

3. Energy (CRF sector 1)

3.1. Overview of sector

Following categories from sector 1 have been identified as key sources (excluding LULUCF):

IPCC Source Categories	Greenhouse Gas	Identification criteria (Level, Trend, Qualitative)		
1.A.1 Fuel combustion - Energy Industries - Liquid Fuels	CO2	L	T	
1.A.1 Fuel combustion - Energy Industries - Solid Fuels	CO2	L	T	
1.A.1 Fuel combustion - Energy Industries - Gaseous Fuels	CO2	L	T	
1.A.1 Fuel combustion - Energy Industries - Other Fossil Fuels	CO2		T	
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Liquid Fuels	CO2	L	T	
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Solid Fuels	CO2	L	T	
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Gaseous Fuels	CO2	L	T	
1.A.2 Fuel combustion - Manufacturing Industries and Construction - Other Fossil Fuels	CO2	L	T	
1.A.3.b Road Transportation	CO2	L	T	
1.A.3.c Railways	CO2		T	
1.A.3.e Other Transportation	CO2		T	
1.A.4 Other Sectors - Liquid Fuels	CO2	L	T	
1.A.4 Other Sectors - Solid Fuels	CO2	L	T	
1.A.4 Other Sectors - Solid Fuels	CH4	L	T	
1.A.4 Other Sectors - Gaseous Fuels	CO2	L	T	
1.A.4 Other Sectors - Biomass	CH4		T	
1.B.1 Fugitive emissions from Solid Fuels	CO2	L		
1.B.1 Fugitive emissions from Solid Fuels	CH4	L	T	
1.B.2.c Fugitive Emissions from Fuels - Venting and flaring	CH4		T	
1.B.2.d Fugitive Emissions from Fuels - Other	CO2	L	T	

Share of these categories in total Poland's GHG emissions amounts 81.21%

Figure 3.3.1 shows emission trend in *Energy* sector while figure 3.1.2 shows emission trend according to subcategories 1.A. *Fuel combustion* and 1.B. *Fugitive emission*. Emission from subcategory 1.A. *Fuel combustion* is the largest contributor to emissions from sector 1. *Energy* – in 2015 about 93%.

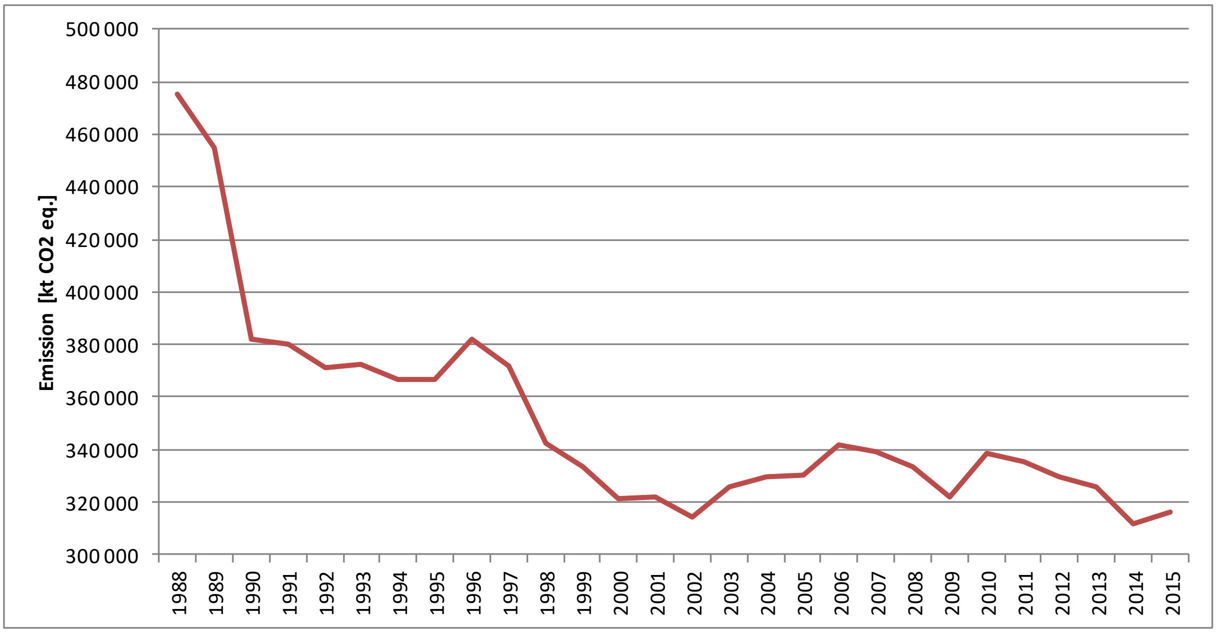

Figure 3.1.1. GHG emission trend in period 1988 – 2015 in sector *Energy*

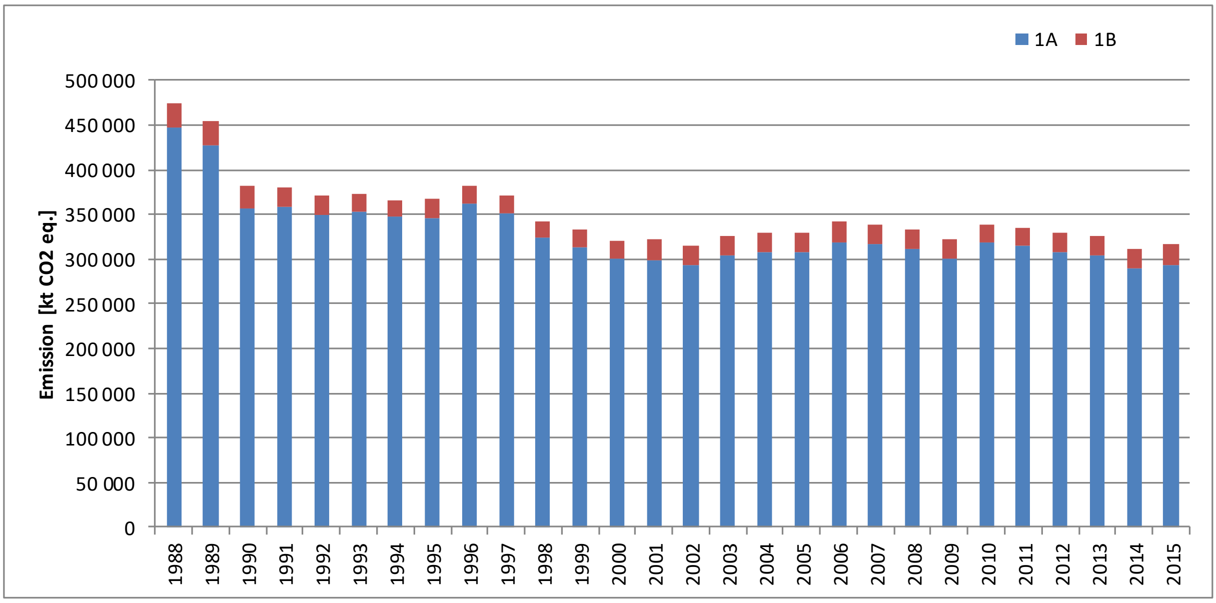

Figure 3.1.2. GHG emission trend in period 1988 - 2015 in subsectors 1.A and 1.B

3.1.1 Fuel combustion (CRF sector 1.A)

Combustion as a source of GHG emission occurs in the following category groups:
1.A.1. *Energy industries*
1.A.2. *Manufacturing industries and construction*
1.A.3. *Transport*
1.A.4. *Other sectors*:
 a. *Commercial/Institutional*
 b. *Residential*
 c. *Agriculture/Forestry/Fishing*

Share of that sector in total GHG emission in 2015 is over 76%. Subsector 1.A.1. *Energy Industries* is by far the largest contributor to emissions from fuel combustion (see figure 3.1.3).

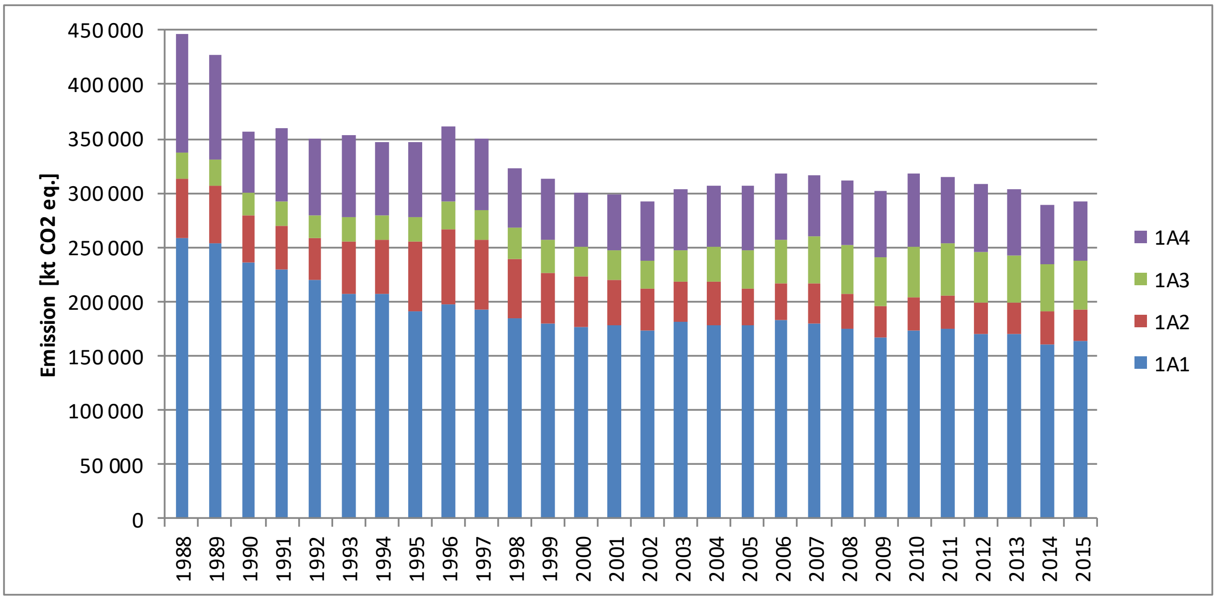

Figure 3.1.3. GHG emissions from fuel combustion in 1988-2015 according to subcategories

Emissions in 1.A.1 *Energy Industries* category are estimated for each detailed sub-categories as follows:

a) 1.A.1.a *Public Electricity and Heat Production*
- public thermal power plants
- autoproducing thermal power plants (CHP)
- heat plants

b) 1.A.1.b *Petroleum Refining*
c) 1.A.1.c *Manufacture of Solid Fuels and Other Energy Industries*
- *manufacture of solid fuels* (coke-oven plants, gas-works plants, mines, patent fuel/briquetting plants)
- *oil and gas extraction*
- *other energy industries* (own use in Electricity, CHP and heat plants)

Emissions in 1.A.2 *Manufacturing Industries and Construction* category are estimated for each fuel in detailed sub-categories as follows:

a) *Iron and Steel* - 1.A.2.a
b) *Non-Ferrous Metals* - 1.A.2.b
c) *Chemicals* - 1.A.2.c
d) *Pulp, Paper and Print* - 1.A.2.d
e) *Food Processing, Beverages and Tobacco* - 1.A.2.e
f) *Non-metallic minerals* - 1.A.2.f
g) *Other* - 1.A.2.g:
- *Manufacturing of machinery*
- *Manufacturing of transport equipment*
- *Mining (excluding fuels) and quarrying*
- *Wood and wood products*
- *Construction*
- *Textile and leather*
- *Off-road vehicles and other machinery*
- *Other* - other industry branches not included elsewhere

Estimation of emissions in 1.A.3 *Transport* are carried out for each fuel in sub-categories listed below:

a) *Civil Aviation* (1.A.3.a)
b) *Road Transportation* (1.A.3.b)
c) *Railways* (1.A.3.c)
d) *Navigation* (1.A.3.d)
e) *Other Transportation* (1.A.3.e)

Emissions in 1.A.4 *Other Sectors* are estimated for each fuel in detailed sub-categories given below:

a) *Commercial/Institutional* (1.A.4.a)
b) *Residential* (1.A.4.b)
c) *Agriculture/Forestry/Fishing* (1.A.4.c)
- agriculture – stationary sources,
- agriculture – mobile sources: off-road vehicles and other machinery
- fishing.

The amount of CO_2 emissions from fuel combustion in stationary sources were estimated on the level determined as IPCC *Tier 2 or Tier 1 depending on EF type (country specific or default).* In this case the calculation was based on the following equation:

$$E = \sum (EF_{ab} * A_{ab})$$

where: E - emission
EF - emission factor
A - fuel consumption
a - fuel type, b - sector

The amount of combusted fuel was accepted according to data included in the energy balance submitted by GUS to Eurostat [EUROSTAT].

List of combusted fuels for which GHG emissions were estimated based upon selected or calculated emission factors is as follows:

- liquid fuels: fuel oil, diesel oil, liquid petroleum gas (LPG), crude oil, motor gasoline, jet kerosene, refinery gas, feedstocks, other petroleum products and petroleum coke
- gaseous fuels: natural gas
- solid fuels: hard coal, lignite, coke, hard coal briquettes, lignite briquettes, coke oven gas, blast furnace gas, gas works gas,
- other fuels: industrial wastes, municipal waste (non-biogenic fraction)
- biomass: fuel wood and wood waste, biogas, municipal waste – biogenic fraction.

The emission factors for CO_2 emission estimation for fuel combustion in stationary sources are the following:

- country specific emission factors for hard coal and lignite;

  the EFs are based on empirical functions, that link the amount of carbon in fuel with the corresponding net calorific value, the empirical functions are the following:
  - for hard coal:

$$C_{hc} = 10(2.4898 * NCV + 3.3132)/NCV$$

  where:
  C_{hc} - emission factor/carbon content for hard coal [kg C/GJ],

  NCV - net calorific value of hard coal [MJ/kg] in the given sub-category calculated based upon hard coal combusted expressed in both physical and energy units,

  - for lignite:

$$C_{bc} = 10(1.9272 * NCV + 9.3856)/NCV$$

  where:
  C_{bc} - emission factor for lignite [kg C/GJ],

  NCV - net calorific value of lignite [MJ/kg] in the given sub-category calculated based upon lignite combusted expressed in both physical and energy units

- default emission factors [IPCC 2006] for all other fuels i.e.: natural gas, coke, hard coal briquettes, lignite briquettes, coke oven gas, blast furnace gas, fuel oil, diesel oil, LPG, crude oil, motor gasoline, jet kerosene, refinery gas, feedstocks, other petroleum products, petroleum coke, biomass (fuel wood and wood waste, biogas), waste (industrial and municipal waste) and gas works gas.

For coal and lignite, where the CS EFs were used, the oxidation factor was assumed as 0.980. In other cases oxidation factor assumed to be 1, because it is included in default emission factor value in accordance with 2006 IPCC GLs.

Emissions of CH_4 and N_2O from fuel combustion in stationary sources are based on fuel quantities submitted by GUS to Eurostat (Eurostat database) and the corresponding emission factors [IPCC 2006].

Trend of fuel use and methodology over the years 1988-2015

Estimation of CO_2 emission from fuel combustion in stationary sources for the years 1988-2014 is based on methodology corresponding to methodology applied for 2015 (that methodology is presented above). For the years: 1990-2014 fuel consumptions from the Eurostat database were applied. The Eurostat database does not cover fuel use data for Poland for the years before 1990. Therefore, fuel use data for the period: 1988-1989 were taken from IEA database [IEA]. Amounts of particular fuel consumptions in individual subsectors: 1.A.1, 1.A.2 and 1.A.4 were presented in the tables 1-13 (Annex 2). CO_2 emission factors from fuel combustion in stationary sources for hard coal and lignite are the country specific EFs. These EFs for the entire time series are based on the same empirical functions described above.

The values of CO_2 EFs changed over the years following the changes of the respective net calorific values for hard coal and lignite (Annex 2 -table 14-26). GHG emission factors for other fuels are the IPCC default EFs [IPCC 2006]. Values of applied emission factors were tabulated in annex 2 (emission factors of CO_2, CH_4 and N_2O for particular fuel are presented in tables 27-29 of this annex).

The time series of fuel use and GHG emissions for the main subsectors of 1.A *Fuel combustion* are presented below (in the following chapters). Detailed data on particular fuel consumption in the main subcategories of 1.A IPCC category for entire period 1988-2015 and GHG EFs for individual fuels are presented in Annex 2 .

3.1.2. Fugitive emissions (CRF sector 1.B)

The GHG emission sources in fugitive emissions sector cover: fugitive emission from solid fuels (CO_2 and CH_4) and fugitive emission from oil and gas (CO_2, CH_4 and N_2O).

Total emission of GHGs as carbon dioxide equivalent in 1.B. subcategory amounted to 23 565kt in 2015 and decreased since 1988 by 16%. Table 3.1. shows emissions from 1.B.1 and 1.B.2 subcategories in period 1988-2015.

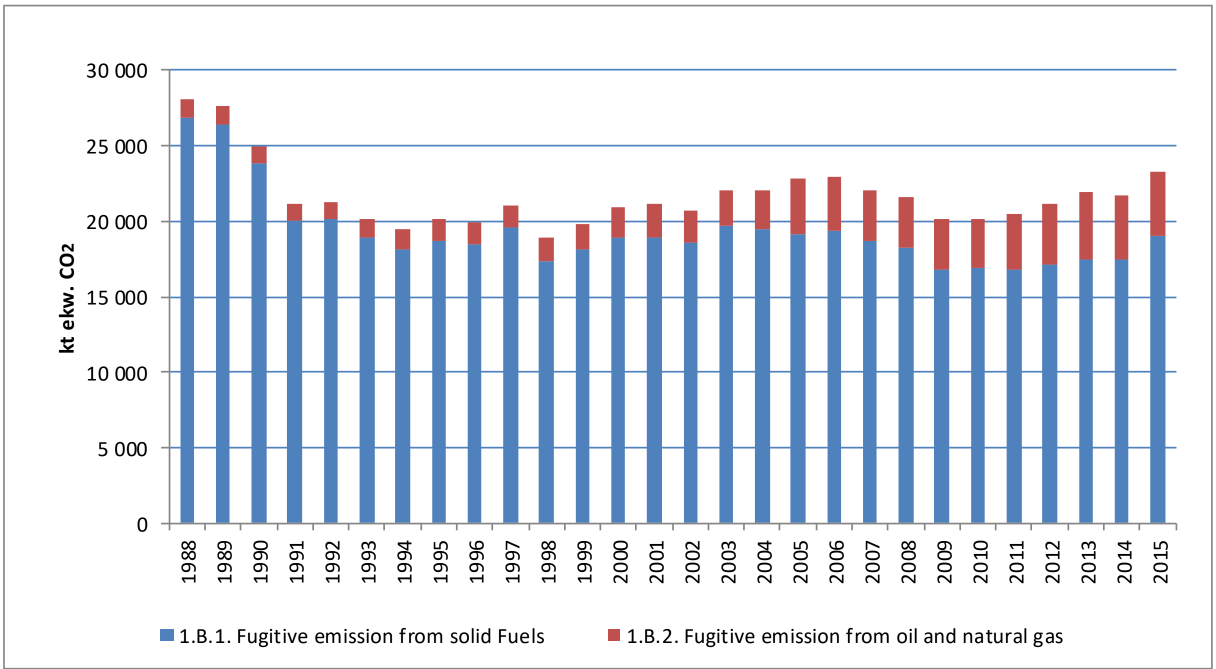

Figure 3.1. GHG emissions from 1.B.1 and 1.B.2 subcategories in 1988-2015.

3.2. Fuel combustion (CRF 1.A)

3.2.1. Comparison of the sectoral approach with the reference approach

The Reference Approach is a top-down approach, using a country's energy supply data to calculate the emissions of CO_2 from combustion of mainly fossil fuels. Comparability between the sectoral and reference approaches continues to allow a country to produce a second independent estimate of CO_2 emissions from fuel combustion. It allow to compare the results of these two independent estimates and indicate possible problems with the activity data, net calorific values, carbon content, carbon stored calculation, etc.

The Reference Approach is designed to calculate the emissions of CO_2 from fuel combustion, starting from high level energy supply data. The Reference Approach does not distinguish between different source categories within the energy sector and only estimates total CO_2 emissions from source category 1.A. *Fuel Combustion*. The IPCC Reference Approach is based on determining carbon dioxide emissions from domestic consumption of fuels and its secondary products.

CO_2 emissions from fuel combustion were estimated based on recommended IPCC methodology [IPCC 2006, equation 6.1]:

$$CO_{2\ Emissions} = \sum_i \left[\left((AP_i \times CF_i \times CC_i) 10^{-3} - EC_i \right) COF_i \times 44/12 \right]$$

where:
i – fuel type
AP – apparent consumption of fuel, TJ or kt
CF – conversion factor for the fuel to energy unit, TJ/kt
CC – carbon content, t C/TJ
EC – excluded carbon, kt C
COF – carbon oxidation factor
44/12 - mass ratio of CO_2/C

CO_2 emissions were estimated based on adjusted fuel consumption data and default oxidation factors. National carbon emission factors were assumed for hard coal and lignite (based on empirical functions described in chapter 3.2.1). For fuels used in transport (gasoline, jet kerosene, diesel oil, LPG) average emission factors were applied from subcategories of 1A. For other fuels default carbon emission factors were applied.

Apparent consumption of fuels was calculated as below:

Apparent Consumption = Production + Imports – Exports – International Bunkers – Stock Change

Data about production, imports, exports, international bunkers and stock change are based on Eurostat database. For calculations only data in energy unit (TJ) were used, therefore conversion factors for all fuels is equal 1 TJ/kt (CRF table 1.A(b)).

Total apparent consumption was corrected by subtracting the amount of carbon (excluded carbon) which does not lead to fuel combustion emission (carbon which is emitted in another sector of the inventory or is stored in a product manufactured from the fuel). The main sources of such carbon are those used as non-energy products and feedstocks. The quantity of carbon to be excluded is calculated according to following equation:

$$\textbf{\textit{Excluded carbon = activity data x CC x 10}}^{-3}$$

where:
activity data – non energy use of fuel and feedstock, TJ
CC – carbon content, t C/TJ

As the use of energy products for non-energy purposes can lead to emissions Poland has calculated these emission and report them under category 2D *Non-energy products from fuels and solvent use* (chapter 4.5).

The Reference Approach and the Sectoral Approach often have different results which may be caused by:

- statistical differences - is the difference between energy available for final consumption covering the energy placed at the disposal of final users and final energy consumption covering energy supplied to the final consumer's door for all energy uses;
- distribution loses - losses due to transport or distribution of natural gas;
- differences in NCVs used in reference and sectoral approaches, especially for hard and brown coal, where NCV affects emission factors;
- part of emission from solid fuel use was included in sector Industrial processes (2.C.1: production of sinter, pig iron and steel).

In 2015 the difference between reference and sectoral approaches in CO_2 emissions is equal -0.01%. Comparison of both methods is given in table 3.2.1.

Table 3.2.1. Differences between CO_2 emissions in sectoral and reference approach

Year	Reference approach [kt]	Sectoral approach [kt]	Difference [%]
2015	286 851	286 866	-0.01
2014	284 095	283 790	0.11
2013	301 435	297 106	1.46
2012	297 918	301 438	-1.17
2011	314 375	308 048	2.05
2010	313 440	311 473	0.63
2009	297 463	295 101	0.80
2008	309 935	304 989	1.62
2007	310 710	310 527	0.06
2006	315 209	312 021	1.02
2005	302 298	300 759	0.51
2004	300 579	301 076	-0.16
2003	303 865	297 553	2.12
2002	294 755	287 081	2.67
2001	299 104	293 595	1.88
2000	297 084	294 596	0.84
1999	316 551	307 682	2.88
1998	324 245	317 150	2.24
1997	353 207	343 489	2.83
1996	359 024	354 523	1.27
1995	346 122	339 614	1.92
1994	337 006	340 069	-0.90
1993	358 983	345 066	4.03
1992	359 771	343 787	4.65
1991	369 342	352 851	4.67
1990	373 766	351 663	6.29
1989	449 540	419 587	7.14
1988	481 728	438 754	9.79

3.2.2. International bunker fuels

3.2.2.1. International aviation

This category include emissions from flights that depart in one country and arrive in a different country.

For the years 1990-2015 data related to jet kerosene are those of the Eurostat database, while for the base year and 1989 – those of the IEA database.

Jet kerosene given in Polish statistic is reported as International aviation although include whole amount of jet kerosene used for domestic and international purposes. To split jet kerosene Eurocontrol data were used. Each year, under contract with the European Commission's Directorate-General for Climate Action, EUROCONTROL calculates the mass of fuel burnt by civil aviation flights starting from and/or finishing at airports in the Member States of the European Union (EU). This work is done in support of both the European Environment Agency (EEA) and the Member States of the EU. The calculation are made with the split on domestic and international aviation. The total amount of jet kerosene used by Poland – calculated by Eurocontrol is similar to this reported by Poland to Eurostat. To stay in line with Eurostat database (and Polish statistic) only the share of domestic and international fuel use were used based on Eurocontrol data. Below in table are given Eurocontrol data of jet kerosene used in Poland for international and domestic purposes, the share of domestic and international use and for comparison Eurostat data.

Table 3.2.2. Eurocontrol and Eurostat data of jet kerosene used in Poland and the share of domestic and international use.

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Eurocontrol												
Domestic	kt	23.66	26.72	29.06	28.52	26.13	30.11	33.22	47.63	35.54	39.41	35.09
International	kt	303.08	383.48	454.37	514.25	452.25	476.26	477.83	493.68	517.51	548.80	586.46
Total	kt	**326.74**	**410.20**	**483.43**	**542.77**	**478.38**	**506.37**	**511.04**	**541.32**	**553.04**	**588.21**	**621.54**
Eurostat	*kt*	*311.00*	*415.00*	*432.00*	*519.00*	*470.00*	*495.00*	*485.00*	*537.00*	*524.00*	*590.22*	*645.00*
Share												
Domestic	%	7.24	6.51	6.01	5.25	5.46	5.95	6.50	8.80	6.43	6.70	5.64
International	%	92.76	93.49	93.99	94.75	94.54	94.05	93.50	91.20	93.57	93.30	94.36
Total	%	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Due to the lack of Eurocontrol data for the years before 2005, the share for years 1988-2004 was assumed as a 5-years average from Eurocontrol data for years 2005-2009. The 5-years average, taken from the nearest years to data lack period, was evaluated as the most representative in consultations with experts in the area of transport and energy. The share 93.90% was then accepted for the whole period before 2005. Such assumption seems to be reliable and not affecting accuracy of the inventory.

For the estimation of GHG emissions from aviation bunker fuels, the same IPCC 2006 default emission factors for jet fuel were assumed as those used for emission estimation for domestic aviation: for CO_2 – 71.50 kg/GJ, for CH_4 - 0.0005 kg/GJ and for N_2O - 0.002 kg/GJ.

The fuel use data and the corresponding emission estimates of CO_2, CH_4 and N_2O for international aviation bunker for the 1988-2015 period are presented in table 3.2.2. Between 1988 and early 1990-ties dramatic decrease in fuel consumption and heavy industry production occurred triggered by significant economic changes related to political transformation from centralized to market economy. These changes affected all energy sectors and this is the main reason why Poland choose 1988 as a base year (as being more representative in trend than 1990 with collapsing industry).

Table 3.2.3. Fuel consumption and GHG emissions in international aviation in 1988-2015

		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Jet Kerosene	PJ	14.09	19.38	8.68	8.96	9.73	9.69	9.81	10.58	12.44	11.14
CO2 emission	kt	1 008	1 386	621	641	696	693	702	756	889	797
CH4 emission	kt	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
N2O emission	kt	0.03	0.04	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
		1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Jet Kerosene	PJ	11.35	10.13	10.78	10.62	10.42	11.27	11.06	12.40	16.68	17.46
CO2 emission	kt	811	725	771	759	745	805	791	887	1 193	1 248
CH4 emission	kt	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
N2O emission	kt	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03
		2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**		
Jet Kerosene	PJ	21.14	19.11	20.02	19.50	21.06	21.08	23.68	26.20		
CO2 emission	kt	1 512	1 366	1 431	1 394	1 506	1 508	1 693	1 873		
CH4 emission	kt	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
N2O emission	kt	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05		

3.2.2.2. International navigation

This category include emissions from journeys that depart in one country and arrive in a different country. Includes emissions from fuels used by vessels of all flags that engaged in international water-borne navigation. Exclude consumption by fishing vessels.

1990-2015 fuel use data for fuels classified to the international marine bunker were taken directly from the Eurostat database. For the years 1988-1989, the respective data were taken from the database of the International Energy Agency (IEA).

For the estimation of GHG emissions from bunker fuels, the same IPCC 2006 default emission factors were assumed as those used for maritime navigation: for CO_2 and diesel oil 74.10 kg/GJ, for fuel oil 77.40 kg/GJ. The emission factors for CH_4 and N_2O for the two fuels are: 0.007 kg/GJ and 0.002 kg/GJ, respectively. The fuel use data and the corresponding emission estimates of CO_2, CH_4 and N_2O for international marine bunker for the 1988-2015 period are presented in table 3.2.4.

Table 3.2.4. Fuel consumption and GHG emissions in international navigation in 1988-2015

		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Diesel oil	PJ	14.23	11.16	6.01	2.70	3.18	2.45	1.29	1.20	1.76	2.53
Fuel oil	PJ	9.00	9.37	10.48	3.76	6.76	3.16	4.24	4.60	5.08	6.28
CO2 emission	kt	1 751	1 552	1 256	491	758	426	424	445	524	674
CH4 emission	kt	0.163	0.144	0.115	0.045	0.070	0.039	0.039	0.041	0.048	0.062
N2O emission	kt	0.046	0.041	0.033	0.013	0.020	0.011	0.011	0.012	0.014	0.018
		1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Diesel oil	PJ	2.87	4.42	1.89	0.94	1.85	1.97	1.67	4.98	3.73	2.15
Fuel oil	PJ	8.08	10.80	9.92	9.80	9.32	9.80	8.80	8.48	8.56	8.16
CO2 emission	kt	838	1163	908	828	858	905	805	1025	939	791
CH4 emission	kt	0.077	0.107	0.083	0.075	0.078	0.082	0.073	0.094	0.086	0.072
N2O emission	kt	0.022	0.030	0.024	0.021	0.022	0.024	0.021	0.027	0.025	0.021
		2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**		
Diesel oil	PJ	2.10	2.77	2.34	2.90	2.86	3.29	3.25	6.17		
Fuel oil	PJ	9.32	7.60	6.68	4.24	3.20	2.60	2.92	1.90		
CO2 emission	kt	877	794	690	543	459	445	467	604		
CH4 emission	kt	0.080	0.073	0.063	0.050	0.042	0.041	0.043	0.056		
N2O emission	kt	0.023	0.021	0.018	0.014	0.012	0.012	0.012	0.016		

Figure 3.2.1 shows emissions of greenhouse gases from international navigation and aviation bunker in period 1988-2015.

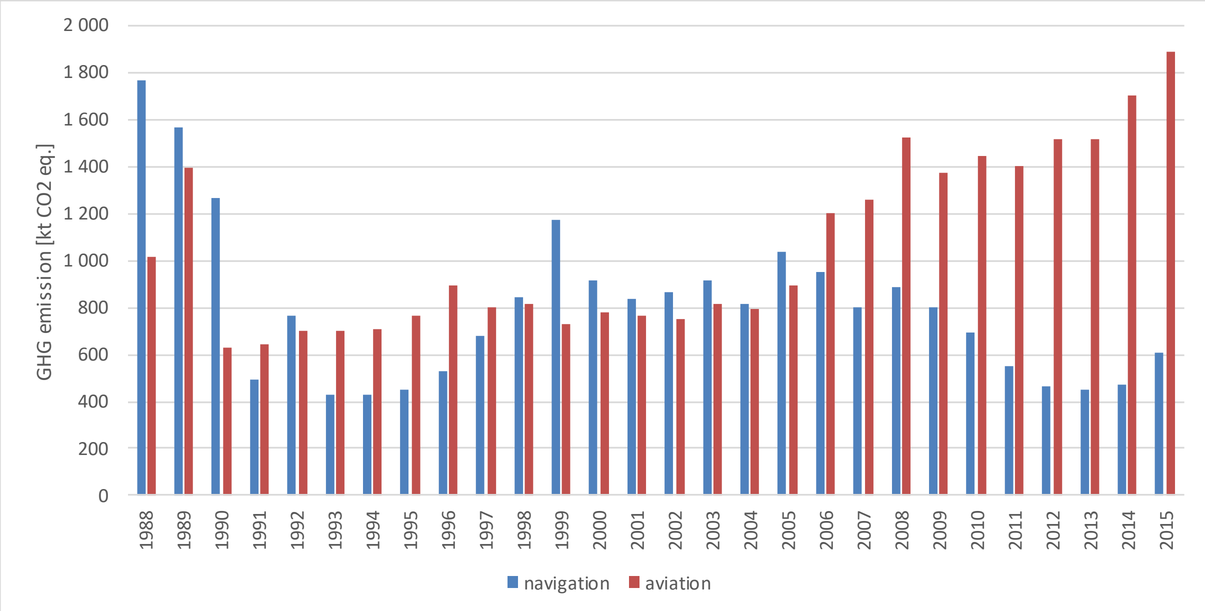

Figure 3.2.1. GHG emissions from international navigation and aviation bunker in period 1988-2015

3.2.3. Feedstocks and non-energy use of fuels

As the use of energy products for non-energy purposes can lead to emissions, Poland has calculated emissions from lubricant and paraffin waxes use and report them under category 2D *Non-energy products from fuels and solvent use*.
For more description see chapter 4.5.

3.2.4. CO_2 capture from flue gases and subsequent CO_2 storage

Not applicable in Poland.

3.2.5. Country-specific issues

Information on country specific fuel structure, important for national emission level and CO_2 emission factors for coal (main fuel in Polish economy), is presented in chapters 3.1.1, 3.2.6 - 3.2.9 and in annex 2.

3.2.6. Energy Industries (CRF sector 1.A.1.)

3.2.6.1. Source category description

Emissions in 1.A.1 *Energy Industries* category are estimated for each detailed sub-categories as follows:

a) 1.A.1.a *Public Electricity and Heat Production*
- public thermal power plants
- autoproducing thermal power plants (CHP)
- heat plants

b) 1.A.1.b *Petroleum Refining*

c) 1.A.1.c *Manufacture of Solid Fuels and Other Energy Industries*
- *manufacture of solid fuels* (coke-oven plants, gas-works plants, mines, patent fuel/briquetting plants)
- *oil and gas extraction*
- *other energy industries* (own use in Electricity, CHP and heat plants)

Subsector 1.A.1.a *Public Electricity and Heat Production* is by far the largest contributor to emissions from this category (see figure 3.2.6.1) – 95% in 2015.

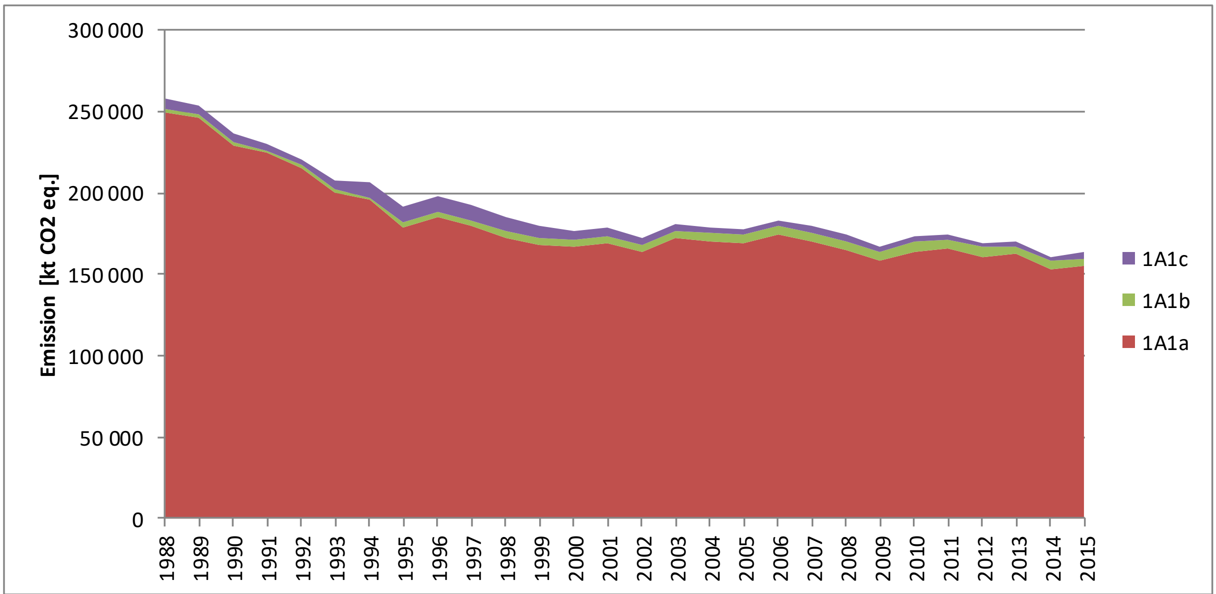

Figure 3.2.6.1. GHG emissions from *Energy Industries* in years 1988-2015 according to subcategories

3.2.6.2. Methodological issues

Methodology of emission estimation in 1.A.1 subcategory corresponds with methodology described for fuel combustion in stationary sources. Detailed information on fuel consumption and applied emission factors for subcategories mentioned below are presented in Annex 2.

3.2.6.2.1. Public electricity and heat production (CRF sector 1.A.1.a)

Table 3.2.6.1 presents the structure and amounts of fuel used in the sub-category 1.A.1.a *Public Electricity and Heat Production* for the years 1988-2015.

Table 3.2.6.1. Fuel consumption for the years 1988-2015 in 1.A.1.a subcategory [PJ]

	1988	1989	1990	1991	1992	1993	1994	1995
Liquid Fuels	75.134	72.672	66.951	62.623	57.602	56.351	57.225	26.233
Gaseous Fuels	21.274	21.900	21.641	16.329	9.561	3.107	4.094	4.738
Solid Fuels	2374.674	2346.290	2197.782	2169.776	2086.989	1942.858	1890.625	1760.175
Biomass	3.741	3.873	5.265	8.914	7.354	6.658	6.876	3.878
Other Fuels	16.699	15.129	14.585	14.387	17.289	13.783	14.057	1.447
TOTAL	**2491.522**	**2459.864**	**2306.224**	**2272.029**	**2178.795**	**2022.757**	**1972.877**	**1796.471**
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Liquid Fuels	28.878	29.000	19.329	18.538	15.837	16.923	15.701	14.154
Gaseous Fuels	7.156	7.949	10.768	16.210	21.627	28.242	38.700	45.496
Solid Fuels	1824.672	1776.913	1715.015	1671.753	1648.958	1665.608	1611.570	1690.270
Other Fuels	3.393	3.267	0.550	0.575	0.883	1.031	1.520	0.372
Biomass	2.793	3.381	3.877	3.747	3.904	5.449	5.424	6.642
TOTAL	**1866.892**	**1820.510**	**1749.539**	**1710.823**	**1691.209**	**1717.253**	**1672.915**	**1756.934**
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Liquid Fuels	11.585	9.281	9.119	8.050	8.215	7.632	8.286	8.040
Gaseous Fuels	53.667	57.039	52.808	49.691	51.163	51.652	52.286	57.961
Solid Fuels	1664.247	1663.495	1717.390	1676.806	1613.352	1553.359	1607.106	1604.922
Other Fuels	0.407	0.483	0.427	0.440	0.593	0.682	0.809	0.861
Biomass	10.198	19.320	23.201	26.696	40.001	57.022	67.892	81.917
TOTAL	**1740.104**	**1749.618**	**1802.945**	**1761.683**	**1713.324**	**1670.347**	**1736.379**	**1753.701**
	2012	**2013**	**2014**	**2015**				
Liquid Fuels	7.174	6.469	5.466	17.591				
Gaseous Fuels	61.963	53.395	52.017	60.426				
Solid Fuels	1550.077	1568.382	1470.390	1476.977				
Other Fuels	0.791	0.718	0.813	1.414				
Biomass	109.804	92.581	102.737	101.978				
TOTAL	**1729.809**	**1721.545**	**1631.423**	**1658.386**				

The data in table 3.2.6.1 shows that the use of solid fuels is dominant in 1.A.1.a – mainly hard coal and lignite. In 2015, the use of hard coal was app. 927 PJ i.e. about 56% of the entire energy of all fuels used in that sub-sector. Lignite made app. 31% of the energy, accordingly. Despite the significant share of solid fuels (app. 89%) in the total energy related fuel use in 1.A.1.a, a slow decreasing trend can be noticed since the late 1990s (from app. 98% in 1998 till 89% in 2015). At the same time in last decade increased the share of biomass as well as the share of natural gas. Detailed data concerning individual fuel consumptions in 1.A.1.a subcategory for the entire period 1988-2015 was presented in Annex 2 (tab. 1).

Figure 3.2.6.2 shows CO_2 emission changes over the period 1988-2015. A significant emission decrease took place over the years 1988-1995 followed by a period of emission stabilization.

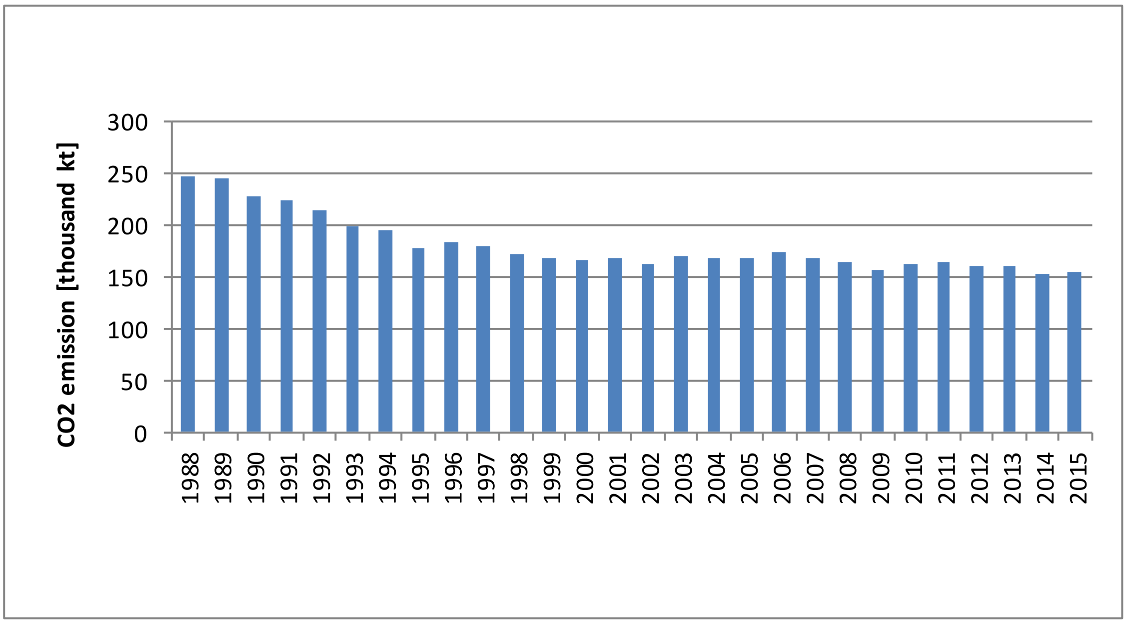

Figure 3.2.6.2. CO_2 emission for 1.A.1.a category in 1988-2015

Figure 3.2.6.3 shows emission trends for CH_4 and N_2O between the base year and 2015. Similarly to CO_2 a significant emission decrease for these gases happened in the period 1988-1995. Since 2002 is noticeable increase of CH_4 emission connected with a growth of biomass consumption. That emission increase is the result of relatively high value of CH_4 EF for solid biomass.

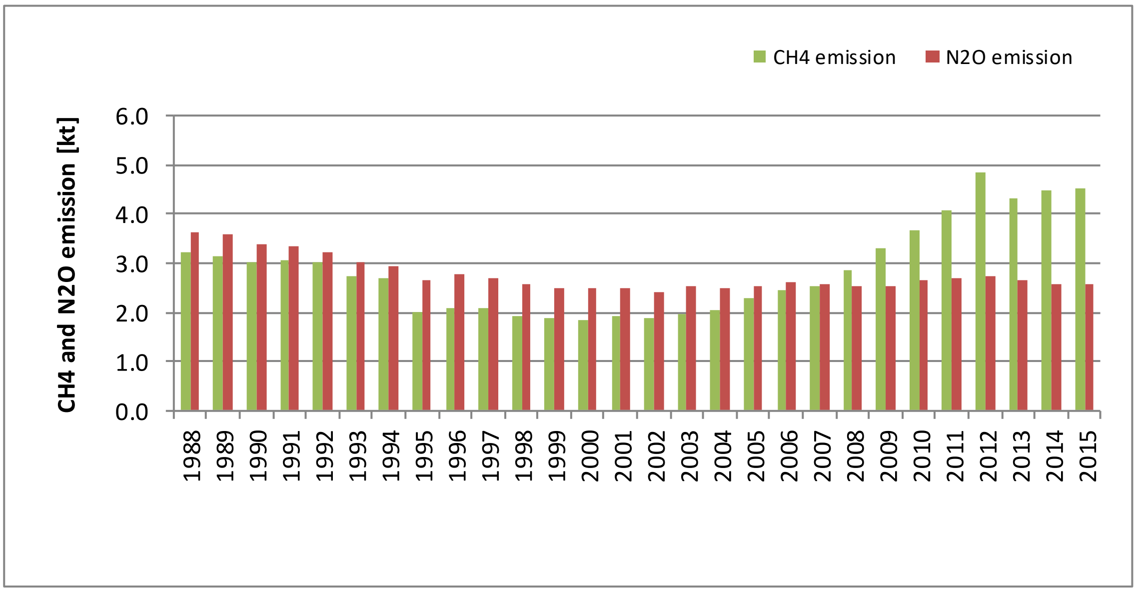

Figure 3.2.6.3. CH_4 and N_2O emissions for 1.A.1.a category in 1988-2015

3.2.6.2.2. Petroleum Refining (CRF sector 1.A.1.b)

Table 3.2.6.2 shows fuel consumption data in sub-category 1.A.1.b *Petroleum Refining* for the years 1988-2015. Detailed data on fuel consumptions in 1.A.1.b subcategory for the entire period 1988-2015 was presented in Annex 2 (table 2).

Table 3.2.6.2. Fuel consumption in 1988-2015 in 1.A.1.b subcategory [PJ]

	1988	1989	1990	1991	1992	1993	1994	1995
Liquid Fuels	23.660	23.106	18.957	18.226	24.274	22.142	22.490	44.600
Gaseous Fuels	2.395	2.396	1.671	1.539	1.508	1.608	1.591	1.562
Solid Fuels	0.142	0.140	0.046	0.118	0.069	0.245	0.068	1.302
Other Fuels	7.724	7.487	5.222	0.272	0.682	0.002	0.259	1.919
Biomass	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	**33.921**	**33.129**	**25.896**	**20.155**	**26.533**	**23.997**	**24.408**	**49.383**
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Liquid Fuels	50.172	43.737	47.441	43.546	47.002	53.150	53.552	54.178
Gaseous Fuels	1.749	2.529	8.244	10.832	12.110	11.354	10.124	12.770
Solid Fuels	1.451	1.349	0.710	0.637	0.277	0.140	0.023	0.000
Other Fuels	0.350	0.163	0.000	0.310	0.219	0.095	0.253	0.176
Biomass	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	**53.722**	**47.778**	**56.395**	**55.325**	**59.608**	**64.739**	**63.952**	**67.124**
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Liquid Fuels	55.859	53.915	55.858	61.194	62.085	60.608	70.009	61.737
Gaseous Fuels	15.454	14.482	14.900	20.816	18.816	17.511	19.363	27.468
Solid Fuels	0.000	0.000	0.000	0.000	0.000	0.113	0.114	0.164
Other Fuels	0.221	0.285	0.224	0.000	0.000	0.000	0.000	0.000
Biomass	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	**71.534**	**68.682**	**70.982**	**82.010**	**80.901**	**78.232**	**89.486**	**89.369**
	2012	**2013**	**2014**	**2015**				
Liquid Fuels	61.108	44.315	38.269	43.155				
Gaseous Fuels	30.638	34.779	35.103	25.957				
Solid Fuels	0.113	0.176	0.181	0.914				
Other Fuels	0.000	0.000	0.000	0.001				
Biomass	0.000	0.000	0.000	0.000				
TOTAL	**91.859**	**79.270**	**73.553**	**70.027**				

Figure 3.2.6.4 shows CO_2 emission changes in 1988-2015 in sub-category 1.A.1.b.

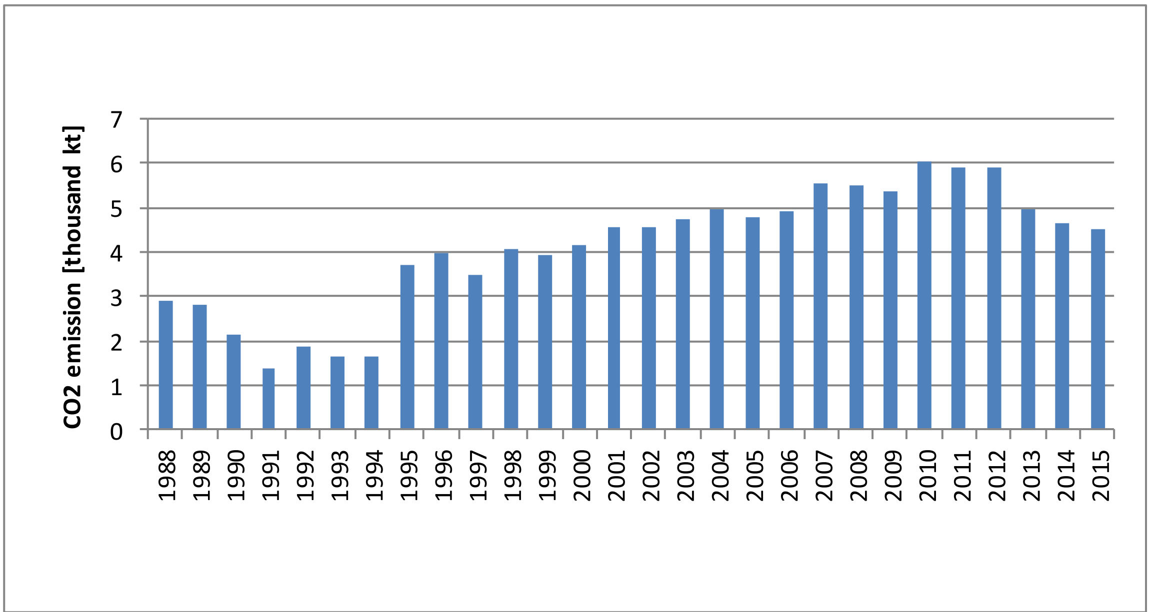

Figure 3.2.6.4. CO_2 emission for 1.A.1.b category in 1988-2015

Figure 3.2.6.5 shows the corresponding CH_4 and N_2O emission in that source sub-category between the base year and 2015.

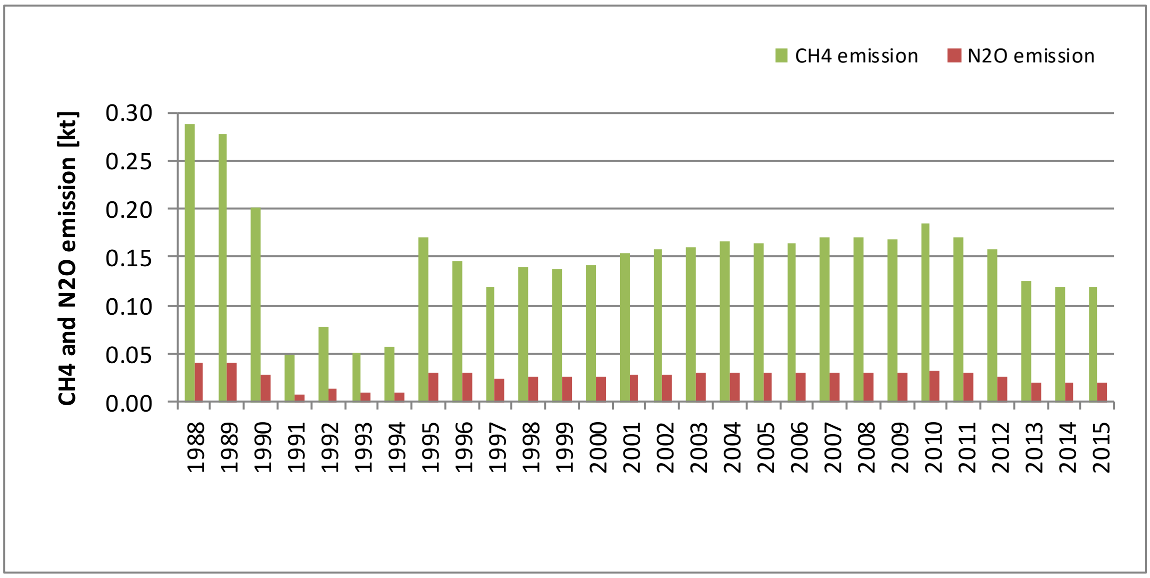

Figure 3.2.6.5. CH_4 and N_2O emissions for 1.A.1.b category in 1988-2015

3.2.6.2.3. Manufacture of Solid Fuels and Other Energy Industries (CRF sector 1.A.1.c)

Table 3.2.6.3 shows the fuel use data in the sub-category 1.A.1.c over the period: 1988-2015. Particular fuel consumptions in 1.A.1.c subcategory for the entire period 1988-2015 were tabulated in Annex 2 (table 3).

Table 3.2.6.3. Fuel consumption in 1988-2015 in 1.A.1.c subcategory [PJ]

	1988	1989	1990	1991	1992	1993	1994	1995
Liquid Fuels	2.550	2.180	2.067	2.367	2.536	5.004	4.200	4.250
Gaseous Fuels	13.736	15.364	12.371	12.432	14.665	12.354	17.401	14.850
Solid Fuels	70.465	66.330	58.694	49.265	47.123	61.209	102.119	98.936
Other Fuels	0.046	0.001	0.000	0.000	0.000	0.311	0.235	0.184
Biomass	0.018	0.001	0.006	0.000	0.004	0.008	0.011	0.004
TOTAL	**86.815**	**83.875**	**73.138**	**64.064**	**64.328**	**78.886**	**123.966**	**118.224**
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Liquid Fuels	3.716	3.164	2.965	2.216	2.208	1.712	1.730	1.652
Gaseous Fuels	23.269	21.155	17.779	19.458	19.491	12.986	12.515	9.741
Solid Fuels	97.647	95.586	89.237	76.215	68.737	66.257	49.936	56.476
Other Fuels	0.158	0.138	0.000	0.000	0.014	0.008	0.005	0.013
Biomass	0.014	0.031	0.026	0.027	0.037	0.052	0.047	0.026
TOTAL	**124.804**	**120.074**	**110.007**	**97.916**	**90.487**	**81.015**	**64.233**	**67.908**
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Liquid Fuels	1.441	1.690	1.413	1.490	1.445	1.631	1.755	2.179
Gaseous Fuels	11.190	10.106	10.363	9.680	9.239	8.858	10.321	9.805
Solid Fuels	50.943	45.375	46.205	65.137	61.482	42.905	47.342	47.419
Other Fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.010
Biomass	0.020	0.014	0.026	0.085	0.037	0.137	0.349	0.162
TOTAL	**63.594**	**57.185**	**58.007**	**76.392**	**72.203**	**53.531**	**59.769**	**59.575**
	2012	**2013**	**2014**	**2015**				
Liquid Fuels	1.574	1.891	1.429	1.928				
Gaseous Fuels	11.205	12.013	12.788	24.293				
Solid Fuels	41.875	42.633	43.055	45.441				
Other Fuels	0.001	0.002	0.002	0.001				
Biomass	0.160	0.122	0.039	0.000				
TOTAL	**54.815**	**56.661**	**57.313**	**71.663**				

The emission trends of CO_2, CH_4 and N_2O in the 1988-2015 period are shown in figures 3.2.6.6 and 3.2.6.7.

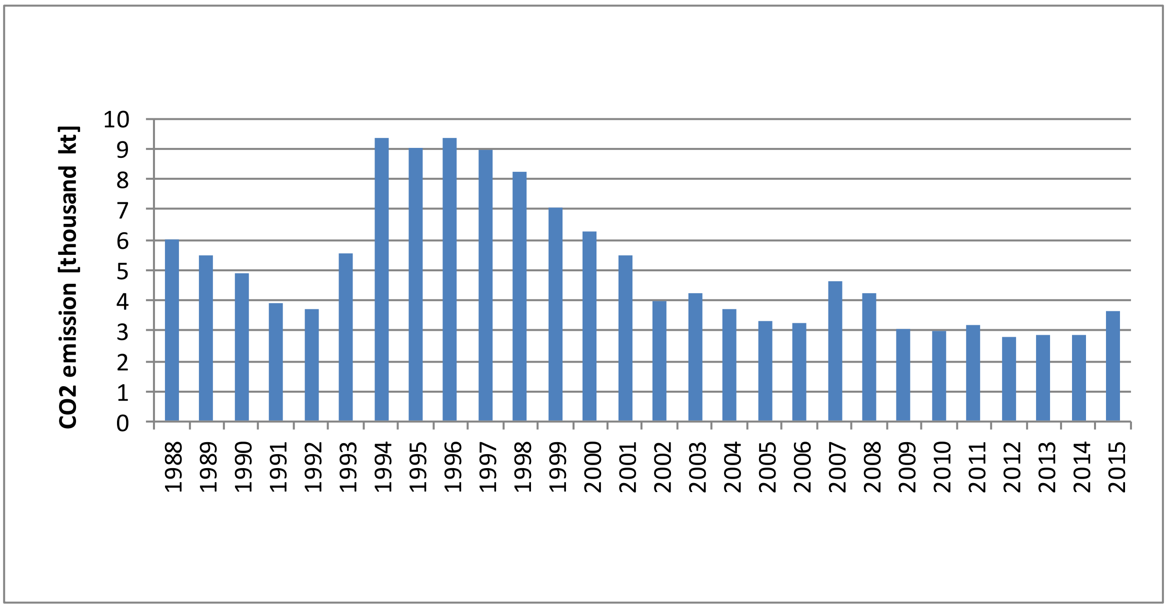

Figure 3.2.6.6. CO_2 emission for 1.A.1.c category in 1988-2015

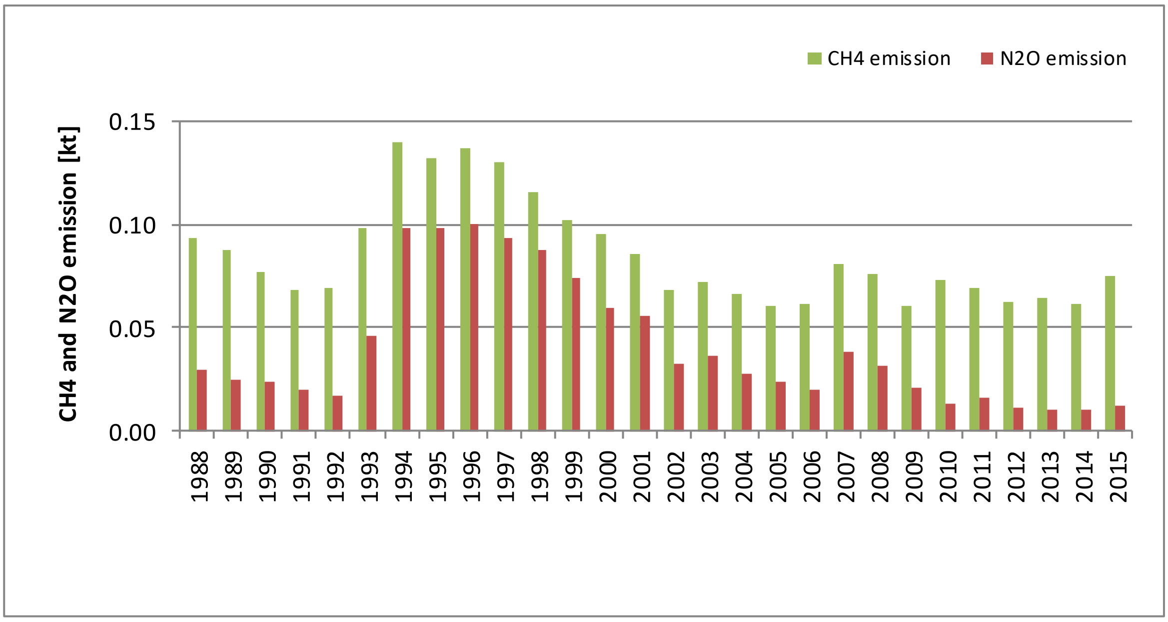

Figure 3.2.6.7. CH_4 and N_2O emissions for 1.A.1.c category in 1988-2015

3.2.6.3. Uncertainties and time-series consistency

Uncertainty analysis for the year 2015 for IPCC sector *1.Energy* was estimated with use of approach 1 described in 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Simplified approach was based on the assumptions that every value is independent and probability distribution is symmetric. Results of the sectoral uncertainty analysis are given below. More details on uncertainty assessment of whole inventory are given in annex 8.
Recalculation of data for years 1988-2014 ensured consistency for whole time-series.

2015	**CO2 [kt]**	**CH4 [kt]**	**N2O [kt]**	**CO_2 Emission uncertainty [%]**	**CH_4 Emission uncertainty [%]**	**N_2O Emission uncertainty [%]**
1. Energy	**291 301.91**	**909.56**	**7.83**	1.9%	34.1%	12.5%
A. Fuel Combustion	**286 866.05**	**144.41**	**7.83**	1.9%	11.3%	12.5%
1. Energy Industries	162 679.76	4.70	2.59	2.6%	16.5%	29.8%
2. Manufacturing Industries and Construction	28 180.03	4.26	0.59	2.4%	11.4%	23.7%
3. Transport	45 267.65	4.33	1.64	5.7%	10.4%	20.2%
4. Other Sectors	50 738.61	131.12	3.00	4.3%	12.4%	16.0%
5. Other						
B. Fugitive Emissions from Fuels	**4 435.86**	**765.16**	**0.00**	8.9%	40.5%	70.9%
1. Solid Fuels	2 347.94	676.40		15.0%	45.8%	
2. Oil and Natural Gas	2 087.93	88.76	0.00	8.8%	13.2%	70.9%

3.2.6.4. Source-specific QA/QC and verification

Activity data used in the GHG inventory concerning energy sector come from Eurostat Database which is fed by the Central Statistical Office (GUS). GUS is responsible for QA/QC of collected and published data. Activity data applied in GHG inventory are regularly checked and updated if necessary according to adjustments made in Eurostat Database.

One of the elements of quality control of activity data correction is fuel balances prepared for the purpose of national GHG inventories (see Annex 4). For the main fuels (i.e. coal, lignite) calorific values are analysed for avoiding significant errors. Close cooperation is developed between inventory experts and institutions responsible for energy data. Any doubtful fuel consumption values are systematically verified - it is often required to obtain additional confirmation of data by installations/entities submitting the energy questionnaire. In case of any doubts energy data are also validated based on Central Statistical Office's Energy Statistics published annually.
Natural verification of data in an energy sector is comparison of sectoral and reference approaches within the GHG inventory.

Calculations in energy sector were examined with focus on formulas, units and trends consistency. Generally QC procedures follow QA/QC plan presented in Annex 7.

3.2.6.5. Source-specific recalculations

Lignite NCV for 2014 was slightly corrected, so CO_2 EF based on empirical functions, that link the amount of carbon in fuel with the corresponding net calorific value, was adjusted as well.

Table.3.2.6.4. Changes of GHG emission values in 1.A.1 subcategory as a result of recalculations

Changes	1988	1989	1990	1991	1992	1993	1994	1995
CO2								
kt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CH4								
kt	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N2O								
kt	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Changes	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
CO2								
kt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CH4								
kt	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N2O								
kt	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Changes	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
CO2								
kt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00
CH4								
kt	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N2O								
kt	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Changes	**2012**	**2013**	**2014**					
CO2								
kt	0.00	0.00	0.31					
%	0.0	0.0	0.0					
CH4								
kt	0.000	0.000	0.000					
%	0.0	0.0	0.0					
N2O								
kt	0.000	0.000	0.000					
%	0.0	0.0	0.0					

3.2.6.6. Source-specific planned improvements

Analysis of the possibility of country specific EF elaboration for the gaseous fuels in Polish fuel structure

3.2.7. Manufacturing Industries and Construction (CRF sector 1.A.2)

3.2.7.1. Source category description

Emissions in 1.A.2 *Manufacturing Industries and Construction* category are estimated for each fuel in detailed sub-categories as follows:

a) *Iron and Steel* - 1.A.2.a
b) *Non-Ferrous Metals* - 1.A.2.b
c) *Chemicals* - 1.A.2.c
d) *Pulp, Paper and Print* - 1.A.2.d
e) *Food Processing, Beverages and Tobacco* - 1.A.2.e
f) *Non-metallic minerals* - 1.A.2.f
g) *Other* - 1.A.2.g:

- *Manufacturing of machinery*
- *Manufacturing of transport equipment*
- *Mining (excluding fuels) and quarrying*
- *Wood and wood products*
- *Construction*
- *Textile and leather*
- *Off-road vehicles and other machinery*
- *Other* - other industry branches not included elsewhere

Subsector 1.A.2.f *Non-metallic minerals, 1.A.2.c Chemicals and 1.A.2.a Iron and Steel are* the largest contributors to emissions from this category (see figure 3.2.7.1) – respectively 26.7%, 21.4% and 18.2% in 2015.

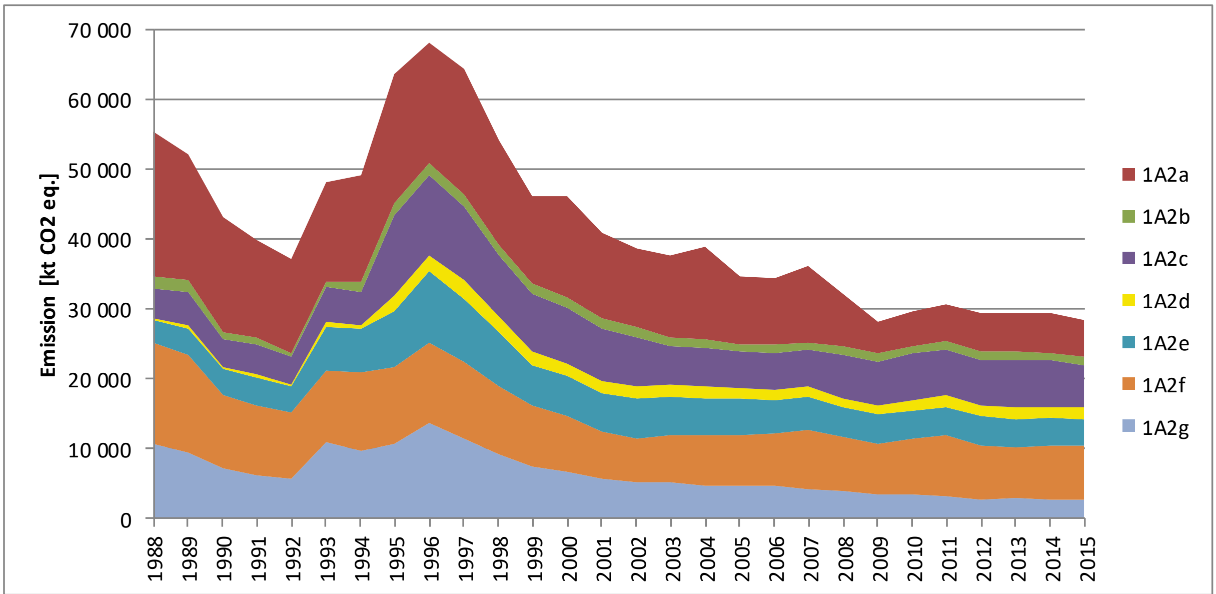

Figure 3.2.7.1. Emissions from *Manufacturing Industries and Construction* category in years 1988-2015 according to subcategories

3.2.7.2. Methodological issues

Methodology of emission estimation in 1.A.2 subcategory corresponds with methodology described for fuel combustion in stationary sources. Detailed information on fuel consumption and applied emission factors for subcategories listed below are presented in Annex 2.

3.2.7.2.1. Iron and Steel (CRF sector 1.A.2.a)

Table 3.3.7.1 shows the fuel use data in the sub-category 1.A.2.a *Iron and Steel* for the period: 1988-2015. As you can see in the table solid fuels is the dominant fuel type in that sub-category. Detailed data on fuel consumptions in 1.A.2.a subcategory for the entire period 1988-2015 was presented in Annex 2 (table 4).

Table 3.3.7.1. Fuel consumption in 1988-2015 in 1.A.2.a subcategory [PJ]

	1988	1989	1990	1991	1992	1993	1994	1995
Liquid Fuels	18.248	15.528	11.172	7.929	5.452	4.623	3.518	2.812
Gaseous Fuels	73.507	63.332	52.851	33.974	26.568	25.562	25.487	24.239
Solid Fuels	95.323	82.955	74.910	72.626	73.599	85.080	96.976	118.715
Other Fuels	3.158	3.344	4.079	6.756	6.497	4.272	3.757	2.941
Biomass	0.000	0.000	0.000	0.000	0.000	0.016	0.014	0.005
TOTAL	**190.236**	**165.159**	**143.012**	**121.285**	**112.116**	**119.553**	**129.752**	**148.712**
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Liquid Fuels	1.861	5.324	1.900	2.189	1.739	0.996	0.359	0.313
Gaseous Fuels	25.898	28.278	23.993	21.440	22.024	18.328	15.463	14.827
Solid Fuels	112.791	113.712	99.754	80.715	89.854	76.419	72.933	77.378
Other Fuels	0.498	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	0.006	0.004	0.006	0.004	0.003	0.006	0.003	0.004
TOTAL	**141.054**	**147.318**	**125.653**	**104.348**	**113.620**	**95.749**	**88.758**	**92.522**
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Liquid Fuels	0.267	0.086	0.129	0.086	0.132	0.133	0.133	0.133
Gaseous Fuels	19.969	20.460	21.008	22.716	20.397	16.595	16.916	17.209
Solid Fuels	84.242	60.073	56.711	60.013	38.753	23.106	26.318	30.476
Other Fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	0.004	0.002	0.001	0.001	0.001	0.001	0.000	0.000
TOTAL	**104.482**	**80.621**	**77.849**	**82.816**	**59.283**	**39.835**	**43.367**	**47.818**
	2012	**2013**	**2014**	**2015**				
Liquid Fuels	0.135	0.089	0.133	0.210				
Gaseous Fuels	16.905	16.242	16.096	16.701				
Solid Fuels	31.593	31.916	33.112	28.424				
Other Fuels	0.000	0.000	0.000	0.000				
Biomass	0.000	0.001	0.001	0.001				
TOTAL	**48.633**	**48.248**	**49.342**	**45.336**				

Blast furnaces transformation efficiency in Eurostat energy balance is very high and it is the reason, that there is too little amount of coke use in „Transformation input in Blast Furnaces" compared with real technological demand. Because of that, some part of coke, classified in *Final energy consumption – Iron and Steel* in Eurostat database (1.A.2.a IPCC subcategory) was reallocated into blast furnace input and use in C mass balance prepared in 2 IPCC sector for pig iron production.

Amounts of coke [PJ] moved from 1.A2.a to 2.C.1 subcategory for individual years were as follow:

1988	12.050	1997	61.375	2006	36.903
1989	14.549	1998	45.291	2007	45.773
1990	97.056	1999	38.295	2008	36.584
1991	67.320	2000	54.904	2009	20.490
1992	66.873	2001	46.626	2010	23.828
1993	58.588	2002	37.455	2011	24.729
1994	65.168	2003	41.101	2012	23.291
1995	67.299	2004	44.292	2013	25.163
1996	58.137	2005	28.445	2014	31.228

CO_2 emission from reallocated coke was included in emission from 2.C.1 subcategory. Emissions of CH_4 and N_2O were included in 1.A.2.a category.

Similar reallocation like for coke was applied in case of coal in years starting from 2010. After 2010 the coal was used in pig iron production. Because of the coal consumption in BF process was aggregated in Eurostat energy balance in *Final Energy Consumption - Iron and Steel*, the amounts of coal used in blast furnaces process (included in C balance for BF in 2C1 subcategory) were deducted from 1.A.2.a category to avoid double counting.
Following amounts of coal [PJ] were reallocated between 1.A.2.a and 2.C.1 subcategories in particular years:

2010	2011	2012	2013	2014	2015
0.948	2.338	5.977	4.205	5.465	7.998

Figure 3.3.7.2 shows CO_2 emissions in the 1988-2015 period. Emissions of CH_4 and N_2O in the same time period are shown in figure 3.3.7.3. Emission trends for all three gases follow closely the trends in fuel use.

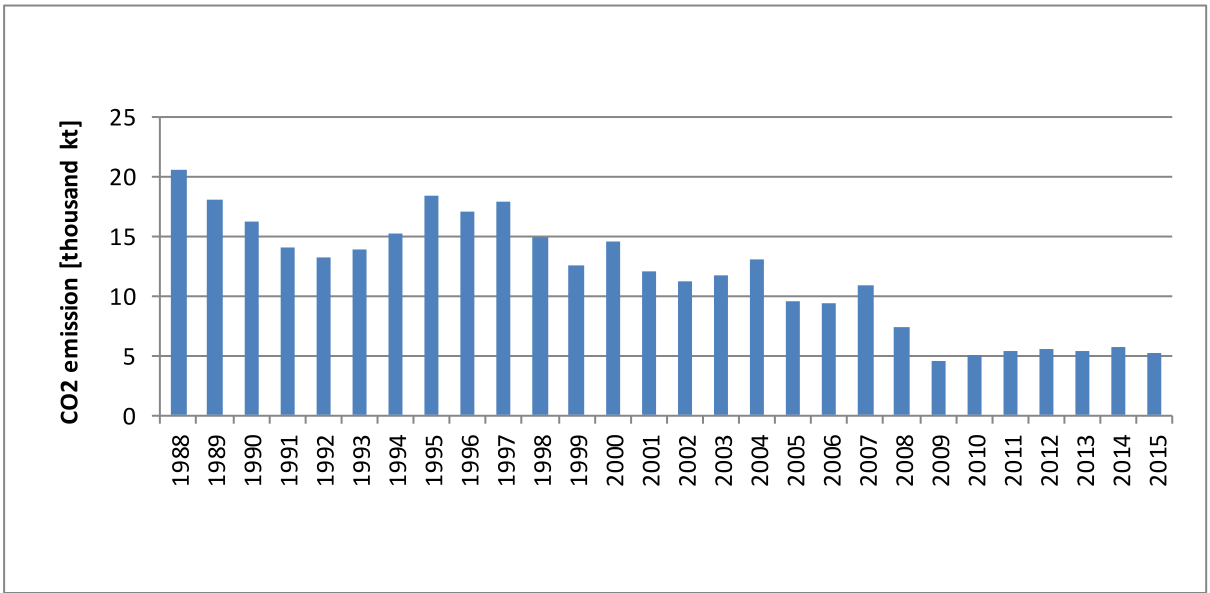

Figure 3.3.7.2. CO_2 emission for 1.A.2.a category in 1988-2015

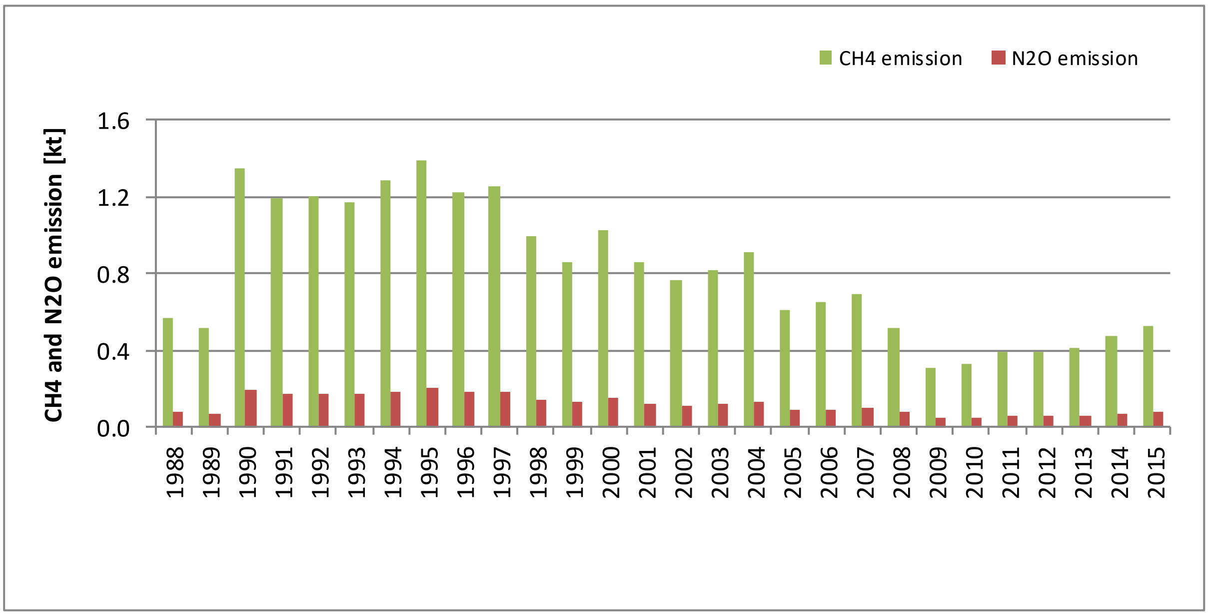

Figure 3.3.7.3. CH_4 and N_2O emissions for 1.A.2.a category in 1988-2015

3.2.7.2.2. Non-Ferrous Metals (CRF sector 1.A.2.b)

The data on fuel type use in the sub-category 1.A.2.b *Non-Ferrous Metals* over the 1988-2015 period are presented in table 3.3.7.2. More detailed data concerning fuel consumptions was tabulated in Annex 2 (table 5).

Table 3.3.7.2. Fuel consumption in 1988-2015 in 1.A.2.b subcategory [PJ]

	1988	1989	1990	1991	1992	1993	1994	1995
Liquid Fuels	0.683	0.803	0.803	0.843	0.929	0.846	0.929	0.892
Gaseous Fuels	5.638	5.470	4.599	4.633	1.213	1.745	5.321	5.447
Solid Fuels	12.001	10.832	6.908	5.965	3.316	4.752	8.183	10.499
Other Fuels	0.870	0.719	0.439	0.483	0.514	0.729	0.823	2.150
Biomass	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000
TOTAL	**19.191**	**17.823**	**12.749**	**11.924**	**5.972**	**8.073**	**15.257**	**18.988**
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Liquid Fuels	0.940	0.854	0.777	0.732	0.863	0.784	0.618	0.495
Gaseous Fuels	5.108	5.424	5.638	5.660	5.814	5.700	5.589	5.868
Solid Fuels	10.897	10.491	11.879	11.115	11.446	12.497	11.455	10.582
Other Fuels	2.411	2.361	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	0.149	0.042	0.026	0.010	0.011	0.005	0.001	0.000
TOTAL	**19.505**	**19.172**	**18.320**	**17.517**	**18.134**	**18.986**	**17.663**	**16.945**
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Liquid Fuels	0.658	0.618	0.618	0.378	0.378	0.379	0.382	0.339
Gaseous Fuels	6.405	6.468	6.884	6.740	6.537	5.846	6.039	6.670
Solid Fuels	8.848	6.841	7.070	7.960	7.860	7.356	7.002	7.470
Other Fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
Biomass	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	**15.911**	**13.927**	**14.572**	**15.078**	**14.775**	**13.581**	**13.424**	**14.479**
	2012	**2013**	**2014**	**2015**				
Liquid Fuels	0.293	0.293	0.253	0.279				
Gaseous Fuels	6.890	6.703	6.950	7.225				
Solid Fuels	7.469	7.488	7.886	7.964				
Other Fuels	0.000	0.000	0.000	0.000				
Biomass	0.000	0.000	0.000	0.000				
TOTAL	**14.652**	**14.484**	**15.089**	**15.468**				

Emissions of the main greenhouse gases in 1.A.2.b between the base year and 2015 are shown in figures 3.3.7.4 and 3.3.7.5.

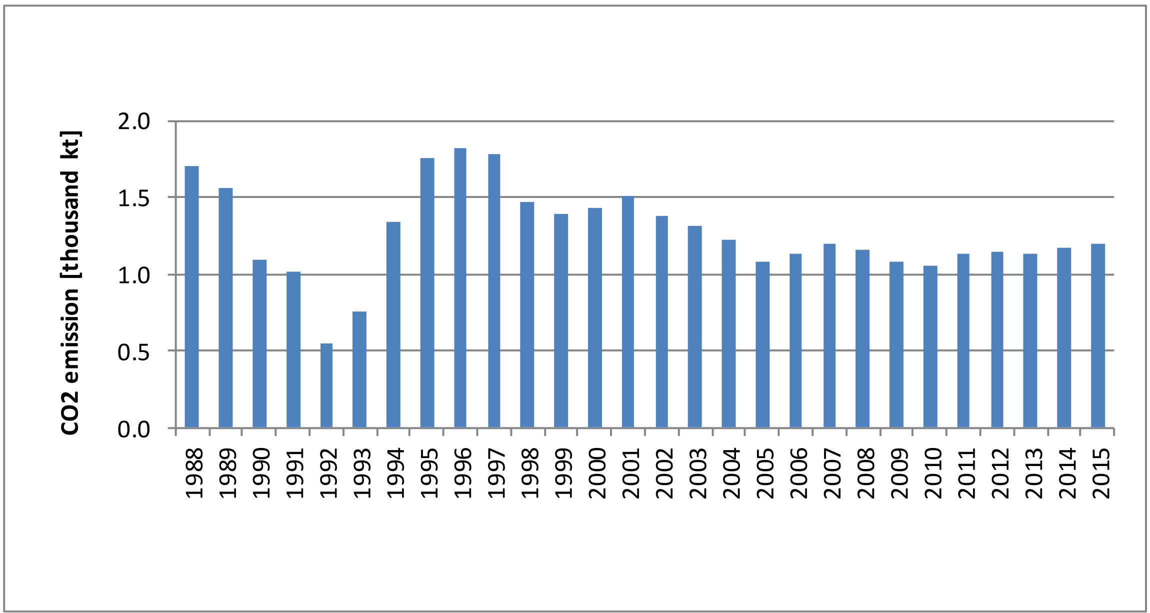

Figure 3.3.7.4. CO_2 emission for 1.A.2.b category in 1988-2015

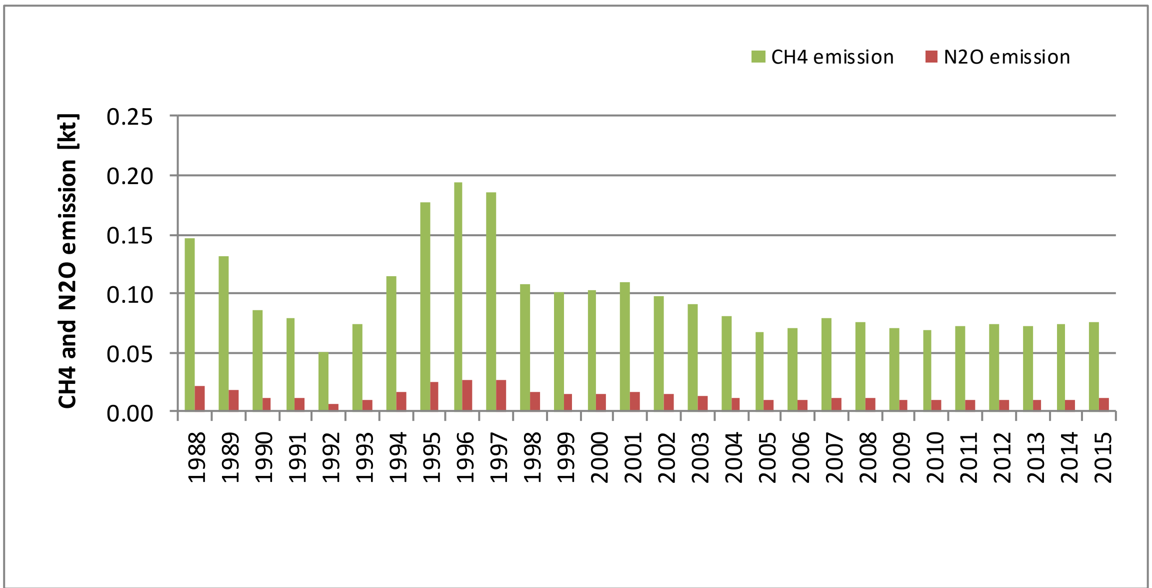

Figure 3.3.7.5. CH_4 and N_2O emissions for 1.A.2.b category in 1988-2015

3.2.7.2.3. Chemicals (CRF sector 1.A.2.c)

Detailed data on fuel consumptions in 1.A.2.c subcategory for the entire period 1988-2015 was presented in Annex 2 (table 6).
The data on fuel type use in the sub-category 1.A.2.c *Chemicals* over the 1988-2015 period are presented in table 3.3.7.3.

Table 3.3.7.3. Fuel consumption in 1988-2015 in 1.A.2.c subcategory [PJ]

	1988	1989	1990	1991	1992	1993	1994	1995
Liquid Fuels	14.825	13.968	4.103	6.203	8.977	7.710	4.527	10.688
Gaseous Fuels	6.409	6.244	5.289	4.340	4.432	10.075	4.507	6.356
Solid Fuels	12.407	14.986	10.896	9.351	7.008	16.738	10.312	74.948
Other Fuels	12.255	14.915	16.712	18.586	17.039	18.003	22.591	21.546
Biomass	0.345	0.390	0.118	0.039	0.010	0.003	0.035	0.007
TOTAL	**46.241**	**50.503**	**37.118**	**38.519**	**37.466**	**52.529**	**41.972**	**113.545**
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Liquid Fuels	19.576	22.964	40.929	39.132	38.344	33.144	32.907	33.483
Gaseous Fuels	6.191	11.024	9.408	9.041	9.464	8.481	7.199	6.457
Solid Fuels	75.455	65.909	57.138	52.421	51.772	50.353	47.485	30.174
Other Fuels	17.374	14.356	0.672	0.582	0.607	0.618	0.567	0.875
Biomass	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.153
TOTAL	**118.596**	**114.253**	**108.148**	**101.176**	**100.187**	**92.596**	**88.159**	**71.142**
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Liquid Fuels	33.648	26.001	29.370	29.765	23.485	26.741	22.114	16.816
Gaseous Fuels	7.498	8.104	9.053	8.754	7.950	9.707	11.807	13.887
Solid Fuels	31.215	32.175	31.194	29.376	45.603	43.378	48.757	49.660
Other Fuels	1.122	0.628	0.721	0.707	0.509	0.584	0.770	0.732
Biomass	0.102	0.165	0.000	0.121	0.000	0.058	0.058	0.053
TOTAL	**73.585**	**67.073**	**70.338**	**68.723**	**77.547**	**80.468**	**83.506**	**81.148**
	2012	**2013**	**2014**	**2015**				
Liquid Fuels	13.779	16.675	13.302	15.789				
Gaseous Fuels	13.568	14.696	14.500	14.859				
Solid Fuels	50.527	50.968	50.138	43.078				
Other Fuels	0.581	1.092	1.082	0.936				
Biomass	0.131	0.050	0.111	0.094				
TOTAL	**78.586**	**83.481**	**79.133**	**74.756**				

Figure 3.3.7.6 shows CO_2 emissions in the sub-category 1.A.2.c in the 1988-2015 period. Emissions of CH_4 and N_2O, in turn, are shown in figure 3.3.7.7.

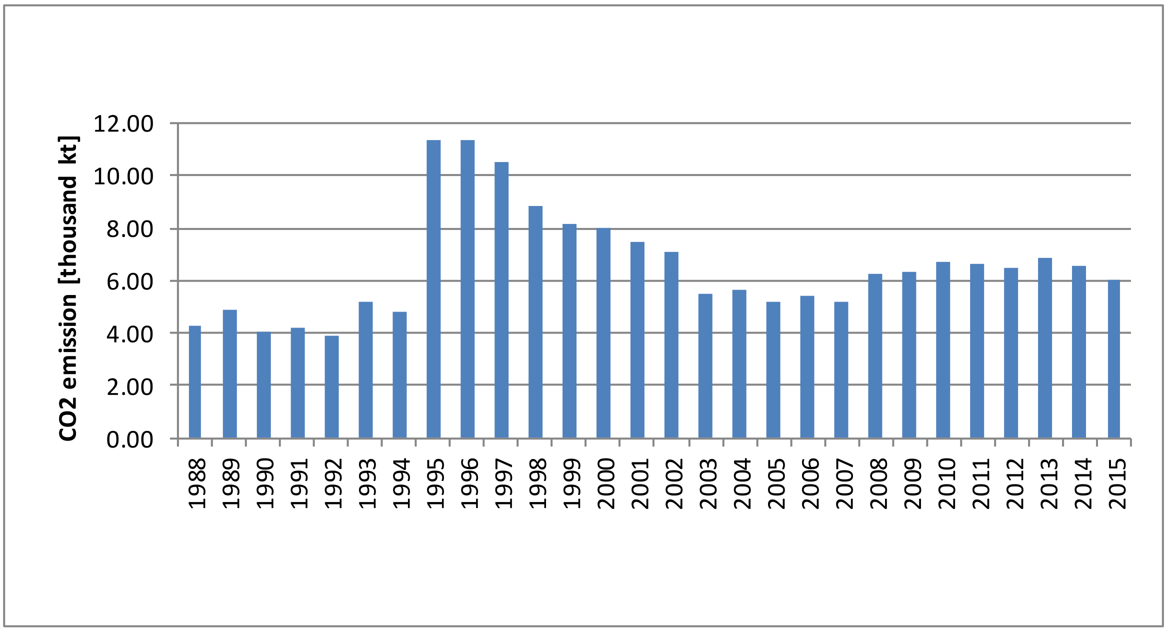

Figure 3.3.7.6. CO_2 emission for 1.A.2.c category in 1988-2015

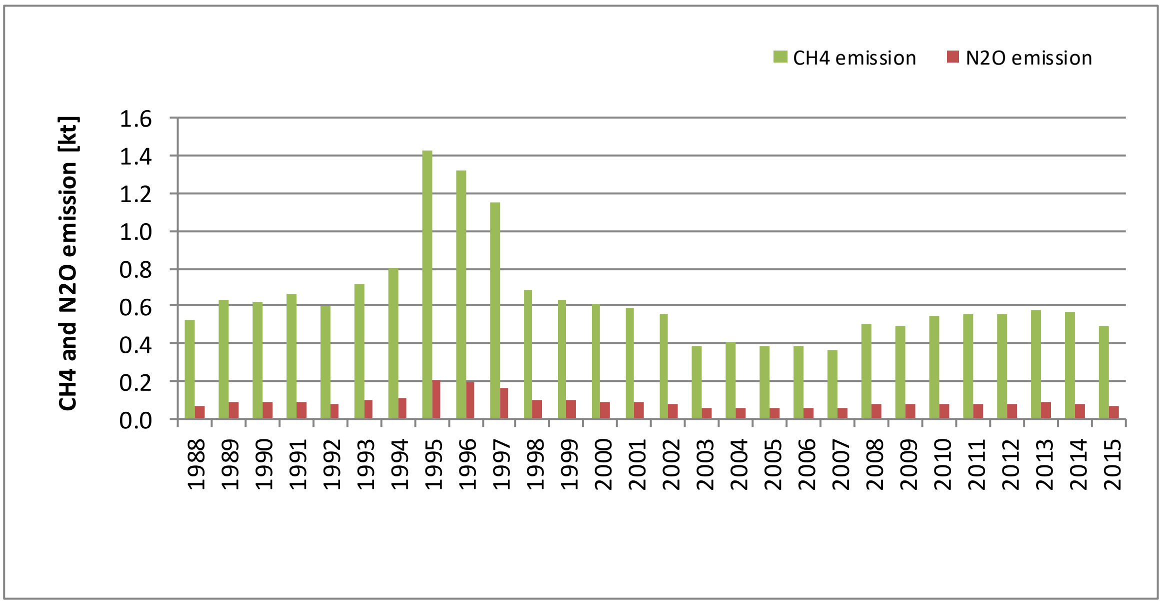

Figure 3.3.7.7. CH_4 and N_2O emissions for 1.A.2.c category in 1988-2015

3.2.7.2.4. Pulp, Paper and Print (CRF sector 1.A.2.d)

The data on fuel type use in the sub-category 1.A.2.d *Pulp, Paper and Print* over the 1988-2015 period are presented in table 3.3.7.4. Characteristic for that sub-sector is relatively large share of biomass in the total fuel use. Detailed data on fuel consumptions in 1.A.2.d subcategory was presented in Annex 2 (table 7).

Table 3.3.7.4. Fuel consumption in 1988-2015 in 1.A.2.d subcategory [PJ]

	1988	1989	1990	1991	1992	1993	1994	1995
Liquid Fuels	1.371	1.291	1.369	1.332	1.409	1.649	1.532	2.535
Gaseous Fuels	0.103	0.162	0.101	0.061	0.026	0.061	0.250	0.232
Solid Fuels	1.976	2.192	1.810	2.043	1.639	4.841	4.123	22.605
Other Fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	0.352	0.205	0.001	0.000	0.000	1.585	1.610	15.437
TOTAL	**3.803**	**3.850**	**3.281**	**3.436**	**3.074**	**8.136**	**7.515**	**40.809**
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Liquid Fuels	1.687	2.119	2.619	2.227	2.099	2.044	2.035	2.208
Gaseous Fuels	0.455	1.096	0.563	1.007	1.210	1.445	1.461	2.094
Solid Fuels	22.494	24.121	19.022	17.528	15.724	15.592	14.345	14.107
Other Fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	16.243	16.472	16.476	15.545	15.938	15.138	16.622	17.950
TOTAL	**40.879**	**43.808**	**38.680**	**36.307**	**34.971**	**34.219**	**34.463**	**36.359**
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Liquid Fuels	2.244	2.029	2.118	2.333	1.986	1.995	1.992	1.988
Gaseous Fuels	2.657	2.288	2.976	4.087	4.822	4.972	5.134	4.587
Solid Fuels	13.825	13.458	11.620	9.480	7.878	8.515	10.114	11.301
Other Fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	18.957	18.611	19.379	18.644	19.729	19.189	19.630	19.475
TOTAL	**37.683**	**36.386**	**36.093**	**34.544**	**34.415**	**34.671**	**36.870**	**37.351**
	2012	**2013**	**2014**	**2015**				
Liquid Fuels	1.785	1.872	1.545	1.840				
Gaseous Fuels	5.535	6.271	6.994	7.167				
Solid Fuels	10.643	11.460	11.291	11.130				
Other Fuels	0.000	0.037	0.125	0.108				
Biomass	20.441	27.243	27.092	27.157				
TOTAL	**38.404**	**46.883**	**47.047**	**47.402**				

Figures 3.3.7.8 and 3.3.7.9 show emissions of CO_2, CH_4 and N_2O, respectively in the sub-category 1.A.2.d in the period: 1988-2015.

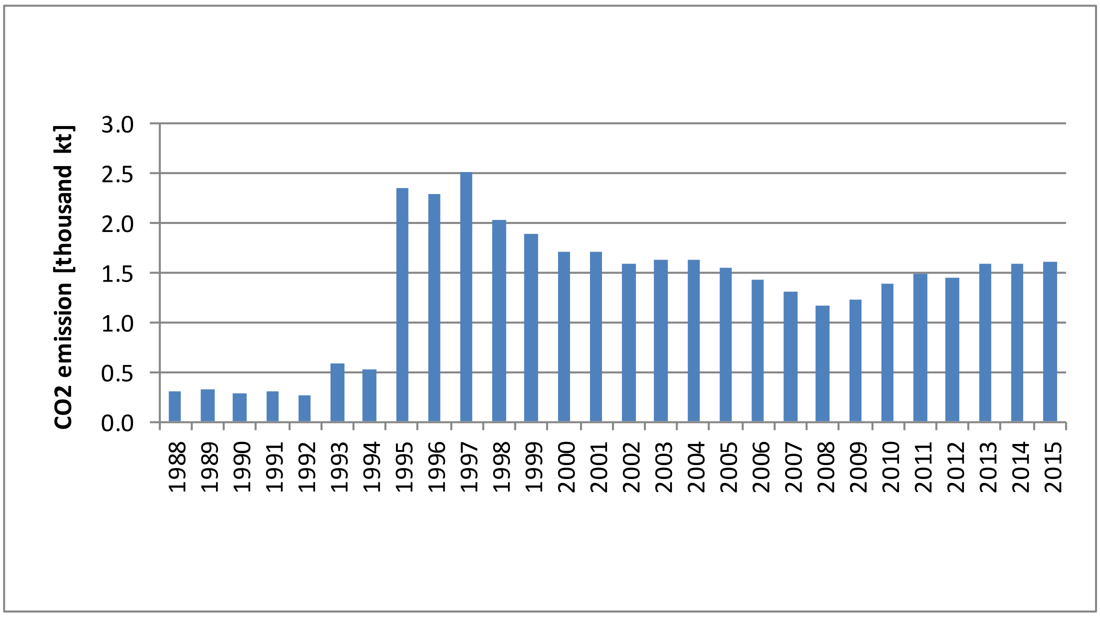

Figure 3.3.7.8. CO_2 emission for 1.A.2.d category in 1988-2015

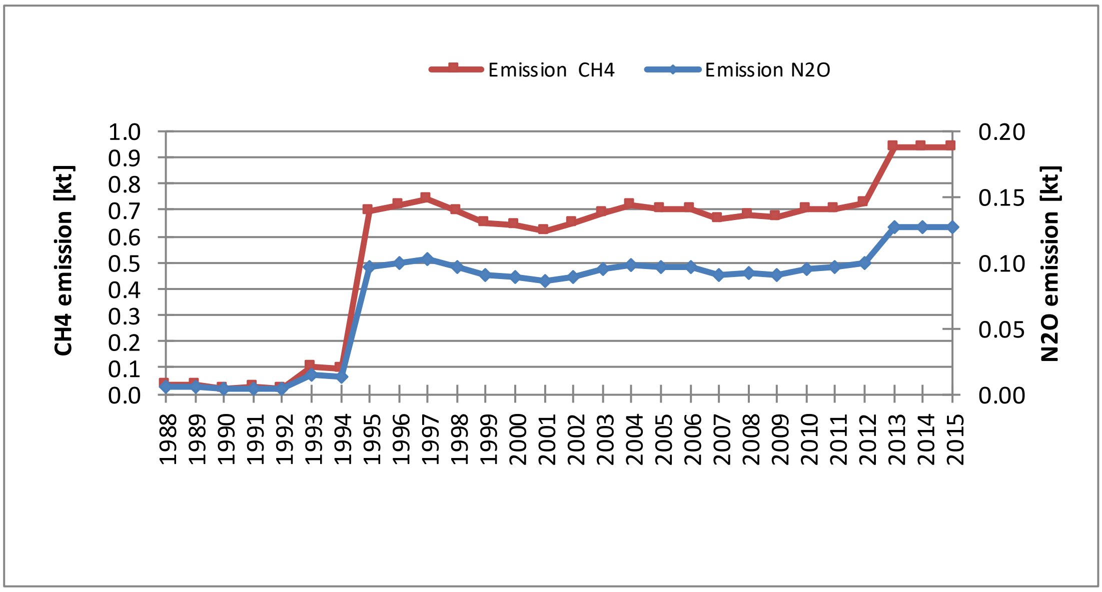

Figure 3.3.7.9. CH_4 and N_2O emissions for 1.A.2.d category in 1988-2015

3.2.7.2.5. Food Processing, Beverages and Tobacco (CRF sector 1.A.2.e)

The data on fuel type use in the sub-category 1.A.2.e *Food Processing, Beverages and Tobacco* over the 1988-2015 period are presented in table 3.3.7.5. Detailed data on fuel consumption was tabulated in Annex 2 (table 8).

Table 3.3.7.5. Fuel consumption in 1988-2015 in 1.A.2.e subcategory [PJ]

	1988	1989	1990	1991	1992	1993	1994	1995
Liquid Fuels	4.413	3.484	3.065	2.646	2.402	4.707	5.219	7.339
Gaseous Fuels	1.965	1.910	1.970	1.984	2.339	3.171	7.180	3.839
Solid Fuels	29.280	35.542	35.468	39.034	35.517	59.569	56.912	75.938
Other Fuels	0.003	0.002	0.000	0.000	0.031	0.003	0.003	0.000
Biomass	0.114	0.105	0.091	0.094	0.072	0.151	0.056	0.082
TOTAL	**35.775**	**41.043**	**40.594**	**43.758**	**40.361**	**67.601**	**69.370**	**87.198**
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Liquid Fuels	8.612	7.900	9.907	10.250	10.681	10.889	11.340	11.374
Gaseous Fuels	15.051	12.927	10.694	9.255	10.494	11.363	12.490	15.075
Solid Fuels	92.385	81.307	67.056	48.274	45.232	41.557	43.534	40.545
Other Fuels	0.000	0.000	0.000	0.000	0.001	0.014	0.000	0.000
Biomass	0.094	0.075	0.104	0.089	0.112	0.104	0.097	0.386
TOTAL	**116.142**	**102.209**	**87.761**	**67.868**	**66.520**	**63.927**	**67.461**	**67.380**
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Liquid Fuels	11.022	10.036	8.665	7.801	7.561	5.612	5.014	4.524
Gaseous Fuels	16.164	17.456	18.623	20.614	20.725	20.950	21.610	22.128
Solid Fuels	37.450	36.955	31.793	32.077	27.434	26.470	26.530	26.156
Other Fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	0.447	0.282	0.311	0.248	0.459	0.301	0.542	0.679
TOTAL	**65.083**	**64.729**	**59.392**	**60.740**	**56.179**	**53.333**	**53.696**	**53.487**
	2012	**2013**	**2014**	**2015**				
Liquid Fuels	4.994	3.900	3.482	2.926				
Gaseous Fuels	23.704	24.475	25.094	26.008				
Solid Fuels	26.486	25.094	24.884	23.236				
Other Fuels	0.000	0.000	0.000	0.000				
Biomass	0.635	0.866	0.988	1.479				
TOTAL	**55.819**	**54.335**	**54.448**	**53.650**				

Figures 3.3.7.10 and 3.3.7.11 show emissions of CO_2, CH_4 and N_2O, respectively in the sub-category 1.A.2.e in the period: 1988-2015.

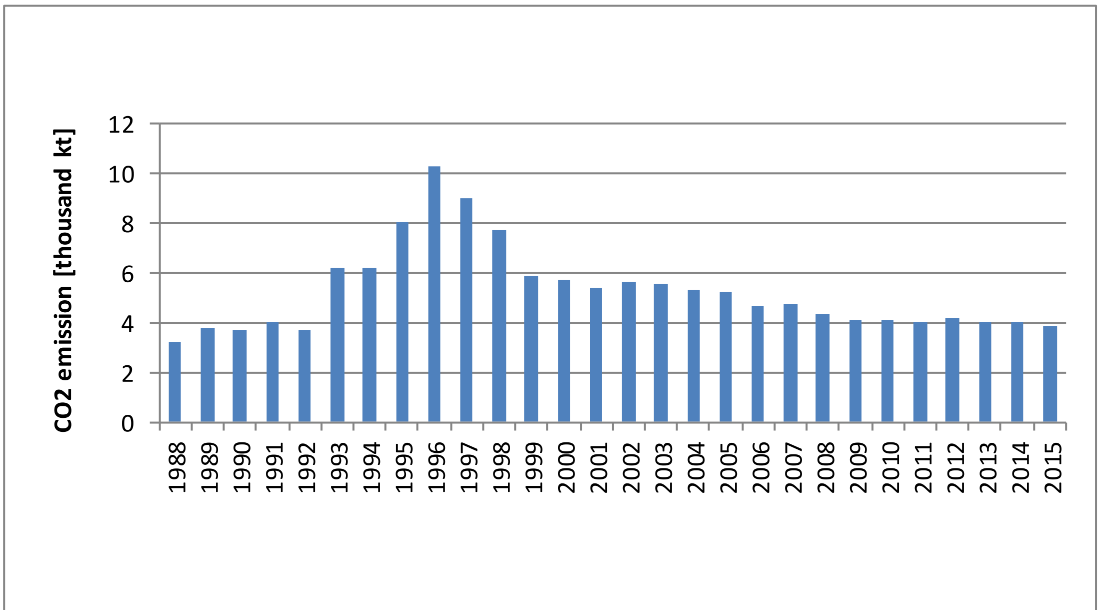

Figure 3.3.7.10. CO_2 emission for 1.A.2.e category in 1988-2015

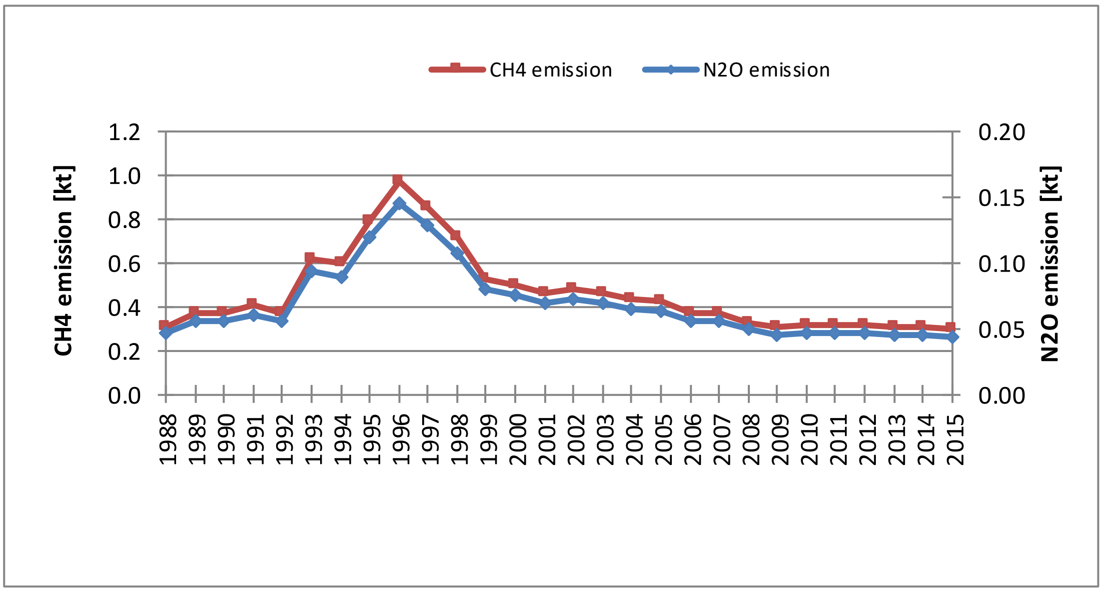

Figure 3.3.7.11. CH_4 and N_2O emissions for 1.A.2.e category in 1988-2015

3.2.7.2.6. Non-metallic minerals (CRF sector 1.A.2.f)

The data on fuel type use in the sub-category 1.A.2.f *Non-metallic minerals* in the 1988-2015 period are presented in table 3.3.7.6. Detailed data concerning total fuel consumption in 1.A.2.f subcategory was tabulated in Annex 2 (table 9).

Table 3.3.7.6. Fuel consumption in 1988-2015 in 1.A.2.f subcategory [PJ]

	1988	1989	1990	1991	1992	1993	1994	1995
Liquid Fuels	7.321	7.828	5.104	3.615	4.332	4.732	5.356	7.548
Gaseous Fuels	28.729	28.108	24.574	22.704	22.246	21.986	21.506	25.518
Solid Fuels	128.357	123.387	92.221	89.061	84.226	91.535	98.135	92.655
Other Fuels	0.382	0.446	0.068	0.023	0.267	0.250	0.145	0.197
Biomass	1.778	1.924	1.155	0.455	0.042	0.033	0.004	0.010
TOTAL	**166.566**	**161.692**	**123.122**	**115.858**	**111.113**	**118.536**	**125.146**	**125.928**
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Liquid Fuels	5.608	8.535	10.126	8.358	6.016	7.029	8.355	12.590
Gaseous Fuels	26.650	25.655	27.097	23.917	27.976	31.858	33.233	35.584
Solid Fuels	99.819	91.341	78.249	69.195	60.767	46.906	39.208	35.992
Other Fuels	0.144	0.047	0.207	0.529	0.472	0.524	0.508	1.474
Biomass	0.010	0.005	0.006	0.002	0.006	0.275	0.292	0.102
TOTAL	**132.231**	**125.583**	**115.685**	**102.001**	**95.237**	**86.592**	**81.596**	**85.742**
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Liquid Fuels	12.156	14.214	8.720	5.855	6.108	7.209	6.038	4.410
Gaseous Fuels	38.233	38.963	41.283	42.465	39.696	41.394	42.872	44.492
Solid Fuels	38.551	35.210	36.102	50.003	41.280	29.982	32.419	39.231
Other Fuels	1.831	3.418	6.663	7.737	7.778	12.134	14.966	16.746
Biomass	0.261	0.110	0.139	0.117	0.224	0.314	0.422	1.686
TOTAL	**91.032**	**91.915**	**92.907**	**106.177**	**95.086**	**91.033**	**96.717**	**106.565**
	2012	**2013**	**2014**	**2015**				
Liquid Fuels	3.556	3.274	2.425	1.985				
Gaseous Fuels	42.349	40.911	40.873	40.514				
Solid Fuels	31.510	27.253	27.959	28.522				
Other Fuels	16.083	16.515	19.231	19.079				
Biomass	1.767	1.889	2.252	2.328				
TOTAL	**95.265**	**89.842**	**92.740**	**92.428**				

Figures 3.3.7.12 and 3.3.7.13 show emissions of CO_2, CH_4 and N_2O, respectively in the sub-category 1.A.2.f in the period: 1988-2015.

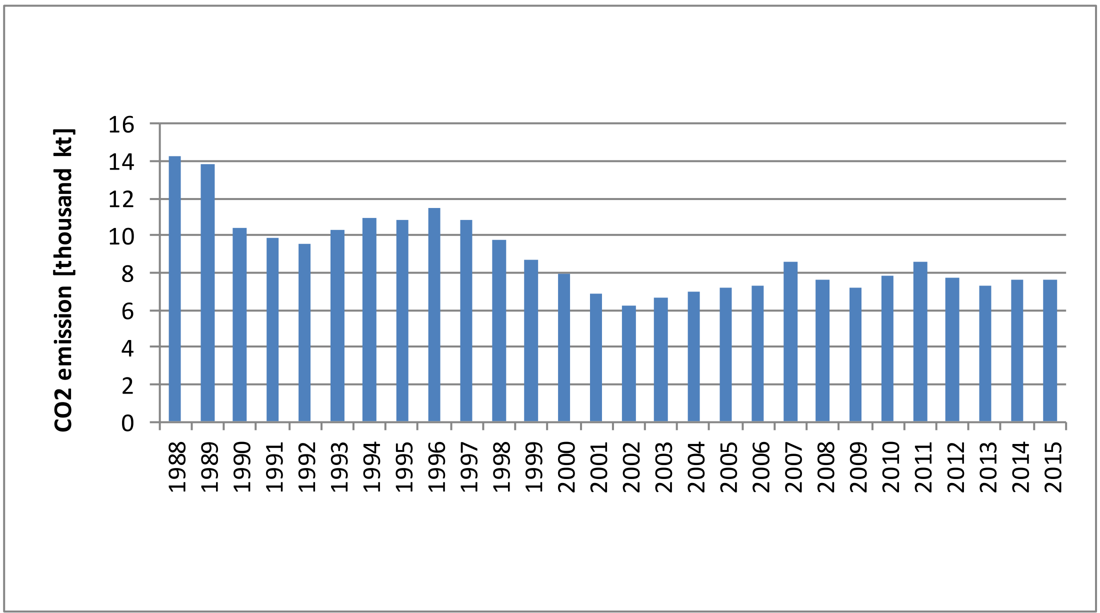

Figure 3.3.7.12. CO_2 emission from 1.A.2.f category in 1988-2015

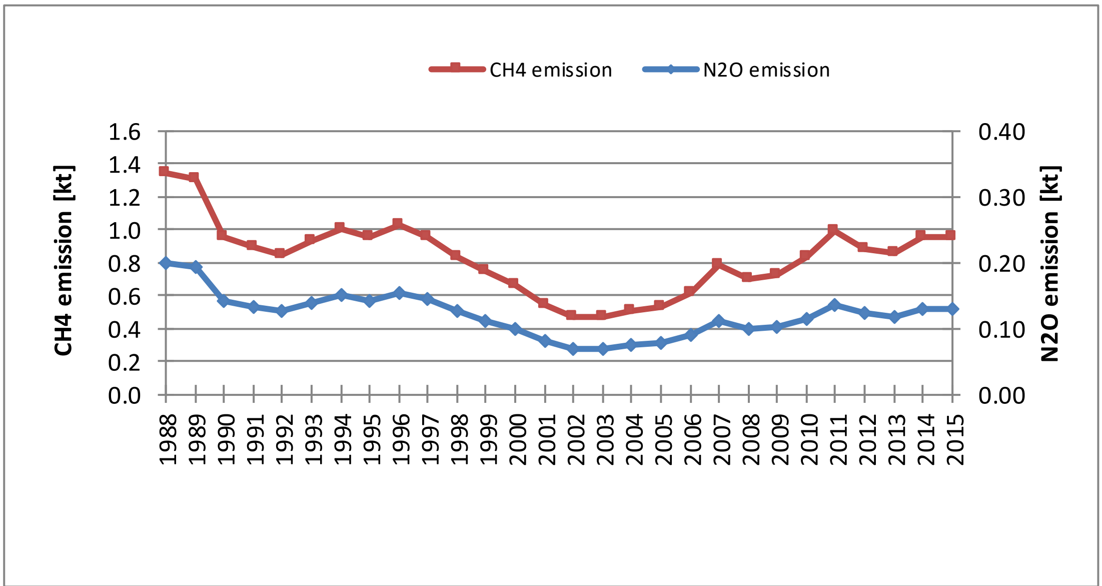

Figure 3.3.7.13. CH_4 and N_2O emissions from 1.A.2.f category in 1988-2015

3.2.7.2.7. Other (1.A.2.g)

The GHG emission was estimated for sub-categories as follows:

- *Manufacturing of machinery*
- *Manufacturing of transport equipment*
- *Mining (excluding fuels) and quarrying*
- *Wood and wood products*
- *Construction*
- *Textile and leather*
- *Off-road vehicles and other machinery*
- *Other* - other industry branches not included elsewhere

The data on fuel type use in stationary sources in the category 1.A.2.g *Other* over the 1988-2015 period are presented in table 3.3.7.7. Detailed data concerning total fuel consumption in 1.A.2.g subcategory was tabulated in Annex 2 (table 10).

Table 3.3.7.7. Fuel consumption in 1988-2015 in stationary sources of 1.A.2.g subcategory [PJ]

	1988	1989	1990	1991	1992	1993	1994	1995
Liquid Fuels	19.848	18.040	13.846	12.029	10.684	12.077	11.560	14.398
Gaseous Fuels	24.039	22.347	15.645	11.755	13.811	17.922	17.336	15.176
Solid Fuels	82.038	72.062	54.022	48.748	41.858	92.328	80.329	87.356
Other Fuels	0.082	0.058	0.022	0.012	0.134	0.298	1.593	2.294
Biomass	8.335	7.545	5.826	5.518	5.035	4.995	3.410	4.970
TOTAL	**134.342**	**120.051**	**89.361**	**78.062**	**71.522**	**127.620**	**114.228**	**124.194**
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Liquid Fuels	22.621	21.909	18.803	16.603	16.480	14.357	13.982	14.478
Gaseous Fuels	14.210	16.060	17.640	16.354	18.545	18.319	19.273	21.156
Solid Fuels	111.430	92.492	67.610	53.094	43.187	34.504	28.893	26.985
Other Fuels	2.675	1.133	2.080	1.482	2.075	1.802	2.078	2.503
Biomass	6.520	8.195	8.233	8.604	10.105	10.716	12.300	11.897
TOTAL	**157.456**	**139.789**	**114.366**	**96.137**	**90.392**	**79.698**	**76.526**	**77.019**
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Liquid Fuels	14.166	15.025	15.380	12.883	11.811	11.545	11.694	11.647
Gaseous Fuels	22.595	23.325	23.290	23.541	26.265	22.861	24.964	23.876
Solid Fuels	23.495	20.805	18.958	17.446	14.889	11.734	11.916	10.953
Other Fuels	1.661	1.700	3.789	0.938	1.154	1.392	0.070	0.052
Biomass	12.184	11.918	11.030	13.171	14.044	14.007	17.901	20.051
TOTAL	**74.101**	**72.773**	**72.447**	**67.979**	**68.163**	**61.539**	**66.545**	**66.579**
	2012	**2013**	**2014**	**2015**				
Liquid Fuels	9.210	8.445	8.877	8.910				
Gaseous Fuels	23.019	26.036	23.395	22.751				
Solid Fuels	8.173	7.973	7.022	8.113				
Other Fuels	0.069	0.098	0.064	0.045				
Biomass	20.854	24.842	25.929	27.981				
TOTAL	**61.325**	**67.394**	**65.287**	**67.801**				

Figures 3.3.7.14 and 3.3.7.15 show emissions of CO_2, CH_4 and N_2O, respectively in the 1.A.2.g category in the period: 1988-2015.

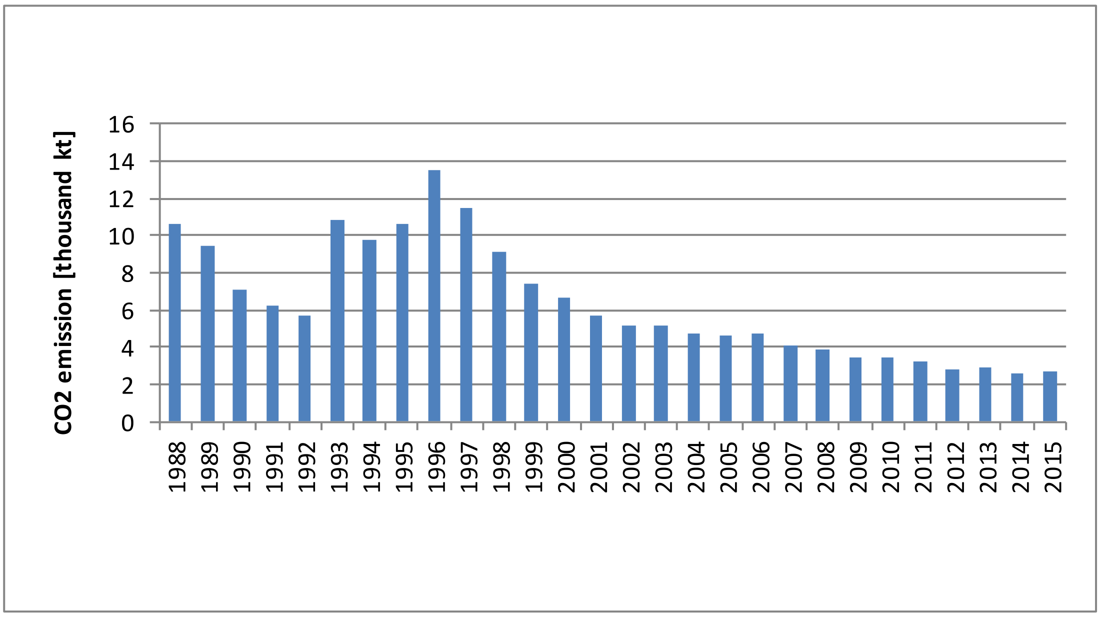

Figure 3.3.7.14. CO_2 emission from 1.A.2.g category in 1988-2015

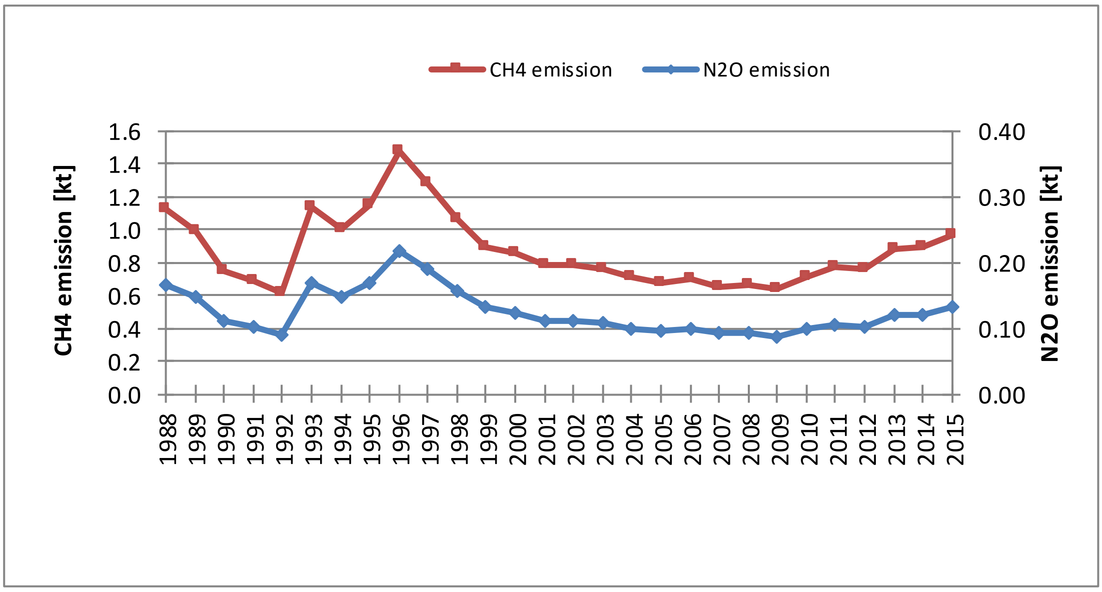

Figure 3.3.7.15. CH_4 and N_2O emissions from 1.A.2.g category in 1988-2015

3.2.7.3. Uncertainties and time-series consistency

See chapter 3.2.6.3.

3.2.7.4. Source-specific QA/QC and verification

See chapter 3.2.6.4.

3.2.7.5. Source-specific recalculations

Coal used in blast furnaces process (included in C balance for BF in 2.C.1 subcategory) for the years 2010-2014 was deducted in calculation of emission from 1.A.2.a subsector to avoid double counting (see explanation given above in the chapter: *3.2.7.2.1. Iron and Steel*)

Table. 3.2.7.8. Changes in GHG emissions in 1.A.2 subsector as a result of recalculations

Changes	1988	1989	1990	1991	1992	1993	1994	1995
				CO2				
kt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				CH4				
kt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				N2O				
kt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Changes	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
				CO2				
kt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				CH4				
kt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				N2O				
kt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Changes	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
				CO2				
kt	0.00	0.00	0.00	0.00	0.00	0.00	-88.63	-218.71
%	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.7
				CH4				
kt	0.00	0.00	0.00	0.00	0.00	0.00	-0.009	-0.023
%	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.6
				N2O				
kt	0.00	0.00	0.00	0.00	0.00	0.00	-0.001	-0.004
%	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.7
Changes	**2012**	**2013**	**2014**					
		CO2						
kt	-557.81	-392.99	-510.16					
%	-1.9	-1.3	-1.7					
		CH4						
kt	-0.060	-0.042	-0.055					
%	-1.6	-1.0	-1.3					
		N2O						
kt	-0.009	-0.006	-0.008					
%	-1.7	-1.1	-1.4					

3.2.7.6. Source-specific planned improvements

Analysis of the possibility of country specific EF elaboration for the gaseous fuels in Polish fuel structure.

3.2.8. Transport (CRF sector 1.A.3)

3.2.8.1. Source category description

Estimation of emissions in 1.A.3 *Transport* are carried out for each fuel in sub-categories listed below:

a) *Civil Aviation* (1.A.3.a)
b) *Road Transportation* (1.A.3.b)
c) *Railways* (1.A.3.c)
d) *Navigation* (1.A.3.d)
e) *Other Transportation* (1.A.3.e)

Share of that sector in total GHG emission in 2015 is about 11.9%. Road transport is by far the largest contributor to transport emissions (see figure 3.2.8.1) - in year 2015 over 97%.

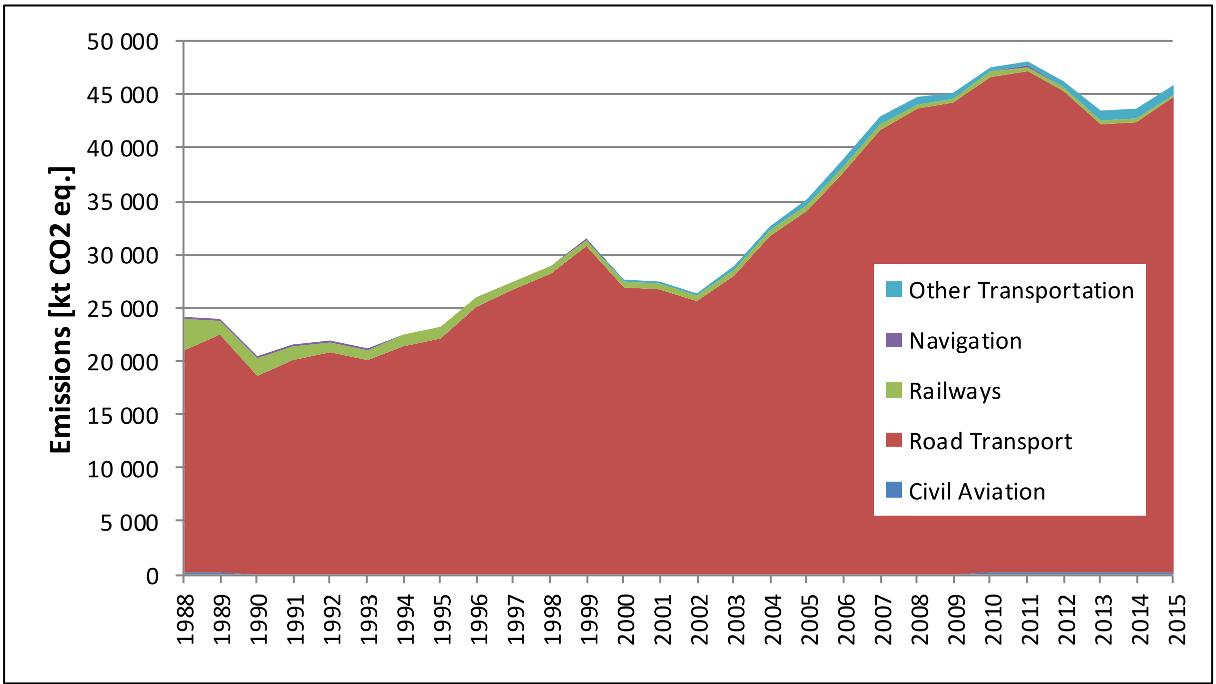

Figure 3.2.8.1. Emissions from transport in years 1988-2015

3.2.8.2. Methodological issues

The methodology used for estimation of GHG emissions in the national inventory for mobile non-road sources for the entire time series 1988-2015 is factor based – data on fuel used are multiplied by the corresponding emission factors. All emission factors for non-mobile sources were taken from IPCC 2006 guidelines and have constant values over the entire time series 1988-2015.

GHG emissions from sector 1.A.3.b. *Road transport* has been calculated, for the first time, with the use of software COPERT 4. All emission factors are default values from COPERT 4.

3.2.8.2.1. Civil Domestic Aviation (CRF sector 1.A.3.a)

This category include emissions from passenger and freight traffic that departs and arrives in the same country (commercial, private, agriculture, etc.). Exclude use of fuel at airports for ground transport, fuel for stationary combustion at airports.

For the years 1990-2015 data related to aviation gasoline and jet kerosene are those of the Eurostat database, while for the base year and 1989 – those of the IEA database.

Jet kerosene given in Polish statistic is reported as International aviation although include whole amount of jet kerosene used for domestic and international purposes. To split jet kerosene Eurocontrol data were used. Each year, under contract with the European Commission's Directorate-General for Climate Action, EUROCONTROL calculates the mass of fuel burnt by civil aviation flights starting from and/or finishing at airports in the Member States of the European Union (EU). This work is done in support of both the European Environment Agency (EEA) and the Member States of the EU. The calculation are made with the split on domestic and international aviation. The total amount of jet kerosene used by Poland – calculated by Eurocontrol is similar to this reported by Poland to Eurostat. To stay in line with Eurostat database (and Polish statistic) only the share of domestic and international fuel use were used based on Eurocontrol data. Below in table are given Eurocontrol data of jet kerosene used in Poland and the share of domestic and international use.

Table 3.2.8.1. Eurocontrol data of jet kerosene used in Poland and the share of domestic and international use for years 2005-2015.

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Eurocontrol												
Domestic	kt	23.66	26.72	29.06	28.52	26.13	30.11	33.22	47.63	35.54	39.41	35.09
International	kt	303.08	383.48	454.37	514.25	452.25	476.26	477.83	493.68	517.51	548.80	586.46
Total	kt	**326.74**	**410.20**	**483.43**	**542.77**	**478.38**	**506.37**	**511.04**	**541.32**	**553.04**	**588.21**	**621.54**
Share												
Domestic	%	7.24	6.51	6.01	5.25	5.46	5.95	6.50	8.80	6.43	6.70	5.64
International	%	92.76	93.49	93.99	94.75	94.54	94.05	93.50	91.20	93.57	93.30	94.36
Total	%	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Due to the lack of Eurocontrol data for the years before 2005, the share for years 1988-2004 was assumed as a 5-years average from Eurocontrol data for years 2005-2009. The 5-years average, taken from the nearest years to data lack period, was evaluated as the most representative in consultations with experts in the area of transport and energy. The share 6.10% was then accepted for the whole period before 2005. Such assumption seems to be reliable and not affecting accuracy of the inventory.

Emission factors for the estimation of GHG emissions from domestic aviation are default values from the IPCC 2006 guidelines (table 3.2.8.2)

Table 3.2.8.2. Emission factors for domestic aviation [kg/GJ].

	CO_2	CH_4	N_2O
Aviation gasoline	70.00	0.005	0.002
Jet kerosene	71.50	0.005	0.002

Emissions from aviation come from the combustion of jet fuel and aviation gasoline. Data on fuel use in domestic aviation are shown in table 3.2.8.3 and figure 3.2.8.2. Figures 3.2.8.3 and 3.2.8.4 show emissions of CO_2, CH_4 and N_2O, respectively in the sub-category 1.A.3.a in the period 1988-2015.
Between 1988 and early 1990-ties dramatic decrease in fuel consumption and heavy industry production occurred triggered by significant economic changes related to political transformation from centralized to market economy. These changes affected all energy sectors and this is the

main reason why Poland choose 1988 as a base year (as being more representative in trend than 1990 with collapsing industry).

Table 3.2.8.3. Fuel consumption and GHG emission in years 1988 – 2015

		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Aviation gasoline	TJ	879.98	836.02	352.00	220.00	88.00	176.00	440.00	308.00	176.00	264.00
Jet fuel	TJ	914.98	1258.42	563.67	582.02	631.83	629.21	637.08	686.89	807.49	723.59
CO2 emission	kt	127.02	148.50	64.94	57.01	51.34	57.31	76.35	70.67	70.06	70.22
CH4 emission	kt	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
N2O emission	kt	0.004	0.004	0.002	0.002	0.001	0.002	0.002	0.002	0.002	0.002
		1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Aviation gasoline	TJ	176.00	132.00	132.00	132.00	176.00	176.00	132.00	132.00	132.00	176.00
Jet fuel	TJ	736.70	658.05	700.00	689.51	676.40	731.46	718.35	968.34	1162.41	1116.81
CO2 emission	kt	64.99	56.29	59.29	58.54	60.68	64.62	60.60	78.48	92.35	92.17
CH4 emission	kt	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001
N2O emission	kt	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003
		2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**		
Aviation gasoline	TJ	132.00	176.00	176.00	220.00	220.00	176.00	220.00	152.00		
Jet fuel	TJ	1 172.75	1 104.08	1 265.85	1 355.55	2 031.94	1 447.79	1 700.31	1 567.38		
CO2 emission	kt	93.09	91.26	102.83	112.32	160.68	115.84	136.97	122.71		
CH4 emission	kt	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001		
N2O emission	kt	0.003	0.003	0.003	0.003	0.005	0.003	0.004	0.003		

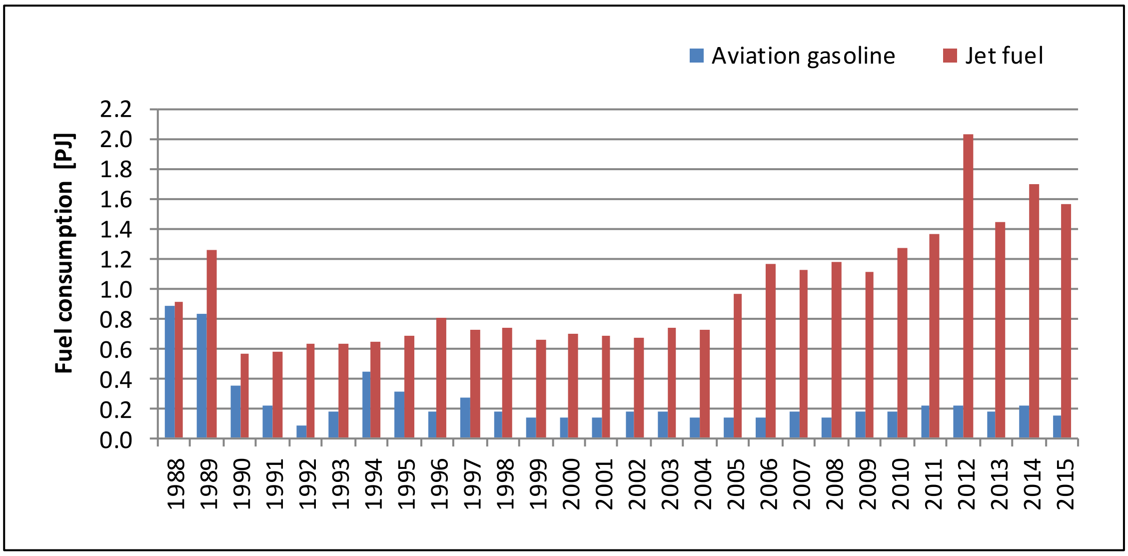

Figure 3.2.8.2. Fuel consumption in 1.A.3.a category for 1988-2015

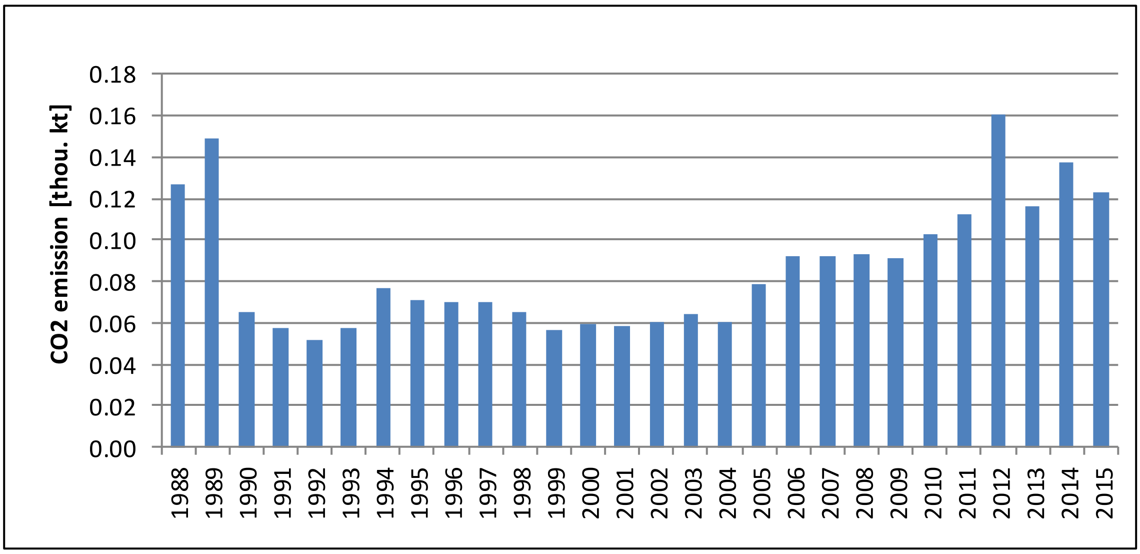

Figure 3.2.8.3. CO_2 emission for 1.A.3.a category in 1988-2015

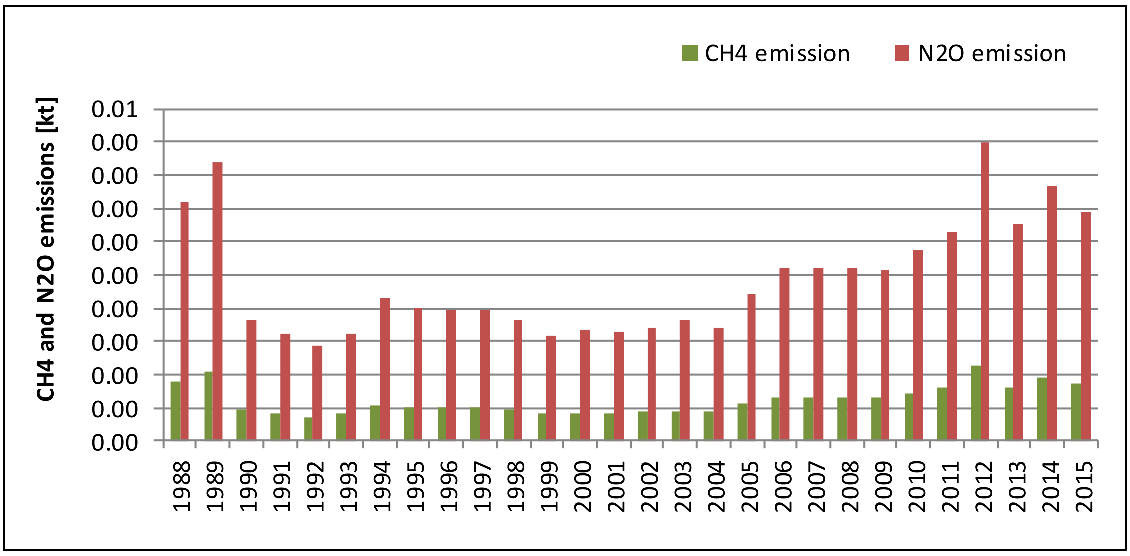

Figure 3.2.8.4. CH_4 and N_2O emissions for 1.A.3.a category in 1988-2015

3.2.8.2.2. Road Transportation (CRF sector 1.A.3.b)

Category includes emissions from all types of vehicles such as: passenger cars, light and heavy duty vehicles, buses, motorcycles and mopeds. For the first time Poland applied software COPERT to the official reporting of national emissions within the framework cooperation in the European Union. COPERT 4 is an program aiming at the calculation of air pollutant emissions from road transport and the methodology applied is part of the EMEP/CORINAIR Emission Inventory Guidebook. The use of COPERT allows for estimating emissions in accordance with the requirements of international conventions and protocols and EU legislation.

Calculations for the year 2015 and recalculations of years 1988-2014 was made by model COPERT 4 version 11.4. All emission factors are default values from COPERT 4.

Emission estimates from this category are based on:
- fuel consumption,
- number of vehicles per vehicle category, engine size or vehicle weigh and emission control technology,
- the mileage per vehicle class and,
- mileage share per road class (urban, rural and highways),
- the average speed per vehicle type and per road class,
- monthly temperature (min and max),
- fuel characteristics.

Data on fuel consumption for years 1990-2015 comes from Eurostat database, and for years 1988-1989 from IEA. Consumption of each type of fuel (used in road transport) in statistics is given without distinguishing on individual vehicle type. Therefore, for the purpose of this report fuel consumption was disaggregated based on COPERT 4 calculations – mass of statistical and calculated fuel consumption is equal. Table 3.2.8.4 shows fuel consumption, implied emission factors and GHG emissions in 2015 by main vehicle categories.

Table 3.2.8.4. Fuel consumption, emission factors and GHG emissions in 2015 by vehicle categories.

Vehicle category by fuel type	Fuel consumption	Implied emission factors			Emissions		
		CO2	CH4	N2O	CO2	CH4	N2O
	TJ	(t/TJ)	(kg/TJ)	(kg/TJ)	kt	kt	kt
Passenger cars	354 745.87				24 399.35	2.99	0.91
Gasoline	134 831.45	69.29	14.66	2.11	9 342.64	1.98	0.28
Diesel oil	147 948.52	70.83	0.81	2.80	10 478.88	0.12	0.41
Liquefied petroleum gases	71 952.26	63.62	12.46	2.99	4 577.83	0.90	0.22
Biomass	13 645	70.80	3.00	0.60	966.07	0.04	0.01
Light duty trucks	83 486.17				5 895.29	0.27	0.17
Gasoline	14 006.02	69.57	15.48	2.51	974.47	0.22	0.04
Diesel oil	69 475.82	70.83	0.70	1.91	4 920.83	0.05	0.13
Biomass	4 332	70.80	3.00	0.60	306.73	0.01	0.00
Heavy duty trucks and buses	191 223.10				13 500.83	0.69	0.44
Diesel oil	190 543.84	70.82	3.57	2.33	13 494.99	0.68	0.44
Gaseous fuels	669.00	8.73	12.01	NO	5.84	0.01	NO
Biomass	10 265	70.80	3.00	0.60	726.76	0.03	0.01
Motorcycles and mopeds	3 841.15				269.87	0.35	0.01
Gasoline	3 840.99	70.26	90.32	1.40	269.87	0.35	0.01
Biomass	162	70.80	3.00	0.60	0.01	0.00	0.00

The number of vehicles per vehicle category, engine size or weigh and emission control technology comes from Polish Central Vehicle and Driver Register system (CEPiK) and Central Statistical Office [GUS T]. The amount of vehicles according to categories and fuel type is shown in figure below.

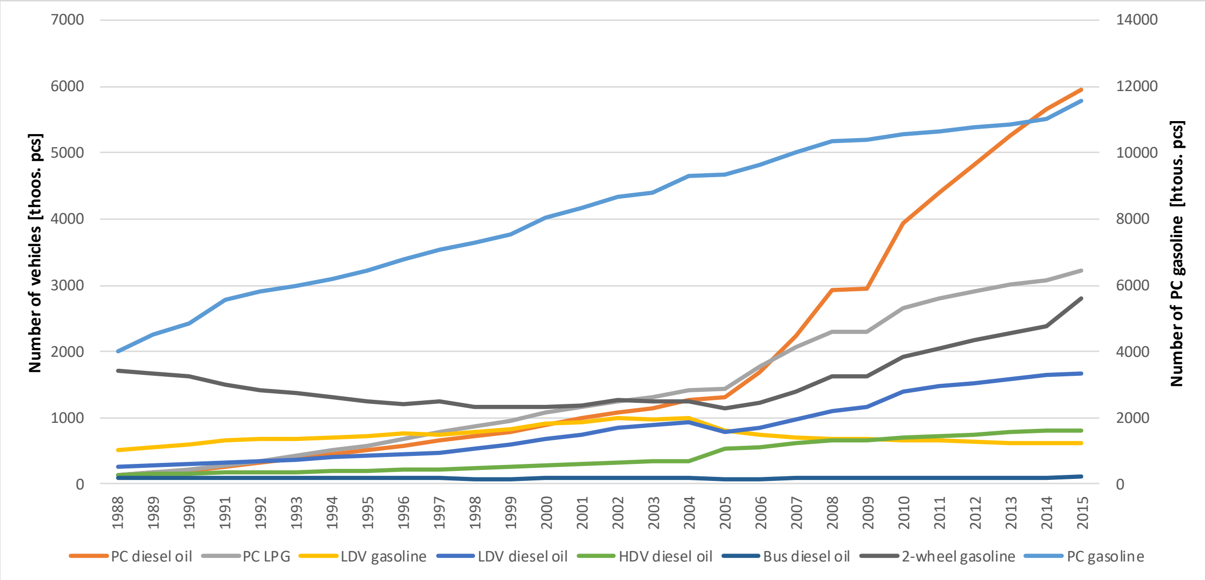

Figure 3.2.8.5. Number of vehicles in years 1988-2015.

Annual mileage for main vehicle categories, speed and share in different travel conditions comes from literature and on the basis of own research. Estimations was based on the results of balancing the consumption of fuel in road transport as well as the results of data from surveys carried out on the vehicle inspection stations, tonne-kilometers, number of registered vehicles and the average value of technical and operational characterizing the work of motor transport (eg. average number of people in car, average utilization rate of the fleet, etc.). To determine the annual mileage of vehicle for elementary ecological categories a model of the intensity of use of vehicles was developed. This model was created on the basis of functional similarity and on the structure of vehicles at the elementary categories. These data were determined using software INFRAS [INFRAS]. Annual mileage for each category in 2015 are presented in figure 3.2.8.6. Mileage share and speed per road class are shown in figures 3.2.8.7-8. Estimations were made using information from [Chlopek].

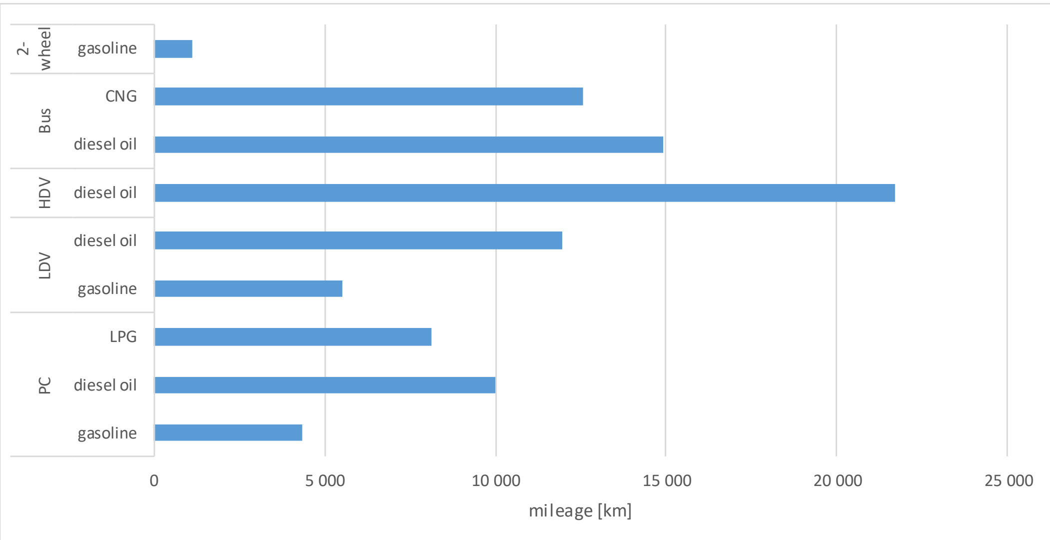

Figure 3.2.8.6. Annual mileage driven by vehicles in 2015.

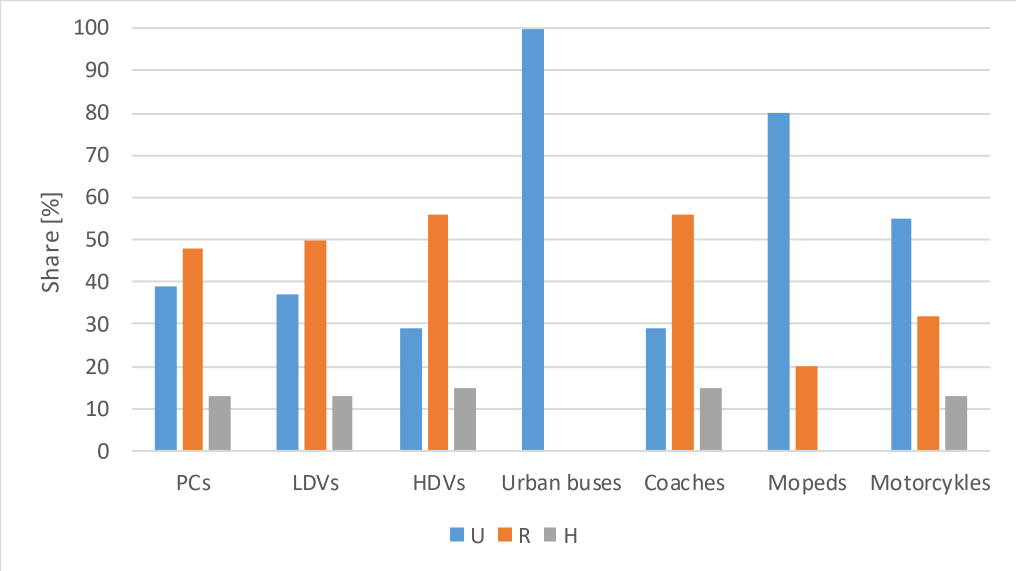

Figure 3.2.8.7. Mileage share per road class (urban, rural and highways) in 2015.

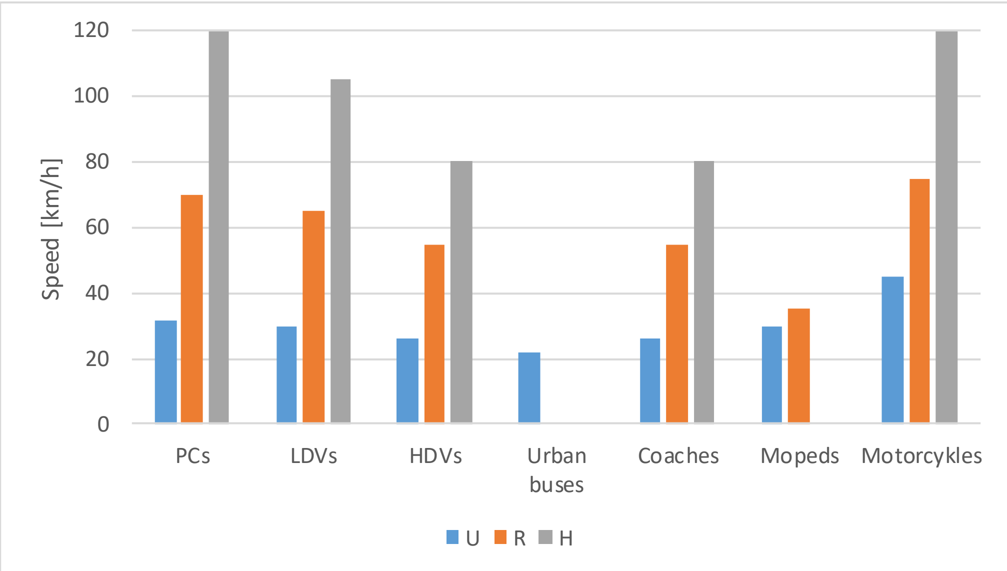

Figure 3.2.8.8. The average speed per road class (urban, rural and highways) in 2015.

Consumption of main fuels in road transport (gasoline, diesel oil and LPG) and GHG emissions in 1988-2015 period is shown in table 3.2.8.5. Consumption of CNG/LNG by buses was published for the first time this year in national statistics (with data only for year 2015). Therefore GHG emissions from this new vehicle category was reported for the first time in this submission. Taking into account that the number of CNG/LNG buses in Poland is still relatively small (399 buses in 2015) therefore, it can be assumed that GHG emission in years before 2015 was rather insignificant.

Table 3.2.8.5. Fuel consumption and GHG emission in years 1988 - 2015

		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Motor gasoline	PJ	130.33	144.36	136.14	158.81	168.42	172.06	190.42	193.03	201.78	217.90
Diesel oil	PJ	155.40	161.03	117.85	116.77	118.15	107.85	101.42	104.89	136.47	139.25
LPG	PJ	0.00	0.00	0.00	0.00	0.00	1.10	3.27	8.10	11.64	15.46
Biodiesel	PJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bioetanol	PJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Emisje CO2	kt	20 509	21 904	18 151	19 676	20 400	19 746	20 917	21 677	24 564	26 128
Emisje CH4	kt	7.401	7.924	7.103	7.964	8.133	7.793	8.375	8.334	8.536	8.783
Emisje N2O	kt	0.655	0.705	0.591	0.645	0.698	0.684	0.773	0.826	0.931	1.015
		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Motor gasoline	PJ	222.17	247.13	222.70	206.59	189.16	180.68	183.42	177.04	181.62	181.35
Diesel oil	PJ	155.34	162.08	134.79	140.58	134.84	164.18	200.99	229.82	268.77	323.21
LPG	PJ	16.10	21.48	19.55	26.96	38.13	49.22	61.69	71.25	78.20	80.50
Biodiesel	PJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	1.46	1.02
Bioetanol	PJ	0.00	0.00	0.00	0.00	0.00	1.18	0.56	1.42	2.30	3.00
Emisje CO2	kt	27 601	30 161	26 359	26 109	25 154	27 449	31 101	33 395	36 972	41 012
Emisje CH4	kt	8.559	8.790	8.030	6.716	6.086	5.979	6.163	6.377	6.593	6.613
Emisje N2O	kt	1.082	1.196	1.073	1.056	1.017	1.080	1.189	1.302	1.376	1.493
		2008	2009	2010	2011	2012	2013	2014	2015		
Motor gasoline	PJ	179.20	179.78	177.66	168.03	160.83	153.23	148.02	152.68		
Diesel oil	PJ	352.55	365.97	402.82	421.92	401.95	369.44	379.22	407.97		
LPG	PJ	79.07	76.04	76.36	73.97	73.88	73.28	73.00	71.95		
CNG/LNG	PJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67		
Biodiesel	PJ	12.88	19.57	29.22	31.60	28.01	25.26	23.97	21.98		
Bioetanol	PJ	5.31	7.05	7.10	6.73	5.79	6.03	5.56	6.43		
Emisje CO2	kt	42 904	43 461	45 970	46 494	44 564	41 622	41 769	44 059		
Emisje CH4	kt	6.392	6.154	5.602	5.258	4.948	4.526	4.235	4.371		
Emisje N2O	kt	1.541	1.546	1.646	1.662	1.588	1.493	1.473	1.548		

The decrease in fuel consumption of petrol and LPG for road transport in recent years may be due to the economic downturn, rising of fuel prices and rationalization of transportation by transport companies. There is a growing trend of consumption of biofuels in road transport – share in 2015 was over 4%. Amounts of biofuels used in years 1988 - 2015 are given in table 3.2.8.5. As the consumption of biofuels in 1.A.3.b is not significant compared to consumption of other fuels, it is not shown in the below figure.

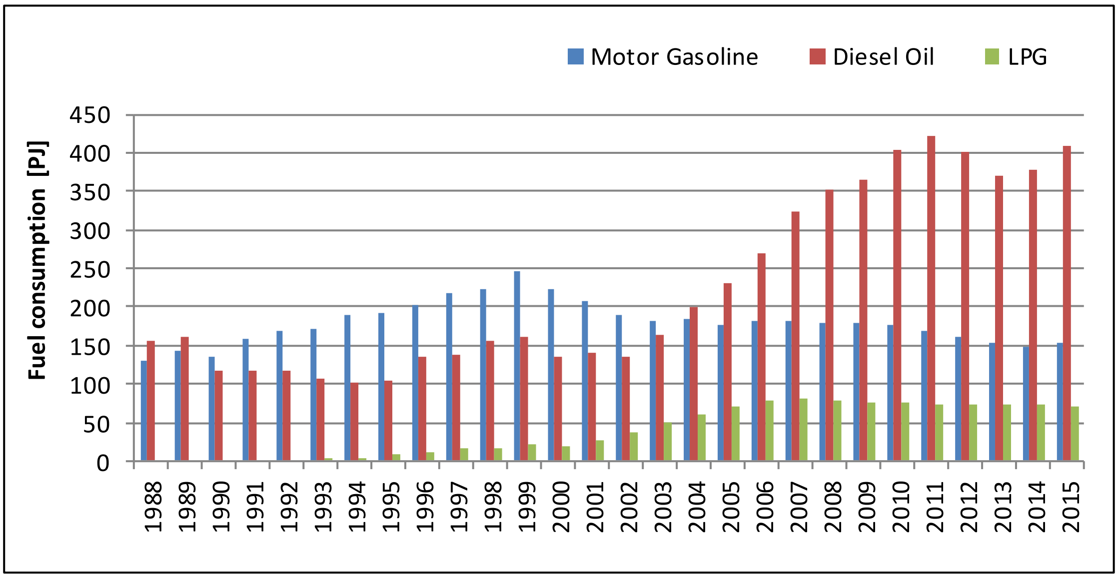

Figure 3.2.8.5. Fuel consumption in 1.A.3.b category for 1988-2015

Figure 3.2.8.6 shows CO_2 emissions in sub-category 1.A.3.b in period 1988-2015. Emissions of CH_4 and N_2O in the same sub-category are shown in figure 3.2.8.7.

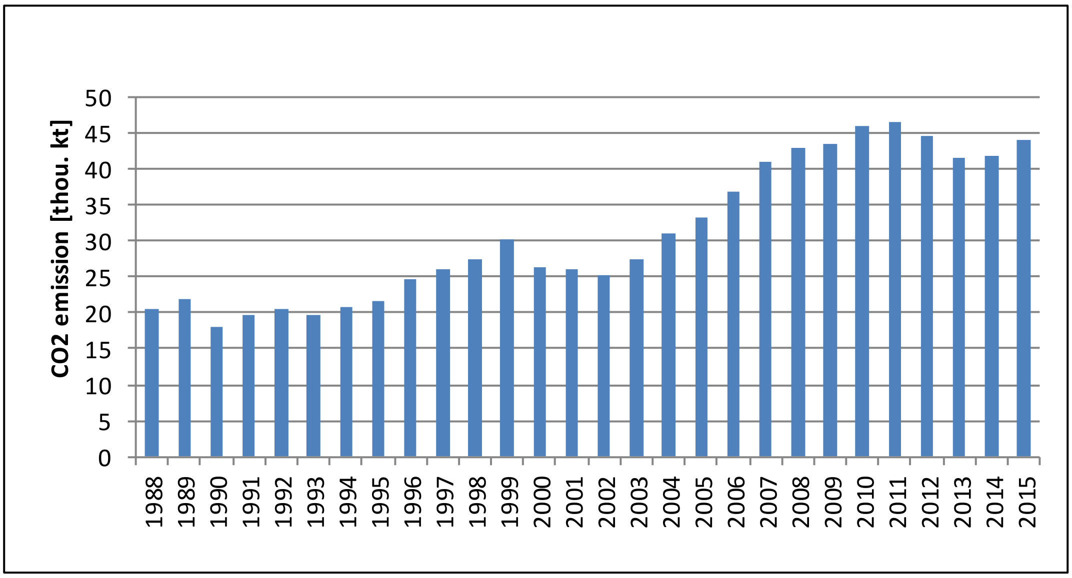

Figure 3.2.8.6. CO_2 emission for 1.A.3.b category in 1988-2015

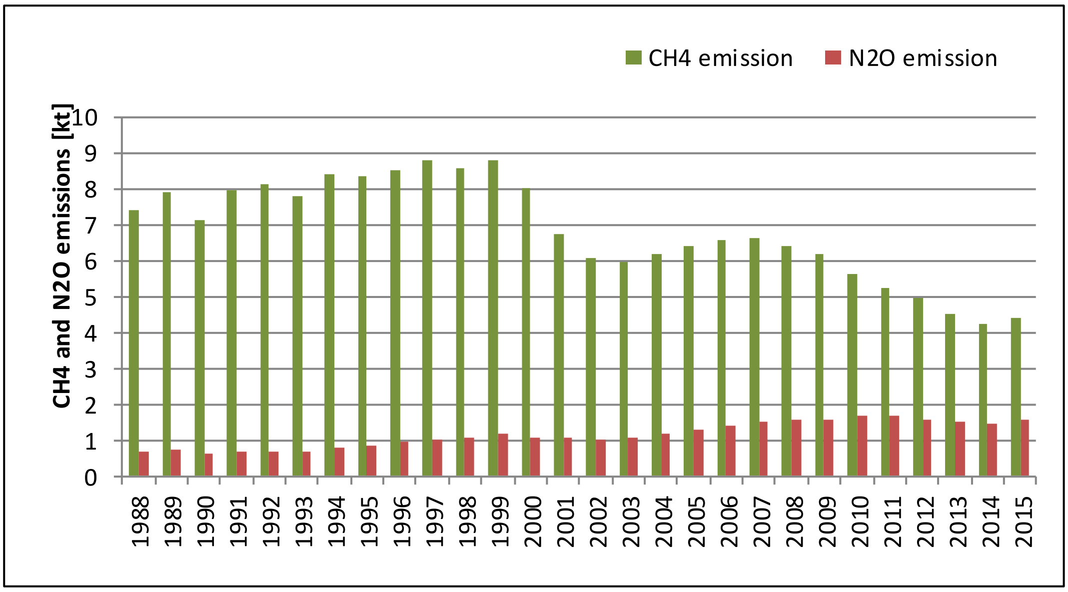

Figure 3.2.8.7. CH_4 and N_2O emissions for 1.A.3.b category in 1988-2015

CO_2 emissions from urea based catalyst

For estimating CO2 emissions from urea-based catalyst additives in catalytic converters model COPERT 4 was used. Emissions are reported in sector 2.D.3 (chapter 4.5.2.3.2). The model assumed that consumption of urea is equal share of fuel consumption. For diesel passenger cars Euro VI the consumption of urea is equal 2% of fuel consumption, the selective catalytic reduction (SCR) ratio being equal to 10%; for diesel heavy duty trucks and buses, the consumption of urea is assumed to be equal 6% of fuel consumption at Euro V level (SCR ratio = 76.2%) and equal 3.5% at Euro VI level (SCR ratio = 100%). The purity (the mass fraction of urea in the urea-based additive), the default value of 32.5% has been used (IPCC 2006).

3.2.8.2.3. Railways (CRF sector1.A.3.c)

Category include emissions from railway transport for both freight and passenger traffic routes. Railway locomotives used in Poland are diesel and electric. Up to year 1998 coal was used in steam locomotives. Electric locomotives are powered by electricity generated at stationary power plants as well as other sources. The corresponding emissions are covered under the Stationary Combustion sector. Emission factors for the estimation of GHG emissions from railways are default values from the IPCC 2006 guidelines (table 3.2.8.6).

Table 3.2.8.6. Emission factors for railways [kg/GJ].

	CO_2	CH_4	N_2O
Hard coal	96.10	0.002	0.0015
Diesel oil	74.10	0.004	0.0286

The amounts of fuels used in railway transport in the 1988-2015 period are shown table 3.2.8.7 and in figure 3.2.8.8.

Table 3.2.8.7. Fuel consumption and GHG emission in years 1988 – 2015

		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Hard coal	TJ	10 972	5 785	3 169	1 686	350	293	156	132	192	181
Diesel oil	TJ	23 600	9 585	17 761	13 556	10 596	10 425	11 798	11 497	9 652	8 666
CO2 emission	kt	2 803	1 266	1 621	1 167	819	801	889	865	734	660
CH4 emission	kt	0.120	0.051	0.080	0.060	0.045	0.044	0.049	0.048	0.040	0.036
N2O emission	kt	0.691	0.283	0.513	0.390	0.304	0.299	0.338	0.329	0.276	0.248
		1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Hard coal	TJ	138	0	0	0	0	0	0	0	0	0
Diesel oil	TJ	8 151	7 722	7 078	6 907	6 564	6 907	6 907	6 778	6 220	6 135
CO2 emission	kt	617	572	524	512	486	512	512	502	461	455
CH4 emission	kt	0.034	0.032	0.029	0.029	0.027	0.029	0.029	0.028	0.026	0.025
N2O emission	kt	0.233	0.221	0.202	0.198	0.188	0.198	0.198	0.194	0.178	0.175
		2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**		
Hard coal	TJ	0	0	0	0	0	0	0	0		
Diesel oil	TJ	5 362	5 196	4 806	4 980	4 633	4 287	3 854	3 526		
CO2 emission	kt	397	385	356	369	343	318	286	261		
CH4 emission	kt	0.022	0.022	0.020	0.021	0.019	0.018	0.016	0.015		
N2O emission	kt	0.153	0.149	0.137	0.142	0.133	0.123	0.110	0.101		

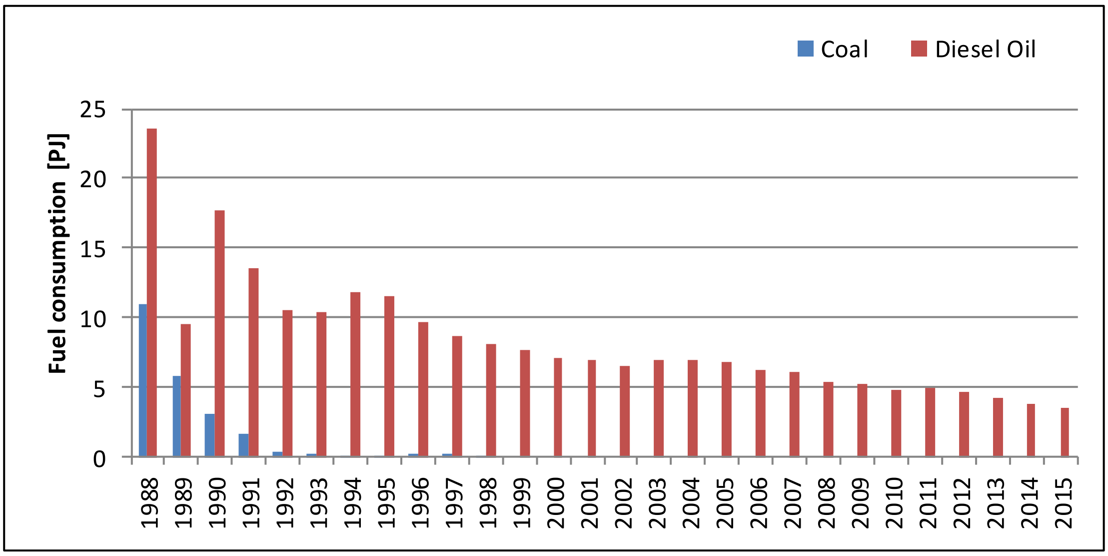

Figure 3.2.8.8. Fuel consumption in 1.A.3.c category for 1988-2015

Figures 3.2.8.9 and 3.2.8.10 show emissions of CO_2, CH_4 and N_2O, respectively in the sub-category 1.A.3.c for the entire time series beginning in the base year.

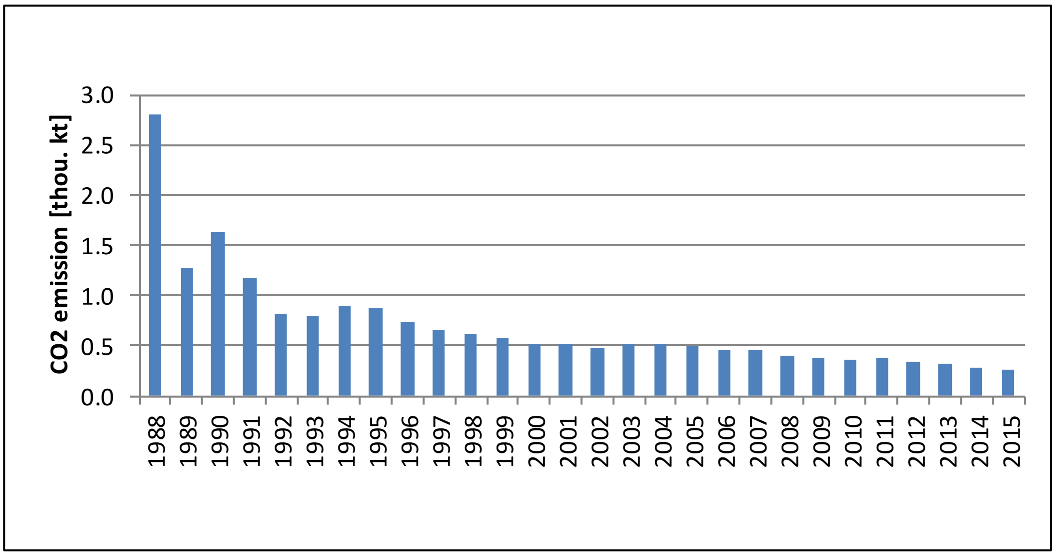

Figure 3.2.8.9. CO_2 emission for 1.A.3.c category in 1988-2015

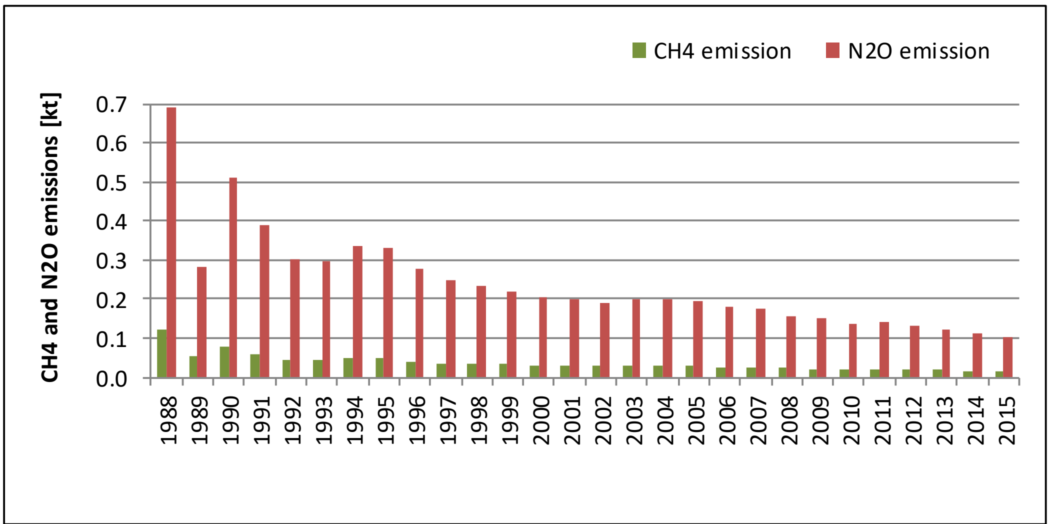

Figure 3.2.8.10. CH_4 and N_2O emissions for 1.A.3.c category in 1988-2015

3.2.8.2.4. Domestic Navigation (CRF sector 1.A.3.d)

Category relates to inland and marine domestic navigation and include emissions from fuels used by vessels of all flags that depart and arrive in the same country. Exclude fishing, which should be reported under 1 A 4 c iii.

Emission factors for the estimation of GHG emissions from domestic navigation are default values from the IPCC 2006 guidelines (table 3.2.8.8).

Table 3.2.8.8. Emission factors for domestic navigation [kg/GJ].

		CO_2	CH_4	N_2O
Inland navigation	Diesel oil	74.10	0.007	0.002
Maritime	Diesel oil	74.10	0.007	0.002
Maritime	Fuel oil	74.40	0.007	0.002

The structure of fuels used in Navigation has been recalculated based on G-03 questionnaires and statistical data on levels of international vs. domestic shipping activity (see table 3.2.8.9). The amounts of fuels (diesel and fuel oil) used in both inland water and maritime navigation in the 1988-2015 period are shown in table 3.2.8.10 and figure 3.2.8.11.

Table 3.2.8.9. Cargo traffic at Polish seaports.

Cargo traffic	**Unit**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
International	kt	45 901	40 671	43 558	49 814	51 148	48 179	47 925	50 630	50 564
Domestic	kt	1 138	1 009	744	711	1 327	1 142	1 068	355	432
Share of domestic	%	2.4	2.4	1.7	1.4	2.5	2.3	2.2	0.7	0.8
		1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
International	kt	49 227	47 334	47 220	48 404	51 020	56 011	58 489	59 137	51 604
Domestic	kt	453	537	534	562	866	907	990	1 182	830
Share of domestic	%	0.9	1.1	1.1	1.1	1.7	1.6	1.7	2.0	1.6
		2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	
International	kt	47 806	44 250	58 613	56 609	57 728	62 898	67 776	68 471	
Domestic	kt	1 027	829	893	1 129	1 098	1 206	1 159	1 264	
Share of domestic	%	2.1	1.8	1.5	2.0	1.9	1.9	1.7	1.8	

Table 3.2.8.10. Fuel consumption and GHG emission in years 1988 - 2015

		1988	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Diesel oil-inland navigation	TJ	968.83	681.61	858.00	686.00	815.00	686.00	300.00	686.00	686.00	644.00
Marine diesel oil	TJ	239.59	236.54	232.96	183.59	119.30	82.08	97.98	93.40	72.68	27.93
Marine fuel oil	TJ	894.34	878.75	900.55	825.50	546.35	340.58	425.53	428.31	399.10	127.94
CO2 emission	kt	158.77	136.05	150.54	128.33	111.52	83.28	62.43	90.90	87.11	59.69
CH4 emission	kt	0.015	0.013	0.014	0.012	0.010	0.008	0.006	0.008	0.008	0.006
N2O emission	kt	0.004	0.004	0.004	0.003	0.003	0.002	0.002	0.002	0.002	0.002
		1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Diesel oil-inland navigation	TJ	386.00	300.00	257.00	257.00	214.00	300.00	257.00	214.00	257.00	214.00
Marine diesel oil	TJ	27.25	25.20	24.52	19.76	19.60	31.67	22.84	30.42	31.48	24.15
Marine fuel oil	TJ	156.91	142.74	138.76	133.80	133.37	182.04	85.41	60.55	80.26	65.28
CO2 emission	kt	42.77	35.15	31.60	30.86	27.63	38.67	27.35	22.80	27.59	22.70
CH4 emission	kt	0.004	0.003	0.003	0.003	0.003	0.004	0.003	0.002	0.003	0.002
N2O emission	kt	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
		2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**		
Diesel oil-inland navigation	TJ	214.00	130.00	130.00	130.00	130.00	130.00	130.00	93.00		
Marine diesel oil	TJ	26.70	16.49	9.22	10.46	10.14	13.39	7.18	68.63*		
Marine fuel oil	TJ	63.97	38.21	12.78	14.79	11.06	23.32	12.19	0.00*		
CO2 emission	kt	22.79	13.81	11.31	11.55	11.24	12.43	11.11	11.98		
CH4 emission	kt	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001		
N2O emission	kt	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000		

*Due to changes in regulations regarding MARPOL Convention 1973/78/97 and implementation of Directive 2012/33/EU of the European parliament and of the council of 21 November 2012 amending Council Directive 1999/32/EC as regards the sulphur content of marine fuels, high sulphur fuel oil was withdraw from use. Instead low sulphur marine diesel oil (MDO) is used.

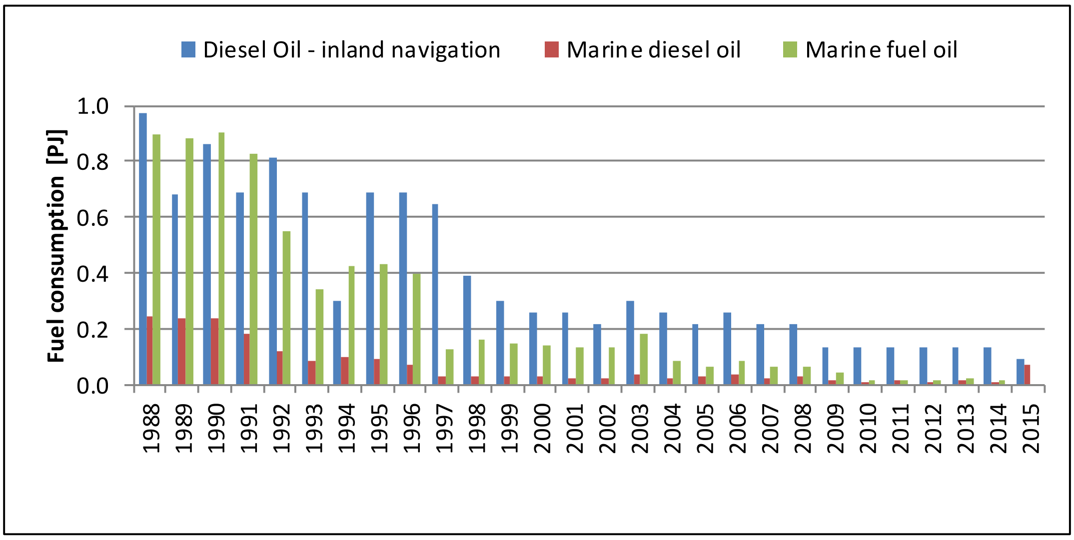

Figure 3.2.8.11. Fuel consumption in 1.A.3.d category for 1988-2015

Figures 3.2.8.12 and 3.2.8.13 show emissions of CO_2, CH_4 and N_2O, respectively in the sub-category 1.A.3.d for the entire time series 1988-2015.

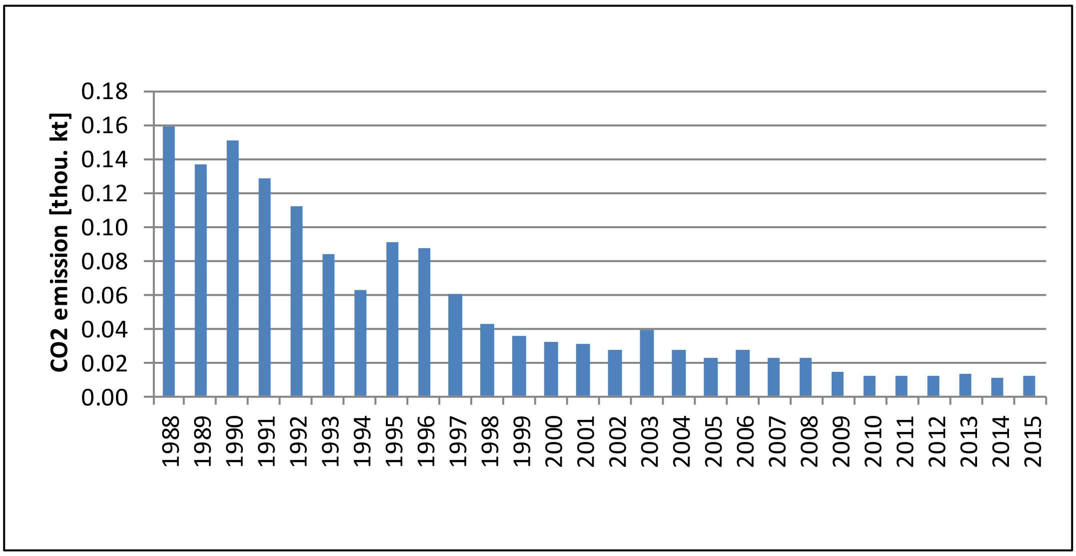

Figure 3.2.8.12. CO_2 emission for 1.A.3.d category in 1988-2015

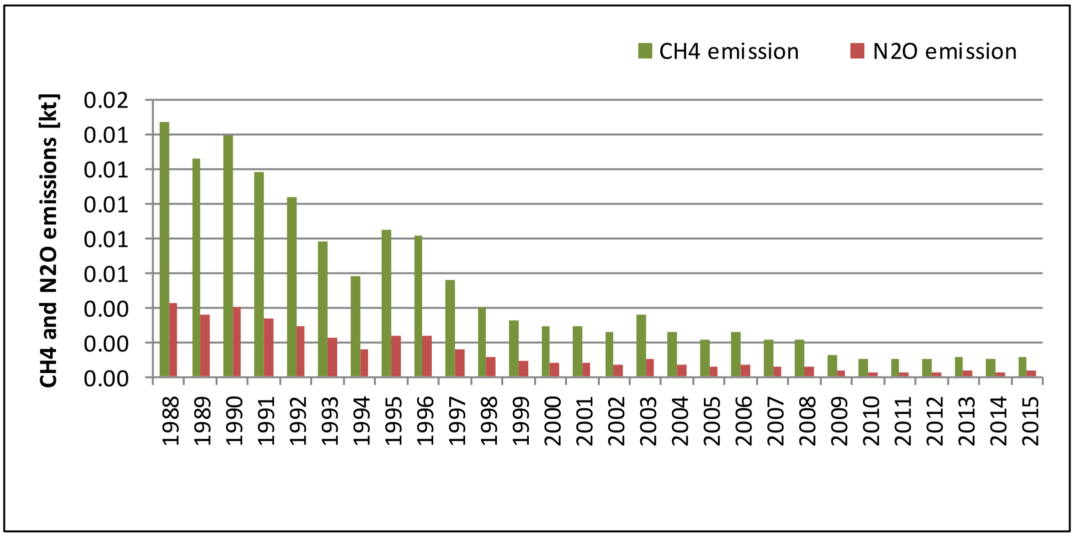

Figure 3.2.8.13. CH_4 and N_2O emissions for 1.A.3.d category in 1988-2015

3.2.8.2.5. Other transportation (CRF sector 1.A.3.e)

Pipeline transport contains combustion related emissions from the operation of pump stations and maintenance of pipelines. From year 2000, when gas pipeline Jamal was completed, the amount of this fuel increased sharply from 21 TJ in 1999 to 2498 TJ in 2000.

The amounts of fuels consumption in the sub-category 1.A.3.e.i. *Pipelines transport* in the 1988-2015 period are shown in table 3.2.8.11 Natural gas consumption is shown on figure 3.2.8.14.

Table 3.2.8.11. Fuel consumption and GHG emission in years 1988 - 2015

		1988	1989	1990	1991	1992	1993	1994	1995	1996
Gasoline	TJ	0	0	0	0	0	0	0	0	0
Diesel oil	TJ	0	0	0	0	0	0	0	0	0
Natural gas	TJ	0	0	0	0	0	0	1	7	24
CO2 emission	kt	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.39	1.34
CH4 emission	kt	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000001	0.000007	0.000024
N2O emission	kt	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000001	0.000002
		1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Gasoline	TJ	0	0	0	0	45	45	45	45	45
Diesel oil	TJ	0	0	0	43	43	0	43	43	43
Natural gas	TJ	26	23	21	2498	3262	3502	5257	7381	9866
CO2 emission	kt	1.45	1.28	1.17	142.62	188.39	198.60	299.75	418.31	557.02
CH4 emission	kt	0.000026	0.000023	0.000021	0.002627	0.003526	0.003637	0.005521	0.007645	0.010130
N2O emission	kt	0.000003	0.000002	0.000002	0.000276	0.000379	0.000377	0.000579	0.000791	0.001039
		2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Gasoline	TJ	0	45	0	45	0	0	0	0	0
Diesel oil	TJ	43	43	43	43	43	43	43	43	43
Natural gas	TJ	12912	11828	13442	11084	9269	9299	10806	15422	15143
CO2 emission	kt	723.93	666.54	742.83	619.10	513.47	515.28	600.56	864.03	848.46
CH4 emission	kt	0.013041	0.012092	0.013571	0.011348	0.009398	0.009428	0.010935	0.015551	0.015272
N2O emission	kt	0.001317	0.001236	0.001370	0.001161	0.000953	0.000956	0.001106	0.001568	0.001540
		2015								
Gasoline	TJ	0								
Diesel oil	TJ	51								
Natural gas	TJ	14378								
CO2 emission	kt	806.36								
CH4 emission	kt	0.014531								
N2O emission	kt	0.001468								

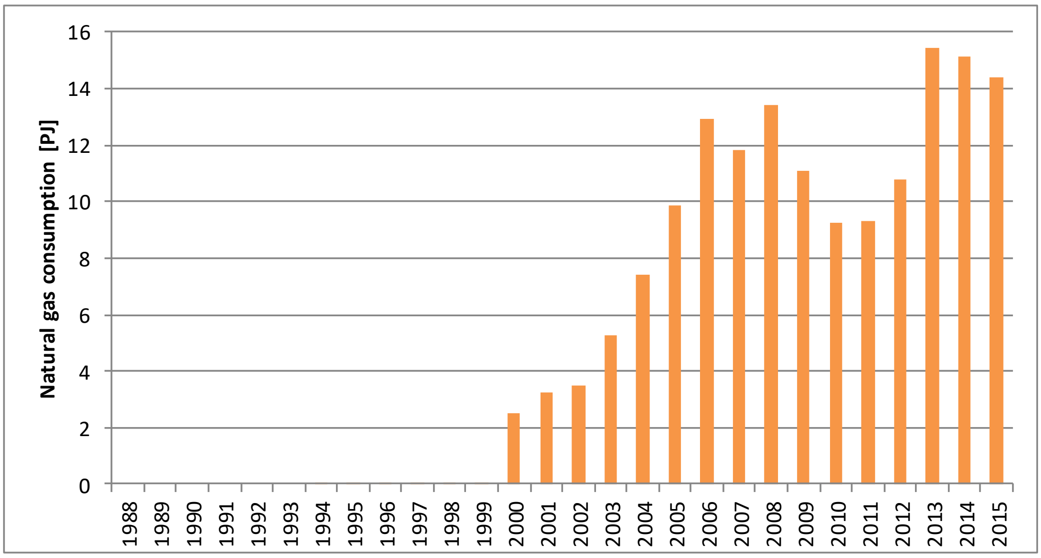

Figure 3.1.8.14. Natural gas consumption in *Pipelines transport* category for 1988-2015

Figures 3.2.8.15 and 3.2.8.16 show respectively emissions of CO_2, CH_4 and N_2O, in the sub-category 1.A.3.e from Pipelines for the entire time series 1988-2015.

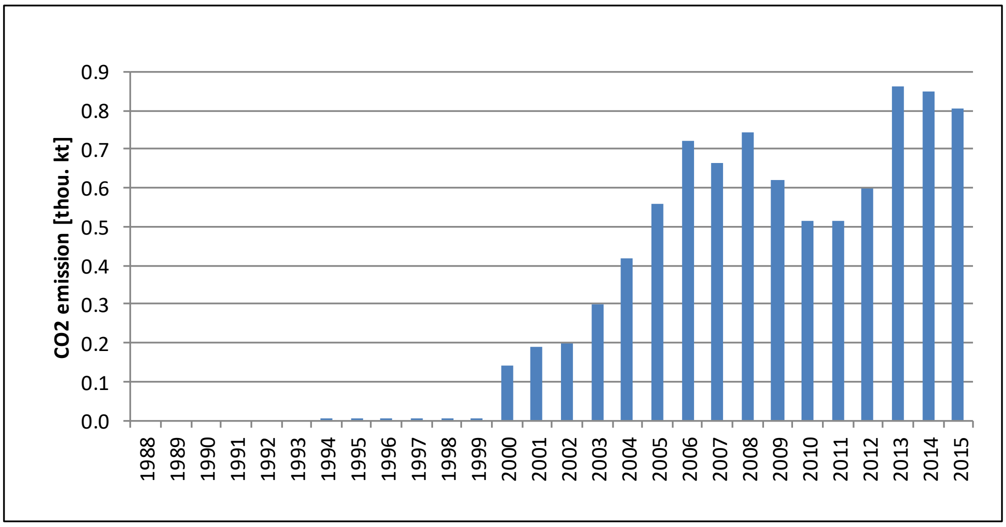

Figure 3.2.8.15. CO_2 emission from Pipelines category in 1988-2015

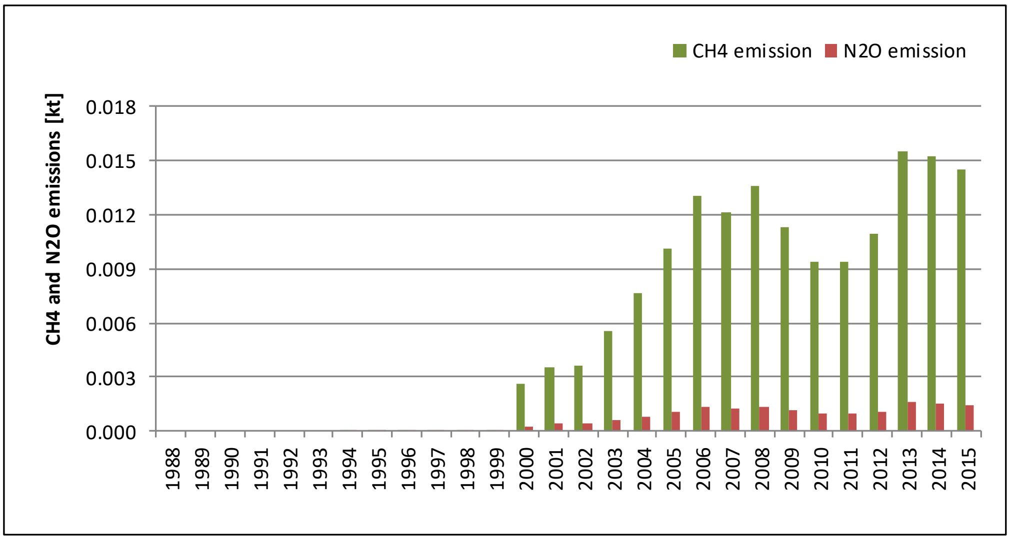

Figure 3.2.16. CH_4 and N_2O emissions from Pipelines category in 1988-2015

3.2.8.2.6. Other mobile sources outside of the source category 1.A.3

Other mobile sources included in the national inventory in sub-categories other than 1.A.3 include:

- machinery and off-road transport in agriculture (sub-category 1.A.4.c.ii) – classified in source category 1.A.4
- fishery (sub-category 1.A.4.c.iii) - classified in source category 1.A.4

The amounts of fuels used in the above listed sub-categories in the 1988-2015 period are presented in table 3.2.8.12 and figure 3.2.8.17. The amounts of corresponding emissions of CO_2, CH_4 and N_2O are shown in tables 3.2.8.13–3.2.8.14 and figures 3.2.8.18 and 3.2.8.19.

Table 3.2.8.12. Fuel consumption in 1988-2015 in mobile sources in subcategories other than 1.A.3

		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
ON-1.A.4.c.ii	PJ	49.42	47.82	50.53	48.68	57.21	72.16	78.15	82.28	91.81	106.80
ON-1.A.4.c.iii	PJ	4.55	4.15	3.44	3.31	3.45	2.83	3.24	3.18	2.57	2.68
OP-1.A.4.c.iii	PJ	7.54	6.87	5.62	5.41	5.64	4.62	5.28	5.18	4.20	4.37
		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
ON-1.A.4.c.ii	PJ	97.17	99.52	110.25	102.78	102.47	103.68	105.60	108.03	80.22	73.74
ON-1.A.4.c.iii	PJ	1.93	1.94	1.72	1.81	1.77	1.43	1.61	1.37	1.29	1.33
OP-1.A.4.c.iii	PJ	3.15	3.16	2.80	2.95	2.90	2.33	2.62	2.23	2.10	2.18
		2008	2009	2010	2011	2012	2013	2014	2015		
ON-1.A.4.c.ii	PJ	73.79	71.69	71.91	72.49	73.03	71.40	68.96	67.95		
ON-1.A.4.c.iii	PJ	1.28	1.92	1.57	1.64	1.66	1.78	1.62	1.70		
OP-1.A.4.c.iii	PJ	2.09	3.11	2.53	2.65	2.68	2.88	2.62	2.77		

Table 3.2.8.13. GHG emission in 1988-2015 in subcategory 1.A.4.c.ii.

1.A.4.c.ii		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
CO2 emission	kt	3 662	3 544	3 744	3 607	4 239	5 347	5 791	6 097	6 803	7 914
CH4 emission	kt	0.205	0.198	0.210	0.202	0.237	0.299	0.324	0.341	0.381	0.443
N2O emission	kt	1.413	1.368	1.445	1.392	1.636	2.064	2.235	2.353	2.626	3.055
1.A.4.c.ii		**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
CO2 emission	kt	7 200	7 374	8 170	7 616	7 593	7 682	7 825	8 005	5 944	5 464
CH4 emission	kt	0.403	0.413	0.458	0.427	0.425	0.430	0.438	0.448	0.333	0.306
N2O emission	kt	2.779	2.846	3.153	2.940	2.931	2.965	3.020	3.090	2.294	2.109
1.A.4.c.ii		**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**		
CO2 emission	kt	5 468	5 312	5 329	5 372	5 412	5 291	5 110	5 035		
CH4 emission	kt	0.306	0.297	0.298	0.301	0.303	0.296	0.286	0.282		
N2O emission	kt	2.110	2.050	2.057	2.073	2.089	2.042	1.972	1.943		

Table 3.2.8.14. GHG emission in 1988-2015 in subcategory 1.A.4.c.iii.

1.A.4.c.iii		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
CO2 emission	kt	921	839	690	664	692	567	648	637	516	537
CH4 emission	kt	0.085	0.077	0.063	0.061	0.064	0.052	0.060	0.059	0.047	0.049
N2O emission	kt	0.024	0.022	0.018	0.017	0.018	0.015	0.017	0.017	0.014	0.014
1.A.4.c.iii		**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
CO2 emission	kt	387	388	344	362	356	286	322	274	258	267
CH4 emission	kt	0.036	0.036	0.032	0.033	0.033	0.026	0.030	0.025	0.024	0.025
N2O emission	kt	0.010	0.010	0.009	0.010	0.009	0.008	0.008	0.007	0.007	0.007
1.A.4.c.iii		**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**		
CO2 emission	kt	257	383	312	326	330	354	322	341		
CH4 emission	kt	0.024	0.035	0.029	0.030	0.030	0.033	0.030	0.031		
N2O emission	kt	0.007	0.010	0.008	0.009	0.009	0.009	0.008	0.009		

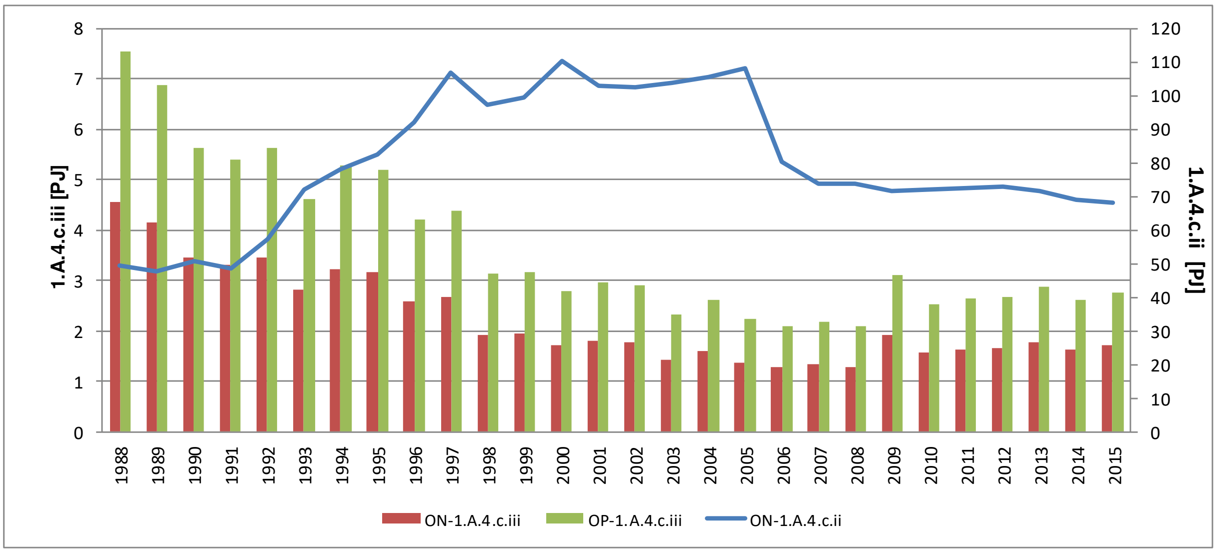

Figure 3.2.8.17. Fuel consumption in 1988-2015 in mobile sources in subcategories other than 1.A.3

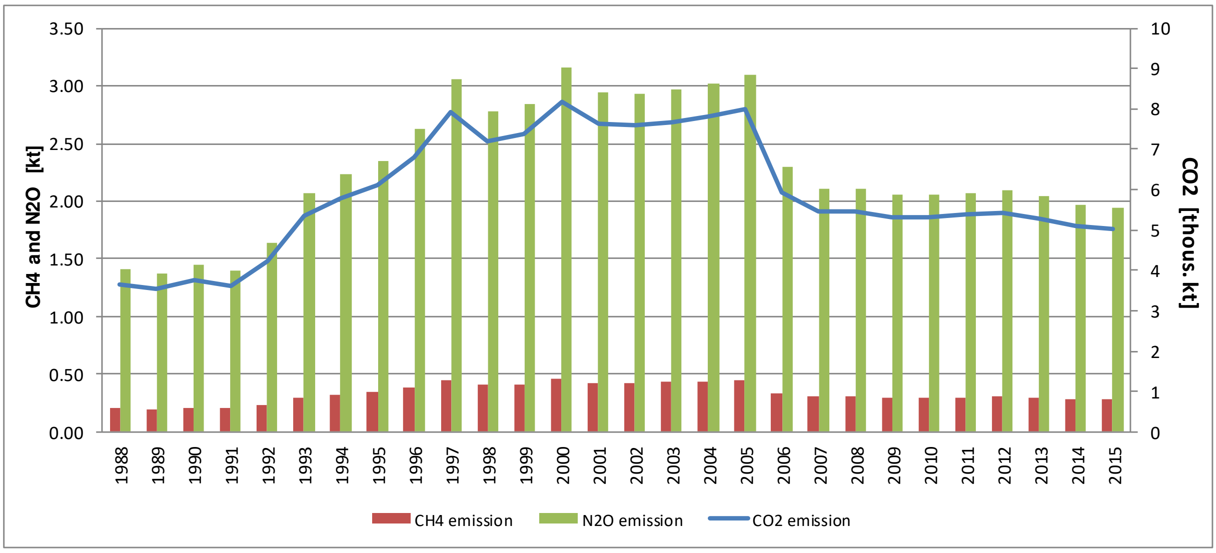

Figure 3.2.8.18. GHG emission in 1988-2015 in subcategory 1.A.4.c.ii.

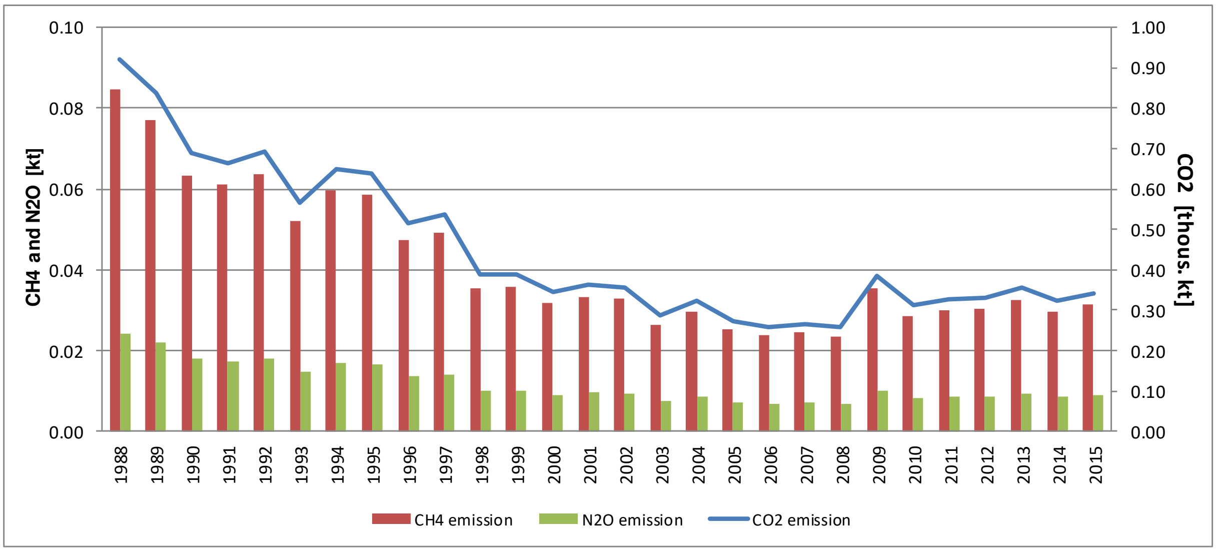

Figure 3.2.8.19. GHG emission in 1988-2015 in subcategory 1.A.4.c.iii.

3.2.8.3. Uncertainties and time-series consistency

See chapter 3.2.6.3

3.2.8.4. Source-specific QA/QC and verification

See chapter 3.2.6.4

3.2.8.5. Source-specific recalculations

- in sector 1.A.3.a *Domestic aviation* share of domestic use of jet kerosene was updated based on actual Eurocontrol data;
- emissions from sectors 1.A.3.b *Road transport* were recalculated using model COPERT 4;

Table 3.2.8.15. Changes in GHG emission in subsector 1.A.3.a. *Domestic aviation* resulting from recalculations.

Difference	1988	1989	1990	1991	1992	1993	1994	1995	1996
kt CO_2 eq.	0.29	0.40	0.18	0.18	0.20	0.20	0.20	0.22	0.26
%	0.23	0.27	0.27	0.32	0.39	0.35	0.26	0.31	0.36
Difference	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
kt CO_2 eq.	0.23	0.23	0.21	0.22	0.22	0.21	0.23	0.23	-0.01
%	0.32	0.36	0.37	0.37	0.37	0.35	0.36	0.37	-0.02
Difference	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
kt CO_2 eq.	1.17	0.41	0.18	0.03	-1.17	-1.16	-0.51	2.29	0.41
%	1.27	0.45	0.19	0.03	-1.12	-1.01	-0.32	2.00	0.30

Table 3.2.8.16. Changes in GHG emission in subsector 1.A.3.b. *Road transport* resulting from recalculations.

Difference	1988	1989	1990	1991	1992	1993	1994	1995	1996
kt CO_2 eq.	-209.08	-216.24	-217.57	-213.69	-297.86	-543.42	-351.79	-339.74	-37.11
%	-0.99	-0.96	-1.16	-1.05	-1.41	-2.63	-1.62	-1.51	-0.15
Difference	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
kt CO_2 eq.	-12.08	-23.39	-84.50	-41.74	-70.90	-107.03	-47.02	-41.05	35.02
%	-0.05	-0.08	-0.27	-0.16	-0.27	-0.42	-0.17	-0.13	0.10
Difference	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
kt CO_2 eq.	12.62	-38.21	-56.55	-349.26	-409.35	-464.25	-442.64	-458.76	-661.77
%	0.03	-0.09	-0.13	-0.79	-0.87	-0.98	-0.97	-1.08	-1.54

3.2.8.6. Source-specific planned improvements

- developing a methodology to split domestic and international aviation bunker fuels and estimating emissions from aviation;

3.2.9. Other sectors (CRF sector 1.A.4)

3.2.9.1. Source category description

Emissions in 1.A.4 *Other Sectors* are estimated for each fuel in detailed sub-categories given below:

a) *Commercial/Institutional* (1.A.4.a)
b) *Residential* (1.A.4.b)
c) *Agriculture/Forestry/Fishing* (1.A.4.c)
   - agriculture – stationary sources,
   - agriculture – mobile sources: off-road vehicles and other machinery,
   - fishing.

Subsector 1.A.4.b *Residential* is by far the largest contributor to emissions from this category (see figure 3.2.9.1) – about 66.7 % in 2015.

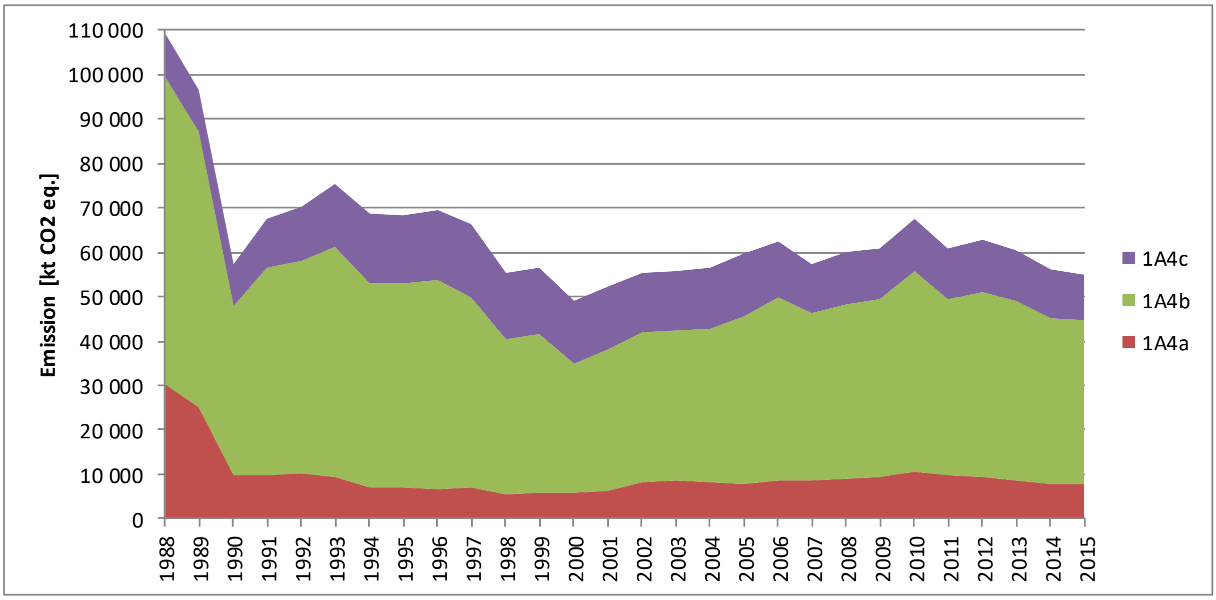

Figure 3.2.9.1. GHG emissions from 1.A.4. *Other sectors* in years 1988-2015 according to subcategories

3.2.9.2. Methodological issues

Methodology of emission estimation in 1.A.4 subcategory corresponds with methodology described for fuel combustion in stationary sources. Detailed information on fuel consumption and applied emission factors for subsectors included in 1.A.4 subcategory are presented in Annex 2.

3.2.9.2.1. Other Sectors – Commercial/Institutional (1.A.4.a)

The data on fuel type use in the sub-category 1.A.4.a *Other Sectors – Commercial/Institutional* over the 1988-2015 period are presented in table 3.5.9.1. Detailed data concerning fuel consumption in 1.A.4.a subcategory was tabulated in Annex 2 (table 11).

Table 3.5.9.1. Fuel consumption in 1988-2015 in 1.A.4.a subcategory [PJ]

	1988	1989	1990	1991	1992	1993	1994	1995
Liquid Fuels	0.000	0.000	0.000	0.000	0.000	0.000	1.334	0.782
Gaseous Fuels	13.079	12.601	13.787	10.977	11.190	11.548	9.573	13.260
Solid Fuels	297.025	244.614	91.215	92.072	95.735	86.052	64.046	62.499
Other Fuels	2.135	0.144	0.504	0.081	0.011	0.352	0.089	0.000
Biomass	0.084	0.123	4.880	3.132	0.206	12.374	11.968	11.983
TOTAL	**312.322**	**257.481**	**110.386**	**106.262**	**107.142**	**110.326**	**87.010**	**88.524**
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Liquid Fuels	1.769	6.118	7.784	10.346	16.522	21.281	22.808	24.014
Gaseous Fuels	18.771	24.256	32.769	37.696	38.567	49.971	61.001	67.057
Solid Fuels	52.142	48.086	29.849	27.864	22.004	17.283	29.822	29.723
Other Fuels	0.124	0.000	0.003	0.004	0.024	0.091	0.101	0.071
Biomass	10.625	9.627	9.085	9.216	9.192	6.596	6.430	6.452
TOTAL	**83.431**	**88.087**	**79.490**	**85.126**	**86.309**	**95.222**	**120.162**	**127.317**
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Liquid Fuels	21.300	17.813	28.496	27.788	27.328	25.682	30.953	28.986
Gaseous Fuels	69.570	68.410	63.517	65.488	71.250	75.746	83.433	78.278
Solid Fuels	28.433	28.087	32.202	27.900	30.862	33.550	38.105	33.664
Other Fuels	0.002	0.022	0.000	0.000	0.037	0.123	0.026	0.046
Biomass	6.586	6.514	5.085	6.563	6.815	8.779	9.859	9.781
TOTAL	**125.891**	**120.846**	**129.300**	**127.739**	**136.292**	**143.880**	**162.376**	**150.755**
	2012	**2013**	**2014**	**2015**				
Liquid Fuels	22.450	18.007	18.448	17.332				
Gaseous Fuels	80.888	76.501	67.429	71.822				
Solid Fuels	34.142	31.724	28.043	26.621				
Other Fuels	0.037	0.421	0.231	0.195				
Biomass	9.113	9.560	8.814	8.890				
TOTAL	**146.630**	**136.213**	**122.965**	**124.862**				

Figures 3.5.9.2 and 3.5.9.3 show emissions of CO_2, CH_4 and N_2O, respectively in the sub-category 1.A.4.a in the period 1988-2015.

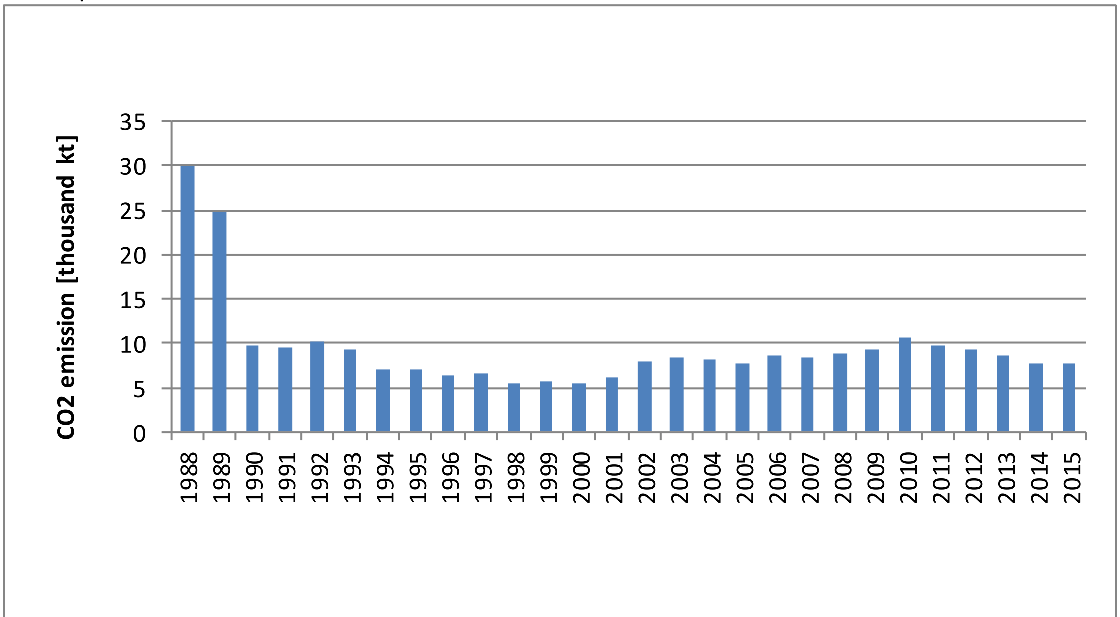

Figure 3.5.9.2. CO_2 emission for 1.A.4.a category in 1988-2015

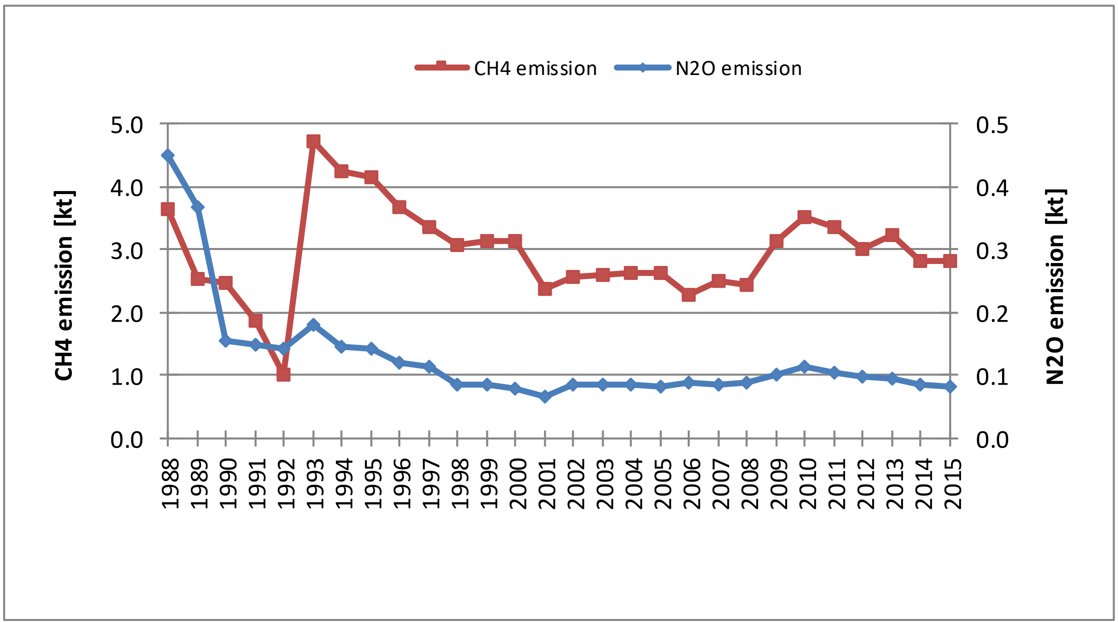

Figure 3.5.9.3. CH_4 and N_2O emissions for 1.A.4.a category in 1988-2015

3.2.9.2.2. Residential (CRF sector 1.A.4.b)

The data on fuel type use in stationary sources in the sub-category 1.A.4.b *Residential* over the 1988-2015 period are presented in table 3.5.2. Detailed information on fuel consumption for 1.A.4.b subcategory are presented in Annex 2 (table 12).

Table 3.5.2. Fuel consumption in 1988-2015 in 1.A.4.b subcategory [PJ]

	1988	1989	1990	1991	1992	1993	1994	1995
Liquid Fuels	6.762	7.452	1.702	1.012	1.840	6.072	8.970	12.834
Gaseous Fuels	102.581	107.619	122.204	133.674	141.212	141.590	151.671	159.559
Solid Fuels	617.874	546.675	307.564	385.686	390.347	413.265	346.089	339.463
Other Fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	33.615	32.351	34.335	27.721	33.969	106.000	104.715	105.000
TOTAL	**760.831**	**694.097**	**465.805**	**548.093**	**567.368**	**666.927**	**611.445**	**616.856**
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Liquid Fuels	18.245	24.835	26.980	29.101	37.400	42.150	44.342	48.252
Gaseous Fuels	143.057	150.022	138.268	135.995	127.611	133.737	127.093	127.629
Solid Fuels	358.593	307.562	235.470	243.304	179.024	198.224	219.937	217.497
Other Fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	101.000	100.000	100.700	95.000	95.000	104.500	104.500	103.075
TOTAL	**620.895**	**582.419**	**501.418**	**503.400**	**439.035**	**478.611**	**495.872**	**496.453**
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Liquid Fuels	45.370	42.305	42.305	39.364	35.963	33.264	29.386	27.763
Gaseous Fuels	126.376	135.111	138.686	132.622	131.450	134.857	148.427	135.471
Solid Fuels	228.811	255.087	290.173	260.866	279.849	288.024	330.381	285.169
Other Fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	103.360	100.700	104.500	102.000	102.500	102.500	112.746	115.000
TOTAL	**503.917**	**533.203**	**575.664**	**534.852**	**549.762**	**558.645**	**620.940**	**563.403**
	2012	**2013**	**2014**	**2015**				
Liquid Fuels	26.767	25.084	25.571	24.406				
Gaseous Fuels	141.397	143.187	131.598	132.202				
Solid Fuels	301.038	289.864	265.515	260.803				
Other Fuels	0.000	0.000	0.000	0.000				
Biomass	116.850	116.850	105.450	105.450				
TOTAL	**586.052**	**574.985**	**528.134**	**522.861**				

Figure 3.5.9.4 show emissions of CO_2 in 1.A.4.b in the 1988-2015 period while CH_4 and N_2O, emissions in the same sub-category are shown in figure 3.5.9.5.

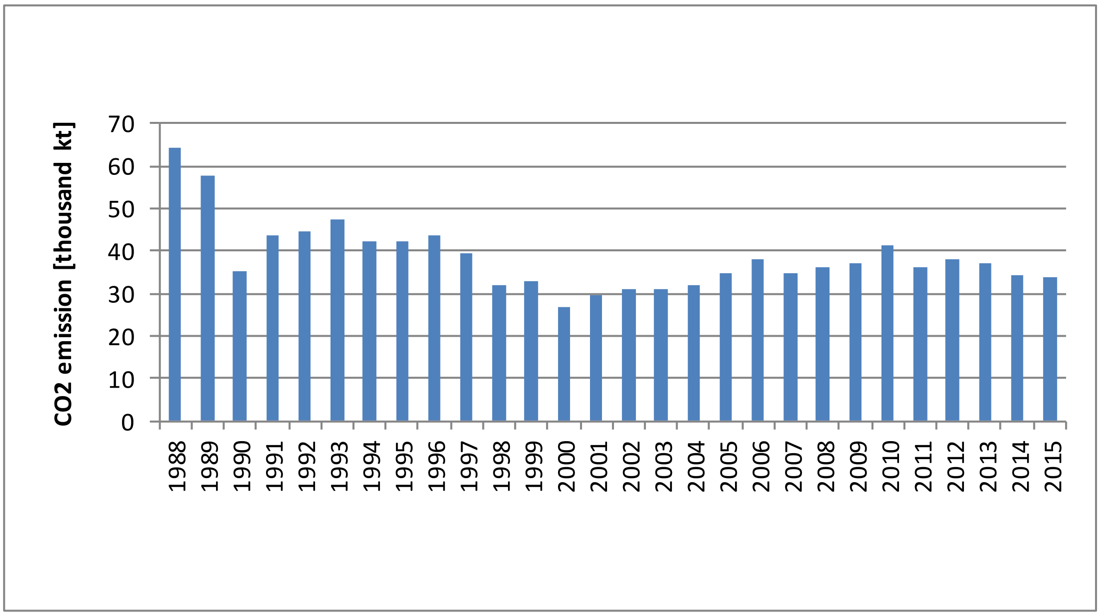

Figure 3.5.9.4. CO_2 emission for 1.A.4.b category in 1988-2015

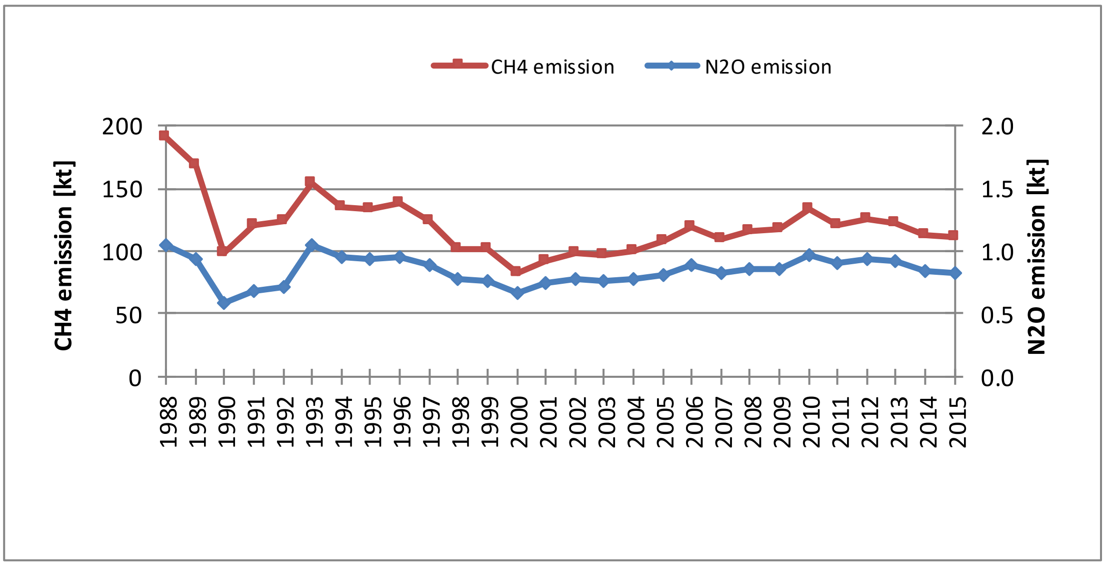

Figure 3.5.9.5. CH_4 and N_2O emissions for 1.A.4.b category in 1988-2015

3.2.9.2.3. Agriculture/Forestry/Fishing – stationary sources (CRF sector 1.A.4.c)

The data on fuel type use in stationary sources in the sub-category 1.A.4.c Agriculture/Forestry/ Fishing over the 1988-2015 period are presented in table 3.5.9.3. Detailed data concerning total fuel consumption in 1.A.4.c subcategory (including fuel consumption related to off-road vehicles and other machinery in agriculture and fuel use in fishing) was tabulated in Annex 2 (table 13).

Table 3.5.9.3. Fuel consumption in stationary sources in 1.A.4.c subcategory for years 1988-2015 [PJ]

	1988	1989	1990	1991	1992	1993	1994	1995
Liquid Fuels	2.720	2.600	3.560	2.720	1.440	14.074	18.302	10.532
Gaseous Fuels	0.507	0.445	0.448	0.275	0.055	0.132	0.212	0.243
Solid Fuels	42.691	42.026	39.465	59.710	64.662	63.946	66.261	64.299
Other Fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	0.039	0.113	0.039	0.278	0.583	20.057	18.367	18.500
TOTAL	**45.956**	**45.185**	**43.512**	**62.983**	**66.740**	**98.209**	**103.142**	**93.574**
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Liquid Fuels	6.272	9.152	8.182	8.437	8.832	8.483	6.909	9.374
Gaseous Fuels	0.428	0.571	0.868	0.476	0.536	0.777	0.914	1.197
Solid Fuels	68.014	58.905	53.170	55.389	37.590	41.916	35.065	34.071
Other Fuels	0.000	0.000	0.000	0.006	0.012	0.011	0.000	0.000
Biomass	17.567	17.000	17.100	17.100	17.100	19.043	19.010	19.017
TOTAL	**92.281**	**85.628**	**79.320**	**81.408**	**64.070**	**70.230**	**61.898**	**63.659**
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Liquid Fuels	9.404	10.689	4.334	3.724	3.930	3.495	3.265	3.671
Gaseous Fuels	1.182	1.084	1.492	1.840	1.900	1.577	1.486	1.531
Solid Fuels	35.838	39.001	46.028	40.728	45.335	44.947	49.927	43.882
Other Fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	19.878	19.038	19.977	19.061	19.118	19.127	21.127	24.154
TOTAL	**66.302**	**69.812**	**71.831**	**65.353**	**70.283**	**69.146**	**75.805**	**73.238**
	2012	**2013**	**2014**	**2015**				
Liquid Fuels	3.705	2.905	3.284	3.058				
Gaseous Fuels	1.796	1.501	1.438	1.144				
Solid Fuels	45.552	44.603	42.540	38.541				
Other Fuels	0.000	0.000	0.000	0.000				
Biomass	21.200	21.223	19.638	19.501				
TOTAL	**72.253**	**70.232**	**66.900**	**62.244**				

Figures 3.5.9.6 and 3.5.9.7 show emissions of CO_2, and CH_4 and N_2O, respectively in the sub-category 1.A.4.c.i in the period: 1988-2015.

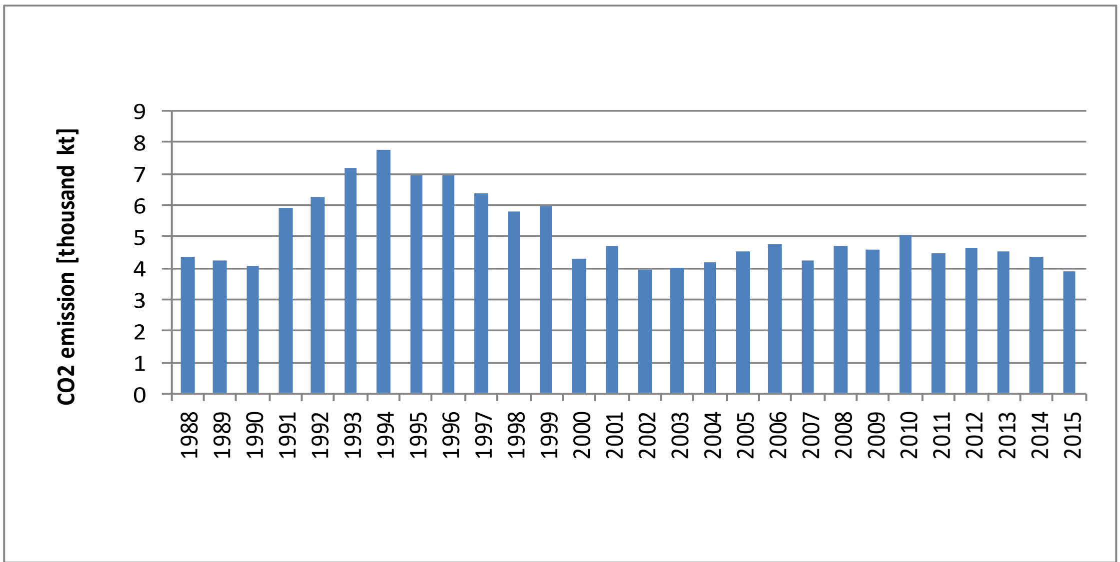

Figure 3.5.9.6. CO_2 emission for stationary sources in 1.A.4.c category in 1988-2015

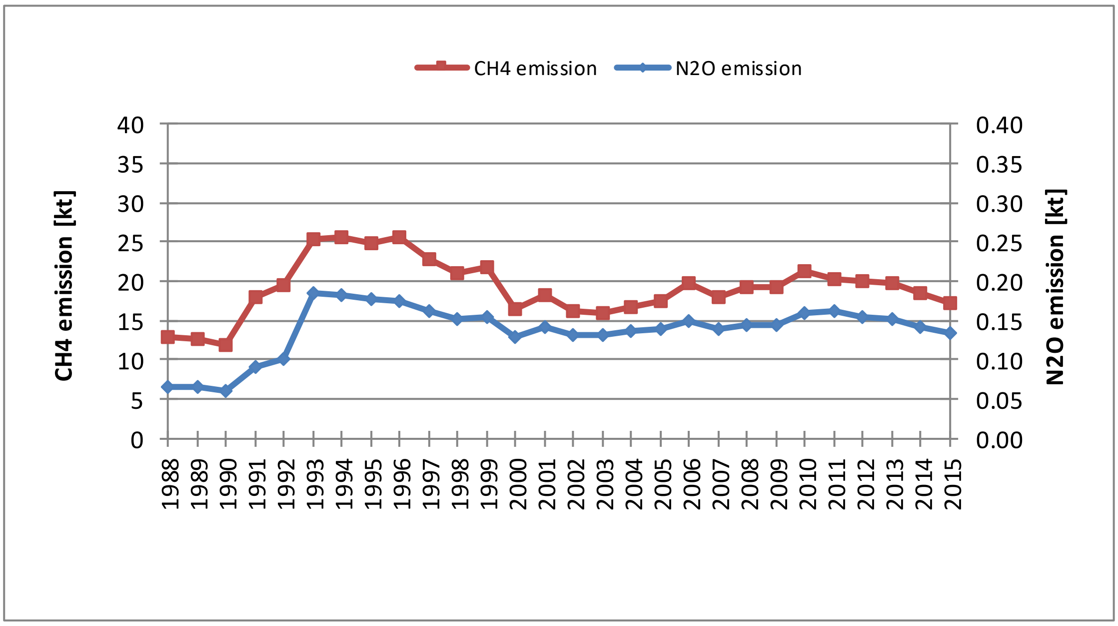

Figure 3.5.9.7. CH_4 and N_2O emissions for stationary sources in 1.A.4.c category in 1988-2015

The mobile sources classified in the sub-category 1.A.4.c (i.e. off-road vehicles and other machinery in agriculture and fishing) are described in chapter 3.2.8.2.6.

3.2.9.3. Uncertainties and time-series consistency

See chapter 3.2.6.3

3.2.9.4. Source-specific QA/QC and verification

See chapter 3.2.6.4

3.2.9.5. Source-specific recalculations

The was no changes in 1.A.4 subsector in the years 1988-2014.

3.2.9.6. Source-specific planned improvements

Analysis of the possibility of country specific EF elaboration for the gaseous fuels in Polish fuel structure.

3.3. Fugitive emissions (CRF sector 1.B)

3.3.1. Fugitive emission from solid fuels (CRF sector 1.B.1)

3.3.1.1. Source category description

Fugitive emission from solid fuels involves emission from coal mining and handling (CH_4) and emission from coke oven gas subsystem (CO_2 and CH_4).

The biggest share of emission in 1.B category comes from coal mining and handling. The hard coal and lignite extraction are presented at the graph bellow (Figure 3.3.1). The main reason for the decreasing coal extraction since late 1980s was the declining demand for coal and lignite in economy.

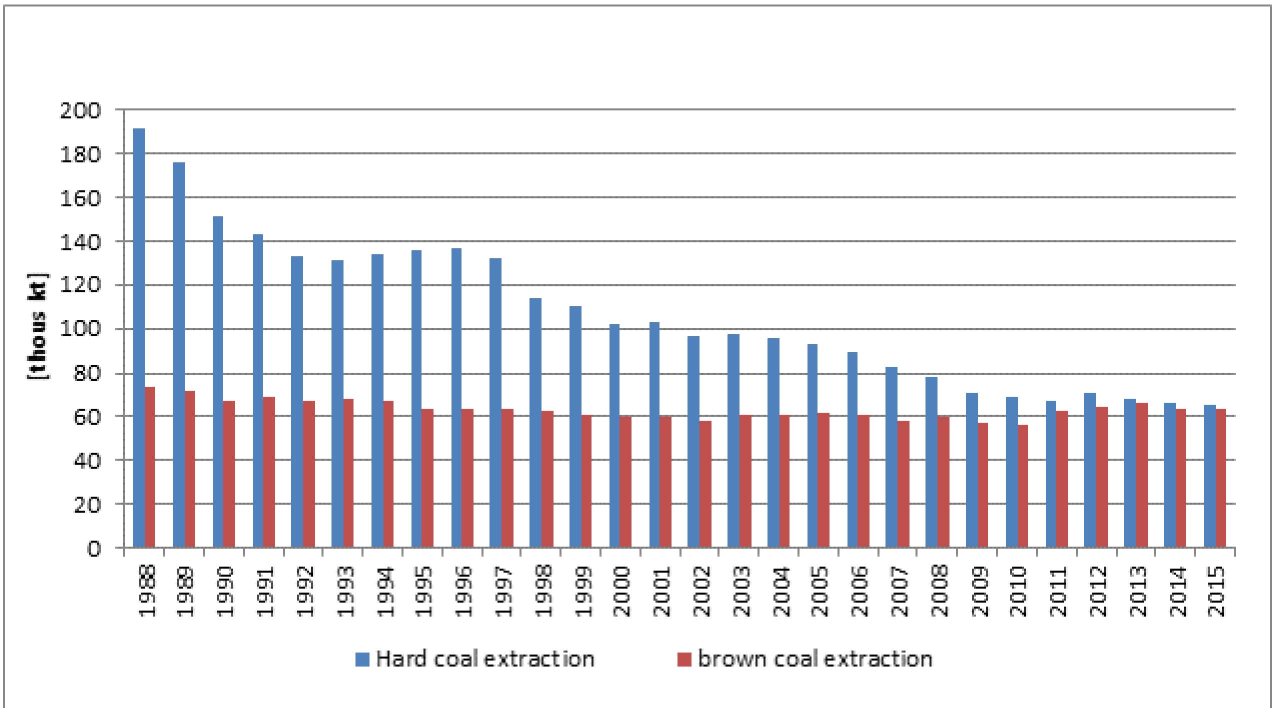

Figure 3.3.1. Hard coal and lignite extraction in 1988-2015.

3.3.1.2. Methodological issues

3.3.1.2.1 Fugitive emissions from fuels – coal mining (CRF sector 1.B.1.a.)

Coal Mining and Handling – underground mines (1.B.1.a.i.)

In response to the ERT recommendations, Emission Inventory Unit (National Centre for Emission Management) made an effort to develop methodology of estimating domestic methane emission from coal mining (1.B.1.a.i *Coal mining and handling, Underground mines, Mining activities*) – "The national methodology for estimating methane emissions from coal mining for reporting to the national inventory of emissions and removals of greenhouse gases" (National Centre for Emission Management 2016, in Polish). The results of this study was implemented in this submission.

To calculate methane emissions from coal mining were used data from other source than presented in the last submission. Data published by the State Mining Authority were used to calculate the amount of methane emitted during coal mining in each year. Based on the report State Mining Authority "Evaluation of work safety, mine rescue and public safety in connection with the activities of mining and geology in 2015" (http://www.wug.gov.pl/bhp/stan_bhp_w_gornictwie), national data on methane emission and development of methane (table 9, page 17) were used to calculate the actual total emissions of methane from coal mines for each year.

To calculate the CH_4 emissions factor for each year, the total emissions of methane and available data on amount of hard coal extraction from the study published by Polish Geological Institute [PIG] were used. Table 3.3.1. shows data used to calculate the CH_4 emissions from coal mining.

Table 3.3.1. Activity data used to calculate the CH_4 emissions from coal mining.

Year	Methane content [mln m^3]	Methane use for energy production [mln m^3]	CH_4 emmision from underground mining - country specific data base published by State Mining Authority [kt]	Underground coal production [Mg]	Annual CH_4 emision factor [kg/t]	Conversion factor [Gg/10^{6}m^3]	Implied CH4 emision factor [m^3/t]
	a	b	a-b				
1988	1037,2	207,90	**555,63**	191 624 000	2,90	0,67	**4,33**
1989	1045,73	208,43	**560,99**	175 947 000	3,19	0,67	**4,76**
1990	988,92	188,53	**536,26**	151 321 000	3,54	0,67	**5,29**
1991	829,24	185,10	**431,57**	143 131 000	3,02	0,67	**4,50**
1992	848,09	174,06	**451,60**	132 730 000	3,40	0,67	**5,08**
1993	779,96	167,60	**410,28**	131 400 000	3,12	0,67	**4,66**
1994	764,53	136,30	**420,91**	134 078 000	3,14	0,67	**4,69**
1995	745,31	137,10	**407,50**	135 523 000	3,01	0,67	**4,49**
1996	748,4	147,50	**402,60**	136 272 000	2,95	0,67	**4,41**
1997	748,4	134,40	**411,38**	132 576 000	3,10	0,67	**4,63**
1998	763,3	152,70	**409,10**	113 859 000	3,59	0,67	**5,36**
1999	744,5	136,90	**407,09**	109 986 000	3,70	0,67	**5,52**
2000	746,9	124,00	**417,34**	102 081 000	4,09	0,67	**6,10**
2001	743,7	131,50	**410,17**	102 477 000	4,00	0,67	**5,97**
2002	752,6	122,40	**422,23**	96 160 000	4,39	0,67	**6,55**
2003	798,1	127,80	**449,10**	97 274 000	4,62	0,67	**6,89**
2004	825,9	144,20	**456,74**	95 623 000	4,78	0,67	**7,13**
2005	851,1	144,80	**473,22**	93 006 000	5,09	0,67	**7,59**
2006	870,3	158,30	**477,04**	89 342 000	5,34	0,67	**7,97**
2007	878,9	165,70	**477,84**	82 779 000	5,77	0,67	**8,62**
2008	880,9	156,50	**485,35**	77 989 000	6,22	0,67	**9,29**
2009	855,7	159,50	**466,45**	70 500 000	6,62	0,67	**9,88**
2010	836,4	161,10	**452,45**	69 189 000	6,54	0,67	**9,76**
2011	828,8	166,30	**443,88**	67 637 000	6,56	0,67	**9,79**
2012	828,2	178,60	**435,23**	71 339 000	6,10	0,67	**9,11**
2013	847,8	187,70	**442,27**	68 399 000	6,47	0,67	**9,65**
2014	891,1	211,40	**455,40**	65 969 000	6,90	0,67	**10,30**
2015	933,00	197,10	**493,05**	65 070 000	7,58	0,67	**11,31**

It should be stressed that the data on emissions are collected and analyzed in a systematic way and they are published according with the law. These data therefore meet the requirements of data quality (QA / QC) arising from IPCC Guidelines in terms of durability and consistency of methodology.

This methodology is in line with Tier 3 approach (Tier 3 approach) of the IPCC Guidelines (2006), because it is based on direct measurements and calculations fugitive emissions from coal mines.

Fugitive emission of CH_4 from post-mining was estimated based on the activity data concerning hard coal extraction amount from the study published by Polish Geological Institute [PIG] and emission factors presented in table 3.3.2. have been taken from IPCC 2006.

Table 3.3.2. CH_4 Emission factor for calculation post-mining emission from coal mines.

CH_4 emission factor	
Post -Mining	2.50 [m^3CH_4/t; IPCC 2006, page 4.12]

Tier 1 method was used for calculation of fugitive emissions from abandoned underground mines, [IPCC 2006, page 4.21 equation 4.1.9.] Fugitive emission of CH_4 from closure mine was estimated based on number of abandoned underground mines from the data provided by State Mining Authority [SMA] and emission factors from IPCC 2006 – table 4.1.5, 4.1.6, and 4.1.7.

Table 3.3.3 shows data on number of closed coal mines, used emission factor and total emission from abandoned underground mines, in 1988-2015 .

Table 3.3.3.Aktivity data on number of closed coal mines, used emission factor and total emission from abandoned underground mines, in 1988-2015.

Inventory year	Number of closed mines per time brand 1976-2000	Emission factor - for interval of mine closure (1976-2000) [mln m^3/ mine]	Number of closed mines per time brand 2001 present	Emission factor - for interval of mine closure (2001-present) [mln m^3/ mine]	Fraction of grassy mines	Conversion factor	Total emission from closed mines [Gg CH4]
1988	0	1,561	0	NA	1,00	0,67	0
1989	0	1,561	0	NA	1,00	0,67	0
1990	0	1,561	0	NA	1,00	0,67	0
1991	0	1,334	0	NA	1,00	0,67	0
1992	0	1,83	0	NA	1,00	0,67	0
1993	0	1,072	0	NA	1,00	0,67	0
1994	0	0,988	0	NA	1,00	0,67	0
1995	1	0,921	0	NA	1,00	0,67	0,62
1996	2	0,865	0	NA	1,00	0,67	1,16
1997	3	0,818	0	NA	1,00	0,67	1,64
1998	4	0,778	0	NA	1,00	0,67	2,09
1999	4	0,743	0	NA	1,00	0,67	1,99
2000	10	0,713	0	NA	1,00	0,67	4,78
2001	10	0,686	17	5,735	1,00	0,67	103,75
2002	10	0,661	22	2,397	1,00	0,67	51,39
2003	10	0,639	22	1,762	1,00	0,67	37,78
2004	10	0,620	23	1,454	1,00	0,67	32,15
2005	10	0,601	23	1,265	1,00	0,67	27,97
2006	10	0,585	23	1,133	1,00	0,67	25,05
2007	10	0,569	23	1,035	1,00	0,67	22,88
2008	10	0,555	23	0,959	1,00	0,67	21,20
2009	10	0,542	23	0,896	1,00	0,67	19,81
2010	10	0,529	23	0,845	1,00	0,67	18,68
2011	10	0,518	23	0,801	1,00	0,67	17,71
2012	10	0,507	23	0,763	1,00	0,67	16,87
2013	10	0,496	23	0,73	1,00	0,67	16,14
2014	10	0,487	23	0,701	1,00	0,67	15,50
2015	10	0,478	23	0,675	1,00	0,67	14,92

<u>Coal Mining and Handling – surface mines (1.B.1.a.ii.)</u>

Tier 1 method was used for calculation of fugitive emissions from surface mining and post-mining [IPCC 2006, page 4.18-4.19]
Fugitive emission of CH_4 from surface mining and post-mining was estimated based on the activity data concerning lignite extraction amount from the study published by Polish Geological Institute [PIG. 2016] and emission factors from IPCC 2006. (table 3.3.4.).

Table 3.3.4. CH_4 Emission factor for calculation mining and post-mining emission from surface coal mining.

CH_4 emission factor	
Mining	1.20 [m^3CH_4/t; IPCC 2006, page.4.18]
Post -Mining	0.1 [m^3CH_4/t; IPCC 2006, page 4.19]

The conversion factor applied for recalculation of emitted methane volume to mass of CH_4 is 0.67 kg/m^3. In table 3.3.5 are shown data on lignite extraction and total related methane emissions in 1988-2015.

Table 3.3.5. Lignite extraction and total methane emissions from lignite mines in 1988-2015.

Year	Lignite extraction [kt]	CH_4 Emissions [kt]
1988	73 970 000	64.43
1989	72 000 000	62.71
1990	67 680 000	58.95
1991	68 720 000	59.86
1992	66 900 000	58.27
1993	68 200 000	59.40
1994	66 780 000	58.17
1995	63 550 000	55.35
1996	63 850 000	55.61
1997	63 200 000	55.05
1998	62 880 000	54.77
1999	60 860 000	53.01
2000	59 490 000	51.82
2001	59 550 000	51.87
2002	58 240 000	50.73
2003	60 920 000	53.06
2004	61 190 000	53.30
2005	61 610 000	53.66
2006	60 850 000	53.00
2007	57 700 000	50.26
2008	59 500 000	51.82
2009	57 060 000	49.70
2010	56 520 000	49.23
2011	62 890 000	54.78
2012	64 297 000	56.00
2013	66 139 000	57.61
2014	64 002 000	55.75
2015	63 135 000	54.99

3.3.1.2.2. Fugitive emission from solid fuel transformation (1.B.1.b.)

Processing emission of CO_2 from coking plants in the period 1990-2014 was estimated based on carbon budgets in the coking plants (tab. 3.3.6). Data concerning input and output are based on [Eurostat] and [GUS 1991a-2015a]. Coke productions for 1990-2014 were applied according to data in Eurostat [Eurostat]. Activity data for 2015 come from GUS – Energy Statistic 2014,2015. [GUS 2015a].

The Eurostat database does not cover energy balances for Poland for the years before 1990 so data on input and output in coking plants (i.e. coke output) applied for C balance in coke production process for the period: 1988-1989 were taken from IEA database [IEA].

The amounts of carbon in the input and output components used in C balances for entire period were calculated based on IPCC factors [IPCC 1997, IPCC 2006].

Fuels given as the input in C balance for coke production process (tab. 3.3.6) did not include the fuels for energy purpose of the process. Emission from coke production given in 1.A.1.c subcategory was related to the fuel consumption for energy purpose of the coke plants, so double counting should not be the case in GHG inventory.

CO_2 emission from coke production in Polish GHG inventory is split between two sub-categories and is reported under following sub-sectors:

1.A.1.c. – includes the emission estimated based on fuel use given in Eurostat database as *Consumption of the energy branch – Coke-oven and gas-works plants* (it means based on fuel consummated for own energy purpose)

CH_4 emission in the period 1990-2014 was estimated based on coke production volume from [Eurostat] while for 1988 and 1989 from [IEA]. For the entire period emission factor equal 0.1g CH_4/Mg coke produced [IPCC 2006 chapter 4, table 4.2., page 4.26] was applied. Activity data for 2015 come from GUS – Energy Statistic 2014,2015. [GUS 2015a].

Table 3.3.6. Carbon balance for coke production in years 1988-2015.

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
INPUT [TJ]														
Coking coal	656 592	637 742	535 538	448 105	437 665	405 168	436 596	451 761	403 902	423 800	377 787	338 208	366 814	362 343
High Methane Natural Gas	0	1239	0	0	0	0	0	0	0	0	0	0	0	0
Coke			969	542	1767	1568	2394	2337	1824	1682	2109	1482	2024	1 054
Blast furnace gas	0	152	0	0	0	0	0	0	0	0	0	0	0	0
Tar	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial waste	7	0	0											0
NCV [MJ/kg]														
Coking coal	29.41	29.41	29.41	29.41	29.41	29.41	28.49	29.36	29.36	29.45	29.54	29.48	29.62	29.53
INPUT – Material-specific carbon content [kg C/GJ]														
Coking coal	26.02	26.02	26.02	26.02	26.02	26.02	26.06	26.03	26.03	26.02	26.02	26.02	26.02	26.02
High Methane Natural Gas	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3
Coke	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5
Blast furnace gas	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0
Tar	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Industrial waste	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
INPUT – Carbon contents in charge components [kt]														
Coking coal	17087.6	16597.0	13937.2	11661.8	11390.1	10544.3	11378.1	11757.8	10512.1	11028.5	9829.9	8800.9	9543.2	9428.2
High Methane Natural Gas	0.0	19.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Coke	0.0	0.0	28.6	16.0	52.1	46.3	70.6	68.9	53.8	49.6	62.2	43.7	59.7	31.1
Blast furnace gas	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tar	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Industrial waste	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Carbon contents in charge – SUM [kt]	**17087.8**	**16626.0**	**13965.7**	**11677.7**	**11442.2**	**10590.6**	**11448.7**	**11826.7**	**10565.9**	**11078.2**	**9892.1**	**8844.6**	**9602.9**	**9459.3**
OUTPUT [TJ]														
Coke	**471501.8**	**455831.8**	385206.0	323646.0	315381.0	292838.0	326468.0	329973.0	294662.0	300248.0	277761.0	238488.0	255702.0	254961.0
Coke-Oven Gas	**118914.6**	**117040.4**	96832.0	84743.0	82307.0	75753.0	84002.0	84767.0	76036.0	79286.0	73457.0	62989.0	68849.0	69008.0
Tar	27580.0	27429.3	22885.3	20268.2	20648.1	19071.4	21146.6	21265.0	19831.9	19600.4	17949.6	16264.8	17003.0	17232.6
Benzol	7701.5	7230.9	6166.9	5150.7	5646.2	5159.1	6010.6	6056.5	5446.7	5428.6	4856.9	4524.7	2498.5	4788.6
OUTPUT – Material-specific carbon content [kg C/GJ]														
Coke	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5
Coke-Oven Gas	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Tar	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Benzol	23	23	23	23	23	23	23	23	23	23	23	23	23	23
OUTPUT – Carbon content in products [kt]														
Coke	13909.3	13447.0	11363.6	9547.6	9303.7	8638.7	9630.8	9734.2	8692.5	8857.3	8193.9	7035.4	7543.2	7521.3
Coke-Oven Gas	1545.9	1521.5	1258.8	1101.7	1070.0	984.8	1092.0	1102.0	988.5	1030.7	954.9	818.9	895.0	897.1
Tar	606.8	603.4	503.5	445.9	454.3	419.6	465.2	467.8	436.3	431.2	394.9	357.8	374.1	379.1
Benzol	177.1	166.3	141.8	118.5	129.9	118.7	138.2	139.3	125.3	124.9	111.7	104.1	57.5	110.1
Carbon content in products – SUM [kt]	**16239.1**	**15738.3**	**13267.7**	**11213.6**	**10957.9**	**10161.7**	**11326.3**	**11443.3**	**10242.6**	**10444.1**	**9655.5**	**8316.1**	**8869.8**	**8907.7**
C process emission[kt]	**848.8**	**887.7**	**698.0**	**464.2**	**484.3**	**428.8**	**122.4**	**383.4**	**323.3**	**634.1**	**236.6**	**528.4**	**733.2**	**551.6**
CO_2 process emission[kt]	**3112.1**	**3254.8**	**2559.5**	**1701.9**	**1775.9**	**1572.4**	**448.8**	**1405.9**	**1185.5**	**2324.9**	**867.5**	**1937.6**	**2688.3**	**2022.5**
Coke output [kt]	17007	16499	13516	11356	11066	10275	11455	11578	10339	10535	9746	8368	8972	8946
EF [kg CO_2/Mg of coke]	**183**	**197**	**189**	**150**	**160**	**153**	**39**	**121**	**115**	**221**	**89**	**232**	**300**	**226**

Table 3.3.6. (cont.) Carbon balance for coke production in years 1988-2015.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
INPUT [TJ]														
Coking coal	353 752	410 854	405 806	335 694	383 094	402 391	389 792	274 662	381 938	364 348	350 150	371 333	375 885	384 351
High Methane Natural Gas	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coke	1 710	1 568	1 710	2 138	2 366	2 650	3 050	1 938	3 021	2 964	2 366	1 710	1 938	2 571
Blast furnace gas	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tar	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial waste	0	0	0	0	0	0	0	0	3.5	0	0	0	0	0
NCV [MJ/kg]														
Coking coal	29.53	29.56	29.55	29.51	29.59	29.50	29.57	29.56	29.49	29.52	29.60	29.59	29.55	29.54
INPUT – Material-specific carbon content [kg C/GJ]														
Coking coal	26.02	26.02	26.02	26.02	26.02	26.02	26.02	26.02	26.02	26.0	26.0	26.0	26.0	26.02
High Methane Natural Gas	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3
Coke	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5
Blast furnace gas	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0
Tar	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Industrial waste	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
INPUT – Carbon contents in charge components [kt]														
Coking coal	9204.6	10689.9	10558.7	8735.0	9967.2	10470.6	10141.8	7146.4	9938.6	9480.5	9110.0	9661.2	9779.6	9999.9
High Methane Natural Gas	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Coke	50.4	46.3	50.4	63.1	69.8	78.2	90.0	57.2	89.1	87.4	69.8	50.4	57.2	75.9
Blast furnace gas	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tar	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Industrial waste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Carbon contents in charge – SUM [kt]	**9255.1**	**10736.2**	**10609.1**	**8798.1**	**10037.0**	**10548.8**	**10231.8**	**7203.6**	**10027.8**	**9567.9**	**9179.8**	**9711.6**	**9836.8**	**10075.7**
OUTPUT [TJ]														
Coke	248606.0	288192.0	287764.0	239514.0	273970.0	289788.0	287138.0	202094.0	280554.0	267244.0	253450.0	266760.0	272688.0	274164.8
Coke-Oven Gas	65570.0	75091.0	72947.0	61947.0	71712.0	76950.0	73935.0	53376.0	73008.0	69440.0	65321.0	68844.0	69754.0	71495,0
Tar	16462.6	18188.1	17417.0	14590.0	16211.0	17342.0	15721.0	11838.0	16475.0	15268.0	14175.0	14854.0	14477.0	14269,0
Benzol	4474.8	5253.3	5358.3	4403.2	3803.7	5315.6	4711.9	3373.4	4892.6	4518.8	4125.1	4465.4	4455.9	4548,2
OUTPUT – Material-specific carbon content [kg C/GJ]														
Coke	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5
Coke-Oven Gas	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Tar	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Benzol	23	23	23	23	23	23	23	23	23	23	23	23	23	23
OUTPUT – Carbon content in products [kt]														
Coke	7333.9	8501.7	8489.0	7065.7	8082.1	8548.7	8470.6	5961.8	8276.3	7883.7	7476.8	7869.4	8044.3	8087,9
Coke-Oven Gas	852.4	976.2	948.3	805.3	932.3	1000.4	961.2	693.9	949.1	902.7	849.2	895.0	906.8	929.4
Tar	362.2	400.1	383.2	321.0	356.6	381.5	345.9	260.4	362.5	335.9	311.9	326.8	318.5	313,9
Benzol	102.9	120.8	123.2	101.3	87.5	122.3	108.4	77.6	112.5	103.9	94.9	102.7	102.5	104.6
Carbon content in products – SUM [kt]	**8651.4**	**9998.8**	**9943.8**	**8293.2**	**9458.5**	**10052.9**	**9886.0**	**6993.7**	**9700.4**	**9226.2**	**8732.7**	**9193.9**	**9372.1**	**9435.8**
C process emission[kt]	**603.7**	**737.4**	**665.4**	**504.9**	**578.5**	**495.9**	**345.8**	**209.9**	**327.4**	**341.6**	**447.1**	**517.8**	**464.7**	**639.9**
CO_2 process emission[kt]	**2213.4**	**2703.8**	**2439.7**	**1851.2**	**2121.0**	**1818.4**	**1267.9**	**769.6**	**1200.5**	**1252.7**	**1639.3**	**1898.4**	**1704.0**	**2346.4**
Coke output [kt]	8723	10112	10 097	8 404	9 613	10 168	10 075	7 091	9 844	9 377	8 893	9 360	9 568	9568
EF [kg CO_2/Mg of coke]	**254**	**267**	**242**	**220**	**221**	**179**	**126**	**109**	**122**	**134**	**184**	**203**	**178**	**245**

3.3.1.2.3. Fugitive emissions from fuels – coke oven gas (CRF sector 1.B.1.c)

Tier 1 method has been used for calculation of fugitive emissions from coke oven gas system [IPCC 2006] while emission factors presented in table 3.3.7. have been taken from domestic case study [Steczko 1994]. Activity data for 1990-2014 come from [EUROSTAT]. For years: 1988-1989 the activity data come from [IEA] database. Activity data for 2015 come from GUS – Energy Statistic 2014, 2015. [GUS 2015a].

Table 3.3.7. Emission factors for CO_2 and CH_4 from coke oven gas system (country specific EF).

Gas system emission factor [kt/PJ]	**CO_2**	**CH_4**
gas processing	0.000194	0.000546
gas transmission	0.020629	0.057977
gas distribution	0.038056	0.106954

For coke-oven gas subsystem there is no possibility to add activity data in PJ in the CRF Reporter database, but only in kt. This conversion into kt was done only for CRF Reporter purposes (emission is estimated on the PJ activity data basis) the mentioned change has no impact on emissions.

3.3.1.3. Uncertainties and time-series consistency

See chapter 3.2.6.3

3.3.1.4. Source-specific QA/QC and verification

QA/QC and verification are integral parts of the inventory and has been elaborated in line with the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and *2006 IPCC Guidelines for National Greenhouse Gas Inventories(2006)*.
Activity data used in the GHG inventory concerning sector 1.B.1 come from Eurostat database which is fed by the Central Statistical Office (GUS) and from Polish Geological Institute - National Research Institute (PIG-PIB). GUS and PIG-PIB are responsible for QA/QC of collected and published data. Activity data applied in GHG inventory are regularly checked and updated if necessary according to adjustments made in Eurostat database.
Generally QC procedures follow QA/QC plan presented in Annex 7.

3.3.1.5. Source-specific recalculations

Recalculations for the years 1988-2014 was made. Recalculations for this years was made as result of implementation new methodology of estimating domestic methane emission from coal mining (1.B.1.a.i *Coal mining and handling, Underground mines, Mining activities*) – "The national methodology for estimating methane emissions from coal mining for reporting to the national inventory of emissions and removals of greenhouse gases" (National Centre for Emission Management 2016, in Polish).
Emission changes for subcategory 1.B.1. are presented in table below.

Table 3.3.8. Emission changes for subcategory 1.B.1. Fugitive emissions from fuels.

Difference	1988	1989	1990	1991	1992	1993	1994
kt eq CO_2	-8 196.68	6.277.07	-4 090.47	-5 736.69	-4 134.54	-4 888.99	-4 914.12
%	-30.48	-23.73	-17.12	-28.56	-20.50	-25.87	-27.12
	1995	1996	1997	1998	1999	2000	2001
kt eq CO_2	-5 387.39	-5 572,22	-4 911,82	-2 819.18	-2 424.78	-1 193.45	-72,92
%	-28.73	-30,21	-24.99	-16.25	-13.35	-6.32	-0,36
	2002	2003	2004	2005	2006	2007	2008
kt eq CO_2	366.07	708.77	1 014.11	1 660.92	2 129.50	2 864.30	3 572.02
%	1.88	3.48	5.05	8.44	10.74	14.96	19.23
	2009	2010	2011	2012	2013	2014	
kt eq CO_2	3 931.56	3 713.72	3 661.36	3 010.89	3 510.58	4 105.94	
%	22.88	21.60	21.44	17.30	19.78	23.17	

3.3.1.6. Source-specific planned improvements

Analysis for possibility of updating the emission factors for the systems of coke-oven gas.

3.3.2. Fugitive emissions from oil and natural gas (CRF sector 1.B.2)

3.3.2.1. Source category description

Fugitive emission from oil and natural gas include fugitive emissions from extraction, transport and refining of oil, from production, processing, transmission, distribution and underground storage of gas as well as from venting and flaring of gas and oil.

3.3.2.2. Methodological issues

3.3.2.2.1 Fugitive emissions from fuels – oil (CRF sector 1.B.2.a)

Tier 1 method has been used for calculation of fugitive emissions from oil system [IPCC 2006]. Activity data come from [EUROSTAT]. For years: 1988-1989 the activity data come from [IEA] database. Activity data for 1990-2014 come from Eurostat (table 3.3.9). Activity data for 2015 come from GUS – Energy Statistic 2014,2015. [GUS 2015a].

Table 3.3.9. Activity data for emission from oil system.

Year	Production [kJ]	Production [kt]	Import [kt]	Transport [kt]	Input to oil refineries [PJ]
1988	6.58	155.51	14 681.42	14 836.92	618.67
1989	6.48	153.19	14 422.39	14 575.59	628.44
1990	6.59	160.00	13 126.00	13 286.00	528.78
1991	6.45	158.00	11 454.00	11 612.00	478.33
1992	7.98	200.00	13 052.00	13 252.00	524.72
1993	9.49	235.00	13 674.00	13 909.00	539.96
1994	10.97	284.00	12 721.00	13 005.00	519.25
1995	11.28	292.00	12 957.00	13 249.00	519.06
1996	12.70	317.00	14 026.00	14 343.00	584.98
1997	11.92	289.00	14 713.00	15 002.00	613.70
1998	14.88	360.00	15 367.00	15 727.00	662.31
1999	18.03	434.00	16 022.00	16 456.00	694.72
2000	26.55	653.00	18 002.00	18 655.00	742.97
2001	31.64	767.00	17 558.00	18 325.00	740.95
2002	29.72	728.00	17 942.00	18 670.00	726.13
2003	32.60	765.00	17 448.00	18 213.00	743.88
2004	37.34	886.00	17 316.00	18 202.00	763.48
2005	35.18	848.00	17 912.00	18 760.00	753.68
2006	32.86	796.00	19 813.00	20 609.00	827.46
2007	30.30	721.00	20 885.00	21 606.00	845.22
2008	31.16	755.00	20 787.00	21 542.00	858.70
2009	28.79	687.00	20 098.00	20 785.00	850.95
2010	28.51	687.00	22 688.00	23 375.00	948.07
2011	25.26	617.00	23 792.00	24 409.00	982.70
2012	27.79	681.00	24 633.00	25 314.00	1 026.41
2013	39.74	962.00	23 347.00	24 309.00	1 003.96
2014	39.03	951.00	23 713.00	24 664.00	993.00
2015	39.57	928.00	26 492.00	27 420.00	1 110.87

CO_2 and CH_4 factors used for estimation of emissions from oil production have been taken from country study [Żebrowski 1994] while for oil transmission and refining default factors were used from [IPCC 2006] (tab. 3.3.10).

Table 3.3.10. Emission factors for CO_2 and CH_4 from oil production and transmission.

Oil system	Emission factors	Source
CO_2		
production [kt/PJ]	6.3150	country specific
transmission [kt/m³]	0.00049	IPCC 2006 page 4.52 table 4.2.4.
CH_4		
production [kt/PJ]	0.0618	country specific
transmission [kt/m³]	0.0054	IPCC 2006 page 4.52 table 4.2.4.
refining [kt/PJ]	0.0410	IPCC 2006 page 4.53 table 4.2.4.

3.3.2.2.2 Fugitive emissions from fuels – natural gas (CRF sector 1.B.2.b).

Estimation of CO_2 and CH_4 emissions from natural gas was carried out based on *Tier 1* method [IPCC 2006]. Activity data for 1990-2014 come from [EUROSTAT]. For years 1988-1989 activity data come from [IEA] database. Activity data are given in table 3.3.11. Activity data for 2015 come from GUS – Energy Statistic 2014,2015. [GUS 2015a].

Table 3.3.11. Activities for natural gas system [TJ]

Year	Production [TJ]	Total consumption [TJ]
1988	156.6	350.7
1989	145.0	343.0
1990	99.6	374.2
1991	111.3	348.9
1992	107.2	325.0
1993	136.9	341.4
1994	129.8	344.0
1995	132.7	376.6
1996	131.5	395.5
1997	134.2	394.3
1998	136.0	398.3
1999	129.9	387.8
2000	138.7	417.0
2001	146.2	434.4
2002	149.4	423.4
2003	151.2	471.5
2004	164.4	497.4
2005	162.6	512.2
2006	162.5	526.8
2007	163.1	523.1
2008	154.5	526.1
2009	154.0	505.0
2010	154.6	536.1
2011	161.2	537.4
2012	163.6	572.8
2013	160.1	575.1
2014	156.0	561.2
2015	154.2	418.3

Emission factors gas system for production, processing, transmission, underground storage and distribution was taken from IPCC 2006. Emission factor listed in table 3.3.12.

Table 3.3.12. Emission factors for CO_2 and CH_4 from natural gas system.[IPCC 2006, page 4.51 table 4.2.4].

Emission factors [kt/10⁶m³]	CO_2	CH_4
Gas production	0.000082	0.0023
Gas processing	0.00032	0.00103
Gas transmission	0.00000088	0.00048
Underground gas storage	0.00000011	0.000025
Gas distribution	0.000051	0.0011

3.3.2.2.3 Fugitive emissions from fuels – Venting and Flaring (CRF sector 1.B.2.c)

Venting and Flaring in oil subsystem

CO_2 and CH_4 emission from venting and CO_2, CH_4 and N_2O emission from flaring were calculated in oil subsystem. Emission factors for both emissions were taken default from [IPCC 2006 page 4.51, table 4.2.4.].

CO_2 EF from venting:	0.000095	$kt/10^3m^3$
CH_4 EF from venting:	0.00072	$kt/10^3m^3$

CO_2 from flaring:	0.00002500	$kt/10^3m^3$
CH_4 from flaring:	0.04100000	$kt/10^3m^3$
N_2O from flaring:	0.00000064	$kt/10^3m^3$

Extraction of oil is used as activity data and is in accordance with whole oil subsystem. Other emissions from venting and flaring in oil subsystem are included in 1.B.2.a.

CO_2 process emission from refineries and flaring was included into sub-category 1.B.2.C.2. This emission were estimated based on the verified reports for refineries which participate in EU ETS [KOBiZE 2016]. These values amounted to: 1789.1kt for 2015, 1545.68kt for 2014, 1701.7kt for 2013, 1671.1 kt for 2012, 1553.6 kt for 2011, 991.9 kt for 2010, 1093.0 kt for 2009, 1091.6 kt for 2008, 956.5 kt for 2007, 1143.1 kt CO2 in 2006 and 1082.3 kt CO2 in 2005 respectively. CO2 emission from refineries reported as process emission mainly resulted from the following processes: hydrogen production, regeneration of catalysts and after-burning gases from asphalt production.

Flaring in natural gas subsystem

CO_2, CH_4 and N_2O emissions from flaring in gas extraction and consumption were calculated in natural gas subsystem. Emission factors for those emissions were taken default from [IPCC 2006 page 4.48. table 4.2.4.].

CO_2 EF from flaring in gas extraction:	0.000000760	$kt/10^6m^3$
CH_4 EF from flaring in gas extraction:	0.0012	$kt/10^6m^3$
N_2O EF from flaring in gas extraction:	0.000000021	$kt/10^6m^3$

CO_2 EF from flaring in gas consumption:	0.00360	$kt/10^6m^3$
CH_4 EF from flaring in gas consumption:	0.00000002	$kt/10^6m^3$
N_2O EF from flaring in gas consumption:	0.00000005	$kt/10^6m^3$

Extraction and consumption of natural gas are used as activity data and are in accordance with whole natural gas subsystem. Other emissions from venting and flaring in natural gas subsystem are included in 1.B.2.b.

3.3.2.3. Uncertainties and time-series consistency

See chapter 3.2.6.3.

3.3.2.4. Source-specific QA/QC and verification

See chapter 3.3.1.4.

3.3.2.5. Source-specific recalculations

Not done.

3.3.2.6. Source-specific planned improvements

Any improvements are planned at the moment.

4. INDUSTRIAL PROCESSES AND PRODUCT USE (CRF SECTOR 2)

4.1. Source category description

Following categories from sector 2 have been identified as key sources (excluding LULUCF):

IPCC Source Categories	Greenhouse Gas	Identification criteria (Level, Trend, Qualitative)		
2.A.1 Cement Production	CO_2	L	T	
2.A.2 Lime Production	CO_2		T	
2.A.4 Other Process Uses of Carbonates	CO_2	L	T	
2.B.1 Ammonia Production	CO_2	L	T	
2.B.2 Nitric Acid Production	N_2O		T	
2.C.1 Iron and Steel Production	CO_2	L	T	
2.F.1 Refrigeration and Air conditioning	F-gases	L	T	

Share of these categories in total Poland's GHG emissions amounts ca. 6.36%

Figure bellow shows GHG emission trend in *Industrial processes* sector.

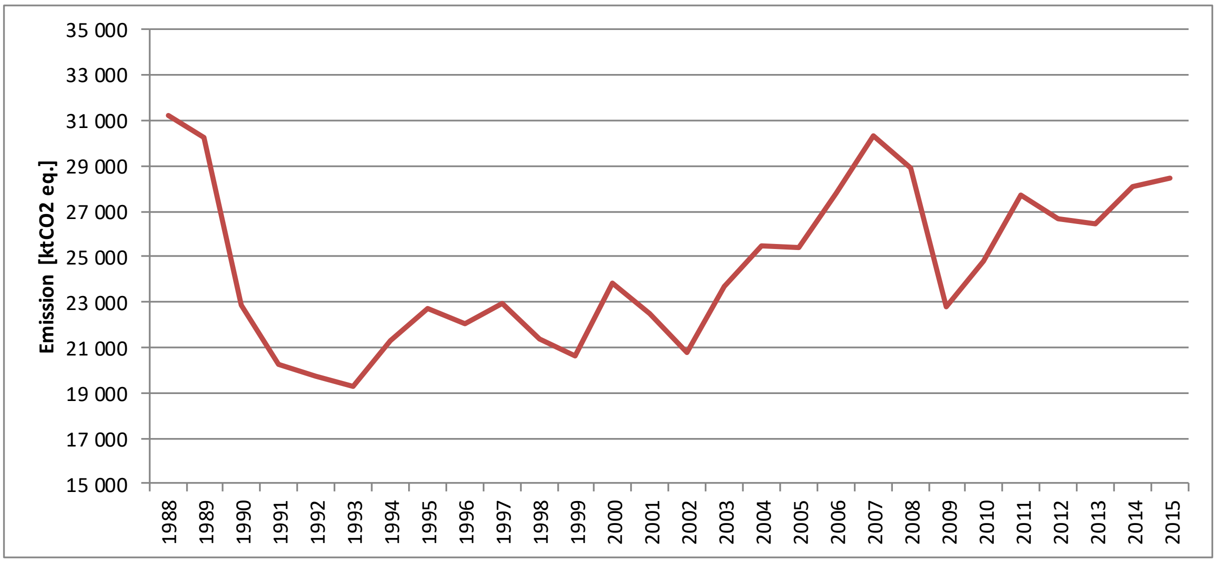

Figure 4.1.1. Emission trend in *Industrial processes* sector in period 1988 – 2015

Figure 4.1.2 shows GHG emissions according to subcategories of sector 2:

- 2.A. *Mineral industry*
- 2.B. *Chemical industry*
- 2.C. *Metal industry*
- 2.D. *Non-energy products from fuels and solvent use*
- 2.E. *Electronics industry*
- 2.F. *Product uses as substitutes for ODS*
- 2.G. *Other product manufacture and use*
- 2.H. *Other*.

For estimation of the 2015 emission in sector 2. *Industrial Processes and product use* some data from EU ETS installation reports was applied in the following subcategories:

- 2.A. *Mineral industry*: 2.A.1. *Cement Production*, 2.A.4.a. *Other process uses of carbonates - ceramics*
- 2.C. *Metal industry:* processes included into *Iron and Steel Production* (2.C.1) such as: sinter production, pig iron production, steel production in basic oxygen process, steel production in electric arc furnace process.

Emissions in individual subcategories in period 1988 – 2015 are shown in figure 4.1.2

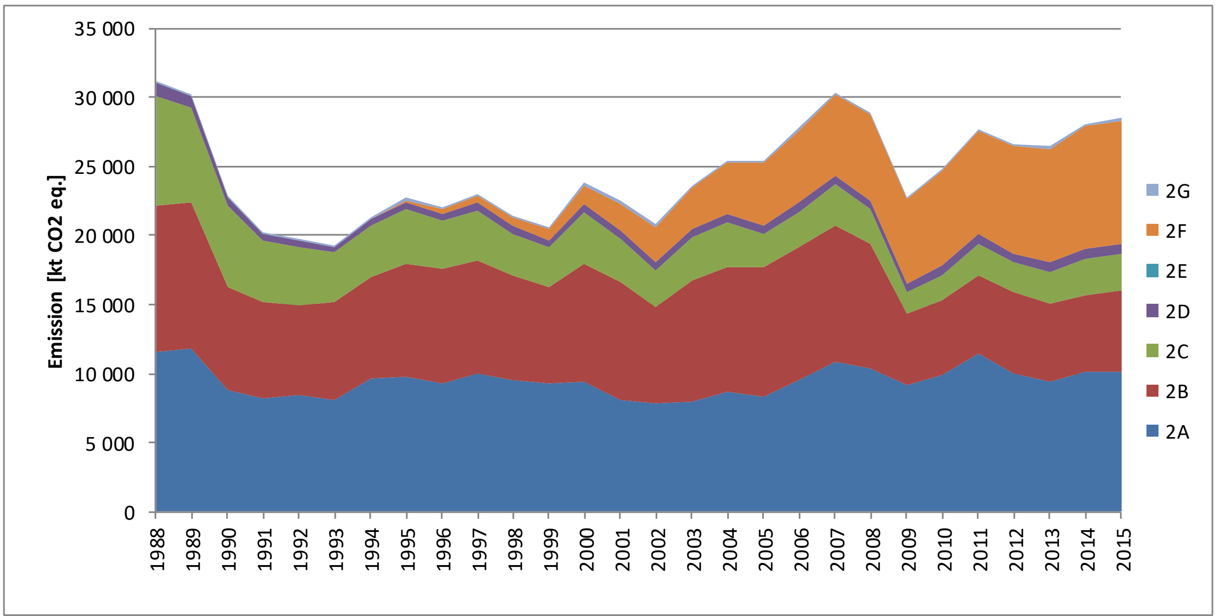

Figure 4.1.2. GHG emissions from *Industrial processes* in 1988-2015 according to subcategories

4.2. Mineral industry (CRF sector 2.A)

4.2.1. Source category description

Estimation of emissions in 2.A. *Mineral industry* is carried out in sub-categories listed below:

a) *Cement Production* (2.A.1)
b) *Lime Production* (2.A.2)
c) *Glass production* (2.A.3)
d) *Other process uses of carbonates* (2.A.4)

- *Ceramics*
- *Other uses of soda ash*
- *Non-metallurgical magnesium production*
- *Other*

Subsector 2.A.1. *Cement Production* is by far the largest contributor to emissions from this category (see figure 4.2.1) – almost 63% in 2015.

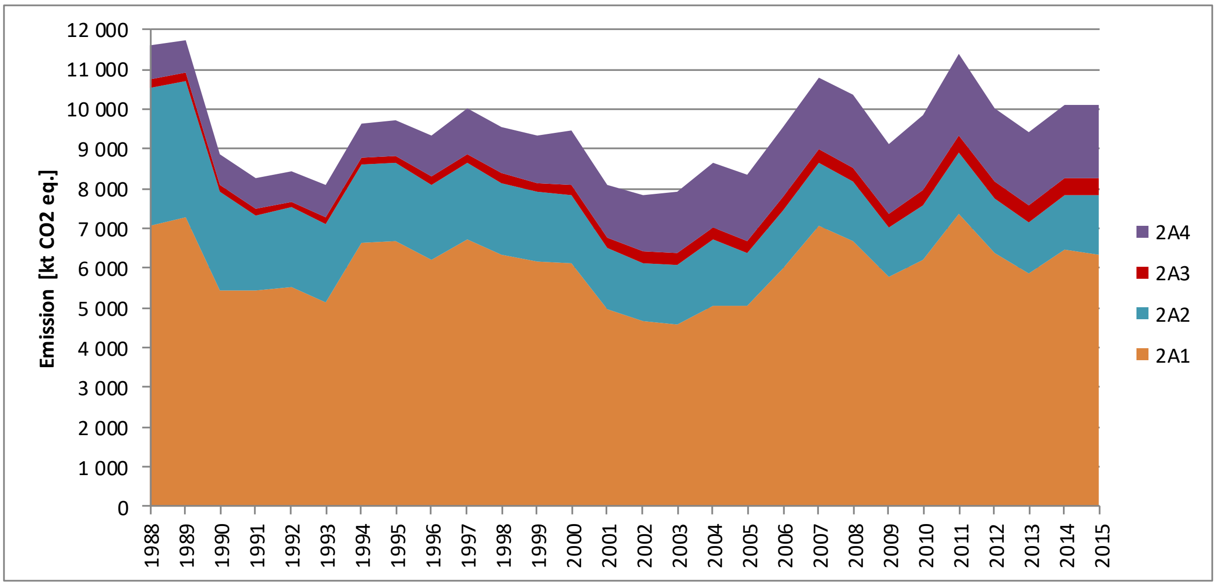

Figure 4.2.1. Emissions from *Mineral industry* sector in years 1988-2015 according to subcategories.

4.2.2. Methodological issues

4.2.2.1. Cement Production (CRF sector 2.A.1)

CO_2 emission from clinker production is the sum of the process emissions given in the verified reports for 2015 for installation of clinker production, which participate in the EU ETS [KOBiZE 2016]. This emission was estimated as 6341.8 kt CO_2. Data on clinker production was taken from [GUS 2016b].

The clinker production in period 1988-2015 is shown on figure 4.2.2. Data on clinker production for the entire inventoried period was taken from [GUS 1989b-2016b].

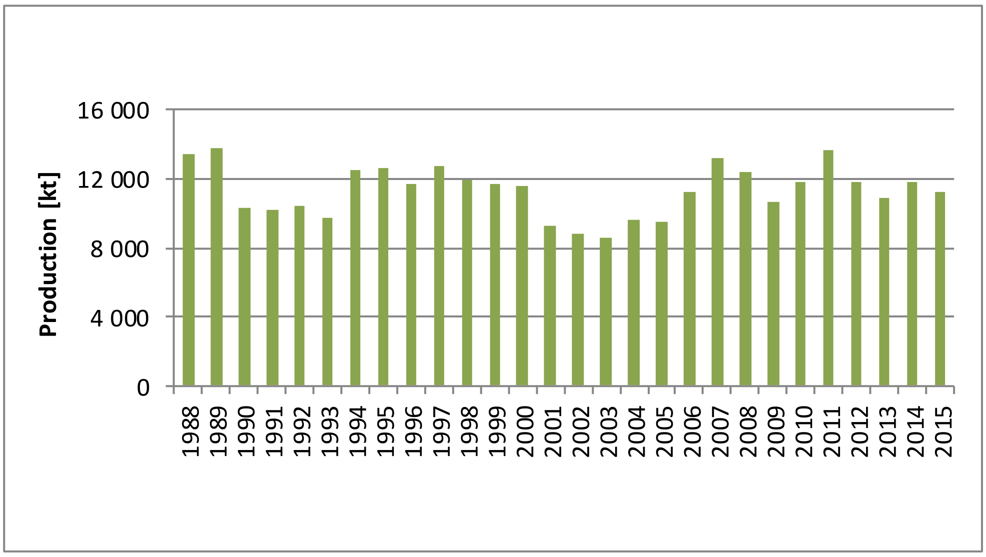

Figure 4.2.2. Clinker production in 1988-2015

CO_2 emission from clinker production was taken from the verified reports for the years: 2005-2015 for installations which participate in EU ETS. For other years emissions were estimated based on clinker production and emission factors. Emission factors which were used to estimate CO_2 process emissions from subcategory 2.A.1 are given bellow:

- for years: 1988-2000 – emission factor equal 529 kg CO_2/t of clinker – average from country specific factors for years: 2001-2004 (2001 – 531 kg CO_2/t, 2002 – 530 kg CO_2/t, 2003 – 528 kg CO_2/t, 2004 – 527 kg CO_2/t). Country specific EFs as listed above come from elaboration [IMMB 2006]. Cited report includes emission data for period 1988-2004 but only emission calculation for 2001-2004 was based on country specific data (chemical analysis of clinker, kiln input etc.). The CO_2 emission for the years 1988-2000 was estimated in cited reports based on default calcination factor (525 kg CO2 /tonne clinker) because of lack of adequate country specific data. For this reason Poland uses average EFs value for 2001-2004 as CS EF for the period before 2001 in the inventory.
- for years: 2001-2004 - country specific factors (given above) from [IMMB 2006].

Since 2005 CO_2 process emissions from clinker production in GHG inventory corresponded to the sums of emissions provided in the EU-ETS verified reports, due to the fact that all installations for clinker production participate in EU-ETS. Emissions of CO_2 for installations covered by the EU ETS are estimated for 2013-2015 following the *Commission Regulation (EU) No 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council* (Annex IV section 9). For the earlier years the emission in ETS reports was estimated based on *Ordinance of the Minister of Environment of 12 September 2008 on the way of monitoring of emission amounts of substances covered by the Community Emission Trading Scheme* (Dz. U. Nr 183, poz. 1142). The ordinance transposes to the Polish law the UE Monitoring and Reporting Guidelines for ETS (Commission Decision 2007/589/EC). Methods applied for CO_2 process emission estimation from clinker production in the EU-ETS are described in ANNEX VII of mentioned EC Decision: *Activity-specific guidelines for installations for the production of cement clinker as listed in Annex I to Directive 2003/87/EC.*

According to Commission Decision 2007/589/EC there was no obligation to provide information concerning production. Production amounts from installations covered by EU ETS were additionally collected in Poland in accordance with *Ordinance of the Minister of Environment of 12 September 2008* *on the way of monitoring of emission amounts of substances covered by the Community Emission Trading Scheme* (Dz. U. Nr 183, poz. 1142).

Data on clinker production provided in ETS reports are comparable to data collected by GUS (differences in production values between GUS data and data based on ETS reports are mostly below 1%).

CO_2 emissions from clinker production in period 1988-2015 are shown in figure 4.2.3.

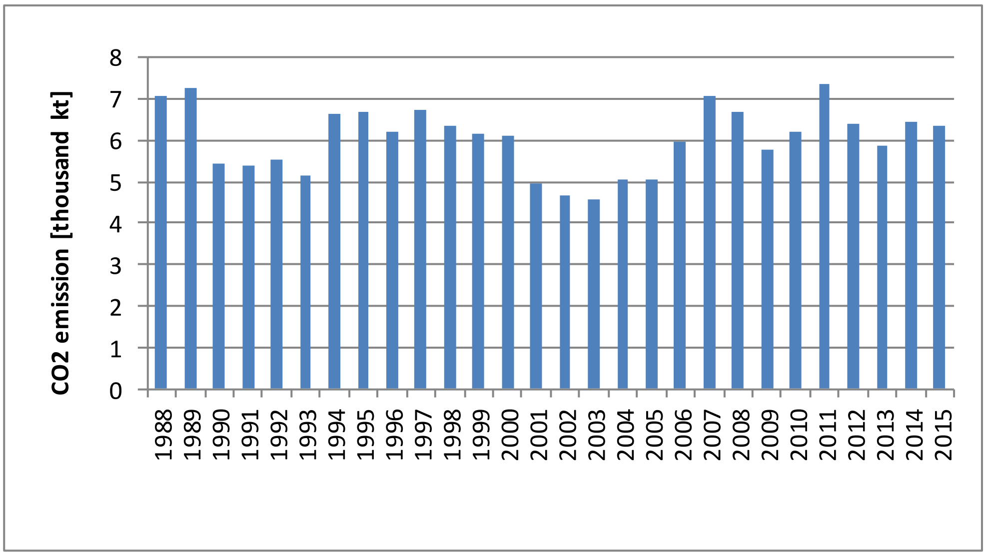

Figure 4.2.3. CO_2 process emission for clinker production in 1988-2015

4.2.2.2. Lime Production (CRF sector 2.A.2)

Emission of CO_2 from lime production was calculated based on lime production data from Central Statistical Office. Since 2000 activity data divided into quicklime, hydrated lime and hydraulic lime has been applied and emission has been estimated for each type of lime separately using default emission factors for high calcium lime and hydraulic lime from IPCC 2006 GLs (tab. 2.4. p. 2.22). For hydrated lime appropriate correction was considered. Due to the lack of the disaggregated lime production data for the years before 2000, the IEFs (average emission factor from the years 2000-2013) and total lime production was used for CO_2 emission estimation.

Dolomite lime production is given separately in the Polish statistical yearbook, as calcined and sintered dolomite. Emission from production of this type of lime was estimated based on dolomite consumption in production process according to the study [Galos 2013]. Emission from dolomite lime production was added to the emission from production of other lime types.

According to information from lime production sector vertical shaft kilns are used in lime production in Poland. This type of kilns generate small amounts of LKD, and it is judged that correction factor for LKD would be negligible and do not need to be estimated (2006 IPCC GLs, Vol. 3, p. 2.24).

The figure 4.2.4 presents data concerning lime production (including dolomite lime) for the entire period. CO_2 emissions in period 1988-2015 are shown in the figure 4.2.5.

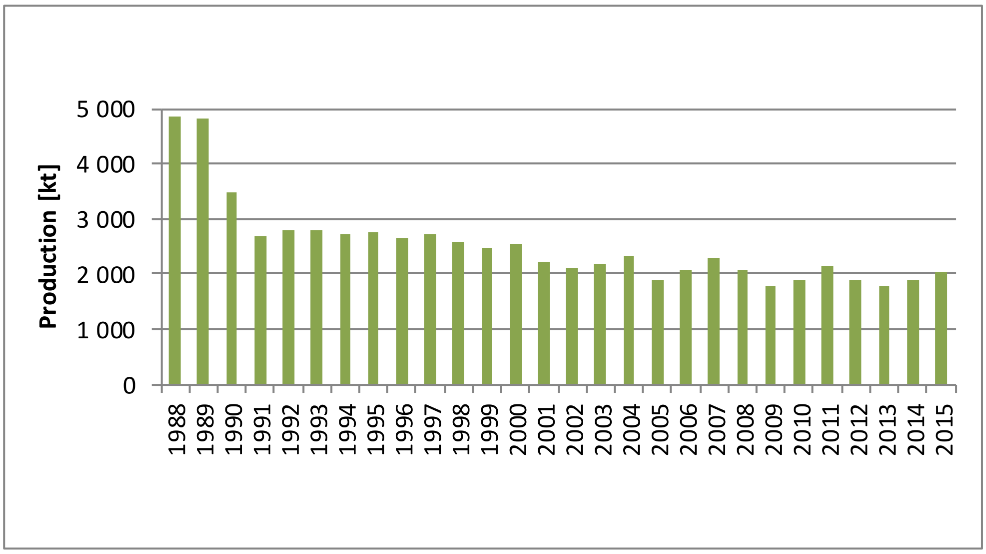

Figure 4.2.4. Lime (including dolomite lime) production in 1988-2015

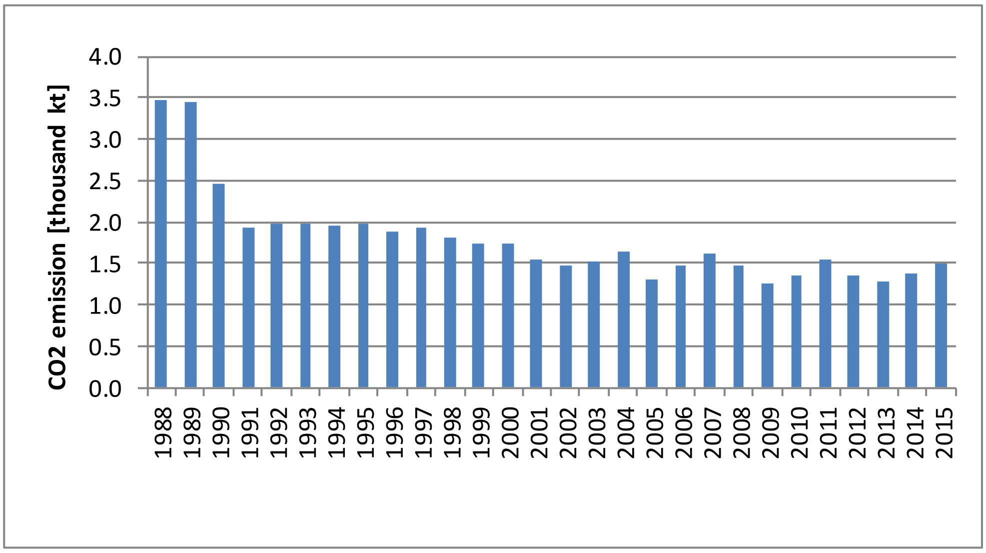

Figure 4.2.5. CO_2 process emission for lime production in 1988-2015

4.2.2.3. Glass production (CRF sector 2.A.3)

Emission of CO_2 from lime production was calculated based on glass production data from Central Statistical Office. Default CO_2 emission factor amounted to 0.2 tonnes CO_2/tonne glass was applied for emission estimation in entire period, according to IPCC 2006 GLs – equation 2.13 p. 2.29. In accordance with information obtained from glass production sector, cullet ratio of 20% was assumed.

Glass production and CO_2 emission values from that process in period 1988-2015 are shown in the figures 4.2.6 and 4.2.7 respectively.

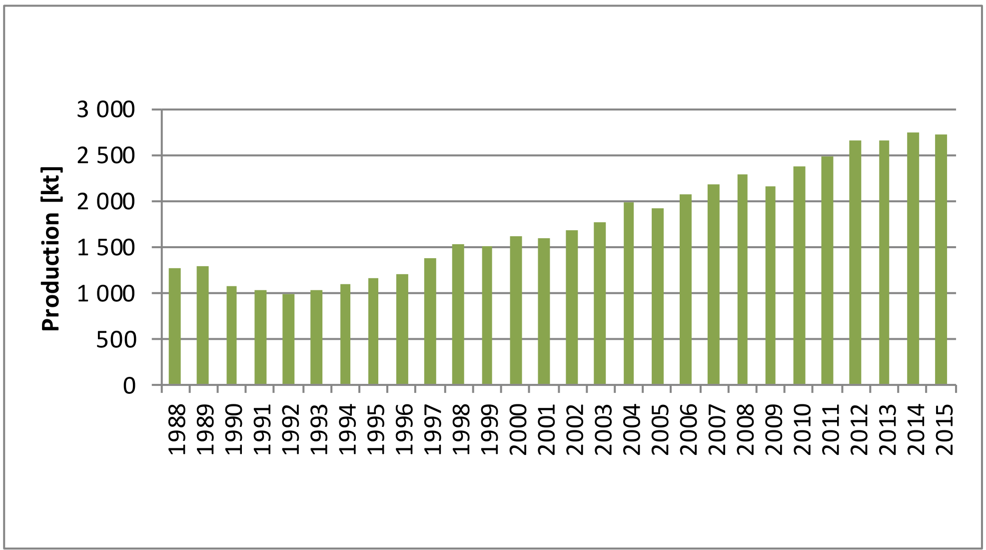

Figure 4.2.6. Glass production in 1988-2015

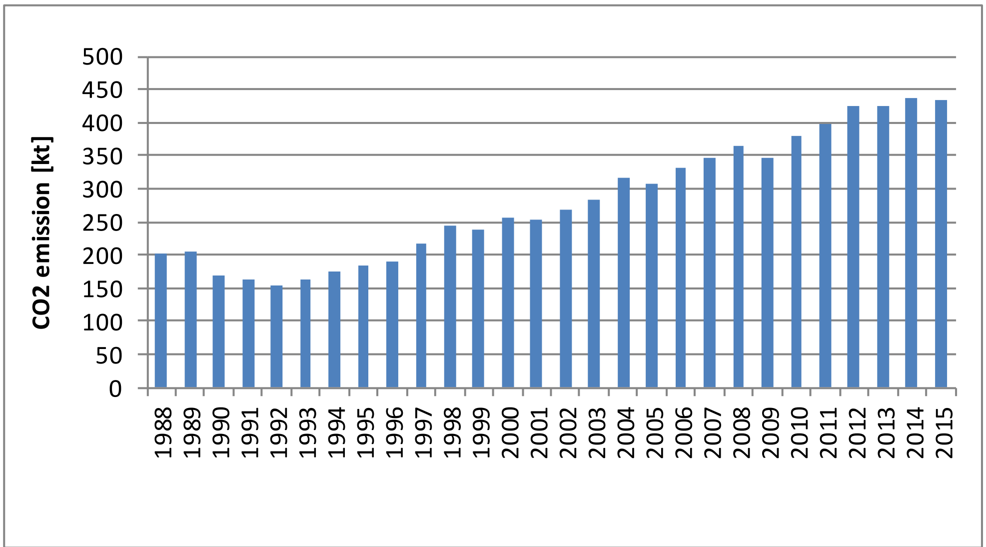

Figure 4.2.7. CO_2 process emission for glass production in 1988-2015

4.2.2.4. Other processes uses of carbonates (CRF sector 2.A.4)

This category includes CO_2 emission from sources as follows:

- ceramics
- other uses of soda ash
- non-metallurgical magnesium production
- other

<u>2.A.4.a. Ceramics</u>

Estimation of CO_2 emission from ceramics was based on ceramics production data from Central Statistical Office (Fig. 4.2.8). CO_2 emission factors for the years 2005-2015 was grounded on the verified reports for ceramic installation covered by EU ETS [KOBiZE 2016].

EFs values, expressed in kg CO_2/t of ceramics, were following:

2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
56.69	48.20	54.30	53.88	48.52	51.44	48.77	49.41	49.86	43.47	50.99

For the years before 2005 average value of EFs from 2005-2013, amounted to 51.23 kg CO_2/t of ceramics, was applied.

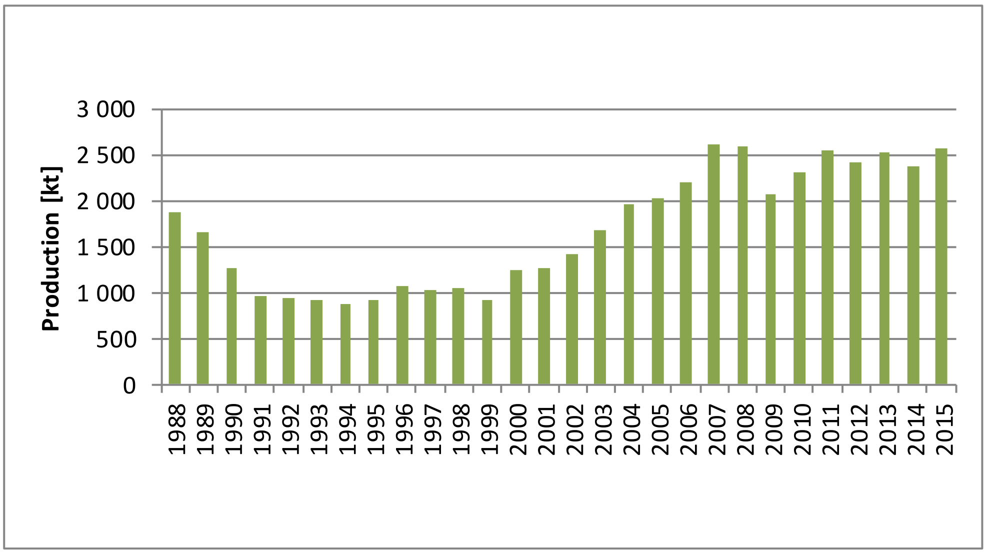

Figure 4.2.8. Ceramic production in 1988-2015

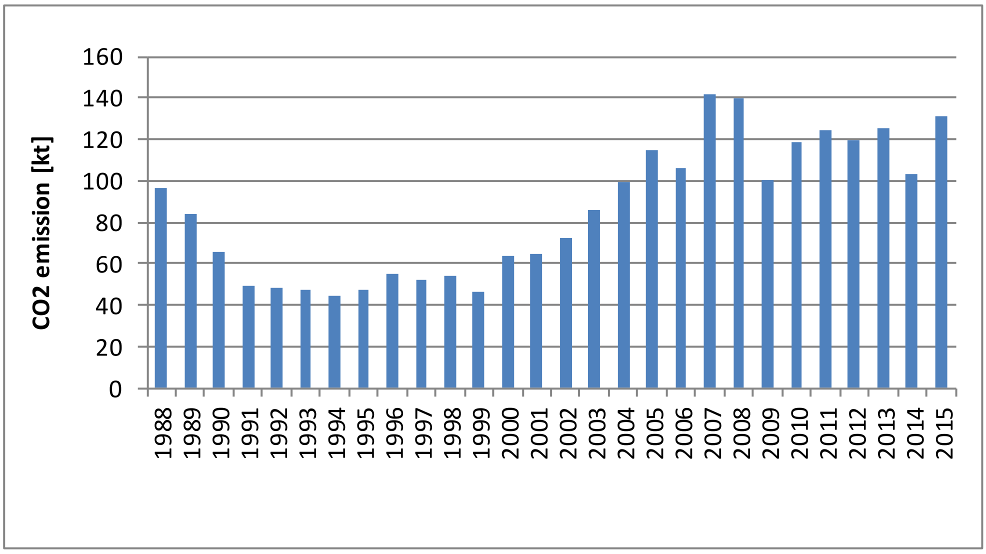

Figure 4.2.9. CO_2 process emission from ceramics in 1988-2015

2.A.4.b. Other uses of soda ash

CO_2 emission from soda ash use was estimated based on annually consumption of soda ash, which was published in GUS yearbook: *Materials Management in 2015* [GUS 2016f]. Additionally to assumed that half of soda ash use was consumed in glass and ceramics production and that amount was subtracted from AD because it was included in 2.A.3 and 2.A.4.a subcategories respectively.

EF amounting to 414.92 kg CO_2/t of soda ash used was applied for inventory calculation for the entire period (EF was taken from IPCC 2006 GLs, tab. 2.1. p. 2.7).

CO_2 emission for the years 1992-2015 was estimated based on data concerning soda ash consumption taken from *Materials Management* [GUS 1994f-2016f]. For years before 1992, due to lack of the published statistical data, the assumption was made, that total soda ash consumption amounts to 50% of soda ash production. That assumption was based on the analysis, which considered production [GUS 1998e-2000e] and use of soda ash in the period 1992-1999.

CO_2 emission values from soda ash use in 2.A.4.b subcategories, for entire period 1988-2015, were presented in the figure 4.2.10.

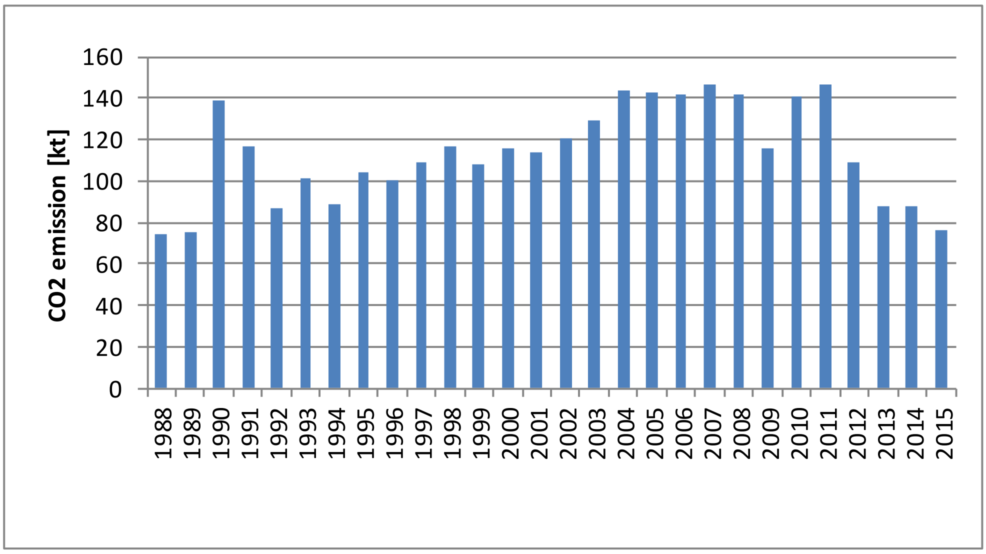

Figure 4.2.10. CO_2 emission values from soda ash use in 2.A.4.b subcategory in the years 1988-2015

2.A.4.c. Non-metallurgical magnesium production

Magnesium has not been produced in Poland [PIG-PIB 2014].

2.A.4.d. Other

CO_2 emission from limestone use as a sorbent in lime wet flue-gas desulfurization, FGD in FBB (fluid bad boiler) and other method of flue gas desulfurization was considered under this subcategory. Estimation of emission was based on study [Galos 2013]. The results were presented in figure 4.2.11. Details concerning calculations of CO_2 emission for 2.A.4.d category were provided in the Annex 3.1.

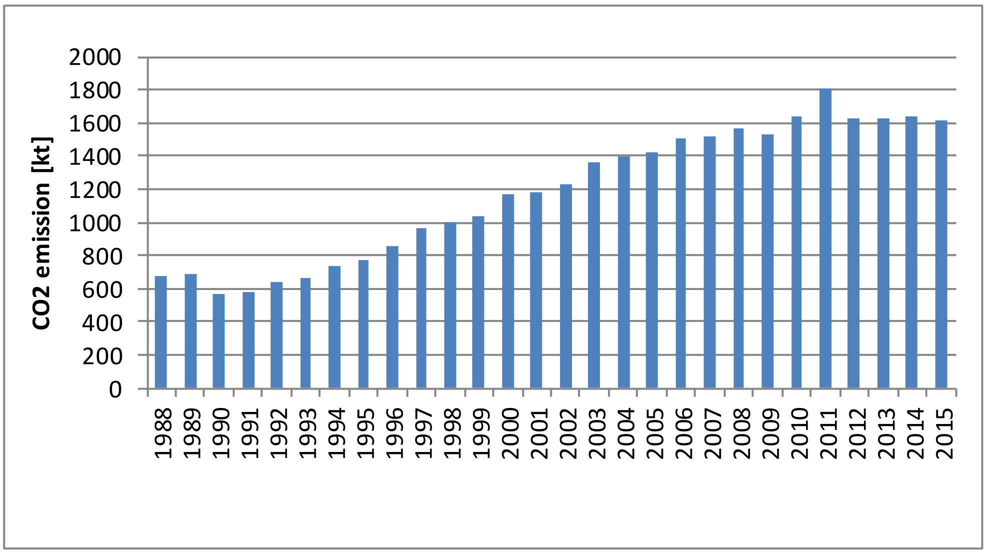

Figure 4.2.11. CO_2 emission from carbonate use in 2.A.4.d subcategory for 1988-2015

4.2.3. Uncertainties and time-series consistency

Uncertainty analysis for the year 2015 for IPCC sector *2.Industrial processes and product use* was estimated with use of approach 1 described in 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Simplified approach was based on the assumptions that every value is independent and

probability distribution is symmetric. Results of the sectoral uncertainty analysis are given below. More details on uncertainty assessment of whole inventory are given in annex 8.
Recalculation of data for years 1988-2014 ensured consistency for whole time-series.

2015	CO2 [kt]	CH4 [kt]	N2O [kt]	CO_2 Emission uncertainty [%]	CH_4 Emission uncertainty [%]	N_2O Emission uncertainty [%]
2. Industrial processes and product use	**18 558.88**	**2.62**	**2.91**	3.4%	31.6%	39.6%
A. Mineral Products	10 088.56			5.7%		
B. Chemical Industry	5 141.13	2.02	2.51	4.2%	40.6%	45.4%
C. Metal Production	2 596.25	0.60	0.00	5.1%	18.1%	0.0%
D. Non-energy Products from Fuels and Solvent Use	732.94			14.3%		
G. Other			0.40			40.3%

4.2.4. Source-specific QA/QC and verification

Activity data used in the GHG inventory concerning industry sector come from yearbooks published by the Central Statistical Office (GUS). GUS is responsible for QA/QC of collected and published data. Data on selected production is compared to data collected from installations/entities covered by the EUETS. Depending on type of emission factor and *Tier* method applied in the GHG inventory, EF is compared with plant specific emission factor or the default one, respectively.

Data relating to EUETS installations are verified by independent reviewers and by verification unit established in the National Centre for Emissions Management (KOBiZE). Additionally data on industrial production is compared with public statistics in case where entire sector is covered by EUETS.
Calculations in industry sector were examined with focus on formulas, units and trends consistency. Generally QC procedures follow QA/QC plan presented in Annex 7.

4.2.5. Source-specific recalculations

CO_2 emission from glass production was corrected in entire period 1988-2014 because of the cullet ratio of 20% was assumed instead of default value of 50%.

Table. 4.2.2. Changes of GHG emission values in 2.A. subcategory as a result of recalculations

Change	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**
				CO2				
kt	76.020	77.220	63.480	61.380	58.128	60.909	64.970	69.036
%	0.7	0.7	0.7	0.8	0.7	0.8	0.7	0.7
Change	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
				CO2				
kt	71.406	81.684	91.654	89.484	96.321	94.751	100.395	105.942
%	0.8	0.8	1.0	1.0	1.0	1.2	1.3	1.4
Change	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
				CO2				
kt	118.578	114.651	123.778	130.301	136.544	129.600	142.620	148.680
%	1.4	1.4	1.3	1.2	1.3	1.4	1.5	1.3
Change	**2012**	**2013**	**2014**					
		CO2						
kt	159.120	159.378	163.876					
%	1.6	1.7	1.6					

4.2.6. Source-specific planned improvements

No improvements are planned at the moment.

4.3. Chemical industry (CRF sector 2.B)

4.3.1. Source category description

Estimation of emissions in 2.B. *Chemical industry* are carried out in sub-categories listed below:

a) *Ammonia production* (2.B.1)
b) *Nitric acid production* (2.B.2)
c) *Adipic acid production* (2.B.3)
d) Caprolactam, glyoxal and glyoxylic acid production (2.B.4)
e) *Carbide production* (2.B.5)
f) *Titanium dioxide production* (2.B.6)
g) *Soda ash production* (2.B.7)
h) *Petrochemical and carbon black production* (2.B.8)

Subsectors 2.B.1. *Ammonia production* is the largest contributors to emissions from this category (see figure 4.3.1) – over 65% in 2015. Adipic acid was produced up to 1994.

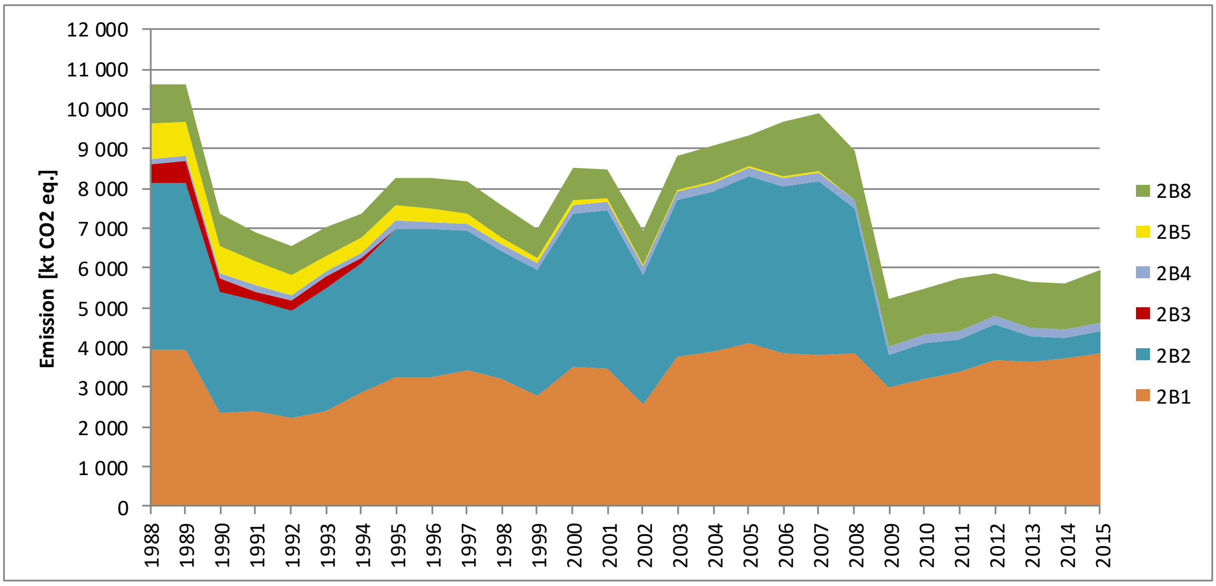

Figure 4.3.1. Emissions from *Chemical industry* category in years 1988-2015 according to subcategories

4.3.2. Methodological issues

4.3.2.1. Ammonia production (CRF sector 2.B.1)

CO_2 emissions for ammonia production are estimated based on the data on natural gas use in this process (natural gas consumption for the years 1988-2015 was presented in Annex 3.2). The amount of natural gas consumption expressed in volume units was taken from [GUS 2016e]. In order to calculate CO_2 emission, country specific carbon content in natural gas was estimated, based on the data from verified EU ETS reports provided by ammonia production installations [KOBiZE 2016]. The value of C content was estimated as 0.545 kg C/m^3 for 2015. Analogical content for 2014 accounted for 0.542 kg C/m^3. For 2013 it amounted to 0.544 kg C/m^3 and the same value was applied for previous years back to 1988. According to above-mentioned information, the CO_2 process emission from ammonia production was calculated using the following formula:

$$E_{CO2} = Z_{\text{natural gas}} * C_{content}*44/12$$

where:
E_{CO2} – CO_2 process emission from ammonia production [t]
$Z_{\text{natural gas}}$ – natural gas use [thousands m^3]
$C_{content}$ – carbon content in natural gas [kg C/m^3]

This method was used for entire period: 1988-2015. In years 1989-1990, also coke-oven gas was used for ammonia production and this fact was reflected in the inventory calculations (Annex 3.2). The coke-oven gas consumption was taken in energy units – also based on G-03 reports – and the carbon content factor is taken from IPCC [IPCC 2006].

CO_2 recovered for fertilizer urea production was deducted in calculation of emission for 2B1 subcategory. The estimation of CO_2 amounts for subtraction in entire period 1988-2015 were detailed presented in the Annex 3.2.

CO_2 process emissions in the period: 1988-2015 are shown in figure 4.3.2 while the ammonia production values [GUS 1989e-2016e] are presented in figure 4.3.3.

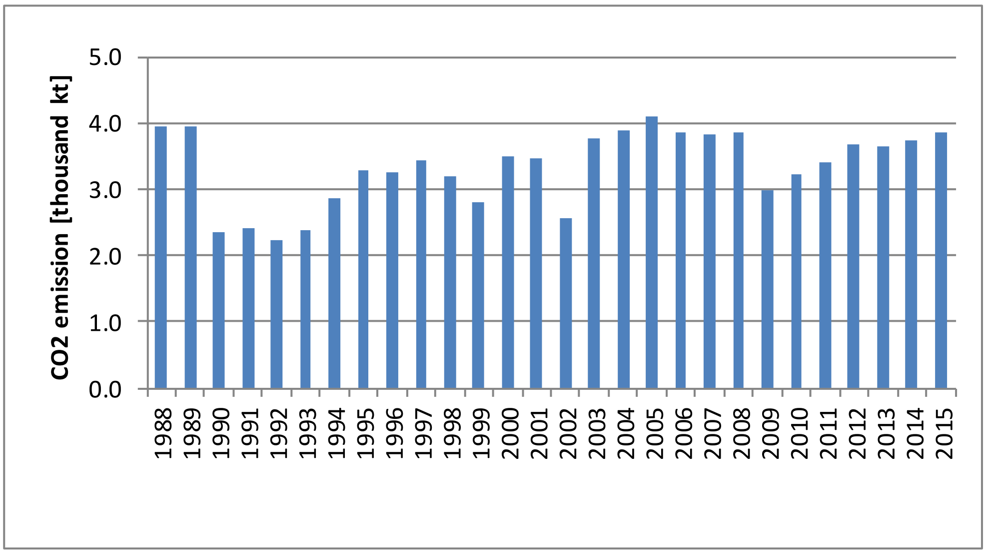

Figure 4.3.2. CO_2 process emission from ammonia production in 1988-2015 (including subtraction of CO_2 connected with fertilizer urea production)

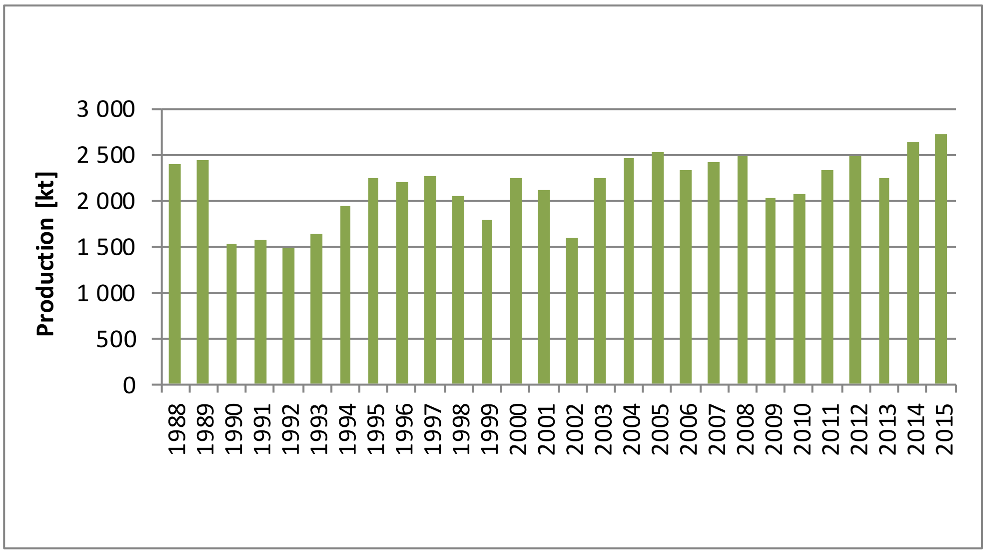

Figure 4.3.3. Production of ammonia in 1988-2015

4.3.2.2. Nitric acid production (CRF sector 2.B.2)

Estimation of N_2O emission from nitric acid production for 2015 was based on annual HNO_3 production data from [GUS 2016b]. The country specific emission factor of 0.72 kg/t nitric acid for 2015 was estimated based on the reports from all producers of HNO_3 [KOBiZE 2016]. The N_2O emission factors for years 2005-2014 were calculated also based on the reports provided by installations of nitric acid production.

The values of N_2O EFs applied for the years 2005-2015, expressed in kg CO_2/t HNO_3, were as follows:

2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
6.36	6.37	6.43	5.40	1.31	1.34	1.21	1.28	0.92	0.70	0.72

Emission factors mentioned above were estimated as weighted average of plant specific emission factors obtained from all nitric acid producers (from 5 installations located in 4 enterprises).

Decrease of the N_2O EF value from nitric acid production in 2008 and its significant drop in 2009 -2011 are the result of the implementation of the JI projects. N_2O catalytic decompose inside the oxidation ammonia reactor is the abatement technology applied in these installations.

Decline of emission factor value in 2012-2014 is mainly the result of change the catalyst for more effective one in the largest HNO_3 production installation.
Individual data obtained from nitric acid producers is confidential, so was not published in the NIR (it could be available for ERT review purpose only).

For the period 1988-2004, N_2O EF amounted to 6.47 kg/t nitric acid was applied. This country specific emission factor was taken from [Kozłowski 2001].

Activity data (i.e. HNO_3 production) for estimation of nitrous oxide emissions in 2.B.2 subcategory were taken from [GUS 1989b-2015b] for the entire period 1988-2015. The amount of production and N_2O emissions from nitric acid production are shown in figures 4.3.4 and 4.3.5, respectively.

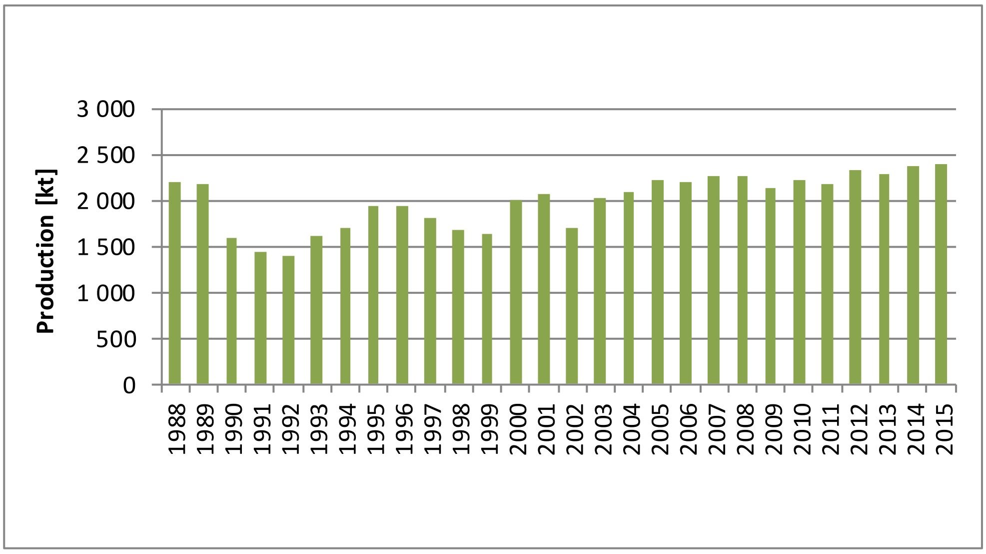

Figure 4.3.4. Production of nitric acid in 1988-2015

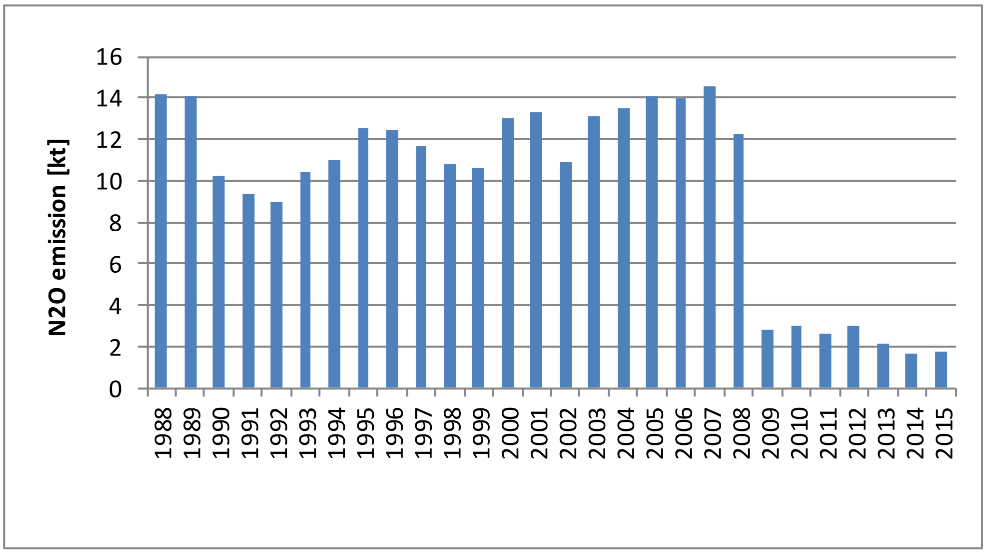

Figure 4.3.5. N_2O process emission for nitric acid production in 1988-2015

4.3.2.3. Adipic acid production (CRF sector 2.B.3)

Production of adipic acid was continued up to 1994. Activity data concerning adipic acid production was taken from the only adipic production plant.
N_2O emission factor for this category, which is equal 300 kg N_2O/ t, was taken from table 3.4, p. 3.30, 2006 IPCC GLs [IPCC 2006].

4.3.2.4. Caprolactam, glyoxal and glyoxylic acid production (CRF sector 2.B.4)

Caprolactam Production

Data on annual caprolactam production for inventory calculation purpose was taken from [GUS 2016b]. Applied country specific emission factor of N_2O, which value is 4.74 kg N_2O/t caprolactam produced, was assessed based on the Polish study [Kozłowski 2001].
For the entire time series the same activity data source – GUS publications [GUS 1989b-2016b] and the same emission factor were applied.

Glyoxal and glyoxylic acid production

Glyoxal and glyoxylic acid have not been produced in Poland.

4.3.2.5. Carbide production (CRF sector 2.B.5)

CO_2 emission from calcium carbide category was estimated for years 1988-2007 based on annual production amounts taken from [GUS 1989b-2008b]. Starting from 2008 carbide is no longer produced in Poland.
EF equal 2190 kg CO2/t of carbide (i.e.: 1090 kg CO_2/t carbide from production + 1100 kg CO_2/t carbide from use) was applied for CO_2 emission estimation in entire period 1988-2007. The factors given above were taken from tab. 3.8, 2006 IPCC GLs [IPCC 2006].

Silicon carbide has not been produced in Poland.

4.3.2.6. Titanium dioxide production (CRF sector 2.B.6)

Titanium dioxide is produced in Poland in sulphate route process, so it was assumed, that the GHG emission is insignificant from TiO_2 production (in accordance with 2006 IPCC GLs (Chapter 3.7, p. 3.47)

4.3.2.7. Soda ash production (CRF sector 2.B.7)

In Poland, soda ash is produced in the Solvay process. Emission of CO_2 from this process was assumed as 0 as coke consumption in soda ash production process is included in fuel use in *Final Energy Consumption - Chemical and Petrochemical* category in Polish energy balance and CO_2 emission is accounted in 1.A.2.c IPCC sector.

4.3.2.8. Petrochemical and carbon black production (CRF sector 2.B.8)

a. Methanol production

Process emissions of CO_2 and CH_4 from methanol production for the entire period 1988-2015 were estimated based on data on annual production from [GUS 1989b-2016b]. CO_2 EF = 670 kg CO_2/t from tab. 3.12 of 2006 IPCC GLs [IPCC 2006] was applied. CH_4 emission values were calculated based on CH_4 EF = 2.3 kg CH_4/t [IPCC 2006].

b. Ethylene production

CO_2 and CH_4 process emissions related to ethylene production were estimated for the entire period 1988-2015 based on the data on annual production amounts taken from [GUS 1989b-2016b]. CO_2 EF = 1903 kg CO_2/t was applied. It is value of CO_2 EF (for default feedstock) given in tab. 3.14 of 2006 IPCC GLs adjusted by recommended regional factor (110% in case of Eastern Europe; tab. 3.15) [IPCC 2006]. CH_4 emission values were calculated based on CH_4 EF = 3.0 kg CH_4/t according to the table 3.16 [IPCC 2006].

c. Ethylene dichloride and vinyl chloride monomer production

CO_2 and CH_4 emission in this IPCC category was estimated based on vinyl chloride monomer production. Activity data for the years 2002-2015 was taken from Central Statistical Office. Data for the years 1988-2001 come directly from VCM producer. CO_2 EF amounted to 294.3 kg CO2/t VCM produced, recommended for balanced process (default process) in the table 3.17 of 2006 IPCC GLs [IPCC 2006], was applied for emission estimation in entire period. CH_4 emission was calculated using EF=0.0226 kg/t VCM produced (tab. 3.19, 2006 IPCC GLs).

d. Ethylene oxide production

Ethylene oxide production amounts from Central Statistical Office were used for estimation of CO_2 and CH_4 emissions. Default EFs for both CO_2 and CH_4 were applied in order to calculation of emissions. Utilized EF values were as follow: CO_2 EF = 863 kg CO_2/tonne ethylene oxide (tab. 3.20, 2006 GLs), CH_4 EF = 1.79 kg CH_4/tonne ethylene oxide (tab. 3.21, 2006 GLs).

e. Acrylonitrile production

According to data from Central Statistical Office production of acrylonitrile in Poland occurred only in the following years: 1988-1990 and 1996-2003. Emission of CO_2 and CH_4 from this production was estimated according to 2006 IPCC GLs. CO_2 EF = 1000 kg CO_2/tonne acrylonitrile produced (tab. 3.22, 2006 GLs) and CH_4 EF = 0.18 kg CH_4/tonne acrylonitrile produced (p. 3.79, 2006 GLs) were applied for GHG inventory purpose.

f. Carbon black production

CO_2 and CH_4 emissions from production of carbon black was estimated based on annual carbon black production taken from [GUS 1989b-2000b] and [GUS 2001e-2016e] respectively. CO_2 EF equal to 2620 kg CO_2/tonne carbon black produced (tab. 3.23, 2006 GLs) and CH_4 EF = 0.06 kg CH_4/tonne carbon black produced (tab. 3.24, 2006 GLs) were used.

g. Other

- Styrene Production

Data on styrene production applied for emission estimation was obtained from [GUS 1996e-2016e] for the years 1995-2015 and directly from the only styrene producer for previous years (1988-1994). Methane emissions values for the entire period 1988-2015 were estimated by applying the same emission factor of 4 kg CH_4/t styrene produced [IPCC 1997].

4.3.3. Uncertainties and time-series consistency

See chapter 4.2.3

4.3.4. Source-specific QA/QC and verification

See chapter 4.2.4

4.3.5. Source-specific recalculations

CO_2 recovered from ammonia production process and consumed in fertilizer urea production was deducted in calculation of emission from 2.B.1 IPCC subcategory in the entire reported period.

Table. 4.3.1. Changes of GHG emission values in 2.B. subcategory as a result of recalculations

Change	1988	1989	1990	1991	1992	1993	1994	1995
CO2								
kt	-568.720	-593.217	-565.996	-484.732	-444.928	-415.953	-512.502	-604.539
%	-9.0	-9.4	-13.0	-11.6	-11.6	-10.7	-11.9	-12.3
Change	1996	1997	1998	1999	2000	2001	2002	2003
CO2								
kt	-544.713	-431.901	-364.084	-375.909	-414.916	-270.271	-356.639	-460.569
%	-11.2	-8.8	-8.1	-9.5	-8.6	-6.0	-9.4	-9.0
Change	2004	2005	2006	2007	2008	2009	2010	2011
CO2								
kt	-453.501	-513.804	-517.234	-538.648	-573.074	-635.991	-530.727	-718.463
%	-8.7	-9.5	-9.0	-9.3	-10.2	-13.4	-10.9	-13.4
Change	2012	2013	2014					
CO2								
kt	-791.034	-760.286	-823.423					
%	-14.4	-13.8	-14.5					

4.3.6. Source-specific planned improvements

No improvements are planned at the moment.

4.4. Metal industry (CRF sector 2.C)

4.4.1. Source category description

Estimation of emissions in 2.C. *Metal Industry* are carried out in sub-categories listed below:

1. *Iron and steel production* (2.C.1)
   a. *Steel* (2.C.1.a)
   b. *Pig iron* (2.C.1.b)
   c. *Direct reduced iron* (2.C.1.c)
   d. *Sinter* (2.C.1.d)
   e. *Pellet* (2.C.1.e)
   f. *Other* (2.C.1.f)
2. *Ferroalloys production* (2.C.2)
3. *Aluminium production* (2.C.3)
4. *Magnesium production* (2.C.4)
5. *Lead production* (2.C.5)
6. *Zinc production* (2.C.6)
7. *Other* (2.C.7)

Subsector 2.C.1. *Iron and Steel Production* is by far the largest contributor to emissions from this category (see figure 4.4.1) – over 78% in 2015.

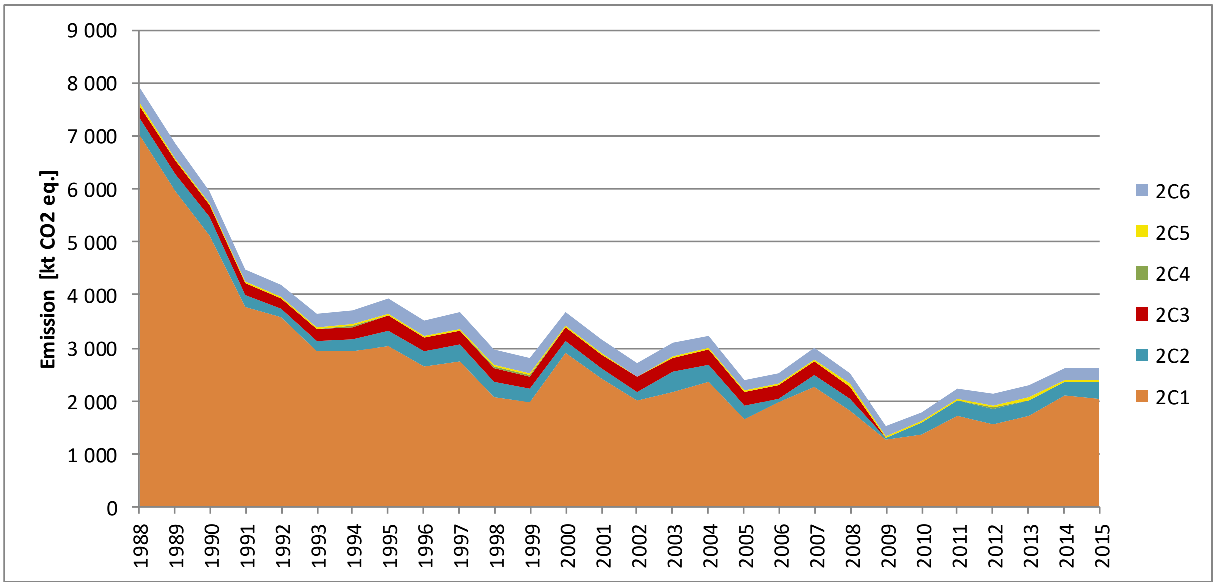

Figure 4.4.1. Emissions from *Metal industry* sector in years 1988-2015 according to subcategories

4.4.2. Methodological issues

4.4.2.1. Iron and steel production (CRF sector 2.C.1)

4.4.2.1.a. Steel (CRF sector 2.C.1.a)

Basic oxygen furnace steel production

Amount of CO_2 process emission from steel production in basic oxygen furnace was estimated based on the carbon balance in converter process (table 4.4.1). For the years 1988-2006 the Polish Steel Association (HIPH) study [HIPH 2007] was the main source of data for C balance purpose. The HIPH data was supplemented for the years 1988-2004 with the information from questionnaires collected by the National Centre for Emissions Management (KOBiZE) for installations covered by EU ETS and starting from 2005 with the data from verified reports concerning CO_2 emission, prepared as part of EU ETS. Based on mentioned verified reports, C balances for basic oxygen steel plants were prepared for the years not included in the HIPH study, it means for the period 2007-2015. Steel production amounts applied in the C balance were in accordance with data published in GUS yearbook [2005b-2016b].

Table 4.4.1. Carbon balance for steel production in basic oxygen process in years 1988-2015

	1988	1989	1990	1991	1992	1993	1994	1995	1996
CHARGE									
Pig iron [t]	6 437 194	6 274 714	6 212 430	4 835 755	5 279 309	5 205 226	5 873 001	6 440 439	5 669 525
Scrap [t]	1 895 954	1 841 725	1 840 367	1 468 313	1 595 404	1 573 016	1 796 072	1 962 554	1 725 579
Carbon pick-up agent [t]	0	0	0	0	0	0	0	0	0
Ferroalloys [t]	61 135	58 311	57 193	45 416	48 066	46 278	53 217	57 027	51 883
Dolomite [t]	187 960	182 054	189 020	144 459	155 741	144 853	163 776	177 073	156 867
Technological indicator [t/t of steel]									
Pig iron	0.867	0.870	0.862	0.841	0.845	0.845	0.835	0.838	0.839
Scrap	0.2554	0.2554	0.2554	0.2554	0.2554	0.2554	0.2554	0.2554	0.2554
Carbon pick-up agent	0	0	0	0	0	0	0	0	0
Ferroalloys	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.007	0.008
Dolomite	0.025	0.025	0.026	0.025	0.025	0.024	0.023	0.023	0.023
Material-specific carbon content									
Pig iron [t C/t]	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Scrap [t C/t]	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Carbon pick-up agent [t C/TJ]	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5
Ferroalloys [t C/t]	0.033	0.033	0.033	0.033	0.032	0.033	0.033	0.033	0.032
Dolomite [t C/t]	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130
Carbon contents in charge components [t C]									
Pig iron	257 488	250 989	248 497	193 430	211 172	208 209	234 920	257 618	226 781
Steel scrap	7 584	7 367	7 361	5 873	6 382	6 292	7 184	7 850	6 902
Carbon pick-up agent	0	0	0	0	0	0	0	0	0
Ferroalloys	2 019	1 936	1 868	1 481	1 557	1 518	1 741	1 862	1 686
Dolomite	24 435	23 667	24 573	18 780	20 246	18 831	21 291	23 019	20 393
Carbon contents in charge – SUM [t]	**291 526**	**283 959**	**282 299**	**219 564**	**239 357**	**234 850**	**265 136**	**290 349**	**255 762**
OUTPUT									
Steel [t]	**7 424 676**	**7 212 315**	**7 206 995**	**5 750 006**	**6 247 703**	**6 160 031**	**7 033 534**	**7 685 488**	**6 757 479**
Material-specific carbon content									
Steel [t C/t]	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Carbon content in products [t C]									
Steel	29 699	28 849	28 828	23 000	24 991	24 640	28 134	30 742	27 030
Carbon content in products – SUM [t]	**29 699**	**28 849**	**28 828**	**23 000**	**24 991**	**24 640**	**28 134**	**30 742**	**27 030**
C emission from steel production [t]	261 827	255 109	253 471	196 564	214 366	210 210	237 002	259 607	228 732
CO_2 process emission from steel production [kt]	**960.033**	**935.401**	**929.394**	**720.734**	**786.009**	**770.769**	**869.006**	**951.893**	**838.684**
CO_2 EMISSION FACTOR [kg CO_2/t of steel]	**129.30**	**129.69**	**128.96**	**125.34**	**125.81**	**125.12**	**123.55**	**123.86**	**124.11**

Table 4.4.1. Carbon balance (cont.) for steel production in basic oxygen process in years 1988-2015

	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
CHARGE									
Pig iron [t]	6 311 208	5 233 149	4 640 291	6 491 867	5 440 047	5 296 410	5 629 786	6 304 253	4 538 670
Scrap [t]	1 923 174	1 588 976	1 303 910	1 657 053	1366064.9	1 360 557	1 424 125	1 608 909	1 147 906
Carbon pick-up agent [t]	0	0	0	0	1 201	2 645	4 286	1 689	1 205
Ferroalloys [t]	59 896	50 915	45 285	57 840	50 035	49 610	48 197	57 157	56 566
Dolomite [t]	188 810	157 145	141 317	174 301	156 426	161 404	127 127	162 673	191 374
Technological indicator [t/t of steel]									
Pig iron	0.838	0.841	0.851	1.047	1.070	1.095	1.078	1.088	1.078
Scrap	0.2554	0.2554	0.2391	0.2437	0.2346	0.2346	0.2346	0.2346	0.2346
Carbon pick-up agent	0	0	0	0	0.0002	0.0005	0.0007	0.0002	0.0002
Ferroalloys	0.008	0.008	0.008	0.009	0.009	0.009	0.008	0.008	0.012
Dolomite	0.025	0.025	0.026	0.026	0.027	0.028	0.021	0.024	0.039
Material-specific carbon content									
Pig iron [t C/t]	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Scrap [t C/t]	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Carbon pick-up agent [t C/TJ]	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5
Ferroalloys [t C/t]	0.033	0.033	0.032	0.033	0.032	0.032	0.032	0.033	0.031
Dolomite [t C/t]	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130	0.130
Carbon contents in charge components [t C]									
Pig iron	252 448	209 326	185 612	259 675	217 602	211 856	225 191	252 170	181 547
Steel scrap	7 693	6 356	5 216	6 628	5 464	5 442	5 696	6 436	4 592
Carbon pick-up agent	0	0	0	0	992	2 184	3 539	1 395	995
Ferroalloys	1 951	1 659	1 466	1 905	1 623	1 598	1 560	1 860	1 779
Dolomite	24 545	20 429	18 371	22 659	20 335	20 983	16 527	21 147	24 879
Carbon contents in charge – SUM [t]	**286 637**	**237 769**	**210 665**	**290 867**	**246 016**	**242 063**	**252 514**	**283 008**	**213 791**
OUTPUT									
Steel [t]	**7 531 274**	**6 222 532**	**5 452 751**	**6 799 681**	**5 822 518**	**5 799 042**	**6 069 985**	**6 857 583**	**4 892 671**
Material-specific carbon content									
Steel [t C/t]	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Carbon content in products [t C]									
Steel	30 125	24 890	21 811	27 199	23 290	23 196	24 280	27 430	19 571
Carbon content in products – SUM [t]	**30 125**	**24 890**	**21 811**	**27 199**	**23 290**	**23 196**	**24 280**	**27 430**	**19 571**
C emission from steel production [t]	256 512	212 879	188 854	263 668	222 726	218 867	228 234	255 578	194 220
CO_2 process emission from steel production [kt]	**940.545**	**780.557**	**692.464**	**966.782**	**816.662**	**802.513**	**836.857**	**937.119**	**712.141**
CO_2 EMISSION FACTOR [kg CO_2/t of steel]	**124.89**	**125.44**	**126.99**	**142.18**	**140.26**	**138.39**	**137.87**	**136.65**	**145.55**

Table 4.4.1. (cont.) Carbon balance for steel production in basic oxygen process in years 1988-2015

	2006	2007	2008	2009	2010	2011	2012	2013	2014
CHARGE									
Pig iron [t]	5 338 401	5 723 961	4 892 172	2 988 979	3 599 854	3 942 754	3 934 606	3 951 192	4 620 431
Scrap [t]	1 352 895	1 414 926	1 105 439	727 586	965 296	1 106 613	912 706	925 533	1 046 608
Carbon pick-up agent [t]	1 036	753	8 270	12 826	16 033	24 905	8 845	9 044	7 874
Ferroalloys [t]	68 765	71 480	65 149	40 273	53 926	59 738	53 477	57 253	66 718
Dolomite [t]	35 776	37 149	18 930	10 786	16 375	14 220	15 560	20 627	15 305
Technological indicator [t/t of steel]									
Pig iron	1.080	0.924	0.936	0.924	0.901	0.891	0.908	0.874	0.892
Scrap	0.2346	0.228	0.212	0.225	0.242	0.250	0.211	0.205	0.202
Carbon pick-up agent	0.0002	0.000	0.002	0.004	0.004	0.006	0.002	0.002	0.002
Ferroalloys	0.012	0.012	0.012	0.012	0.013	0.014	0.012	0.013	0.013
Dolomite	0.006	0.006	0.004	0.003	0.004	0.003	0.004	0.005	0.003
Material-specific carbon content									
Pig iron [t C/t]	0.04	0.042	0.042	0.043	0.042	0.042	0.043	0.043	0.043
Scrap [t C/t]	0.004	0.003	0.008	0.008	0.009	0.009	0.008	0.008	0.008
Carbon pick-up agent [t C/t]	0.826	0.899	0.820	0.845	0.823	0.806	0.823	0.833	0.853
Ferroalloys [t C/t]	0.029	0.032	0.035	0.035	0.033	0.028	0.031	0.031	0.033
Dolomite [t C/t]	0.130	0.130	0.124	0.125	0.125	0.125	0.126	0.125	0.126
Carbon contents in charge components [t C]									
Pig iron	213 536	239 730	207 333	127 337	150 438	165 971	167 334	168 816	197 002
Steel scrap	5 412	4 297	8 457	5 785	9 109	9 865	7 292	6 999	8 255
Carbon pick-up agent	855	677	6 783	10 839	13 198	20 075	7 277	7 538	6 714
Ferroalloys	2 021	2 288	2 249	1 427	1 761	1 673	1 681	1 769	2 222
Dolomite	4 649	4 829	2 341	1 345	2 047	1 780	1 960	2 586	1 924
Carbon contents in charge – SUM [t]	**226 474**	**251 821**	**227 163**	**146 733**	**176 553**	**199 365**	**185 544**	**187 708**	**216 117**
OUTPUT									
Steel [t]	**5 766 375**	**6 197 910**	**5 225 075**	**3 235 666**	**3 994 650**	**4 423 604**	**4 333 168**	**4 520 358**	**5 182 371**
Material-specific carbon content									
Steel [t C/t]	0.004	0.003	0.008	0.008	0.010	0.009	0.008	0.003	0.002
Carbon content in products [t C]									
Steel	23 066	18 304	41 662	25 760	38 441	40 780	34 990	11 919	8 579
Carbon content in products – SUM [t]	**23 066**	**18 304**	**41 662**	**25 760**	**38 441**	**40 780**	**34 990**	**11 919**	**8 579**
C emission from steel production [t]	203 408	233 516	185 501	120 974	138 111	158 585	150 554	175 789	207 538
CO_2 process emission from steel production [kt]	**745.831**	**856.227**	**680.171**	**443.570**	**506.409**	**581.478**	**552.032**	**644 561**	**760 973**
CO_2 EMISSION FACTOR [kg CO_2/t of steel]	**129.34**	**138.15**	**130.17**	**137.09**	**126.77**	**131.45**	**127.40**	**142.59**	**146.84**

Table 4.4.1. (cont.) Carbon balance for steel production in basic oxygen process in years 1988-2015

	2015
CHARGE	
Pig iron [t]	4 792 153
Scrap [t]	1 023 858
Carbon pick-up agent [t]	8 414
Ferroalloys [t]	71 598
Dolomite [t]	23 850
Technological indicator [t/t of steel]	
Pig iron	0.894
Scrap	0.191
Carbon pick-up agent	0.002
Ferroalloys	0.013
Dolomite	0.004
Material-specific carbon content	
Pig iron [t C/t]	0.043
Scrap [t C/t]	0.008
Carbon pick-up agent [t C/t]	0.859
Ferroalloys [t C/t]	0.029
Dolomite [t C/t]	0.126
Carbon contents in charge components [t C]	
Pig iron	203 829
Steel scrap	7 966
Carbon pick-up agent	7 229
Ferroalloys	2 067
Dolomite	3 003
Carbon contents in charge – SUM [t]	**224 094**
OUTPUT	
Steel [t]	**5 358 991**
Material-specific carbon content	
Steel [t C/t]	0.002
Carbon content in products [t C]	
Steel	8 860
Carbon content in products – SUM [t]	**8 860**
C emission from steel production [t]	261 827
CO_2 process emission from steel production [kt]	**789.194**
CO_2 EMISSION FACTOR [kg CO_2/t of steel]	**147.27**

Electric furnace steel production

Process emissions of CO_2 from steel production in electric furnaces for particular years in the period 1988-2006 were estimated based on the data from Polish Steel Association study [HIPH 2007]. For the last years information from verified reports, prepared as part of EU ETS, was applied for emission calculation. Steel production amounts was taken from Central Statistical Office yearbook [GUS 2008b-2016b]. Results of CO_2 emission estimation, AD and emission factors applied for calculation are presented in the table 4.4.2.

Table 4.4.2. Values of steel production in electric furnace [kt] as well as CO_2 emission factors [kg/t of steel] and CO_2 emission [kt] connected with that process for the years 1988-2015.

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Production	2572.4	2264.3	2308.6	1950.9	1727.3	2044.2	2368.1	2581.9	2648.4	2906.3
CO_2 emission factor	34.75	36.94	36.94	36.11	33.21	37.82	36.44	33.05	33.05	33.05
CO_2 emission	89.38	83.63	85.27	70.45	57.36	77.32	86.29	85.34	87.54	96.07
	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Production	3116.9	2825.1	3283.9	2809.1	2561.2	2916.6	3720.9	3443.2	4225.3	4432.8
CO_2 emission factor	35.83	29.15	44.13	44.10	45.64	41.90	55.10	46.97	48.88	44.76
CO_2 emission	111.66	82.35	144.91	123.89	116.90	122.20	205.00	161.74	206.53	198.41
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**		
Production	4502.3	3892.8	4001.4	4352.9	4209.3	3679.0	3617.1	3 978.1		
CO_2 emission factor	53.44	52.84	50.70	54.98	52.70	61.26	58.44	52.20		
CO_2 emission	240.58	205.68	202.88	239.30	221.84	225.38	211.40	207.67		

Open-hearth furnace steel production

Steel production in open-hearth furnaces was continued up to 2002. CO_2 process emissions from this source was estimated according to case study prepared by the Polish Steel Association (HIPH) [HIPH 2007]. CO_2 emission was calculated based on carbon balance developed for steel production process in mentioned furnaces.

4.4.2.1.b. Pig iron (CRF sector 2.C.1.b)

CO_2 process emission from pig iron production for the years 1988-2015 was estimated based on carbon balance in blast furnace process. Balances for individual years were founded on the statistical data for main components of input and output. Pig iron production values for entire period were accepted according to G-03 questioners [GUS 1989e-2016e]. Output of blast furnace gas was taken from Eurostat database for the period 1990-2015. For the years 1988-1989 that data came from IEA database [IEA] due to data for mentioned years is not available in Eurostat database. Coke input amounts were derived from joint IEA/Eurostat/OECD/UNECE questionnaires including energy balances, submitted every year by Poland to mentioned organisation. Data from Eurostat database was not applied in this area, because of blast furnaces transformation efficiency in Eurostat energy balance is very high and it is the reason, that there is too little amount of coke use in „Transformation input in Blast Furnaces" compared with real technological demand. This problem was also mentioned in chapter 3.2.7.2.1. *Iron and steel* (1.A.2.a). Coal consumption in BF process was taken from joint IEA/Eurostat/OECD/UNECE questionnaires as well, due to in Eurostat database the coal used as reductant in pig iron production is aggregated in *Final Energy Consumption - Iron and Steel*. Consequently, the deduction of that coal from consumption in 1.A.2.a category was needed (see chapter 3.2.7.2.1). Amounts of other components in BF process were estimated according to technological factors taken from literature [Szargut J. 1978]. These applied coefficients, expressed in tonne per tonne of pig iron produced, were as follows: for dolomite – 0.0885, for limestone – 0.0974, for roasted ore 0.188 and 0.0716 for manganese ore. In accordance with data from steel plants was assumed, that total annual iron ore sinter production is consumed in given year in BF process. Carbon contents in components of charge and output were calculated based on C EFs from 2006 IPCC guidelines (for coke, pig iron, limestone, dolomites) or based on country specific values (data for iron ore comes from [Szargut J. 1978] while for BF gas − from plants). Carbon balance for blast furnace process for the years 1988-2015 and estimated emissions for entire period were presented in the table 4.4.3.

Table 4.4.3. Carbon balance for blast furnace process in years: 1988-2015

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
CHARGE – amount used in process in given year										
Sinter [kt]	14 107.3	12 992.5	11 779.4	8 612.7	8 621.7	7 628.2	8 787.4	8 646.6	8 318.6	8 980.8
Roasted ore [kt]	1 929.3	1 783.7	1 627.5	1 222.3	1 214.9	1 183.1	1 331.3	1 399.4	1 233.6	1 394.6
Dolomite [kt]	907.7	839.2	765.7	575.1	571.6	556.6	626.4	658.4	580.4	656.2
Limestone [kt]	999.6	924.1	843.2	633.3	629.4	612.9	689.7	725.0	639.1	722.5
Manganese ore [kt]	734.8	679.3	619.8	465.5	462.7	450.6	507.0	533.0	469.8	531.1
Coke [kt]	6 607.5	6 365.7	5 576.0	3 838.0	3 760.0	3 378.0	3 820.0	3 944.0	3 400.0	3 593.0
Coking coal [TJ]										
CHARGE – C content										
Sinter [kg/kg]	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
Roasted ore [kg/kg]	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113
Dolomite [kg/kg]	0.1300	0.1300	0.1300	0.1300	0.1300	0.1300	0.1300	0.1300	0.1300	0.1300
Limestone [kg/kg]	0.1200	0.1200	0.1200	0.1200	0.1200	0.1200	0.1200	0.1200	0.1200	0.1200
Manganese ore [kg/kg]	0.0262	0.0262	0.0262	0.0262	0.0262	0.0262	0.0262	0.0262	0.0262	0.0262
Coke [kg/kg]	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Coking coal [kg/GJ]										
CHARGE – total C content [kt]										
Sinter	15.5	14.3	13.0	9.5	9.5	8.4	9.7	9.5	9.2	9.9
Roasted ore	21.7	20.1	18.3	13.8	13.7	13.3	15.0	15.8	13.9	15.7
Dolomite	118.0	109.1	99.5	74.8	74.3	72.4	81.4	85.6	75.5	85.3
Limestone	119.9	110.9	101.2	76.0	75.5	73.6	82.8	87.0	76.7	86.7
Manganese ore	19.2	17.8	16.2	12.2	12.1	11.8	13.3	13.9	12.3	13.9
Coke	5 484.2	5 283.5	4 628.1	3 185.5	3 120.8	2 803.7	3 170.6	3 273.5	2 822.0	2 982.2
Coking coal										
C IN CHARGE – SUM	5 778.6	5 555.7	4 876.3	3 371.7	3 305.9	2 983.2	3 372.7	3 485.3	3 009.5	3 193.7
OUTPUT IN GIVEN YEAR										
Pig iron [kt]	**10 262.4**	**9 487.6**	**8 656.7**	**6 501.5**	**6 462.0**	**6 292.9**	**7 081.2**	**7 443.5**	**6 561.9**	**7 418.0**
Blast furnace gas [TJ]	74 521	71 771	62 970	42 811	40 802	38 157	44 162	45 545	39 062	41 319
OUTPUT – C content										
Pig iron [kg/kg]	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Blast furnace gas [kg/GJ]	66.88	66.88	66.88	66.88	66.88	66.88	66.88	66.88	66.88	66.88
OUTPUT – total C content [kt]										
Pig iron	410.5	379.5	346.3	260.1	258.5	251.7	283.2	297.7	262.5	296.7
Blast furnace gas	4 983.7	4 799.8	4 211.2	2 863.0	2 728.7	2 551.8	2 953.4	3 045.9	2 612.3	2 763.3
C IN OUTPUT – SUM	5 394.2	5 179.3	4 557.5	3 123.1	2 987.2	2 803.5	3 236.6	3 343.6	2 874.8	3 060.0
DIFFERENCE BETWEEN C IN INPUT and C IN OUTPUT [kt]	384.5	376.4	318.8	248.6	318.7	179.6	136.1	141.7	134.7	133.7
CO_2 EMISSION [kt]	**1 410**	**1 380**	**1 169**	**912**	**1 169**	**659**	**499**	**520**	**494**	**490**
CO_2 EMISSION FACTOR [kg/t]	**137**	**145**	**135**	**140**	**181**	**105**	**70**	**70**	**75**	**66**

Table 4.4.3. (cont.) Carbon balance for blast furnace process in years: 1988-2015

	1998	1999	2000	2001	2002	2003	2004	2005	2006
CHARGE – amount used in process in given year									
Sinter [kt]	6 882.1	6 475.9	8 078.7	7 352.8	7 616.9	7 732.2	8 590.6	6 168.4	6 907.8
Roasted ore [kt]	1 180.5	993.1	1 223.0	1 023.3	995.7	1 061.4	1 208.3	842.5	1 042.1
Dolomite [kt]	555.4	467.2	575.4	481.4	468.5	499.4	568.5	396.4	490.3
Limestone [kt]	611.6	514.5	633.6	530.1	515.9	549.9	626.0	436.5	539.9
Manganese ore [kt]	449.6	378.2	465.8	389.7	379.2	404.2	460.2	320.9	396.9
Coke [kt]	2 983	2 495	3 386	2 935	2 553	2 753	2 990	2 056	2 549
Coking coal [TJ]									
CHARGE – C content									
Sinter [kg/kg]	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
Roasted ore [kg/kg]	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113
Dolomite [kg/kg]	0.1300	0.1300	0.1300	0.1300	0.1300	0.1300	0.1300	0.1300	0.1300
Limestone [kg/kg]	0.1200	0.1200	0.1200	0.1200	0.1200	0.1200	0.1200	0.1200	0.1200
Manganese ore [kg/kg]	0.0262	0.0262	0.0262	0.0262	0.0262	0.0262	0.0262	0.0262	0.0262
Coke [kg/kg]	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Coking coal [kg/GJ]									
CHARGE – total C content [kt]									
Sinter	7.6	7.1	8.9	8.1	8.4	8.5	9.4	6.8	7.6
Roasted ore	13.3	11.2	13.8	11.5	11.2	12.0	13.6	9.5	11.7
Dolomite	72.2	60.7	74.8	62.6	60.9	64.9	73.9	51.5	63.7
Limestone	73.4	61.7	76.0	63.6	61.9	66.0	75.1	52.4	64.8
Manganese ore	11.8	9.9	12.2	10.2	9.9	10.6	12.0	8.4	10.4
Coke	2 475.9	2 070.9	2 810.4	2 436.1	2 119.0	2 285.0	2 481.7	1 706.5	2 115.7
Coking coal									
C IN CHARGE – SUM	2 654.1	2 221.5	2 996.1	2 592.1	2 271.3	2 446.9	2 665.8	1 835.1	2 273.9
OUTPUT IN GIVEN YEAR									
Pig iron [kt]	**6 279.4**	**5 282.3**	**6 505.3**	**5 442.8**	**5 296.4**	**5 645.9**	**6 426.9**	**4 481.2**	**5 543.4**
Blast furnace gas [TJ]	34 289	28 179	37 053	31 904	28 752	31 031	33 836	23 446	28 948
OUTPUT – C content									
Pig iron [kg/kg]	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Blast furnace gas [kg/GJ]	66.88	66.88	66.88	66.88	66.88	66.88	66.88	66.88	66.88
OUTPUT – total C content [kt]									
Pig iron	251.2	211.3	260.2	217.7	211.9	225.8	257.1	179.2	221.7
Blast furnace gas	2 293.1	1 884.5	2 478.0	2 133.6	1 922.8	2 075.2	2 262.8	1 568.0	1 935.9
C IN OUTPUT – SUM	2 544.3	2 095.8	2 738.2	2 351.3	2 134.7	2 301.1	2 519.9	1 747.2	2 157.7
DIFFERENCE BETWEEN C IN INPUT and C IN OUTPUT [kt]	109.8	125.7	257.9	240.7	136.6	145.9	145.9	87.8	116.3
CO_2 EMISSION [kt]	**403**	**461**	**946**	**883**	**501**	**535**	**535**	**322**	**426**
CO_2 EMISSION FACTOR [kg/t]	**64**	**87**	**145**	**162**	**95**	**95**	**83**	**72**	**77**

Table 4.4.3. (cont.) Carbon balance for blast furnace process in years: 1988-2015

	2007	2008	2009	2010	2011	2012	2013	2014	2015
CHARGE – amount used in process in given year									
Sinter [kt]	6 954.0	6 306.4	4 362.6	5 837.3	6 512.8	6 672.5	6 854.2	7 389.4	7 429.9
Roasted ore [kt]	1 091.2	927.6	560.9	683.9	747.3	741.0	754.2	871.8	1 056.7
Dolomite [kt]	513.4	436.4	263.9	321.8	351.6	348.6	354.9	410.2	497.2
Limestone [kt]	565.4	480.6	290.6	354.3	387.2	383.9	390.8	451.7	547.5
Manganese ore [kt]	415.6	353.3	213.6	260.5	284.6	282.2	287.3	332.0	402.5
Coke [kt]	3 057	2 521	1 561	1 827	1 878	1 830	1 898	2 227	2 280
Coking coal [TJ]				948	2 338	5 977	4 205	5 465	7 998
CHARGE – C content									
Sinter [kg/kg]	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
Roasted ore [kg/kg]	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113
Dolomite [kg/kg]	0.1300	0.1300	0.1300	0.1300	0.1300	0.1300	0.1300	0.1300	0.1300
Limestone [kg/kg]	0.1200	0.1200	0.1200	0.1200	0.1200	0.1200	0.1200	0.1200	0.1200
Manganese ore [kg/kg]	0.0262	0.0262	0.0262	0.0262	0.0262	0.0262	0.0262	0.0262	0.0262
Coke [kg/kg]	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Coking coal [kg/GJ]				26.02	26.03	25.97	26.01	26.02	26.02
CHARGE – total C content [kt]									
Sinter	7.6	6.9	4.8	6.4	7.2	7.3	7.5	8.1	8.2
Roasted ore	12.3	10.4	6.3	7.7	8.4	8.3	8.5	9.8	11.9
Dolomite	66.7	56.7	34.3	41.8	45.7	45.3	46.1	53.3	64.6
Limestone	67.8	57.7	34.9	42.5	46.5	46.1	46.9	54.2	65.7
Manganese ore	10.9	9.2	5.6	6.8	7.4	7.4	7.5	8.7	10.5
Coke	2 537.3	2 092.4	1 295.6	1 516.4	1 558.7	1 518.9	1 575.3	1 848.4	1 892.3
Coking coal				24.7	60.9	155.2	109.4	142.2	208.1
C IN CHARGE – SUM	2 702.7	2 233.5	1 381.5	1 646.4	1 734.8	1 788.6	1 801.3	2 124.7	2 261.3
OUTPUT IN GIVEN YEAR									
Pig iron [kt]	**5 804.4**	**4 933.8**	**2 983.5**	**3 638.0**	**3 974.9**	**3 941.4**	**4 012.0**	**4 637.5**	**5 620.8**
Blast furnace gas [TJ]	34 626	28 551	17 610	22 022	22 271	22 684	22 530	25 802	26 470
OUTPUT – C content									
Pig iron [kg/kg]	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Blast furnace gas [kg/GJ]	66.88	68.37	67.85	65.7	65.51	66.97	67.12	67.31	69.90
OUTPUT – total C content [kt]									
Pig iron	232.2	197.4	119.3	145.5	159.0	157.7	160.5	185.5	224.8
Blast furnace gas	2 315.7	1 952.2	1 194.8	1 446.3	1 459.1	1 519.2	1 512.2	1 736.7	1 850.3
C IN OUTPUT – SUM	2 547.8	2 149.5	1 314.1	1 591.8	1 618.1	1 676.8	1 672.7	1 922.2	2 075.1
DIFFERENCE BETWEEN C IN INPUT and C IN OUTPUT [kt]	154.9	83.9	67.4	54.6	116.7	111.8	128.6	202.6	186.2
CO_2 EMISSION [kt]	**568**	**308**	**247**	**200**	**428**	**410**	**472**	**743**	**683**
CO_2 EMISSION FACTOR [kg/t]	**98**	**62**	**83**	**55**	**108**	**104**	**118**	**160**	**121**

4.4.2.1.c. Direct reduced iron (CRF sector 2.C.1.c)

Direct reduced iron has not been produced in Poland (information confirmed by Polish Steel Association (HIPH)).

4.4.2.1.d Sinter (2.C.1.d)

Estimation of carbon dioxide process emissions from iron ore sinter production for 2015 was based on the data from the EU ETS verified reports on annual emissions of CO_2 from iron ore sinter installations [KOBiZE 2016]. Sinter production (not published from 2000 in statistical materials) and data needed for estimation of country specific CO_2 EFs (i.a. amounts of components in input and output of the sintering process) were accepted according to mentioned EU ETS reports as well. Emissions for 2005-2014 were also estimated in accordance with EU ETS reports while for the years 1988-2004 according to data from questionnaires obtained by the National Centre for Emissions Management from installations entering the EU ETS [KOBiZE 2016]. The values of iron ore sinter production (AD), CO_2 EFs and CO_2 emissions were presented in the table 4.4.1. AD sources were as follows: G-03 reports for 1988-2000 [GUS 1989e-2001e], questionnaires from EU ETS installations collected by National Centre for Emissions Management for 2001-2004 and EU ETS verified reports for the years starting from 2005 [KOBiZE 2016].

For the entire period 1988-2015 emissions of CH_4 were also estimated from iron ore sinter production. The default emission factor for CH_4 (0.07 kg/t), was taken from tab. 4.2., 2006 GLs [IPCC 2006].

Table 4.4.4. Iron ore sinter production [kt], CO_2 emission factors [kg/t of sinter] and CO_2 emission values from sinter production in the years 1988-2015 [kt]

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Production	14107.3	12992.5	11779.4	8612.7	8621.7	7628.2	8787.4	8646.6	8318.6	8980.8
CO_2 emission factor	78.05	56.72	71.41	79.08	72.97	75.70	73.10	79.77	79.81	74.89
CO_2 emission	1101.14	736.98	841.16	681.13	629.08	577.45	642.35	689.76	663.94	672.58
	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Production	6882.1	6475.9	8078.7	7352.8	7616.9	7732.2	8590.6	6168.4	6907.8	6954.0
CO_2 emission factor	73.55	83.21	79.00	72.36	73.92	85.08	76.79	72.59	84.59	88.28
CO_2 emission	506.20	538.89	638.21	532.01	563.07	657.86	659.70	447.73	584.31	613.91
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**		
Production	6306.4	4362.6	5837.3	6512.8	6672.5	6854.2	7389.4	7429.9		
CO_2 emission factor	91.11	82.25	75.77	69.29	52.63	51.86	49.10	48.09		
CO_2 emission	574.59	358.80	442.32	451.29	351.14	355.48	362.79	357.28		

4.4.2.1.e Pellet (2.C.1.e)

Direct reduced iron has not been produced in Poland.

4.4.2.2. Ferroalloys production (CRF sector 2.C.2)

Emission of CO_2 concerning ferroalloys production was estimated based on annual ferrosilicon production taken from [GUS 2016b]. Applied emission factor of 4000 kg CO_2/t ferrosilicon, was taken from [IPCC 2006] – tab. 4.5 for ferrosilicon – 75% Si.

CH_4 emission was estimated based on emission factors from [IPCC 2006] – tab. 4.7 which is equal 1 kg CH_4/t ferrosilicon – 75% Si.

In the period 1988-2014 CO_2 and CH_4 process emission from ferroalloys production was estimated also based on annual ferrosilicon production taken from [GUS 1989b-2015b] (figure 4.4.2) and emission factors as in 2015.

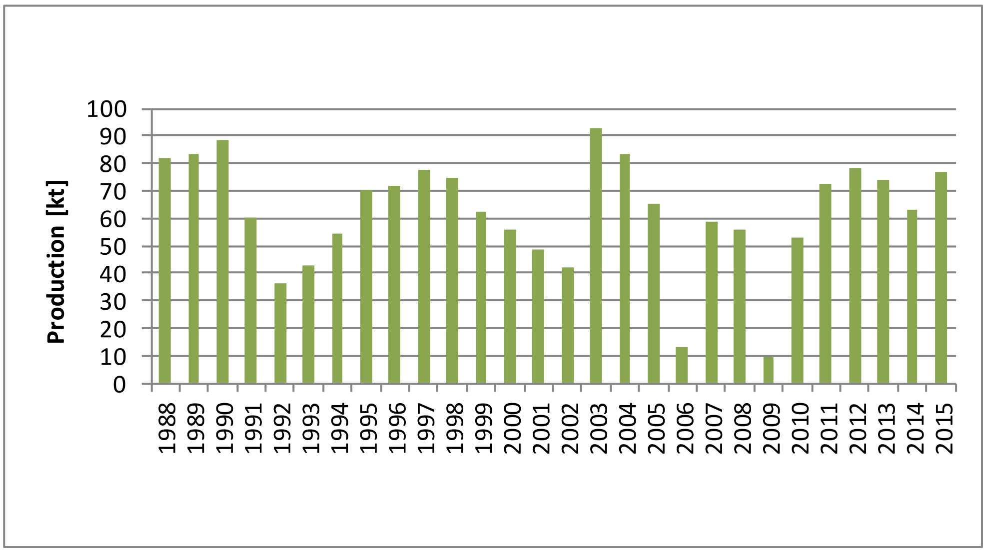

Figure 4.4.2. Production of ferrosilicon in 1988-2015

Coal consumption in ferroalloys production is submitted in national energy statistics as non-energy use of fuel. This means that coal consumed as reducer in mentioned process is not included in energy consumption of coal in 1.A.2 subsector, so double counting is avoided.

4.4.2.3. Aluminium production (CRF sector 2.C.3)

CO_2 emission from aluminium production was estimated for years 1988-2008 based on annual production amounts taken from [GUS 1989b-2009b]. Starting from 2009 primary aluminium is no longer produced in Poland.
The emission factor amounting to 1.7 t CO_2/t primary aluminium was applied in order to estimate CO_2 emission for entire period 1988-2008. Mentioned CO_2 EF is given in tab. 4.10. of 2006 IPCC GLs [IPCC 2006] as the value recommended for Soderberg process.

Emission of PFC gases from aluminium production is described in chapter 4.7.2.

4.4.2.4. Magnesium production (CRF sector 2.C.4)

Emission from use of SF_6 in magnesium foundries is described in chapter 4.7.2.

4.4.2.5. Lead production (CRF sector 2.C.5)

Process emissions of CO_2 from lead production for the years 1988-2015 were estimated based on annual lead productions taken from GUS yearbooks [GUS 1989b-2016b]. The default emission factor of 0.52 t CO_2/t lead produced, taken from the table 4.21 of 2006 GLs [IPCC 2006], was applied for the entire period.

The trend of process emissions from lead production is given in figure 4.4.3.

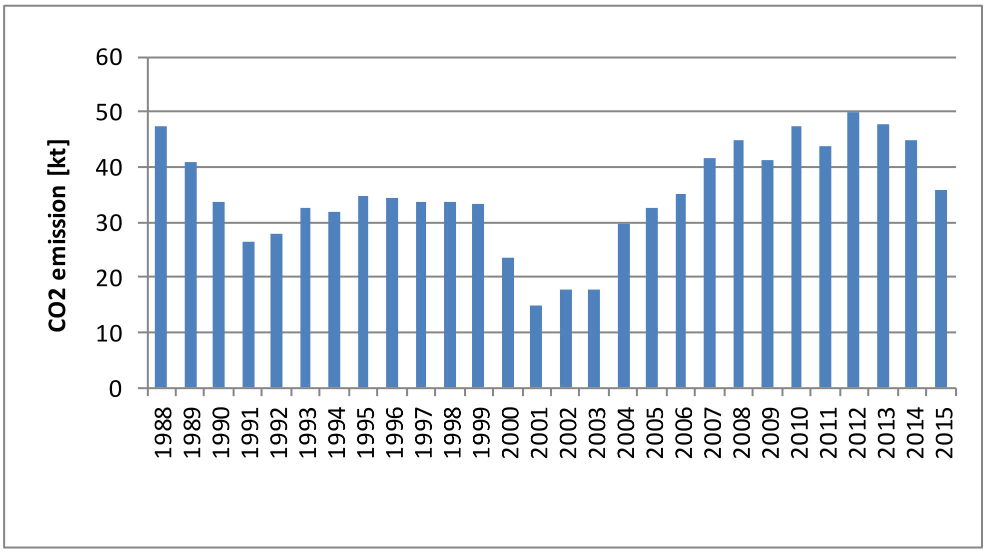

Figure 4.4.3. CO_2 process emission for lead production in 1988-2015

4.4.2.6. Zinc production (CRF sector 2.C.6)

CO_2 process emission from zinc production for the years 1988-2015 was estimated based on annual zinc production taken from GUS yearbooks [GUS 1989b-2016b]. The default emission factor amounting to 1.72 t CO_2/t zinc was used for entire reporting period. The factor comes from table 4.24 of 2006 GLs [IPCC 2006].
Process emission trend of CO_2 from zinc production is presented in figure 4.4.4.

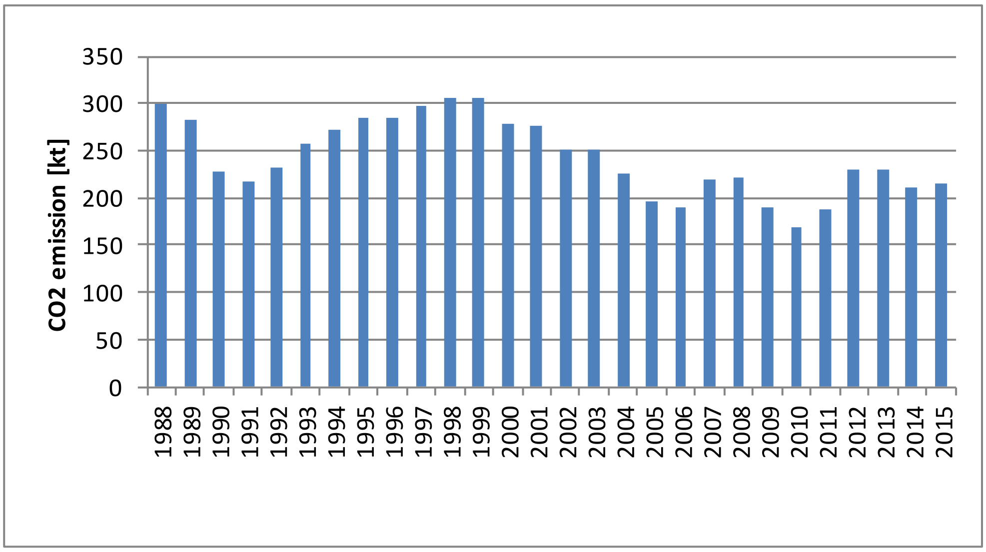

Figure 4.4.4. CO_2 process emission for zinc production in 1988-2015

4.4.3. Uncertainties and time-series consistency

See chapter 4.2.3

4.4.4. Source-specific QA/QC and verification

See chapter 4.2.4

4.4.5. Source-specific recalculations

The was no changes in 1.A.4 subsector in the years 1988-2014.

4.4.6. Source-specific planned improvements

No improvements are planned at the moment.

4.5. Non-energy Product from Fuels and Solvent Use (CRF sector 2.D)

4.5.1. Source category description

Estimation of emissions in 2.D *Non Energy Product from Fuels and Solvent Use* are carried out in sub-categories listed below:

a) *Lubricant use* (2.D.1)
b) *Paraffin wax use* (2.D.2)
c) *Other (2.D.3)*

Subsector 2.D.3. *Other* is by far the largest contributor to emissions from this category (see figure 4.4.1) – almost 81% in 2015.

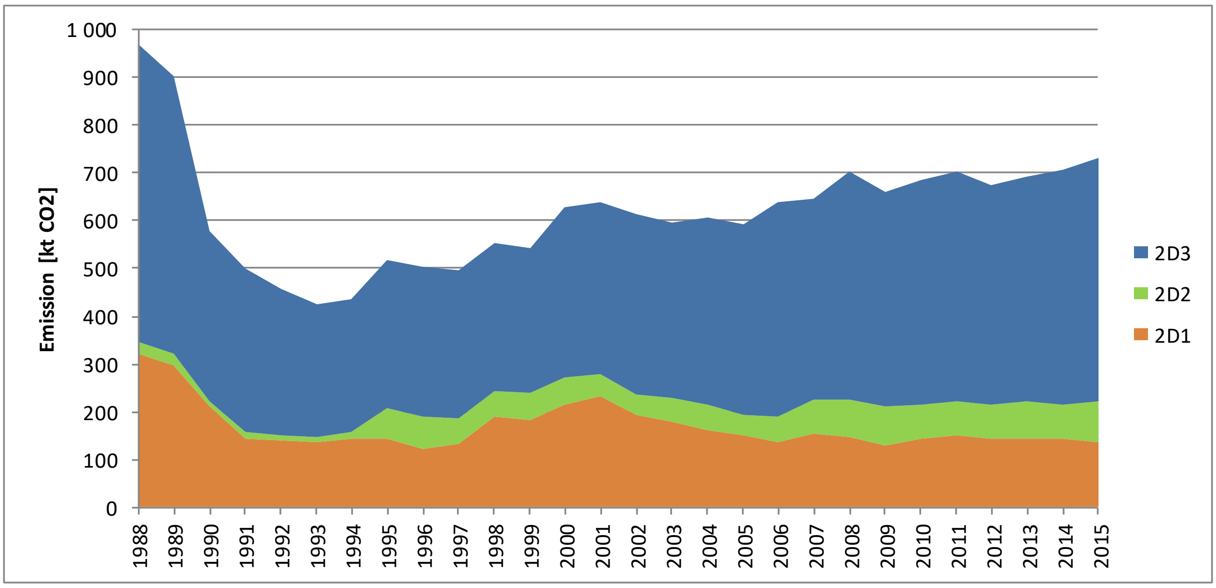

Figure 4.5.1. Emissions from *Non Energy Product from Fuels and Solvent Use* sector in years 1988-2015 according to subcategories

4.5.2. Methodological issues

4.5.2.1. Lubricant use (CRF sector 2.D.1)

CO_2 emissions concerning non-energy use of lubricants were estimated based on Tier 1 method according to IPCC 2006 guidelines. Calculations were made in accordance with the following formula:

$$CO_{2\,emissions} = LC \times CC \times ODU \times 44/12$$

where:
LC – non-energy use of lubricants, TJ
CC – carbon content of lubricants (carbon emission factor), t C/TJ
ODU – oxidised during use factor
44/12 – mass ratio of CO_2/C

Carbon content of lubricants is default value equal 20 t C/TJ. ODU factor for lubricant is country specific and is equal 0.5.

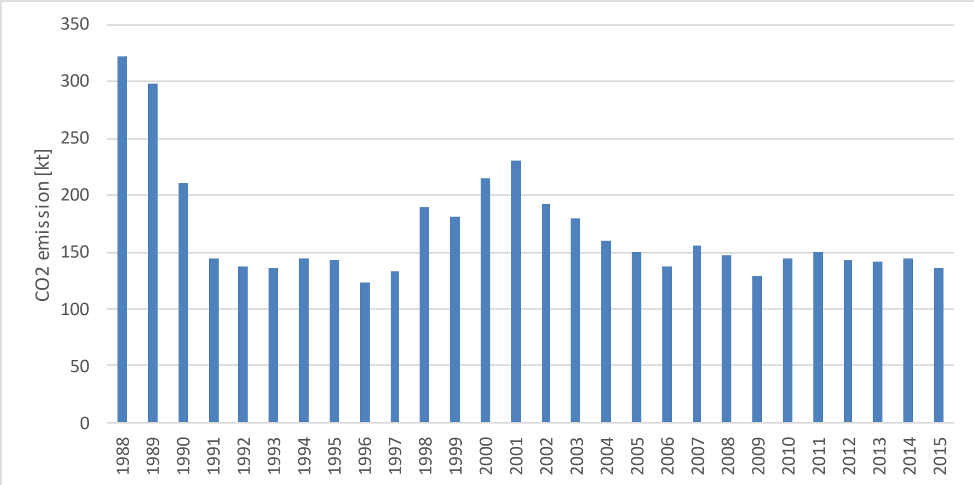

Figure 4.5.2. CO_2 emissions from non-energy use of lubricants in years 1988 - 2015

4.5.2.2. Paraffin wax use (CRF sector 2.D.2)

CO_2 emissions concerning non-energy use of paraffin wax were estimated based on Tier 1 method according to IPCC 2006 guidelines. Calculations were made in accordance with the following formula:

$$CO_{2\ emissions} = PW \times CC \times ODU \times 44/12$$

where:
PW – non-energy use of paraffin wax, TJ
CC – carbon content of paraffin wax (carbon emission factor), t C/TJ
ODU – oxidised during use factor
44/12 – mass ratio of CO_2/C

Carbon content of paraffin wax is default value equal 20 t C/TJ. ODU factor for paraffin wax is default value equal 0.2.

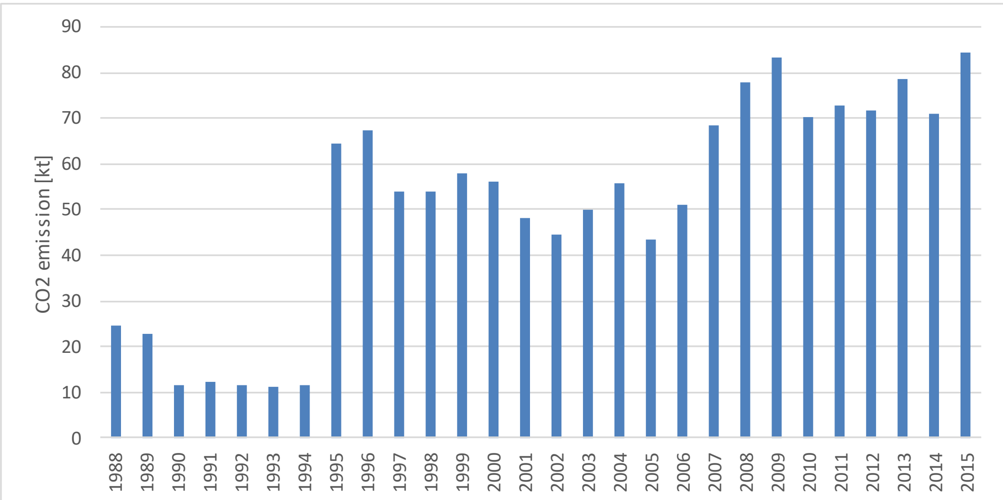

Figure 4.5.3. CO_2 emissions from non-energy use of paraffin waxes in years 1988 - 2015

4.5.2.3. Other (CRF sector 2.D.3)

Category contain emission from solvent use and associated CO_2 emissions concerning non-energy use of fuels.

4.5.2.3.1. Solvent use

There are no sources from sub-category Solvent Use , which are identified as key sources.

The use of solvents is one of the main sources of NMVOC emissions and is associated with following processes:

- Paint application(SNAP 0601),
- Degreasing and dry cleaning (SNAP 0602),
- Chemical Products, Manufacture and Processing(SNAP 0603),
- Other solvents use(SNAP 0604).

The GHG emission sources in Solvent and Other Product Use sector involve:

CO_2 emission from the following activities: Paint application, Degreasing and dry cleaning, Chemical Products, Manufacture and Processing and Other solvents use (Fat edible and non-edible oil extraction, Other non-specified),

Emission trend is consistent with the submission to:
the European Union in the framework of reporting to the Directive 2001/81/EC of European Parliament and the Council of 23 October 2001 on national emission ceilings for certain pollutants
the Convention on Long-range Transboundary Air Pollution (LRTAP).

According to the new 2006 IPCC guidelines N2O emissions from the use of N_2O for anesthesia is reported sub-category 2.G.3.

Total emission of GHG in this sector in 2015 was estimated to 616.9 kt CO_2. This emission decreased by 20% from year 1988 to 2015 (Figure 4.5.4 and 4.5.5).

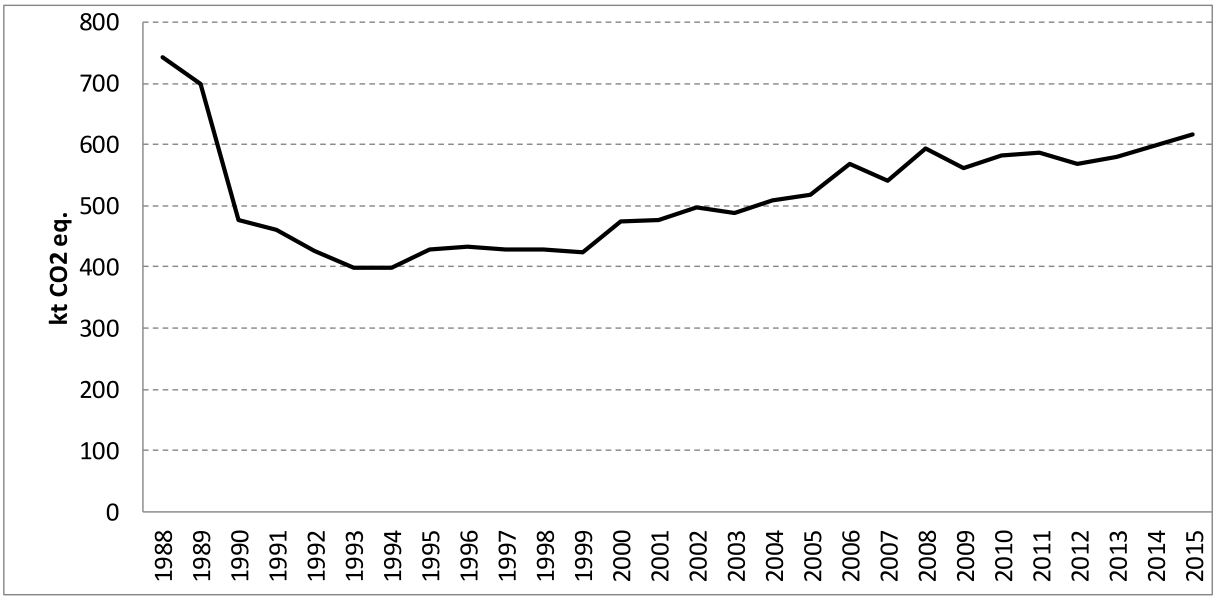

Figure 4.5.4. GHG emission from Solvent and Other Product Use sector in 1988-2015.

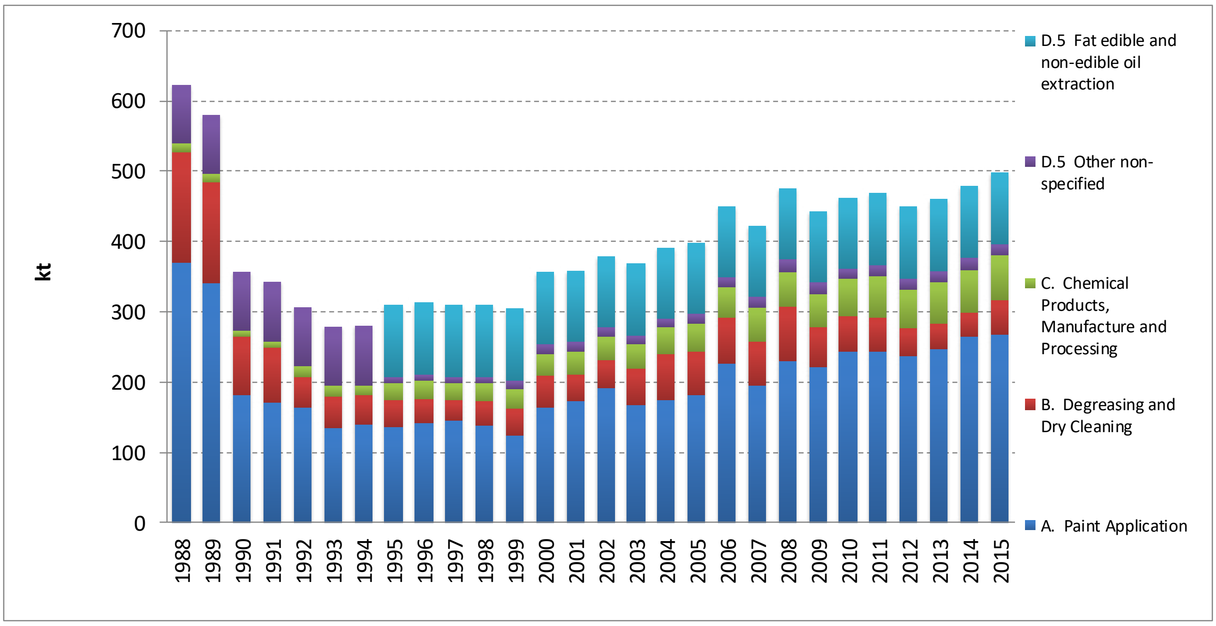

Figure 4.5.5. CO_2 emission from Solvent and Other Product Use sector in 1988-2015.

Calculations of CO_2 emissions within Sector Solvent Use, using the common methodology, were carried out on the basis of results of NMVOC emissions [EMEP 2015]. CO_2 emission factor was determined assuming, that carbon content in NMVOC is 60% [IPCC 2006, chapter 5.5.1., page 5.16.].Then carbon content has been calculated in a stoichiometric way to CO_2. Calculations were made in accordance with the following formula:

$$\mathbf{CO_2 = 0.60 * 44/12 * NMVOC}$$

where:

CO_2 – carbon dioxide emission from particular subsectors,
NMVOC – NMVOC emission from particular subsectors.

Paint application

Paint application includes the following processes:

- cars production,
- car repair,
- use in households,
- coil coating,
- ship building,
- wood painting,
- other applications in industry,
- other non-manufacturing applications.

In the national inventory all of these processes are considered jointly with the division on the use of paints based on organic solvents and water-based paints.

Degreasing and dry Cleaning

Degreasing and dry cleaning include:

- degreasing metals,
- chemical cleaning,
- production of electronic components,
- other industrial cleaning processes.

In the Polish national inventory the first two processes were considered. It was assumed that "degreasing metals" include also solvents used for other purposes in industrial processes, which were not included separately in the inventory report for NMVOC (eg., electronic industry, textile, leather, etc.).

Chemical products, manufacture and processing

The national inventory includes emissions from the following processes:
- polyvinylchloride processing,
- polystyrene foam processing,
- rubber processing,
- pharmaceutical products manufacturing,
- paints manufacturing.

Other solvents use

The category "Other use of solvents" includes following processes:

- solvents in the household use (except paint)
- oil extraction (production of fats and oils)

4.5.2.3.2. CO_2 emissions from urea based catalyst

For estimating CO2 emissions from urea-based catalyst additives in catalytic converters model COPERT 4 was used. The model assumed that consumption of urea is equal share of fuel consumption. For diesel passenger cars Euro VI the consumption of urea is equal 2% of fuel consumption, the selective catalytic reduction (SCR) ratio being equal to 10%; for diesel heavy duty trucks and buses, the consumption of urea is assumed to be equal 6% of fuel consumption at Euro V level (SCR ratio = 76.2%) and equal 3.5% at Euro VI level (SCR ratio = 100%). The purity (the mass fraction of urea in the urea-based additive), the default value of 32.5% has been used (IPCC 2006).

4.5.3. Uncertainties and time-series consistency

See chapter 4.2.3

4.5.4. Source-specific QA/QC and verification

See chapter 4.2.4

4.5.5. Source-specific recalculations

In table 4.5.1. are shown emission changes for subcategory Solvent Use. Recalculations for the year 1988-2014 was made as result of development of NMVOCs methodology from IPCC 2006 [Chapter 5.5.1 page 5.16].

Table 4.5.1. Emission changes for subcategory 2.D.3. Solvent Use.

Difference	1988	1989	1990	1991	1992	1993	1994	1995
kt CO_2 eq.	-259.55	-241.81	-148.60	-142.42	127.81	116.28	116.78	129.00
%	-41.67	-41.67	-41.67	-41.67	-41.67	-41.67	-41.67	-41.67
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
kt CO_2 eq	-130.41	-129.08	-129.25	-126.63	-148.20	-149.34	-157.94	-153.24
%	-41.67	-41.67	-41.67	-41.67	-41.67	-41.67	-41.67	-41.67
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
kt CO_2 eq	-162.67	-165.81	-187.49	-175.78	-197.99	-184.84	-193.47	-195.38
%	-41.67	-41.67	-41.67	-41.67	-41.67	-41.67	-41.67	-41.67
	2012	**2013**	**2014**					
kt CO_2 eq	187.43	191.57	-199.40					
%	-41.67	-41.67	-41.67					

4.5.6. Source-specific planned improvements

Any possible improvements will be related to further development of NMVOCs emissions methodology.

4.6. Electronic industry (CRF sector 2.E)

Not occurring.

4.7. Product uses as substitutes for ODS (CRF sector 2.F) and other minor sources of f-gases emissions

4.7.1 Source category description

Data used to estimate emissions in preparation of the greenhouse gas inventories is based on aggregated data collected by operators under Article 3(6) of Regulation (EC) No 842/2006. Use of the same data source for both obligations results in full consistency between datasets. Data consistency checks are performed on yearly basis for the whole reported time series.

In case of refrigeration and air-conditioning equipment containing HFCs, some information concerning e.g. amounts of gas used, are collected by experts among main domestic producers and importers/exporters [Mąkosa 2012, Popławska-Jach 2017].

To assure transparency and completeness of the description in NIR it was decided to group description of all f-gases emission in this chapter. Methodologies described here were divided into 3 groups referring to the substance: HFCs, PFCs and SF_6.

Besides dominating category in terms of f-gases emission 2.F Product uses as substitutes for ODS – this chapter also includes description of **PFC emission** from IPCC category **2.C.3 Aluminium production** described under PFC section below.

This chapter also includes description of **SF_6 emissions** from IPCC categories **2.C.4 Magnesium production** and 2.G.1 **Electrical equipment.**

Implementation of IPCC 2006 Guidelines resulted in number of changes in methodology – most notable are:
- use of updated global warming potentials (GWPs) from the IPCC 4th Assessment Report
- the reporting of new greenhouse gases (GHGs) including NF_3 and the new species of hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

4.7.2 Methodological issues

NF_3

Since 2015 mandatory reporting was extended to include NF3, which is used in the manufacture of semiconductors, liquid crystal display (LCD) panels and photovoltaics. Other application of NF_3 are hydrogen fluoride and deuterium fluoride lasers.

During preparation of submission 2015 Polish market was investigated to identify potential sources of NF_3. During this process **no activity resulting in NF_3 emission was identified** and all potential sources are not occurring in Poland. During preparation of f-gases inventory for submission 2017 this information was verified and confirmed by information reported by producers and suppliers of f-gases in Poland. Therefore, NF_3 emission from all potential categories was reported as not occurring.

HFC

The national GHG inventory covers the following emission sources for HFCs:

- 2.F.1 Refrigeration and air-conditioning equipment (dominating category in terms of emission volume),
- 2.F.2 Foam blowing agents,
- 2.F.3 Fire protection,
- 2.F.4 Aerosols (technical and medical),
- 2.F.5 Solvents.

2.F.1 Refrigeration and air-conditioning equipment

For transparency reasons and due to importance of the emissions from the refrigeration and air-conditioning equipment (2.F.1) – the main assumptions for estimates were described with more details below. Due to availability of new information some activity data were revised in submission 2017 (described in recalculation chapter of this section). Amount of f-gases input in each equipment type was given in table 4.7.1 below.

Methodology used for estimates of f-gases is IPCC 2006 Guidelines, which is mandatory for submission 2017. Applying new guidelines didn't affect estimated emission values directly, because this methodology was used before, however some emissions were allocated differently than in submission 2014 to reflect new classification of categories (electrical equipment, etc).

Table 4.7.1. Amount of input in each equipment type

Equipment type	**F-gas input per piece of equipment [kg]**
Domestic refrigerators	0.285
Domestic freezers	0.285
Commercial refrigeration (small hermetic MT)	0.24
Commercial refrigeration (small hermetic LT)	0.24
Commercial refrigeration (single condensing units MT)	3.60
Commercial refrigeration (single condensing units LT)	2.70
Commercial refrigeration (large multipack MT)	100.00
Commercial refrigeration (large multipack LT)	50.00
Stationary air-conditioning (small split)	0.90
Stationary air-conditioning (medium split)	2.25
Stationary air-conditioning (large split)	5.60
Stationary air-conditioning (packaged systems)	20.0
Stationary air-conditioning (VRF systems)	25.0
Stationary air-conditioning (small chillers)	30.0
Stationary air-conditioning (medium chillers)	150.0
Stationary air-conditioning (large chillers)	500.0
Passenger cars with air-conditioning	1.20
Public transport	1.50
Trucks	1.50
Trailers	5.50
Wagon, tank, cold rooms	5.50
Cargo railway cars	5.50
Tram cars	5.50
Equipment used for refrigeration	5.50

Estimates of the amount of each gas in selected equipment type assumption on shares of gases (or their mixes) were applied (see table 4.7.2. and 4.7.3 below).

Table 4.7.2. Share of gases and mixes for commercial refrigerators

Gas or mix	**Percent of mix**	**HFC-125 amount**	**HFC-134a amount**	**HFC-143a amount**	**HFC-32 amount**
407c	10	4	4	2	0
410a	70	35	0	0	35
HFC-134a	20	0	20	0	0
Amount of gas applied to estimates		38	25	2	35

Table 4.7.3. Share of gases and mixes for stationary air-conditioning

Gas or mix	Percent of mix	HFC-125 amount	HFC-134a amount	HFC-143a amount	HFC-32 amount
404a	30	12	1	17	0
507a	40	20	0	20	0
HFC-134a	30	0	30	0	0
Amount of gas applied to estimates		35	30	35	0

The final assumptions on percent of refrigeration equipment where HFC-32, 125, 134a and 143a were used was shown in tables 4.7.4-4.7.7 below.

Table 4.7.4. Percent of equipment in which HFC-32 was used

Type of equipment	Percent of equipment in which HFC-32 was used																				
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Stationary air-conditioning	0	0	0	0	0	25	30	35	35	35	35	35	35	35	35	35	35	35	35	32	32

Table 4.7.5. Percent of equipment in which HFC-125 was used

Type of equipment	**Percent of equipment in which HFC-125 was used**																				
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Commercial air-conditioning	0	0	5	10	15	20	20	25	30	25	30	30	30	30	29	28	27	27	27	25	25
Stationary air-conditioning	0	0	0	0	0	25	30	35	35	35	38	38	38	38	38	38	38	38	38	35	35
Transport refrigeration	0	0	0	0	0	11	11	11	11	11	11	22	22	22	22	33	33	41	41	41	41

Table 4.7.6. Percent of equipment in which HFC-134a was used

Type of equipment	**Percent of equipment in which HFC-134a was used**																				
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Domestic refrigerators	50	70	100	100	100	100	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0
Domestic freezers	50	70	100	100	100	100	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial air-conditioning	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Stationary air-conditioning	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Passenger cars with air-conditioning	15	20	25	30	40	50	60	60	70	70	80	80	90	90	100	100	100	100	100	100	100
Public transport	10	10	20	25	30	30	30	30	40	40	40	50	50	50	60	60	60	60	60	60	60
Trucks	0	0	15	20	25	25	25	30	30	30	40	40	40	50	50	50	50	50	50	50	50
Trailers	0	0	0	0	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Wagon, tank, cold rooms	0	0	0	0	0	1	1	1	1	1	1	3	3	3	3	4	4	5	5	5	5
Cargo railway cars	0	0	0	0	0	1	1	1	1	1	1	3	3	3	3	4	4	5	5	5	5
Tram cars	0	0	0	0	0	1	1	1	1	1	1	3	3	3	3	4	4	5	5	5	5
Equipment used for refrigeration	0	0	0	0	0	1	1	1	1	1	1	3	3	3	3	4	4	5	5	5	5

Table 4.7.7. Percent of equipment in which HFC-143a was used

Type of equipment	Percent of equipment in which HFC-143a was used																				
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Commercial air-conditioning	0	0	7	15	20	25	25	35	35	35	40	40	40	40	39	39	38	38	38	38	38
Stationary air-conditioning	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2
Transport refrigeration	0	0	0	0	0	13	13	13	13	13	13	26	26	26	26	38	48	48	48	48	48

Table 4.7.8 shows aggregated national total HFCs emissions over 1995-2015 expressed in CO_2 equivalents and HFCs emission in sub-sector: 2.F.1 Refrigeration and Air Conditioning Equipment. Prior to 1995, HFCs were not used in Poland.

Table 4.7.8. HFCs emissions in 2.F.1 Refrigeration and Air Conditioning Equipment and in Total

Year	HFCs emissions in 2.F.1 Refrigeration and Air Conditioning Equipment [t CO_2 eq.]	Total HFCs emissions [t CO_2 eq.]
1995	117 175	134 693
1996	252 869	335 495
1997	355 414	481 018
1998	449 088	569 317
1999	659 903	780 466
2000	1 255 433	1 366 497
2001	1 751 664	1 925 337
2002	2 307 438	2 505 928
2003	2 977 385	3 077 997
2004	3 331 905	3 733 225
2005	3 845 289	4 556 732
2006	4 287 984	5 226 221
2007	4 925 751	5 827 966
2008	5 461 976	6 153 059
2009	5 561 494	6 107 839
2010	6 395 401	6 824 533
2011	7 000 938	7 453 975
2012	7 339 808	7 799 326
2013	7 679 611	8 202 699
2014	8 295 375	8 836 194
2015	8 383 225	8 924 044

2.F.2 Foam blowing agents

Activity data for this application was collected during the questionnaire survey of importers, suppliers and end users of HFCs. Analysis of the Polish market allowed to identify use of HFC-134a, HFC-227ea, HFC-365mfc, HFC-245ca and HFC-152a as foam blowing agents. Following IPCC 2006 GLs it was assumed that HFCs applied to open cells foam are released in first year of use. Regarding release ratio from hard foam (closed pores) applications it was assumed as follows:

- EF for HFC-134a: new product = 95% first year; 2.5% next years
- EF for HFC-227ea: new product = 10% first year; 4.5% next years
- EF for HFC-365mfc: new product = 25% first year; 1.5% next years
- EF for HFC-245ca: new product = 25% first year; 1.5% next years
- EF for HFC-152a: new product = 95% first year; 2.5% next years

At the moment of finalization this report activity data for 2015 was not available, to ensure time series consistency estimates for 2014 were repeated. Results of the emission estimates for foam blowing agents were presented in table 4.6.9 below.

Table 4.7.9. HFCs emissions for categories: 2.F.2 Foam blowing agents, 2.F.3 Fire protection; 2.F.4 Aerosols and 2.F.5 Solvents [t CO2 eq.]

	HFCs emissions			
Year	2.F.2 Foam blowing agents [t CO_2 eq.]	2.F.3 Fire protection [t CO_2 eq.]	2.F.4 Aerosols [t CO_2 eq.]	2.F.5 Solvents [t CO_2 eq.]
1995	NO	NO	17 518	NO
1996	NO	43	82 583	NO
1997	NO	121	125 483	NO
1998	NO	234	119 995	NO
1999	11 440	1 408	107 715	NO
2000	11 440	1 580	98 044	NO
2001	11 440	3 517	158 716	NO
2002	42	3 008	195 441	NO
2003	1 561	9 097	89 954	NO
2004	9 707	7 959	383 655	NO
2005	318 273	11 930	380 716	524
2006	352 563	15 114	569 559	1 000
2007	395 357	21 341	484 877	640
2008	347 947	25 107	317 701	328
2009	245 586	30 143	269 631	984
2010	263 026	40 387	123 484	2 234
2011	277 983	47 156	125 112	2 786
2012	277 067	54 565	126 268	1 618
2013	336 316	61 407	124 955	410
2014	343 833	71 131	125 445	410
2015	343 833	71 131	125 445	410

NO – emission not occurring

2.F.3 Fire protection

Activity data for this application was collected during the same questionnaire survey of importers, suppliers and end users of HFCs as for categories 2.F.1 and 2.F.2. Analysis of the Polish market allowed to identify use of HFC-227ea and HFC-236fa (since 1996). Regarding release ratio from fire protection equipment it was assumed as follows:

- EF for HFC-227ea: new product = 1% first year; 5% next years

- EF for HFC-236fa: new product = 1% first year; 5% next years

As mentioned in paragraph above activity data for 2015 was not available when this inventory was finalized and emission data for 2014 was used. Results of the emission estimates for foam blowing agents were presented in table 4.6.9 above.

2.F.4 Aerosols

As mentioned in description of categories above activity data for this application of technical and medical aerosols was collected during the questionnaire survey of importers, suppliers and end users of HFCs. Analysis of the Polish market allowed to identify use of HFC-134a (since 1995). Release ratio for technical and medical aerosols was assumed as follows:

- EF for HFC-134a: import for production of technical aerosols = 50% first year; 50% next year
- EF for HFC-134a: import of technical aerosols = 50% first year; 50% next year
- EF for HFC-134a: import for production of medical aerosols = 100% first year
- EF for HFC-134a: import of medical aerosols = 100% first year

As mentioned in paragraphs above activity data for 2015 was not available when this inventory was finalized and emission data for 2014 was used. Results of the emission estimates for foam blowing agents were presented in table 4.6.9 above.

2.F.5 Solvents

As mentioned in description of categories above activity data for this application of technical and medical aerosols was collected during the questionnaire survey of importers, suppliers and end users of HFCs. Analysis of the Polish market allowed to identify use of HFC-365mfc and HFC-43-10mee (since 2005). Release ratio for solvents category was assumed as follows:

- EF for HFC-365mfc: 50% first year; 50% next year
- EF for HFC-43-10mee: 50% first year; 50% next year

As mentioned in paragraph above activity data for 2015 was not available when this inventory was finalized and emission data for 2014 was used. Results of the emission estimates for foam blowing agents were presented in table 4.6.9 above.

PFC

The national GHG inventory covers the following emission sources for PFCs: fire extinguishers (C_4F_{10}) and primary aluminium production (CF_4, C_2F_6).

2.C.3 Aluminium production

The dominating source of emission of PFC gases in Poland is IPCC sector 2.C.3 Aluminium production. Activities on aluminium production were taken from [GUS 2010b]. *Tier 1* method and the country specific emission factors were used for estimation of PFC emissions:

- for CF_4 EF = 0.373 kg/Mg aluminium produced
- for C_2F_6 EF = 0.027 kg/Mg aluminium produced

Country specific emission factors given above are based on plant specific reporting of installations under EU ETS.

Table 4.7.10 shows aggregated national total PFCs emissions over 1988-2015 expressed in CO_2 equivalents and PFCs emission in sub-sector: 2.C.3 Aluminium Production. More details on activity in this category was provided in chapter describing CO_2 emission from aluminium production. Aluminium production in Poland stopped in 2008 and is not occurring since then.

2.F.3 Fire protection

According to historical data obtained from producers and importers/exporters first use of PFCs (C_4F_{10}) in fire extinguishers began in 1996. Prior to 1996, the only known source of PFCs was primary aluminium production. On basis of IPCC 2006 GL applied emission factors for C_4F_{10} for import and use of equipment were 1% and 5% respectively. Formula used for estimating amount of substance in use in current year (n+1) is presented below:

in use n+1 = in use n - emission from in use n + (import n+1 - emission from import n+1)

where: n - year

As mentioned in paragraphs referring to HFCs methodological issues above activity data for 2015 was not available when this inventory was finalized and emission data for 2014 was used.

Table 4.7.10. PFCs emissions in 2.C.3 Aluminium production and 2.F.3 Fire protection compared to national total PFCs emission

Year	PFCs emissions in 2.C.3 Aluminium Production [t CO_2 eq.]	PFCs emissions in 2.F.3 Fire protection [t CO_2 eq.]	Total PFCs emissions [t CO_2 eq.]
1988	147 258	NO	147 258
1989	147 508	NO	147 508
1990	141 870	NO	141 870
1991	141 311	NO	141 311
1992	134 630	NO	134 630
1993	144 857	NO	144 857
1994	152 778	NO	152 778
1995	171 969	NO	171 969
1996	160 231	843	161 074
1997	165 446	7 915	173 361
1998	167 155	7 703	174 858
1999	157 299	11 414	168 713
2000	161 499	15 181	176 680
2001	168 489	28 855	197 343
2002	181 449	25 881	207 330
2003	176 635	24 443	201 078
2004	181 853	23 221	205 074
2005	165 347	22 060	187 407
2006	172 620	20 957	193 577
2007	164 721	19 909	184 630
2008	144 203	18 914	163 116
2009	NO	17 968	17 968
2010	NO	17 070	17 070
2011	NO	16 216	16 216
2012	NO	15 405	15 405
2013	NO	14 635	14 635
2014	NO	13 903	13 903
2015	NO	13 903	13 903

NO – emission not occurring

SF_6

As concerns SF_6 the national GHG inventory covers the following emission sources: electrical equipment and magnesium foundries.

2.C.4 Magnesium casting

Data on Mg casting were obtained from yearbooks of *Modern Casting*. The first use of SF_6 in magnesium foundries was identified in 1994. Due to unavailability of the data on magnesium in national statistics and other external data sources for recent years it was decided to use last verified activity data available (2007). Emission factors referring to amount of cast per year was used for calculation of SF_6 emission:

Mg casting EF = 1kg SF_6 /Mg of the amount of alloy used to produce casting

Amount of alloy used to produce casting is based on amount of magnesium production per year taking into account yield factor 55%.

Table 4.7.11 includes the activity data used for estimation SF_6 emissions over the period: 1988-2015.

2.G.1 Electrical equipment

Applied emissions factors were based on methodology provided in IPCC 2006 GL. Amounts of equipment on the market was assessed on the basis of data provided by producers and importers/exporters. As mentioned in paragraphs referring to HFCs methodological issues above activity data for 2015 was not available when this inventory was finalized and emission data for 2014 was used.

Electrical equipment manufacturing EF = 0.06 Mg/Mg of SF_6 used
Electrical equipment use EF = 0.05 Mg/Mg SF6 in use (1995), EF = 0.02 Mg/Mg (since 1996)

Table 4.7.11 presented below includes the activity data used for estimation SF_6 emissions over the period: 1994-2015.

Table 4.7.11. Activity data used for estimation of SF_6 emissions in 2.C.4 Magnesium production and 2.G.1 Electrical equipment

Activity characteristic for the source sector	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
2.C. Metal industry											
4. Magnesium production – amount of alloy used to produce casting [Mg]	320	400	400	345	291	236	181	127	72	46	20
2.G Consumption of HFC, PFC and SF_6											
1. Electrical equipment – amount of SF_6 in use [Mg]		11.00	14.02	17.05	20.07	23.10	26.12	28.70	32.04	33.75	36.45
1 Electrical equipment – amount of imported SF_6 [Mg]	NO	NO	0.60	0.60	2.00	2.33	2.66	3.30	4.16	2.50	3.59

Activity characteristic for the source sector (cont.)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
2.C. Metal industry											
4. Magnesium production – amount of alloy used to produce casting [Mg]	30	65	100	100	100	100	100	100	100	100	100
2.G Consumption of HFC, PFC and SF_6											
1. Electrical equipment – amount of SF_6 in use [Mg]	40.57	46.23	48.63	51.32	55.80	57.97	61.50	65.66	71.70	78.95	78.95
1. Electrical equipment –amount of imported SF_6 [Mg]	5.16	6.89	3.54	3.89	5.86	3.50	4.99	5.73	7.82	9.24	9.24

Table 4.7.12 below shows aggregated national total SF_6 emissions over 1994-2015 in tones compared to SF_6 emission in most important sub-sector: 2.G.1 *Electrical Equipment*. There is no data available on SF_6 use prior to 1994.

Table 4.7.12. SF_6 emissions in 2.C.4 Magnesium foundries and 2.G.1 Electrical equipment compared to national total emission

Year	SF_6 emissions in 2.C.4 Magnesium [t]	SF_6 emissions in 2.G.1 Electrical Equipment [t]	Total SF_6 emissions [t]
1994	0.58	NO	0.58
1995	0.73	0.55	1.28
1996	0.73	0.32	1.04
1997	0.63	0.38	1.00
1998	0.53	0.52	1.05
1999	0.43	0.60	1.03
2000	0.33	0.68	1.01
2001	0.23	0.77	1.00
2002	0.13	0.89	1.02
2003	0.08	0.82	0.91
2004	0.04	0.94	0.98
2005	0.05	1.12	1.18
2006	0.12	1.34	1.46
2007	0.18	1.18	1.37
2008	0.18	1.26	1.44
2009	0.18	1.47	1.65
2010	0.18	1.37	1.55
2011	0.18	1.53	1.71
2012	0.18	1.66	1.84
2013	0.18	1.90	2.08
2014	0.18	2.13	2.32
2015	0.18	2.13	2.32

NO – emission not occurring

4.7.3. Uncertainties and time-series consistency

Simplified analysis were made for industrial gases HFC, PFC and SF6, where uncertainty assumptions were applied directly to emission values of each pollutant. Due to lack of available information, simplified approach has to be used and country recognizes need of additional analysis in this sector as planned improvement for future inventories. More details on uncertainty assessment of whole inventory are given in annex 8.

	Emission HFC [kt of CO2 eq.]	Emission PFC [kt of CO2 eq.]	Emission SF6 [kt of CO2 eq.]	Uncertainty of emission HFC [%]	Uncertainty of emission PFC [%]	Uncertainty of emission SF6 [%]	Absolute emission uncertainty for HFC [kt of CO2 eq.]	Absolute emission uncertainty for PFC [kt of CO2 eq.]	Absolute emission uncertainty for SF6 [kt of CO2 eq.]
TOTAL	**8 924,04**	**13,90**	**52,79**	**47,0%**	**85,0%**	**92,5%**	**4 195,76**	**11,82**	**52,79**
2. Industrial processes and product use	8 924,04	13,90	52,79	47,0%	85,0%	92,5%	4 195,76	11,82	52,79
C. Metal industry		0,00	4,15		85,0%	100,0%		0,00	4,15
3. Aluminium production		NO			85,0%				
4. Magnesium production			4,15			100,0%			4,15
F. Product uses as substitutes for ODS	8 924,04	13,90		47,0%	85,0%		4195,76	11,82	0,00
1. Refrigeration and Air Conditioning Equipment	8 383,22			50,0%			4191,61		
2. Foam Blow ing	343,83			50,0%			171,92		
3. Fire protection	71,13	13,90		50,0%	85,0%		35,57	11,82	
4. Aerosols/ Metered Dose Inhalers	125,45			50,0%			62,72		
5. Solvents	0,41			50,0%			0,21		
G. Other Product Manufacture and Use			48,64			100,0%			48,64
1. Electrical Equipment			48,64			100,0%			48,64

4.7.4. Source-specific QA/QC and verification

See chapter 4.2.4

4.7.5. Source-specific recalculations

Activity data for estimating HFCs emission from 2.F.1 Refrigeration and air conditioning were revised to reflect new data obtained from the market.

Example results of the recalculations for 2014 were presented in table below:

kt of CO2 eq.	**HFCs**	**PFCs**	**SF6**
Previous sub.	8586.93	13.90	52.79
Latest sub.	8836.19	13.90	52.79
Difference	-249.26	0.00	0.00
%	-2.90%	0.00%	0.00%

4.7.6. Source-specific planned improvements

Continuing ongoing project on revision and extending dataset for f-gases. Updating activity data for categories other than 2.F.1 Refrigeration and air conditioning. Improving description of methodology and assumptions in NIR. Further analysis of filling amounts in equipment containing HFCs, PFCs and SF_6.

4.8. Other product manufacture and use (CRF sector 2.G)

SF_6 emissions from sector 2.G.1 *Electrical equipment* is described in chapter 4.7.2.

2.G.3. Other Product Manufacture and Use - N_2O emission from Use of N_2O for Anaesthesia.

N_2O emission from anaesthesiology was estimated based on: Strategy of reduction of GHG emission until 2020 in the division into separate gases (N_2O, HFCs, PFCs and SF_6) and sectors - Institute of Environmental Protection [IOŚ 2001].

Further analysis of possibilities to amend data covering N_2O used in anaesthesiology.

5. AGRICULTURE (CRF SECTOR 3)

5.1. Overview of sector

The GHG emission sources in agricultural sector involve: enteric fermentation from domestic livestock (CH_4), manure related to livestock management (CH_4 and N_2O), agricultural soils (N_2O), liming and urea application (CO_2) and agricultural residue burning (CH_4 and N_2O). Emission categories like: rice cultivation and prescribed burning of savannas do not occur in Poland and are therefore not reported.

Following categories from sector 4 have been identified as key sources (excluding LULUCF):

IPCC Source Categories	Greenhouse Gas	Identification criteria (Level, Trend, Qualitative)		
3.A Enteric Fermentation	CH4	L	T	
3.B Manure Management	N2O	L		
3.D.1 Direct N2O Emissions From Managed Soils	N2O	L	T	
3.D.2 Indirect N2O Emissions From Managed Soils	N2O	L		
3.G Liming	CO2		T	

Share of these categories in total Poland's GHG emissions amounts ca. 7.18%.

Total emissions of GHG in Agriculture sector presented as carbon dioxide equivalent amounted to 29.6 Mt in 2015 and decreased since 1988 by about 38%. Strong decrease in emissions in Poland occurred after 1989 when economic transformation began shifting from centrally planned economy to the market one (Fig. 5.1). The cost-effectiveness of agricultural production deeply changed then – up to 1989 agricultural production was generally subsidised on the state level. Since 1990 the prices for agricultural products as well as for agricultural means of production (like mineral fertilisers or machines) became the market ones and the subsidies were cut off. Deterioration of macroeconomic conditions for agricultural production in early 1990-ties during the restructuring of the state economy triggered changes in structure of agricultural farms since 1989. The big state agricultural farms became economically ineffective in a new market conditions so they were constantly eliminated. Also production of many small family farms became cost-ineffective so for instance the process of leaving the animal production by small farms started. On the other hand - gradual development of private and collective farms breeding large livestock herds begun. Still almost 54% of Polish farms are smaller than 5 hectares [GUS R 2015].

Dramatic decrease of livestock numbers was observed after 1989 – the cattle population decreased almost by half – from over 10 million in 1988 to less than 6 million since 2002. Since 2002, just before accessing Poland to the European Union (in 2004), population of dairy cattle stabilized when the limits of milk production were known in advance what stabilized the milk market. In the same time sheep population drop by 94% (from over 4 million in 1988 up to 0.2 million in 2015). Especially sheep breeding became unprofitable – the wool up to 1989 was highly subsidised so sheep farming was related mostly to wool production and over 70% of sheep farms' income was related to wool sale. Small domestic demand for sheep meat also caused retreat from sheep breeding.

Additional reasons for decreasing the agricultural production in 1990-ties were export limitation for Eastern markets, deterioration of relationship between prices for agricultural products and prices for means of production as well as increased competition of imported food from Western Europe. Since 2004, when Poland joined the European Union, the key factor influencing the Polish agriculture and rural areas is the EU Common Agricultural Policy aiming at improvement of productivity through introducing technical progress and stabilisation of agricultural market.

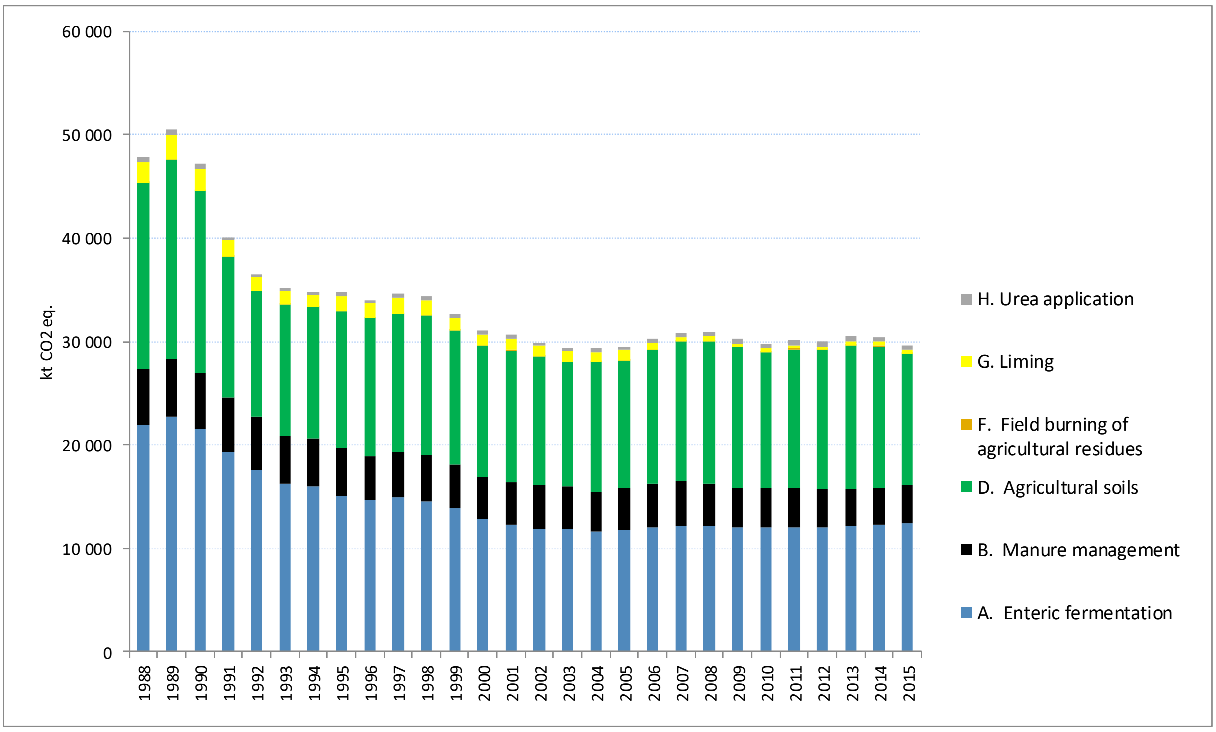

Figure 5.1. Total greenhouse gas emissions from the Polish agriculture in 1988-2015 presented in CO_2 equivalent

In 2015, in relation to the previous year, gross agricultural output decreased by 4,2%. The decrease in global production was the result of a significant drop in crop production (by 11.2%) with an increase in animal production (by 3.1%). The decrease in harvests of most crops affected the decline in crop production. Crop yields, in conditions of an extreme deficit of rainfall and very high temperatures occurring in many parts of the country, was lower than last year. Decreased yields affected the volume of the harvest and the fall in domestic supply of most crop products. The largest decline in production was recorded for root crops and vegetables. The growth in level of livestock production resulted from an increase in the production of all main species of livestock, chicken eggs and cow milk. The area of agricultural land in the use of farms amounted about 14.5 million ha, and was 0.1% less than in 2014.

Year 2015 was following year in which market conditions of agricultural production have worsened, which had a negative impact on profitability of agricultural production. Consumption of mineral fertilizers (NPK) per 1 ha of agricultural land in the farming year 2014/15 has decreased in comparison to the previous period by 7.3% and amounted to 123.2 kg. Consumption of lime fertilizers due to the state of acidification of Polish soil is still insufficient [GUS R4 2016].

Contribution of Agriculture in national emissions excluding LULUCF is about 7.7% in 2015. Among GHGs the highest contribution has N_2O – 50.0%, then CH_4 – 47.4% and CO_2 – 2.6%. The biggest share in GHG Agricultural emissions have 2 sectors: Agricultural soils – 42.9% and Enteric fermentation – 41.9%. Manure management is responsible for about 12.5% GHG emissions, liming and urea application similarly for 1.3%. Share of CH_4 and N_2O emissions from Field burning of agricultural residues are minor – only about 0.1%.

The review of trends by gases and subsectors are given in Figures 5.2–5.4. Carbon dioxide emissions in Agriculture sector come from liming and urea application – responsible for 49% and 51% respectively in 2015 (Fig. 5.2).

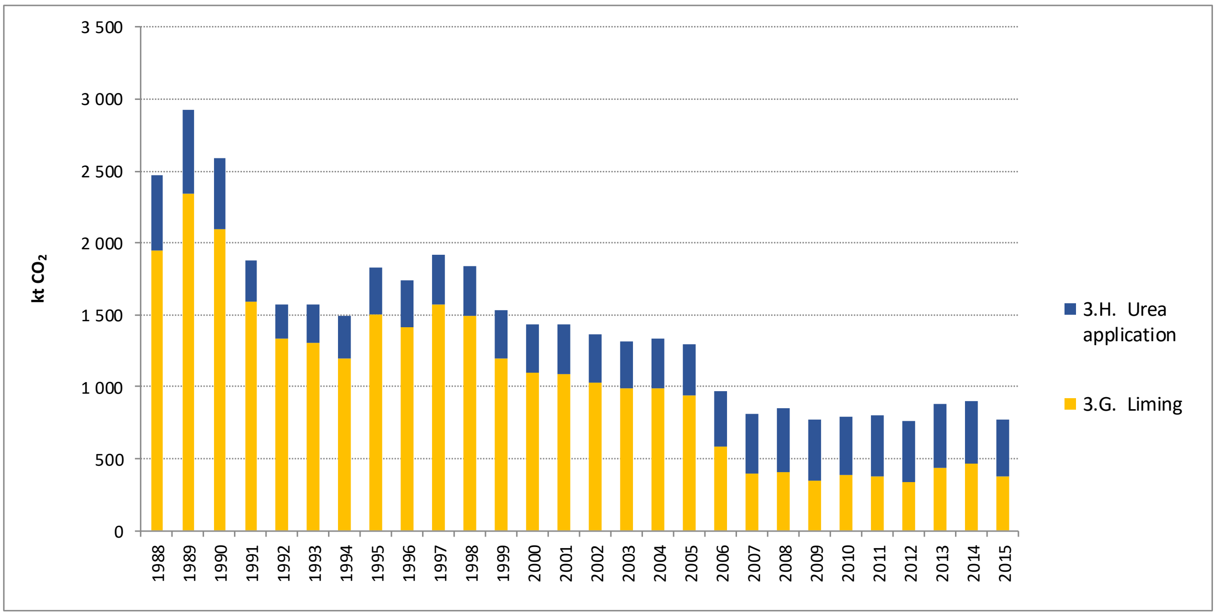

Figure 5.2. Carbon dioxide emissions from the Polish agriculture according to subcategories

As relates to methane emissions most of them originated from enteric fermentation (88.3%) and about 11.5% is related to manure management in 2015. Share of field burning of agricultural residues represent only 0.2% of emissions (Fig. 5.3).

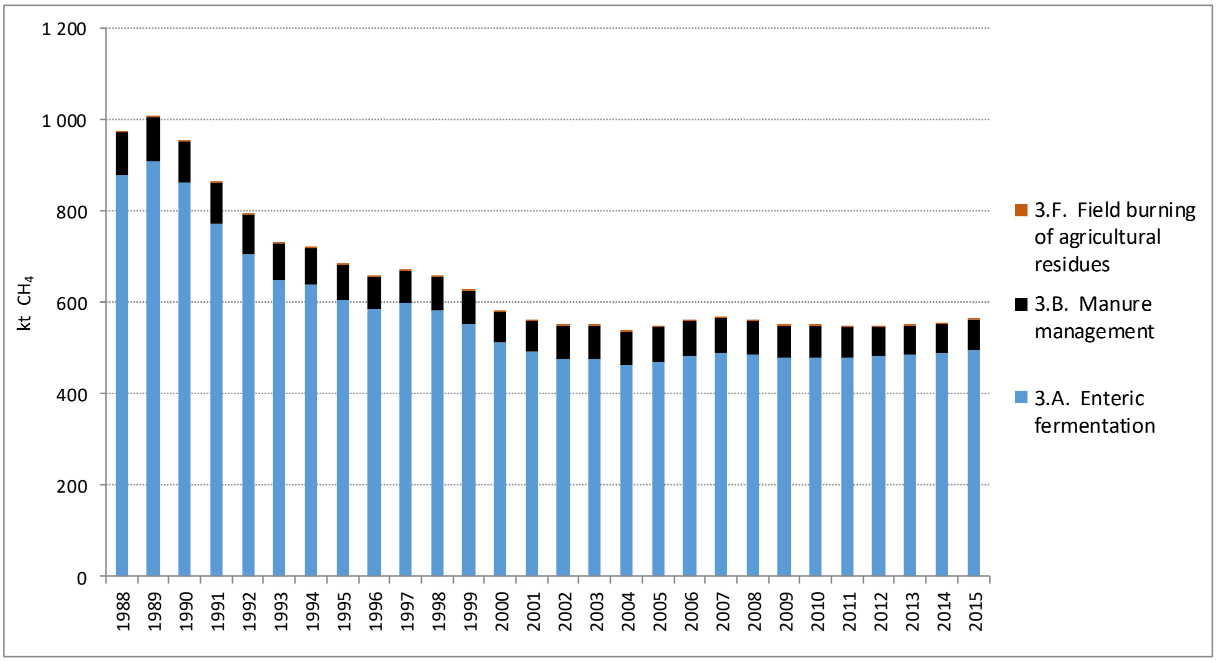

Figure 5.3. Methane emissions from the Polish agriculture according to subcategories

As concerns the nitrous oxide emissions, the main source of emissions in 2015 is agricultural soils responsible for 85.8% while manure management – for 14.1%. Emissions from field burning of agricultural residues are negligible (0.07%) (Fig. 5.4).

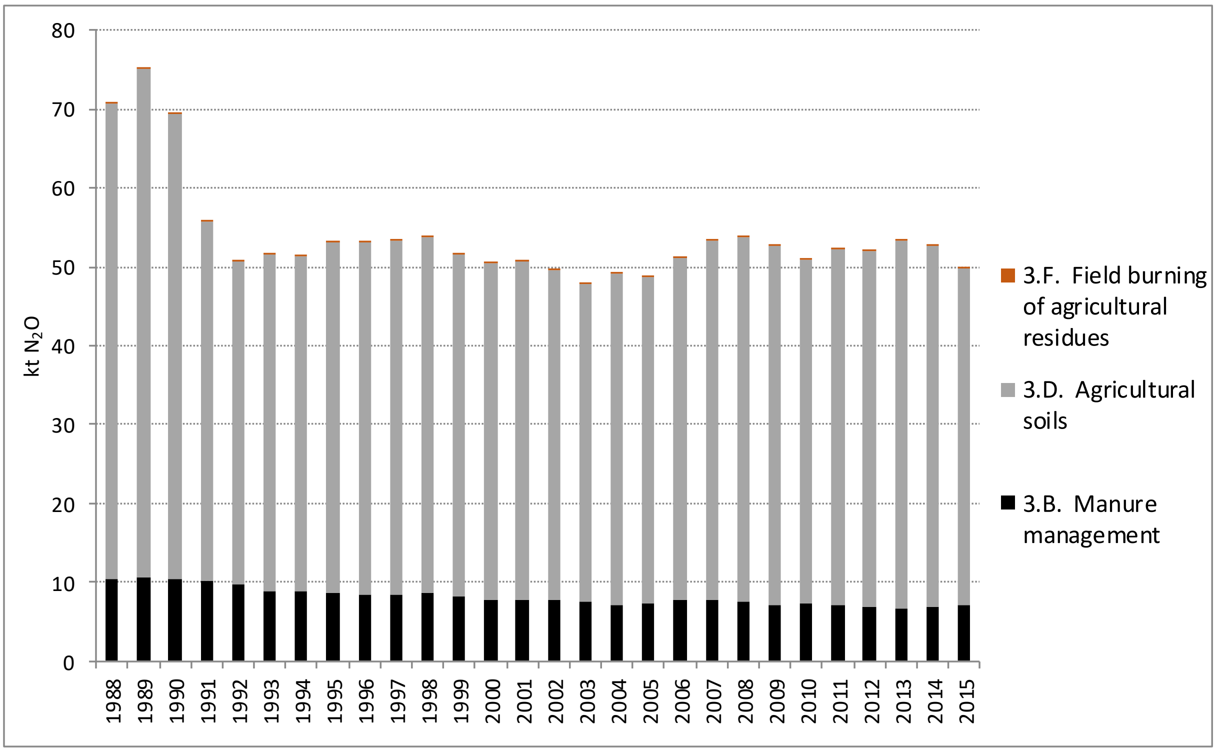

Figure 5.4. Nitrous oxide emissions from the Polish agriculture according to subcategories

5.2. Enteric Fermentation (CRF sector 3.A)

5.2.1. Source category description

CH_4 emissions from animals' enteric fermentation in 2015 amounted to 496.8 kt CH_4 and decreased since 1988 by 43%. Majority of CH_4 emissions in this subcategory, more than 95%, are related to cattle breeding. The main driver influencing CH_4 emissions decline from enteric fermentation is the decrease of livestock population since 1988. The biggest change over time relates to the sheep breeding where cut of emissions reaches 95% in 1988-2015. At the same time CH_4 emission reduction for dairy cattle amounted for about 43%.

Table 5.1. Trends in CH_4 emissions from enteric fermentation in 1988-2015 [kt CH_4]

Year	Dairy cattle	Non-dairy cattle	Sheep	Goats	Horses	Swine	Total
1988	525.16	268.70	35.02	0.90	18.92	29.41	878.10
1989	548.45	279.54	35.27	0.90	17.51	28.25	909.93
1990	532.09	249.77	33.27	0.90	16.94	29.20	862.16
1991	487.69	207.69	25.87	0.90	16.90	32.80	771.85
1992	447.52	192.86	14.96	0.90	16.20	33.13	705.56
1993	418.28	178.01	10.14	0.90	15.14	28.29	650.75
1994	406.63	186.31	6.96	0.90	11.20	29.20	641.19
1995	375.20	181.07	5.70	0.90	11.45	30.63	604.95
1996	365.48	178.47	4.42	0.90	10.24	26.95	586.46
1997	371.33	185.33	3.93	0.91	10.04	27.20	598.74
1998	375.88	164.16	3.62	0.93	10.10	28.75	583.45
1999	360.69	150.66	3.14	0.91	9.92	27.81	553.11
2000	329.82	143.74	2.90	0.88	9.89	25.68	512.92
2001	324.37	130.14	2.74	0.86	9.83	25.66	493.60
2002	310.39	129.62	2.76	0.97	5.94	27.94	477.62
2003	314.34	124.70	2.70	0.96	5.99	27.91	476.61
2004	304.64	123.42	2.54	0.88	5.78	25.48	462.75
2005	306.41	128.69	2.53	0.71	5.62	27.17	471.12
2006	310.54	134.95	2.41	0.65	5.53	28.32	482.39
2007	310.77	141.01	2.66	0.72	5.92	27.19	488.27
2008	312.93	142.62	2.59	0.68	5.86	23.14	487.81
2009	302.21	148.08	2.29	0.59	5.36	21.42	479.96
2010	298.62	151.30	2.06	0.54	4.75	22.30	479.57
2011	297.52	155.41	2.01	0.56	4.58	20.26	480.34
2012	298.63	160.34	2.13	0.45	4.00	17.37	482.93
2013	297.26	166.10	1.78	0.41	3.73	16.74	486.03
2014	295.60	171.31	1.61	0.41	3.73	17.59	490.25
2015	298.80	174.56	1.82	0.41	3.73	17.46	496.78
share [%] in 2015	*60.1*	*35.1*	*0.4*	*0.1*	*0.8*	*3.5*	*100.0*
change [%] 1988-2015	*-43.1*	*-35.0*	*-94.8*	*-54.4*	*-80.3*	*-40.6*	*-43.4*

5.2.2. Methodological issues

Activity data for 2015, similarly to those for entire period since 1988, related to livestock population come from national statistics (Central Statistical Office) [GUS R1 2016]. Detail methodological information related to collecting data on livestock population is given in Annex 5.

Generally population of major livestock is available on an annual basis. As relates to goats population some lack of data is noticed for 1988-1995 and 1997, so data for 1996 was taken for the period 1988−1995 and for 1997 the average value for 1996 and 1998 was calculated. Since 1998 goats population is available on an annual basis. Trends of animal population (excluding cattle) in 1988−2015 is given in table 5.2.

Table 5.2. Trends of livestock population in 1988-2015

Years	Livestock population [thousands]						
	Sheep	Goats	Horses	Swine	Poultry	Rabbits	Fur-bearing animals
1988	4 377	179	1 051	19 605	234 605	1 091	483
1989	4 409	179	973	18 835	253 301	1 091	441
1990	4 159	179	941	19 464	216 341	1 091	399
1991	3 234	179	939	21 868	209 090	1 091	357
1992	1 870	179	900	22 086	192 880	1 091	314
1993	1 268	179	841	18 860	188 759	1 091	272
1994	870	179	622	19 466	194 661	1 091	230
1995	713	179	636	20 418	185 745	1 091	187
1996	552	179	569	17 964	203 873	1 091	145
1997	491	182	558	18 135	197 400	1 054	164
1998	453	186	561	19 168	197 193	1 017	183
1999	392	181	551	18 538	197 267	981	201
2000	362	177	550	17 122	194 126	944	220
2001	343	172	546	17 105	202 519	907	239
2002	345	193	330	18 629	193 996	870	257
2003	338	192	333	18 605	143 457	840	281
2004	318	176	321	16 988	128 835	811	305
2005	316	142	312	18 112	122 755	781	329
2006	301	130	307	18 881	122 068	751	353
2007	332	144	329	18 129	133 475	721	377
2008	324	136	325	15 425	141 615	691	401
2009	286	119	298	14 279	125 878	661	425
2010	258	108	264	14 865	140 997	632	449
2011	251	112	254	13 509	139 837	550	427
2012	267	90	222	11 581	127 130	468	404
2013	223	82	207	11 162	134 584	386	382
2014	201	82	207	11 724	142 342	386	382
2015	228	82	207	11 640	159 422	386	382

Trends of cattle population presented for specific subcategories is given in Table 5.3. In 1998 Central Statistical Office introduced methodological changes in collecting statistical data on cattle population (apart from dairy cattle). This change triggered some inconsistency in population trend of other cattle. So in response to recommendations of the Expert Review Team (ERT 2013) the non-dairy cattle trend for 1988-1997 was unified based on average share in 1998-2007 of specific age groups in relation to all non-dairy cattle population (italics).

Table 5.3. Trends of cattle population in 1988-2015 [thousands]

Years	Dairy cattle	Non-dairy cattle			
		young cattle < 1 year	young cattle 1-2 years	heifers > 2 years	bulls >2 years
1988	4 806	*2 879*	*2 025*	*401*	*211*
1989	4 994	*2 996*	*2 107*	*417*	*219*
1990	4 919	*2 678*	*1 883*	*373*	*196*
1991	4 577	*2 227*	*1 567*	*310*	*163*
1992	4 257	*2 069*	*1 456*	*288*	*151*
1993	3 983	*1 910*	*1 344*	*266*	*140*
1994	3 863	*2 001*	*1 407*	*279*	*146*
1995	3 579	*1 946*	*1 368*	*271*	*142*
1996	3 461	*1 919*	*1 349*	*267*	*140*
1997	3 490	*1 992*	*1 401*	*278*	*146*
1998	3 542	1 799	1 235	280	99
1999	3 418	1 647	1 108	283	99
2000	3 098	1 572	1 101	231	81
2001	3 005	1 472	973	210	74
2002	2 873	1 384	1 084	142	50
2003	2 898	1 349	932	229	81
2004	2 796	1 309	916	246	86
2005	2 795	1 425	978	209	76
2006	2 824	1 428	1 040	224	90
2007	2 787	1 473	1 072	265	99
2008	2 806	1 502	1 102	263	83
2009	2 688	1 472	1 204	238	99
2010	2 656	1 457	1 244	276	92
2011	2 626	1 481	1 300	242	113
2012	2 578	1 469	1 344	239	147
2013	2 531	1 586	1 422	178	144
2014	2 479	1 609	1 433	259	141
2015	2 444	1 669	1 529	222	97

In the estimation of CH_4 emissions from enteric fermentation two types of approaches were applied – in case of horses, sheep, goats and swine, the IPCC *Tier 1* method was applied using default CH_4 Emission Factors [IPCC 2006, table 10.10] as given below:

Animal	Emission Factor [kg CH_4/head/year]
Horses	18.0
Sheep	8.0
Goats	5.0
Swine	1.5

Emissions from enteric fermentation of poultry and fur animals were not estimated as the IPCC do not provide the guidelines.

More detailed, IPCC *Tier 2* method, was applied in calculation of methane emissions from enteric fermentation from cattle responsible for over 95% of CH_4 emissions in this subsector. Here country specific emission factors were calculated based on specific gross energy intake (GE) values estimated for selected cattle sub-categories [IPCC 2006, equation 10.21]:

$$EF = \left(GE * \frac{Y_m}{100} * 365\frac{days}{yr}\right) / \left(55.65\frac{MJ}{kg\ CH_4}\right)$$

where:

EF – emission factor, kg CH_4/head/yr

GE – gross energy intake, MJ/head/day
Ym – methane conversion rate which is the fraction of gross energy in feed converted to methane, %.

Gross energy intake (GE) was calculated separately for dairy cattle and for and non-dairy cattle disaggregated for: calves under 1 year, young cattle 1-2 years and other mature cattle (divided for heifers and bulls over 2 years) using the equation 10.16 from [IPCC 2006]:

$$GE = \left[\frac{(NE_m + NE_a + NE_l + NE_{work} + NE_p)}{REM} + \frac{NE_g}{REG} \right] / \frac{DE\%}{100}$$

Where:

GE = gross energy, MJ/day
NE_m = net energy required by the animal for maintenance (Equation 10.3), MJ/day
NE_a = net energy for animal activity (Equation 10.4), MJ/day
NE_l = net energy for lactation (Equations 10.8), MJ/day
NEwork = net energy for work (Equation 10.11), MJ/day (assumed zero)
NEp = net energy required for pregnancy (Equation 10.13), MJ/day
REM = ratio of net energy available in a diet for maintenance to digestible energy consumed (Equation 10.14)
NEg = net energy needed for growth (Equation 10.6), MJ/day
REG = ratio of net energy available for growth in a diet to digestible energy consumed (Equation 10.15)
DE%= digestible energy expressed as a percentage of gross energy

Parameters required for estimation of GE factor for dairy cattle like pregnancy [GUS R1 2016], milk production [GUS M 2016], percent of fat in milk [GUS R 2015] come from national statistics. Digestible energy (DE – expressed as a percent of gross energy) for cattle was estimated by the National Research Institute of Animal Production [Walczak 2006, 2013] and relates to genetic as well as feeding improvements of cattle breading throughout inventoried period. For dairy cattle DE varies from 58.6% in 1988 through 60% in 1995 up to 63.3% since 2012. As concerns non-dairy cattle, DE parameters for 1988-2015 are as following: young cattle up to 1 year: 71.1−71.3%, bovines between 1–2 years: 66.1−66.5%, for matured heifers – 62.4−62.7% and for bulls constant value was taken – 59.1%. Other parameters used for calculation of GE were taken from IPCC 2006 GLs (C_{fi} − table 10.4, C_a − table 10.5, $C_{pregnacy}$ − table 10.7). Methane conversion rate (Y_m) for cattle was adopted as 6.5% from [IPCC 2006, table 10.12].

Methane emission factor for dairy cattle, established based on the above described methodology, vary from 109.3 CH_4/animal/year in 1988 up to 122.2 kg CH_4/animal/year in 2015, following GE changes, and is higher than IPCC default one (89 kg CH_4/animal/year for Eastern Europe with average milk production 2550 kg/head/yr) due to increasing intensification of dairy cattle production, characterised among others, with growing milk production (tab. 5.4). For non–dairy cattle GE factor was calculated for every subcategory based on country specific parameters like mean mass and daily weight gain [Walczak 2006]. Specific methane emission factors for entire trend for non-dairy cattle are presented in table 5.5. The values of EFs vary from 48.7 kg CH_4/animal/year in 1988 up to 49.7 kg CH_4/animal/year in 2015. Relatively low EF (IPCC default is 58 kg CH_4/animal/year for Eastern Europe) depends on high share of youngest cattle (< 1 year) among this category (53% in 1998 and 47% in 2015) (table 5.3).

As relates to dairy cattle breeding and impact on milk productivity, three main factors influence the most: feeding, genetic and environmental. Observed in Poland increased milk productivity, especially after joining the EU in 2004, is related to all three factors, but genetic progress (mostly selection and increasing share of HF cattle) influences here the littlest. Still mean milk production in Poland is about 30% lower than, for instance, in Germany. The feeding factor has the highest impact on milk productivity improvement for country specific dairy cattle population based on research made by the National Research Institute of Animal Production. The feeding model reshaped into good quality maize silage used for forage at the milk market. Significant investments were made on farms with changing from tied to free-stall maintenance systems in parallel with modernisation of cowsheds for semi-open buildings with curtain ventilation. Also thermal stress has been eliminated in herds with increasing milk productivity for both: high and low temperatures (elimination of pasturage during heat waves and thermal modernisation of barns).

Genetic progress still remains the most expensive way of increasing milk productivity. As the income of milk farms is relatively low most of them decides to cross/mix existing cattle with Holstein- Friesian (KF) breed than to purchase pure breed cattle. Mean share of HF mix within these herds is about 70%. However the remaining 70% of domestic dairy cows population is based on the Polish Black-White breed, Simental and Jersey characterised with lower body mass than HF. In Poland small milky farms still dominate having 15-30 dairy cattle for which genetic progress is too expensive. Moreover Simental breed is maintained at the mountainous areas where fodder is much worse taking into account climatic conditions.

Table 5.4. Average annual milk production, daily gross energy intake (GE) and CH_4 emissions factors for dairy cattle in 1988–2015

Years	Average milk production [litres/cow/yr]	GE gross energy intake [MJ/cow/day]	EF emission factor [kg CH_4/animal/year]
1988	3 165	256	109
1989	3 260	258	110
1990	3 151	254	108
1991	3 082	250	107
1992	3 015	247	105
1993	3 075	246	105
1994	3 121	247	105
1995	3 136	246	105
1996	3 249	248	106
1997	3 370	250	106
1998	3 491	249	106
1999	3 510	248	106
2000	3 668	250	106
2001	3 828	253	108
2002	3 902	253	108
2003	3 969	254	108
2004	4 082	256	109
2005	4 147	257	110
2006	4 200	258	110
2007	4 292	262	112
2008	4 351	262	112
2009	4 455	264	112
2010	4 487	264	112
2011	4 618	266	113
2012	4 845	272	116
2013	4 978	276	117
2014	5 164	280	119
2015	5 395	287	122

Table 5.5. Trends of emission factors for cattle with detail breakdown of non-dairy cattle population in 1988-2015 [kg CH_4/head/yr]

Years	Non-dairy cattle weighted mean EF	Non-dairy cattle EF			
		young cattle < 1 year	young cattle 1-2 years	heifers > 2 years	bulls >2 years
1988	48.71	32.71	68.41	49.65	76.29
1989	48.71	32.71	68.41	49.65	76.29
1990	48.69	32.70	68.38	49.61	76.24
1991	48.67	32.68	68.36	49.58	76.18
1992	48.65	32.67	68.33	49.55	76.13
1993	48.64	32.66	68.31	49.52	76.08
1994	48.61	32.65	68.28	49.48	76.03
1995	48.58	32.63	68.26	49.45	75.98
1996	48.56	32.62	68.23	49.42	75.93
1997	48.55	32.61	68.21	49.38	75.88
1998	48.10	32.60	68.19	49.35	75.83
1999	48.03	32.58	68.16	49.32	75.78
2000	48.15	32.57	68.14	49.29	75.73
2001	47.69	32.56	68.11	49.25	75.68
2002	48.73	32.55	68.09	49.22	75.63
2003	48.13	32.53	68.06	49.19	75.58
2004	48.27	32.54	67.98	48.98	75.59
2005	47.88	32.55	67.97	48.26	75.59
2006	48.51	32.55	67.97	48.95	75.59
2007	48.47	32.49	67.80	48.99	75.59
2008	48.34	32.47	67.80	48.87	75.59
2009	49.16	32.35	67.63	48.76	75.59
2010	49.31	32.27	67.46	48.76	75.40
2011	49.56	32.19	67.29	48.65	75.40
2012	50.13	32.11	67.29	48.65	75.59
2013	49.90	32.11	67.29	48.65	75.59
2014	49.78	32.11	67.29	48.65	75.59
2015	49.65	32.11	67.29	48.65	75.59

5.2.3. Uncertainties and time-series consistency

Uncertainty analysis for the year 2015 for IPCC sector *3.Agriculture* was estimated with use of approach 1 described in 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Simplified approach was based on the assumptions that every value is independent and probability distribution is symmetric. Results of the sectoral uncertainty analysis are given below. More details on uncertainty assessment of whole inventory are given in annex 8.
Recalculation of data for years 1988-2014 ensured consistency for whole time-series.

2015	CO2 [kt]	CH4 [kt]	N2O [kt]	CO_2 Emission uncertainty [%]	CH_4 Emission uncertainty [%]	N_2O Emission uncertainty [%]
3. Agriculture	**770.57**	**562.50**	**49.72**	18.9%	29.5%	60.8%
A. Enteric Fermentation		496.78			32.5%	
B. Manure Management		64.77	7.01		60.7%	40.0%
D. Agricultural Soils			42.68			70.6%
F. Field Burning of Agricultural Residues		0.95	0.04		18.6%	99.8%
G. Liming	373.84			21.7%		
H. Urea application	396.73			30.4%		

5.2.4. Source-specific QA/QC and verification

Activity data related to livestock population and any additional parameters like milk productivity or cattle pregnancy come from national statistics prepared by the Central Statistical Office. Data like livestock population, crop production, nitrogen fertilizers use and others are available in several publications that were cross-checked. Emphasis was put on data consistency between sub-categories and between sectors using agricultural data. Emission factors and methodology is compared with international literature and other countries methods/EF applied. Calculations were examined with focus on formulas, units and trends consistency. Generally QC procedures follow QA/QC plan presented in Annex 7.

5.2.5. Source-specific recalculations

- change of GE parameter resulting from update of fat contain in milk for dairy cattle in 2014

Table 5.6. Changes in CH_4 emissions from enteric fermentation due to recalculations made

Change	1988	1989	1990	1991	1992	1993
kt	0	0	0	0	0	0
%	0	0	0	0	0	0
Change	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
kt	0	0	0	0	0	0
%	0	0	0	0	0	0
Change	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
kt	0	0	0	0	0	0
%	0	0	0	0	0	0
Change	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
kt	0	0	0	0	0	0
%	0	0	0	0	0	0
Change	**2012**	**2013**	**2014**			
kt	0	0	-1.53			
%	0	0	-0.52			

5.2.6. Source-specific planned improvements

No further improvements are planned at the moment.

5.3. Manure Management (CRF sector 3.B)

5.3.1. Source category description

CH_4 emissions related to animal manure management in 2015 amounted to 65 kt and decreased since 1988 by about 31%. Most of CH_4 emissions come from manure generated by cattle (56%) and swine (36%).

Table 5.7. Trends in CH_4 emissions from manure management according to livestock categories in 1988-2015

Year	Dairy cattle	Non-dairy cattle	Sheep	Goats	Horses	Swine	Poultry	Fur animals	Total
1988	35.96	11.97	0.83	0.02	1.64	36.66	5.94	0.42	93.44
1989	37.49	13.81	0.84	0.02	1.52	35.27	6.66	0.39	95.99
1990	35.97	10.01	0.79	0.02	1.47	36.50	5.82	0.36	90.95
1991	32.99	9.37	0.61	0.02	1.46	41.07	5.57	0.33	91.43
1992	29.92	8.66	0.36	0.02	1.40	41.55	5.25	0.30	87.46
1993	27.50	7.74	0.24	0.02	1.31	35.53	5.20	0.27	77.82
1994	26.75	8.02	0.17	0.02	0.97	36.73	5.54	0.24	78.44
1995	24.69	7.61	0.14	0.02	0.99	38.58	5.17	0.21	77.42
1996	23.61	7.33	0.10	0.02	0.89	34.00	5.12	0.19	71.27
1997	24.37	7.44	0.09	0.02	0.87	34.37	5.00	0.20	72.37
1998	24.10	6.74	0.09	0.02	0.88	36.57	5.19	0.21	73.79
1999	24.96	6.35	0.07	0.02	0.86	35.33	5.23	0.22	73.05
2000	23.25	6.16	0.07	0.02	0.86	32.63	5.26	0.23	68.48
2001	22.79	5.66	0.07	0.02	0.85	32.74	5.43	0.23	67.80
2002	25.90	5.67	0.07	0.03	0.51	35.72	5.20	0.24	73.34
2003	28.56	5.54	0.06	0.03	0.52	35.65	3.62	0.26	74.24
2004	29.91	5.48	0.06	0.02	0.50	32.54	3.32	0.27	72.10
2005	30.24	5.71	0.06	0.02	0.49	35.53	3.26	0.29	75.59
2006	30.31	5.85	0.06	0.02	0.48	37.37	3.33	0.30	77.71
2007	30.83	6.18	0.06	0.02	0.51	36.39	3.60	0.31	77.92
2008	31.20	6.26	0.06	0.02	0.51	30.87	3.88	0.33	73.13
2009	29.91	6.44	0.05	0.02	0.46	29.40	3.59	0.34	70.21
2010	28.60	6.64	0.05	0.01	0.41	30.36	3.84	0.36	70.27
2011	29.01	6.81	0.05	0.01	0.40	26.95	3.86	0.33	67.42
2012	29.01	6.79	0.05	0.01	0.35	23.19	3.76	0.31	63.47
2013	28.88	7.11	0.04	0.01	0.32	22.30	3.75	0.29	62.71
2014	28.72	7.43	0.04	0.01	0.32	23.38	3.93	0.29	64.12
2015	29.03	7.55	0.04	0.01	0.32	23.16	4.37	0.29	64.77
share [%] in 2015	*44.8*	*11.7*	*0.1*	*0.0*	*0.5*	*35.8*	*6.7*	*0.4*	*100.00*
change [%] 1988-2015	*-19.3*	*-37.0*	*-94.8*	*-54.4*	*-80.3*	*-36.8*	*-26.5*	*-30.2*	*-30.7*

Generally decreasing trend is observed in CH_4 emissions from manure management for all livestock sub-categories, where the biggest drop over time occurred to sheep breeding where CH_4 emissions dropped by 95% in 1988-2015 (tab. 5.7). The main reason for decreasing emissions are diminishing livestock populations and conditions described in previous chapter.

N_2O emissions from manure management amounted to 7 kt in 2015 and drop since 1988 by 33% what is associated mostly with the diminishing livestock population. Direct emissions are responsible for about 49% and indirect for 51% of N_2O emissions in this category (fig. 5.5).

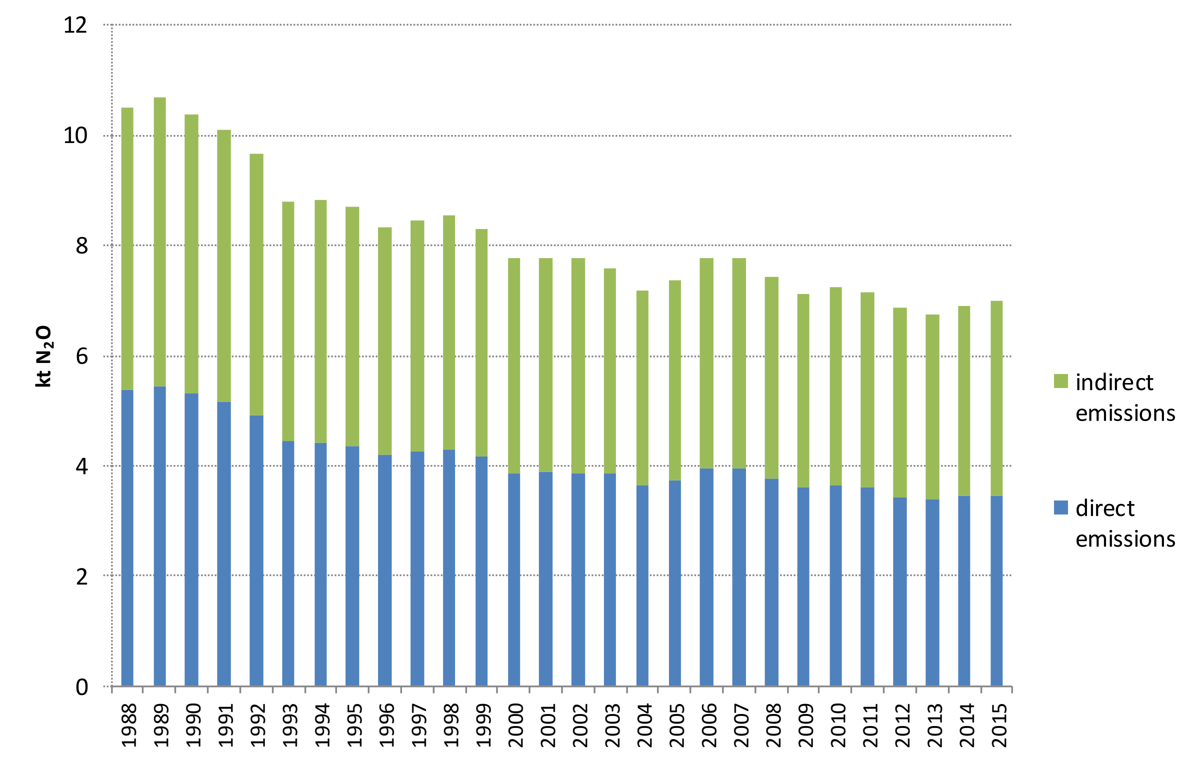

Figure 5.5. Trends of N_2O emissions (in division for direct and indirect) from manure management in 1988-2015

5.3.2. Methodological issues

The source of activity data i.e. animal population was taken from the public statistics as described in chapter 5.2.2 (tab. 5.2, 5.3). Additionally emissions from fur animals in this sub-category are estimated. Data on fur animals population is available in public statistics only for selected years like: 1983 [GUS R5 1987] and 1996 [GUS R6 1996], 2002 [GUS R7 2002], 2010 [GUS R8 2010] and 2013 [GUS R9 2014] when Agricultural Censuses were performed or other periodic studies were published containing required data. Interpolation was used for lacking years, for 2014-2015 data from 2013 was used. No information on deer population is available.

Country specific data on the animal waste management systems (AWMS) come from [Walczak 2006, 2009, 2011, 2012, 2013]. The fractions of manure managed in given AWMS for cattle were assessed on an annual basis for periods 1988-2002 and 2004–2012, data for 2003 was interpolated between 2002 and 2004. The share of pastures and solid storage were assessed for the key years: 1988-1989 and for 2004-2012 and the values in-between were interpolated (tab. 5.8). As concerns swine manure management systems the share of liquid and solid storage was estimated based on AWMS shares and pigs population for age categories for 1988 [Walczak 2006]. Data for 2004–2012 was taken from [Walczak 2011, 2012, 2013]. Data for years between 1988 and 2004 interpolation was made. Data for 2012 were used for 2013-2015.

For other animals permanent shares of AWMS for entire inventoried period were assumed based on data assessed for 2004–2012: for sheep - 40% on pastures and 60% solid storage, for goats: 44% on pastures and 56% on solid storage and for horses: 22% and 78% respectively. For poultry the following AWMS shares were established: 11% on litter-free systems and 89% on solid storage [Walczak 2011, 2012, 2013].

Table 5.8. Fractions of manure managed in given AWMS for cattle and swine for selected years [%]

	Dairy cattle			Other cattle			swine		
	liquid	solid	pasture	liquid	solid	pasture	liquid	solid	pasture
1988	2.8	75.2	22.0	4.9	77.1	18.0	22.3	77.7	0.0
1990	2.7	76.1	21.2	3.2	79.2	17.6	22.4	77.6	0.0
1995	2.3	80.4	17.2	3.8	80.6	15.6	22.7	77.3	0.0
2000	3.7	83.1	13.2	4.0	82.4	13.6	23.0	77.0	0.0
2005	10.6	79.4	10.0	5.2	82.8	12.0	24.0	76.0	0.0
2010	10.1	79.6	10.3	5.1	82.9	12.1	25.5	74.5	0.0
2015	10.5	79.2	10.3	5.1	82.9	12.0	24.3	75.7	0.0

In Poland prevail small farms where solid systems for animal management are commonly used. Liquid systems are applied only at big farms, having more than 120 animals. Development of such big milk farms in early years of 2000 influenced significant increase of CH_4 emissions from manure management for dairy cattle since 2002.

5.3.2.1. Estimation of CH_4 emissions from manure management

The *Tier 1* methodology was used for estimation of CH_4 emissions from manure management of horses, sheep, goats, swine, poultry and fur animals [IPCC 2006] (tab. 5.9). The *Tier 2* methodology was used to establish domestic CH_4 emission factors for cattle applying equation 10.23 from [IPCC 2006]:

$$EF = Vs * 365\frac{days}{year} * B_o * 0.67\frac{kg}{m^3} * \sum MCF * MS$$

where:

- EF – emission factor (kg CH_4/animal/year),
- Vs – average daily volatile excreted solids,
- B_o – maximum CH_4 production capacity for manure produced by animal
- MCF – methane conversion factors for each manure management system for cool climate [IPCC 2006, tab. 10.17],
- MS – fraction of livestock category manure in given AWMS (table 5.8).

For cattle volatile solids (Vs) were estimated based on equation 10.24 in 2006 IPCC GLs with the use of specific GE and DE parameters, urinary energy expressed as fraction of GE was assumed as 0.04 (IPCC 2006) while ASH content as 0.08 (IPCC 2006). Maximum CH_4 producing capacity (B_o) was taken from IPCC 2006 tables 10A.4 and 10A.5.

For swine also the above mentioned equation was used in calculation of emission factors but the default values for Vs, B_o and MCF were used (IPCC 2006). Examples of above mentioned parameters and emission factors used for calculation of CH_4 emissions from manure management for livestock are shown in table 5.9.

Methane conversion factors (MFCs) for all systems were taken from the table 10.17 of the 2006 IPCC Guidelines for cool climate ≤ 10^{o}C: 1% for pasture/range/paddock, 2% for solid storage and for 17% liquid/slurry systems. As the information on share of liquid systems with and without crust are not presently recognised in detail the conservative approach was taken to use the higher value of MCF characterising slurry system without natural crust cover for cool climate conditions.

Table 5.9. Methane-producing potential (B_o), volatile solids excreted (Vs) and CH_4 emission factors for manure management in 2015

Livestock	EF Emission Factor [kg CH_4/animal/year]	Vs Volatile Solids Excreted [kg dm/animal/day]	B_o Methane-producing potential [m^3 CH_4/kg Vs]
Dairy cattle	11.87	5.82	0.24
Non-dairy cattle	2.15	1.88	0.17
Swine	1.99	Breeding swine: 0.50 Market swine: 0.30	0.45
Sheep	0.19		
Goats	0.13		
Horses	1.56		
Poultry:			
Layers (dry)	0.03		
Broilers	0.02		
Turkeys	0.09		
Ducks	0.02		
Rabbits	0.08		
Fur-bearing animals	0.68		

5.3.2.2. Estimation of direct N_2O emissions from manure management

Direct nitrous oxide emissions from manure management were estimated based on recommended IPCC methodology [IPCC 2006, equation 10.25] using the same AWMS data as for CH_4 emissions (chapter 5.3.2.1):

$$\mathrm{N_2O_{D(mm)}} = [\sum_S [\sum_T (N_{(T)} * Nex_{(T)} * MS_{(T,S)})] * EF_{3(S)}] * \frac{44}{28}$$

where:

$N_2O_{D(mm)}$ – direct N2O emissions from manure management in the country (kg N_2O/year),
$N_{(T)}$ – livestock population in given category *T* in the country,
$Nex_{(T)}$ – annual average N excretion per head of livestock category T in country (kg N/animal/year),
$MS_{(T,S)}$ – fraction of total annual nitrogen excretion for each livestock category *T* managed in manure management system *S,*
$EF_{3(S)}$ – emission factor for direct N_2O emissions from manure management system *S* (kg N_2O–N/kg N),
S – manure management system
T – livestock category
44/28 – conversion of $(N_2O–N)_{(mm)}$ emissions to $N_2O_{(mm)}$ emissions

As the data on animals' nitrogen excretion rates (kg N/head/year) is country specific one [IUNG, Kopiński 2014] it could be assumed that the *Tier 2* method is applied for all livestock categories (apart from fur-bearing animals). The basis for assessment of Nitrogen excretion rates (Nex) applied in calculations of N_2O emissions constitutes the standard amounts of nitrogen in faeces and urine determined for different groups of livestock animals grounded on standard quantity, sort and digestibility of fodder applied. The Nex parameters for dairy cattle differ in time what is related mostly to increasing milk production where mean milk yield exceeded 4500 litters/yr on average in 2011 (table 5.4). Country specific Nex values are generally in line with parameters published in [UNECE 2001] as well as with those published in [IPCC 2006, table 10.19] for most livestock categories (table 5.10).

The exemptions are sheep and goats where Nex values for Poland are among group of countries with lower factor then the default ones in 2006 IPCC GLs. The country specific Nex values were established based on livestock categories raised in Poland as well as country specific conditions and international literature and research. Sheep (as well as goats) in Poland are fed on pastures for around half a year and housed for another half. Sheep and goats are fed mostly on roughage from extensive pastures and meadows. Winter feeding cover hay, straw and root crops. Additional protein fodder is not widely applied among sheep and goats, if applied it is limited to lambs. It should be mentioned here that Nex is established for entire group of sheep of which about 30% are lambs and other immature animals.

For rabbits and other fur-bearing animals the *Tier 1* method and default Nex values were used from [IPCC 2006, table 10.19] where Nex for rabbits amounts to 8.1 kg N/head/yr and Nex for other fur-bearing animals is the weighted mean value of 6.36 kg N/head/yr, established based on population of foxes and minks (respectively 12.09 for foxes and 4.59 kg N/head/yr for minks).

Table 5.10. Country specific Nitrogen excretion rates (Nex) in manure by livestock categories

Livestock	Nex [kg/head/year]		
	CS	UNECE 2001	2006 IPCC (based on default animal mass)
Dairy cattle: 1988–1995 1996–2000 2001–2005 2006–2010 Since 2011	 65.0 70.0 75.0 80.0 83.0	60 – 110 (< 5000 kg milk/cow/yr) 100 - 140 (5000-6000 kg milk/cow/yr; low amount of concentrate) 80 – 100 (5000-6000 kg milk/cow/yr; >500 kg concentrate/yr) 110 - 140 (9000-10000 kg milk/cow/yr)	70.26
Non-dairy cattle: calves up to 1 year Young cattle 1–2 years Heifers above 2 years Bulls above 2 years	 19.0 46.0 53.0 65.0	Beef cattle: 40-50 Extensive (maily grazing) 35-45 Intensive (corn silage etc.)	49.95
Swine: piglets (< 20 kg) piglets (20-50 kg) fattening pigs (> 50 kg) sows butcher hogs	 2.6 9.0 15.0 20.0 18.0	10-18 30-40 (including piglets to 25 kg)	Market – 10.04 Breeding – 30.22
Sheep	9.5	-	15.93
Goats	8.0	-	17.99
Horses	55.0	-	41.28
Poultry: Laying hens Broilers Turkeys ducks	 0.8 0.2 1.6 1.0	 0.60 – 0.80 0.35 – 0.50	 0.54 0.36 1.84 0.82

Default values of N_2O emission factors for given management systems from [IPCC 2006, table 10.21] were applied (table 5.11). As the information on share of liquid systems with and without crust are not presently recognised in detail the conservative approach was taken to use the higher value of N_2O EF characterising slurry system with natural crust cover.

Table 5.11. Emission factors for calculating N_2O emissions from manure management [IPCC 2006]

Animal Waste Management Systems	Emission factor (EF_3) [kg N_2O-N/kg N]
Liquid / slurry with natural crust cover	0.005
Liquid / slurry without natural crust cover	0.000
Solid storage	0.005
Pit storage below animal confinements	0.002
Poultry manure with litter	0.001
Poultry manure without litter	0.001

5.3.2.3. Indirect N_2O emission from manure management

Following IPCC 2006 Guidelines the indirect N_2O emissions from manure management were estimated based on equations: 10.27 (N volatilisation) and 10.29 (N leaching) as well as nitrogen excretion rates (Nex) and manure management systems shares (MS) described in previous subchapters related to GHG emissions from manure management. Emission factor for calculation of N_2O emissions from atmospheric nitrogen deposition was assumed as 0.01 kg N_2O−N while emission factor for N_2O emissions from nitrogen leaching and runoff was adopted as 0.0075 kg N_2O−N (default EFs from IPCC 2006).

Nitrogen losses related to volatilisation from manure management were calculated based on equation 10.26 [IPCC 2006] where fractions of managed manure nitrogen for given livestock category that volatilises as NH_3 and NOx in given manure system ($Frac_{GAS}$) are taken from [IPCC 2006 table 10.22]. Nitrogen losses due to leaching from manure management were estimated based on equation 10.28 [IPCC 2006] applying fraction of managed manure nitrogen losses for livestock categories due to runoff and leaching during manure storage as the difference between Nitrogen loss from manure management $Frac_{Loss}M$ (IPCC 2006 Table 10.23) and Nitrogen loss due to volatilisation of NH_3 and NOx from manure management $Frac_{Gass}MS$ (IPCC 2006 Table 10.22).

5.3.3. Uncertainties and time-series consistency

Description of uncertainties is given in Chapter 5.2.3.

5.3.4. Source-specific QA/QC and verification

Activity data related to livestock population come from national statistics prepared by the Central Statistical Office. Data on Animal Waste Management Systems are elaborated by the National Research Institute of Animal Production which develops activities aiming at obtaining representative data on the production of main livestock categories. Collection of this data is based on appointing a suitable monitoring for various institutions like statistical office, Farmers Chambers, Centres for Agricultural Advice and Veterinary Inspection. Partially monitoring is covered also by Institute's employees.
Emphasis was put on data consistency between sub-categories and between sectors using agricultural data. Emission factors and methodology is compared with international literature and other countries methods/EF applied. Calculations were examined with focus on formulas, units and trends consistency. Generally QC procedures follow QA/QC plan presented in Annex 5.

5.3.5. Source-specific recalculations

- update of GE for dairy cows due to updating the fat contain in milk for dairy cattle in 2014 (CH_4)
- correction of fractions of managed manure nitrogen losses due to runoff and leaching during manure storage (N_2O)

Table 5.12. Changes in CH_4 emissions from manure management due to recalculations

Change	1988	1989	1990	1991	1992	1993
kt	0	0	0	0	0	0
%	0	0	0	0	0	0
Change	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
kt	0	0	0	0	0	0
%	0	0	0	0	0	0
Change	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
kt	0	0	0	0	0	0
%	0	0	0	0	0	0
Change	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
kt	0	0	0	0	0	0
%	0	0	0	0	0	0
Change	**2012**	**2013**	**2014**			
kt	0	0	-0.15			
%	0	0	-0.52			

Table 5.13. Changes in N_2O emissions from manure management due to recalculations

Change	1988	1989	1990	1991	1992	1993
kt	-0.24	-0.23	-0.23	-0.23	-0.22	-0.18
%	-2.22	-2.12	-2.12	-2.20	-2.20	-2.04
Change	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
kt	-0.18	-0.19	-0.17	-0.17	-0.17	-0.17
%	-2.00	-2.10	-1.99	-2.01	-1.98	-1.97
Change	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
kt	-0.15	-0.15	-0.16	-0.18	-0.17	-0.18
%	-1.94	-1.86	-2.02	-2.27	-2.29	-2.35
Change	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
kt	-0.19	-0.19	-0.17	-0.16	-0.16	-0.16
%	-2.37	-2.36	-2.18	-2.19	-2.19	-2.14
Change	**2012**	**2013**	**2014**			
kt	-0.14	-0.14	-0.15			
%	-2.04	-2.08	-2.10			

5.3.6. Source-specific planned improvements

Recognition related to data on liquid systems management with differentiation for with/without crust is planned.

5.4. Agricultural Soils (CRF sector 3.D)

5.4.1. Source category description

Nitrous oxide emissions from agricultural soils amounted to 42.7 kt N_2O in 2015 and significantly decreased since base year by about 30% up to 2015 (fig. 5.6). Since 1993 emissions stabilised with few percent changes between years. There are several main driving forces influencing emissions variability during entire inventoried period: nitrogen mineral and organic fertilizers use, livestock and crops production.

As a result of economic transformation of the Polish economy in 1989 significant changes were observed in relation to crop production and usage of agricultural land. For instance the decrease of agricultural land of which share in total country area changed from 59.2% in 1989 up to 54% in 1996, also significant increase of fallow land was noted - in 1989 the share of fallow land in agricultural land was 1.1% while in 2002 - 13.6%. Between 1990 and 2002 the decrease of sown area by 3.5 million hectares occurred, also the decrease of mineral fertilisers' use drop from 164 kg per 1 ha of agricultural land in 1989/90 to 93 kg in 2001/02. Since 1988 production of certain crops in Poland changed noteworthy – potatoes cultivation dropped by almost 82% up to 2015 while maize production increased more than 15-fold (table 5.14).

Table 5.14. Main crops production in 1988–2015 in Poland [kt]

	wheat	barley	maize	oats	rye	triticale	cereal mixed	millet & buckwheat	pulses edible	pulses feed	potatoes	rape & agrimony	All vegetables	All fruits
1988	7582	3804	204	2222	5501	1731	3387	73	108	457	34707	1199	5179	2168
1989	8462	3909	244	2185	6216	2404	3466	72	120	495	34390	1586	5067	2078
1990	9026	4217	290	2119	6044	2721	3554	43	116	493	36313	1206	5259	1416
1991	9270	4257	340	1873	5900	2449	3683	39	133	547	29038	1043	5637	1873
1992	7368	2819	206	1229	3981	1711	2612	36	98	282	23388	758	4518	2385
1993	8243	3255	290	1493	4992	1894	3200	50	107	304	36270	594	5823	2705
1994	7658	2686	189	1243	5300	1631	3026	30	66	149	23058	756	5198	2109
1995	8668	3278	239	1495	6288	2048	3844	45	101	167	24891	1377	5746	2115
1996	8576	3437	350	1581	5653	2130	3520	51	97	180	27217	449	5253	2781
1997	8193	3866	416	1630	5299	1841	4105	49	97	163	20776	595	5136	2887
1998	9537	3612	497	1460	5663	2058	4274	58	111	178	25949	1099	6096	2517
1999	9051	3401	599	1447	5181	2097	3914	60	99	218	19927	1132	5457	2387
2000	8503	2783	923	1070	4003	1901	3084	74	93	171	24232	958	5721	2247
2001	9283	3330	1362	1305	4864	2698	4060	58	88	123	19379	1064	5428	3413
2002	9304	3370	1962	1486	3831	3048	3608	40	95	134	15524	953	4537	3018
2003	7858	2831	1884	1182	3172	2812	2812	44	66	172	13731	793	4870	3309
2004	9892	3571	2344	1430	4281	3723	4322	72	77	193	13999	1633	5283	3521
2005	8771	3582	1945	1324	3404	3903	3916	83	66	187	10369	1450	5220	2923
2006	7060	3161	1261	1035	2622	3197	3379	59	60	146	8982	1652	4919	3212
2007	8317	4008	1722	1462	3126	4147	4257	96	75	210	11791	2130	5475	1694
2008	9275	3619	1844	1262	3449	4460	3673	82	56	179	10462	2106	5023	3843
2009	9790	3984	1706	1415	3713	5234	3884	93	60	212	9703	2497	5601	3749
2010	9408	3397	1994	1516	2852	4576	3339	146	88	268	8188	2229	4878	2826
2011	9339	3326	2392	1382	2601	4235	3373	109	84	251	9362	1862	5575	3414
2012	8608	4180	3996	1468	2888	3349	3920	128	85	395	9041	1866	5431	3286
2013	9485	2934	4040	1190	3359	4273	3021	135	84	291	7290	2678	4986	4128
2014	11629	3275	4468	1459	2793	5247	2922	135	115	352	7689	3276	5607	4189
2015	10958	2961	3156	1220	2013	5339	2250	99	172	543	6314	2701	4795	4100
change [%] 1988-2015	*44,5*	*-22,2*	*1447,2*	*-45,1*	*-63,4*	*208,5*	*-33,6*	*36,0*	*58,8*	*18,9*	*-81,8*	*125,3*	*-7,4*	*89,1*

More than 80% of N_2O emissions here are related to direct soil cultivation, while about 20% are generated in indirect emission processes. The main sources of N_2O emissions estimated relate to direct soil cultivation covering:

- Inorganic N fertilizers use,
- Organic N fertilizers use (animal manure and sewage sludge),
- Urine and dung deposited by grazing animals,
- Crop residues,
- Mineralisation/immobilisation associated with loss/gain of soil organic matter,
- Cultivation of organic soils (i.e. histosols).

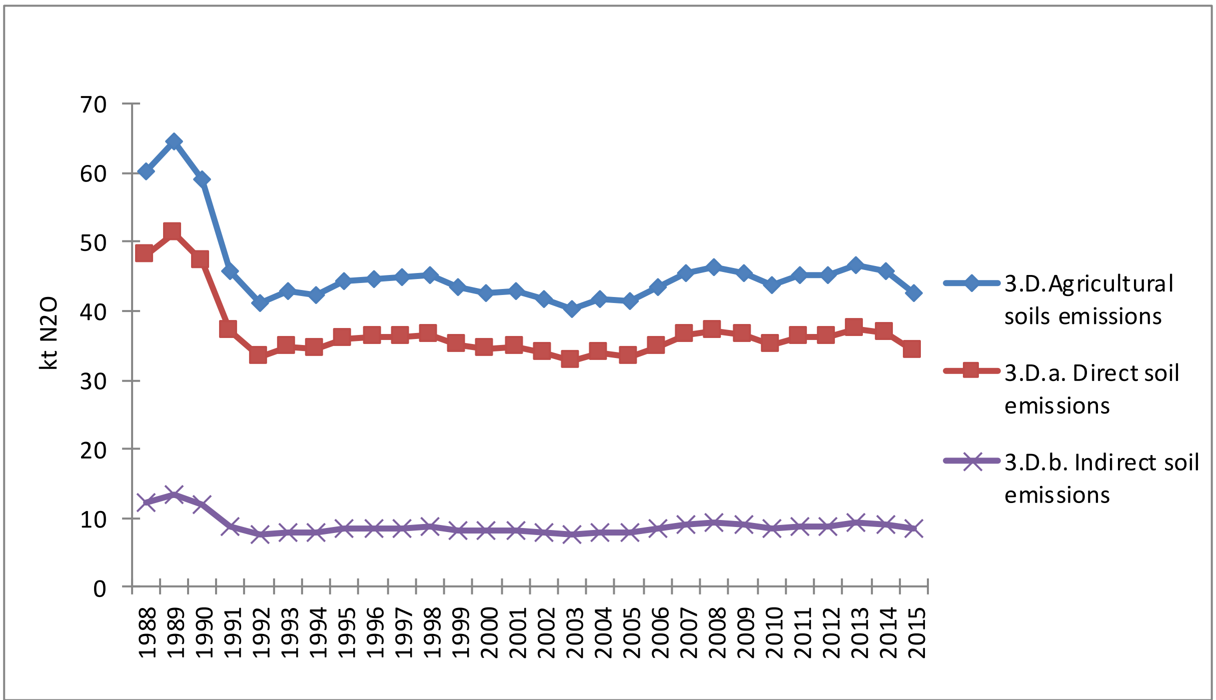

Figure 5.6. N_2O emissions from agricultural soils for 1988–2015

5.4.2. Methodological issues

5.4.2.1. Direct N_2O emissions from managed soils (CRF sector 3.D.a)

Direct N_2O emissions from managed soils has been estimated based on equation 11.1 from the IPCC 2006:

$$N_2O_{Direct} - N = (F_{SN} + F_{ON} + F_{CR} + F_{SOM})EF_1 + F_{OS} * EF_2 + F_{PRP} * EF_{3PRP}$$

where:

N_2O_{Direct}-N = annual direct N_2O–N emissions produced from managed soils (kg N_2O–N/year)
F_{SN} = annual amount of synthetic fertiliser N applied to soils (kg N/year)
F_{ON} = annual amount of animal manure, compost, sewage sludge and other organic N additions applied to soils (kg N/year)
F_{CR} = annual amount of N in crop residues (above and below ground), including N-fixing crops, and from forage/pasture renewal, returned to soils (kg N/year)
F_{SOM} = annual amount of N in mineral soils that is mineralised, in association with loss of soil C from soil organic matter as a result of changes of land use or management (kg N/year)
F_{OS} = annual area of managed/drained organic soils (ha)
F_{PRP} = annual amount of urine and dung N deposited by grazing animals on pasture, range and paddock (kg N/year)
EF_1 = emission factor for N_2O emissions from N inputs (kg N_2O–N/kg N input)

EF_2 = emission factor for N_2O emissions from drained/managed organic soils (kg N_2O–N/ha/year)
EF_{3PRP} = emission factor for N_2O emissions from urine and dung N deposited on pasture, range and paddock by grazing animals (kg N_2O–N/kg N input)

The following default values of N_2O emission factors to estimate direct emissions from managed soils were applied [IPCC 2006, table 11.1]:
EF_1 = 0.01 kg N_2O–N/kg N input
EF_2 = 8 kg N_2O–N/ha/year (for temperate organic crop and grassland soils)
EF_{3PRP} = 0.02 for cattle, swine and poultry, 0.01 for sheep, goats and horses

In 2015 about 46% of direct N_2O emissions comes from the use of synthetic nitrogen fertilizers, about 25% relates to management of organic soils, 12% − to crop residues and 14% − to organic fertilizers applied to soils. Only 3% of direct N_2O emissions comes from urine and dung left by grazing animals on pastures (fig. 5.7). As relates to mineralisation of soils as a result of changes of land use or management – these emissions are moved to LULUCF sector.

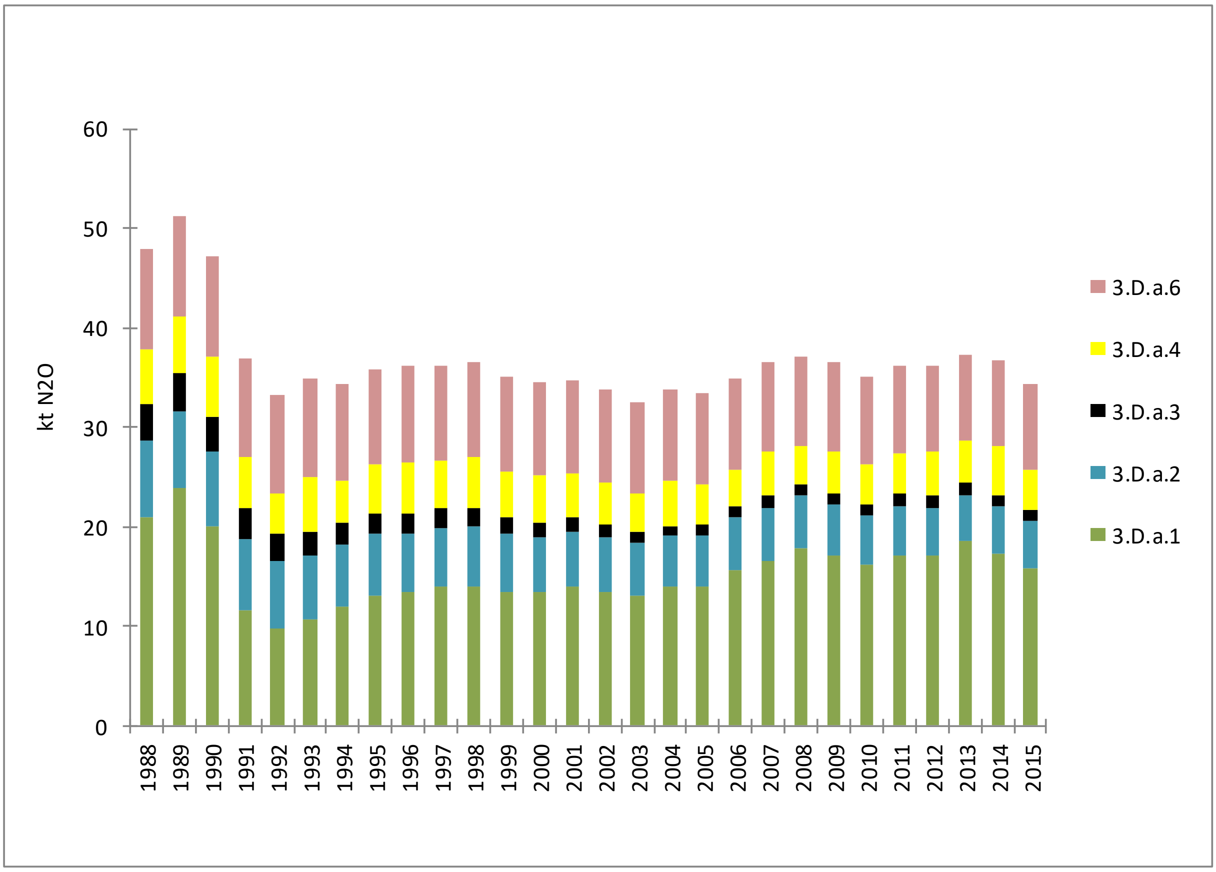

Fig. 5.7. Direct N_2O emissions from specific subcategories

Synthetic nitrogen fertilizers (F_{SN}) (CRF sector 3.D.a.1)

N_2O emission from synthetic fertilizers was estimated based on the amount of nitrogen synthetic fertilizer applied to soils published in [GUS R2 2015]. Data regarding consumption of mineral fertilizers is elaborated on the basis of reporting from production and trade units, statistical reports of agricultural farms: state-owned, co-operatives and companies with share of public and private sector, expert's estimates as well as Central Statistical Office estimates. Present level of fertilizing is still lower than it was in 1988−1989. The drop of nitrogen fertilizers use in 1989−1992 amounted to 41% and gradually increased up to 2007 when exceeded 1 million tons (table 5.15). As part of the Act on Fertilisers and Fertilisation, *inter alia*, the following measures are introduced: limitation of the natural fertiliser dose to 170 kg N/ha/year, a ban on the use of natural fertilisers from the end of November to the beginning of March and mandatory training courses for persons who provide services in application of fertilisers [BR2 POL 2015, chapter 3.5.2].

Table 5.15. Nitrogen fertilizers use (F_{SN}) in 1988–2015 in Poland [kt N]

1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1 335	1 520	1 274	735	619	683	758	836	852	890	891	862
2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
861	895	862	832	895	895	996	1 056	1 142	1095	1028	1091
2012	**2013**	**2014**	2015								
1095	1179	1098	1004								

Nitrous oxide emissions amounted in 2015 about 15.8 kt N_2O. Generally trend in N_2O emissions follow nitrogen fertilizers use and range from 23.9 kt N_2O in 1989 to 9.7 kt N in 1992.

Organic nitrogen fertilizers (F_{ON}) (CRF sector 3.D.a.2)

Organic nitrogen fertilisers cover both animal manure as well as sewage sludge applied to fields.

The amount of nitrogen in **animal manure applied to soils** is calculated according to the method described in chapter 5.3.2.2. Following guidelines given in chapter 10.5.4 and using equation 10.34 (2006 IPCC), all nitrogen excreted on pasture, range and paddock as well as all nitrogen volatilised prior to final application to managed soils is subtracted from the total excreted manure. The amount of managed manure nitrogen that is lost in the manure management system is taken from table 10.23 (IPCC 2006) for particular livestock categories. Nitrogen from bedding material was taken into account in total Nitrogen applied to soils. Data related to Nitrogen added in straw was calculated in line with Ammonia emissions from manure management for straw based systems and amounts to: dairy cattle; 6 kg N/animal/yr., other cattle 2 kg N/animal/yr., fattening pigs: 0.8 kg N/animal/yr., sows 2.4 kg N/animal/yr., sheep and goats 0.08 kg N/animal/yr., horses 2 kg N/animal/yr. The fractions of animal manure burned for fuel, used for feed and fuel were neglected because these activities do not occur in Poland.

Nitrous oxide emissions from animal manure applied to soils in 2015 was about 4.8 kt N_2O. Trend of emissions is caused by trend of livestock population, mainly cattle and sheep after 1989 (see tables 5.2, 5.3).

Activity data on the amount of **sewage sludge applied on the fields** were taken from national statistics [GUS 2016d] and regards both - industrial and municipal sewage sludge applied in cultivation of all crops marketed, including crops designed to produce fodder as well as this applied in cultivation of plants intended for compost production. As the consistent reporting of data concerning application of sewage sludge in agriculture in the public statistics starts in 2003, the activities since 1988 were supplemented based on annual mean changes of AD in 2003−2009 where constant increasing trend was noted (fig. 5.8). Diminishing trend back to 1988 corresponds to the number of people using sewage treatment plants that ranges from 11 million in 1988 through 19 million in 1998 and almost 28 million in 2015 where this number was more than doubled in 1988-2015. Also the number of municipal sewage treatment plants increased from 558 in 1988 up to 1923 in 1998 and 3268 in 2015 [GUS 2016, 2016d].

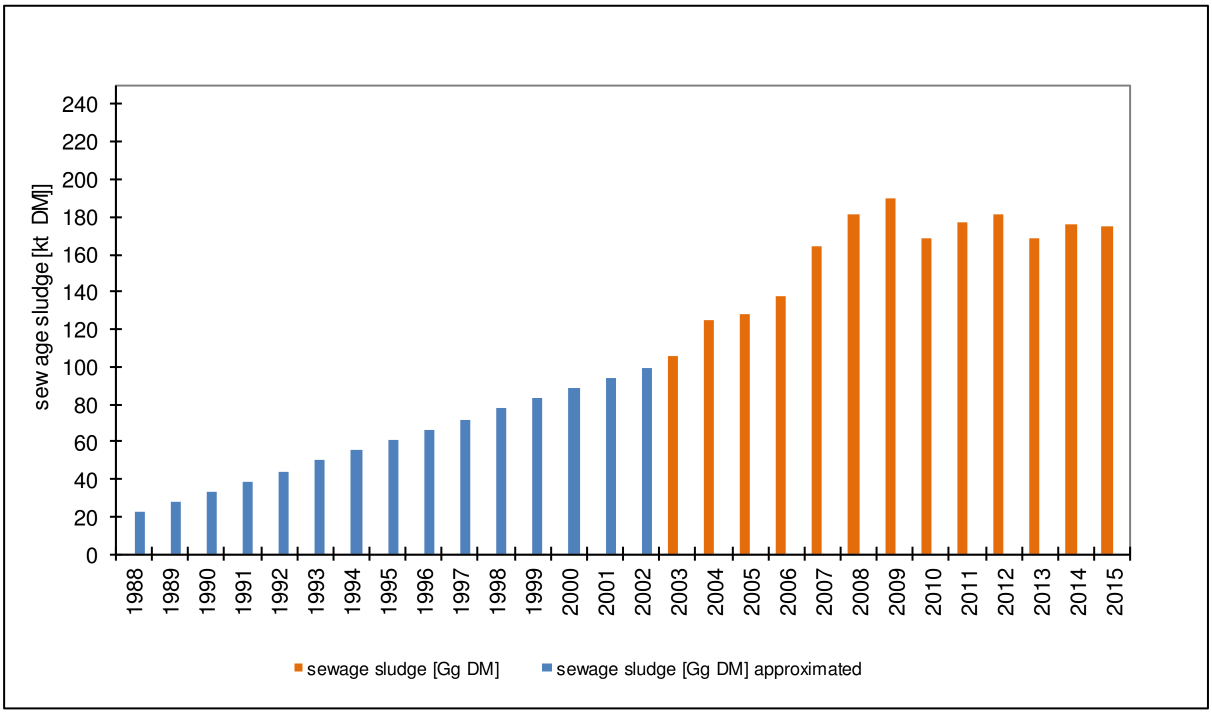

Fig. 5.8. Amounts of sewage sludge applied in agriculture [kt DM]

The mean content of nitrogen in sewage sludge was taken as 2.61% from publication [Siebielec, Stuczyński 2008] where analysis of nitrogen content in domestic sewage sludge applied in agriculture was made. The study covered a group of 60 biosolids collected in 2001-2004 from 43 municipal sewage treatment plants. The same N content was assumed for both – municipal and industrial sewage sludge because majority of it applied in agriculture (about 76%) come from municipal treatment plants.

In Poland application of sewage sludge as fertilizer is relatively small, after increasing trend 2003–2009, certain stabilisation is noticed. Emissions of N_2O for this subcategory amount to 0.07 kt N_2O in 2015.

Urine and dung deposited by grazing animals (F_{PRP}) (CRF sector 3.D.a.3)

Emission of N_2O resulting from animal urine and dung deposited on pastures is calculated based on equation 11.5 [IPCC 2006] using animal population (tables 5.2, 5.3), total amount of nitrogen in animal excreta (Nex) estimated based on country specific parameters presented in table 5.10 and data on fraction of manure related to grazing animals was presented in chapter 5.3.2 and, table 5.8.

Emissions in 2015 from pasture, range and paddock manure were 1.2 kt N_2O and stabilized since 2002. This value is much lower than in 1988 by about 68% what was caused by decreasing livestock population as well as decreasing percentage of livestock grazed.

Crop Residues (F_{CR}) (CRF sector 3.D.a.4)

N_2O emission from crop residue returned to soils was generally estimated based on modified equation 11.6 from [Corrigenda for the 2006 IPCC GLs]:

$$F_{CR} = \sum_{T} \{Crop_{(T)} * Area_{(T)} * Frac_{Renew(T)} * [R_{AG(T)} * N_{AG(T)} * (1 - Frac_{Burn(T)} - Frac_{Remove(T)}) + R_{BG(T)} * N_{BG(T)}]\}$$

where:

F_{CR} = annual amount of N in crop residues (above and below ground), including N-fixing crops, and from forage/pasture renewal, returned to soils annually, kg N / yr

$Crop_{(T)}$ = harvested annual dry matter yield for crop *T*, kg d.m. / ha

$Area_{(T)}$ = total annual area harvested of crop *T*, ha / yr

$Frac_{Renew(T)}$ = fraction of total area under crop *T* that is renewed annually.

$R_{AG(T)}$ = ratio of above-ground residues dry matter ($AG_{DM(T)}$) to harvested yield for crop *T* ($Crop_{(T)}$), kg d.m. / kg d.m.,

$N_{AG(T)}$ = N content of above-ground residues for crop *T*, kg N / kg d.m.,

$Frac_{Burn(T)}$ - fraction of crop residues burned as indicated in sector 3.F

$Frac_{Remove(T)}$ = fraction of above-ground residues of crop *T* removed annually for purposes such as feed, bedding and construction, kg N / kg crop-N

$R_{BG(T)}$ = ratio of below-ground residues to harvested yield for crop *T*, kg d.m. / kg d.m.

$N_{BG(T)}$ = N content of below-ground residues for crop *T*, kg N / kg d.m.

T = crop or forage type

$R_{BG(T)}$ is calculated by multiplying R_{BG-BIO} in Table 11.2 by the ratio of total above-ground biomass to crop yield (= [($AG_{DM(T)}$ ● 1000 + $Crop_{(T)}$) / $Crop_{(T)}$], calculating $AG_{DM(T)}$ from the information in Table 11.2. Values of nitrogen content in below-ground residues for specific crops $N_{BG(T)}$ were taken from table 11.2 [IPCC 2006]. For permanent pastures and meadows, which are renewed on average every 20 years, $Frac_{Renew}$ = 1/20. For annual crops $Frac_{Renew}$ was taken as 1.

Data on N content in the above-ground residues, ratio of above-ground residues in dry matter to harvested yield for crops, fraction of crops burned come from country studies [Łoboda 1994, IUNG 2012] where experimental and literature data as well as default emission factors were used and are given in table 5.23. Fraction of total above-ground crop biomass that is removed from the field as a crop product (FracR) were consulted with the Institute of Soil Science and Plant Cultivation – State Research Institute and is presented in table 5.16.

Table 5.16. Fraction of total above-ground crop biomass that is removed from the field as a crop product ($Frac_{Remove}$) according to crops/group of crops

crop	$Frac_{Remove}$	crop	$Frac_{Remove}$
wheat	0.70	sugar beet	0.25
rye	0.70	rape	0.10
barley	0.70	other oil-bearing	0.10
oats	0.70	flux straw	0.90
triticale	0.70	tobacco	0.65
`cereal mixed	0.70	hop	0.01
millet & buckwheat	0.70	hey from pastures and meadows	0.95
maize	0.10	hey from pulses	0.95
pulses edible	0.10	hey from legumes	0.95
pulses feed	0.10	vegetables	0.10
potatoes	0.01		

Activity data concerning crop production was taken from national statistics [GUS R3 2016] (table 5.12). The default emission factor of 0.01 kgN_2O-N/kg N [IPCC 2006, table 11.1] multiplied by 44/28 was used for estimating the N_2O emissions from N inputs from crop residues.

Emission from above- and belowground crop residues in 2015 was 4.0 kt N_2O and is lower by about 27% than in 1988 due to drop in area sawn and crop production.

Mineralised N resulting from loss of soil organic C stocks in mineral soils through land-use change or management practices (F_{SOM}) (CRF sector 3.D.a.5)

The N_2O emission reported in this subcategory in previous NIRs was moved to the category 4.B. related to cropland use change as the indicated emissions were related to N loss due to land management change. For cropland remaining cropland no N_2O emissions are recognised.

Cultivation of organic soils (F_{OS}) (CRF sector 3.D.a.6)

The area of cultivated organic soils (i.e. histosols) in Poland was estimated as a case study for the purposes at national inventory [Oświecimska–Piasko 2008]. Based on information collected from Computer database on peatlands in Poland "TORF" as well as from system of Spatial Information on Wetlands in Poland the area of histosols was assessed for mid–1970s and mid–1990s. The area from which N_2O emissions were calculated covers histosols as agricultural lands cultivated and/or irrigated. So the area of such area was 882.6 thousand ha in mid–1970–ties and 769 thousand ha in mid–1990–ties. The area of histosols was then interpolated for 1976−1994.

Additionally the area of cultivated histosols was assessed for 2015 for the purpose of GHG emission projections which amounts to 680 thousand ha [6RR 2013, chapter 5.1]. Similarly to the previous period interpolation of histosol areas was applied between 1995 and 2015.

Nitrous oxide emissions from cultivated histosols in Poland in 2015 was about 8.5 kt N_2O and is falling since 1988 because of continuous progress of mineralization of organic matter as well as increasing area of histosols occupied by forest and scrub communities following cultivation termination of these areas.

5.4.2.2. Indirect N_2O emissions from managed soils (CRF sector 3.D.b)

Atmospheric deposition (CRF sector 3.D.b.1)

Indirect emissions of N_2O from atmospheric deposition of N volatilised were assessed using equation 11.9 [IPCC 2006]:

$$N_2O_{(ATD)} - N = \left[(F_{SN} * Frac_{GASF}) + \left((F_{ON} + F_{PRP}) * Frac_{GASM}\right)\right] * EF_4$$

where:

$N_2O_{(ATD)}$-N – annual amount of N_2O-N produced from atmospheric deposition of N volatilised from managed soils (kg N_2O-N/year)
F_{SN} – annual amount of synthetic N fertilizer applied to soils (kg N/year)
F_{ON} – annual amount of organic N fertilizer applied to soils (animal manure and sewage sludge nitrogen) (kg N/year)
F_{PRP} = annual amount of urine and dung N deposited by grazing animals on pasture, range and paddock (kg N/year)
$Frac_{GASF}$ - fraction of synthetic fertilizer that volatilises as NH_3 and NO_x (kg of N applied)
$Frac_{GASM}$ - fraction of organic fertilizer materials that volatilises as NH_3 and NO_x (kg of N applied)
EF_4 – emission factor for N_2O emissions from atmospheric deposition of N on soils and water surfaces (kg N–N_2O)

Nitrogen amounts from synthetic fertilizers as well as from organic additions to soils (livestock manure and sewage sludge) correspond to values presented in chapter 5.4.2.1. Parameters characterising $Frac_{GASF}$ and $Frac_{GASM}$ are taken from table 11.3 [IPCC 2006] and amount respectively: 0.1 kg NH_3-N+NO_x-N/kg N applied and 0.2 kg NH_3-N+NO_x-N/kg N applied. Also the default emission factor EF_4 [IPCC 2006, table 11.3] is used amounting to 0.01 kg N_2O-N (kg NH_3-N+NO_x-N volatilised).

Table 5.17. Volatized nitrogen from synthetic and organic fertilizers applied to soils

Year	Volatized N [kt N/yr]	Year	Volatized N [kt N/yr]
1988	257.17	2002	163.52
1989	278.15	2003	158.32
1990	248.72	2004	160.68
1991	188.32	2005	162.09
1992	169.04	2006	175.67
1993	165.84	2007	182.08
1994	170.86	2008	188.51
1995	175.79	2009	180.77
1996	173.63	2010	174.60
1997	178.04	2011	180.28
1998	178.26	2012	178.17
1999	172.15	2013	185.31
2000	166.26	2014	178.34
2001	169.43	2015	169.71

Nitrogen leaching and run-off (CRF sector 3.D.b.2)

Indirect emissions of N_2O from leaching and runoff of N from soils were assessed using equation 11.10 [IPCC 2006]:

$$N_2O_{(L)}\text{-}N = (F_{SN} + F_{ON} + F_{PRP} + F_{CR} + F_{SOM}) * Frac_{LEACH\text{-}(H)} * EF_5$$

where:

$N_2O_{(L)}$-N – annual amount of N_2O-N produced from leaching and runoff of N additions to managed soils (kg N_2O−N/year)

F_{SN} = annual amount of synthetic fertiliser N applied to soils (kg N/year)

F_{ON} = annual amount of animal manure, compost, sewage sludge and other organic N additions applied to soils (kg N/year)

F_{PRP} = annual amount of urine and dung N deposited by grazing animals on pasture, range and paddock (kg N/year)

F_{CR} = annual amount of N in crop residues (above and below ground), including N-fixing crops, and from forage/pasture renewal, returned to soils (kg N/year)

F_{SOM} = annual amount of N in mineral soils that is mineralised, in association with loss of soil C from soil organic matter as a result of changes of land use or management (kg N/year)

$Frac_{LEACH\text{-}(H)}$ - fraction of all N added to/mineralised in managed soils (kg N / kg of N additions)

EF_5 – emission factor for N_2O emissions from N leaching and runoff (kg N_2O−N)

Nitrogen additions to soils correspond to values presented in chapter 5.4.2.1. $Frac_{LEACH\text{-}(H)}$ equals 0.3 kg N/kg N added and is the default value taken from [IPCC 2006, table 11.3]. The default emission factor EF_5 equal 0.0075 kg N_2O-N/kg N leached and runoff was used for calculation of N_2O-N emissions produced from leaching and runoff of N [IPCC 2006, table 11.3].

Table 5.18. Nitrogen losses through leaching and runoff from nitrogen added to soils

Year	N losses [kt N/yr]	Year	N losses [kt N/yr]
1988	690.79	2002	457.43
1989	753.95	2003	436.25
1990	679.78	2004	462.36
1991	490.27	2005	455.32
1992	424.76	2006	482.75
1993	457.44	2007	515.38
1994	451.37	2008	527.83
1995	482.99	2009	517.27
1996	489.38	2010	490.66
1997	491.42	2011	513.05
1998	500.84	2012	515.63
1999	473.87	2013	535.90
2000	466.80	2014	525.51
2001	472.65	2015	481.64

Total indirect emission in 2015 was about 8.3 kt N_2O and the trend since 1992 is rather stable after significant drop in 1989−1992 accompanying serial decrease in mineral fertilisers use and animal population.

5.4.3. Uncertainties and time-series consistency

Description of uncertainties is given in Chapter 5.2.3.

5.4.4. Source-specific QA/QC and verification

Activity data related to mineral fertilisers use or crop production come from national statistics prepared by the Central Statistical Office. Overall final estimation of cereals and potatoes output was verified by means of simulative calculation of crops quantity according to the distribution of output between: sale, sowing/planting, fodder and self consumption. Final estimation of sugar beets, rape and turnip rape, and some species of industrial crops were verified with procurement data for these crops. Estimation of fodder crops output in private farms, conducted by local experts of CSO, was additionally verified by the calculation of fodder crops according to the directions of their use. Total area of fodder crops comprises the area of meadows, pastures and field crops for fodder. This area does not include the area of cereals, potatoes, and other agricultural crops, a part of which was directly or indirectly used for fodder.
Emphasis was put on data consistency between sub-categories and between sectors using agricultural data. Emission factors and methodology is compared with international literature and other countries methods/EF applied. Calculations were examined with focus on formulas, units and trends consistency. Generally QC procedures follow QA/QC plan presented in Annex 5.

5.4.5. Source-specific recalculations

- inclusion of Nitrogen from bedding material to the manure applied to soils (ERT 2016),
- correction of trend in activities for sewage sludge used for agricultural purposes in 1988-2002 based on trend for 2003-2009 (ERT 2016)
- moving the N_2O emissions from related to loss of soil organic C in mineral soils to category 4.B,

Table 5.19. Changes in N_2O emissions from agricultural soils resulting from recalculations.

Change	1988	1989	1990	1991	1992	1993
kt	1.27	1.27	1.26	1.21	1.15	1.05
%	2.16	2.01	2.17	2.73	2.89	2.51
Change	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
kt	1.05	1.03	0.97	0.99	0.99	0.94
%	2.53	2.37	2.23	2.25	2.24	2.23
Change	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
kt	0.87	0.85	0.85	0.84	0.80	0.81
%	2.09	2.02	2.07	2.14	1.95	2.01
Change	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
kt	0.82	0.80	0.76	0.72	0.72	0.69
%	1.94	1.79	1.67	1.62	1.69	1.54
Change	**2012**	**2013**	**2014**			
kt	0.64	0.51	0.51			
%	1.44	1.11	1.13			

5.4.6. Source-specific planned improvements

Presently no improvements are planned.

5.5. Field Burning of Agricultural Residues (CRF sector 3.F)

5.5.1. Source category description

Greenhouse gas emissions in 2015 from field burning of agricultural residues amounted to 0.95 kt CH_4 and 0.04 kt N_2O. The share of GHG emissions from field burning of agricultural residues in total agricultural emissions is 0.1%. The trend of GHG emissions within this category is presented on figure 5.9 and fluctuates following the annual crop production.

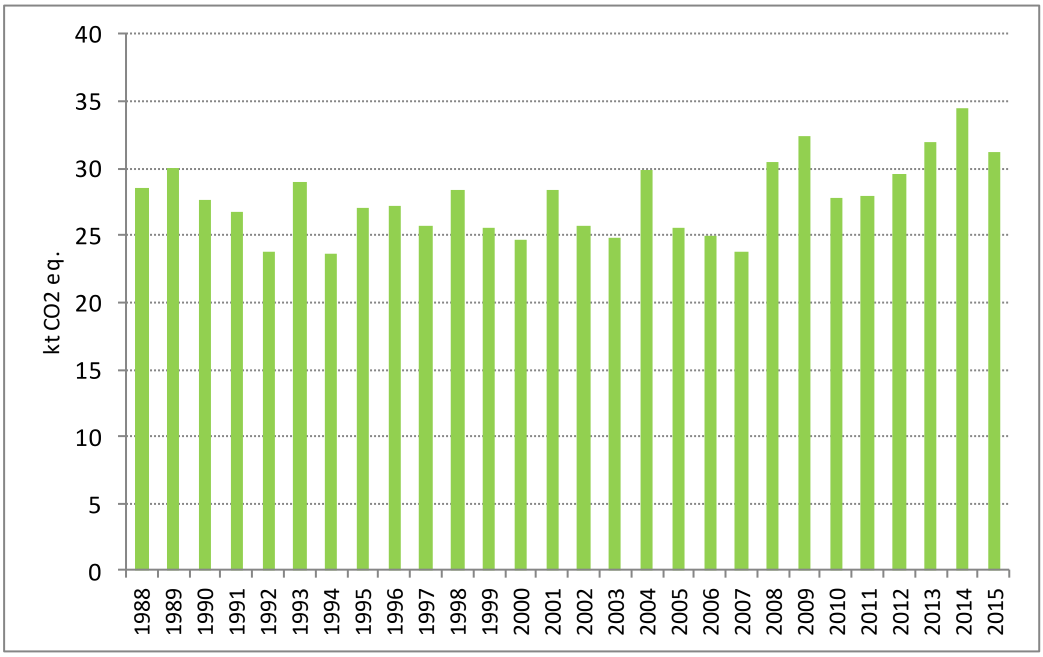

Figure 5.9 CH_4 and N_2O emissions from field burning of agricultural residues presented as CO_2 equivalent

5.5.2. Methodological issues

While estimating GHG emissions in this subcategory only methane and nitrous oxide are taken into account assuming that carbon dioxide released during burning of crop residues is reabsorbed during the next growing season.

Estimation of CH_4 and N_2O emissions from burning of agricultural residues in fields is still based on the IPCC methodology as published in 1997. This method is more detail and covers specific crops burned, than the method described in IPCC 2006 GLs (Chapters 2.4 and 5.2.4). These parameters and emissions are also consistent with calculations made for category 3.1.a.4 Crop residues retained to soils.

For domestic purposes 43 crops were selected for which residues can potentially be burned [Łoboda *at al* 1994]. Within this group certain plants were excluded for which residues can be composted or used as forage. So finally there were selected 38 crops which were than aggregated into 32 groups containing cereals, pulses, tuber and root, oil-bearing plants, vegetables and fruits potentially could be burned on fields.

Activity data on crop production comes from public statistics [GUS R3 2016, GUS R10, 2016]. Factors applied for emissions calculation were taken from country studies [Łoboda 1994, IUNG 2012] where experimental and literature data as well as default emission factors were used. These values for selected crops are presented in the table 5.20.

Table 5.20. Selected crop residue statistics employed in GHG estimation from field burning of agriculture residues (3.F) and direct soil emissions related to crop residues returned to soils (3.D.a.4)

Crops	Residue to crop ratio	Dry matter fraction	Fraction burned in fields	Fraction oxidized	Carbon fraction of residue	Nitrogen fraction of residue
winter wheat	0.90	0.85	0.005	0.90	0.4853	0.0068
spring wheat	0.85	0.85	0.005	0.90	0.4853	0.0068
rye	1.40	0.86	0.005	0.90	0.4800	0.0053
spring barley	0.80	0.86	0.005	0.90	0.4567	0.0069
oats	1.10	0.86	0.004	0.90	0.4700	0.0075
triticale	1.10	0.86	0.005	0.90	0.4853	0.0063
cereal mixed	0.90	0.86	0.004	0.90	0.4730	0.0071
buckwheat & millet	1.70	0.86	0.002	0.90	0.4500	0.0090
maize	1.30	0.52	0.002	0.90	0.4709	0.0094
edible pulses	0.90	0.86	0.001	0.90	0.4500	0.0180
feed pulses	1.30	0.85	0.001	0.90	0.4500	0.0203
potatoes	0.10	0.25	0.100	0.85	0.4226	0.0203
rape	1.20	0.87	0.030	0.90	0.4500	0.0068
other oil-bearing crops	3.50	0.87	0.030	0.90	0.4500	0.0068
flax straw	0.25	0.86	0.001	0.90	0.4500	0.0072
tobacco	1.25	0.50	0.002	0.85	0.4500	0.0180
hop	4.00	0.25	0.020	0.90	0.4500	0.0158
hay from greenland	0.05	0.23	0.001	0.90	0.4500	0.0198
hay from pulses	0.05	0.23	0.001	0.90	0.4500	0.0203
hay from clover and lucerne	0.05	0.23	0.001	0.90	0.4500	0.0275
tomatoes	0.60	0.15	0.050	0.85	0.4500	0.0225
other ground vegetables	0.35	0.15	0.010	0.90	0.4500	0.0248
vegetables under cover	0.40	0.35	0.010	0.90	0.4500	0.0270
apples	1.50	0.35	0.050	0.90	0.4500	0.0275
pears and other fruits	1.50	0.35	0.070	0.90	0.4500	0.0149
plums	1.50	0.35	0.100	0.90	0.4500	0.0149
cherries	1.50	0.35	0.100	0.90	0.4500	0.0149
sweet cherries	1.50	0.35	0.100	0.90	0.4500	0.0149
strawberries	0.50	0.18	0.010	0.90	0.4500	0.0149
raspberries	1.20	0.30	0.250	0.90	0.4500	0.0248
currants	1.20	0.30	0.250	0.90	0.4500	0.0149
gooseberries and other berries	1.20	0.30	0.250	0.90	0.4500	0.0149

5.5.3. Uncertainties and time-series consistency

Description of uncertainties is given in Chapter 5.2.3.

5.5.4. Source-specific QA/QC and verification

Activity data related to mineral fertilisers use or crop production come from national statistics prepared by the Central Statistical Office. Overall final estimation of cereals and potatoes output was verified by means of simulative calculation of crops quantity according to the distribution of output between: sale. sowing/planting. fodder and self consumption. Final estimation of sugar beets. rape and turnip rape. and some species of industrial crops were verified with procurement data for these crops. Estimation of fodder crops output in private farms. conducted by local experts of CSO. was additionally verified by the calculation of fodder crops according to the directions of their use. Total area of fodder crops comprises the area of meadows. pastures and field crops for fodder. This area does not include the area of cereals. potatoes. and other agricultural crops. a part of which was directly or indirectly used for fodder.

Emphasis was put on data consistency between sub-categories and between sectors using agricultural data. Emission factors and methodology is compared with international literature and other countries methods/EF applied. Calculations were examined with focus on formulas. units and trends consistency. Generally QC procedures follow QA/QC plan presented in Annex 5.

5.5.5. Source-specific recalculations

No recalculations were made.

5.5.6. Source-specific planned improvements

No improvements are planned presently.

5.6. CO2 emissions from liming (CRF sector 3.G)

5.6.1. Source category description

Emissions of CO_2 from lime ($CaCO_3$) and dolomite ($CaMg(CO_3)_2$) application to agricultural soils in 2015 amounted to 159 kt and 215 kt respectively. Trend in CO_2 emissions of both fertilizers drop since 1988 due to significant changes of agricultural farms after 1989 (see chapter 5.1) as well as current economic situation at rural market (prices of means of production vs. prices of agricultural goods).

5.6.2. Methodological issues

The annual carbon emission from agricultural lime application is calculated Tier 1 method using equation 11.12 and the default emission factors for carbon conversion of 0.12 and 0.13 for limestone and dolomite respectively [IPCC 2006]:

$$CO_2\text{-}C\ \mathit{Emission} = (M_{limestone} * EF_{limestone}) + (M_{dolomite} * EF_{dolomite})$$

where:

CO_2-C *Emission* = annual C emissions from lime application (t C/year)
$M_{limestone}$ – annual amount of calcic limestone ($CaCO_3$) [t / yr]
$M_{dolomite}$ – annual amount of dolomite ($CaCO_3$) [t / yr]
$EF_{limestone}$ – emission factor for limestone – 0.12 [t C / t limestone] [IPCC 2006]
$EF_{dolomite}$ – emission factor for dolomite – 0.13 [t C / t dolomite] [IPCC 2006]

Activity data on use of lime fertilizers, in division for calcic limestone and dolomite, is available in national statistics on an annual basis in pure nutrient (CaO, CaO+MgO) [GUS R2 2015]. Based on country study [Radwański 2006b] it was established that application of oxides of lime occurs in Poland in limited amount, carbonate limes dominate (respectively 12% and 88%). As the oxides of lime do not contain inorganic carbon they are not included in calculations for CO_2 estimation from application to soils [Chapter 11.3.1 IPCC 2006].

5.6.3. Uncertainties and time-series consistency

Description of uncertainties is given in Chapter 5.2.3.

5.6.4. Source-specific QA/QC and verification

Description is given in Chapter 5.2.4.

5.6.5. Source-specific recalculations

- no recalculations were made

5.6.6. Source-specific planned improvements

No improvements are planned at the moment.

5.7. CO_2 emissions from urea fertilization (CRF sector 3.H)

5.7.1. Source category description

Adding urea to soils during fertilisation leads to a loss of atmospheric CO_2 that was fixed in the industrial production process of the fertilizer. Emissions related to this process in Poland amounted to 438 kt CO_2 in 2015 and drop since 1988 by 15%.

5.7.2. Methodological issues

The annual carbon emission from urea application is calculated Tier 1 method using equation 11.13 [IPCC 2006]:

$$CO_2\text{-C } \mathit{Emission} = M * EF$$

where:

CO_2-C *Emission* = annual C emissions from urea application (t C / year)
M – annual amount of urea fertilization [t urea / year]
EF – emission factor [t C/ t urea]

Annual amount of urea used for application to soils is derived from data on mineral nitrogen fertilizers used in Poland [GUS R2 2015] and share of urea in nitrogen fertilizers used (Central Statistical Office). Emission factor is the default one from the IPCC 2006 GLs: 0.20 t C/ t urea.

5.7.3. Uncertainties and time-series consistency

Description of uncertainties is given in Chapter 5.2.3.

5.7.4. Source-specific QA/QC and verification

Description is given in Chapter 5.2.4.

5.7.5. Source-specific recalculations

- correction of urea content in urea based fertilizers for 2013 and 2014

Table 5.21. Changes in CO_2 emissions from urea application resulting from recalculations.

Change	1988	1989	1990	1991	1992	1993
kt	0.00	0.00	0.00	0.00	0.00	0.00
%	0.00	0.00	0.00	0.00	0.00	0.00
Change	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
kt	0.00	0.00	0.00	0.00	0.00	0.00
%	0.00	0.00	0.00	0.00	0.00	0.00
Change	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
kt	0.00	0.00	0.00	0.00	0.00	0.00
%	0.00	0.00	0.00	0.00	0.00	0.00
Change	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
kt	0.00	0.00	0.00	0.00	0.00	0.00
%	0.00	0.00	0.00	0.00	0.00	0.00
Change	**2012**	**2013**	**2014**			
kt	0.00	3.69	-3.63			
%	0.00	0.83	-0.83			

5.7.6. Source-specific planned improvements

No improvements are planned at the moment.

6. LAND USE, LAND USE CHANGE AND FORESTRY (CRF SECTOR 4)

6.1. Overview of sector

The greenhouse gas inventory of the Land Use, Land Use Change and Forestry (LULUCF) sector covers all CO_2 emissions and removals of due to gains and losses in the relevant carbon pools of the predefined six land-use categories, as well as non-CO_2 emissions from biomass burning and disturbance associated with land-use conversions. It should be noted that a number of factors used in the estimations of GHG's assumes default values (recommended by the IPCC). Those factors are considered to be modified on the basis of in-country analysis.

Data included in this inventory is based on statistical data presented in statistical journals published by the Central Statistical Office. The data relating to the land area by the type of usage (in accordance with the methodology recommended by IPCC 2006) is based on:

- generalized results of land use and sown area survey conducted on private farms, data on the condition and changes in the registered intended use of land were developed on the basis of annual reports on land, introduced in the following Regulations: of the Minister of Agriculture and Municipal Management of 20 February 1969 on land register (MP No. 11, item 98), from 1997 – of the Minister of Spatial Economy and Construction and of the Minister of Agriculture and Food Economy 17 December 1996 on register of land and buildings (O. J. No. 158, item 813), and from 2002 of the Minister of Regional Development and Construction of 29 March 2001 on register of land and buildings (O. J. No. 38, item 454).

Amendments to the regulations introduced changes in classifications of land. Subsequent changes were implemented inter alia due to adoption of the international standards. Beginning with data for 1997 on, the registers of land were prepared by the Head Office of Geodesy and Cartography as well as voivodship branches of geodesy and land management. The data are presented, taking into consideration geodesic area.

6.1.1. The greenhouse gas inventory overview of the Land Use, Land-Use Change and Forestry (LULUCF) sector

The greenhouse gas inventory of LULUCF sector comprises emissions and removals of CO_2 due to overall carbon gains or losses in the relevant carbon pools of the predefined six land-use categories. These activities in 2015 altogether resulted in net removals estimated to be equal to 29 996 kt of CO_2 equivalent.

Most removals are generated by biomass gains in the *Forest Land remaining Forest Land* and the *Land converted to Forest Land* categories. The net sink in these category is mainly due to the fact that the forest area has been increasing, and that the total increment of the growing stock in forest lands has always been higher than the annual harvest

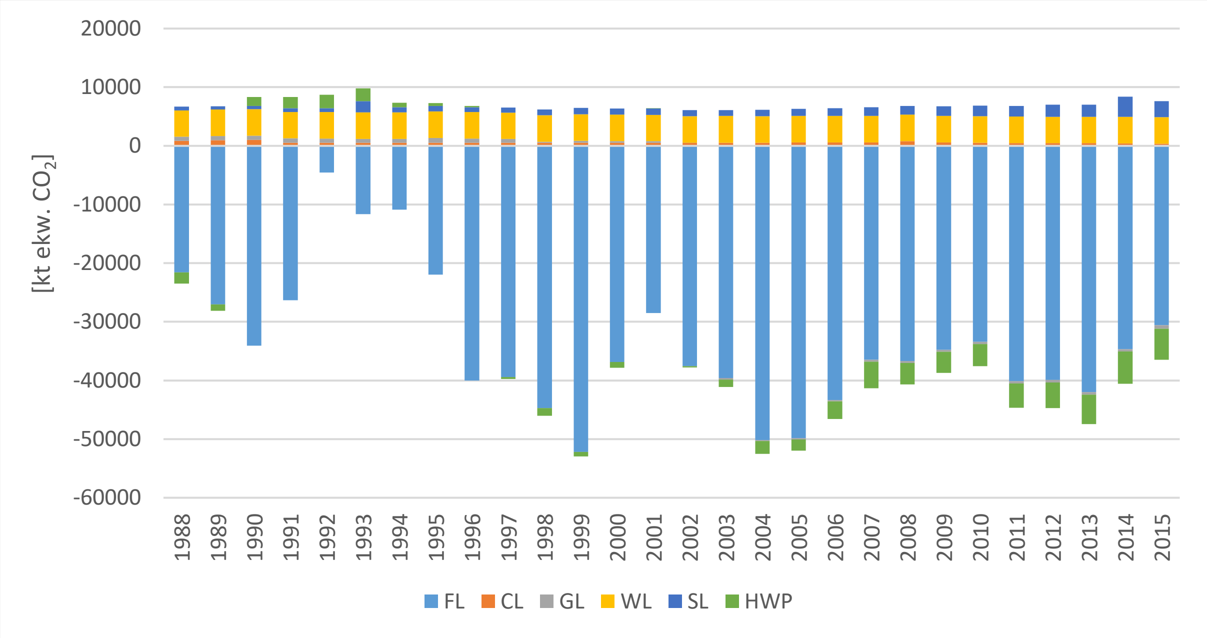

Figure 6.1. Trends in emissions/removals from the LULUCF sector by land-use

The most important category recognised to be the main source of CO_2 removals is the subcategory 4.*A forest land*. This situation is, to some extent, related to the recorded growth of timber resources. It shall be noted that the recorded growth is the result of timber harvest carried out in accordance with the forest sustainability principle and furthermore persistent enlargement of the forest area.

6.1.2. Country area balance in 2015

Table 6.1 Country area balance in 2015

Year	2015
Greenhouse gas source and sink categories	Area [ha]
4. Total land-use categories	
4.A. forest land	9 395 171
4.A.1. forest land remaining forest land	8 730 153
4.A.2. land converted to forest land	665 018
total organic soils on forest land, of which	258 023
on forest land remaining forest land	239 737
on land converted to forest land	18 280
4.B. cropland	
total cropland area	14 023 264
4.B.1. cropland remaining cropland	13 685 278
4.B.2. land converted to cropland	337 985
total organic soils on cropland, of which	533 422
on cropland remaining cropland	533 422
on land converted to cropland	NO
4.C. grassland	
total grassland area	4 172 971
4.C.1. grassland remaining grassland	3 974 872
4.C.2. land converted to grassland	198 099
total organic soils on grassland, of which	148 044
on grassland remaining grassland	148 043
on land converted to grassland	NO
4.D. wetlands	
total wetlands area	1 369 747
4.D.1. wetlands remaining wetlands	1 308 507
4.D.2. land converted to wetlands	61 239
total organic soils on wetland, of which	274 930

Year	2015
on wetlands remaining wetlands	274 930
on land converted to wetlands	NO
4.E. settlements	
total settlements area	2 209 027
4.E.1. settlements remaining settlements	1 906 102
4.E.2. land converted to settlements	302 924
4.F. other Land	97 791
Country area balance	31 267 967

6.1.3. Land uses classification for representing LULUCF areas

For the reporting purposes to the United Nations Framework Convention on Climate Change and Kyoto Protocol it is recommended to assign national land-use categories (as specified in the Regulation of the Minister of Administration and Digitization of 29 November 2013 amending the regulation on the registration of land and buildings *(Journal of Laws 2013 pos. 1551))* to the appropriate categories of land use consistently to the IPCC guidelines (Chapter 3.3.1. of IPCC 2006 Guidelines of the Volume 4). To fulfil the above mentioned recommendations available data were summarized taking into account the assessment provided in the table 7.1.3.

Table 6.2 Land use assignement.

IPCC category	National Land Identification System
4.A forest land	forest land
4.B cropland	arable land, orchards,
4.C grassland	permanent meadows and pastures; woody and bushy land
4.D wetland	land under waters (marine internal, surface stands); land under ponds; land under ditches; ecological arable land; wasteland
4.E settlements	agricultural build-up areas; build-up and urbanized areas;
4.F other land	miscellaneous land

6.1.4. Key categories

Key category assessment for LULUCF category is included in annex 1.

6.2. Forest Land (CRF sector 4.A.)

6.2.1. Source category description

Estimations for this subcategory were based on IPCC methodology described in the chapter 4 of IPCC 2006 guidelines of the Volume 4. GHG balance in this category in 2015 is a net CO_2 sink, estimated to be equal to 30 622 kt CO_2.

6.2.1.1. Area of forest land in Poland in year 2015

Forest land reported under subcategory 4.A. is classified as a "forest" according to Art. 3 of *Act on Forests of 28 Sep 1991 (Journal of Law of 1991 No 101 item 444, as amended).* This assessment is in line with internationally adopted standard which takes into account the forest land associated with forest management. Forest land area in Poland, as of 1 January 2016, was equal to 9 395 171 ha *(GUS; Environmental protection 2016)*.

Table 6.3 Forest land area by provinces as of the end of inventory year.

No	Voivodship	Unit	2008	2009	2010	2011	2012	2013	2014	2015
	Total	[ha]	9 251 404	9 275 786	9 304 762	9 329 174	9353731	9369403	9382578	9395171
1.	**Dolnośląskie**	[ha]	606 104	607 327	608 387	609 279	610583	610968	611562	611919
2.	**Kujawsko-pomorskie**	[ha]	425 207	426 170	427 147	427 843	428254	428491	428772	429045
3.	**Lubelskie**	[ha]	568 601	572 620	576 420	579 237	581002	582307	583447	584477
4.	**Lubuskie**	[ha]	706 788	707 583	708 201	709 002	709881	710350	710858	711077
5.	**Łódzkie**	[ha]	386 172	387 711	388 597	389 350	390358	390950	391259	391722
6.	**Małopolskie**	[ha]	439 126	438 280	439 765	440 114	440432	440664	440672	440683
7.	**Mazowieckie**	[ha]	802 158	804 912	808 810	812 973	817869	824660	828607	835112
8.	**Opolskie**	[ha]	257 858	258 170	258 246	258 399	258570	258846	258982	259139
9.	**Podkarpackie**	[ha]	671 363	674 450	677 953	680 166	683371	683462	685002	686848
10.	**Podlaskie**	[ha]	621 718	624 856	626 532	627 235	628678	629184	630047	630622
11.	**Pomorskie**	[ha]	676 165	677 673	678 226	679 898	681014	681537	682244	682783
12.	**Śląskie**	[ha]	400 709	399 592	399 954	401 747	402014	402307	402989	403341
13.	**Świętokrzyskie**	[ha]	331 492	332 089	332 487	332 980	402364	334796	335083	335277
14.	**Warmińsko-mazurskie**	[ha]	752 146	755 050	760 064	763 567	334385	769824	771463	774906
15.	**Wielkopolskie**	[ha]	778 863	780 795	783 340	784 649	785648	785998	786497	786015
16.	**Zachodniopomorskie**	[ha]	826 934	828 508	830 633	832 735	834009	834760	835094	833205

Difference between the areas reported by Poland under FAO and UNFCCC

Data on the condition and changes in the registered intended use of land, developed on the basis of annual reports on land prepared by the Head Office of Geodesy and Cartography, was applied in the estimations and reported under the UNFCCC. National statistics prepared and published on the basis of those reports, describes areas of all land uses, including forest land, with the consideration of the geodesic area [e.g. "GUS; Environmental Protection 2016"].

In relation to the FAO reports, data collected and reported there was developed on the basis of information obtained from stand-alone statistical surveys in subsequent years. As a result of various methods, which were applied for data collection and processing some notable differences can occur. What needs to be emphasized, statistical approach used in stand-alone statistical surveys do not consider all land use types in the same survey at the same time. Therefore, with regard to the data comparability and accuracy reported under the UNFCCC and KP, information obtained from statistical surveys on land areas, which covers country territory partially, could not be applied.

6.2.1.2. Habitat structure

The diversity of growing conditions for forests in Poland is linked to the natural-forest habitats allocations and is presented on Fig. 6.3. Poland has mainly retained forests on the poorest soils, which is reflected in the structure of forest habitat types. Coniferous habitats prevail, accounting for 68.7% *(GUS; Leśnictwo 2016)* of the total forest area, while broadleaved habitats cover 13.0% . In both groups, a further distinction of forests area is made between lowland (84.9%), upland (6.5%) and mountain (8.5%) habitats.

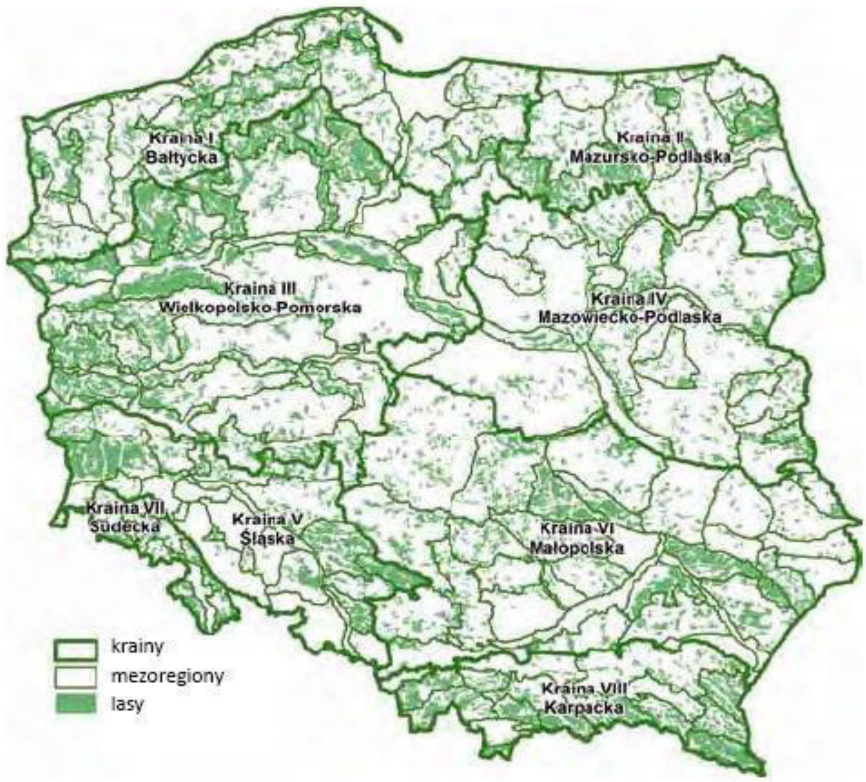

Figure 6.2 Natural-forest habitats diversification in Poland

6.2.1.3. Species composition

The geographical distribution of habitats is, to a great extent, reflected in the spatial structure of dominant tree species. Apart from the mountain regions where spruce (west) and spruce and beech (east) are the main species in stand composition, and a few other locations where stands have diversified species structure, in most of the country stands with pine prevail as the dominant species.

In terms of forest area, coniferous species dominate in Polish forests, accounting for 68.7 % of the total forest area. Poland offers optimal climatic and site conditions for pine within its Euro-Asiatic natural range, which resulted in development of a number of important ecotypes (e.g. the Taborska pine or the Augustowska pine). Pine accounts for 58,1 % of the area of forests in all ownership categories, for 63,0 % in the State Forests and for 55.4 % in the privately-owned forests.

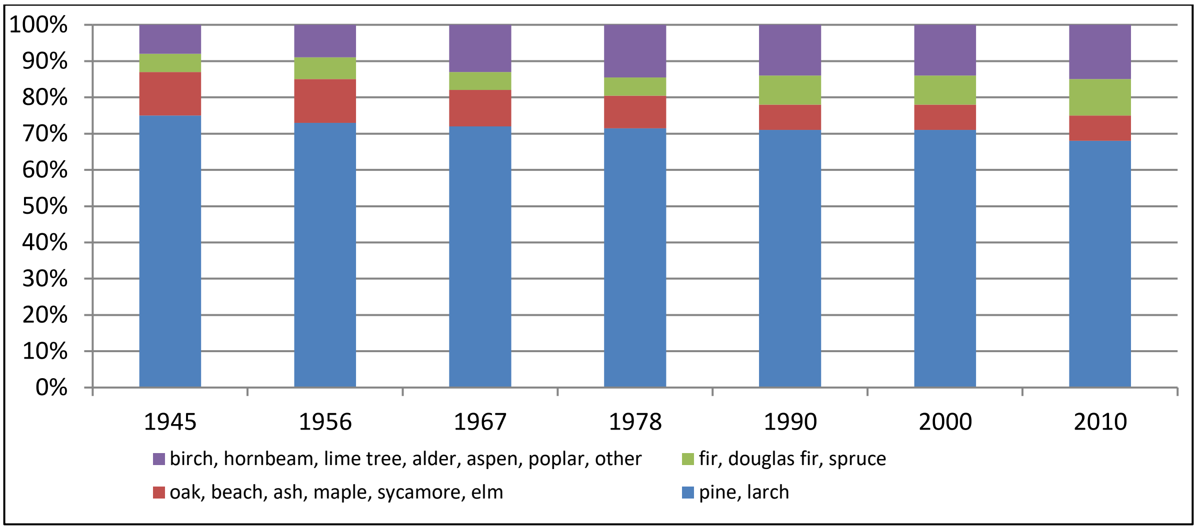

Figure 6.3. Spatial structure of dominant tree species

Since 1945 forest species structure has undergone significant changes, expressed, inter alia, by increased share of stands for deciduous trees. Considering state forests, where it is possible to trace this phenomenon on the basis of annual updates of forest land area and timber resources, total area of deciduous stands increased from 13 to 31.3%. Despite the increase in the surface of deciduous forests, their share is still below potential, arising from the structure of forest habitats.

6.2.1.4. Age structure

Stands aged 41–80 years, representing age classes III and IV prevail in the age structure of forests and cover 25.5% and 19.1% of the forest area respectively. Moreover, stands aged 41–80 years are dominating in total forests area, with their total share equal to nearly 44.6%. Stands over 80 years old, including stands in the restocking class, account for 22.1% of the total forest area.

6.2.1.5. Structure of timber resources by volume

According to the Statistical Yearbook "Forestry 2016", estimated timber resources, as of the end of 2016 amounted to 2 491 488 m^3 of gross merchantable timber, including 2 082 336 m^3 in the public forests and 409 152 m^3 in forests owned privately.

6.2.2. Information on approaches used for representing land area and on land-use databases used for the inventory preparation

According to the description suggested in the chapter 3.3.1. of IPCC 2006 Guidelines of the Volume 4, managed forest land areas associated with the forestry activities in Poland is identified using Approach 3. Geographic boundaries encompassing units of land subject to multiple activities are identified based on data *on the condition and changes in the registered intended use of land* developed on the basis of annual reports on land.

6.2.3. Land-use definitions and classification system used and their correspondence to the LULUCF categories

According to the regulations of art. 3 of the Act on Forests of September 28th 1991 *(Journal of Law of 1991 No 101 item 444, as amended)*, forest land is the area:

1) of contiguous area greater than or equal to 0.10 ha, covered with forest vegetation (or plantation forest) – trees and shrubs and ground cover, or else in part deprived thereof, that is:
    a. designated for forest production, or

b. constituting a Nature Reserve or integral part of a National Park, or
c. entered on the Register of Monuments;

2) of contiguous area greater than or equal to 0.10 ha, associated with forest management.

This subcategory includes entire land with woody vegetation consistent with thresholds used to define forest land in the national GHG inventory with :

- minimum area: 0.1 hectare,
- minimum width of forest land area: 10 m,
- minimum tree crown cover: 10% with trees having a potential to reach a minimum height of 2 metres at maturity in situ. Young stands and all plantations that have yet to reach a crown density of 10 percent or a tree height of 2 metres are included under forest. Areas normally forming part of the forest area that are temporarily un-stocked as a result of human intervention, such as harvesting or natural causes such as wind-throw, but which are expected to revert to forest are also included.

6.2.4. Forest Land remaining Forest Land (CRF sector 4.A.1)

GHG balance in this category is a net sink. In 2015 net CO_2 sink was about 27 931 kt CO_2. Methodological assumptions are provided in the following chapters.

6.2.4.1 Methodological issues

Due to the intensive forest monitoring as described above, all forest stands are continuously accounted for. This also means that all changes in the biomass carbon stocks of the forests due to any causes from growth through harvests, natural disturbances and deforestation are captured by the forestry statistics of each stand at least on a decade scale, and those of the whole forest area even on an annual basis.

6.2.4.2 Subcategory area

Land use change matrix is presented in the annex 6

According to the provisions of the decision 9/CP.2 *Communications from Parties included in Annex I to the Convention: guidelines, schedule and process for consideration* where it is decided that the four Parties that have invoked Article 4.6 of the Convention, which requested in their first communications for flexibility to use base years other than 1990, Poland has chosen the year 1988 to be set as a starting point for the reported transitions according to the IPCC 2006 guidelines.

6.2.4.3. Living biomass

Carbon stock changes

Annual change in carbon stocks in living biomass reservoir was estimated considering the changes in forest resources on forest land all forms of ownership, using the information contained in the statistical yearbooks "Forestry". Estimations were based on the equation 2.8 contained in the IPPC guidelines; as suggested in the Volume 4, Chapter 2.3.1.1. Data sources contains tables describing forest resources species cover and age classes.

As mentioned above, the general methodology to estimate emissions and removals in the forestry sector is based on the IPCC methodology (IPCC 2006). However, wherever it was possible, country specific data was used (Tier 2), and IPCC default values (Tier 1) were only used in a few cases. Changes in carbon stocks in the biomass pool are accounted annually on the basis of the Polish forestry statistics which provides relevant information, describing aboveground volume of all forests at the country level, available annually for the each inventory year. Moreover gross merchantable volume stock used in the above mentioned calculations is estimated on the basis of data obtained from the most recent

5-year cycle of large-scale inventory, which is published in the form of official statistics by the Central Statistical Office.

Fortunately, the State Forest Holding's data base also contains aggregate annual statistics on total growing stocks by species and age classes. These statistics are produced by a bottom-up approach, i.e. growing stocks of stands are aggregated by species and age classes. There are uncertainties around these statistics, however, they are regarded smaller than those associated with a gain-loss method and systematic errors. We noted that since growing stocks and their changes incorporate the effects of all processes mentioned above, no particular inferences on emissions and removals can be made separately for any of these processes.

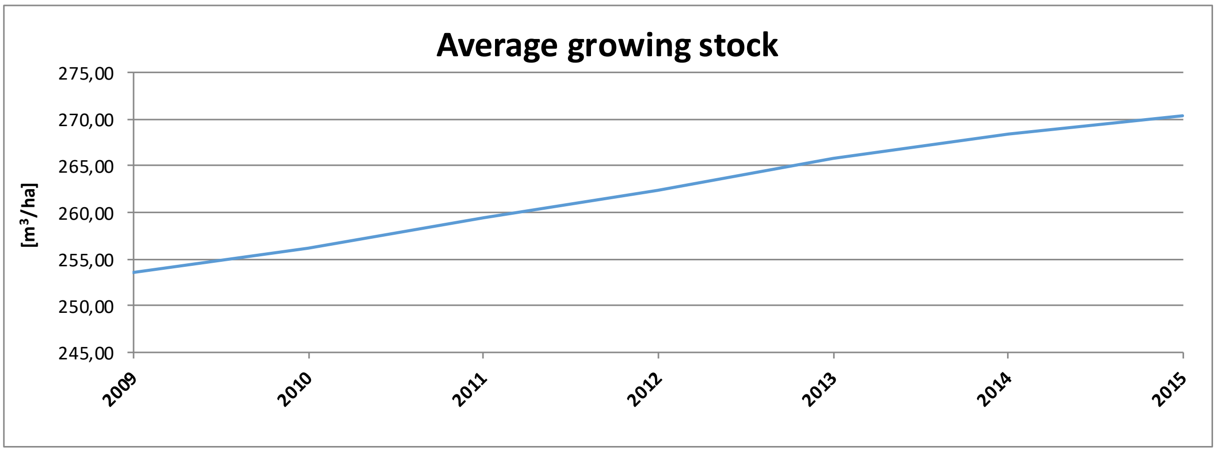

Figure 6.4 Average volume stock of merchantable timber in Polish forests

Data provided on the graph above was prepared on the basis of data collected from the periodical forest inventory surveys by the Forest Management and Geodesy Bureau. Recent result are not fully comparable with data published up to 2009. To eliminate potential overestimations of carbon sinks linear calibration of previous data was applied. The inventory data is stored by stand in a publically available databases, i.e. the Forest Data Bank. During the continuous survey of the forest inventory, the main stand measures (such as height, diameter, basal area, and density) are estimated by various measurement methods. The survey also includes mapping of the forest area. The survey methods applied in individual stands depend on species, age and site. Since the recent forest inventory scheme is based on survey's considering measurements of individual sample plots, more accurate results were obtained as from the year 2009.

For carbon stock changes in biomass, the system of calculations allows for the use of even simpler sensitivity analysis than before. This is especially true if only the major sources of CO_2 emissions and removals are considered, which represent the bulk of all emissions and removals. The reason for this is that the equation inherent in the calculation is simple: only volume stock changes, wood density, root-to-shoot ratio, and carbon fraction factors are involved. With respect to accuracy and precision, the reported estimated values are generally accurate and precise as far as practicable. Where uncertainty seems to be high, and for non-quantifiable factors, the principle of conservativeness is always applied. With regard to carbon stock change estimation, it can be concluded that many sources of error were removed by switching from the process-based method to the stock-change method. Thus, it is expected that current estimates better reflect emissions and removals associated with forest land than previous estimates.

6.2.4.4. Basic wood density

The current form of the equation 2.8 of chapter 4 of the Volume 4 of the IPCC 2006 (p.2.12) actually triggered the use of a weighted mean of wood density. Basic wood density by species can only be applied when the volume of the average merchantable growing stock by single species is provided. Since the average merchantable growing stock has been applied in the eq. 2.8, the weighted mean of wood density was also applied to adjust the BCEF (as provided in the section 2.3.1.1 of the chapter 2 of the Volume 4 of the IPCC 2006. In the calculation of specific wood density (oven dry) by species, air dry wood density values by species (with the humidity at the level of 15%) and volumetric shrinkage of wood by species were used. Simplified approach for calculation of weighted mean of wood density by major tree species is presented I the table 6.6.

Table 6.4. Air-dry wood density [t/m^3]/ 15% of wood humidity

Table 1Species	Air-dry wood density [t/m^3]
Pine	0.52
Spruce	0.47
Fir	0.45
Beech	0.73
Oak	0.69
Hornbeam	0.83
Birch	0.65
Alder	0.53
Poplar	0.45
Aspen	0.44

Data source: Krzysik S. Wood science (In Polish). PWN Warszawa 1975

Table 6.5 Volumetric wood shrinkage [%]

Species	Volumetric wood shrinkage [%]
Pine	12.4
Spruce	12.0
Fir	11.7
Beech	17.6
Oak	12.6
Hornbeam	19.7
Birch	14.2
Alder	12.6
Poplar	14.3
Aspen	11.0

Data source: Krzysik S. Wood science (In Polish). PWN Warszawa 1975

Air-dry wood density [t/m^3] was multiplied by the volumetric shrinkage of wood to estimate basic wood density (oven dry) by species. Results are presented in the table below. Almost in all cases country specific dry wood density is lower than value provided by the IPCC in the table 4.14 on p. 4.71 of chapter 4 of the Volume 4 of the IPCC 2006:

D= Air-dry wood density [t/m3] * (1- volumetric shrinkage of wood)

Table 6.6 Basic wood density by major tree species.

Species	Air-dry wood density [t/m³]	Volume of thick [m³]	Mean wood density [t dm.]
	A	B	C=A*B
Pine	0.43	1563034	672105
Spruce	0.38	133267	50641
Fir	0.36	92903	33445
Beech	0.57	148927	84888
Oak	0.57	158515	90353
Hornbeam	0.63	11252	7089
Birch	0.52	102202	53145
Alder	0.43	105933	45551
Poplar	0.35	1577	552
Aspen	0.36	8461	3046
Other	0,36	165419	59551
Total	-	2491489	1100366
Weighted mean wood density			**0.4417**

6.2.4.5. Biomass conversion and expansion factor

Biomass conversion and expansion factor was adjusted on the basis of default values proposed to be used by the IPCC in the framework of IPCC 2006 Guidelines; Volume 4, table 4.5.

Table 6.5. Scheme for calculation of BCEF .

BEF_2 – coniferous species	A	dimensionless	1.30
BEF_2 – deciduous species	B	dimensionless	1.40
Gross merchantable timber – coniferous species	C	[thous. m³]	1789204
Gross merchantable timber – deciduous species	D	[thous. m³]	702284
Gross merchantable timber – total	E	[thous. m³]	2491488
BEF_2 – weighted mean	F=((A*C)+(B*D))/E	dimensionless	**1.3282**
BCEF – weighted mean		dimensionless	**0.5866**

6.2.4.6. Root-to-shoot ratio

Root-to-shoot ratio was adjusted based on weighted average default values proposed to be used by the IPCC in IPCC 2006 Guidelines of the Volume 4, table 4.4.

Table 6.6. Scheme of R factor calculation

R – coniferous species	A	R (default)	0.20
R– deciduous species	B	R (default)	0.24
Gross merchantable timber – coniferous species	C	m³	1789204
Gross merchantable timber – deciduous species	D	m³	702284
Gross merchantable timber – total	E	m³	2491488
R- weighted mean	F=((A*C)+(B*D))/E		**0,2112**

6.2.4.7. Carbon fraction

Estimations are based on the following default factor:

- fraction of carbon in the dry matter: 0.47 [IPCC 2006].

6.2.4.8. Dead organic matter

It is assumed that this reservoir is not the net source of CO_2 emissions, relevant reporting tables related to dead organic matter, were filled up with the notation" NO".

What should be highlighted, the potential carbon gains might have a positive impact on final carbon balance related to the category *4.A.1 forest land remaining forest land*, therefore recent approach may lead to the potential overestimation of net emissions.

Current demonstration that this reservoir in not a source depends on the data availability, generally following justifications were considered:

1. direct implementation of Tier 1 description suggested in the chapter 4.2.2.1 of IPCC 2006 Guidelines of the Volume 4, assuming that the average transfer rate into the dead organic matter reservoir is equal to the transfer rate out of this pool so the net change is in equilibrium;
2. expert judgments based on a combination of qualitative and quantitative arguments, like international references to the neighbouring country's GHG's inventories;
3. conservative assumptions based on in-country forestry practices, as described below.

In the last decades, the close-to-nature forest management has been promoted in Poland and clear cuts were limited, especially after the adoption of the most recent Forest Act of 1991. This Act requests that semi natural forests must be managed in an increasingly natural way, which includes leaving more deadwood in the forest after harvests than before, as well as creating and maintaining gaps, and enhancing species mixture. It should be noted that the recent increasing share of broadleaved species in the species structure drives important positive role in the final changes of CS in dead organic matter pool. As a result of the implementation of these requirements, we can assume the accumulation of dead wood in the Polish forests is stable.

The other reason of the increase of dead organic matter stock in all forests is that about one-third of all forests are afforestations since 1945 (post World War II afforestations) and most of these forests are still in their intensive growing phase, which means that carbon stocks of the dead organic matter pool have not saturated yet. Finally, no major disturbances or other processes have occurred that could have resulted in substantial emissions from the dead organic matter pool.

6.2.4.9. Mineral soils

Annual change in carbon stocks in the litter reservoir was estimated using equation 2.25 contained in IPCC 2006 Guidelines of the Volume 4, section 2.3.3. For the needs of equation application, default reference values of SOC_{ref} were considered to be used linked with the dominant tree habitats.

Table 6.7 Forest habitant types in Poland with the SOC_{ref} assignment

SOC_{ref}	Forest habitat types
high active SOC ref (50 [MgC/ha])	Fresh mixed forest, moist mixed forest, mixed upland forest, mountain mixed forest, fresh broadleaved forest, moist broadleaved forest upland forest, mountain forest
low active SOC ref (33[MgC/ha])	Moist coniferous forest, mountain coniferous forest, high- mountain coniferous forest, 0,5*fresh mixed coniferous forest, moist mixed coniferous forest, upland mixed coniferous forest, mountain mixed coniferous forest
sandy SOC ref (34 [MgC/ha])	Dry coniferous forest, fresh coniferous forest 0,5* fresh mixed coniferous forest
wetland SOC ref (87 [MgC/ha])	Marshy coniferous forest, boggy mountain coniferous forest, boggy mixed coniferous forest, boggy mixed forest, alder forest, ash- alder swamp forest, mountain alder forest, floodplain forest, mountain floodplain forest

Table 6.8. Percentage share of soil types by land use system (for time t and t–20)

Habitats	**2015 (t)**	**1995 (t-20)**
high activity	45,7	34,2
low activity	17,8	19,7
sandy	31,9	42,3
wetland	4,6	3,8
Total	100.0	100.0

Carbon stock changes in mineral soils were estimated based ion following references contained in the IPCC 2006 Guidelines of the Volume 4, section 2.3:

- transitional period - 20 years
- $f_{man\ intensity}$ - 1.0
- $f_{dist\ regime}$ - 1.0
- $f_{forest\ type}$ - 1.0

6.2.4.10. Organic soils

The area of cultivated histosols in Poland was estimated as a case study for the purposes at national inventory [Oświecimska–Piasko 2008]. Based on information collected from Computer database on peatlands in Poland "TORF" as well as from system of Spatial Information on Wetlands in Poland the area of histosols was assessed for mid–1970s and mid–1990s. The area from which N_2O emissions were calculated covers histosols as agricultural lands cultivated and/or irrigated. So the area of such area was 882.6 thousand ha in mid–1970–ties and 769 thousand ha in mid–1990–ties. The area of histosols was then interpolated for 1976–1994.

Additionally the area of cultivated histosols was assessed for 2015 for the purpose of GHG emission projections which amounts to 680 thousand ha [PLNC6 2013]. Similarly to the previous period interpolation of histosols areas was applied between 1995 and 2015. Since 1970-ties area of histosols occupied by forest and scrub communities is increasing. In 1970-ties it was equal 170 800 ha. in 1990-ties – 214 400 ha. Also proportion of and scrub communities at organic soils are increasing from 12% at the beginning of 1970-ties to 16.5 % in 1990-ties.

Total organic soils area in 2015 was estimated for ha with the following split for subcategories: forest land remaining forest land – 234 076 ha land converted to forest land – 17 383 ha. Emissions from organic soils on forest land were estimated with the default EF contained in the table 4.6 of IPCC 2006 Guidelines of the Volume 4.

Table 6.9 CO_2 emission factor for drained organic soils

Name	Volume	Unit
$EF_{drainag}$	0.68	[tC/ha/rok]

6.2.4.11. Biomass burning

According to the article 30 of *Act on forests of 28th September, 1991 (Journal of Law of 1991 No 101 item 444, as amended)* the burning of surface soil layers or remnants of vegetation is forbidden. In relation to this record it is considered that controlled biomass burning does not occur on forests. CH_4, N_2O, CO and NO_x emissions from uncontrolled forest fires were calculated using following equation 2.27 (IPCC 2006, page 2.42.):

Table 6.10. Emissions ratios for calculation CH_4, N_2O, CO and NO_x emissions from forests fires [table 2.5 p. 2.47 of IPCC 2006 Guidelines, Volume 4]

Compound	Ratio [g/kg d.m]		
CH_4	4.7	default	[IPCC 2003]
CO	107.0	default	[IPCC 2003]
N_2O	0.26	default	[IPCC 2003]
NO_x	3.0	default	[IPCC 2003]

6.2.5. Land converted to Forest Land (CRF sector 4.A.2)

GHG balance in this category is a net sink. In 2015 net CO_2 sink was approximately 2691 kt CO_2. For the methodologies used, see following chapters.

6.2.5.1 Methodological issues

Due to the intensive forest monitoring as described above, all forest stands are continuously accounted for. This also means that all changes in the biomass carbon stocks of the forests due to any causes from growth through harvests, natural disturbances and deforestation are captured by the forestry statistics of each stand at least on a decade scale, and those of the whole forest area even on an annual basis.

6.2.5.2. Subcategory area

Land use change matrix is presented in the annex 6.

6.2.5.3. Living biomass

Annual change in carbon stocks in living biomass reservoir was estimated considering the annual gains and losses with the equation 2.16 (section 2.3.1 of IPCC 2006 guidelines of the Volume 4). For the needs of equation application, default reference values of biomass increment were considered to be used.

Table 6.11. Default biomass increment.

Name	Value	Unit
G_{ext}	4	[m^3/ha/year]

6.2.5.4. Dead organic matter

Carbon stock changes in dead wood on afforested and reforested areas is assumed to be equal to zero, therefore reported as 'NO'. The accumulation of dead wood was assumed to be marginal on afforested and reforested sites, during 1993-2015, and also dead wood pool cannot decrease on those sites, because there is actually no dead wood there before the conversion. The dead wood starts to accumulate when natural mortality or thinnings occur that is nearly at the age of over 20 years. To keep correctness in CRF tables notation keys NO (not occurring) were used in the relevant table. Additionally, when an area is afforested, first it is cleared of all above-ground biomass in case there was any, however, no DW and LI are usually present on these lands prior to afforestations. After afforestations, dead woody debris, litter as well as dead trees start to accumulate. In lack of representative measurements, the rate and timing of accumulation is not known, however, standard forestry experience suggests that they depend on species, site and silvicultural regime, and quickly accumulate over time. Fast growing species are usually planted so that no large amount of deadwood is produced, or thinned so that self-thinning does not ensue, but litter is continuously produced even in these stands. On the other hand, slow-growing species tend to produce dead wood and litter even at an early stage.. The above demonstration is based upon well-established principles of forest science, the every-day experiences of forestry practice, the experience and data of forest surveys, as well as sound reasoning. Because of this, although no representative measurements have been made as mentioned, the level of confidence of the demonstration is suggested to be very high. To keep correctness in CRF tables notation keys NO (not occurring) were used in the relevant table.

6.2.6. Uncertainties and time-series consistency

Detailed information contain chapter 6.6.5.

6.2.7. Category-specific QA/QC and verification

Detailed information contain chapter 6.6.6.

6.2.8. Recalculations

Detailed information contain chapter 6.6.7.

6.2.9. Planned improvements

Detailed information contain chapter 6.6.8.

6.3. Cropland (CRF sector 4.B.)

6.3.1. Source category description

Estimations for category 4.B. were based on IPCC methodology described in the chapter 5. of IPCC 2006 guidelines of the Volume 4.

6.3.1.1. Cropland remaining Cropland (CRF sector 4.B.1.)

GHG balance in this category was identified as a net CO_2 source. Net CO_2 balance was equal to 299 kt CO_2.

Activity data (i.e. area) for the lands divisions included in this category is provided by the land use change matrix, for both 4.B.1 Cropland remaining Cropland and 4.B.2 Land converted to Cropland subcategories. Estimation of carbon stock changes corresponds to Tier 1, estimating annual rates of growth and loss for national level data on the major type of crops.

6.3.1.2. Land converted to Cropland (CRF sector 4.B.2.)

GHG balance in this category was identified as a net CO_2 source. Net CO_2 balance was equal to 62 kt CO_2.

6.3.2. Information on approaches used for representing land areas and on land-use databases used for the inventory preparation

According to the description suggested in the chapter 3.3.1. of IPCC 2006 Guidelines of the Volume 4, Poland has selected Approach 2, considering the set of information’s available in the register of land and buildings.

6.3.3. Land-use definitions and classification system used and their correspondence to the LULUCF categories

According to the Regulation of the Minister of Administration and Digitization of 29 November 2013 amending the regulation on the registration of land and buildings. (Journal of Laws 2013 pos. 1551),agricultural land considered as cropland consists of:

- arable land includes land which is cultivated, i.e. sowed and fallow land. Arable land should be maintained in good agricultural condition. Cultivated arable land is understood as land sowed or planted with agricultural or horticultural products, willow and hops plantations, area of greenhouses, area under cover and area of less than 10 a, planted with fruit trees and bushes, as well as green manure,
- fallow land includes arable land which are not used for production purposes but are maintained in good agricultural condition;
- orchards include land with the area of at least 10 a, planted with fruit trees and bushes.

6.3.4. Methodological issues

6.3.4.1. Subcategory area

Land use matrix is provided in the annex 6.

6.3.4.2. 4.C.1. Living organic matter on cropland remaining cropland

Annual carbon stock change in living biomass was calculated based on cropland area covered by perennial woody biomass (orchards). Annual growth rate for perennial woody biomass was calculated using equation 2.7 of IPCC 2006 guidelines of the Volume 4. For calculations there were used default factors as below:

- biomass accumulation rate – 2.1 [tC/ha] table 5.1 p. 5.9,
- harvest/maturity cycle – 30 [year] table 5.1 p. 5.9,biomass carbon loss – 63 [t/ha*yr] table 5.1 p. 5.9.

Estimation of C stocks changes was made individually on each of the two different types of land included in the Cropland category and their subcategories: perennial crops (orchards) and non-woody agricultural land (arable).

6.3.4.3. 4.C.2. Living organic matter on land converted to croplands

Agricultural land here is represented mainly by arable land or management cycles which include arable land. Current data shows there are conversions from all land use categories to cropland, largest area being the conversions from grasslands. Conversion also occur from Settlements and Other land (i.e. industrial dumps and ecologization, reclamation of river deposits and islands along Danube and other rivers).

Estimates are calculated using equation 2.15 from 2006 Guidelines. Initial C stock changes in biomass are calculated under Tier 1 (ΔCconversions), assuming a biomass C stock of 6.1 t dm/ha for grasslands the default value for the warm temperate dry eco-region (Table 6.4 of 2006 Guidelines) and 4.7t C/ha for annual crops (Table 5.9 of 2006 Guidelines). Entire amount of C stock in biomass in land use category before conversion is assumed to be lost in the moment of conversion to cropland (e.g. usually the technology implies deep soil preparation and removals of any pre-existing vegetation).

6.3.4.4. Mineral soil

Agricultural land valuation classes with the assignment to IPCC soils types.

- high activity soils - soils having appreciable contents of high activity clays (eg. 2:1 expandable clays such as montmorillonite) which promote long-term stabilization of organic matter, particularly in many carbon-rich temperate soils.
- low activity soils - soils with low-activity clays (eg., 1:1 non-expandable clays such as kaolinite and hydropus oxide clays of iron and aluminum) which have a much lower ability to stabilize organic matter and consequently respond more rapidly to changes in the soil's carbon balance; among these are highly-weathered acid soils of subtropical and tropical regions.
- sandy soil - soils with less than 8% clay and more than 70% sand, which generally have low structural stability and low capacity to stabilize carbon.
- wetland - mineral soils which have developed in poorly-drained, wet environments; they have reduced decomposition rates and high organic matter contents; if drained for agriculture they are subject to large losses of carbon.

Estimation of area of different soil types (high activity soils, low activity soils, sandy and wetland) were based on area of soil valuation classes. The percentage fraction of all soil types in croplands was calculated based on available data sets.

Table 6.12. Area of soil valuation classes

Valuation classes	1976	1979	1985	1990	2000
	thous. ha				
agriculture land					
Total	**19349.4**	**19200.5**	**18945**	**18804.8**	**18536.9**
I	71	70.7	70	68.7	67.8
II	547.6	551.1	550.3	544.1	536.4
III	4153.2	4152.1	4199.1	4201.6	4201.9
IV	7627.5	7611.8	7545.6	7493.4	7402.9
V	4522	4441	4310.3	4267.2	4197.2
VI	2428.1	2373.8	2269.7	2229.8	2114.9
land not classified	0	0	0	0	15,8
arable land and orchard					
Total	**15173.7**	**15073.4**	**14818**	**14682.8**	**14451.1**
I	69	68.5	67.4	66.5	65
II	480	483.8	485	482.2	479.6
III	3621.5	3618.9	3643.7	3650.7	3664.6
IV	5961	5924.2	5807.6	5743.4	5640.2
V	3151.8	3114.5	3018.3	2976.2	2908.3
VI	1890.4	1863.5	1796.1	1763.8	1682.6
Land not classified					10.8

Due to limited data availability, linear interpolation was applied between the subsequent years. Since 2000, estimations are based on the latest available data sets from the year 2000.

Table 6.13 Valuation classes of agricultural land with the SOC_{ref} assignment.

Soil type	Soil valuation classes
high activity	I, II, III
low activity	IV
sandy	V
wetland	other

Valuation classes of agricultural land describe the quality of land in terms of value to agricultural production. Class I corresponds to the highest agricultural value and class VI to the lowest. Valuation classes of agricultural land are presented in table 7.3.1.

Table. 6.14. Soil organic carbon by land use system and soil types

Land-use/ management system	Soil by IPCC	Carbon in soils [Mg C/ha]
		default IPCC
agricultural crops	high activity soils	50
	low activity soils	33
	sandy	34
	wetland	87

For calculations there were used default factors as below:

- stock change factor for land use or land-use change type in the beginning of inventory year - $F_{LU}(0\text{-}T)$ = 0.80 [IPCC 2006 tab. Tab. 5.5 page 5.17].
- stock change factor for management regime in the beginning of inventory year – $F_{MG}(0\text{-}T)$=1.00 [IPCC 2006 tab. Tab. 5.5 page 5.17].
- Stock change factor for input of organic matter in the beginning of inventory year – $F_I(0\text{-}T)$=0.95 [IPCC 2006 tab. Tab. 5.5 page 5.17].
- Stock change factor for land use or land-use change type in current inventory year – $F_{LU}(0)$= 0.80 [IPCC 2006 tab. Tab. 5.5 page 5.17].
- Stock change factor for management regime in current inventory year –$F_{MG}(0)$=1.00 [IPCC 2006 tab. Tab. 5.5 page 5.17].

- Stock change factor for input of organic matter in current inventory year – $F_I(0)$ = 0.95 [IPCC 2006 tab. Tab. 5.5 page 5.17].

6.3.4.5. Organic soils

The area of cultivated histosols in Poland was estimated as a case study for the purposes at national inventory [Oświecimska–Piasko 2008]. Based on information collected from Computer database on peatlands in Poland "TORF" as well as from system of Spatial Information on Wetlands in Poland the area of histosols was assessed for mid–1970s and mid–1990s. The area from which N_2O emissions were calculated covers histosols as agricultural lands cultivated and/or irrigated. So the area of such area was 882.6 thousand ha in mid–1970–ties and 769 thousand ha in mid–1990–ties. The area of histosols was then interpolated for 1976−1994. Additionally the area of cultivated histosols was assessed for 2015 for the purpose of GHG emission projections which amounts to 680 thousand ha [PL NC6 2013]. Similarly to the previous period interpolation of histosols areas was applied between 1995 and 2015.

N_2O emission from cultivation of histosols was estimated based on default emission factor for Mid-Latitude Organic Soils from [IPCC 2006]: 8 kg N_2O-N /ha. N_2O emission is reported in sector 4. Agriculture in subcategory 3.D.a.6.

To estimate CO_2 emission from cultivated organic soils were used default emission factor for cold temperate climate – 5 tC/ha*year [tab. page 5.19 IPCC 2006].

6.3.4.6. CH_4, N_2O, CO and NO_x emissions from fires

CH_4, N_2O, CO and NO_x emissions from wildfires fires on croplands are reported in subcategory 4.C.1.

6.3.4.7. Mineralised N resulting from loss of soil organic C stocks in mineral soils through land-use change or management practices

This category deals with direct N_2O emissions from N mineralization resulting from change of land use or management of mineral soils. Tier 3 method was not applied to the estimation in this subcategory in Poland. Therefore, according to the 2006 IPCC Guidelines, N immobilization associated with gain of soil carbon on mineral soils is not considered. Consequently, only N_2O emissions from mineralization associated with loss of soil organic matter (SOM) were estimated.

For amount of N mineralized in mineral soil associated with land use change, annual loss of soil carbon in mineral soil for estimating carbon stock changes in mineral soils was used. The area of mineral soil in land use change, which are calculated by subtracting the area of organic soil from the total area of land converted to cropland, were considered for the estimation as the activity data.

Estimation of the N release by mineralization was made according to the following steps:

- Step 1: Calculations of the average annual loss of soil C (ΔCMineral, LU) for the land use change, over the inventory period, using equation 2.25.
- Step 2: Each land use change has been assessed by the single value of ΔCMineral, LU As a consequence of this loss of soil C (FSOM), equation 11.8 was applied to estimate N potentially mineralized .

Losses of soil organic matter were accounted for land-use change activity occurring when grassland is converted to cropland. Additionally, nitrogen mineralisation was estimated by dividing the carbon loss on grasslands converted to croplands with a C/N-ratio of 15 (default value from IPCC 2006).

6.3.5. Uncertainties and time-series consistency

With ongoing project to derive new activity data for all land categories the uncertainty is not yet estimated. Estimates for the uncertainty of the activity data would be derived as soon as data processing will be finalized. The advantage of the new land classification and area estimation method is that it provides sampling error for the area estimates for each land category and subcategory.

6.3.6. Category-specific QA/QC and verification

For the estimation of C stock changes in soils of land "remaining croplands" there is an improvement plan available, related to the development of national system to respond accounting requirements set in decision 529/2013UE. According to this decision a reporting to European Commission on the national estimating system for cropland management and grazing land management is due annually for 2016-2018 while provide preliminary estimates before 2022 and final estimates in the final deadline in 2022.

6.3.7. Recalculations

Detailed information contain chapter 6.6.7.

6.3.8. Planned improvements

Detailed information contain chapter 6.2.8.

6.4. Grassland (CRF sector 4.C.)

6.4.1. Source category description

Calculation for category 4.C. based on IPCC methodology described in the chapter 6 of IPCC 2006 guidelines of the Volume 4.

Activity data used to calculate GHG emissions for the land included in the Grassland category is provided by the land use change matrix, both for the 4.C.1 – Grassland remaining Grassland and 4.C.2 Land converted to Grassland category. Estimation of carbon stock change in the Grassland category corresponds to Tier 1, with country specific data on reference C stock in soils.

6.4.1.1. Grassland remaining Grassland (CRF sector 4.C.1.)

GHG balance in this was identified as a net CO_2 source. Net CO_2 balance was equal to 308 kt of CO_2 emissions .

6.4.1.2. Land converted to Grassland (CRF sector 4.C.2.)

GHG balance in this was identified as a net CO_2 sink. Net CO_2 balance was equal to 876 kt of CO_2 removals.

6.4.2. Information on approaches used for representing land areas and on land-use databases used for the inventory preparation

According to the description suggested in the chapter 3.3.1. of IPCC 2006 Guidelines of the Volume 4, Poland has selected Approach 2, considering the set of information's available in the register of land and buildings.

6.4.3. Land-use definitions and classification system used and their correspondence to the LULUCF categories

According to the Regulation of the Minister of Administration and Digitization of 29 November 2013 amending the regulation on the registration of land and buildings. (Journal of Laws 2013 pos. 1551), agricultural land considered as grassland consists of:

- permanent meadows and pastures include land permanently covered with grass, but it does not include arable land sown with grass as part of crop rotation; permanent meadows are understood as the land permanently covered with grass and mown in principle and in mountain area also the area of mown mountain pastures and meadows.
- permanent pastures are understood as the land permanently covered with grass not mown but grazed in principle and in mountain area – also the area of grazed pastures and meadows;

Permanent meadows and pastures classified to this category must be maintained in good agricultural condition.

6.4.4. Methodological issues

6.4.4.1. Subcategory area

Land use change matrix is provided in the annex 6.

6.4.4.2. Living organic matter

Estimates of the change of C stocks vary by type of land included in this land category:

- *Land remaining under the same use.* In the case of grasslands where there are no changes in usage it was considered that there are no changes in the C stocks of any pool (aboveground, belowground).
- *Land in conversion to grassland*. A default biomass value for the warm temperate dry eco-region (Table 6.4 of 2006 Guidelines) of 6.1tC/ha was used in calculations. Estimates are calculated using equation 2.15 from 2006 Guidelines. Initial C stock changes in biomass are calculated under Tier 1 (ΔCconversions), assuming a biomass C stock of 4.7t C/ha for annual crops (Table 5.9 of 2006 Guidelines).

6.4.4.3. Change of C stock in dead organic matter and soil

For the estimation of C stock changes in dead organic matter of land "remaining grasslands" there is an improvement plan available, related to the development of national system to respond accounting requirements set in decision 529/2013/UE. Current approach is that there no change in dead organic matter C pool since there is no management change (reference soil C stock and values of C stock change factors would practically no change in time).

For the estimation of C stock changes in soil organic matter in land remaining the same category following assumptions were applied. Estimation of area of different soil types (high activity soils, low activity soils, sandy and wetland) is based on area of soil valuation classes. The percentage fraction of all soil types in grassland was calculated based on available data sets.

Table 6.15. Area of soil valuation classes

Valuation classes	**1976**	**1979**	**1985**	**1990**	**2000**
	thous. ha				
grassland					
Total	**4175.7**	**4127.1**	**4126.9**	**4122**	**4085.8**
I	2.0	2.2	2.6	2.2	2.8
II	67.6	67.3	65.3	61.9	56.8
III	531.7	533.2	555.4	550.9	537.3
IV	1666.5	1687.6	1738	1750	1762.7
V	1370.2	1326.5	1292	1291	1288.9
VI	537.7	510.3	473.6	466	432.3
land not classified					5.0

Due to limited data availability, linear interpolation was applied between the subsequent years. Since 2000, estimations are based on the latest available data sets.

Table 6.16 Valuation classes of agricultural land with the SOC_{ref} assignment.

soil type	soil valuation classes
high activity	I, II, III
low activity	IV
sandy	V
wetland	other

Valuation classes of agricultural land describe the quality of land in terms of value to agricultural production. Class I corresponds to the highest agricultural value and class VI to the lowest.

Table 6.4.3. Soil organic carbon by land use system and soil types

Land-use/ management system	Soil types by IPCC	Carbon in soils [Mg C/ha]
		Default IPCC
Permanent meadows and pastures	sigh activity	50
	low activity	33
	sandy	34
	wetland	87

For calculations there were used default factors as below:

- stock change factor for land use or land-use change type in the beginning of inventory year - $F_{LU}(0\text{-}T)$ = 1.00 [IPCC 2006 tab. Tab. 6.2 page 6.16]
- stock change factor for management regime in the beginning of inventory year – $F_{MG}(0\text{-}T)$=1.14 [IPCC 2006 tab. Tab. 6.2 page 6.16]
- Stock change factor for input of organic matter in the beginning of inventory year – $F_I(0\text{-}T)$=1.11 [IPCC 2006 tab. Tab. 6.2 page 6.16]
- Stock change factor for land use or land-use change type in current inventory year – $F_{LU}(0)$= 1.00 [IPCC 2006 tab. Tab. 6.2 page 6.16]
- Stock change factor for management regime in current inventory year –$F_{MG}(0)$=1.14 [IPCC 2006 tab. Tab. 6.2 page 6.16]
- Stock change factor for input of organic matter in current inventory year – $F_I(0)$ = 1.11 [IPCC 2006 tab. Tab. 6.2 page 6.16]

6.4.4.4. Organic soils

The area of cultivated histosols in Poland was estimated as a case study for the purposes if national inventory [Oświecimska–Piasko 2008]. To estimate CO_2 emission from cultivated organic soils the default emission factor was used for cold temperate – 0.25 tC/ha*year [IPCC 2006 tab. Tab. 6.3 page 6.17].

6.4.4.5. Biomass burning

CH_4, N_2O, CO and NO_x emissions from fires were calculated using following equation (IPCC 2006, page 2.429. equation 2.27). This subcategory is covering the non-CO_2 emission from crop area, meadows and stubbles fires.

6.4.5. Uncertainties and time-series consistency

Detailed information contain chapter 6.6.5.

6.4.6. Category-specific QA/QC and verification

Detailed information contain chapter 6.6.6.

6.4.7. Recalculations

Detailed information contain chapter 6.6.7.

6.4.8. Planned improvements

For the estimation of C stock changes in soils of land "remaining grasslands" there is an improvement plan available, related to the development of national system to respond accounting requirements set in decision 529/2013UE. According to this decision a reporting to European Commission on the national estimating system for cropland management and grazing land management is due annually for 2016-2018 while provide preliminary estimates before 2022 and final estimates in the final deadline in 2022.

6.5. Wetlands (CRF sector 4.D.)

6.5.1. Source category description

Calculation for category 4.D. is based on IPCC methodology described in the chapter 7. of IPCC 2006 guidelines of the Volume 4.

6.5.1.1. Wetlands remaining wetlands

GHG balance in this was identified as a net CO_2 source. Net CO_2 balance was equal to 4526 kt of CO_2 emissions.

6.5.1.2. Lands converted to Wetlands

GHG balance in this was identified as a net CO_2 source. Net CO_2 balance was equal to 27 kt of CO_2 emissions.

6.5.2. Information on approaches used for representing land areas and on land-use databases used for the inventory preparation

According to the description suggested in the chapter 3.3.1. of IPCC 2006 Guidelines of the Volume 4, Poland has selected Approach 2, considering the set of information's available in the register of land and buildings.

6.5.3. Land-use definitions and classification system used and their correspondence to the LULUCF categories

According to the Regulation of the Minister of Administration and Digitization of 29 November 2013 amending the regulation on the registration of land and buildings. (Journal of Laws 2013 pos. 1551), agricultural land considered as wetland consists of:

1. land under waters
    - marine internal;
    - surface flowing waters, which covers land under waters flowing in rivers, mountain streams, channels, and other water courses, permanently or seasonally and their sources as well as land under lakes and artificial water reservoirs. from or to which the water course flow;
    - land under surface lentic water which covers land under water in lakes and reservoirs other than those described above;
2. land under ponds including water reservoirs (excluding lakes and dam reservoirs for water level adjustment) including ditches and areas adjacent and related to ponds;
3. land under ditches including open ditches acting as land improvement facilities for land used.

According to IPCC 2006 wetlands are divided into organic soils managed for peat extraction and flooded lands. Area of organic soils managed for peat extraction in 2015 was 3 360 ha and area of flooded land was 852 992 ha.

CO_2 and N_2O emissions are estimated from organic soils managed for peat extraction. This area was 78 341 ha in 1960-ties and 1 200 ha at the end of 1990-ties. Area of organic soils managed for peat extraction between years 1960-1999 was calculated using interpolation, and due to the data relevant data gaps, for years 2000-2008 value from year 1999 was taken. Since 1999 national statistics contain data on area of organic soils managed for peat extraction It need to be highlighted that data from national statistics are consistent with the previously estimated values of organic soils managed for peat extraction.

Table 6.17. Area of organic soils managed for peat extraction in period 1999-2015

Year		**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Area of organic soils managed for peat extraction:, in this:	[ha]	4680.0	5178.0	2912.0	5138.0	5141.0	5508.0	5107.0	3429.0	3433.0	3410.0	3311.0	3314.0	3312.0	3312.0	3312.0	3312,0	3360,0
Rich organic soli	[ha]	4009.7	4436.4	2494.9	4402.1	4404.7	4719.1	4375.6	2937.9	2941.3	2921.6	2836.8	2839.4	2838.0	2838.0	2838.0	2837,4	2885,4
Poor organic soli	[ha]	670.3	741.6	417.1	735.9	736.3	788.9	731.4	491.1	491.7	488.4	474.2	474.6	474.6	474.6	474.6	474,6	474,6

Source: Central Statistical Office - Environmental Protection 2000-2015

6.5.4. Methodological issues

6.5.4.1. Wetlands remaining wetlands

Emission calculations are based on equation 7.6 of IPCC 2006 guidelines of the Volume 4. page 7.9.

Table 6.18. Emission factors for CO_2-C

Symbol	Unit	Emission factor	Source
$EF_{peatNrich}$	[t C/ha*year]	1.1	table 7.4. page 7.13 IPCC 2006
$EF_{peatNpoor}$	[t C/ha*year]]	0.2	

N_2O emission calculations are based on equation 7.7 of IPCC 2006 guidelines of the Volume 4.

Table 6.19. Emission factors for N2O emissions from managed peatlands

Symbol	Unit	Emission factor	Source
$EF_{peatNrich}$	[kgN_2O/ha*year]	1.8	table 7.6. page 7.16 IPCC 2006
$EF_{peatNpoor}$	[kgN_2O/ha*year]	negligible	

CO_2 emission calculations are based on equation 7.5 of IPCC 2006 guidelines of the Volume 4For calculations default emission factors for cold climate were used as presented below:

Table 6.20 Emission factors for the subcategory wetland remaining wetland

Symbol	Unit	Emission factor	Source
CO_2-C	[t C/t air-dry peat]$^{-1}$]	0.45	table 7.5. page 7.13 IPCC 2006
CO_2-C	[t C/t air-dry peat]$^{-1}$]	0.40	

6.5.4.2. Land converted to Wetlands (CRF sector 4.D.2.)

For calculations default emission factors were used as presented below:

- carbon fraction of dry matter CF = 0.5 [IPCC 2006],
- living biomass in land immediately before conversion to flooded land B_{Before} = 2.8 t dm/ha [IPCC 2006, page 6.8],living biomass immediately following conversion to flooded land $B_{After\,=\,0\,t}$ dm/ha [IPCC 2006. page 7.20].

Table 6.21 Emission factors

Emission factor	unit	value	Source
$EF_{peatNrich}$	[t C/ha*yr]	1.1	table 7.4. page 7.13 IPCC 2006

6.5.5. Uncertainties and time-series consistency

Detailed information contain chapter 6.6.5.

6.5.6. Category-specific QA/QC and verification

Detailed information contain chapter 6.5.6.

6.5.7. Recalculations

Detailed information contain chapter 6.6.7.

6.5.8. Planned improvements

Detailed information contain chapter 6.6.8.

6.6. Settlements (CRF sector 4.E.)

6.6.1. Source category description

Calculation for category 4.E. is based on IPCC methodology described in the chapter 8. of IPCC 2006 guidelines of the Volume 4. GHG balance for this subcategory was identified as a net CO_2 Source. Net CO_2 balance was equal to 1646 kt of CO_2.

6.6.2. Information on approaches used for representing land areas and on land-use databases used for the inventory preparation

According to the description suggested in the chapter 3.3.1. of IPCC 2006 Guidelines of the Volume 4, Poland has selected Approach 2, considering the set of information's available in the register of land and buildings.

6.6.3. Land-use definitions and classification system used and their correspondence to the LULUCF categories

According to the Regulation of the Minister of Administration and Digitization of 29 November 2013 amending the regulation on the registration of land and buildings (Journal of Laws 2013 pos. 1551), agricultural land considered as settlements consists of:

- residential areas include land not used for agricultural and forest production, put under dwelling buildings, devices functionally related to dwelling buildings (yards, drives, passages, playgrounds adjacent to houses), as well as gardens adjacent to houses;
- industrial areas include land put under buildings and devices serving the purpose of industrial production;
- other built-up areas include land put under buildings and devices related to administration. not listed under residential and industrial areas;
- undeveloped urbanised areas include land that is not built over, allocated in spatial management plans to building development and excluded from agricultural and forest production;
- recreational and resting areas comprise the following types of land not put under buildings;
- areas of recreational centres,. children playgrounds, beaches, arranged parks, squares, lawns (outside street lanes);
- areas of historical significance: ruins of castles, strongholds, etc.;
- sport grounds: stadiums, football fields, ski-jumping take-offs, toboggan-run, sports rifle-ranges, public baths etc.;
- area for entertainment purposes: amusement, grounds, funfairs etc.;
- zoological and botanical gardens;
- areas of non-arranged greenery, not listed under woodlands or land planted with trees or shrubbery;
- transport areas including land put under:
    1. roads: national roads; voivodship roads; poviat roads; communal roads; roads within housing estates; access roads to agricultural land and woodlands and to facilities of public utility; stopping and manoeuvring yards next to railway stations, bus stations and airports, maritime and river ports and other ports, as well as universal accesses to unloading platforms and storage yards;
    2. railway grounds;
    3. other transport grounds.

6.6.4. Methodological issues

6.6.4.1. Settlements remaining Settlements

Living biomass

Calculations for carbon stock changes in living biomass were based on crown cower area method (urban green area – GUS 2016 Environmental Protection). Carbon stock changes in living biomass were calculated based on equation 8.2. page 8.7 [IPCC 2006]. Default accumulation rate C_{RF}=2.9 t C/ha was used for calculations [IPCC 2006, page 8.9].

6.6.4.2. Land converted to Settlements (CRF sector 4.E.2.)

Net emissions in this subcategory are equal to 1994 kt of CO_2 emissions. The fundamental equation for estimating change in carbon stocks associated with land-use conversions has been explained in other sections covering conversions of land converted to to forest land, cropland and grassland, respectively. The same decision tree and the same basic method were applied to estimate change in carbon stocks in forest land converted to settlements.

Living biomass

Annual change in carbon stocks in living biomass reservoir was estimated considering the changes in carbon stocks between biomass in the forest prior to conversion (B_{Before}) and that in the settlements after conversion (B_{After}). Estimations are based on the equation 2.16 contained in IPCC 2006 guidelines of the Volume 4.

Average gross merchantable volume used in the above mentioned equation is estimated on the basis of data from the most recent 5-year cycle of large-scale inventory and is published in the form of official statistics by the Central Statistical Office. This method follows the approach in the IPCC Guidelines where the amount of living aboveground biomass that is cleared for expanding settlements is estimated by multiplying the forest area converted annually to settlements by the difference in carbon stocks between biomass in the forest prior to conversion (B_{Before}) and that in the settlements after conversion (B_{After}) which is equal to zero.

To estimate LB carbon stock change in Forest Land converted to Settlements, we have considered instant oxidation of carbon stock in living biomass and litter and dead wood.

Dead organic matter

Annual change in carbon stocks in dead wood reservoir was estimated considering the changes in dead wood resources on forest land all forms of ownership, using the information contained in the statistical yearbooks "Forestry". Estimations are based on the equation 2.19 contained in IPCC 2006 guidelines of the Volume 4.
Dead wood thickness used in the above mentioned equation is estimated on the basis of data from the most recent 5-year cycle of large-scale inventory and is published in the form of official statistics by the Central Statistical Office.

This method follows the approach in the IPCC guidelines where the amount of living aboveground biomass dead organic matter that is cleared for expanding settlements is estimated by multiplying the forest area converted annually to settlements by the difference in carbon stocks between biomass in the forest prior to conversion (DOM_{t1}) and that in the settlements after conversion (DOM_{t2}) which is assumed to be equal to zero.

Soils

Annual change in carbon stocks in the litter reservoir was estimated using equation 3.2.14 contained in the Good Practice Guidance for Land Use, Land Use Change and Forestry ", section 3.2.1.3.1. For the needs of equation application, default reference values of SOC_{ref} were considered to be used linked with the dominant tree habitats.

Table 6.22. Forest habitant types in Poland with the SOC_{ref} assignment

SOC_{ref}	Forest habitat types
high active SOC ref (50 [MgC/ha])	Fresh mixed forest, moist mixed forest, mixed upland forest, mountain mixed forest, fresh broadleaved forest, moist broadleaved forest upland forest, mountain forest
low active SOC ref (33[MgC/ha])	Moist coniferous forest, mountain coniferous forest, high- mountain coniferous forest, 0,5*fresh mixed coniferous forest, moist mixed coniferous forest, upland mixed coniferous forest, mountain mixed coniferous forest
sandy SOC ref (34 [MgC/ha])	Dry coniferous forest, fresh coniferous forest 0,5* fresh mixed coniferous forest
wetland SOC ref (87 [MgC/ha])	Marshy coniferous forest, boggy mountain coniferous forest, boggy mixed coniferous forest, boggy mixed forest, alder forest, ash- alder swamp forest, mountain alder forest, floodplain forest, mountain floodplain forest

Carbon stock changes in mineral soils were estimated based ion following references contained in of IPCC 2006 Guidelines of the Volume 4 [IPCC, 2006]:

- transition period – 1 year
- $f_{man\ intensity}$ – 1.0
- $f_{dist\ regime}$ – 1.0
- $f_{forest\ type}$ – 1.0

6.6.5. Uncertainties and time-series consistency

Uncertainty analysis for the revised year 2015 for IPCC sector *4.Land-Use Change and Forestry* was estimated with use of approach 1 described in 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Simplified approach was based on the assumptions that every value is independent and probability distribution is symmetric. This year uncertainty assumptions were applied directly to on activities and emission factors, instead of emission as in previous years. Results of the sectoral uncertainty analysis are given below. More details on uncertainty assessment of whole inventory are given in annex 8.
Recalculation of data for years 1988-2014 ensured consistency for whole time-series.

Table 6.23. Results of the sectoral uncertainty analysis in 2015

2015	CO2 [kt]	CH4 [kt]	N2O [kt]	CO_2 Emission uncertainty [%]	CH_4 Emission uncertainty [%]	N_2O Emission uncertainty [%]
4. Land-Use Change and Forestry	**-29996.20**	**1.27**	**3.67**	26.3%	80.2%	99.6%
A. Forest Land	-30622.92	1.27	0.02	20.6%	80.2%	100.1%
B. Cropland	362.12			20.6%		
C. Grassland	-568.12	0.00	0.00	20.6%	80.2%	100.1%
D. Wetlands	4526.55	0.00	0.00	20.6%	0.0%	0.0%
E. Settlements	1646.71			20.6%		
F. Other Land						
G. Other	-5340.55			20.6%		

6.6.6. Category-specific QA/QC and verification

Basing on the current recommendations from the IPCC Good Practice Guidance and Uncertainty Management in National GHG Inventories, following elements of quality assurance and control were defined for the inventory of national activities in this area:

- performing an inventory of institutions. is responsible for coordinating QA / QC,
- general procedures for quality control inventory QA / QC (using Tier 1),
- a detailed set for the category of sources. quality control procedures (using Tier 2).

Most of the input data used in the inventory process comes from official national statistics in the statistical studies of Central Statistical Office, reports of Forest Management and Geodesy Bureau. In case of deviations from the trend, more detailed checks are carried out concerning data input. This situation has occurred in the year 2009 for the studies presented in the official statistical volume of forest resources as a result of changes in methodology for their estimation. Presented data as a result of using National of State Forest Inventory of all forms of ownership become an official source of national statistics. In addition, for the annually calculated emissions are compared with the corresponding values from the previous years (trend of emissions), and in the event of any unexpected changes they are examined in more detail. For the detailed information see chapter QA/QC.

6.6.7. Recalculations

Main reasons leading to recalculations in the LULUCF sector for the whole time-series are as follows:

- comprehensive implementation of methods and factors provided in IPCC 2006 guidelines.
- factors related adjustment of carbon stocks calculation in category 4A;
- activity data assessment for entire time series due to change of land use assessment system;
- new estimates of nitrous oxide (N2O) emissions from drained organic soils;,
- new direct nitrous oxide (N2O) emissions from nitrogen (N) mineralization/immobilization associated with loss/gain of soil organic matter.

Net effect of recalculations on CO2 emissions/removals is provided in the Table 7.6.1.

Table 6.24 Recalculations overview.

CRF	Unit	1990	1991	1992	1993	1994	1995	1996	1997
4A	[%]	-0,20	-0,07	-19,30	-1,36	-1,42	-0,31	-0,19	0,01
	[kt]	67,34	18,52	734,07	155,93	152,35	67,85	75,38	-2,95
4B	[%]	-0,20	-0,07	-19,30	-1,36	-1,42	-0,31	-0,19	0,01
	[kt]	67,34	18,52	734,07	155,93	152,35	67,85	75,38	-2,95
4C	[%]	-0,20	-0,07	-19,30	-1,36	-1,42	-0,31	-0,19	0,01
	[kt]	67,34	18,52	734,07	155,93	152,35	67,85	75,38	-2,95
4D	[%]	-0,20	-0,07	-19,30	-1,36	-1,42	-0,31	-0,19	0,01
	[kt]	67,34	18,52	734,07	155,93	152,35	67,85	75,38	-2,95
4E	[%]	-0,20	-0,07	-19,30	-1,36	-1,42	-0,31	-0,19	0,01
	[kt]	67,34	18,52	734,07	155,93	152,35	67,85	75,38	-2,95

CRF	Unit	1998	1999	2000	2001	2002	2003	2004	2005
4A	[%]	0,37	-0,13	-0,11	-0,22	0,25	-0,19	0,63	0,24
	[kt]	-166,64	69,51	39,13	63,62	-95,29	75,13	-318,05	-120,94
4B	[%]	0,63	0,70	0,74	0,82	0,90	1,00	1,08	1,18
	[kt]	3,30	3,66	4,02	4,38	4,73	5,10	5,45	7,04
4C	[%]	0,00	0,00	0,00	0,00	0,02	0,00	-0,01	0,00
	[kt]	-0,01	-0,01	0,01	0,00	0,00	0,00	0,02	0,00
4D	[%]	1,19	1,25	1,47	1,58	1,38	2,58	2,64	2,68
	[kt]	54,19	57,18	67,44	72,38	63,31	121,08	122,96	124,43

CRF	Unit	1998	1999	2000	2001	2002	2003	2004	2005
4E	[%]	-80,03	-75,39	-78,74	-83,62	-86,63	-89,38	-83,80	-78,55
	[kt]	-440,86	-450,41	-460,74	-496,72	-484,84	-481,69	-515,75	-526,89

CRF	Unit	2006	2007	2008	2009	2010	2011	2012	2013
4A	[%]	-0,21	0,35	0,00	-0,12	-0,01	-0,04	-0,25	-0,15
	[kt]	92,33	-128,20	1,38	42,23	4,24	16,35	99,74	61,30
4B	[%]	1,27	1,44	2,00	2,99	2,05	2,35	2,54	2,63
	[kt]	7,48	8,12	16,60	17,48	10,68	11,20	11,71	12,19
4C	[%]	0,02	0,01	-0,75	-0,95	-0,87	-0,80	-0,84	-0,95
	[kt]	-0,03	-0,02	2,46	2,94	3,32	3,24	3,57	3,99
4D	[%]	2,80	3,09	3,19	3,20	3,24	3,27	3,24	3,33
	[kt]	130,07	144,44	148,93	149,16	151,80	152,82	151,35	155,78
4E	[%]	-73,07	-69,57	-81,15	-75,55	-79,40	-87,92	-89,45	-106,19
	[kt]	-564,29	-620,01	-660,13	-721,04	-805,64	-838,85	-958,68	-1050,55

CRF	Unit	2014
4A	[%]	-0,36
	[kt]	123,14
4B	[%]	2,88
	[kt]	12,72
4C	[%]	8,08
	[kt]	-31,95
4D	[%]	3,56
	[kt]	166,64
4E	[%]	-83,73
	[kt]	-1575,64

6.6.8. Planned improvements

With the connection to the first cycle of National Forest Inventory of all ownership forms, executed in a 5-year cycles but updated annually, a continuous analysis of the conventional statistics and indicators is being continuously performed on the basis of the collected material and the use of the collected data to estimate emissions and removals from the forestry sector with regard to actions under Article. 3.3 and 3.4 of the Kyoto Protocol. It should be added that the results of NFI are a valuable source of reliable information on forest resources (i.e. dead wood on forest land, which are used in the National Inventory of greenhouse gases). In addition, research projects will be able to allow a precise determination of changes in carbon content in forest litter. and also allows verification of the conventional factors used to determine changes in carbon content in forest soils. Moreover Party is considering the revision of in-country specific SOC factors. Such an eventuality is dictated by many factors and processes that are determining the direction and rate of change in SOC content when vegetation and soil management practices are changed. Ones that may be important for increasing SOC storage include: (1) increasing the input rates of organic matter, (2) changing the decomposition of organic matter inputs that increase LF-OC in particular, (3) placing organic matter deeper in the soil either directly by increasing belowground inputs or indirectly by enhancing surface mixing by soil organisms, and (4) enhancing physical protection through either intra-aggregate or organo-mineral complexes. Subsequent analysis will be possible at the end of the ongoing studies related SOC at national level. Poland is considering described factor as important for further improvements.

6.7. Other land (CRF sector 4.F)

Emissions/removals from this subcategory were not estimated. It is included to match overall consistency of country land area.

6.8 Harvested wood products (CRF sector 4G)

Following coefficients from Table 12.4 of 2006 Guidelines (default factors to convert from product units to carbon) were adapted to the conditions of our country, resulting the following factors for conversion to carbon:

Table 6.25 Factors for conversion to carbon

Item	Value
Solid wood	0.285
Sawn wood	0.268
Wood panel	0.294
Paper ansd paper board	0.45
Wood charcoal	0.765
Bark	1.120

The half-live time parameters

According to the 2006 Guidelines, the half-live time parameters are: 30 years - solid wood (decay rate k=0,023) and 2 years- paper products (decay rate k=0,347).

Data sources (FAO database)

When determining CO_2 emission balance, we resorted to consulting the FAO database (available at the following address: http://faostat.fao.org). Based on FAO classification, we retrieved data regarding the production and export of the following wood products: roundwood, sawnwood, wood-based panels, paper and paperboard, wood pulp and recovered paper, industrial roundwood, chips and particles, wood charcoal and wood residues.

Estimating data for the period between 1900 and 1960.

Due to the fact that FAO only supplies data beginning with 1961, we resorted to estimate production and export of wood products between 1900 and 1960 by equation 12.6, which takes into account the production and exports values for 1961 and U (the exchange rate in Europe, which amounts to 0.0151).

The variables (1.A, 1.B, 2.A, 2.B,3,4,5) were determined in conformity with the provisions of the *IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Agriculture, Forestry and Other Land Use, chapter 12 Harvested Wood Products 2006*. Calculation runs through all of the mentioned stages, and also by using the I*nventory Software ver 2.12*, available at http://www.ipcc-nggip.iges.or.jp/software/index.html.

Calculation

Step 1: Calculating variable 1.A (i.e. Annual change in carbon stock in "products in use"). It was calculated using formulas 12.1 and 12.2, for each product category (solid wood or paper products), inflow, k (decay rate), and the carbon stock at the beginning of the year (C(i)).

Step 2: Calculating variable 2.A (Annual change in carbon stock in "products in use" where wood came from harvest in the reporting country (includes exports)). It was calculated using formulas 12.1 and 12.3, accounting for the product category (solid wood or paper products), inflow, k (decay rate) and the stock of carbon at the beginning of the year (C(i)).

Step 3: Calculating variable 1.B (Annual Change in stock of HWP in SWDS from consumption) and 2.B (annual Change in stock of HWP in SWDS produced from domestic harvest). When calculating the 1.B and 2.B variables, we took into account the Waste Sector Tier 1 estimates, as laid out in the IPCC 2006 Guidelines .

6.8.1 Uncertainties and time series consistency

Estimation of C stock change in HWP is under further refining. Estimate of uncertainty is going to be done with future submissions.

6.8.2 Category-specific QA/QC and verification, if applicable

Comparable order of magnitude of currently submitted estimates with those submitted by Poland in the past (TAR for forest management reference level).

6.8.3 Category-specific recalculations, if applicable, including changes made in response to the review process and impact on emission trend

No recalculations were performed in relation to the HWP estimates.

6.8.4 Category-specific planned improvements, if applicable (e.g. methodologies, activity data, emission factors, etc.), including those in response to the review process

Current approach is to build capacity to cover HWP, to better understand the estimation methodologies and requirements, as well as available data.

7. WASTE

7.1. Overview of sector

The GHG emission sources in waste sector involve: methane emission from 5.A *Solid Waste Disposal*, CH_4 and N_2O emissions from 5.B *Biological Treatment of Solid Waste*; CO_2, CH_4 and N_2O emissions from 5.C *Incineration and Open Burning of Waste* and CH_4 and N_2O emissions from 5.D *Wastewater Treatment and Discharge*.

Following category from sector 6 have been identified as key source (excluding LULUCF):

IPCC Source Categories	Greenhouse Gas	Identification criteria (Level, Trend, Qualitative)		
5.A Solid Waste Disposal	CH4	L	T	
5.D Wastewater Treatment and Discharge	CH4		T	

Share of these categories in total Poland's GHG emissions is 2.18%.

Total emission of GHG as carbon dioxide equivalent amounted to 10 395.82 kt in 2015 and decreased since 1988 by 30.09% (figure 7.1).

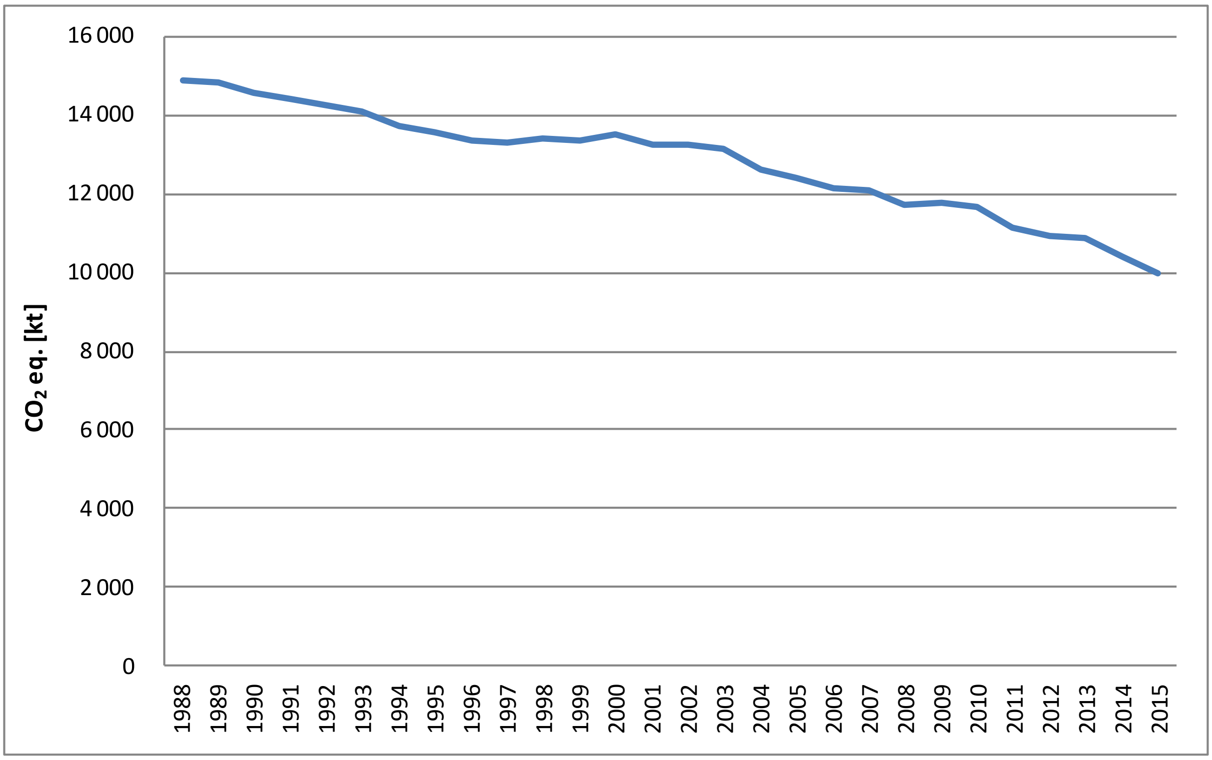

Figure 7.1. GHG emissions from waste sector in 1988-2015

Between years 1988 and 2015 decrease of GHG emissions appeared in subcategory 5.A (by 18.6 %) and 5.D (by 72.1 %) while emissions from sources gathered in subcategories 5.B and 5.C increased since 1988 by 3 939.4 % (5.B) and 29.2 % (5.C). The main reason of decrease of emissions from sector 5 is decrease of GHG emissions in subsector 5.A *Solid Waste Disposal on Land* and subsector 5.D *Wastewater Treatment and Discharge* (figure 7.2), the biggest (81.4% and 10.7% of emission respectively) contributors to emission from *Waste* sector.

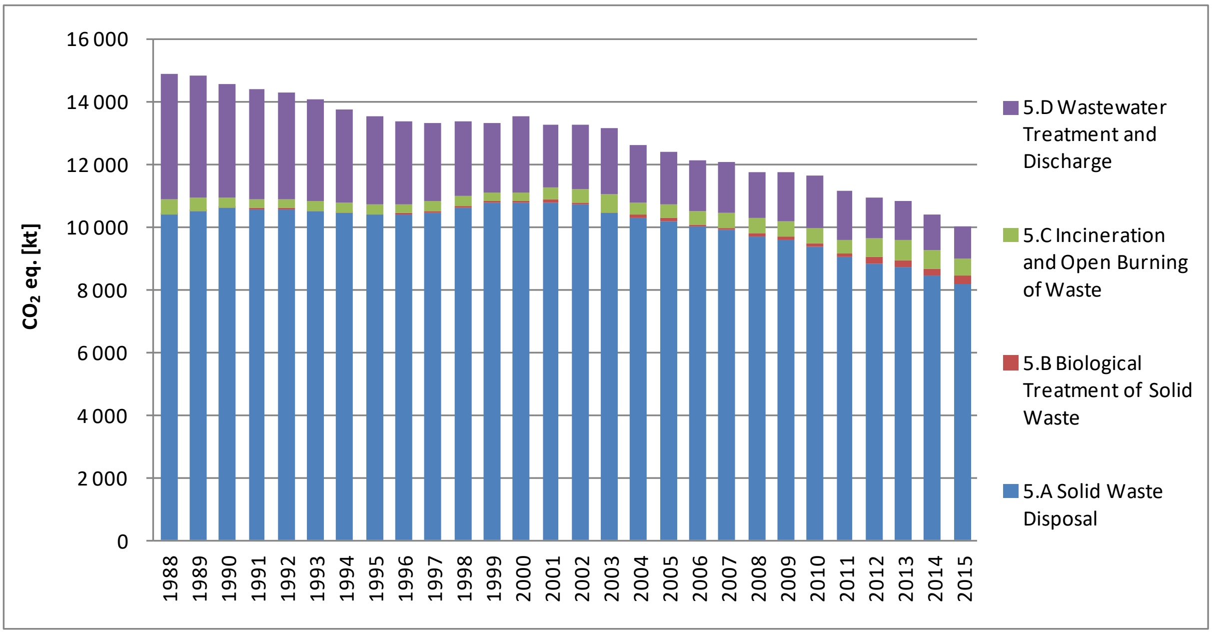

Figure 7.2. GHG emissions from waste sector divided to subsectors

According to statistical data [GUS (2016d)] in 2015 collected municipal solid wastes go to four different pathways: incineration (0.4%), biological treatment (16.1%), recycling (39.2%) and landfilling (44.3%).

The changes in shares of municipal solid waste treatment pathways since 2007 are presented below (figure 7.3).

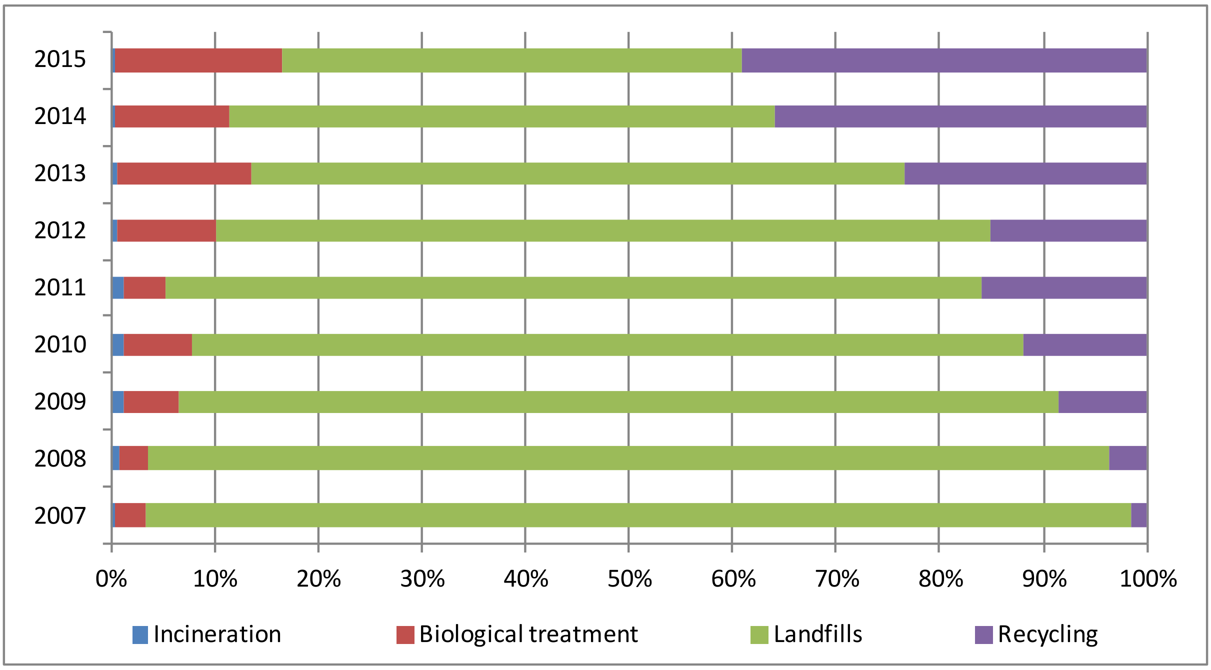

Figure 7.3. Municipal solid waste treatment pathways

7.2. Solid Waste Disposal (CRF sector 5.A)

7.2.1. Source category description

The 5.A *Solid Waste Disposal on Land* subcategory share in total waste sector is 81.4% and it involves methane emissions from Managed Waste Disposal on Land (42.8% share of 5.A), Unmanaged Waste Disposal on Land deep (27.8% share of 5.A) and Uncategorized MSW Disposal on Land (10.8% share of 5.A). This sector includes emission from disposal of sewage sludge on land which is mentioned in chapter 7.2.2.1.

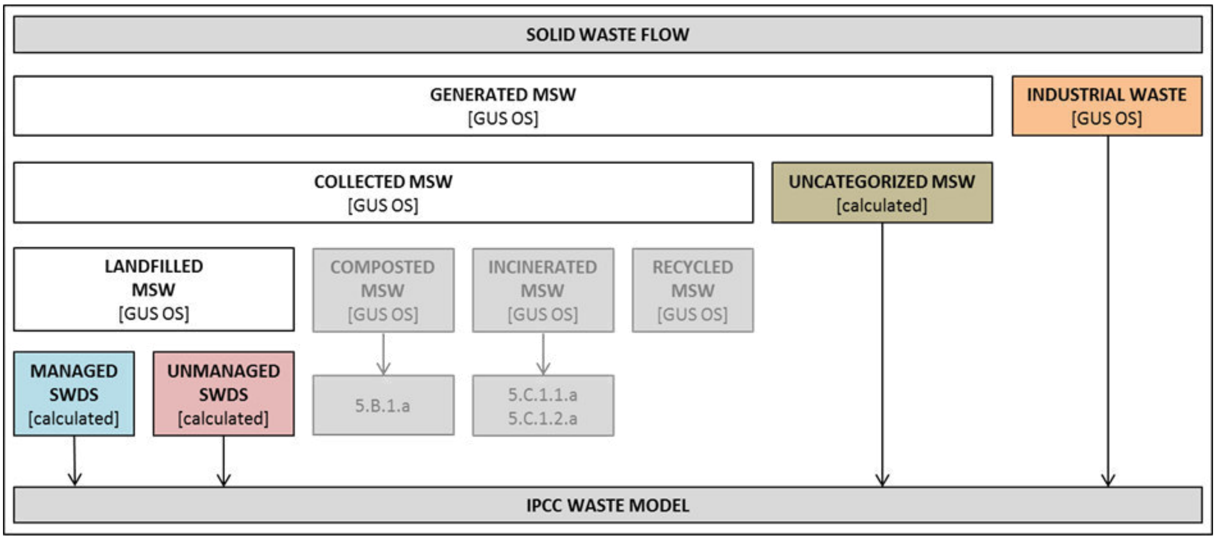

Figure 7.4. Solid waste flow scheme

The trend of emissions from sector 5.A is mostly conditioned by activity data – amounts of waste generated and collected – which reached highest values around the year 1990 and the year 1999. The first peak in the trend (Fig. 7.4) is a result of high waste generation and poorly developed waste collection and recycling system in the early '90. The post-communist economy was generating big amounts of municipal and industrial waste and the most of it was being landfilled, and the significant amount of disposal sites was unmanaged. Increase of emission resulting in second peak, which appeared around the year 1999, is related to highest share of utilization in unmanaged waste disposal sites.

Since 1999 the trend of methane emission is decreasing, mostly due to development of collection, segregation and landfilling system (what is the result of implementing recommendations of Landfill Directive 1999/31/EC, among others). During this period waste recycling was popularized and the recycling system was developed, what resulted in decrease of landfilled municipal waste. Moreover, new technologies were introduced on disposal sites what caused the decrease in amount of waste landfilled in unmanaged disposal sites.

The basic legal regulatory for waste management in Poland is the Act on waste (Dz.U. 2013/0/21 with later changes) describing the ways of waste treatment leading to human and environmental protection.

Poland is importing solid waste but according to information from Chief Inspectorate of Environmental Protection those are mostly hazardous waste (no municipal waste is imported) for incineration and it's amount is included in data on incinerated waste used by Party for estimates from subsector 5.C.

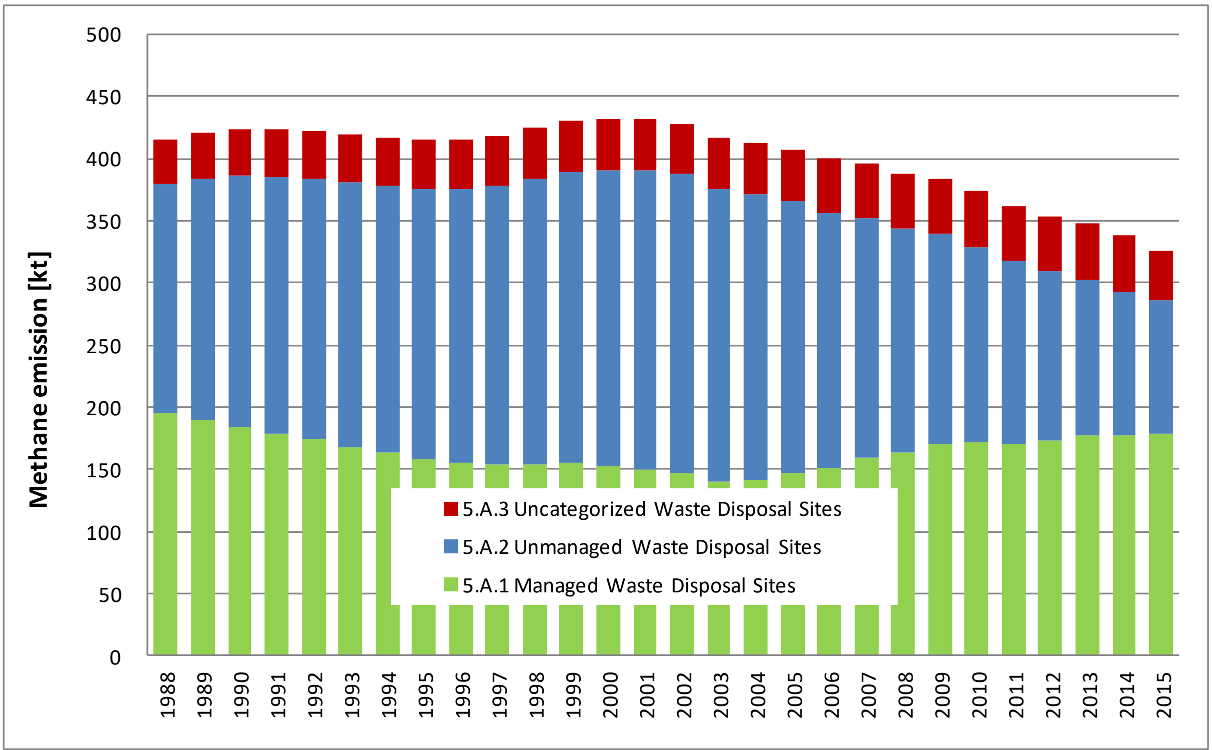

Figure 7.5. Methane emission from 5.A subsector divided to subcategories

7.2.2. Methodological issues

The methane emission estimates from waste disposal sites were calculated using IPCC 2006 *Tier 2* method. The choice of the method was supported by good quality country-specific historical and current activity data on waste disposal at SWDSs from Central Statistical Office and the Ministry of Environment.

The methane emissions estimates were calculated with application the IPCC Waste Model published in [IPCC (2006)]. The model establishes multiyear series when methane is generated from organic matter decomposition in anaerobic conditions. The emission of CH_4 is diminished by recapturing of this gas for energy purposes. The data on recovered methane are based on responses to questionnaires of Central Statistical Office on energy combustion.

The following factors were used for estimation of CH_4 emissions:
- DOC – degradable organic carbon in the year of deposition (default value [IPCC (2006)]),
- DOC_f – fraction of DOC that can decompose (default value [IPCC (2006)]),
- MCF – CH_4 correction factor for aerobic decomposition in the year of deposition (default value [IPCC (2006)]),
- OX – Oxidation Factor reflecting the amount of CH_4 from solid waste disposal sites that is oxidized in the soil or other material covering the waste (default value [IPCC (2006)]),
- k – reaction constant [IPCC (2006)],
- F – fraction of CH_4 by volume, in generated landfill gas (country specific).

Fraction of degradable organic carbon in bulk waste (DOC) was calculated with application of default IPCC 2006 method and country specific data on waste composition.

The values of abovementioned factors are presented in tables 7.1 – 7.5.

Table 7.1. DOC and DOC_f indicators, municipal waste

DOC (Degradable Organic Carbon)	Range	Default	Adopted Value
Food waste	0.08-0.20	0.15	0.15
Garden	0.18-0.22	0.2	0.2
Paper	0.36-0.45	0.4	0.4
Wood and straw	0.39-0.46	0.43	0.43
Textiles	0.20-0.40	0.24	0.24
DOC_f		0.5	0.5

Table 7.2. MCF indicators of organic carbon in disposed municipal and industrial waste

Unmanaged, shallow	Unmanaged, deep	Managed	Managed, semiaerobic	Uncategorised
0.4	0.8	1	0.5	0.6

Party assummed on the basis of the expert judgement that all unmanaged landfills are considered to be „deep". This is more restrictive approach that could lead to overestimation of the emission, but there is no available statistical historical and present data on the share of „shallow" and „deep" landfills.

Table 7.3. Factors k, F and OX assumed for calculations, municipal waste

Methane generation rate constant (k)	Range	Default	Value
Food waste	0.1–0.2	0.185	0.185
Garden	0.06–0.1	0.1	0.1
Paper	0.05–0.07	0.06	0.06
Wood and straw	0.02–0.04	0.03	0.03
Textiles	0.05–0.07	0.06	0.06
Delay time (months)		6	6
Fraction of methane (F) in developed gas		0.5	0.55
Oxidation factor (OX)		0	0-0.1*

* since 2001 managed SWDSs fulfill requirements of [IPCC (2006)] to be treated as "well-managed" SWDSs for which the 0.1 value of oxidation factor is default

Party is applying IPCC 2006 values of methane generation rate (k) and half-life ($t_{1/2}$) default for wet temperate climate zone.

Table 7.4. DOC and DOC_f indicators, industrial waste

DOC (Degradable Organic Carbon)	Range	Default	Adopted Value
Food waste	0.08-0.20	0.15	0.15
Paper	0.36-0.45	0.4	0.4
Wood and straw	0.39-0.46	0.43	0.43
Textiles	0.20-0.40	0.24	0.24
Rubber		0.39	0.39
DOC_f		0.5	0.5

Table 7.5. Factors k, F and OX assumed for calculations, industrial waste

Methane generation rate constant (k)	Range	Default	Value
Food waste	0.1–0.2	0.185	0.185
Paper	0.05–0.07	0.06	0.06
Wood and straw	0.02–0.04	0.03	0.03
Textiles	0.05–0.07	0.06	0.06
Rubber	0.02–0.04	0.03	0.03
Delay time (months)		6	6
Fraction of methane (F) in developed gas		0.5	0.5
Oxidation factor (OX)		0	0

Fraction of methane in generated landfill gas in municipal SWDSs was calculated on basis of country specific studies performed on data from thirteen solid waste disposal sites in Poland. Measured shares of CH_4 in generated biogas are presented in table 7.6. The value of obtained factor F applied in inventory is an arithmetical average of measured fractions and equals 55%.

Table 7.6. Calculation of factor F for municipal waste

No.	SWDS	Measured CH_4 fraction in landfill gas [%]	Data source
1.	Sierakowo	65.8	Grzybek (2005)
2.	Kłoda	33.8	
3.	Lipówka I	50.6	Ocieczek (2010)
4.	Kraków-Barycz	56.2	Dudek (2013)
5.	Myślenice-Borzęta	62.1	
6.	Brzesko-Jadowniki	71.9	
7.	Choszczno-Stradzewo	48.7	
8.	Nowy Sącz	54.0	Ciuła (2013)
9.	Łódź-Nowosolna	63.0	Czurejno (2006)
10.	Warszawa-Radiowo	59.3	
11.	Bydgoszcz	31.6	
12.	Gdańsk-Szadłówki	69.0	
13.	Toruń	47.5	Grzesik (2006)
	calculated F value:	**54.9**	-

Fraction of methane in generated landfill gas in industrial SDWSs in accordance with the case study [Gworek (2003)] amounts between 40% and 60%, therefore usage of default IPCC 2006 value F=0.5 is justified for Polish conditions. Recovered gas is combusted for energy purposes or flared (no data on amounts available).

Emission from sewage sludge was estimated on the basis of [IPCC (2006)] methodology, using IPCC Waste Model. Party assumed that sewage sludge is being landfilled only since 1995 (earlier data are not available and extrapolation is not possible due to lack of distinct trend) and only in managed municipal waste disposal sites. Emission factors used are default [IPCC (2006)] (table 7.7). Other parameters were assumed as for municipal solid waste landfilled in managed waste disposal sites.

Table 7.7. Sewage sludge emission factors

DOC	Reaction constant (k)
0.05	0.185

7.2.2.1 Managed Waste Disposal Sites – Municipal Waste

Activities used for estimation of CH_4 emissions from solid waste disposals contain:

- generated municipal solid waste – for the years 1970 – 2004 data was extrapolated according to amount of collected MSW (table 7.8.),
- collected municipal solid wastes (MSW) was taken from National Statistics. Because of lack of data for years 1971-1973 and 1976 values were interpolated (table 7.8). In domestic statistics data were given in dam^3 - to recalculate it into kilotonnes a conversion factor 0.26 Mg/m^3 was used, given by Central Statistical Office,
- MSW deposited on landfills fulfilling requirements of Landfill Directive 1999/31/EC – data from Waste Management Department of Ministry of the Environment (table 7.9.),
- amount of Industrial Waste deposited on landfills [GUS (1974d-2016d)],
- amount of sewage sludge deposited on landfills [GUS (1974d-2016d)],
- composition of municipal waste (table 7.10.) and industrial waste (table 7.12),
- R – methane recovery [GUS OZE (2000-2016)],
- population of Poland [GUS (1989-2016)].

Table 7.8. Data sources for amount of municipal waste

Years	Generated MSW [kt]	Data source	Collected MSW [kt]	Data source
1970	6 365.93	extrapolation	4 113.98	GUS (1987)
1971	6 876.60	extrapolation	4 624.65	interpolation
1972	7 387.26	extrapolation	5 135.31	interpolation
1973	7 897.93	extrapolation	5 645.98	interpolation
1974	8 408.60	extrapolation	6 156.64	GUS (1974d)
1975	9 040.92	extrapolation	6 788.96	GUS (1986d)
1976	9 649.95	extrapolation	7 397.99	interpolation
1977	10 258.98	extrapolation	8 007.03	GUS (1981d)
1978	10 954.78	extrapolation	8 702.83	GUS (1981d)
1979	11 304.58	extrapolation	9 052.63	GUS (1981d)
1980	12 120.67	extrapolation	9 868.72	GUS (1986d)
1981	12 266.37	extrapolation	10 014.42	GUS (1986d)
1982	12 581.02	extrapolation	10 329.07	GUS (1986d)
1983	12 793.86	extrapolation	10 541.91	GUS (1986d)
1984	13 116.49	extrapolation	10 864.54	GUS (1986d)
1985	13 338.90	extrapolation	11 086.95	GUS (1986d)
1986	13 798.81	extrapolation	11 546.86	GUS (1987)
1987	14 129.40	extrapolation	11 877.45	GUS (1989d)
1988	14 336.13	extrapolation	12 084.18	GUS (1989d)
1989	14 252.90	extrapolation	12 000.95	GUS (1990d)
1990	13 350.23	extrapolation	11 098.28	GUS (1996)
1991	12 889.93	extrapolation	10 637.98	GUS (1996)
1992	12 872.95	extrapolation	10 621.00	GUS (1996)
1993	12 896.61	extrapolation	10 644.66	GUS (1996)
1994	13 266.59	extrapolation	11 014.64	GUS (1996)
1995	13 236.95	extrapolation	10 985.00	GUS (2005d)
1996	13 873.17	extrapolation	11 621.22	GUS (1997d)
1997	14 435.40	extrapolation	12 183.44	GUS (1998d)
1998	14 527.72	extrapolation	12 275.77	GUS (1999d)
1999	14 568.85	extrapolation	12 316.90	GUS (2000d)
2000	14 477.95	extrapolation	12 226.00	GUS (2005d)
2001	13 360.95	extrapolation	11 109.00	GUS (2005d)
2002	12 760.65	extrapolation	10 508.70	GUS (2005d)
2003	12 176.56	extrapolation	9 924.61	GUS (2005d)
2004	12 011.26	extrapolation	9 759.31	GUS (2005d)
2005	12 169.00	[GUS 2012d]	9 352.12	GUS (2006d)
2006	12 235.00	[GUS 2009d]	9 876.59	GUS (2007d)
2007	12 264.00	[GUS 2010d]	10 082.58	GUS (2011d)
2008	12 194.00	[GUS 2011d]	10 036.41	GUS (2011d)
2009	12 053.00	[GUS 2012d]	10 053.50	GUS (2012d)
2010	12 038.00	[GUS 2012d]	10 040.11	GUS (2012d)
2011	12 128.80	[GUS 2012d]	9 827.64	GUS (2012d)
2012	12 085.00	[GUS 2013d]	9 580.87	GUS (2013d)
2013	11 295.00	[GUS 2014d]	9 473.83	GUS (2014d)
2014	10330.40	[GUS 2015d]	10330.40	GUS (2015d)
2015	10863.50	[GUS 2016d]	10863.50	GUS (2016d)

Distribution of solid waste disposal sites for managed and unmanaged SWDSs for years 1970-2001 was made in accordance to elaboration [Gworek (2003)]. According to this publication 14% of disposal sites are managed, and 86% are unmanaged.

Since 2001 Poland was implementing the Landfill Directive (1999/31/EC) and, as a result, the share of unmanaged SWDSs started to decrease (landfills fulfilling requirements of the Directive are considered to be managed). In accordance to data from Waste Management Department of Ministry of Environment on amount of MSW landfilled on landfills fulfilling requirements of the Directive the share of MSW on managed and unmanaged SWDSs was updated. According to data from abovementioned Department since 2012 all SWDSs in Poland fulfill the Directive and can be considered as managed.

In the inventory Party still estimates emissions from waste landfilled in unmanaged SWDSs before 2012. Impossibility of determining wheather those finally became upgraded to managed SWDSs or closed justifies this approach as the best available.

Tabela 7.9. Amount of waste collected and landfilled on managed SWDSs

Year	Collected MSW [kt]	MSW landfilled on managed SWDS [kt]	Share
2001	data unavailable	data unavailable	20%*
2002	data unavailable	data unavailable	26%*
2003	10753.0	3414.0	32%
2004	9029.3	5207.5	58%
2005	8623.1	5210.0	60%
2006	7824.4	5903.3	75%
2007	9227.8	7411.4	80%
2008	8947.2	7584.8	85%
2009	8543.6	7379.9	86%
2010	8577.6	7885.3	92%
2011	7649.8	6979.1	91%
2012	7158.2	7158.2	100%
2013	5978.7	5978.7	100%
2014	5437.0	5437.0	100%
2015	4808.0	4808.0	100%

* extrapolated data

Composition of municipal waste was calculated on the basis of publication [Rosik-Dulewska Cz. (2000)] and on the basis of publication by [Rzeczyński B. (1996)]. From the first publication composition of waste in 1985 was taken. From the second publication, information on change in composition of metals and plastics during 20 years was taken (11.8% decrease from 1992 to 1972), and interpolation for the years until 2000 was made (table 7.10). Data for 2001-2003 are based on National Waste Management Plan 2003 [KPGO 2003], for 2004-2008 on [KPGO 2010], for 2008-2013 on [KPGO 2014] and for the year 2015 [KPGO 2022].

Table 7.10. Composition of municipal solid waste

Year	Food	Garden	Paper	Wood	Textile	Plastics, and other inert
1970	31.50%	4.70%	15.50%	6.30%	3.50%	38.48%
1971	31.15%	4.63%	15.56%	6.09%	3.49%	39.07%
1972	30.80%	4.56%	15.63%	5.88%	3.47%	39.67%
1973	30.44%	4.49%	15.69%	5.67%	3.45%	40.26%
1974	30.09%	4.41%	15.75%	5.46%	3.44%	40.85%
1975	29.73%	4.34%	15.81%	5.25%	3.42%	41.44%
1976	29.38%	4.27%	15.87%	5.04%	3.41%	42.04%
1977	29.02%	4.20%	15.93%	4.83%	3.39%	42.63%
1978	28.67%	4.12%	15.99%	4.62%	3.37%	43.22%
1979	28.31%	4.05%	16.05%	4.41%	3.36%	43.81%
1980	27.96%	3.98%	16.11%	4.20%	3.34%	44.40%
1981	27.61%	3.91%	16.17%	3.99%	3.32%	45.00%
1982	27.25%	3.83%	16.24%	3.78%	3.31%	45.59%
1983	26.90%	3.76%	16.30%	3.57%	3.29%	46.18%
1984	26.54%	3.69%	16.36%	3.36%	3.27%	46.77%
1985	26.19%	3.62%	16.42%	3.15%	3.26%	47.37%
1986	25.83%	3.54%	16.48%	2.94%	3.24%	47.96%
1987	25.48%	3.47%	16.54%	2.73%	3.23%	48.55%
1988	25.13%	3.40%	16.60%	2.52%	3.21%	49.14%
1989	24.77%	3.33%	16.66%	2.31%	3.19%	49.74%
1990	24.42%	3.25%	16.72%	2.10%	3.18%	50.33%
1991	24.06%	3.18%	16.78%	1.89%	3.16%	50.92%
1992	23.71%	3.11%	16.85%	1.68%	3.14%	51.51%
1993	23.35%	3.04%	16.91%	1.47%	3.13%	52.11%
1994	23.00%	2.96%	16.97%	1.26%	3.11%	52.70%
1995	22.65%	2.89%	17.03%	1.05%	3.09%	53.29%
1996	22.29%	2.82%	17.09%	0.84%	3.08%	53.88%
1997	21.94%	2.75%	17.15%	0.63%	3.06%	54.48%
1998	21.58%	2.67%	17.21%	0.42%	3.05%	55.07%
1999	21.23%	2.60%	17.27%	0.21%	3.03%	55.66%
2000	20.87%	2.53%	17.33%	0.00%	3.01%	56.25%
2001	21.44%	3.12%	17.48%	0.41%	2.60%	54.96%
2002	22.00%	3.70%	17.62%	0.81%	2.18%	53.68%
2003	22.56%	4.29%	17.77%	1.22%	1.77%	52.39%
2004	23.12%	4.88%	17.91%	1.63%	1.36%	51.10%
2005	26.01%	4.80%	16.58%	1.31%	1.69%	49.61%
2006	28.91%	4.71%	15.24%	1.00%	2.02%	48.12%
2007	31.80%	4.63%	13.90%	0.68%	2.36%	46.63%
2008	34.69%	4.54%	12.56%	0.37%	2.69%	45.14%
2009	34.83%	3.93%	12.86%	0.40%	2.86%	45.11%
2010	34.97%	3.33%	13.15%	0.44%	3.04%	45.08%
2011	35.11%	2.72%	13.44%	0.47%	3.21%	45.05%
2012	35.26%	2.12%	13.73%	0.50%	3.38%	45.02%
2013	35.40%	1.51%	14.02%	0.53%	3.55%	44.98%
2014	35.54%	0.91%	14.31%	0.57%	3.73%	44.95%
2015	35.68%	0.30%	14.60%	0.60%	3.90%	44.92%

Abovementioned composition of municipal solid waste is used in IPCC Waste Model to calculate weight of each fraction of waste deposited at SWDSs, and finally - amounts of CH_4 generated by each fraction.

The data on amounts of landfilled sewage sludge was taken from Central Statistical Office annuals – Environment Protection. For years 1998, 1999 and 2001 there was a lack of activity data and interpolation method was used for its achievement.

Table 7.11. Sewage sludge activity data

Year	Amount of sewage sludge disposed on landfills [kt]	Data source
1995	1 471	GUS (1996d)
1996	1 419	GUS (1997d)
1997	2 184	GUS (1998d)
1998	1 983	interpolation
1999	1 783	interpolation
2000	1 582	GUS (2005d)
2001	1573	interpolation
2002	1 565	GUS (2005d)
2003	1 510	GUS (2005d)
2004	1 511	GUS (2005d)
2005	1 330	GUS (2006d)
2006	1 271	GUS (2007d)
2007	991	GUS (2011d)
2008	696	GUS (2011d)
2009	605	GUS (2012d)
2010	553	GUS (2012d)
2011	534	GUS (2012d)
2012	559	GUS (2013d)
2013	458	GUS (2014d)
2014	451	GUS (2015d)
2015	438	GUS (2016d)

In Poland, disposal of waste outside Waste Management System is strictly prohibited by law and it is assumed that since 2014 no new waste is being landfilled in uncategorized waste disposal sites. Still no data on treatment of waste disposed illegally before 2014 are available, therefore assumption that methane emissions from this source stopped is unjustifiable. For this reason emission of methane from waste landfilled before 2014 in uncategorized waste disposal sites is still estimated.

7.2.2.2 Managed Waste Disposal – Industrial Waste

Methodology of estimation of methane emissions from industrial solid waste disposal is based on 2006 IPCC Guidelines [IPCC (2006)] and performed with application of IPCC Waste Model. The model does not support estimating the emissions for each type of industrial waste – there is only possibility to use the total amount. Therefore, the emission from industrial waste was calculated with the application of forms for municipal waste, which approach, according to IPCC Guidelines, is correct. For this reason the Waste Model was used separately to calculate emissions from municipal and industrial waste. The choice of the method was supported by good quality country-specific historical and current activity data on industrial waste disposal at SWDSs.

According to IPCC Guidelines only following types of industrial waste generate CH_4 emission:

- paper and cardboard,
- food,
- wood,
- tobacco,
- textiles and rubber and leather (only synthetic).

In national inventory activity data were taken from Central Statistical Office annuals – Environment Protection. Time series are 1975-2015. Before year 1975 there were no data on industrial waste.

Waste from manufacturing of furniture is not included in the inventory due to lack of information on content of wood, plastic, metal and other materials in disposed furniture.

Table 7.12. Composition of industrial waste

Year	Food	Paper	Wood	Textile	Rubber	Plastics, other inert	Source of activity data
1975	87.80%	7.43%	2.56%	2.21%	0.00%	0.00%	GUS (1975d)
1976	91.76%	4.70%	2.15%	1.39%	0.00%	0.00%	GUS (1976d)
1977	90.68%	4.65%	2.30%	2.37%	0.00%	0.00%	GUS (1977d)
1978	91.47%	3.08%	1.65%	3.80%	0.00%	0.00%	GUS (1978d)
1979	92.91%	3.37%	1.94%	1.79%	0.00%	0.00%	GUS (1979d)
1980	90.75%	4.83%	2.15%	2.27%	0.00%	0.00%	GUS (1981d)
1981	93.76%	3.49%	1.04%	1.71%	0.00%	0.00%	GUS (1982d)
1982	90.26%	6.60%	1.15%	1.99%	0.00%	0.00%	GUS (1983d)
1983	87.41%	9.44%	1.51%	1.65%	0.00%	0.00%	GUS (1984d)
1984	88.26%	8.35%	1.33%	2.06%	0.00%	0.00%	GUS (1985d)
1985	88.81%	7.54%	1.57%	2.08%	0.00%	0.00%	GUS (1986d)
1986	68.18%	18.59%	5.47%	7.76%	0.00%	0.00%	GUS (1987d)
1987	68.00%	20.60%	6.68%	4.73%	0.00%	0.00%	GUS (1988d)
1988	69.65%	19.02%	4.93%	6.41%	0.00%	0.00%	GUS (1989d)
1989	64.78%	25.85%	5.69%	3.68%	0.00%	0.00%	GUS (1990d)
1990	69.12%	23.29%	5.19%	2.41%	0.00%	0.00%	GUS (1991d)
1991	72.98%	21.45%	3.46%	2.11%	0.00%	0.00%	GUS (1992d)
1992	63.77%	24.67%	1.62%	3.63%	5.53%	0.78%	GUS (1993d)
1993	70.65%	22.62%	1.17%	2.27%	2.41%	0.87%	GUS (1994d)
1994	71.00%	23.00%	1.59%	1.79%	1.76%	0.86%	GUS (1995d)
1995	67.60%	23.03%	3.37%	2.48%	1.84%	1.68%	GUS (1996d)
1996	68.81%	23.22%	2.69%	2.54%	1.70%	1.05%	GUS (1997d)
1997	64.96%	26.87%	2.39%	2.57%	1.82%	1.38%	GUS (1998d)
1998	53.01%	40.21%	1.81%	1.84%	0.71%	2.42%	GUS (1999d)
1999	36.84%	57.46%	1.93%	0.99%	0.41%	2.37%	GUS (2000d)
2000	45.78%	47.45%	2.31%	0.73%	0.35%	3.37%	GUS (2001d)
2001	44.93%	49.29%	1.83%	0.38%	0.38%	3.18%	GUS (2002d)
2002	43.08%	51.94%	2.23%	0.25%	0.13%	2.37%	GUS (2003d)
2003	47.16%	47.09%	2.33%	0.21%	0.10%	3.11%	GUS (2004d)
2004	59.59%	37.70%	2.04%	0.38%	0.14%	0.14%	GUS (2005d)
2005	66.57%	30.59%	1.61%	0.95%	0.15%	0.13%	GUS (2006d)
2006	65.69%	32.13%	1.05%	0.54%	0.08%	0.51%	GUS (2007d)
2007	66.38%	31.89%	1.06%	0.09%	0.03%	0.54%	GUS (2008d)
2008	66.36%	31.50%	1.35%	0.13%	0.00%	0.66%	GUS (2009d)
2009	45.94%	52.19%	1.04%	0.00%	0.00%	0.83%	GUS (2010d)
2010	32.30%	66.34%	0.53%	0.00%	0.00%	0.83%	GUS (2011d)
2011	31.99%	65.92%	0.79%	0.00%	0.05%	1.26%	GUS (2012d)
2012	31.64%	66.45%	0.83%	0.00%	0.00%	1.07%	GUS (2013d)
2013	25.98%	70.33%	0.92%	0.00%	0.00%	2.77%	GUS (2014d)
2014	16.20%	77.53%	1.43%	0.00%	0.00%	4.83%	GUS (2015d)
2015	31.98%	57.83%	5.61%	0.00%	0.00%	4.57%	GUS (2016d)

For years 1977 and 1978 no data on amount of industrial waste from separate industries are available, for this reason data on waste amount from resorts are used. But the data were aggregated – in textile resort there were data for textiles and leather products, in forests and wood resort there were data on wood and on pulp and paper. Disaggregating of these data was made on the basis of adequate data from years 1976 and 1979. Also the percentages of food waste in a food resort were taken from 1976 and 1979.

On the basis of waste amount from each industry sector the composition of waste was calculated.

7.2.3. Uncertainties and time-series consistency

Uncertainty analysis for the revised year 2015 for IPCC sector 5.*Waste* was estimated with use of approach 1 described in 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Simplified approach was based on the assumptions that every value is independent and probability distribution is symmetric. Results of the sectoral uncertainty analysis are given below. More details on uncertainty assessment of whole inventory are given in annex 8.
Recalculation of data for years 1988-2014 ensured consistency for whole time-series.

2015	CO2 [kt]	CH4 [kt]	N2O [kt]	CO_2 Emission uncertainty [%]	CH_4 Emission uncertainty [%]	N_2O Emission uncertainty [%]
5. Waste	**487.60**	**343.38**	**3.08**	33.5%	63.5%	122.2%
A. Solid Waste Disposal on Land		326.02			66.7%	
B. Biological treatment of solid waste		7.34	0.44		104.4%	153.0%
C. Waste Incineration	487.60	0.00	0.18	33.5%	101.1%	150.7%
D. Wastewater treatment and discharge		10.02	2.46		99.7%	150.3%

7.2.4. Source-specific QA/QC and verification

Activity data concerning solid waste disposals and sewage sludge come from Central Statistical Office (GUS). GUS is responsible for QA/QC of collected and published data. In some cases of solid waste comparison is made between national statistical data and National Waste Management Plan. Activity data on waste incineration is based on external expert's research involving questionnaires from individual entities. Country specific emission factors involved in estimation of GHG emissions from waste water treatment are based on external expert's analysis of questionnaires from individual entities.
The attempt has been undertaken to ensure internal consistency between different treatment pathways of waste and sewage sludge. Calculations in waste sector were examined with focus on formulas, units and trends consistency. Generally QC procedures follow QA/QC plan presented in Annex 7.

7.2.5. Source-specific recalculations

Table 7.13. Change in methane emissions in result of recalculations

Change	1988	1989	1990	1991	1992	1993	1994	1995	1996
kt CH_4	-3.1	-3.4	-3.7	-4.0	-4.3	-4.6	-4.9	-5.2	-5.6
%	-1%	-1%	-1%	-1%	-1%	-1%	-1%	-1%	-1%

Change	1997	1998	1999	2000	2001	2002	2003	2004	2005
kt CH_4	-5.9	-6.3	-6.7	-7.6	-8.1	-8.4	-7.9	-7.4	-6.7
%	-1%	-1%	-2%	-2%	-2%	-2%	-2%	-2%	-2%

Change	2006	2007	2008	2009	2010	2011	2012	2013	2014
kt CH_4	-6.2	-5.8	-5.8	-5.4	-5.4	-5.5	-5.2	-4.9	-3.7
%	-2%	-1%	-1%	-1%	-1%	-2%	-1%	-1%	-1%

Recalculations details:
- recalculation of composition of municipal waste was performed,
- new value of fraction of methane in landfill gas was applied.

7.2.6. Source-specific planned improvements

No further improvements are currently planned for sector 5.A.

7.3. Biological Treatment of Solid Waste (CRF sector 5.B)

7.3.1. Source category description

In the following section estimation of emissions of methane and N_2O from sector 5.B is provided. Because of lack of sufficient data on amounts of waste digested anaerobically only emissions from composting of waste were estimated. The 5.B subcategory share in total waste sector is 2.1%.

7.3.2. Methodological issues

Calculations are based on IPCC 2006 Guidelines [IPCC (2006)] methodology, *Tier 1*, choice of which justifies lack of country-specific method of estimation GHG emission.

Default emission factors applied by Party are: 4 g CH_4/kg treated waste and 0.24 g N_2O/kg treated waste (composting, wet weight basis).

Activity data and its sources are presented in table 7.14. Data on amounts of municipal waste composted in years 1993-2015 were taken from statistical yearbooks, apart from the year 1997 where, due to lack of data, interpolation was applied. For the years 1988 – 1992 activity data were achieved by extrapolation.

Data on amounts of waste other than municipal composted in years 1998-2015 were taken from statistical yearbooks. For the years prior to 1998 no activity data are available and extrapolation was not possible due to lack of distinct trend.

Table 7.14. Amounts of composted waste and data sources

Year	Municipal waste [kt]	Data source	Other waste [kt]	Data source
1988	32.0	extrapolation	NA	-
1989	39.6	extrapolation	NA	-
1990	48.9	extrapolation	NA	-
1991	60.5	extrapolation	NA	-
1992	74.7	extrapolation	NA	-
1993	92.4	[GUS 1994d]	NA	-
1994	114.2	[GUS 1997d]	NA	-
1995	200.6	[GUS 1997d]	NA	-
1996	218.6	[GUS 1998d]	NA	-
1997	220.2	interpolation	NA	-
1998	221.7	[GUS 2002d]	82.6	GUS (2002d)
1999	225.2	[GUS 2003d]	96.8	GUS (2003d)
2000	248.3	[GUS 2003d]	73.7	GUS (2003d)
2001	309.0	[GUS 2004d]	86.1	GUS (2004d)
2002	214.8	[GUS 2004d]	82.8	GUS (2004d)
2003	128.9	[GUS 2004d]	115.3	GUS (2004d)
2004	234.1	[GUS 2007d]	158.1	GUS (2007d)
2005	317.9	[GUS 2007d]	219.6	GUS (2007d)
2006	297.1	[GUS 2009d]	181.6	GUS (2009d)
2007	277.7	[GUS 2010d]	224.3	GUS (2010d)
2008	262.4	[GUS 2011d]	225.9	GUS (2011d)
2009	508.3	[GUS 2012d]	175.4	GUS (2012d)
2010	608.5	[GUS 2012d]	173.5	GUS (2012d)
2011	365.6	[GUS 2012d]	118.9	GUS (2012d)
2012	926.5	[GUS 2013d]	137.8	GUS (2013d)
2013	1230.5	[GUS 2014d]	142.3	GUS (2014d)
2014	1154.0	[GUS 2015d]	138.8	GUS (2015d)
2015	1750.0	[GUS 2016d]	85.6	GUS (2016d)

7.3.3. Uncertainties and time-series consistency

See chapter 7.2.3.

7.3.4. Source-specific QA/QC and verification

See chapter 7.2.4.

7.3.5. Source-specific recalculations

Change	1988	1989	1990	1991	1992	1993	1994	1995	1996
kt CO_2 eq.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Change	1997	1998	1999	2000	2001	2002	2003	2004	2005
kt CO_2 eq.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Change	2006	2007	2008	2009	2010	2011	2012	2013	2014
kt CO_2 eq.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Recalculations details:
- no recalculations was performed.

7.3.6. Source-specific planned improvements

Investigation on possibility of estimation of GHG from anaerobic digestion of organic waste is planned.

7.4. Incineration and Open Burning of Waste (CRF sector 5.C)

7.4.1. Source category description

The 5.C subcategory share in total waste sector is 5.7% and it involves CO_2 and N_2O emissions from incineration of municipal, industrial (including hazardous) and medical waste and sewage sludge. According to IPCC Guidelines biogenic emission of CO_2 (140.61 kt in 2015) is not included in total emission.

Polish law strictly prohibits open burning of waste. Therefore no data on open burning are present in national statistics and no estimation of emissions of GHG from this subsector is calculated.

7.4.2. Methodological issues

Estimates of emissions of GHG from waste incineration are based on IPCC 2006 Guidelines [IPCC (2006)] and domestic case study [Wielgosiński G. 2003]. For estimation of carbon dioxide from incineration of municipal waste *Tier 2a* approach was taken due to availability of country specific data on amount and fractions of incinerated waste. Estimation of emissions of N_2O from incineration of municipal waste, and emissions of GHG from incineration of industrial and medical waste as well as sewage sludge was performed using *Tier 1*.

Table 7.15. Emission factors

Incinerated waste	**Factor**	**Data source**
municipal	composition of waste	CS - see table 7.18
	dry matter	default IPCC 2006
	fraction of carbon (CF)	default IPCC 2006
	fraction of fossil carbon (FCF)	default IPCC 2006
	oxidation factor	default IPCC 2006
	N_2O emission factor	default IPCC 2006
Industrial	dry matter	default IPCC 2006
	fraction of carbon in the dry matter	default IPCC 2006
	fraction of fossil carbon	default IPCC 2006
	oxidation factor	default IPCC 2006
	N_2O emission factor	default IPCC 2006
medical	dry matter	default IPCC 2006
	fraction of carbon in the dry matter	default IPCC 2006
	fraction of fossil carbon	default IPCC 2006
	oxidation factor	default IPCC 2006
sewage sludge	dry matter	default IPCC 2006
	fraction of carbon in the dry matter	default IPCC 2006
	fraction of fossil carbon	default IPCC 2006
	oxidation factor	default IPCC 2006
	N_2O emission factor	default IPCC 2006

Biogenic and non-biogenic content fractions was taken from [IPCC (2006)] - municipal solid waste, and [IPCC 2000] - industrial and medical waste and sewage sludge and are presented in table 7.16.

Table 7.16. Biogenic and non-biogenic content of waste in 2015

Type of waste	Biogenic waste fraction	Non-biogenic waste fraction
municipal	0.43	0.57
industrial	0.1	0.9
medical	0.6	0.4
sewage sludge	1	0

The amounts of incinerated municipal, industrial waste and sewage sludge are taken from Central Statistical Office Environmental Protection Yearbooks [GUS (2016d)]. Data on incinerated medical waste is taken from Central Waste System database.

Table 7.17. Activity data in 2015 [kt]

Type of waste	Amount of waste incinerated
municipal	45.64
industrial	342.10
medical	41.99
sewage sludge	165.37

National Waste Management Plans are source of data on composition of municipal waste. Data for 2001-2003 are based on National Waste Management Plan 2003 [KPGO 2003], for 2004-2008 on [KPGO 2010], for 2008-2013 on [KPGO 2014] and for the year 2015 [KPGO 2022].

Table 7.18. Composition of incinerated municipal solid waste

Year	Paper	Textiles	Food waste	Wood	Garden and park waste	Nappies	Rubber and leather	Plastics	Metal	Glass	Other inert waste
2000	17.33%	3.01%	20.87%	0.00%	2.53%	0.00%	0.00%	16.29%	4.59%	8.54%	26.84%
2001	17.48%	2.60%	20.92%	0.41%	3.12%	0.00%	0.00%	15.45%	4.54%	8.29%	27.20%
2002	17.62%	2.18%	20.97%	0.81%	3.70%	0.00%	0.00%	14.62%	4.50%	8.03%	27.55%
2003	17.77%	1.77%	21.02%	1.22%	4.29%	0.00%	0.00%	13.79%	4.46%	7.78%	27.90%
2004	17.91%	1.36%	21.06%	1.63%	4.88%	0.00%	0.00%	12.96%	4.41%	7.53%	28.26%
2005	16.58%	1.69%	23.83%	1.31%	4.80%	0.00%	0.00%	12.88%	3.89%	8.16%	26.86%
2006	15.24%	2.02%	26.60%	1.00%	4.71%	0.00%	0.00%	12.81%	3.36%	8.79%	25.46%
2007	13.90%	2.36%	29.37%	0.68%	4.63%	0.00%	0.00%	12.74%	2.83%	9.42%	24.07%
2008	12.56%	2.69%	32.13%	0.37%	4.54%	0.00%	0.00%	12.67%	2.31%	10.05%	22.67%
2009	12.86%	2.86%	31.13%	0.40%	3.93%	0.00%	0.00%	12.88%	2.26%	9.84%	23.83%
2010	13.15%	3.04%	30.12%	0.44%	3.33%	0.00%	0.00%	13.08%	2.22%	9.64%	24.99%
2011	13.44%	3.21%	29.12%	0.47%	2.72%	0.00%	0.00%	13.28%	2.17%	9.43%	26.15%
2012	13.73%	3.38%	28.11%	0.50%	2.12%	0.00%	0.00%	13.49%	2.13%	9.22%	27.32%
2013	14.02%	3.55%	27.11%	0.53%	1.51%	0.00%	0.00%	13.69%	2.09%	9.01%	28.48%
2014	14.31%	3.73%	26.10%	0.57%	0.91%	0.00%	0.00%	13.90%	2.04%	8.81%	29.64%
2015	14.60%	3.90%	25.10%	0.60%	0.30%	0.00%	0.00%	14.10%	2.00%	8.60%	30.80%

Table 7.19. Composition of incinerated waste [kt]

Year	Municipal		Medical		Industrial (incl. hazardous)		Sewage sludge
	nonbiogenic	biogenic	nonbiogenic	biogenic	nonbiogenic	biogenic	biogenic
1988	NO	NO	22.6	33.9	291.7	32.4	NA
1989	NO	NO	22.1	33.1	268.2	29.8	NA
1990	NO	NO	22.4	33.6	225.8	25.1	NA
1991	NO	NO	22.0	33.1	201.4	22.4	NA
1992	NO	NO	21.4	32.1	191.2	21.2	NA
1993	NO	NO	21.7	32.5	189.1	21.0	NA
1994	NO	NO	21.8	32.7	189.7	21.1	NA
1995	NO	NO	21.4	32.2	192.5	21.4	NA
1996	NO	NO	21.3	32.0	195.5	21.7	NA
1997	NO	NO	20.9	31.3	195.3	21.7	NA
1998	NO	NO	20.7	31.1	208.9	23.2	41.4
1999	NO	NO	19.9	29.9	172.6	19.2	31.9
2000	1.2	1.7	20.4	30.6	168.2	18.7	34.1
2001	11.3	14.7	10.8	16.1	220.8	24.5	46.6
2002	16.0	20.0	7.3	10.9	278.7	31.0	31.5
2003	18.9	22.7	8.2	12.3	370.5	41.2	47.0
2004	19.9	23.1	10.7	16.1	236.7	26.3	39.9
2005	21.1	23.3	11.8	17.7	267.6	29.7	37.4
2006	20.1	21.1	8.8	13.3	268.6	29.8	39.3
2007	21.9	21.9	10.1	15.2	300.1	33.3	33.7
2008	20.9	19.9	9.8	14.7	301.9	33.5	44.5
2009	20.2	20.1	11.4	17.2	290.8	32.3	50.4
2010	20.0	20.9	11.1	16.6	277.7	30.9	66.4
2011	18.8	20.6	13.3	20.0	280.9	31.2	85.2
2012	17.9	20.6	13.7	20.5	349.9	38.9	101.1
2013	22.7	27.4	14.0	20.9	364.4	40.5	148.8
2014	13.9	17.7	16.7	25.0	344.5	38.3	164.4
2015	19.6	26.0	16.8	25.2	307.9	34.2	165.4

The table 7.19 presents composition of incinerated waste. Before the year 2000 no municipal waste was incinerated in Poland. Data on incineration of sewage sludge before 1998 are not available and lack of distinguishable trend indisposes extrapolation. Country specific composition of incinerated of municipal solid waste is presented in table 7.18.

Waste combusted for energy purposes is included in Energy sector and treated as a fuel. Information on used EFs is included in NIR report under the Annex 2.

7.4.3. Uncertainties and time-series consistency

See chapter 7.2.3.

7.4.4. Source-specific QA/QC and verification

See chapter 7.2.4.

7.4.5. Source-specific recalculations

Table 7.20. Change in GHG emissions in result of recalculations

Change	1988	1989	1990	1991	1992	1993	1994	1995	1996
kt CO_2 eq.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Change	1997	1998	1999	2000	2001	2002	2003	2004	2005
kt CO_2 eq.	0.0	0.0	0.0	1.2	10.4	13.6	14.7	14.2	14.6
%	0%	0%	0%	0%	3%	3%	3%	4%	3%

Change	2006	2007	2008	2009	2010	2011	2012	2013	2014
kt CO_2 eq.	13.5	14.2	13.1	13.2	13.7	13.4	12.7	17.7	11.4
%	3%	3%	3%	3%	3%	3%	2%	3%	2%

Recalculations details:
- correction of composition of incinerated municipal waste was performed.

7.4.6. Source-specific planned improvements

Continuation of research on usage of activity data from Central Waste System for emissions estimation is planned.

7.5. Waste Water Handling (CRF sector 5.D)

7.5.1. Source category description

The 5.D category share in emission of GHG from waste sector is 10.7% and it involves methane emission from industrial wastewater (23.2% share of 5.D), methane emission from Domestic wastewater (11.1% share of 5.D) and N_2O emission from human sewage (65.7% share of 5.D).

The emission from sector 5.D decreased ca. 72.1% since the base year, mostly because of significant development of national wastewater collection and treatment system. The main contributor and driver of emission change in 5.D is the *Domestic Wastewater* subsector (5.D.1) – responsible of ca. 76.8% of emission of GHG from sector 5.D in 2015.

Emission of methane from subsector *5.D.2 Industrial Wastewater* is ca. 23.2% of emission of GHG from sector 5.D in 2015 and it is constantly decreasing due to reduction of wastewater production by industries.

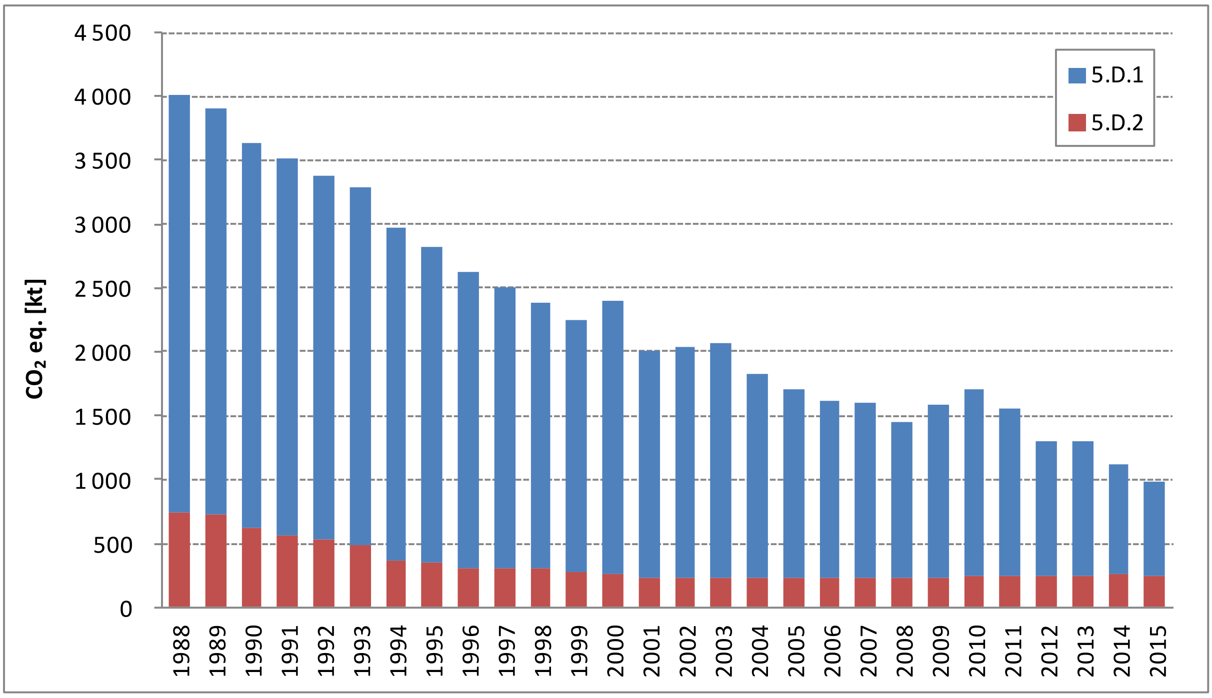

Figure 7.6. GHG emission from 5.D subsector

7.5.2. Methodological issues

7.5.2.1. Domestic Wastewater (CRF sector 5.D.1)

Methane emission

Estimation of CH_4 emissions from sector 5.B.1 *Domestic Wastewater* was based on methodology IPCC 2006 Guidelines [IPCC (2006)], *Tier 2* – which choice is justified by availability of country specific activity data. Amounts of degradable organic components were estimated basing on the data on population of Poland, and rural and urban population using different sewage treatment pathways. These data were taken from [GUS (2016d)]. Activity data are presented in table 7.21.

Table 7.21. Rural and urban population using given sewage treatment pathways [%]

Year	Rural population shares in treatment pathway					Urban population shares in treatment pathway				
	mechanical treatment plant	biological treatment plant	high nutrient removal	not connected	septic tanks	mechanical treatment plant	biological treatment plant	high nutrient removal	not connected	septic tanks
1988	0.04	2.06	0.00	0.89	97.02	13.43	31.46	0.00	35.77	19.35
1989	0.06	2.04	0.00	1.20	96.69	11.05	34.01	0.00	35.81	19.13
1990	0.09	2.02	0.00	1.56	96.34	8.55	36.58	0.00	36.21	18.66
1991	0.12	1.99	0.00	1.93	95.96	16.51	39.21	0.00	26.01	18.27
1992	0.14	1.97	0.00	2.30	95.59	15.12	42.14	0.00	24.80	17.94
1993	0.17	1.95	0.00	2.75	95.13	17.47	42.64	0.00	22.08	17.80
1994	0.19	1.93	0.00	3.25	94.64	15.23	47.53	0.00	19.64	17.60
1995	0.27	2.51	0.31	2.82	94.10	14.24	46.77	4.69	16.86	17.44
1996	0.35	3.31	0.50	2.33	93.50	13.47	46.14	7.42	15.75	17.23
1997	0.38	4.85	0.63	1.44	92.70	11.64	47.78	13.07	10.54	16.97
1998	0.38	5.54	1.16	1.41	91.50	9.26	46.27	20.42	7.28	16.77
1999	0.33	6.72	1.61	1.24	90.10	7.31	47.47	23.90	4.78	16.54
2000	0.37	8.09	2.36	0.69	88.50	5.53	43.47	30.96	3.79	16.25
2001	0.45	8.76	3.82	0.00	86.96	5.09	41.57	35.01	2.48	15.84
2002	0.48	9.15	5.56	0.00	84.81	4.22	38.03	40.90	0.00	16.85
2003	0.43	10.44	5.97	0.00	83.16	3.92	33.48	46.23	0.00	16.37
2004	0.43	11.16	7.53	0.00	80.87	3.21	30.53	50.41	0.00	15.85
2005	0.35	11.97	8.88	0.00	78.79	3.16	25.75	55.80	0.00	15.29
2006	0.26	12.85	9.93	0.00	76.96	0.87	26.29	58.07	0.00	14.77
2007	0.17	13.63	11.19	0.00	75.01	0.65	23.94	60.91	0.00	14.50
2008	0.19	13.94	13.05	0.00	72.82	0.26	16.76	68.86	0.00	14.12
2009	0.20	14.42	13.80	0.00	71.59	0.10	14.90	71.41	0.00	13.58
2010	0.22	14.94	14.85	0.00	70.00	0.08	13.64	72.84	0.00	13.45
2011	0.22	15.73	15.63	0.00	68.42	0.07	10.85	76.22	0.00	12.85
2012	0.29	16.55	17.41	0.00	65.75	0.06	10.35	77.75	0.00	11.84
2013	0.21	17.43	18.84	0.00	63.52	0.03	9.91	78.81	0.00	11.24
2014	0.06	19.70	17.62	0.00	62.62	0.04	9.06	81.11	0.00	9.80
2015	0.05	20.20	19.36	0.00	60.38	0.04	8.65	81.98	0.00	9.34

Default value of organic load in biochemical oxygen demand per person, which is equal to 60 g BOD/person/day [IPCC (2006)], was taken for the calculations.

Amounts of recovered methane are taken from national statistics [GUS OZE (2016)]. Fraction of methane in generated gas was calculated on basis of four country specific studies performed on data measured in wastewater treatment plants. Obtained shares of CH_4 in generated biogas are presented in table 7.22. The final share applied in inventory is an arithmetical average of measured fractions and equals 65%. Recovered gas is combusted for energy purposes.

Table 7.22. Calculation of fraction of methane in recovered biogas

No.	Measured CH_4 fraction in generated gas [%]	Data source
1.	65.0	Grzybek (2005)
2.	65.6	Kołodziejak (2012)
3.	65.0	Błaszczyk-Pasteczka (2007)
4.	63.0	Jędrczak (2007)
-	**64.6**	**calculated fraction**

Amounts of organic component removed as sludge are calculated on basis of statistical data on amounts of sewage sludge applied in agriculture, composting, incinerated and landfilled [GUS (2016d)] and factor supplied by ATV Germany which equals to 0.8 kg dry matter/kg BOD.

Methane Correction Factors (MCF) for various treatment pathways are taken from [IPCC (2006)] and domestic study [Bernacka (2005)]. Their values are listed in table 7.23.

Table 7.23. MCF values

Treatment pathway	mechanical treatment plant	biological treatment plant	high nutrient removal plant	not connected	latrine
MCF	0.05	0.05	0.05	0.1	0.5
Data source	Bernacka (2005)	Bernacka (2005)	Bernacka (2005)	default IPCC 2006	default IPCC 2006

N_2O emission

N_2O emission from human sewage was calculated according to default method [IPCC (2006)]. Population of Poland was provided by Central Statistical Office [GUS (2016)]. Amounts of animal and vegetal protein consumption per capita per year was taken from FAO database. For years 2014-2015 protein consumption was assumed on the level of 2013 data, what is a result of lack of up-to-date data in FAO database. Values and sources of emission factors are provided in table 7.24.

Table 7.24. Emission factors

Emission factor	F_{npr}	$EF_{effluent}$	$F_{non-con}$	$F_{ind-com}$
Value	0.16	0.005	1.1	1.25
Data source	default IPCC 2006	default IPCC 2006	default IPCC 2006	default IPCC 2006

7.5.2.2. Industrial Wastewater (CRF sector 5.D.2)

Estimates of emissions of methane from industrial wastewater treatment subsector are based on IPCC 2006 Guidelines [IPCC (2006)] *Tier 1* and domestic case study [Przewłocki (2007)], and based on COD default emission factors. For some branches, were the COD EF was not available country specific data were used [Rueffer (1998)].

Data on share of aerobic and anaerobic wastewater treatment method and recovery of methane in industrial wastewater treatment was taken from expert opinion [Przewłocki (2007)]. Recovered gas is combusted for energy purposes.

Data on amount of industrial wastewater from separate branches and on biological treatment of organic wastewater were taken from national statistics [GUS (2016d)]. Data on employment and production from some branches were taken from national statistics [GUS (1989-2016)].

Total organic product is derived from amount of wastewater from each industry, COD concentration in organic wastewater and wastewater produced per unit product by industry.

Table 7.25. Emission factors on wastewater and sludge

Industry sector	COD concentration in organic wastewater	Methane correction factor from wastewater	Maximum CH_4 producing capacity form wastewater	Methane emission factor for wastewater	Methane correction factor from sludge	Maximum CH_4 producing capacity form sludge	Methane emission factor for sludge
	kg/m^3		kg CH_4/kg ChZT	kg CH_4/kg ChZT		kg CH_4/kg ChZT	kg CH_4 kg ChZT
Mining and quarrying	0.60	0.10	0.25	0.030	0.32	0.25	0.080
Iron and steel	0.75	0.10	0.25	0.030	0.32	0.25	0.080
Non-iron metals	0.67	0.10	0.25	0.030	0.32	0.25	0.080
Synthetic fertilizers	0.82	0.10	0.25	0.030	0.32	0.25	0.080
Food products: Meat & Poultry	3.00	0.20	0.25	0.050	0.36	0.34	0.120
Food products: Fish Processing	2.50	0.15	0.25	0.040	0.68	0.34	0.231
Food products: Vegetables & Fruits	2.82	0.20	0.25	0.050	0.35	0.29	0.102
Food products: Vegetable Oils	0.79	0.34	0.25	0.090	0.65	0.34	0.221
Food products: Dairy Products	2.88	0.16	0.25	0.040	0.32	0.34	0.109
Food products: Sugar	2.51	0.52	0.25	0.130	0.38	0.34	0.129
Food products: Soft Drinks	1.49	0.10	0.25	0.030	0.2	0.34	0.068
Food products: Beer & Malt	3.81	0.10	0.25	0.030	0.20	0.34	0.068
Food products: Other	2.77	0.22	0.25	0.060	0.39	0.34	0.133
Textiles	0.90	0.12	0.25	0.030	0.24	0.25	0.060
Leathers	3.31	0.29	0.25	0.070	0.24	0.25	0.060
Wood and Paper	2.71	0.11	0.25	0.030	0.12	0.25	0.030
Petroleum Refineries	0.37	0.15	0.25	0.040	0.08	0.25	0.020
Organic Chemicals	3.00	0.15	0.25	0.040	0.08	0.25	0.020
Plastics & Resins	3.70	0.15	0.25	0.040	0.08	0.25	0.020
Other non-metallic	2.50	0.10	0.25	0.030	0.32	0.25	0.080
Manufacturing of Machinery and Transport Equipment	4.97	0.10	0.25	0.030	0.32	0.25	0.080
Other	0.77	0.10	0.25	0.030	0.32	0.25	0.080

Table 7.26. Amount of industrial wastewater by industry [million m^3]

Rok	Mining and quarrying	Iron and steel	Non-iron metals	Synthetic fertilizers	Food products: Meat & Poultry	Food products: Fish Processing	Food products: Vegetables & Fruits	Food products: Vegetable Oils	Food products: Dairy Products	Food products: Sugar	Food products: Soft Drinks	Food products: Beer & Malt	Food products: Other	Textiles	Leathers	Wood and Paper	Petroleum Refineries	Organic Chemicals	Plastics & Resins	Other non-metallic	Manufacturing of Machinery and Transport Equipment	Other
1988	548.0	94.2	48.7	123.0	3.3	1.6	14.2	3.7	19.5	23.7	4.1	4.0	2.7	14.2	6.3	195.0	43.2	126.0	17.4	58.2	53.6	90.9
1989	426.5	119.6	86.1	118.3	3.0	1.5	12.0	2.5	20.6	21.0	4.2	4.0	5.7	13.9	5.7	199.1	43.4	224.1	0.0	59.6	54.6	91.3
1990	519.0	99.8	39.7	92.5	2.7	1.3	10.0	1.5	19.7	20.4	4.3	4.3	3.7	11.1	4.7	184.0	38.7	107.0	17.6	53.3	50.3	95.2
1991	470.0	73.1	67.8	58.4	3.2	1.2	8.5	1.0	17.7	13.9	5.0	4.0	2.6	8.2	4.2	168.0	40.0	120.0	15.8	43.9	42.1	89.8
1992	453.0	51.4	66.2	53.5	5.4	1.1	7.4	0.5	16.2	10.0	5.8	4.0	0.6	9.0	3.0	146.0	36.6	108.0	15.7	31.0	32.6	79.8
1993	392.0	47.0	59.7	48.5	4.6	0.9	8.0	2.1	15.3	11.0	2.3	3.6	1.5	7.8	2.6	132.0	33.6	97.7	15.1	28.0	30.7	82.7
1994	382.0	45.8	128.0	51.3	3.9	0.8	7.4	1.2	14.2	7.9	2.6	2.7	1.6	7.3	1.7	129.0	32.6	101.0	14.6	29.6	29.5	104.0
1995	378.0	44.4	134.0	41.5	4.0	0.3	8.3	1.0	13.2	7.7	2.4	2.1	1.5	6.4	1.6	121.0	33.2	98.6	12.6	29.3	27.0	94.5
1996	362.0	43.0	142.0	48.5	4.2	0.4	7.8	3.6	12.5	6.5	2.6	1.7	0.9	5.7	1.3	117.0	28.1	94.3	6.7	28.8	25.9	115.0
1997	340.0	43.9	172.0	51.9	4.2	0.2	7.7	4.8	12.2	5.7	2.9	1.7	1.1	5.2	1.1	114.0	25.1	81.5	9.2	32.9	26.5	110.0
1998	336.0	25.3	188.0	52.3	3.9	0.1	9.4	2.5	12.3	6.1	2.7	1.6	2.5	4.7	0.7	106.0	24.3	63.1	10.3	27.9	25.1	161.0
1999	362.3	13.2	184.8	52.6	4.0	0.1	7.5	3.2	11.4	4.9	2.6	1.4	0.5	3.1	0.7	90.3	20.3	55.9	8.4	29.8	22.0	116.7
2000	350.0	14.2	184.0	51.7	3.6	0.1	7.5	2.4	11.3	4.0	2.5	1.3	0.8	2.6	1.1	81.7	17.8	47.7	7.8	32.3	12.0	121.0
2001	332.0	14.8	187.0	49.7	3.4	0.1	7.2	0.7	11.7	2.9	2.1	1.3	0.7	2.1	1.2	76.9	18.1	42.4	4.7	34.2	10.4	130.0
2002	293.0	13.3	184.0	50.3	3.4	0.1	6.4	0.3	11.3	2.7	2.2	1.4	0.7	1.7	0.9	77.1	16.8	42.0	2.7	38.0	9.1	126.0
2003	272.0	9.6	155.0	46.0	3.5	0.1	7.8	0.2	11.5	2.7	3.1	1.2	0.8	1.6	0.8	71.5	17.4	38.3	2.5	31.9	8.1	120.0
2004	261.0	8.2	135.0	49.4	4.1	0.1	6.8	0.3	13.0	2.2	2.0	1.2	3.3	1.5	0.6	70.9	19.6	36.0	2.5	37.4	6.8	129.0
2005	267.0	6.5	132.0	48.6	4.3	0.0	6.6	0.3	13.5	1.8	2.1	1.3	2.8	1.6	0.7	68.9	19.3	38.4	2.4	36.3	7.0	128.0
2006	272.0	7.4	132.0	50.7	4.6	0.0	7.0	0.4	13.8	1.4	2.1	1.7	2.3	1.3	0.6	69.7	20.7	38.6	2.2	43.2	4.4	128.0
2007	271.0	10.8	133.0	52.6	4.8	0.0	6.8	0.4	14.4	1.9	1.9	1.4	2.4	0.7	0.6	67.6	23.0	39.1	2.3	39.4	4.2	148.0
2008	242.6	8.3	130.8	176.3	5.0	0.0	6.0	0.6	14.2	2.7	1.6	1.4	2.6	0.6	0.4	64.7	20.9	35.5	1.9	46.1	3.7	141.7
2009	252.9	12.8	128.4	121.3	5.8	0.0	6.1	0.8	14.2	3.2	1.8	1.1	2.1	0.4	0.5	66.8	21.3	29.4	1.8	39.9	2.1	168.4
2010	283.2	16.5	147.3	49.8	6.6	0.0	5.8	0.7	14.5	2.6	1.6	2.4	36.1	0.3	0.4	64.2	23.1	35.6	2.1	46.8	2.8	183.2
2011	286.2	13.2	166.4	48.1	6.5	0.0	5.8	0.6	13.8	3.1	2.2	10.3	35.3	0.0	0.3	66.3	23.1	38.0	2.4	48.0	2.7	164.9
2012	286.0	12.4	133.5	53.8	6.6	0.0	7.1	0.7	13.9	3.6	3.1	1.3	39.2	0.0	0.2	69.4	23.8	35.4	2.2	40.2	2.2	136.1
2013	320.9	13.4	134.6	51.1	6.9	0.0	6.8	0.8	14.7	3.5	3.0	1.3	39.2	0.0	0.2	71.4	24.0	37.2	1.8	19.9	1.7	79.3
2014	312.1	12.2	128.6	52.0	7.6	0.0	7.3	0.8	14.8	3.5	3.3	1.3	42.5	0.0	0.3	71.1	22.5	38.8	2.5	40.4	2.1	160.8
2015	247.7	13.8	124.5	84.6	8.2	0.0	7.3	0.8	15.8	4.5	4.1	0.0	43.1	0.1	0.2	73.3	22.1	1.6	2.3	38.5	1.9	229.5

7.5.3. Uncertainties and time-series consistency

See chapter 7.2.3.

7.5.4. Source-specific QA/QC and verification

See chapter 7.2.4.

7.5.5. Source-specific recalculations

Table 7.27. Change in emissions in result of recalculations

Change	1988	1989	1990	1991	1992	1993	1994	1995	1996
kt eq. CO_2	-20.2	-20.2	-29.2	-14.1	-17.6	-6.5	-19.5	-32.6	-43.7
%	-1%	-1%	-1%	0%	-1%	0%	-1%	-1%	-2%

Change	1997	1998	1999	2000	2001	2002	2003	2004	2005
kt eq. CO_2	-43.2	-51.3	-54.5	-58.6	-69.3	-53.9	-66.6	-96.7	-118.1
%	-2%	-2%	-2%	-2%	-3%	-3%	-3%	-5%	-6%

Change	2006	2007	2008	2009	2010	2011	2012	2013	2014
kt eq. CO_2	-133.1	-134.8	-181.3	-177.5	-197.1	-204.6	-250.7	-269.9	-287.6
%	-8%	-8%	-11%	-10%	-10%	-12%	-16%	-17%	-20%

Recalculations details:
- new value of fraction of methane in recovered biogas was applied,
- application of FAO's latest protein consumption data.

7.5.6. Source-specific planned improvements

No further improvements are currently planned for sector 5.D.

8. OTHER (CRF SECTOR 6)

No other emissions were identified in the Polish GHG inventory apart from those given in CRF categories 1-5.

9. INDIRECT CO_2 AND NITROUS OXIDE EMISSIONS

Addressing paragraph 29 of decision 24/CP.19, Poland has not elected to report indirect CO_2 and N_2O emissions. Information on indirect N_2O emissions in the Agriculture sector can be found in Chapter 5.

10. RECALCULATIONS AND IMPROVEMENTS

10.1. Explanations and justifications for recalculations

10.1.1. GHG inventory

Recalculations made in 2017 consists mostly in further improvements in calculation methods based on the 2006 IPCC Guidelines and country specific ones. Detail sectoral information on recalculations made are given in Chapters 3-7 dedicated to source/sink categories. Also information on planned improvements is included in sectoral Chapters 3-7.

The percentage change caused by recalculation with respect to the previous submission, has been calculated as follows:

$$Change = 100\% \times [(LS-PS)/PS]$$

where:

LS = Latest Submission (for 1988–2012 inventory submitted in NIR 2017)
PS = Previous Submission (for 1988–2012 inventory submitted in NIR 2016)

Specific information on recalculation within CRF sectors are given in sectoral chapters 3-8 and in CRF table 8.

10.1.2. KP-LULUCF inventory

Main reasons leading to recalculations in the LULUCF sector for the whole time-series are as follows:

- Inherited emissions when considered when calculating the initial carbon stock at the beginning of the commitment period (flux data method) in order to subsequently estimate net-emissions based on pool changes;
- Accounting of HWP in solid waste disposal sites (on the basis of pool changes) was excluded
- The apparent consumption of e.g. industrial roundwood is assumed to equal the feedstock used to manufacture e.g. sawnwood;
- HWP estimates were calculated by means of flux data methods (annual carbon inflow based on annual statistical data on production and trade) allowing estimating C pool change (i.e. net-emissions) on annual basis

Net effect of recalculations on CO_2 emissions/removals is provided in Table 7.6.1.

10.2. Implications for emission levels and trends

10.2.1. GHG inventory

Recalculations of CO_2 emissions are generally insignificant, less than +/-1% (Fig. 10.1). The main cause for changes in CO_2 total emissions and removals were related to further methodological improvements following recommendations from ERT 2016 as well as 2006 IPCC Guidelines in sectors: transport, chemical industry, non-energy products from fuels and solvents use, but also in the LULUCF sector.

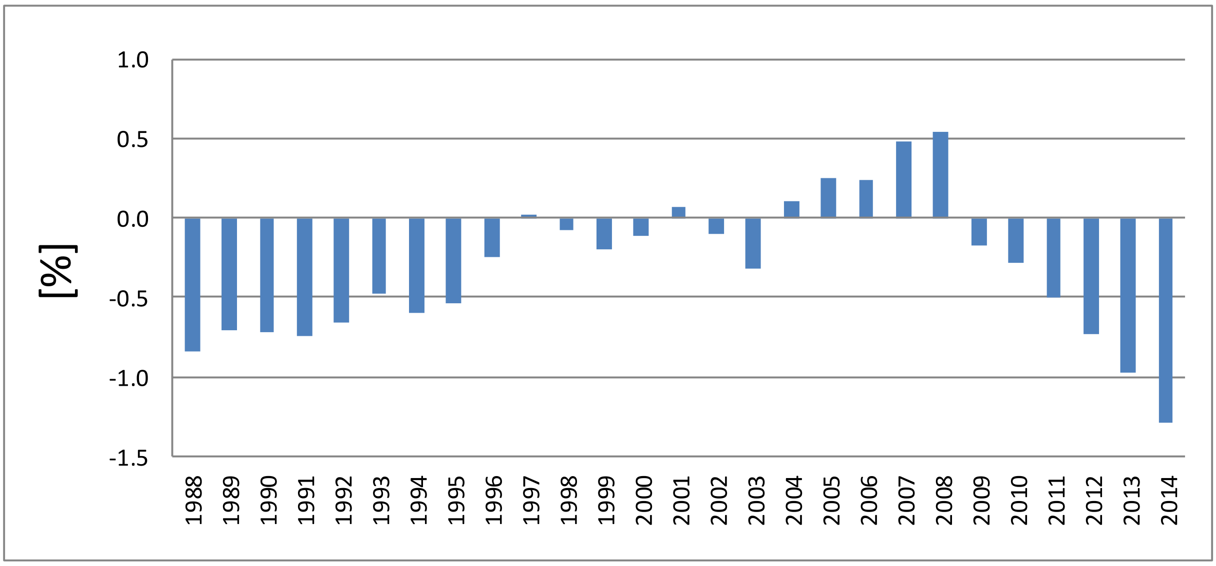

Figure 10.1. Recalculation of CO_2 for entire time series made in CRF 2017 comparing to CRF 2065

In the case of CH_4 the most significant recalculations were made in Fugitive emissions sector were country specific method has been applied in estimating methane emissions accompanying the underground coal mines(Fig. 10.2).

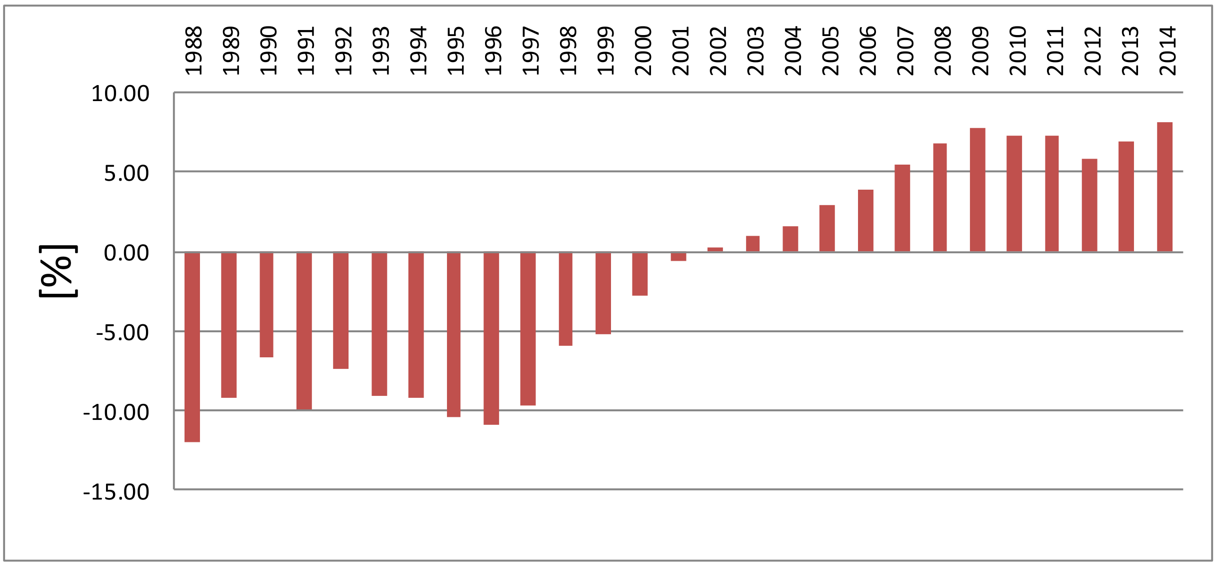

Figure 10.2. Recalculation of CH_4 for entire time series made in CRF 2017 comparing to CRF 2016

Increase in N_2O emissions in entire period (Fig. 10.3) was mostly triggered by Agriculture sector were additional nitrogen from straw based animal management systems was added to N_2O from soils as well and by LULUCF sector where N_2O emissions related to nitrogen mineralization/immobilization associated with loss/gain of soil organic matter were included and update of N_2O emissions from drained organic soils were introduced.

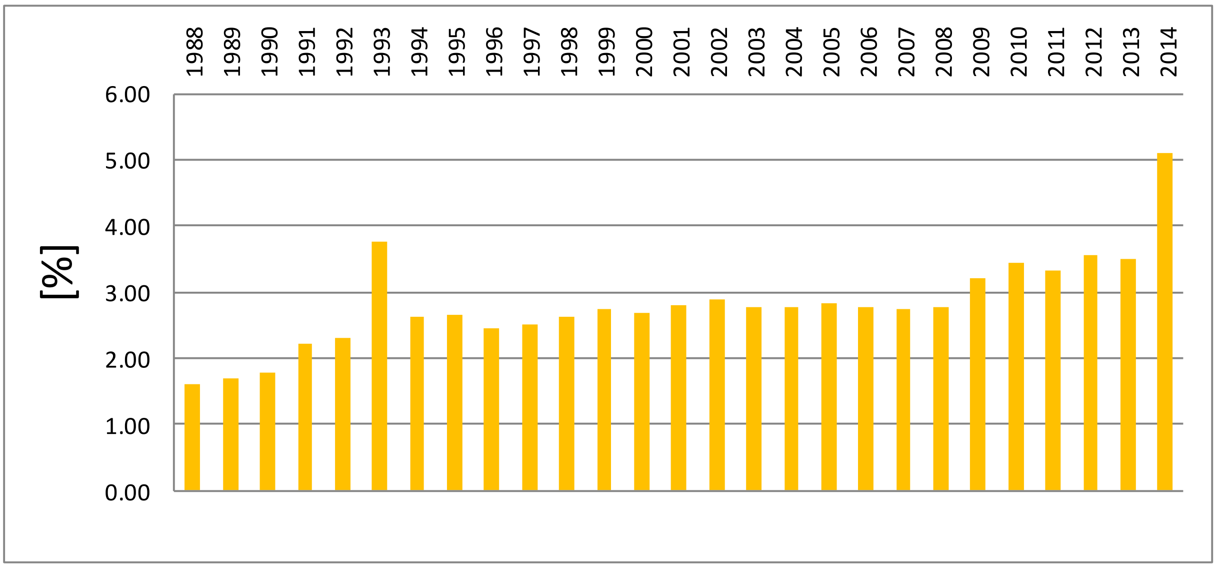

Figure 10.3. Recalculation of N_2O for entire time series made in CRF 2017 comparing to CRF 2016

10.2.2. KP-LULUCF inventory

Main reason leading to recalculations in the LULUCF sector for the whole time-series are as follows:

- HWP estimates were calculated by means of flux data methods (annual carbon inflow based on annual statistical data on production and trade) allowing estimating C pool change (i.e. net-emissions) on annual basis

As a result of recalculations for KP−LULUCF sector decrease in net emissions for 2008−2014 was observed. The main reason for recalculations was the revision of HWP estimates, assigned to forest management. Net emissions of CO_2 related to more detailed estimations resulted in emissions decrease by 0, 86% comparing to Submission 2016. Data on emissions of non-CO_2 gases did not change.

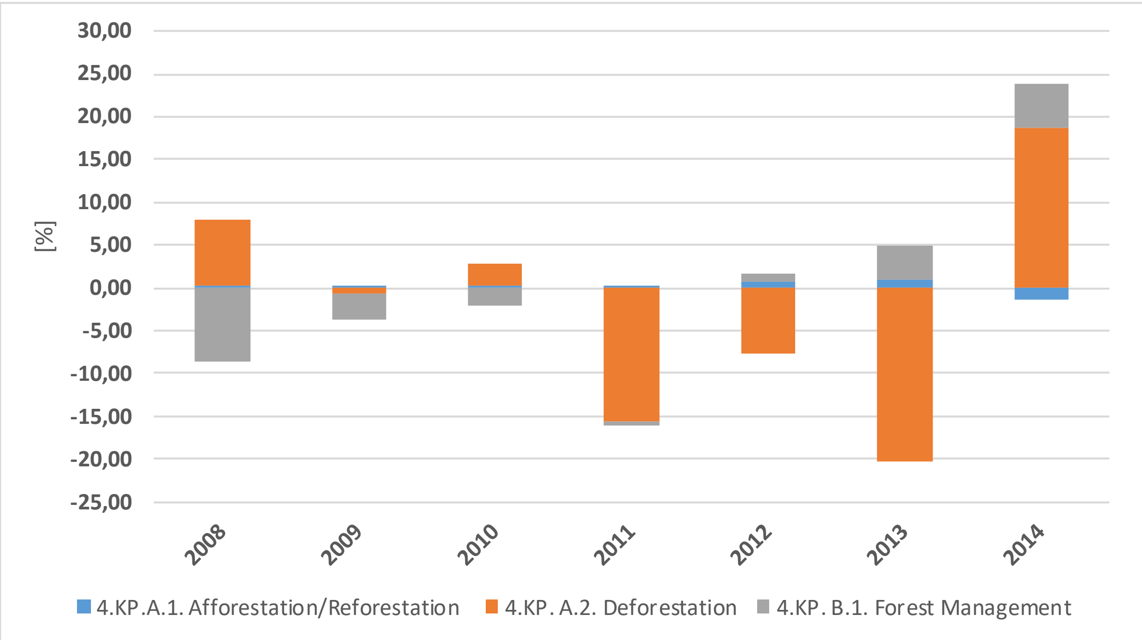

Figure 10.4. Recalculation of CO_2 for 2008−2015 for KP-LULUCF activities made in CRF 2017 comparing to CRF 2016

10.3. Implications for emission trends

10.3.1. GHG inventory

Changes in GHG emissions made in 2017 in relation to previous Submission 2016 for period 1988-2014 vary between -1.9% in 1988 up to +0.4% in 2009. The biggest drop at the beginning of inventoried period was related to introducing the country specific method for calculation of fugitive emissions from coal mines.
(Fig. 10.4).

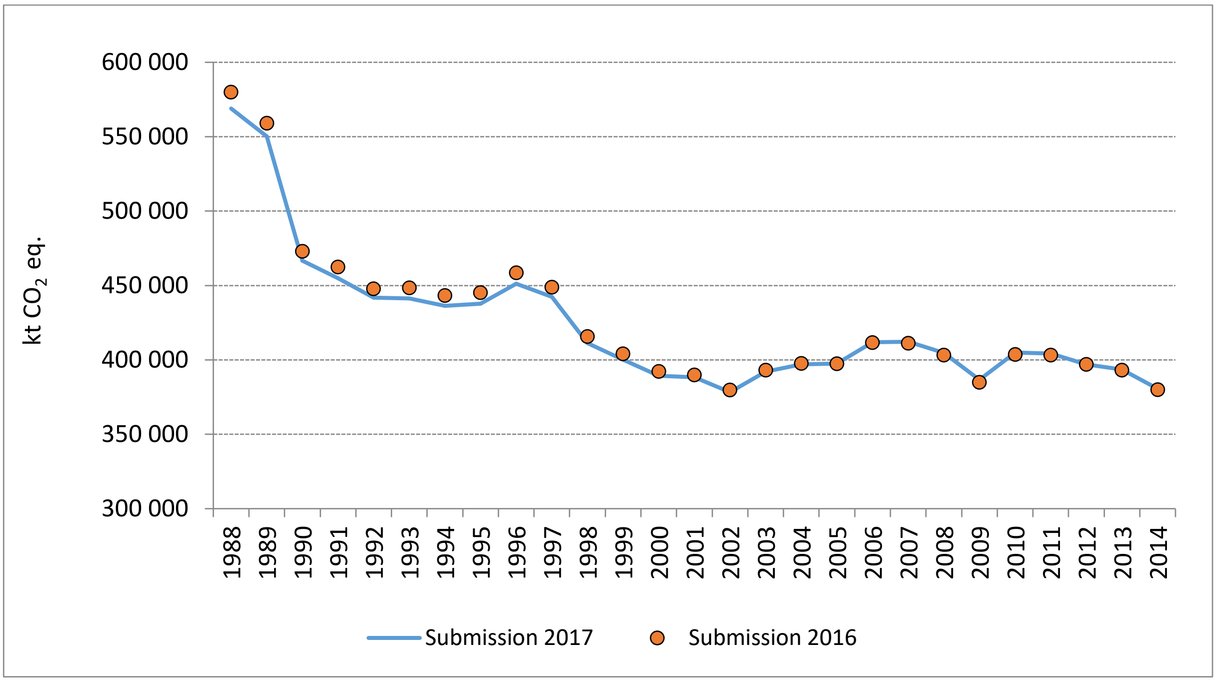

Figure 10.4. GHG emission trends according to Submissions made in 2017 and 2016

10.3.2. KP-LULUCF inventory

Net CO_2 emissions/removals related to elaborating the calculations in more detail, decreased overall by 0.7 % comparing to Submission 2015. Net emissions of other gases did not change.

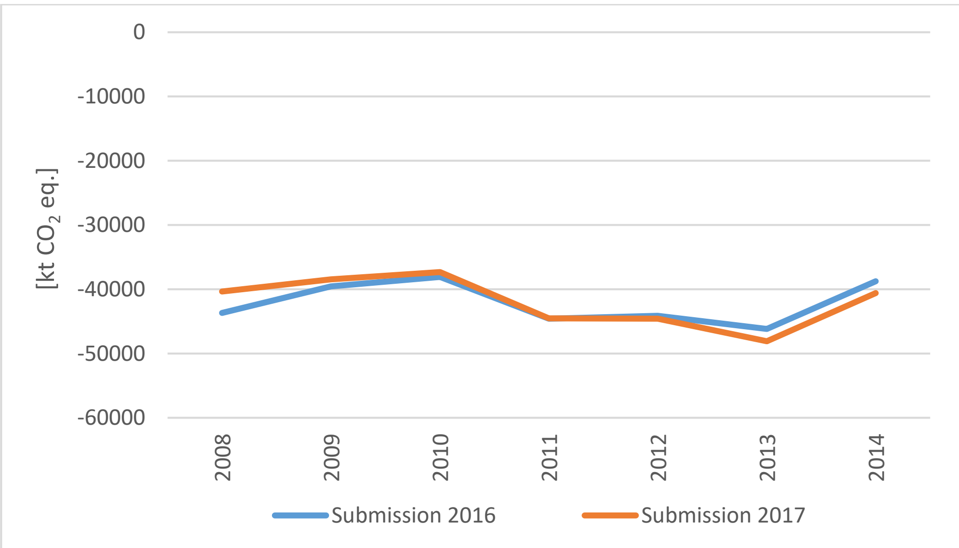

Figure 10.5. KP LULUCF GHG emission trends according to Submissions made in 2017 and 2016

10.4. Recalculations, including in response to the review process, and planned improvements to the inventory

10.4.1. GHG inventory

Table 10.1. The following list of preliminary recommendations (and its implementation status) comes from the individual review of the annual submission of Poland submitted in 2016 (ARR POL 2016 is still under preparation)

CRF category / issue	Review recommendation	Paragraph	MS response / status of implementation	Chapter/section in the NIR
Energy				
Feedstocks, reductants and other NEU of fuels – Liquid – CO2	Poland explained in the NIR (Page 57) that emissions related to feedstocks and non-energy use of fuels were calculated and reported under 2D (Non-energy products from fuels and solvent use). However, the ERT noted that in the related section there is only emissions data which was also shown in CRF table 2(I)A-G-category other and it's difficult to track AD/EF. In response to a question raised by the ERT during the review, Party explained that the script filling the import CRF tables has not imported activity data and this will be corrected in the next submission. The ERT recommends that Poland include the information regarding AD/EF of the non-energy use with correct data and more detailed information in the next submission to increase the transparency of the NIR.		issue resolved by applying revised methodology in Submission 2017	
1.A.3.b Road transportation – Liquid – CO2	The ERT noted that the notation key "NO" is used for gaseous fuels of road transportation. However, there are several LNG/CNG stations in Poland for urban buses use (http://www.lngworldnews.com/lng-buses-hit-the-streets-of-warsaw/). In response to the question raised by the ERT during the review, Poland explained that the number of urban buses is still relatively small (384 in 2014) and statistical information on LNG/CNG consumption is still not available. Nevertheless it is expected that the number of such buses will systematically grow and Poland is going to include these activities in the national inventory as soon as data become available. In this case, Poland agrees to use "NE" instead of "NO" till then, taking into account the number of the LNG/CNG buses it can be assumed that GHG emission is rather insignificant. The ERT recommends that Poland include this information in the next submission to increase the tranparency of the NIR and change the notation key for the gaseous fuel for road transportation. Poland is further encouraged to check the data availability of the LNG/CNG used for urban buses.		issue resolved. LNG/CNG used for urban buses is available in statistic for the year 2015 and emission from LNG/CNG consumption is presented in Submission 2017.	

Industrial processes and solvent and other product use				
no methodological recommendations				
Agriculture				
3.D.a Direct N2O emissions from managed soils – N2O	In the NIR 2016 (page 180) and NIR 2015 (page 169), Poland reported that nitrogen from bedding material was not accounted for under animal manure applied to soils, it is covered by the nitrogen returned to soils as crop residues. In the response to the question raised during the review, Poland informed the ERT that the FracRemove(fraction of above-ground residues of crop removed annually for various purposes) used by the Party include the fraction removed from the field covers also straw used for later bedding. The ERT conclude that the bedding material was not taken into account for neither organic nitrogen fertilizers (FON) nor crop residues (FCR). The ERT recommend that Poland consider the additional nitrogen from the bedding material as part of the managed manure N applied to soils as suggested by IPCC (2006) GL in its next submission.		issue resolved. Additional N from bedding material has been taken into account when calculating N2O emissions from agricultural soils (animal manure)	3.D.a Direct N2O emissions from managed soils – N2O
3.D.a Direct N2O emissions from managed soils – Add gas(es)	Poland has indicated consistent reporting of data concerning application of sewage sludge in agriculture in the public statistics started in 2003 and for this reason, the activities since 1988 were supplemented based on annual mean changes of activities data in 2003-2012. The ERT noted that the amount of sewage sludge applied in agriculture consistently increases over the period 2003-2009 while it decreases from 2009 to 2012. In response to the question raised by the ERT during the review, Poland did not provide any other reason apart the data gaps to explain the use of annual mean changes of activities data over the 2003-2012 to estimate the amount of sewage sludge application from 1988 to 2002. The ERT noted that the amount of sewage sludge applied in agriculture consistently increases over the period 2003-2009 while it decreases from 2009 to 2012. On this basis, the ERT recommend Poland to consider the annual mean changes of activities data over the 2003-2009 to estimate the amount of sewage sludge application from 1988 to 2002 in its next annual submission.		issue resolved. The trend for sewage sludge use for agricultural purposes has been recalculated based on trend 2003-2009 back to 1988	3.D.a Direct N2O emissions from managed soils – Add gas(es)
LULUCF				
4. General (LULUCF) – CO2	Soil organic C (SOC) stock changes are estimated using default reference SOC stocks (SOC_{ref}) and default stock change factors (FLU, FMG, FI) for all land use categories (Eq 2.25 of 2006 IPCC guidance). The Party showed in its NIR, and confirmed during the Centralized Review, that SOC_{ref}, FLU, FMG and FI		Issue resolved. Following the ERT recomendation for determining SOCt0 and SOCt1 in estimation CSC in the mineral soils in t categories, Poland ihas applied approapriate values of FLU or	4. General (LULUCF) – CO2

	values used by the Party are the same for determining SOC_{t0} and SOC_{t1} and so there is no carbon stock change over the transition period. The ERT recommends to Poland to follows the 2006 IPCC Guidelines correctly and applies different FLU or FMG values for different land use or management categories as outlined in the 2006 IPCC guidelines.		FMG for different land use and management categories as outlined in relevant section of the Volume 4 of the IPCC 2006 Guidelines	
4. General (LULUCF) – All gases	The ERT noted that the Party has improved the transparency of the reporting of land representation in the NIR by continuing the provision of the land-use matrix for 2014 in annex 6 to the NIR. The land-use transitions from one category to another have been provided in Table 4.1 of the CRFs. However, the ERT noted that the total territorial area in annex 6 is only consistent for the period 2009–2014. For the other years since 1988, the total area shows annual variability from 31,267,938 ha to 31,268,800 ha, even with the inclusion of other land. In response to questions raised by the ERT during the review, the Party explained that the total country area (total land area) slightly fluctuates due mainly to geodesic re-measurements at subsequent surveys and that the unstable country borders are considered as the main factor of relative area changes. The ERT noted that IPCC Guidelines requires that total territorial area is consistent for the entire inventory period. The ERT reiterates the recommendation made in the previous review report that Poland revise the time series of the land-use change data to ensure that the total territorial area is consistent for the entire inventory period since 1988 in the next annual submission.		Issue resolved. Relevant informatiuon will providedd in the NIR 2017. All relevant information related to land use area as well as to land use change area will be reflected in the CRF table 4.1. The land area values (Ai) are respective values in the land use change matrix in the inventory year, and include all area in the year in a 'remaining' category, or all areas for conversion category i that have been in the category for a maximum period of default length of 20 years. In general, total country area (total land area) slightly fluctuate with the following reason. Central Statistical Office (CSO) in the statistical yearbooks (Environment), indicated that country total area variations are driven mainly by geodesic re-measurements at subsequent surveys. The fact that the country borders are very unstable was considered as the main factor of relative area changes. Polish coastline is constantly changing as a result of water erosion. The same changes in the area are driven by the land boarders movement. A significant part of Polish border runs along the rivers mainstreams, where a large part of these rivers is unregulated, so the frequent changes in the location of the mainstream occurs. Country area fluctuations were reflected in the changes of the area of other land.	4. General (LULUCF) – All gases

4.A.2 Land converted to forest land – CO2	To estimate emissions/removals in land converted to forest land, the Party uses a default value of 4m3/ha/year, which is a reasonable and conservative value for new fores land areas in the ecological region of Poland. However, the ERT found there is national data for growing stock volumes per age class in the Central Bureau of Statistics (http://stat.gov.pl/obszary-tematyczne/rolnictwo-lesnictwo/lesnictwo/lesnictwo-2015,1,11.html#) from where IEF can be obtained for land converted to forest land. Also, Poland is exploring the possibility to estimate carbon stock changes in the biomass pool of the newly established forests with an empirical model of growing stock over age on a unit area of afforestation. The ERT recommends that Poland use a higher tier to estimate country-specific biomass increment value to increase the accuracy of the estimate for Land converted to Forest land category and provide the results and the limitations encountered in the next version of the NIR, e.g. using NFI data exclusively from age class I (1-20 years old).		Issue under consideration. It has to be noted that National Forest Inventory wouldn't provide annual data related to increment, exclusively from age class I (1–20 years old), applicable or the removal estimation in this category. Application of the default values results in a consistent time series of both the area and the GHG information. With respect to the estimation related to the biomass, data from the forest monitoring system is used, the primary objective of which has been to obtain accurate information on the status and development of all forests in the country. The forest inventory was designed to collect data at the stand level, but provide accurate estimates at aggregated levels. However, Poland is exploring the possibility to estimate carbon stock changes in the biomass pool of the newly established forests with an empirical model of growing stock over age on a unit area of afforestation. In order to estimate the volume data, we are analyzing available species-specific simplified models for the young forests using a sample of young stands of varying age (known based on the year of the afforestation) for which volume was known. This volume would preferably available either from direct assessment or from yield tables (in this last case, height was measured).	4.A.2 Land converted to forest land – CO2
4.A.2 Land converted to forest land – CO2	Deadwood and litter are reported as "NO" in land converted to forest land. The ERT acknowledge that these pools can probably be a net sink, given the explanations and stocks values of deadwood given during the centralized review. The ERT found that the National Forest Inventory has available data on dead wood stocks. Given this is a key category, the ERT recommends to the Party to account for emissions and removals under dead wood and litter following IPCC 2006 Guidelines, Volume 4, chapter 2.3.2 with the highest possible tier approach.		Issue under consideration. Poland is exploring application of highest tier approach application. Nevertheless it has to be noted, that without proper samplings and data it is not possible to develop estimates from emissions/removals from deadwood and litter on a statistical basis. Since , the conversions of non-forest land to forest land results, in all probability, in net removals in the DOM & litter pools, approach i which this pool is reported with the	4.A.2 Land converted to forest land – CO2

			notation "NO" (application of "a not a source provisions") in these pools is considered as the most acceptable approach for L-FL until a more advanced estimation would be developed.	
4. General (LULUCF) – Gen	The previous ERT recommended that the Party provide detailed information on the rationale and impact of the recalculations in the next annual submission. The main reason behind this recommendation is because Poland has made recalculations between the 2013 submission and the later annual submissions for the LULUCF sector. The three most significant recalculations made by Poland between the 2013 submission and the later annual submissions were in the following categories: forest land, cropland and grassland. The recalculations were made for the entire inventory period following changes in the methodology used to estimate the changes in carbon stock in the living biomass in forest land, from the default (gain-loss) method to the stock-change method; due to the revision of biomass increments on land converted to forest land; due to the revision of soil classification; and following the introduction of new country-specific soil organic carbon stocks estimates. Compared with the 2013 annual submission, the recalculations in 2016 annual submission resulted in an increase of removals in the LULUCF sector by 17,377.42 Gg CO2 eq (79.3%) for 2011. Moreover, the change for 1992 is -12553.99 (-153%) while the changes during 1996-1999 are more than 400%. In response to this recommendation, the Party provided rationale and the percentage change as well as the net effect (in the CO2 eq.) of recalculations in the section 6.6.7 of the NIR 2016 at the category level. However, these rationale and impacts are for changes in 2016 only. Despite the large changes in total emissions/removals in the LULUCF sector between 2013 submission and the later submissions, the rationale and impacts of the changes between 2013 submission and the later submissions including the change from gain-loss to stock-change method for estimating CO2 emissions/removals in the forestland remaining forestland have not been sufficiently provided. The ERT reiterates the recommendation made in the previous review report that the Party provide rationale and impacts of the changes made between the 2013 submission and the later submissions in the next annual submission.		Issue resolved. Recalculations of previously submitted estimates of emissions and removals as a result of changes in methodologies, changes in the manner in which EFs and AD are obtained and used, or the inclusion of new sources or sinks which have existed since the base year but were not previously reported, shall be reported for the base year and all subsequent years of the time series up to the year for which the recalculations are made. It has to be noted, the approach applied by Poland to calculate the percentage change as well as the net effect (in the CO2 eq.) of changes in methodologies, changes in the manner in which EFs and AD, or the inclusion of new sources or sinks which have existed since the base year, allows to maintain TACCC principle in relatively simple way. Despite the fact that recalculations of reported data, driven mainly by the ERT recommendations are frequent and sometimes substantial (see Annex I) but as long as the whole time series of data is updated this is not an issue for time consistency. Since the recalculations always affects all reported time series, we consider the recalculated values consistent with the trends in the activity data, and thus more accurate and comparable than before. The percentage change as well as the net effect (in the CO2 eq.) of recalculations will be provided in the section 6.6.7 of the NIR 2017 at the category level.	4. General (LULUCF) – Gen

4.A.1 Forest land remaining forest land – CO2, CH4, N2O	The title of Table 6.10 (p. 203) says the reference for emission ratios is from table 2.5 p. 2.47 of IPCC 2006 Guidelines, Volume 4. The Party acknowledged that the EF values chosen in Table 6.10 are reflecting factors for biofuel burning instead of extra tropical forests. Notation given under table 2.5, p. 2.47 of IPCC 2006 Guidelines, Volume 4 provides additional information, that for the forest other than tropical, extra tropical forest EF values should be applied. The ERT recommends that the Party apply the correct EF values used in biomass burning emission estimation in the next annual submission.		Issue resolved. EF used in biomass burning emission estimation has been corrected, consistent with the notation given under table 2.5, p. 2.47 of IPCC 2006 Guidelines,	4.A.1 Forest land remaining forest land – CO2, CH4, N2O
4.A.2 Land converted to forest land – CO2	In 2014 submission, the Party applied incorrect default biomass increment unit. In this submission, Table 6.11 (p. 203) refers to default biomass increment as 4 m3/ha/year. However, the correct default biomass increment should be 4 tonnes d.m./ha/year (table 4.12, p. 4.63 of IPCC 2006 Guidelines, Volume 4). In response to questions raised by the ERT during the review, the Party explained that correct default biomass increment applied in the estimations is 4 tonnes d.m./ha/year and acknowledged the necessity for the biomass increment description correction. The ERT recommends that the Party correct the biomass increment unit for estimating CO2 emissions/removals from Land converted to Forestland in the next annual submission.		Issue resolved. The correct biomass increment applied in the estimations is 4 tonnes d.m./ha/year. Following the ERT recommendation, related amendment will be implemented in the next version of the NIR	4.A.2 Land converted to forest land – CO2
4.E.2 Land converted to settlements – CO2	In 2014, 20.76 kha of wetlands has been converted to settlements (CRF Table 4.E). However, the corresponding net CO2 emissions/removals is reported as 'NO'. This issue happens for other years as well. In response to questions raised by the ERT during the review, the Party explained that the reporting of this source is not mandatory and proposed to change the reporting notation from "NO" to "NA" to improve the completeness of the reporting. The ERT recommends that the Party estimate and report the carbon stock changes from wetlands converted to settlements or change the notation to "NA" in the next annual submission.		Issue under consideration. In the recent version of the NIR, Poland's approach is to fiil the relevant tables and blanks with the notation key " NA". This approach will mainly facilitate the assessment of the completeness of an inventory. Nevertheless, to maintain TACCC principle, Poland is exploring potential data sources, applicable for the reporting of emissions in source categories for which estimation methods in the 2006 IPCC Guidelines are not in appendices due to the limited availability of information.	4.E.2 Land converted to settlements – CO2
Waste				
no methodological recommendations				

10.5. Changes in methodological description

The major changes in methodological descriptions that have been made since the previous Polish submission in 2016 are presented below in aggregated form.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	DESCRIPTION OF METHODS	RECALCULATIONS	REFERENCE
	Please mark the relevant cell where the latest NIR includes major changes in methodological descriptions compared to the NIR of the previous year	Please mark the relevant cell where this is also reflected in recalculations compared to the previous years' CRF	If the cell is marked please provide a reference to the relevant section or pages in the NIR and if applicable some more detailed information such as the sub-category or gas concerned for which the description was changed.
1. Energy			
A. Fuel Combustion (sectoral approach)			
1. Energy industries			
2. Manufacturing industries and construction			coal used in blast furnaces process (included in C balance for BF in 2C1 subcategory) was deducted in calculation of emission for 1A2a subsector to avoid double counting; change concerns the years 2010-2014
3. Transport	x	x	Model COPERT 4 was used to estimate emissions from road transport
4. Other sector			
5. Other			
B. Fugitive emissions from fuels			
1. Solid fuels			
2. Oil and natural gas and other emissions from energy production			
C. CO2 transport and storage			
2. Industrial processes and product use			
A. Mineral industry			cullet ratio in glass production was changed - value of 20% was assumed instead of default value (50%)
B. Chemical industry			CO2 recovered for fertilizer urea production was deducted in calculation of emission for 2B1 subcategory
C. Metal industry			
D. Non-energy products from fuels and solvent use	x	x	CO2 emission from urea used us catalyst was estimated
E. Electronic industry			
F. Product uses as substitutes for ODS			
G. Other product manufacture and use			
H. Other			
3. Agriculture			
A. Enteric fermentation			

B. Manure management	X	X	EFs in indirect N2O emissions from manure mngt have been corrected to ensure consistency between N in 3. B Manure mngt systems and N applied to soils in 3.D.a.2
C. Rice cultivation			
D. Agricultural soils	X	X	3.D.a.2.a Additional N from bedding material has been taken into account when calculating N2O emissions 3.D.a.2.b. Trend for sewage sludge use for agricultural purposes has been recalculated based on trend 2003-2009 back to 1988
E. Prescribed burning of savannahs			
F. Field burning of agricultural residues			
G. Liming			
H. Urea application			
I. Other carbon containing fertilisers			
J. Other			
4. Land use, land-use change and forestry			
A. Forest land	X	X	EF used in biomass burning emission estimation has been corrected, consistent with the notation given under table 2.5, p. 2.47 of IPCC 2006 Guidelines
B. Cropland			
C. Grassland			
D. Wetlands			
E. Settlements			
F. Other land			
G. Harvested wood products			
H. Other			
5. Waste			
A. Solid waste disposal	x	x	Update of fraction of CH4 in biogas according to latest CS research. Recalculation of MSW composition.
B. Biological treatment of solid waste			
C. Incineration and open burning of waste	x	x	Correction of MSW composition.
D. Wastewater treatment and discharge	x	x	Update of fraction of CH4 in biogas according to latest CS research.
E. Other			
6. Other (as specified in Summary 1.A)			
KP LULUCF			

Article 3.3 activities			
Afforestation/reforestation	x	x	EF used in biomass burning emission estimation has been corrected, consistent with the notation given under table 2.5, p. 2.47 of IPCC 2006 Guidelines
Deforestation			
Article 3.4 activities			
Forest management	x	x	EF used in biomass burning emission estimation has been corrected, consistent with the notation given under table 2.5, p. 2.47 of IPCC 2006 Guidelines
Cropland management (if elected)			
Grazing land management (if elected)			
Revegetation (if elected)			
Wetland drainage and rewetting (if elected)			

PART II:
SUPPLEMENTARY INFORMATION
REQUIRED UNDER ARTICLE 7, PARAGRAPH 1

11. KP-LULUCF

11.1. General information

According to relevant provisions, Parties to the Kyoto Protocol (KP) must submit information on land use, land use change and forestry (LULUCF) that is supplementary to what is contained in the report under the UNFCCC (i.e., Section 6). These provisions set principles to govern the treatment of LULUCF activities; require a consistent definition for terms such as "forest", as well as definitions for activities under Article 3.3 and agreed activities under Article 3.4; and describe how modalities, rules and guidelines are implemented relating to the accounting of activities under Articles 3.3 and 3.4. Good practice guidance concerning the methodology for estimating GHG emissions and removals are given in IPCC guidelines (2013).

As Poland only elected Forest Management (FM) under Art. 3.4 for the first commitment period (it is obligatory to report on FM in the second commitment period), and no other activity has been elected for the second commitment period, this part of the NIR mainly covers issues related to the forestry sector. Information on other land use related activities (e.g. cropland management) is limited to relevant information about land use conversions.

11.1.1. Definition of forest and any other criteria

For the needs of reporting to Articles 3.3 and 3.4 of the Kyoto Protocol, Poland selected the following minimum values for the forest definition[1]:

1. minimum forest land area: 0.1 hectare
2. minimum width of forests land area[2]: 10 m
3. minimum tree crown cover: 10% with trees having a potential to reach a minimum height of 2 meters at maturity in situ. Young stands and all plantations that have yet to reach a crown density of 10 percent of tree height of 2 meters are included under forest. Areas normally forming part of the forest area that are temporarily un-stocked as result of human intervention, such as harvesting or natural causes such as wind-throw, but which are expected to revert to forest are also included.

According to the regulations of art. 3 of the Act on Forests of September 28th, 1991 [Journal of Law of 1991 NO 101 item 444, as amended], a forest is a land:

1. of contiguous area greater than or equal to 0.1 ha, covered with forest vegetation (or plantation forest) – trees and shrubs and ground cover, or else in part deprived thereof, that is:
   - designated for forest production, or
   - constituting a Nature Reserve or integral part of a National Park, or
   - entered on the Register of Monuments;
2. associated with forest management, but occupied in the name thereof by buildings or building sites, melioration installations and systems, forest division lines, forest roads, land

[1] These values are not in contradiction to forest definition in the Polish law (A*ct on forests of 28 Sep 1991* [Journal of Law of 1991 No 101 item 444, as amended]).

[2] Excluding small private properties, private land given to State Forest [Państwowe Gospodarstwo Leśne Lasy Państwowe] or land belonging to Agriculture Real Estate Agency [Agencja Nieruchomości Rolnych Skarbu Państwa].

beneath power lines, forest nurseries and timber stores; or else put to use as forest car parks or tourist infrastructure.

As indicated in the above forest definition, areas normally forming part of the forest area that are temporarily un-stocked as result of human intervention, shall also be included. Therefore, land associated with forest management is considered as temporary un-stocked area subject to forest management activity. A pivotal feature of the UNFCCC definition of forest is that temporarily un-stocked forest areas are classified as forest provided that their land use remains forestry. There are a number of reasons why the term `temporary' should be qualified.

Many lands which for legal or administrative reasons are classified as forest lands falling under forestry land use may not be covered with trees in a near future (or ever). On the other hand, there may be other ways than legal provisions or administrative decisions to ensure that the tree cover will be re-established and that forestry continues to be the land use. For example, existence of a management plan to reforest the land (soon) could be considered a qualifier, or that the tree cover is expected to expand to more than 10% of the crown cover and reach a minimum of 2 meters in height, if the area is brought under protection and not further disturbed by human intervention.

Minimum forest stand dimensions are included within forestry definition to keep the task of monitoring forested areas feasible. For the purposes of forestry operations, the limit was set as 0.1 ha, with minimum width of only 10 m. Although such resolution is required at the scale of forestry operations, it creates practical difficulties in monitoring extensive areas for changes (such as those associated with ARD activities). The cost of monitoring rises sharply with increasing resolution. Thus, in practice, monitoring and reporting agency (Forest Management and Geodesy Bureau) is constrained by the cost of measurement programs and by available resources.

11.1.2. Elected activities under Article 3, paragraph 4, of the Kyoto Protocol

Poland reports GHG emissions and CO2 removals on afforestation/reforestation and deforestation (ARD), forest management (FM). Forest management activity accounted in the first commitment period under the Kyoto Protocol continues to be accounted during the second commitment period. The land area reported and changes in land area subject to the various activities in the inventory year are reported in the CRF in NIR-2 table.

11.1.3. Description of how the definitions of each activity under Article 3.3 and each mandatory and elected activity under Article 3.4 have been implemented and applied consistently over time

The definitions given below refer to those caused by human activities that increase or reduce the total area of forest land.

a) *<u>Afforestation</u>*

Afforestation refers to the conversion of land not fulfilling the forest definition to forest land according to the following assumptions:

1. area of the transformed land is at least equal to 0.1 ha;
2. transformed land remained without cover of forest vegetation for at least 50 years, until 31.12.1989;
3. transformation is directly caused by intended human activity.

Land subject to the afforestation activity, was assigned to the area of forest land, established on the basis of legal land use conversion since 1990. This approach was applied due to the fact that from the moment of conversion afforested land is at least subject of the protective measures listed respectively in the Act on forests of September 28th, 1991 (Journal of Laws of 1991 No. 101, item. 444, as amended) as well as in the Act on the protection of agricultural and forest land of February 3rd, 1995 (Journal of Laws of 1995 No. 16, item. 78, as amended) considered as direct human-induced activities, intended for the forest land including newly established.

b) Reforestation

Reforestation refers to the conversion of land not fulfilling the forest definition to forest land according to the following assumptions:

1. area of the transformed land is at least equal to 0.1 ha;
2. transformed land remained without cover of forest vegetation for less than 50 years, until 31.12.1989;
3. transformation is directly caused by intended human activity

Forestry legislation in Poland does not distinguish between afforestation (A) and reforestation activities (R) in the sense of the Marrakesh Accord, so they were treated similarly in the national GHG inventory and supplementary reporting. This lands are included under 4.A.2 conversions to forest lands. Artificial plantations of forest trees on lands which are expected to meet forest definitions thresholds are reported as AR. Currently, data provided by National Statistics is used.

c) Deforestation

Deforestation refers to the conversion of forest land to other categories of land use. Within the national statistical surveys that category of land use change is considered as the exclusion of forest land for non –forestry purposes. The assumptions used to determine the size of deforestation are as follows:

1. the area of transformed land was covered with forest vegetation on 1 January 1990;
2. transformation is directly caused by intended human activity.

Deforestation is strictly limited by the national law. The main document in this regard is the Act on the protection of agricultural and forest land of February 3rd, 1995 (Journal of Laws of 1995 No. 16, item. 78, as amended). Any exclusion of forest land for non –forestry and non agricultural purposes requires:

1) for the agricultural land consisting valuation land classes I-III – the consent of the minister responsible for rural development;
2) for the forest land owned by the State – the consent of the minister responsible for the environment or the person having the minister's authorization;
3) for the remaining forest land - the consent of the province marshal, issued considering the opinion expressed by the local Chamber of Agriculture.

d) Forest Management

Forest management has been defined in paragraph 1 (f) of the Annex to Decision 16/CMP.1 as a system of practices aimed as management of forests, including their ecological (including protection of biodiversity), economic and social functions conducted in a sustainable manner. Sustainable forest management as described in the *Act on Forest Forests of 28 Sep 1991...* sets out principles for the retention, protection and augmentation of forest resources, as well as for the management of forests and other elements of the environment in reference to the national economy.

Sustainable forest management practices, consistent to the provisions of this *Act on Forests*..., apply to all forests irrespectively of their form of ownership. Such activities carried out mainly by the State Forest National Forests Holding result in biomass increase leading to growth of carbon sequestration. Increasing forest area as well as activities aiming at saving forest resources in Poland support this process. The following main activities are performed within forest management by the General Direction of The State Forests:

- increasing of the area undergrowth plants,
- change of species structure from monoculture to multi-species-stands rebuilding,
- introducing second storey into one storey stands,
- using the maximum age for cutting main species of trees,
- if it is advisable not to harvesting some parts of stands above their normal cutting age,
- if it advisable using selective cutting instead of clear cutting method,
- leaving residues on cutting area,
- enhancing natural regeneration,
- enhancing forest fire prevention.

"Forest management" in general includes all kinds of activities in the forest from protecting forests through their economic utilization (of all kinds) to making use of a wide variety of social and ecological functions and services of the forests. All these activities often require rather intensive management of all forests, although this intensity is quite different in the various stands depending on site, species, and the local objective of managing the stand. Managing forests involves preparing forest management plans, afforesting, regenerating, intensive thinning, harvesting, forest protection, maintenance of roads and road building, inspecting of forestry operations and others. The intensity of management is characterized by the length of the operational cycle of returning to each forest compartment, which varies from about a few weeks (in afforested or regenerated areas where tending in necessary) to a year (in young poplar stands for tending) to five years (between pre-commercial thinnings in young stands of fast growing species) to maximum 15-20 years (between thinnings in older stands of slow growing species). Forest management planning covers all forests, and forest management plans are made for 10(-12) years. That all forests (in the sense of the above "forest" definition) are managed in one way or another in Poland is partly an economic and practical necessity because the country uses more wood a year than what it produces, and because the density of the population, which requires all kinds of products and services from the forests, is quite high according to official statistics.

Land under the "FM since 1990" activity is identified by establishing FM in 31 December 1989 (which equaled the total FL at that point) and then subtracting D areas in subsequent years. It thus excludes D areas.

11.1.4. Description of precedence conditions and/or hierarchy among Article 3.4 activities, and how they have been consistently applied in determining how land was classified.

As stated in previous section, as soon as site preparation and planting or seeding of propagation material is done, all AR lands become "forest" from the viewpoint of the definition of "forest" under the KP. From a domestic administrative point of view, when an AR land becomes a "forest" under the relevant regulations, it right away becomes an area subject to FM. Thus, since the category "AR since 1990" includes all areas that have been afforested since 1990, these areas could also be regarded as 3.4 FM. These areas are, however, not considered as FM areas to avoid double counting.

This separation is done, thus, double counting is avoided, and full consistency with the report under the UNFCCC is achieved, by first establishing the area of AR and then developing FM as all forests ("FL" in the report under the UNFCCC) minus the total of the "AR since 1990" as well as minus "D since 1990". In this way, AR since 1990 that would otherwise classify as FM is automatically excluded from FM.

Since only one activity of the listed Article 3.4 Activities was elected by Poland, no precedence conditions among Article 3.4 activities are applicable. The ranking of priority is given in the following order: Deforestation – Afforestation – Forest management.

11.2. Land-related information

11.2.1. Information on geographical location and identification of land.

National boundaries were applied for all activities.

11.2.2. Spatial assessment unit used for determining the area of the units of land under Article 3.3

Artificial plantations of forest trees on lands which are expected to meet forest definitions thresholds are reported as AR. Currently, data provided by National Statistics is used, but the system improves to provide better data by statistical sampling associated to NFI combined with spatial information from register of land and buildings.

With regard to the regulations of art. 3 of the act on forests, forest land considered a subject to the forest management is the area:

3) of contiguous area greater than or equal to 0.10 ha, covered with forest vegetation (or plantation forest) – trees and shrubs and ground cover, or else in part deprived thereof, that is:
    a. designated for forest production, or
    b. constituting a Nature Reserve or integral part of a National Park, or
    c. entered on the Register of Monuments;
4) of contiguous area greater than or equal to 0.10 ha, associated with forest management.

Provisions of this act allow to standardize the definition of forest land as a part of land use scheme. Party has established a system of regulations allowing to identify, collect, process, report and publish data of land use in the annual statistics. Annual summary reports on land use areas submitted by the Head Office of Geodesy and Cartography are prepared on the basis of regulations of *Act on geodesy and cartography* (Journal of Laws of 1989 No. 30, item. 163, as amended) constituting the basis for the statistical publications fulfilling requirements of National Land Identification System.

11.2.3. Methodology used to develop the land transition matrix

The land transition matrix is developed the following way:

1. Areas under annual AR activities are identified on a per stand basis each year, and the area of these stands are summed up.
2. Areas under D activity are identified since 1 Jan 1990 on a per stand basis each year, and the area of these stands is summed up.
3. The total (known) forest area at the end of each year (since 1990) is identified on the basis of the NFD that includes appropriate records for each known stand in the country.
4. By identifying the total forest area, as well as all additions to, and reductions from, the forest area of the previous year, the constant elements (i.e. FM) can be identified. Land under FM was first identified at 31 December 1989. FM area has subsequently been reduced by the area of the deforested stand.

The above procedure ensures the consistency of land identification under all KP activities, as well as FL under the UNFCCC. We identified all changes in the land use statistics and classified them so that, eventually, all land can be accounted for in the respective categories since 1990 (see also section 6.) Land statistics based on annually updated data obtained from National Record of land and buildings directly refers to changes in land use caused by intended human intervention at the level of single cadastral unit.

Any changes in land use categories are recorded with the attribute of the area being a subject of any type of conversion and are aggregated in a form of annual reports on land prepared by the Head Office of Geodesy and Cartography. Data on the condition and changes in the registered intended use of land were developed on the basis of annual reports on land are published as the official statistical information by the Central Statistical Office. Publications of the different categories of land use are subsequently used to determine the direction of changes in land use.

Considering the area of the country and its specific conditions, there is no applicable stratification that would justify reporting on smaller scale than at the national level. This is also supported by the attributes of the available activity data. However, the land-use representation and land-use change identification system developed for the KP and UNFCCC reporting purposes permit a truly detailed spatial assessment and identification of AR and D activities at the level of the individual cadastral units.

Methodology for the preparation of the land use change matrix is described in the LULUCF section 6.2. There were two matrices developed: one that starts in 1988, developed for the inventory purpose (which covers GHG inventory 1988-2015) and another one that starts in 1990 developed for the Kyoto Protocol reporting and accounting purpose. The two are fully consistent, the difference is that Convention's one implements 20 years transition period,

Since 1988 is applied as the base year for Poland, pre-1990 data was only needed to provide a net GHG emission/removals estimate for the Convention categories activity in 1988 and 1989. The complete matrix used for estimation of emission/removals on KP eligible lands is available in NIR-2 table in CRFas well as in Annex 6.2 KP LULUCF LTM.

11.2.4. Maps and/or database to identify the geographical locations, and the system of identification codes for the geographical locations

Afforestation and reforestation (AR) - mapping and identification

The identification of land area eligible as AR activities could be done based on forest management plans and their forest maps, in which these areas are included after the conversion to the forest land. Thus, the explicit location and plantation/stand description is available for each such area. Further on, such land can be tracked in time through the numbering systems of the forest parcels (compartments), as far as the number (code) remains unchanged over the planning cycles. A piece of land covered by afforestation is subject of plantation and, if necessary, repeated gap filling according technical norms for afforestation.

Deforestation (D) - mapping and identification

Deforested lands are identified by statistical sampling method.

Forest management (FM)- mapping and identification

For each year, all FM area (i.e. each stand) is allocated to one of the geographical locations, thus, aggregate data (e.g. volume stocks, volume stock changes etc.) for these locations can be developed for each year. The identification system of sub-compartments is made up of three elements which are registered for every sub-compartment. These elements are: the municipality (village, or town), the compartment (a larger piece of forest, e.g. a hillside or a valley) and sub-compartment (which is part of a compartment). Measurements and observations are made on permanent sample plots. System of permanent observation plots (ICP Forest) was applied as a basis for damage assessment in forests, according to the European Union regulations (ie. the network 16x16 km).

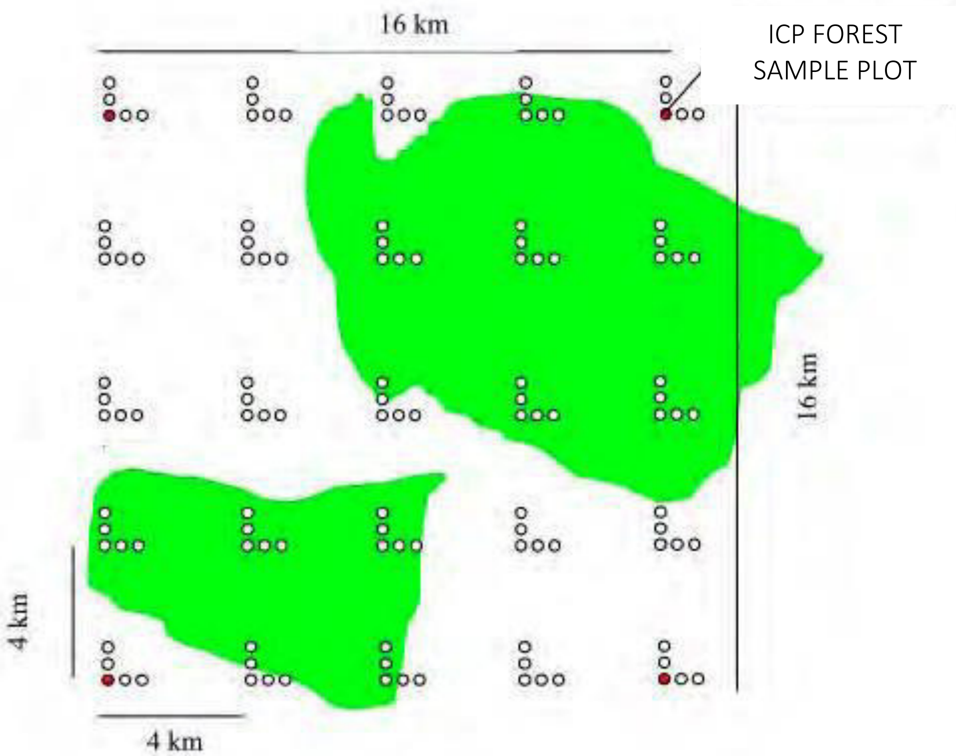

Figure 11.1. The general layout of sample plots.

The network of sample plots for large-scale inventory system was concentrated to 4x4 km, with the individual specification of single plots coordinates in WGS 84 and PUWG 1992 systems. The individual sample plot was located schematically in line with the system schemes deployed in the 4x4 km network, while within each line 200 meters long (shaped L with equal arms) five sample plots is located.

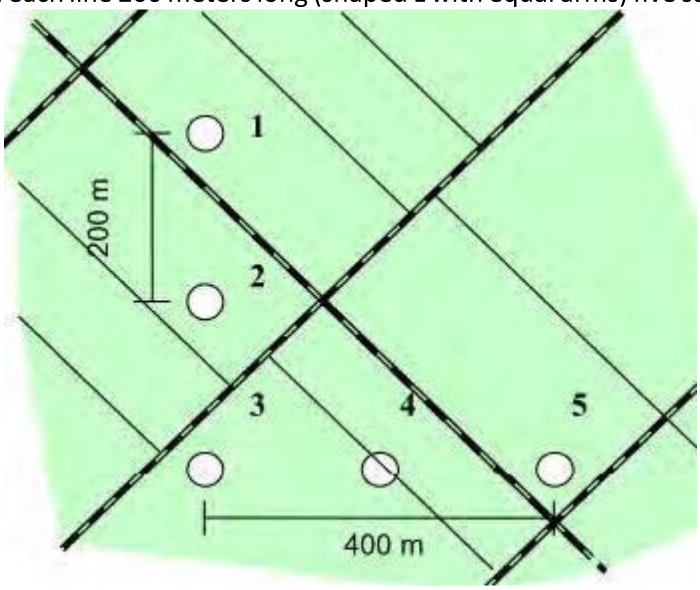

Figure 11.2. Routes system with the background of the sample plots distribution

Over 28 thous. of sample plots have been established in Polish forests during the current inventory process. Location of every single sample plots in the area was marked up on the map with its marker points designation and identification (determined by the location of individual sample plots). Since the long term stabilization was completed and single points were marked (by punching a metal tube about 1 inch in diameter around 30 cm into the ground and punching the nails in his neck the next three root trees), offsets to the centre of each sample plot were measured (using the azimuth and distance). Locations of sample plots were recorded mostly by GPS receivers, starting from the point of marker and by navigation to the ground of the next trial area where it was possible to read the GPS coordinates with appropriate measurement parameters. This point was also marked as an intermediate point, stabilized in the same manner as marker point.

11.3. Activity-specific information

11.3.1. Methods for carbon stock change and GHG emission and removal estimates

Further implementation of the 2006 Guidelines has affected insignificantly the estimates for KP activities. All emissions are estimated, none is considered as insignificant in the sense of para 37 of the Annex to decision 24/CP19.

11.3.1.1. Description of the methodologies and the underlying assumptions used

Similar methodological approaches were implemented under the convention and KP reporting. Estimation of GHG emissions from sources is consistent with data and methods used in the convention estimation and are described under section 6 of the NIR.

Afforestation/reforestation

Net changes in C stocks in aboveground and belowground biomass, and soil organic matter pools during each year of the annual commitment period are estimated and reported for accounting purposes under Tier 2.

Good practice for forest carbon accounting allows application of conservative assumptions, where accounting relies on values and procedures with high uncertainty. The most conservative option in the biological range should be chosen so as not overestimate sinks or underestimate sources of GHGs. Conservative carbon estimates can also be achieved through the omission of carbon pools, therefore Poland considered that the CSC related to deadwood and litter pools due to carbon loss/gain associated with land-use conversions on land subject to the Afforestation and Reforestation activities under Article 3, paragraph 3, of the Kyoto Protocol are not a net source of CO2 emissions (provision of the art 26 of the Annex to the Decision 2/CMP.7).

Deforestation

Emissions are calculated using Tier 2 methods and input data as described under the chapter 6. All carbon pools are reported and D is not a key activity under KP.

Forest management

Emissions/removals from FM activity have been calculated, using the same assumptions, formulas and parameters as used for the estimation of the GHG inventory (see section 6 of the NIR). The FM is a key category under KP.

Following the ERT 2014 recommendation , Poland considered that the carbon stock changes from litter under forest management activities under Article 3, paragraph 4, of the Kyoto Protocol are not a net source of CO2 emissions. At the same time Poland recognised that the use of the default data, as given in table 3.2.1 of the IPCC good practice guidance for LULUCF for assessment of the carbon stock changes from litter under Forest management activities under Article 3, paragraph 4, could lead to potential net overestimation of removals for the litter pool under the forest management. Therefore, demonstration that litter pool in not a source was considered more appropriate. The following justifications was considered:

1. direct implementation of Tier 1 of GPG for LULUCF guidance assuming that the average transfer rate into the litter pool is equal to the transfer rate out of the litter pool so the net change is equal to zero;
2. expert judgments based on a combination of qualitative and quantitative arguments, like international references to the neighbouring country's GHG's inventories;
3. conservative assumptions based on in-country forestry practices.

Taking into account above considerations Party decided, following ERT 2014 recommendation, to apply tier 1 as provided in page 3.35 in the IPCC good practice guidance for LULUCF and the option given in the paragraph 21 in the annex to the decision 16/CMP.1, and report net carbon stock change in litter pool as not occurring. Relevant reporting tables KP-LULUCF CRF 5(KP-I)B.1 in relation to litter pool for the full time series has been corrected and filled up with notation key "NO".

Nevertheless, as the result of subsequent improvements in GHG's inventory, partially driven by the implementation of 2nd commitment period's related KP decision's as well as by implementation of new guidelines to be applied by Annex I Parties and also following the ERT 2014 recommendation, Poland applied Tier 1 approach as provided in the section 2.3.2 of the chapter 4 of the volume 4 of the IPCC 2006.

Poland would like to highlight that since the deadwood and litter pool and its carbon stock change is assumed as insignificant and to keep the notations keys use relevant, notation key " NE" will be applied in relevant CRF table in the forthcoming submission, with the view to provide additional, more detailed explanation that this pools are demonstrated not a net source (instead of "NO" and " NA" reported respectively).

11.3.1.2 Justification when omitting any carbon pool or GHG emissions/removals from activities under Article 3.3 and elected and mandatory activities under Article 3.4

For the litter and dead wood pools on AR land, the option of paragraph 2e of decision 2/CMP.8 is selected, and it is demonstrated (see below) that these pools are not a source, thus, no accounting is made for these pools.

Carbon stock changes in dead wood on afforested and reforested areas is assumed to be equal to zero, therefore reported as 'NO'. The accumulation of dead wood was assumed to be marginal on afforested and reforested sites, during 1990-2012, and also dead wood pool cannot decrease on those sites, because there is actually no dead wood there before the conversion. The dead wood starts to accumulate when natural mortality or thinnings occur that is nearly at the age of over 20 years. To keep correctness in CRF tables notation keys NO (not occurring) were used in the relevant table.

When an area is afforested, first it is cleared of all above-ground biomass in case there was any, however, no DW and LI are usually present on these lands prior to afforestation. After afforestation, dead woody debris, litter as well as dead trees start to accumulate. In lack of representative measurements, the rate and timing of accumulation is not known, however, standard forestry experience suggests that they depend on species, site and silvicultural regime, and quickly accumulate over time. Fast growing species are usually planted so that no large amount of deadwood is produced, or thinned so that self-thinning does not ensue, but litter is continuously produced even in these stands. On the other hand, slow-growing species tend to produce dead wood and litter even at an early stage. Overall for all AR land, also considering that AR activity has been continuous since 1990 and stands on AR land are usually younger for deadwood and litter accumulation to saturate, it can safely be concluded that the carbon in the deadwood and litter pools in AR lands was increasing between 2008-2010, i.e. these pools are not a source. The above demonstration is based upon well-established principles of forest science, the every-day experiences of forestry practice, the experience and data of forest surveys, as well as sound reasoning. Because of this, although no representative measurements have been made as mentioned, the level of confidence of the demonstration is suggested to be very high. To keep correctness in CRF tables notation keys NO (not occurring) were used in the relevant table.

According to the article 30 of *Act on forests of 28th September, 1991 (Journal of Law of 1991 No 101 item 444, as amended)* burning of surface soil layers or remnants of vegetation is forbidden. In relation to this record it is considered that controlled biomass burning does not occur on forests. To keep correctness in CRF tables notation keys NO (not occurring) were used in the table NIR 1 and connected tables for all indicated activities for wildfires on forest land.

The size of forest land with the relation to legitimacy of fertilization on forest land in a large scale causing that fertilization is limited only to the forest nurseries where use of fertilizers is a part of intensive production technology. In this situation, to prevent the possibility of double emission estimation in conjunction with the sector "Agriculture", it is assumed that fertilization on forest land is not affected. To keep correctness in CRF tables notation keys NO (not occurring) were used in the table NIR 1 and connected tables for all indicated activities for fertilization on forest land.

11.3.1.3 Information on whether or not indirect and natural GHG emissions and removals have been factored out

Available activity data and methodologies did not allow the exclusions of indirect and natural GHG emissions from the present estimation of anthropogenic GHG emissions for the relevant activities.

According to the report of a rather recent IPCC meeting (Expert Meeting on Revisiting the Use of Managed Land as a Proxy for Estimating National Anthropogenic Emissions and Removals, 5-7 May 2009, Sao Paulo, Brazil), there are currently no scientifically sound methods to separate out indirect and natural GHG emissions and removal (IPCC, 2010). On the other hand, this is not necessarily needed if appropriate proxies are used. The above mentioned meeting, among others, stated that, although not perfect, the currently applied proxy, i.e. the so called "managed land" proxy is one that approximates the effects of direct human induced activities.

We also note that, especially for FM, this separation is taken care of by the various steps of the accounting, thus, no additional separation is necessary, and we have indeed not have done any.

11.3.1.4 Changes in data and methods since the previous submission (recalculations)

All changes are caused by the change in activity data, for forest and forest management activity. Emission and C stock change factors are not changed at all.

11.3.1.5 Information on other methodological issues

11.3.1.2.1 Information that demonstrates methodological consistency between the reference level and reporting for forest management

In order to avoid expectance of net debits and credits, during the second commitment period, the consistency of parameters used for FMRL and estimates over the CP2 has to be ensured for, i.e. area accounted for, the treatment of harvested wood products, and the accounting of any emissions from natural disturbances.

It is important to highlight that we always use the best methods and data that is currently available.
This often, but not always, represents Tier 2 or 3. In order not to underestimate emissions and overestimate removals, a highly conservative approach is applied in all steps of the inventory whenever the application of higher Tiers is not possible. This approach is characterized by always selecting data and methods that overestimate emissions and underestimate removals.

Generally, the area, harvest and forest fire statistics are based on annual nationwide assessments, whereas the emission factors and models applied do not consider the inter-annual variability of the physical processes. Therefore, the estimated emissions and removals partly, but not completely, reflect the inter-annual variability of the true processes. (The annual stock data mainly reflect actual harvests, but partly only modelled increment data.) It also needs to be underlined that the net removal values for either FM or AR represent rather small changes (i.e., net removals) relative to rather large stocks (i.e., the total carbon stocks of the biomass of all forests in the respective categories). It is due to the nature of such relatively small net values that they have a rather high inter-annual variability, and are not a result of some artefacts.

In principle, we consistently use the same methods for estimating carbon stock change and non-CO2 greenhouse gas emissions for the whole 1988-2015 period, and data reported under the KP is consistent with those under the UNFCCC.

With respect to the methodological Tiers applied in this report, at least the same or higher Tiers are applied for the categories under the KP as in our report under the UNFCCC. In general, higher tier, or at least methods of higher accuracy, are applied with respect to the identification and estimation of areas in the various land use and land use change categories under the KP. In general, too, Tier 2/3 is applied for AR, D and FM land: the land area identification is country-specific, and so is the estimation of volume, as well as that of the biomass conversion factor from volume to above-ground biomass. For the expansion of above-ground to total biomass, a Tier 1 factor is applied. The application of such a Tier 1 default factor is well compensated by selecting a conservatively low root-to-shoot factor, which may result in a bias in the estimation, but this bias is conservative as it is towards lower net removals

11.3.2.3.2 Technical corrections

A technical correction is planned in the light of new data available from NFI at the later stage.

11.3.1.6 The year of the onset of an activity, if after 2013

Data on the year of onset of activity is reflected in the time series used to derive the activity data. Under current method, which determines the land use change periodically, interpolation is used between successive moments in time. The Kyoto CRF tables, as well as data and calculations as demonstrated above, clearly and transparently report both the areas and the associated emissions and removals under Article 3.3 that have entered the accounting system. For Art. 3.4 FM, activities on all land are assumed to be started before the beginning of the first commitment period. As a consequence, the Polish accounting system fully complies with paragraph 23 in Annex to Decision 2/CMP.7.

11.4. Article 3.3

11.4.1. Information that demonstrates that activities under Article 3.3 began on or after 1 January 1990 and before 31 December 2012 and are direct human-induced

The annually updated cadastral information from the National Record of Lands and Buildings refers exclusively to intentional, i.e. human-induced interventions into land use. These interventions are thereby reflected in the corresponding records, including the time attribute, collected and summarized at the level of cadastral units. Summarised area of land use changes at the level of cadastral units are annually reported as a official statistical data by the Central Statistical Office

11.4.2. Information on how harvesting or forest disturbance that is followed by the re-establishment of forest is distinguished from deforestation

Since no remote sensing technology is directly involved in the KP LULUCF emission inventory, there is no issue related to distinguishing harvesting or forest disturbance from deforestation. Harvesting and forest disturbance always occur on forest land, while deforestation is a cadastral change of land use from forest land to other land use categories

The forest disturbance alone cannot trigger land conversions from forestland, i.e. land is subject to further forest management. Thus distinction between harvested and disturbance affected areas, on the one hand, and deforestation, on the other, is made as follows: for the former, there is legal obligation for the forest owner/administrator to maintain the land under forests category and forestry regime (including tree harvest based on permit), to apply the forest management plans specifications and regenerate it within a given timeframe (maximum 5 years); for the latter, following legal procedure with the issuance of the approval, a new land use category is assigned to that land, and the forestry regime is no longer applicable.

Any deforestation in terms of land use change in the in-country land use scheme requires an official decision. Hence, no permanent loss of forest cover may occur prior to this approval, which is reflected in cadastral land use. A temporary loss of forest cover up to an area of 2 [ha] ha may occur as part of forest management operations on Forest land (units of land subject to FM), which is not qualified as deforestation in terms of Art. 3.3. KP LULUCF activity. Nevertheless, forest owners (art. 13.1 of the the *Act on forests* of September 28th, 1991 *(Journal of Laws of 1991 No. 101, item. 444, as amended)* shall be obliged to ensure the permanent maintenance of forest cover, as well as continuity of utilization, and in particular:

1) to preserve forest vegetation (plantations) in forests, as well as natural marshlands and peatlands;
2) to reintroduce forest vegetation (plantations) in forest areas within five years of a stand being cleared;
3) to tend and protect forest, including against fire;
4) to convert and rebuild stands, where these are not in a condition to ensure achievement of the objectives of forest management set out in the Forest Management Plan, Simplified Forest Management Plan or Decision;
5) to make rational use of forests in a manner permanently ensuring optimal discharge of all the functions thereof, by means of:
   a) the harvesting of wood within limits not exceeding a forest's productive capabilities,
   b) the harvesting of raw materials and by-products of forest use, in a manner providing for biological renewal, and also ensuring protection of forest-floor vegetation.

A basic requirement of the forest regime is that an area has to be restocked in maximum 5 years, without reference to a minim area. In practice, such lands can regenerate either by plantations (usually followed by state forests) or by assisted natural regeneration (, or by mixed ways. Its implementation is observed by public authority responsible for forestry. These areas cannot be confounded with deforested areas as far as they are subject to continuous planning and management (i.e. planting/ gap filling, maintenance, etc).

In Poland, all forests must be regenerated after clearing mature stands by law (as defined by Forestry Act. Regeneration usually means that a cut-and-regeneration sequence of operations is applied, which involves that most of the area that is cut in a year is void of mature trees for many years.

Harvests on afforested area have so far mainly been final cuttings in stands that have reached their rotation age. In case an area is regenerated that was afforested or reforested earlier but after 1989, the same rules apply by law than for all other forests. These rules require that harvested forests must be regenerated at least in fifth year from the disturbance. All areas under regeneration are continuously surveyed by the Forest Authorities, and tough penalties are applied to those that violate relevant provisions.

11.4.3. Information on the size and geographical location of forest areas that have lost forest cover but which are not yet classified as deforested

The actions referred to the deforestation under Article 3.3 of the Kyoto Protocol and the provisions of Article 5 of the *Act on Agricultural and Forest Land Protection (Journal of Laws of 1995, No 16, item78 as amended*) require a formal decision to exclude individual forest plots as administrative units of forestry production. National legal considerations indicate deforestation as a process of administrative changes in land use category, while the temporary deprivation of the forest land of forest cover cannot be equated with deforestation process and should be treated as part of sustainable forest management. Size of final felling sites at the country level that have lost forest cover but which is not yet classified as deforested is presented in the table below.

Table 11.1. Size of final felling sites.

Year	Land area [thos. ha]
2008	72.7
2009	76.9
2010	78.0
2011	77.9
2012	79.6
2013	79.0
2014	77.9
2015	79.4

11.4.4. Information related to the natural disturbances provision under article 3.3

Not applicable

11.4.5. Information on Harvested Wood Products under article 3.3

As requested by para 26 of Annex to 2/CMP.7, carbon stock changes in the HWP pool are reported and accounted for in the Polish inventory. The methodology of estimation is described in Section 11.5.2.5 because, due to lack of data, we are unable to separate harvest from AR and FM. Therefore, according to page 2.118 of the IPCC 2013 KP Supplement, "in case it is not possible to differentiate between the harvest from AR and FM, it is conservative and in line with good practice to assume that all HWP entering the accounting framework originate from FM", thus we report carbon stock changes together for the two categories. In contrast, harvest from D is separated and excluded, and treated as instantaneous oxidation.

11.5. Article 3.4

11.5.1. Information that demonstrates that activities under Article 3.4 have occurred since 1 January 1990 and are human-induced

Confirmation that the FM activity is human induced and occurred since 1990 is given by the fact that associated lands were reported as part of the national economic system by continuous planning and implementation of the management measures or subject to forest regime in any case.

The basis for the management is forest management plans that are prepared for all forests of the country, i.e. all stands of both the AR and the FM category. These plans, which are parts of the underlying documentation, contain information, among others, on the status of the stand during the survey, long-term objectives, plans for short-term operations (for as long as a maximum 10-year period) and information on the last harvesting operations. These plans thus demonstrate that activities under Article 3.4 have occurred since 1 January 1990 and are human-induced.

11.5.2. Information relating to Forest Management

Forest management activity refers to forest for which a management plan has been set up (some 90% of forests) while the rest are subject to wood harvesting permission. First category are managed according to management plans, they are continuously surveyed for disturbances; forest operations and harvesting are subject to 10 years cycle planning; forest regeneration is closely and intensively assisted. Such lands are mapped, landmarked and annually up-dated in statistics. The forestry regime relies primarily on the forest law, then in subsequent legislation and technical norms, in order to ensure sustainable forests management at national scale.

11.5.2.1. Information that the definition of forest for this category conforms with the definition in item 11.1 above

FM land only includes managed forest areas that are included in the FL category, for which the definition of "forest" is applied as required by the the *Act on forests* of September 28th, 1991 *(Journal of Laws of 1991 No. 101, item. 444, as amended)*, as it is demonstrated above in section 11.1.

11.5.2.2. Conversion of natural forest to planted forest

It is assumed that this type of conversion does not occur in Poland.

11.5.2.3. Forest Management Reference Level (FMRL)

In order to avoid expectance of net debits and credits, during the second commitment period, the consistency of parameters used for FMRL and estimates over the CP2 has to be ensured for, i.e. area accounted for, the treatment of harvested wood products, and the accounting of any emissions from natural disturbances.

Emissions from harvested wood products originating from forests prior to the start of the second commitment period have been calculated in the FMRL using the stock change approach defined in IPCC 2006 (data used were associated with years starting with 1900).

11.5.2.3. Technical Corrections of FMRL

The methodology of the projection, shall consider the effect of policies on the projections, the same as in the Preparation of original FMRL. Therefore, the technical correction should only concern the revised estimates of the historical time series of the emissions and removals from FM that are used for the adjustment. Technical correction is planned in the light of new data available from NFI.

Considering all the above, technical correction is planned in the light of new data available from NFI. All elements of the necessary technical correction will consider Equation 2.7.1 of the IPCC 2013 KP Supplement:

$$FMRLcorr = FMRL + Technical\_Correction$$

where

FRMLcorr = the corrected FMRL,

FMRL = Forest Management Reference Level inscribed in Appendix to Decision 2/CMP.7

Technical_Correction = the total of the partial corrections in Table 11.16.

11.5.2.4. Information related to the natural disturbances provision under article 3.4

Not applicable. Poland does not intend to use the provision to exclude emissions caused by natural disturbances during the second commitment period of the Kyoto-Protocol.

11.5.2.5. Information on Harvested Wood Products under article 3.4

From a methodological point of view, emissions and removals HWP under FM are treated similarly than that under the UNFCCC, see Section 6.5.4.2.4. However, there are a number of elements where, due to KP-specific provisions, accounting has to follow specific rules and involves reporting different amounts of emissions and removals than those under the UNFCCC.

The estimation was done with annual historical production data, specific half-lives for product types, application of the first-order decay function using equation 12.1 from the 2006 IPCC Guidelines, with default half-lives of two years for paper, 25 years for wood panels and 35 years for sawn wood and instantaneous oxidation assumed for wood in solid waste disposal sites. Historical data dated back to 1964. It was assumed that, with the exception of wood harvested in deforestations, all harvested wood is allocated to forest management and that all forests in Polish are managed. The estimates include exports. As a result of the above procedure, the net emission estimates from the HWP pool in the FM category under the KP are only different from those under the UNFCCC in that while the latter includes harvested wood products produced from all harvests from all forests, the former excludes harvested wood products from the Deforestation category.

First, HWP from FM under the KP is treated together with HWP from AR, see Section 11.4.5. Second, an important specific methodological element of the estimation of carbon stock changes in the HWP pool under the KP is that, complying with Paragraph 16 of the Annex to Decision 2/CMP.7 and the methodological guidance of the IPCC 2013 KP Supplement (page 2.121), which is applicable in case the FMRL is based on a projection representing a 'business as usual scenario' (see Section 11.5.2.2), inherited emissions from before the start of the second commitment period are excluded from accounting.

As a consequence of the above, whereas losses from the HWP pool accounted for under the UNFCCC are partly from wood products that were produced prior to the second CP, losses from the HWP pool accounted for under the KP are only from wood products produced during the second CP. Recent estimates of carbon stock changes in the HWP pool under the KP using statistical data for inventory year 2015.

11.5.3. Information relating to Cropland Management, Grazing Land Management and Revegetation, if elected, for the base year

As Poland did not elect either Cropland Management, nor Grazing Land Management, nor Wetland drainage and Rewetting, nor Revegetation, this is a non-issue.

11.6. Other information

11.6.1. Key category analysis for Article 3.3 activities, forest management and any elected activities under Article 3.4

In the national GHG inventory, the Tier 1 analysis (Level Assessment, including LULUCF), showed that the CO2 removals from the category 4.A.1 Forest Land remaining Forest Land is a key category. Country specific data is used for this category, noting that reporting some C pools are still achieved according to Tier 1.

Significant changes regarding the two related estimates ("Forest Land remaining Forest Land" under the Convention tables and "Forest Management" activity under the KP) are not expected for the following years.

11.7. Information relating to Article 6

There are no Article 6 activities concerning the LULUCF sector in Poland.

12. INFORMATION ON ACCOUNTING OF KYOTO UNITS

12.1. Background information

The information on accounting of Kyoto units is provided as a part of greenhouse gas inventories of Poland. The following paragraphs present relevant data on holdings and transactions with Kyoto Protocol Units within the Polish registry. The Polish registry operates within the Consolidated System of European Union Registries (hereafter: CSEUR).

Information related to transactions, CDM notifications and accounting of Kyoto units are based on data derived from the consolidated Union Registry.

12.2. Summary of information reported in the SEF tables

In accordance with paragraph 11 of the annex I.E to Decision 15/ CMP.1 the Standard Electronic Format report for 2016 (hereafter: SEF) has been submitted in conjunction with this report (please refer to the files: RREG1_PL_2016.xlsx and ITL_PL_2016_2_2.xml).

The SEF includes information regarding: total quantities of Kyoto Protocol units held on national accounts at the beginning and at the end of reported year, annual internal transactions and transaction between PPSR accounts, share of proceeds transactions under decision 1/CMP.8, paragraph 21 - Adaptation Fund, expiry, cancellation and replacement of CER units and summary information for the commitment period.

12.3. Discrepancies and notifications

In accordance with respective paragraphs of the annex I.E to Decision 15/CMP.1 relevant information is provided:

a) *paragraph 12: List of discrepant transactions*
   <u>No discrepant transactions occurred in 2016.</u>
b) *paragraph 13 & 14: List of CDM notifications*
   <u>No CDM notifications occurred in 2016.</u>
c) *paragraph 15: List of non-replacements*
   <u>No non-replacements occurred in 2016.</u>
d) *paragraph 16: List of invalid units*
   <u>No invalid units exist as at 31 December 2016.</u>
e) *paragraph 17: Actions and changes to address discrepancies*
   <u>No actions were taken or changes made to address discrepancies for the period under review.</u>

12.4. Publicly accessible information

The information that was made available to the public in accordance with section E in Part II of Annex to Decision 13 / CMP.1 is provided at http://www.kobize.pl/pl/article/rejestr-uprawnien/id/661/publicly-available-reports . It contains data regarding accounts, transactions and holdings, article 6 projects, transactions with Kyoto units and authorized legal entities information:

a) paragraph 45: Account information
   In this report following information were provided:
   - *paragraph 45 (a): Account name: the holder of the account*
   - *paragraph 45 (b): Account type: the type of account (holding, cancellation or retirement)*

- *paragraph 45(c): Commitment period: the commitment period with which a cancellation or retirement account is associated*

(reference: https://dokumenty.kobize.pl/raporty/Public_ART45.pdf)

In line with the data protection requirements of Regulation (EC) No 45/2001 and Directive 95/46/EC and in accordance with Article 110 and Annex XIV of Commission Regulation (EU) No 389/2013, the information on account identifier and account representatives held in the EUTL, the Union Registry and any other KP registry (required by paragraph 45) is considered confidential.

b) *paragraph 46: Article 6 project information*
- *paragraph 46 (a): Project name*
- *paragraph 46 (b): Project location - the Party and town or region in which the project is located*
- *paragraph 46 (c): Years of ERUs issuance as a result of the Article 6 project*
- *paragraph 46 (d): Reports - downloadable electronic version of all publicly available documentation relating to the project*

These information is available in the report - *Joint Implementation (JI) project information*
(reference: https://dokumenty.kobize.pl/projekty_ji/index.htm)

c) *paragraph 47: Holding and transaction information*
- *paragraph 47 (a): The total quantity of ERUs, CERs, AAUs and RMUs at the beginning of the year*

(reference: https://dokumenty.kobize.pl/raporty/Public_ART47_a.pdf)

Information on the total quantity of ERUs, CERs, AAUs and RMUs held in each account is considered to be confidential (in accordance with article 110 (1) of Commission Regulation (EU) No 389/2013 of 2 May 2013). Therefore, the report details were limited to information related to subtotals per account type only.

- *paragraph 47 (b): The total quantity of AAUs issued on the basis of the assigned amount pursuant to Article 3*

(reference: https://dokumenty.kobize.pl/raporty/Public_ART47_b_h_k.pdf)

- *paragraph 47 (c): The total quantity of ERUs issued on the basis of Article 6 projects*

(reference: https://dokumenty.kobize.pl/raporty/Public_ART47_c_e_g_i_j.pdf)

- *paragraph 47 (d): The total quantity of ERUs, CERs, AAUs and RMUs acquired from other registries and the identity of the transferring registries*

(reference: https://dokumenty.kobize.pl/raporty/Public_ART47_d_f.pdf)

Information on details of transactions carried out is considered to be confidential (in accordance with article 110 (1) of Commission Regulation (EU) No 389/2013 of 2 May 2013). Therefore, the transaction details were limited to transferring and/or acquiring registry ID only.

- *paragraph 47 (e): The total quantity of RMUs issued on the basis of each activity under Article 3*

(reference: https://dokumenty.kobize.pl/raporty/Public_ART47_c_e_g_i_j.pdf)

- *paragraph 47 (f): The total quantity of ERUs, CERs, AAUs and RMUs transferred to other registries and the identity of the acquiring registries*

(reference: https://dokumenty.kobize.pl/raporty/Public_ART47_d_f.pdf)

Information on details of transactions carried out is considered to be confidential (in accordance with article 110 (1) of Commission Regulation (EU) No 389/2013 of 2 May 2013). Therefore, the transaction details were limited to transferring and / or acquiring registry ID only.

- *paragraph 47 (g): The total quantity of ERUs, CERs, AAUs and RMUs cancelled on the basis of activities under Article 3*

(reference: https://dokumenty.kobize.pl/raporty/Public_ART47_c_e_g_i_j.pdf)

- *paragraph 47 (h): The total quantity of ERUs, CERs, AAUs and RMUs cancelled following determination by the Compliance Committee that the Party is not in compliance with its commitment under Article 3*

(reference: https://dokumenty.kobize.pl/raporty/Public_ART47_b_h_k.pdf)

- *paragraph 47 (i): The total quantity of other ERUs, CERs, AAUs and RMUs cancelled*

(reference: https://dokumenty.kobize.pl/raporty/Public_ART47_c_e_g_i_j.pdf)

- *paragraph 47 (j): The total quantity of ERUs, CERs, AAUs and RMUs retired*

(reference: https://dokumenty.kobize.pl/raporty/Public_ART47_c_e_g_i_j.pdf)

- *paragraph 47 (k): The total quantity of ERUs, CERs and AAUs carried over from the previous commitment period*

(reference: https://dokumenty.kobize.pl/raporty/Public_ART47_b_h_k.pdf)

- *paragraph 47 (l): Current holdings of ERUs, CERs, AAUs and RMUs in each account*

(reference: https://dokumenty.kobize.pl/raporty/Public_ART47_l.pdf)

Information on the total quantity of ERUs, CERs, AAUs and RMUs held in each account is considered to be confidential (in accordance with article 110 (1) of Commission Regulation (EU) No 389/2013 of 2 May 2013). Therefore, the report details were limited to information related to subtotals per account type only.

d) *paragraph 48: Authorized Legal Entities Information*
(reference: https://dokumenty.kobize.pl/raporty/Public_ART48.pdf)

In line with the data protection requirements of Regulation (EC) No 45/2001 and Directive 95/46/EC and in accordance with Article 110 and Annex III of the Commission Regulation (EU) no 389/2013, the legal entity contact information (required by paragraph 48) is considered confidential.

12.5. Calculation of the commitment period reserve (CPR)

The recent value of commitment period reserve of Poland is **1 996 339 848 tCO_2 eq.** The calculation of Poland's CPR is contained in chapter G.2 of the "Report on the individual review of the annual submission of Poland submitted in 2014" (ref.: FCCC/ARR/2014/POL, paragraph 135., http://unfccc.int/resource/docs/2015/arr/pol.pdf).

13. Information on changes in national system

There were no changes in the national system for GHG inventories in Poland since the last NIR was issued.

14. Information on changes in national registry

The following changes to the national registry of Poland have occurred in 2016.

a) *15/CMP.1 annex II, paragraph 32.(a): Change of name or contact*

<u>No change in the name or contact information of the registry administrator occurred during the reported period.</u>

b) *15/CMP.1 annex II, paragraph 32.(b): Change of cooperation arrangement*

<u>No change of cooperation arrangement occurred during the reported period.</u>

c) *15/CMP.1 annex II, paragraph 32.(c): Change to the database or the capacity of national registry*

New tables were added to the CSEUR database for the implementation of the CP2 SEF functionality.

Versions of the CSEUR released after 6.7.3 (the production version at the time of the last year submission) introduced other minor changes in the structure of the database.

These changes were limited and only affected EU ETS functionality. No change was required to the database and application backup plan or to the disaster recovery plan. The database model, including new tables, is provided in Annex 9 (please refer to *CSEUR_entity relationship diagram* and *CP2 SEF Tables*).

No change to the capacity of the national registry occurred during the reported period.

d) 15/CMP.1 annex II, paragraph 32.(d): Change of conformance to technical standards

Changes introduced since version 6.7.3 of the national registry are listed in Annex 9 (please refer to *Changes from EUCR v7.0.1-v8.0.7*).

Each release of the registry is subject to both regression testing and tests related to new functionality. These tests also include thorough testing against the DES and were successfully carried out prior to the relevant major release of the version to Production (please refer to Annex 9 *Changes from EUCR v7.0.1-v8.0.7*). Annex H testing was completed in January 2017 (please refer to *Test Report - ITL Annex H tests for EUCR software* included in Annex 9).

No other change in the registry's conformance to the technical standards occurred for the reported period.

e) 15/CMP.1 annex II, paragraph 32.(e): Change of discrepancies procedures

No change of discrepancies procedures occurred during the reported period.

f) 15/CMP.1 annex II, paragraph 32.(f): Change of Security

The mandatory use of hard tokens for authentication and signature was introduced for registry administrators.

g) 15/CMP.1 annex II, paragraph 32.(g): Change of list of publicly available information

No change to the list of publicly available information occurred during the reporting period.

h) 15/CMP.1 annex II, paragraph 32.(h): Change of Internet address

No change of the registry internet address occurred during the reporting period.

i) 15/CMP.1 annex II, paragraph 32.(i): Change of data integrity measure

No change of data integrity measures occurred during the reporting period.

j) 15/CMP.1 annex II, paragraph 32.(j): Change of test results

Changes introduced since version 6.7.3 of the national registry are listed in Annex 9. Both regression testing and tests on the new functionality were successfully carried out prior to release of the version to Production. The site acceptance test was carried out by quality assurance consultants on behalf of and assisted by the European Commission (please refer to Annex 9 *Changes from EUCR v7.0.1-v8.0.7*). Annex H testing was completed in January (please refer to *Test Report - ITL Annex H tests for EUCR software* included in Annex 9).

15. CHANGES IN INFORMATION ON MINIMIZATION OF ADVERSE IMPACTS IN ACCORDANCE WITH ARTICLE 3.14

According to chapter I.H of the annex to the decision 15/CMP.1 below Poland provides new information on how it is implementing its commitment under Article 3.14 of the Kyoto Protocol related to striving to implement its commitment under Article 3.1 of the Kyoto Protocol in such a way as to minimize potential adverse social, environmental and economic impacts on developing countries.

In 2015 the climate related activities supported in non-Annex I countries by the Ministry of Foreign Affairs in frames of bilateral co-operation were realised covering 1.4 million EUR. About 51% of those funds was assigned to infrastructure projects, the remaining part supported activities aimed at capacity building. These projects were realised in the following countries: Georgia, Kirgizstan, Tajikistan, Moldova, Ethiopia, Kenya and Uganda. The projects cover climate change adaptation actions as well as mitigation ones mostly in the areas of: improvement of availability of fresh water systems as well as energy efficiency and renewable energy sources. The capacity building projects cover mostly: education on environmental protection and deforestation limitation, sustainable development at the local scale, flood warning systems.

ABBREVIATIONS

AR	Afforestation/ Reforestation
AWMS	Animal waste management system
BEF	Biomass expansion factor (LULUCF)
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
CRF	Common reporting format
D	Deforestation
DOC	Degradable organic component
DW	Dead wood
ERT	Expert Review Team
FM	Forest management
FMRL	Forest Management Reference Level
GHG	Greenhouse Gases
HWP	Harvested wood products
IE	Included elsewhere
KOBiZE	National Centre for Emissions Management
LT	Litter
LULUCF	Land use, land-use change and forestry
MCF	Methane correction factor (Waste)
MCF	Methane Conversion Factor (Agriculture)
MSW	Municipal solid waste
NA	Not applicable
NE	Not estimated
NO	Not occurring
NMVOC	Non-methane volatile organic compounds
SOC	Soil organic carbon
SWDS	Solid waste disposal site
TC	Technical correction

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EUROCONTROL, Annual Fuel Burnt and Emissions Calculation for the EEA (for data from 2005).

EUROSTAT, EUROSTAT database.

FAOSTAT, FAOSTAT database.

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Annex 1. Key categories in 2015

The source/sink categories in all sectors, are identified to be key sources on the basis of their contribution to the total level and/or trend assessment. The methodology of reporting key categories is based on 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Approach 1.

Additionally, qualitative method is used to indentify key categories.

Poland's key category analysis guides the inventory preparation and is used to set priorities for the development of more advanced methodologies.

From source categories which have been identified as key sources in level assessment, the biggest contributors of the GHG emissions (without LULUCF) in 2015 are categories:

1.A.1 Fuel combustion - Energy Industries - Solid Fuels	CO_2
1.A.3.b Road Transportation	CO_2
1.A.4 Other Sectors - Solid Fuels	CO_2

Emission from abovementioned sources made up to 58.97% of the total GHG emissions in Poland expressed in units of CO_2 equivalents.

The biggest contributors of the GHG emissions in trend assessment (without LULUCF) in 2015 are categories:

1.A.4 Other Sectors - Solid Fuels	CO_2
1.A.3.b Road Transportation	CO_2
1.A.1 Fuel combustion - Energy Industries - Solid Fuels	CO_2

Share of these sources made up to 58.97% of the total GHG emissions in Poland (CO_2 equivalent).

As a result of analysis with use of qualitative criteria no additional categories were identified as key sources.

Summary of key category analysis with sector LULUCF in 2015

No.	IPCC Source Categories	Greenhouse Gas	Identification criteria (Level, Trend, Qualitative)		
1	1.A.1 Fuel combustion - Energy Industries - Liquid Fuels	CO_2	L	T	
2	1.A.1 Fuel combustion - Energy Industries - Solid Fuels	CO_2	L	T	
3	1.A.1 Fuel combustion - Energy Industries - Gaseous Fuels	CO_2	L	T	
4	1.A.1 Fuel combustion - Energy Industries - Other Fossil Fuels	CO_2		T	
5	1.A.2 Fuel combustion - Manufacturing Industries and Construction - Liquid Fuels	CO_2	L	T	
6	1.A.2 Fuel combustion - Manufacturing Industries and Construction - Solid Fuels	CO_2	L	T	
7	1.A.2 Fuel combustion - Manufacturing Industries and Construction - Gaseous Fuels	CO_2	L	T	
8	1.A.2 Fuel combustion - Manufacturing Industries and Construction - Other Fossil Fuels	CO_2	L	T	
9	1.A.3.b Road Transportation	CO_2	L	T	
10	1.A.3.c Railways	CO_2		T	
11	1.A.3.e Other Transportation	CO_2		T	
12	1.A.4 Other Sectors - Liquid Fuels	CO_2	L	T	
13	1.A.4 Other Sectors - Solid Fuels	CO_2	L	T	
14	1.A.4 Other Sectors - Solid Fuels	CH_4	L	T	
15	1.A.4 Other Sectors - Gaseous Fuels	CO_2	L	T	
16	1.A.4 Other Sectors - Biomass	CH_4		T	
17	1.B.1 Fugitive emissions from Solid Fuels	CO_2	L		
18	1.B.1 Fugitive emissions from Solid Fuels	CH_4	L	T	
19	1.B.2.c Fugitive Emissions from Fuels - Venting and flaring	CH_4		T	
20	1.B.2.d Fugitive Emissions from Fuels - Other	CO_2	L	T	
21	2.A.1 Cement Production	CO_2	L	T	
22	2.A.2 Lime Production	CO_2		T	
23	2.A.4 Other Process Uses of Carbonates	CO_2	L	T	
24	2.B.1 Ammonia Production	CO_2	L	T	
25	2.B.2 Nitric Acid Production	N_2O		T	
26	2.B.5 Carbide Production	CO_2		T	
27	2.B.8 Petrochemical and Carbon Black Production	CO_2		T	
28	2.C.1 Iron and Steel Production	CO_2	L	T	
29	2.F.1 Refrigeration and Air conditioning	F-gases	L	T	
30	3.A Enteric Fermentation	CH_4	L	T	
31	3.B Manure Management	N_2O	L		
32	3.D.1 Direct N2O Emissions From Managed Soils	N_2O	L	T	
33	3.D.2 Indirect N2O Emissions From Managed Soils	N_2O	L		
34	3.G Liming	CO_2		T	
35	4.A.1 Forest Land Remaining Forest Land	CO_2	L	T	
36	4.A.2 Land Converted to Forest Land	CO_2	L	T	
37	4.D.1.2 Flooded Land Remaining Flooded Land	CO_2	L	T	
38	4.E.2 Land Converted to Settlements	CO_2	L	T	
39	4.G Harvested Wood Products	CO_2	L	T	
40	4(III).Direct N2O emissions from N mineralization/immobilization	N_2O		T	
41	5.A Solid Waste Disposal	CH_4	L	T	
42	5.D Wastewater Treatment and Discharge	CH_4		T	

Summary of key category analysis without sector LULUCF in 2015

No.	IPCC Source Categories	Greenhouse Gas	Identification criteria (Level, Trend, Qualitative)		
1	1.A.1 Fuel combustion - Energy Industries - Liquid Fuels	CO_2	L	T	
2	1.A.1 Fuel combustion - Energy Industries - Solid Fuels	CO_2	L	T	
3	1.A.1 Fuel combustion - Energy Industries - Gaseous Fuels	CO_2	L	T	
4	1.A.1 Fuel combustion - Energy Industries - Other Fossil Fuels	CO_2		T	
5	1.A.2 Fuel combustion - Manufacturing Industries and Construction - Liquid Fuels	CO_2	L	T	
6	1.A.2 Fuel combustion - Manufacturing Industries and Construction - Solid Fuels	CO_2	L	T	
7	1.A.2 Fuel combustion - Manufacturing Industries and Construction - Gaseous Fuels	CO_2	L	T	
8	1.A.2 Fuel combustion - Manufacturing Industries and Construction - Other Fossil Fuels	CO_2	L	T	
9	1.A.3.b Road Transportation	CO_2	L	T	
10	1.A.3.c Railways	CO_2		T	
11	1.A.3.e Other Transportation	CO_2		T	
12	1.A.4 Other Sectors - Liquid Fuels	CO_2	L	T	
13	1.A.4 Other Sectors - Solid Fuels	CO_2	L	T	
14	1.A.4 Other Sectors - Solid Fuels	CH_4	L	T	
15	1.A.4 Other Sectors - Gaseous Fuels	CO_2	L	T	
16	1.A.4 Other Sectors - Biomass	CH_4		T	
17	1.B.1 Fugitive emissions from Solid Fuels	CO_2	L		
18	1.B.1 Fugitive emissions from Solid Fuels	CH_4	L	T	
19	1.B.2.c Fugitive Emissions from Fuels - Venting and flaring	CH_4		T	
20	1.B.2.d Fugitive Emissions from Fuels - Other	CO_2	L	T	
21	2.A.1 Cement Production	CO_2	L	T	
22	2.A.2 Lime Production	CO_2		T	
23	2.A.4 Other Process Uses of Carbonates	CO_2	L	T	
24	2.B.1 Ammonia Production	CO_2	L	T	
25	2.B.2 Nitric Acid Production	N_2O		T	
26	2.C.1 Iron and Steel Production	CO_2	L	T	
27	2.F.1 Refrigeration and Air conditioning	F-gases	L	T	
28	3.A Enteric Fermentation	CH_4	L	T	
29	3.B Manure Management	N_2O	L		
30	3.D.1 Direct N_2O Emissions From Managed Soils	N_2O	L	T	
31	3.D.2 Indirect N_2O Emissions From Managed Soils	N_2O	L		
32	3.G Liming	CO_2		T	
33	5.A Solid Waste Disposal	CH_4	L	T	
34	5.D Wastewater Treatment and Discharge	CH_4		T	

Summary of key category analysis with sector LULUCF in 1988

No.	IPCC Source Categories	Greenhouse Gas	Identification criteria (Level, Trend, Qualitative)		
1	1.A.1 Fuel combustion - Energy Industries - Liquid Fuels	CO_2	L		
2	1.A.1 Fuel combustion - Energy Industries - Solid Fuels	CO_2	L		
3	1.A.2 Fuel combustion - Manufacturing Industries and Construction - Gaseous Fuels	CO_2	L		
4	1.A.2 Fuel combustion - Manufacturing Industries and Construction - Liquid Fuels	CO_2	L		
5	1.A.2 Fuel combustion - Manufacturing Industries and Construction - Solid Fuels	CO_2	L		
6	1.A.3.b Road Transportation	CO_2	L		
7	1.A.3.c Railways	CO_2	L		
8	1.A.4 Other Sectors - Gaseous Fuels	CO_2	L		
9	1.A.4 Other Sectors - Liquid Fuels	CO_2	L		
10	1.A.4 Other Sectors - Solid Fuels	CO_2	L		
11	1.A.4 Other Sectors - Solid Fuels	CH_4	L		
12	1.B.1 Fugitive emissions from Solid Fuels	CH_4	L		
13	1.B.1 Fugitive emissions from Solid Fuels	CO_2	L		
14	2.A.1 Cement Production	CO_2	L		
15	2.A.2 Lime Production	CO_2	L		
16	2.B.1 Ammonia Production	CO_2	L		
17	2.B.2 Nitric Acid Production	N_2O	L		
18	2.C.1 Iron and Steel Production	CO_2	L		
19	3.A Enteric Fermentation	CH_4	L		
20	3.B Manure Management	N_2O	L		
21	3.D.1 Direct N2O Emissions From Managed Soils	N_2O	L		
22	3.D.2 Indirect N2O Emissions From Managed Soils	N_2O	L		
23	4.A.1 Forest Land Remaining Forest Land	CO_2	L		
24	4.D.1.2 Flooded Land Remaining Flooded Land	CO_2	L		
25	5.A Solid Waste Disposal	CH_4	L		
26	5.D Wastewater Treatment and Discharge	CH_4	L		

Summary of key category analysis without sector LULUCF in 1988

No.	IPCC Source Categories	Greenhouse Gas	Identification criteria (Level, Trend, Qualitative)		
1	1.A.1 Fuel combustion - Energy Industries - Liquid Fuels	CO_2	L		
2	1.A.1 Fuel combustion - Energy Industries - Solid Fuels	CO_2	L		
3	1.A.2 Fuel combustion - Manufacturing Industries and Construction - Gaseous Fuels	CO_2	L		
4	1.A.2 Fuel combustion - Manufacturing Industries and Construction - Liquid Fuels	CO_2	L		
5	1.A.2 Fuel combustion - Manufacturing Industries and Construction - Solid Fuels	CO_2	L		
6	1.A.3.b Road Transportation	CO_2	L		
7	1.A.4 Other Sectors - Gaseous Fuels	CO_2	L		
8	1.A.4 Other Sectors - Liquid Fuels	CO_2	L		
9	1.A.4 Other Sectors - Solid Fuels	CO_2	L		
10	1.A.4 Other Sectors - Solid Fuels	CH_4	L		
11	1.B.1 Fugitive emissions from Solid Fuels	CH_4	L		
12	2.A.1 Cement Production	CO_2	L		
13	2.A.2 Lime Production	CO_2	L		
14	2.B.1 Ammonia Production	CO_2	L		
15	2.B.2 Nitric Acid Production	N_2O	L		
16	2.C.1 Iron and Steel Production	CO_2	L		
17	3.A Enteric Fermentation	CH_4	L		
18	3.B Manure Management	N_2O	L		
19	3.D.1 Direct N2O Emissions From Managed Soils	N_2O	L		
20	3.D.2 Indirect N2O Emissions From Managed Soils	N_2O	L		
21	5.A Solid Waste Disposal	CH_4	L		
22	5.D Wastewater Treatment and Discharge	CH_4	L		

Annex 2. Fuel consumption and GHG emission factors from selected categories of CRF sector 1.A

Table 1. Fuel consumption [PJ] in 1.A.1.a category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Hard coal	1752.496	1719.899	1597.240	1574.444	1504.529	1364.716	1317.391	1205.058	1267.444	1221.134	1155.693
Lignite	568.786	575.819	555.587	561.502	548.623	550.751	539.277	529.124	533.077	530.661	535.230
Hard coal briquettes (patent fuels)	5.001	3.888	2.520	0.322	0.117	0.059	0.059	0.000	0.000	0.059	0.000
Brown coal briquettes	0.354	0.247	0.140	0.060	0.200	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	21.274	21.900	21.641	16.329	9.561	3.107	4.094	4.738	7.156	7.949	10.768
Fuel wood and wood waste	16.695	15.123	14.571	14.384	17.265	13.783	14.051	1.322	2.656	3.293	3.673
Biogas	0.004	0.006	0.014	0.003	0.024	0.000	0.006	0.125	0.137	0.088	0.204
Industrial wastes	3.741	3.873	5.265	8.914	7.354	6.658	6.876	3.878	3.393	3.267	0.550
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	13.591	12.561	12.626	12.967	10.944	8.864	7.524	7.239	6.954	5.301	4.076
Liquid petroleum gas (LPG)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046	0.184
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	0.767	0.724	0.601	0.601	0.558	0.429	0.387	0.343	1.158	1.674	1.545
Fuel oil	73.080	70.760	65.360	61.280	56.400	55.080	55.600	25.840	27.720	27.280	17.600
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	1.287	1.188	0.990	0.742	0.644	0.842	1.238	0.050	0.000	0.000	0.000
Coke oven gas	5.568	6.565	7.125	7.555	8.863	8.144	13.147	12.828	13.975	16.450	13.697
Blast furnace gas	28.221	26.733	22.377	12.797	13.378	10.239	13.190	5.905	3.218	3.306	3.060
Gas works gas	0.659	0.579	0.167	0.129	0.335	0.085	0.037	0.021	0.004	0.002	3.259
Fuels											
Liquid fuels	75.134	72.672	66.951	62.623	57.602	56.351	57.225	26.233	28.878	29.000	19.329
Gaseous fuels	21.274	21.900	21.641	16.329	9.561	3.107	4.094	4.738	7.156	7.949	10.768
Solid fuels	2374.674	2346.290	2197.782	2169.776	2086.989	1942.858	1890.625	1760.175	1824.672	1776.913	1715.015
Other fuels	3.741	3.873	5.265	8.914	7.354	6.658	6.876	3.878	3.393	3.267	0.550
Biomass	16.699	15.129	14.585	14.387	17.289	13.783	14.057	1.447	2.793	3.381	3.877
Total	**2491.522**	**2459.864**	**2306.224**	**2272.029**	**2178.795**	**2022.757**	**1972.877**	**1796.471**	**1866.892**	**1820.510**	**1749.539**

Table 1. (cont.) Fuel consumption [PJ] in 1.A.1.a category

Fuels	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Hard coal	1125.965	1118.163	1127.286	1091.937	1144.769	1122.123	1105.919	1159.978	1148.642	1060.617	1033.585
Lignite	521.068	504.999	512.219	494.038	518.250	514.275	533.979	525.818	501.140	521.178	494.048
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	16.210	21.627	28.242	38.700	45.496	53.667	57.039	52.808	49.691	51.163	51.652
Fuel wood and wood waste	3.398	3.461	4.886	4.809	5.799	8.905	17.500	21.180	25.181	37.976	54.823
Biogas	0.349	0.443	0.563	0.615	0.843	1.293	1.820	2.021	1.515	2.025	2.199
Industrial wastes	0.575	0.883	1.031	1.520	0.372	0.407	0.483	0.427	0.440	0.209	0.314
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.384	0.368
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	2.850	1.995	1.710	1.254	0.912	0.598	0.342	0.171	0.142	0.086	0.056
Liquid petroleum gas (LPG)	0.230	0.184	0.184	0.184	0.046	0.000	0.000	0.000	0.000	0.000	0.000
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	1.588	1.973	2.059	2.317	2.188	1.545	1.201	1.159	0.730	0.815	0.952
Fuel oil	16.720	13.680	14.680	13.200	11.920	10.040	8.080	7.960	7.320	7.400	6.680
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	16.077	17.094	17.079	16.420	18.032	16.955	14.373	18.322	16.024	16.765	13.112
Blast furnace gas	3.286	4.317	4.976	4.783	5.715	6.665	4.146	8.323	6.395	10.204	7.730
Gas works gas	2.507	2.390	2.338	3.109	2.592	3.631	4.736	4.778	4.463	4.502	4.828
Fuels											
Liquid fuels	18.538	15.837	16.923	15.701	14.154	11.585	9.281	9.119	8.050	8.215	7.632
Gaseous fuels	16.210	21.627	28.242	38.700	45.496	53.667	57.039	52.808	49.691	51.163	51.652
Solid fuels	1671.753	1648.958	1665.608	1611.570	1690.270	1664.247	1663.495	1717.390	1676.806	1613.352	1553.359
Other fuels	0.575	0.883	1.031	1.520	0.372	0.407	0.483	0.427	0.440	0.593	0.682
Biomass	3.747	3.904	5.449	5.424	6.642	10.198	19.320	23.201	26.696	40.001	57.022
Total	**1710.823**	**1691.209**	**1717.253**	**1672.915**	**1756.934**	**1740.104**	**1749.618**	**1802.945**	**1761.683**	**1713.324**	**1670.347**

Table 1. (cont.) Fuel consumption [PJ] in 1.A.1.a category

Fuels	2010	2011	2012	2013	2014	2015
Hard coal	1095.945	1054.878	990.212	993.766	920.138	927.133
Lignite	477.467	517.018	527.314	539.685	513.429	507.993
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	52.286	57.961	61.963	53.395	52.017	60.426
Fuel wood and wood waste	65.114	78.589	105.585	87.694	96.989	95.656
Biogas	2.778	3.328	4.219	4.887	5.732	6.313
Industrial wastes	0.442	0.458	0.420	0.381	0.470	0.687
Municipal waste - non-biogenic fraction	0.367	0.403	0.371	0.337	0.343	0.727
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.016	0.009
Other petroleum products	0.060	0.000	0.031	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000
Coke	0.057	0.028	0.028	0.028	0.028	0.004
Liquid petroleum gas (LPG)	0.000	0.000	0.000	0.000	0.000	0.004
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	0.866	1.040	0.823	0.909	0.866	1.225
Fuel oil	7.360	7.000	6.320	5.560	4.600	15.966
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.396
Coke oven gas	18.611	16.640	15.993	17.867	17.789	20.883
Blast furnace gas	9.954	11.001	11.328	11.729	13.937	16.242
Gas works gas	5.072	5.357	5.202	5.307	5.069	4.723
Fuels						
Liquid fuels	8.286	8.040	7.174	6.469	5.466	17.591
Gaseous fuels	52.286	57.961	61.963	53.395	52.017	60.426
Solid fuels	1607.106	1604.922	1550.077	1568.382	1470.390	1476.977
Other fuels	0.809	0.861	0.791	0.718	0.813	1.414
Biomass	67.892	81.917	109.804	92.581	102.737	101.978
Total	**1736.379**	**1753.701**	**1729.809**	**1721.545**	**1631.423**	**1658.386**

Table 2. Fuel consumption [PJ] in 1.A.1.b category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Hard coal	0.114	0.113	0.046	0.090	0.069	0.245	0.068	1.302	1.451	1.349	0.629
Lignite	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	2.395	2.396	1.671	1.539	1.508	1.608	1.591	1.562	1.749	2.529	8.244
Fuel wood and wood waste	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industrial wastes	7.724	7.487	5.222	0.272	0.682	0.002	0.259	1.919	0.350	0.163	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.520	1.080	0.880
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	0.028	0.028	0.000	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Liquid petroleum gas (LPG)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046	0.092
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	0.000	0.000	0.043	0.043	0.000	0.086	0.086	0.172	0.172	0.214	0.343
Fuel oil	14.800	13.800	11.440	10.560	15.760	12.800	11.960	32.400	40.520	32.200	39.840
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	8.860	9.306	7.474	7.623	8.514	9.256	10.444	12.028	8.960	10.197	6.286
Coke oven gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.081
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuels											
Liquid fuels	23.660	23.106	18.957	18.226	24.274	22.142	22.490	44.600	50.172	43.737	47.441
Gaseous fuels	2.395	2.396	1.671	1.539	1.508	1.608	1.591	1.562	1.749	2.529	8.244
Solid fuels	0.142	0.140	0.046	0.118	0.069	0.245	0.068	1.302	1.451	1.349	0.710
Other fuels	7.724	7.487	5.222	0.272	0.682	0.002	0.259	1.919	0.350	0.163	0.000
Biomass	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	**33.921**	**33.129**	**25.896**	**20.155**	**26.533**	**23.997**	**24.408**	**49.383**	**53.722**	**47.778**	**56.395**

Table 2. (cont.) Fuel consumption [PJ] in 1.A.1.b category

Fuels	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Hard coal	0.586	0.208	0.070	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.113
Lignite	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	10.832	12.110	11.354	10.124	12.770	15.454	14.482	14.900	20.816	18.816	17.511
Fuel wood and wood waste	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industrial wastes	0.310	0.219	0.095	0.253	0.176	0.221	0.285	0.224	0.000	0.000	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	1.720	0.000	0.040	0.040	0.040	0.360	0.320	0.440	0.360	0.672	0.986
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Liquid petroleum gas (LPG)	0.184	0.276	0.000	0.046	0.092	0.000	0.000	0.000	0.000	0.000	0.000
Motor gasoline	0.090	0.135	0.000	0.000	0.135	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.043	0.000	0.000	0.000	0.000
Diesel oil	0.086	1.373	0.386	0.858	0.343	0.987	0.300	0.729	0.172	0.429	0.216
Fuel oil	35.080	36.160	42.280	42.560	43.520	42.880	42.560	41.720	44.080	43.560	44.160
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	6.386	9.058	10.444	10.048	10.048	11.632	10.692	12.969	16.582	17.424	15.246
Coke oven gas	0.051	0.069	0.070	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuels											
Liquid fuels	43.546	47.002	53.150	53.552	54.178	55.859	53.915	55.858	61.194	62.085	60.608
Gaseous fuels	10.832	12.110	11.354	10.124	12.770	15.454	14.482	14.900	20.816	18.816	17.511
Solid fuels	0.637	0.277	0.140	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.113
Other fuels	0.310	0.219	0.095	0.253	0.176	0.221	0.285	0.224	0.000	0.000	0.000
Biomass	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	**55.325**	**59.608**	**64.739**	**63.952**	**67.124**	**71.534**	**68.682**	**70.982**	**82.010**	**80.901**	**78.232**

Table 2. (cont.) Fuel consumption [PJ] in 1.A.1.b category

Fuels	2010	2011	2012	2013	2014	2015
Hard coal	0.114	0.114	0.091	0.113	0.158	0.903
Lignite	0.000	0.050	0.022	0.063	0.023	0.011
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	19.363	27.468	30.638	34.779	35.103	25.957
Fuel wood and wood waste	0.000	0.000	0.000	0.000	0.000	0.000
Biogas	0.000	0.000	0.000	0.000	0.000	0.000
Industrial wastes	0.000	0.000	0.000	0.000	0.000	0.001
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.450	0.660	1.271	0.992	0.960	0.919
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000
Coke	0.000	0.000	0.000	0.000	0.000	0.000
Liquid petroleum gas (LPG)	0.000	0.092	0.092	0.092	0.138	0.664
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.011
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	0.130	0.173	0.130	0.043	0.087	0.559
Fuel oil	46.560	39.280	31.400	22.200	21.640	22.524
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	22.869	21.532	28.215	20.988	15.444	18.478
Coke oven gas	0.000	0.000	0.000	0.000	0.000	0.000
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.000	0.000	0.000	0.000	0.000	0.000
Fuels						
Liquid fuels	70.009	61.737	61.108	44.315	38.269	43.155
Gaseous fuels	19.363	27.468	30.638	34.779	35.103	25.957
Solid fuels	0.114	0.164	0.113	0.176	0.181	0.914
Other fuels	0.000	0.000	0.000	0.000	0.000	0.001
Biomass	0.000	0.000	0.000	0.000	0.000	0.000
Total	**89.486**	**89.369**	**91.859**	**79.270**	**73.553**	**70.027**

Table 3. Fuel consumption [PJ] in 1.A.1.c category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Hard coal	12.314	10.347	10.425	7.912	6.205	23.487	57.593	58.698	59.891	56.159	53.263
Lignite	0.416	0.057	0.078	0.132	0.073	0.322	0.303	0.336	0.370	0.333	0.296
Hard coal briquettes (patent fuels)	0.023	0.000	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.035	0.018	0.020	0.020	0.000	0.040	0.020	0.020	0.040	0.040	0.020
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080	0.082	0.083
Natural gas	13.736	15.364	12.371	12.432	14.665	12.354	17.401	14.850	23.269	21.155	17.779
Fuel wood and wood waste	0.018	0.001	0.006	0.000	0.004	0.008	0.011	0.003	0.003	0.003	0.003
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.011	0.028	0.023
Industrial wastes	0.046	0.001	0.000	0.000	0.000	0.311	0.235	0.184	0.158	0.138	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080	0.080	0.040
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	1.173	0.522	0.619	0.538	0.284	0.513	1.226	0.884	0.598	0.142	0.086
Liquid petroleum gas (LPG)	0.092	0.092	0.092	0.092	0.092	0.046	0.046	0.046	0.046	0.000	0.046
Motor gasoline	0.088	0.088	0.090	0.090	0.090	0.180	0.314	0.269	0.090	0.090	0.045
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	2.130	1.960	1.845	2.145	2.274	4.418	3.560	3.775	3.260	2.832	2.231
Fuel oil	0.240	0.040	0.040	0.040	0.080	0.360	0.280	0.160	0.160	0.080	0.520
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	50.866	50.938	43.557	38.488	39.121	34.604	40.489	37.038	35.105	37.000	33.709
Blast furnace gas	5.632	4.440	3.961	1.995	1.430	2.123	2.488	1.954	1.582	1.893	1.695
Gas works gas	0.005	0.008	0.005	0.180	0.010	0.120	0.000	0.006	0.061	0.019	0.168
Fuels											
Liquid fuels	2.550	2.180	2.067	2.367	2.536	5.004	4.200	4.250	3.716	3.164	2.965
Gaseous fuels	13.736	15.364	12.371	12.432	14.665	12.354	17.401	14.850	23.269	21.155	17.779
Solid fuels	70.465	66.330	58.694	49.265	47.123	61.209	102.119	98.936	97.647	95.586	89.237
Other fuels	0.046	0.001	0.000	0.000	0.000	0.311	0.235	0.184	0.158	0.138	0.000
Biomass	0.018	0.001	0.006	0.000	0.004	0.008	0.011	0.004	0.014	0.031	0.026
Total	**86.815**	**83.875**	**73.138**	**64.064**	**64.328**	**78.886**	**123.966**	**118.224**	**124.804**	**120.074**	**110.007**

Table 3. (cont.) Fuel consumption [PJ] in 1.A.1.c category

Fuels	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Hard coal	44.994	34.648	32.658	16.819	19.618	13.900	12.331	9.542	19.965	14.265	9.458
Lignite	0.286	0.420	0.307	1.000	0.625	0.542	0.175	0.204	1.380	1.766	0.908
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.020	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.083	0.041	0.000	0.041	0.128	0.126	0.000	0.000	0.000	0.000	0.000
Natural gas	19.458	19.491	12.986	12.515	9.741	11.190	10.106	10.363	9.680	9.239	8.858
Fuel wood and wood waste	0.005	0.006	0.039	0.029	0.008	0.004	0.002	0.011	0.057	0.020	0.134
Biogas	0.022	0.027	0.012	0.018	0.018	0.016	0.012	0.015	0.028	0.017	0.003
Industrial wastes	0.000	0.010	0.008	0.005	0.013	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste - non-biogenic fraction	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.080	0.080	0.000	0.040	0.040	0.040	0.080	0.040	0.040	0.032	0.029
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	0.028	0.171	0.028	0.000	0.114	0.057	0.028	0.000	0.028	0.656	0.000
Liquid petroleum gas (LPG)	0.046	0.000	0.000	0.000	0.000	0.000	0.000	0.046	0.046	0.000	0.046
Motor gasoline	0.045	0.045	0.045	0.045	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	1.802	1.802	1.587	1.244	1.244	1.115	1.330	1.287	1.244	1.373	1.516
Fuel oil	0.160	0.240	0.080	0.360	0.240	0.160	0.280	0.040	0.160	0.040	0.040
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	29.872	32.634	33.111	32.027	36.094	36.410	32.796	36.410	43.722	44.789	32.527
Blast furnace gas	0.847	0.840	0.149	0.086	0.021	0.030	0.042	0.045	0.037	0.000	0.000
Gas works gas	0.168	0.004	0.004	0.004	0.004	0.004	0.003	0.004	0.005	0.006	0.012
Fuels											
Liquid fuels	2.216	2.208	1.712	1.730	1.652	1.441	1.690	1.413	1.490	1.445	1.631
Gaseous fuels	19.458	19.491	12.986	12.515	9.741	11.190	10.106	10.363	9.680	9.239	8.858
Solid fuels	76.215	68.737	66.257	49.936	56.476	50.943	45.375	46.205	65.137	61.482	42.905
Other fuels	0.000	0.014	0.008	0.005	0.013	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	0.027	0.037	0.052	0.047	0.026	0.020	0.014	0.026	0.085	0.037	0.137
Total	**97.916**	**90.487**	**81.015**	**64.233**	**67.908**	**63.594**	**57.185**	**58.007**	**76.392**	**72.203**	**53.531**

Table 3. (cont.) Fuel consumption [PJ] in 1.A.1.c category

Fuels	2010	2011	2012	2013	2014	2015
Hard coal	2.221	4.534	2.482	2.184	2.473	2.968
Lignite	1.442	1.666	0.728	0.221	0.283	0.089
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.004
Natural gas	10.321	9.805	11.205	12.013	12.788	24.293
Fuel wood and wood waste	0.349	0.162	0.160	0.122	0.039	0.000
Biogas	0.000	0.000	0.000	0.000	0.000	0.000
Industrial wastes	0.002	0.010	0.001	0.002	0.002	0.001
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.030	0.060	0.062	0.032	0.000	0.020
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000
Coke	0.000	0.057	0.000	0.000	0.000	0.001
Liquid petroleum gas (LPG)	0.000	0.000	0.000	0.000	0.000	0.008
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.037
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	1.645	2.079	1.472	1.819	1.429	1.852
Fuel oil	0.080	0.040	0.040	0.040	0.000	0.007
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	43.667	41.153	38.653	40.220	40.298	42.384
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.012	0.009	0.012	0.008	0.001	0.000
Fuels						
Liquid fuels	1.755	2.179	1.574	1.891	1.429	1.928
Gaseous fuels	10.321	9.805	11.205	12.013	12.788	24.293
Solid fuels	47.342	47.419	41.875	42.633	43.055	45.441
Other fuels	0.002	0.010	0.001	0.002	0.002	0.001
Biomass	0.349	0.162	0.160	0.122	0.039	0.000
Total	**59.769**	**59.575**	**54.815**	**56.661**	**57.313**	**71.663**

Table 4. Fuel consumption [PJ] in 1.A.2.a category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Hard coal	2.367	1.278	1.138	1.243	1.494	9.159	8.513	25.320	28.922	23.636	21.085
Lignite	0.000	0.000	0.000	0.019	0.000	0.000	0.000	0.000	0.000	0.009	0.000
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	73.507	63.332	52.851	33.974	26.568	25.562	25.487	24.239	25.898	28.278	23.993
Fuel wood and wood waste	0.000	0.000	0.000	0.000	0.000	0.016	0.014	0.005	0.006	0.004	0.006
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industrial wastes	3.158	3.344	4.079	6.756	6.497	4.272	3.757	2.941	0.498	0.000	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	12.258	7.268	9.076	19.909	22.910	28.028	34.566	28.031	25.180	29.632	24.400
Liquid petroleum gas (LPG)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046	0.000
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	0.128	0.128	0.172	0.129	0.172	0.343	0.558	0.772	0.901	0.558	0.300
Fuel oil	18.120	15.400	11.000	7.800	5.280	4.280	2.960	2.040	0.960	4.720	1.600
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	32.570	30.997	26.038	22.090	22.568	21.604	25.480	27.686	24.404	24.257	24.742
Blast furnace gas	43.812	40.192	36.484	27.903	25.909	25.676	28.350	37.610	34.205	36.120	29.520
Gas works gas	4.316	3.219	2.174	1.462	0.718	0.613	0.067	0.068	0.080	0.058	0.007
Fuels											
Liquid fuels	18.248	15.528	11.172	7.929	5.452	4.623	3.518	2.812	1.861	5.324	1.900
Gaseous fuels	73.507	63.332	52.851	33.974	26.568	25.562	25.487	24.239	25.898	28.278	23.993
Solid fuels	95.323	82.955	74.910	72.626	73.599	85.080	96.976	118.715	112.791	113.712	99.754
Other fuels	3.158	3.344	4.079	6.756	6.497	4.272	3.757	2.941	0.498	0.000	0.000
Biomass	0.000	0.000	0.000	0.000	0.000	0.016	0.014	0.005	0.006	0.004	0.006
Total	**190.236**	**165.159**	**143.012**	**121.285**	**112.116**	**119.553**	**129.752**	**148.712**	**141.054**	**147.318**	**125.653**

Table 4. (cont.) Fuel consumption [PJ] in 1.A.2.a category

Fuels	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Hard coal	19.074	18.262	14.701	12.424	12.593	17.281	11.379	9.636	11.747	3.950	4.784
Lignite	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hard coal briquettes (patent fuels)	0.000	0.000	0.029	0.029	0.029	0.000	0.000	0.029	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	21.440	22.024	18.328	15.463	14.827	19.969	20.460	21.008	22.716	20.397	16.595
Fuel wood and wood waste	0.004	0.003	0.006	0.003	0.004	0.004	0.002	0.001	0.001	0.001	0.001
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industrial wastes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	21.724	22.144	17.650	20.776	22.147	22.830	15.847	12.681	4.874	5.613	2.679
Liquid petroleum gas (LPG)	0.046	0.184	0.184	0.230	0.184	0.138	0.000	0.000	0.000	0.046	0.046
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	0.343	0.515	0.172	0.129	0.129	0.129	0.086	0.129	0.086	0.086	0.087
Fuel oil	1.800	1.040	0.640	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	15.875	17.574	16.994	15.122	16.132	15.368	12.643	12.770	13.885	9.850	5.296
Blast furnace gas	24.034	31.874	26.768	23.876	25.282	27.109	19.239	20.580	28.194	18.347	9.873
Gas works gas	0.008	0.000	0.277	0.706	1.195	1.654	0.965	1.015	1.313	0.993	0.474
Fuels											
Liquid fuels	2.189	1.739	0.996	0.359	0.313	0.267	0.086	0.129	0.086	0.132	0.133
Gaseous fuels	21.440	22.024	18.328	15.463	14.827	19.969	20.460	21.008	22.716	20.397	16.595
Solid fuels	80.715	89.854	76.419	72.933	77.378	84.242	60.073	56.711	60.013	38.753	23.106
Other fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	0.004	0.003	0.006	0.003	0.004	0.004	0.002	0.001	0.001	0.001	0.001
Total	**104.348**	**113.620**	**95.749**	**88.758**	**92.522**	**104.482**	**80.621**	**77.849**	**82.816**	**59.283**	**39.835**

Table 4. (cont.) Fuel consumption [PJ] in 1.A.2.a category

Fuels	2010	2011	2012	2013	2014	2015
Hard coal	2.644	2.533	2.299	1.972	2.448	0.750
Lignite	0.000	0.000	0.000	0.000	0.000	0.000
Hard coal briquettes (patent fuels)	0.000	0.000	0.029	0.000	0.000	0.001
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	16.916	17.209	16.905	16.242	16.096	16.701
Fuel wood and wood waste	0.000	0.000	0.000	0.001	0.001	0.001
Biogas	0.000	0.000	0.000	0.000	0.000	0.000
Industrial wastes	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.063
Coke	3.050	8.062	9.636	10.601	9.687	11.119
Liquid petroleum gas (LPG)	0.046	0.046	0.092	0.046	0.046	0.054
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.002
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.001
Diesel oil	0.087	0.087	0.043	0.043	0.087	0.090
Fuel oil	0.000	0.000	0.000	0.000	0.000	0.000
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	8.378	8.420	8.230	8.518	9.014	5.556
Blast furnace gas	12.059	11.258	11.352	10.797	11.863	10.229
Gas works gas	0.187	0.203	0.047	0.028	0.099	0.770
Fuels						
Liquid fuels	0.133	0.133	0.135	0.089	0.133	0.210
Gaseous fuels	16.916	17.209	16.905	16.242	16.096	16.701
Solid fuels	26.318	30.476	31.593	31.916	33.112	28.424
Other fuels	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	0.000	0.000	0.000	0.001	0.001	0.001
Total	**43.367**	**47.818**	**48.633**	**48.248**	**49.342**	**45.336**

Table 5. Fuel consumption [PJ] in 1.A.2.b category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Hard coal	1.411	1.323	0.455	0.565	0.850	1.916	1.771	4.172	4.285	3.907	3.331
Lignite	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	5.638	5.470	4.599	4.633	1.213	1.745	5.321	5.447	5.108	5.424	5.638
Fuel wood and wood waste	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.149	0.042	0.026
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industrial wastes	0.870	0.719	0.439	0.483	0.514	0.729	0.823	2.150	2.411	2.361	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	9.754	8.730	6.014	5.216	2.280	2.793	6.412	6.327	6.612	6.584	6.384
Liquid petroleum gas (LPG)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046	0.000	0.000
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	0.043	0.043	0.043	0.043	0.129	0.086	0.129	0.172	0.214	0.214	0.257
Fuel oil	0.640	0.760	0.760	0.800	0.800	0.760	0.800	0.720	0.680	0.640	0.520
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.461	0.437	0.397	0.178	0.186	0.043	0.000	0.000	0.000	0.000	0.000
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.375	0.341	0.042	0.006	0.000	0.000	0.000	0.000	0.000	0.000	2.164
Fuels											
Liquid fuels	0.683	0.803	0.803	0.843	0.929	0.846	0.929	0.892	0.940	0.854	0.777
Gaseous fuels	5.638	5.470	4.599	4.633	1.213	1.745	5.321	5.447	5.108	5.424	5.638
Solid fuels	12.001	10.832	6.908	5.965	3.316	4.752	8.183	10.499	10.897	10.491	11.879
Other fuels	0.870	0.719	0.439	0.483	0.514	0.729	0.823	2.150	2.411	2.361	0.000
Biomass	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.149	0.042	0.026
Total	**19.191**	**17.823**	**12.749**	**11.924**	**5.972**	**8.073**	**15.257**	**18.988**	**19.505**	**19.172**	**18.320**

Table 5. (cont.) Fuel consumption [PJ] in 1.A.2.b category

Fuels	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Hard coal	3.117	3.108	3.790	2.560	2.115	1.092	0.024	0.024	0.570	0.000	0.000
Lignite	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	5.660	5.814	5.700	5.589	5.868	6.405	6.468	6.884	6.740	6.537	5.846
Fuel wood and wood waste	0.010	0.011	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industrial wastes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	5.928	6.070	6.156	6.156	5.928	5.956	5.814	6.042	6.441	6.640	6.270
Liquid petroleum gas (LPG)	0.000	0.046	0.092	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	0.172	0.257	0.172	0.172	0.129	0.172	0.172	0.172	0.172	0.172	0.173
Fuel oil	0.560	0.560	0.520	0.400	0.320	0.400	0.400	0.400	0.160	0.160	0.160
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	2.070	2.268	2.551	2.739	2.539	1.800	1.003	1.004	0.949	1.220	1.086
Fuels											
Liquid fuels	0.732	0.863	0.784	0.618	0.495	0.658	0.618	0.618	0.378	0.378	0.379
Gaseous fuels	5.660	5.814	5.700	5.589	5.868	6.405	6.468	6.884	6.740	6.537	5.846
Solid fuels	11.115	11.446	12.497	11.455	10.582	8.848	6.841	7.070	7.960	7.860	7.356
Other fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	0.010	0.011	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	**17.517**	**18.134**	**18.986**	**17.663**	**16.945**	**15.911**	**13.927**	**14.572**	**15.078**	**14.775**	**13.581**

Table 5. (cont.) Fuel consumption [PJ] in 1.A.2.b category

Fuels	2010	2011	2012	2013	2014	2015
Hard coal	0.000	0.250	0.114	0.113	0.091	0.021
Lignite	0.000	0.000	0.000	0.000	0.000	0.000
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	6.039	6.670	6.890	6.703	6.950	7.225
Fuel wood and wood waste	0.000	0.000	0.000	0.000	0.000	0.000
Biogas	0.000	0.000	0.000	0.000	0.000	0.000
Industrial wastes	0.001	0.000	0.000	0.000	0.000	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.004
Coke	6.042	6.214	6.384	6.270	6.469	6.580
Liquid petroleum gas (LPG)	0.046	0.046	0.000	0.000	0.000	0.019
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.001
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.002
Diesel oil	0.216	0.173	0.173	0.173	0.173	0.155
Fuel oil	0.120	0.120	0.120	0.120	0.080	0.098
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.000	0.039	0.043	0.039	0.051	0.047
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.960	0.967	0.928	1.066	1.275	1.316
Fuels						
Liquid fuels	0.382	0.339	0.293	0.293	0.253	0.279
Gaseous fuels	6.039	6.670	6.890	6.703	6.950	7.225
Solid fuels	7.002	7.470	7.469	7.488	7.886	7.964
Other fuels	0.001	0.000	0.000	0.000	0.000	0.000
Biomass	0.000	0.000	0.000	0.000	0.000	0.000
Total	**13.424**	**14.479**	**14.652**	**14.484**	**15.089**	**15.468**

Table 6. Fuel consumption [PJ] in 1.A.2.c category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Hard coal	9.197	9.059	7.216	6.623	4.550	13.125	7.945	70.221	71.191	63.913	54.992
Lignite	0.056	0.038	0.039	0.038	0.027	0.047	0.029	0.428	0.460	0.389	0.429
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	6.409	6.244	5.289	4.340	4.432	10.075	4.507	6.356	6.191	11.024	9.408
Fuel wood and wood waste	0.345	0.390	0.118	0.039	0.010	0.003	0.035	0.007	0.000	0.000	0.000
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Industrial wastes	12.255	14.915	16.712	18.586	17.039	18.003	22.591	21.546	17.374	14.356	0.672
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.600	2.880	3.440
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	1.763	4.530	2.679	1.966	1.852	1.881	1.938	3.477	2.964	1.454	1.539
Liquid petroleum gas (LPG)	3.726	4.554	0.000	0.000	0.000	0.046	0.000	0.000	0.000	0.000	0.000
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	1.406	1.363	0.987	0.858	0.772	0.729	0.729	0.944	1.072	1.072	1.416
Fuel oil	6.080	6.120	2.720	1.880	2.760	2.480	3.600	8.160	9.320	9.360	17.560
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	3.614	1.930	0.396	3.465	5.445	4.455	0.198	1.584	6.584	9.652	18.513
Coke oven gas	1.053	0.993	0.701	0.522	0.440	1.548	0.276	0.729	0.784	0.140	0.174
Blast furnace gas	0.148	0.136	0.047	0.010	0.006	0.011	0.014	0.023	0.004	0.013	0.004
Gas works gas	0.190	0.230	0.214	0.192	0.133	0.126	0.110	0.070	0.052	0.000	0.000
Fuels											
Liquid fuels	14.825	13.968	4.103	6.203	8.977	7.710	4.527	10.688	19.576	22.964	40.929
Gaseous fuels	6.409	6.244	5.289	4.340	4.432	10.075	4.507	6.356	6.191	11.024	9.408
Solid fuels	12.407	14.986	10.896	9.351	7.008	16.738	10.312	74.948	75.455	65.909	57.138
Other fuels	12.255	14.915	16.712	18.586	17.039	18.003	22.591	21.546	17.374	14.356	0.672
Biomass	0.345	0.390	0.118	0.039	0.010	0.003	0.035	0.007	0.000	0.000	0.001
Total	**46.241**	**50.503**	**37.118**	**38.519**	**37.466**	**52.529**	**41.972**	**113.545**	**118.596**	**114.253**	**108.148**

Table 6. (cont.) Fuel consumption [PJ] in 1.A.2.c category

Fuels	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Hard coal	50.522	50.115	48.485	45.458	27.959	28.709	30.107	27.683	26.780	43.781	42.011
Lignite	0.138	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	9.041	9.464	8.481	7.199	6.457	7.498	8.104	9.053	8.754	7.950	9.707
Fuel wood and wood waste	0.000	0.000	0.000	0.001	0.153	0.102	0.165	0.000	0.121	0.000	0.058
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industrial wastes	0.582	0.607	0.618	0.567	0.875	1.122	0.628	0.721	0.707	0.509	0.584
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	2.520	0.480	0.480	0.280	0.240	0.000	0.040	0.040	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	1.624	1.596	1.710	1.738	1.568	1.881	1.454	2.964	1.938	1.168	0.884
Liquid petroleum gas (LPG)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.092
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.090
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	1.330	1.030	4.762	4.247	4.333	3.904	3.775	4.076	3.732	3.689	4.590
Fuel oil	15.680	13.520	7.360	7.640	7.080	7.320	3.920	3.920	3.560	0.640	1.080
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	19.602	23.314	20.542	20.740	21.830	22.424	18.266	21.334	22.473	19.156	20.889
Coke oven gas	0.130	0.050	0.150	0.285	0.634	0.606	0.608	0.547	0.658	0.654	0.483
Blast furnace gas	0.007	0.011	0.008	0.004	0.013	0.019	0.006	0.000	0.000	0.000	0.000
Gas works gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuels											
Liquid fuels	39.132	38.344	33.144	32.907	33.483	33.648	26.001	29.370	29.765	23.485	26.741
Gaseous fuels	9.041	9.464	8.481	7.199	6.457	7.498	8.104	9.053	8.754	7.950	9.707
Solid fuels	52.421	51.772	50.353	47.485	30.174	31.215	32.175	31.194	29.376	45.603	43.378
Other fuels	0.582	0.607	0.618	0.567	0.875	1.122	0.628	0.721	0.707	0.509	0.584
Biomass	0.000	0.000	0.000	0.001	0.153	0.102	0.165	0.000	0.121	0.000	0.058
Total	**101.176**	**100.187**	**92.596**	**88.159**	**71.142**	**73.585**	**67.073**	**70.338**	**68.723**	**77.547**	**80.468**

Table 6. (cont.) Fuel consumption [PJ] in 1.A.2.c category

Fuels	2010	2011	2012	2013	2014	2015
Hard coal	47.304	47.704	46.768	47.308	46.501	39.348
Lignite	0.000	0.000	0.000	0.000	0.000	0.000
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.002
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	11.807	13.887	13.568	14.696	14.500	14.859
Fuel wood and wood waste	0.058	0.053	0.131	0.050	0.103	0.088
Biogas	0.000	0.000	0.000	0.000	0.008	0.006
Industrial wastes	0.770	0.732	0.581	1.092	1.082	0.936
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000
Coke	0.826	1.340	3.164	3.021	2.992	3.104
Liquid petroleum gas (LPG)	0.138	0.138	0.138	0.184	0.138	6.026
Motor gasoline	0.000	0.045	0.045	0.045	0.000	0.010
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	4.200	3.637	3.334	4.027	2.468	1.719
Fuel oil	0.600	0.720	0.560	0.440	0.400	0.589
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	17.176	12.276	9.702	11.979	10.296	7.443
Coke oven gas	0.627	0.616	0.595	0.639	0.645	0.624
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.000	0.000	0.000	0.000	0.000	0.000
Fuels						
Liquid fuels	22.114	16.816	13.779	16.675	13.302	15.789
Gaseous fuels	11.807	13.887	13.568	14.696	14.500	14.859
Solid fuels	48.757	49.660	50.527	50.968	50.138	43.078
Other fuels	0.770	0.732	0.581	1.092	1.082	0.936
Biomass	0.058	0.053	0.131	0.050	0.111	0.094
Total	**83.506**	**81.148**	**78.586**	**83.481**	**79.133**	**74.756**

Table 7. Fuel consumption [PJ] in 1.A.2.d category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Hard coal	1.639	1.940	1.548	1.741	1.379	4.524	3.836	22.318	22.233	23.979	18.936
Lignite	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	0.103	0.162	0.101	0.061	0.026	0.061	0.250	0.232	0.455	1.096	0.563
Fuel wood and wood waste	0.352	0.205	0.001	0.000	0.000	1.585	1.610	15.437	16.243	16.472	16.476
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industrial wastes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	0.331	0.247	0.256	0.285	0.256	0.314	0.285	0.285	0.256	0.142	0.086
Liquid petroleum gas (LPG)	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.092	0.184
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	0.085	0.085	0.043	0.086	0.043	0.043	0.086	0.129	0.601	0.987	1.115
Fuel oil	1.240	1.160	1.280	1.200	1.320	1.560	1.400	2.360	1.040	1.040	1.320
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.004	0.003	0.003	0.003	0.002	0.003	0.002	0.002	0.001	0.000	0.000
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.003	0.003	0.003	0.014	0.002	0.000	0.000	0.000	0.004	0.000	0.000
Fuels											
Liquid fuels	1.371	1.291	1.369	1.332	1.409	1.649	1.532	2.535	1.687	2.119	2.619
Gaseous fuels	0.103	0.162	0.101	0.061	0.026	0.061	0.250	0.232	0.455	1.096	0.563
Solid fuels	1.976	2.192	1.810	2.043	1.639	4.841	4.123	22.605	22.494	24.121	19.022
Other fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	0.352	0.205	0.001	0.000	0.000	1.585	1.610	15.437	16.243	16.472	16.476
Total	**3.803**	**3.850**	**3.281**	**3.436**	**3.074**	**8.136**	**7.515**	**40.809**	**40.879**	**43.808**	**38.680**

Table 7. (cont.) Fuel consumption [PJ] in 1.A.2.d category

Fuels	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Hard coal	17.528	15.696	15.564	14.317	14.050	13.797	13.430	11.592	9.452	7.850	8.515
Lignite	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	1.007	1.210	1.445	1.461	2.094	2.657	2.288	2.976	4.087	4.822	4.972
Fuel wood and wood waste	15.545	15.938	15.138	16.622	17.950	18.957	18.611	19.379	18.644	19.729	19.171
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.018
Industrial wastes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.040	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	0.000	0.028	0.028	0.028	0.057	0.028	0.028	0.028	0.028	0.028	0.000
Liquid petroleum gas (LPG)	0.092	0.138	0.092	0.046	0.046	0.092	0.046	0.092	0.184	0.046	0.092
Motor gasoline	0.000	0.000	0.000	0.000	0.090	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	0.815	0.601	0.472	0.429	0.472	0.472	0.343	0.386	0.429	0.300	0.303
Fuel oil	1.320	1.360	1.480	1.560	1.600	1.680	1.600	1.600	1.720	1.640	1.600
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuels											
Liquid fuels	2.227	2.099	2.044	2.035	2.208	2.244	2.029	2.118	2.333	1.986	1.995
Gaseous fuels	1.007	1.210	1.445	1.461	2.094	2.657	2.288	2.976	4.087	4.822	4.972
Solid fuels	17.528	15.724	15.592	14.345	14.107	13.825	13.458	11.620	9.480	7.878	8.515
Other fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	15.545	15.938	15.138	16.622	17.950	18.957	18.611	19.379	18.644	19.729	19.189
Total	**36.307**	**34.971**	**34.219**	**34.463**	**36.359**	**37.683**	**36.386**	**36.093**	**34.544**	**34.415**	**34.671**

Table 7. (cont.) Fuel consumption [PJ] in 1.A.2.d category

Fuels	2010	2011	2012	2013	2014	2015
Hard coal	10.086	11.301	10.643	11.460	11.291	11.130
Lignite	0.000	0.000	0.000	0.000	0.000	0.000
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	5.134	4.587	5.535	6.271	6.994	7.167
Fuel wood and wood waste	19.581	19.402	20.358	27.152	26.987	27.070
Biogas	0.049	0.073	0.083	0.091	0.105	0.086
Industrial wastes	0.000	0.000	0.000	0.037	0.125	0.108
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000
Coke	0.028	0.000	0.000	0.000	0.000	0.000
Liquid petroleum gas (LPG)	0.092	0.092	0.092	0.092	0.092	0.094
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.006
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	0.260	0.216	0.173	0.260	0.173	0.282
Fuel oil	1.640	1.680	1.520	1.520	1.280	1.458
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.000	0.000	0.000	0.000	0.000	0.000
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.000	0.000	0.000	0.000	0.000	0.000
Fuels						
Liquid fuels	1.992	1.988	1.785	1.872	1.545	1.840
Gaseous fuels	5.134	4.587	5.535	6.271	6.994	7.167
Solid fuels	10.114	11.301	10.643	11.460	11.291	11.130
Other fuels	0.000	0.000	0.000	0.037	0.125	0.108
Biomass	19.630	19.475	20.441	27.243	27.092	27.157
Total	**36.870**	**37.351**	**38.404**	**46.883**	**47.047**	**47.402**

Table 8. Fuel consumption [PJ] in 1.A.2.e category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Hard coal	25.200	31.694	31.914	35.940	32.724	55.643	53.801	73.024	88.777	78.207	64.659
Lignite	0.085	0.104	0.058	0.019	0.018	0.369	0.195	0.265	0.380	0.250	0.317
Hard coal briquettes (patent fuels)	0.023	0.023	0.000	0.000	0.000	0.205	0.205	0.059	0.029	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	1.965	1.910	1.970	1.984	2.339	3.171	7.180	3.839	15.051	12.927	10.694
Fuel wood and wood waste	0.114	0.105	0.091	0.094	0.072	0.151	0.056	0.082	0.094	0.075	0.101
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
Industrial wastes	0.003	0.002	0.000	0.000	0.031	0.003	0.003	0.000	0.000	0.000	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080	0.080	0.040
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	3.609	3.569	3.334	2.936	2.650	3.249	2.708	2.565	3.192	2.850	2.080
Liquid petroleum gas (LPG)	0.046	0.046	0.046	0.046	0.046	0.046	0.092	0.138	0.184	0.184	0.276
Motor gasoline	0.440	0.264	0.135	0.090	0.135	0.180	0.135	0.180	0.180	0.045	0.090
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	2.087	1.534	1.244	1.030	0.901	1.201	1.072	0.901	5.448	5.191	6.821
Fuel oil	1.840	1.640	1.640	1.480	1.320	3.280	3.920	6.120	2.720	2.400	2.680
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.336	0.120	0.111	0.125	0.124	0.102	0.003	0.025	0.004	0.000	0.000
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.027	0.032	0.051	0.014	0.001	0.001	0.000	0.000	0.003	0.000	0.000
Fuels											
Liquid fuels	4.413	3.484	3.065	2.646	2.402	4.707	5.219	7.339	8.612	7.900	9.907
Gaseous fuels	1.965	1.910	1.970	1.984	2.339	3.171	7.180	3.839	15.051	12.927	10.694
Solid fuels	29.280	35.542	35.468	39.034	35.517	59.569	56.912	75.938	92.385	81.307	67.056
Other fuels	0.003	0.002	0.000	0.000	0.031	0.003	0.003	0.000	0.000	0.000	0.000
Biomass	0.114	0.105	0.091	0.094	0.072	0.151	0.056	0.082	0.094	0.075	0.104
Total	**35.775**	**41.043**	**40.594**	**43.758**	**40.361**	**67.601**	**69.370**	**87.198**	**116.142**	**102.209**	**87.761**

Table 8. (cont.) Fuel consumption [PJ] in 1.A.2.e category

Fuels	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Hard coal	46.327	43.417	40.020	41.803	39.030	36.095	35.894	30.864	31.165	26.778	25.814
Lignite	0.237	0.191	0.149	0.192	0.175	0.129	0.092	0.074	0.000	0.000	0.000
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	9.255	10.494	11.363	12.490	15.075	16.164	17.456	18.623	20.614	20.725	20.950
Fuel wood and wood waste	0.069	0.049	0.062	0.060	0.323	0.373	0.214	0.239	0.164	0.365	0.192
Biogas	0.020	0.063	0.042	0.037	0.063	0.074	0.068	0.072	0.084	0.094	0.109
Industrial wastes	0.000	0.001	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	1.710	1.624	1.368	1.539	1.340	1.226	0.969	0.855	0.912	0.656	0.656
Liquid petroleum gas (LPG)	0.460	0.690	0.874	1.426	1.380	1.564	1.426	1.196	0.920	1.012	0.966
Motor gasoline	0.045	0.135	0.045	0.090	0.090	0.000	0.045	0.045	0.045	0.045	0.045
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	7.465	7.336	7.250	6.864	6.864	6.178	5.405	4.504	4.076	4.504	3.161
Fuel oil	2.280	2.520	2.720	2.960	3.040	3.280	3.160	2.920	2.760	2.000	1.440
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuels											
Liquid fuels	10.250	10.681	10.889	11.340	11.374	11.022	10.036	8.665	7.801	7.561	5.612
Gaseous fuels	9.255	10.494	11.363	12.490	15.075	16.164	17.456	18.623	20.614	20.725	20.950
Solid fuels	48.274	45.232	41.557	43.534	40.545	37.450	36.955	31.793	32.077	27.434	26.470
Other fuels	0.000	0.001	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	0.089	0.112	0.104	0.097	0.386	0.447	0.282	0.311	0.248	0.459	0.301
Total	**67.868**	**66.520**	**63.927**	**67.461**	**67.380**	**65.083**	**64.729**	**59.392**	**60.740**	**56.179**	**53.333**

Table 8. (cont.) Fuel consumption [PJ] in 1.A.2.e category

Fuels	2010	2011	2012	2013	2014	2015
Hard coal	25.903	25.614	26.172	24.724	24.428	22.625
Lignite	0.000	0.000	0.000	0.000	0.000	0.002
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	21.610	22.128	23.704	24.475	25.094	26.008
Fuel wood and wood waste	0.441	0.534	0.436	0.664	0.747	1.134
Biogas	0.101	0.145	0.199	0.202	0.241	0.345
Industrial wastes	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000
Coke	0.627	0.542	0.314	0.370	0.456	0.609
Liquid petroleum gas (LPG)	0.828	0.782	0.690	0.828	0.966	0.984
Motor gasoline	0.045	0.000	0.000	0.000	0.000	0.015
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	2.901	2.382	2.944	1.992	1.516	1.324
Fuel oil	1.240	1.360	1.360	1.080	1.000	0.603
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.000	0.000	0.000	0.000	0.000	0.000
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.000	0.000	0.000	0.000	0.000	0.000
Fuels						
Liquid fuels	5.014	4.524	4.994	3.900	3.482	2.926
Gaseous fuels	21.610	22.128	23.704	24.475	25.094	26.008
Solid fuels	26.530	26.156	26.486	25.094	24.884	23.236
Other fuels	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	0.542	0.679	0.635	0.866	0.988	1.479
Total	**53.696**	**53.487**	**55.819**	**54.335**	**54.448**	**53.650**

Table 9. Fuel consumption [PJ] in 1.A.2.f category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Hard coal	102.301	98.072	72.637	72.514	68.894	76.924	83.926	79.647	86.930	81.562	66.639
Lignite	0.263	0.180	0.156	0.150	0.091	0.161	0.117	0.163	0.150	0.185	0.153
Hard coal briquettes (patent fuels)	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.035	0.018	0.020	0.020	0.000	0.000	0.000	0.000	0.000	0.040	0.040
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	28.729	28.108	24.574	22.704	22.246	21.986	21.506	25.518	26.650	25.655	27.097
Fuel wood and wood waste	1.778	1.924	1.155	0.455	0.042	0.033	0.004	0.010	0.010	0.005	0.006
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industrial wastes	0.382	0.446	0.068	0.023	0.267	0.250	0.145	0.197	0.144	0.047	0.207
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.400	1.200
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	18.984	18.997	13.936	11.314	11.115	10.716	11.400	10.118	11.144	8.664	10.089
Liquid petroleum gas (LPG)	0.000	0.000	0.000	0.000	0.000	0.000	0.092	0.138	0.046	0.092	0.230
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.135	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	1.321	1.108	0.944	0.815	0.772	0.772	0.944	1.330	1.802	2.788	2.016
Fuel oil	6.000	6.720	4.160	2.800	3.560	3.960	4.320	6.080	3.760	4.120	6.680
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	2.685	2.241	2.101	1.821	1.341	1.234	0.482	0.886	0.509	0.353	0.988
Blast furnace gas	0.140	0.118	0.101	0.106	0.079	0.108	0.120	0.053	0.053	0.036	0.010
Gas works gas	3.926	3.761	3.270	3.136	2.706	2.392	2.090	1.788	1.033	0.501	0.330
Fuels											
Liquid fuels	7.321	7.828	5.104	3.615	4.332	4.732	5.356	7.548	5.608	8.535	10.126
Gaseous fuels	28.729	28.108	24.574	22.704	22.246	21.986	21.506	25.518	26.650	25.655	27.097
Solid fuels	128.357	123.387	92.221	89.061	84.226	91.535	98.135	92.655	99.819	91.341	78.249
Other fuels	0.382	0.446	0.068	0.023	0.267	0.250	0.145	0.197	0.144	0.047	0.207
Biomass	1.778	1.924	1.155	0.455	0.042	0.033	0.004	0.010	0.010	0.005	0.006
Total	**166.566**	**161.692**	**123.122**	**115.858**	**111.113**	**118.536**	**125.146**	**125.928**	**132.231**	**125.583**	**115.685**

Table 9. (cont.) Fuel consumption [PJ] in 1.A.2.f category

Fuels	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Hard coal	59.965	53.349	41.103	33.981	30.332	32.332	31.206	31.547	43.846	36.975	26.468
Lignite	0.069	0.057	0.009	0.019	0.000	0.000	0.000	0.000	0.000	0.063	0.000
Hard coal briquettes (patent fuels)	0.000	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.040	0.040	0.020	0.020	0.040	0.040	0.040	0.040	0.040	0.040	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	23.917	27.976	31.858	33.233	35.584	38.233	38.963	41.283	42.465	39.696	41.394
Fuel wood and wood waste	0.002	0.006	0.275	0.292	0.102	0.261	0.110	0.139	0.116	0.223	0.285
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industrial wastes	0.529	0.472	0.524	0.508	1.471	1.818	2.701	5.043	5.961	7.400	7.715
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.003	0.013	0.717	1.620	1.776	0.378	4.419
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.029
Other petroleum products	0.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	4.416	3.232	7.072	3.584	1.568	1.152	2.752
Coke	8.008	6.868	4.874	4.418	4.874	4.674	2.594	3.050	4.503	2.679	2.280
Liquid petroleum gas (LPG)	0.322	0.506	0.736	1.610	1.380	1.656	0.874	0.368	0.322	0.368	0.460
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.045
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	1.716	1.630	1.973	2.145	2.274	2.788	2.188	1.888	1.845	2.188	1.992
Fuel oil	5.920	3.880	4.320	4.600	4.520	4.480	4.080	2.880	2.120	2.400	1.960
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.804	0.413	0.897	0.767	0.746	1.505	1.370	1.465	1.614	1.523	1.233
Blast furnace gas	0.005	0.011	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Gas works gas	0.304	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuels											
Liquid fuels	8.358	6.016	7.029	8.355	12.590	12.156	14.214	8.720	5.855	6.108	7.209
Gaseous fuels	23.917	27.976	31.858	33.233	35.584	38.233	38.963	41.283	42.465	39.696	41.394
Solid fuels	69.195	60.767	46.906	39.208	35.992	38.551	35.210	36.102	50.003	41.280	29.982
Other fuels	0.529	0.472	0.524	0.508	1.474	1.831	3.418	6.663	7.737	7.778	12.134
Biomass	0.002	0.006	0.275	0.292	0.102	0.261	0.110	0.139	0.117	0.224	0.314
Total	**102.001**	**95.237**	**86.592**	**81.596**	**85.742**	**91.032**	**91.915**	**92.907**	**106.177**	**95.086**	**91.033**

Table 9. (cont.) Fuel consumption [PJ] in 1.A.2.f category

Fuels	2010	2011	2012	2013	2014	2015
Hard coal	28.045	34.403	26.766	22.808	23.013	22.949
Lignite	0.224	0.283	0.549	0.347	0.487	0.593
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.180	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	42.872	44.492	42.349	40.911	40.873	40.514
Fuel wood and wood waste	0.299	0.348	0.407	0.498	0.724	0.623
Biogas	0.000	0.000	0.000	0.000	0.000	0.041
Industrial wastes	10.454	11.729	12.170	12.763	15.171	15.068
Municipal waste - non-biogenic fraction	4.512	5.017	3.913	3.752	4.060	4.011
Municipal waste – biogenic fraction	0.123	1.338	1.360	1.391	1.528	1.664
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	1.792	0.064	0.064	0.160	0.032	0.000
Coke	2.536	2.679	2.508	2.366	2.508	3.139
Liquid petroleum gas (LPG)	0.414	0.368	0.230	0.322	0.414	0.356
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.032
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.005
Diesel oil	1.992	2.338	1.862	1.472	1.299	1.287
Fuel oil	1.840	1.640	1.400	1.320	0.680	0.305
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	1.614	1.866	1.687	1.552	1.951	1.841
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.000	0.000	0.000	0.000	0.000	0.000
Fuels						
Liquid fuels	6.038	4.410	3.556	3.274	2.425	1.985
Gaseous fuels	42.872	44.492	42.349	40.911	40.873	40.514
Solid fuels	32.419	39.231	31.510	27.253	27.959	28.522
Other fuels	14.966	16.746	16.083	16.515	19.231	19.079
Biomass	0.422	1.686	1.767	1.889	2.252	2.328
Total	**96.717**	**106.565**	**95.265**	**89.842**	**92.740**	**92.428**

Table 10. Fuel consumption [PJ] in 1.A.2.g category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Hard coal	56.386	49.492	38.514	36.640	29.689	80.735	73.256	81.016	105.124	88.131	65.259
Lignite	0.789	0.662	0.176	0.564	0.182	0.654	0.274	0.621	0.600	0.389	0.317
Hard coal briquettes (patent fuels)	0.210	0.139	0.088	0.029	0.000	0.000	0.000	0.000	0.029	0.000	0.000
Brown coal briquettes	0.088	0.071	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	24.039	22.347	15.645	11.755	13.811	17.922	17.336	15.176	14.210	16.060	17.640
Fuel wood and wood waste	8.335	7.545	5.826	5.518	5.035	4.995	3.410	4.968	6.519	8.194	8.231
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.001	0.002
Industrial wastes	0.082	0.058	0.022	0.012	0.134	0.298	1.593	2.294	2.675	1.133	2.080
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.120	0.440	0.520
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	20.610	18.284	12.797	10.032	11.001	10.402	6.640	5.614	5.614	3.961	2.023
Liquid petroleum gas (LPG)	0.184	0.138	0.138	0.092	0.092	0.092	0.138	0.046	0.138	0.414	0.460
Motor gasoline	1.716	1.584	1.123	1.302	0.898	0.943	0.539	1.032	0.630	2.201	0.763
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.086
Diesel oil	14.228	13.078	10.425	8.795	7.294	7.722	7.163	8.280	18.533	15.574	13.214
Fuel oil	3.720	3.240	2.160	1.840	2.400	3.320	3.720	5.040	3.200	3.280	3.760
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	2.499	2.357	1.675	0.984	0.734	0.475	0.056	0.049	0.022	0.010	0.011
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	1.457	1.056	0.732	0.459	0.212	0.022	0.063	0.016	0.001	0.001	0.000
Fuels											
Liquid fuels	19.848	18.040	13.846	12.029	10.684	12.077	11.560	14.398	22.621	21.909	18.803
Gaseous fuels	24.039	22.347	15.645	11.755	13.811	17.922	17.336	15.176	14.210	16.060	17.640
Solid fuels	82.038	72.062	54.022	48.748	41.858	92.328	80.329	87.356	111.430	92.492	67.610
Other fuels	0.082	0.058	0.022	0.012	0.134	0.298	1.593	2.294	2.675	1.133	2.080
Biomass	8.335	7.545	5.826	5.518	5.035	4.995	3.410	4.970	6.520	8.195	8.233
Total	**134.342**	**120.051**	**89.361**	**78.062**	**71.522**	**127.620**	**114.228**	**124.194**	**157.456**	**139.789**	**114.366**

Table 10. (cont.) Fuel consumption [PJ] in 1.A.2.g category

Fuels	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Hard coal	49.964	40.662	31.997	26.862	25.045	21.927	20.047	18.024	16.542	14.069	10.978
Lignite	0.247	0.210	0.149	0.106	0.055	0.009	0.009	0.018	0.000	0.009	0.163
Hard coal briquettes (patent fuels)	0.000	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.080	0.100
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	16.354	18.545	18.319	19.273	21.156	22.595	23.325	23.290	23.541	26.265	22.861
Fuel wood and wood waste	8.604	10.105	10.716	12.300	11.897	12.184	11.918	11.028	13.166	14.043	14.004
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.003
Industrial wastes	1.482	2.075	1.802	2.078	2.503	1.661	1.700	3.789	0.937	1.154	1.392
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.005	0.000	0.000
Other petroleum products	0.360	0.240	0.040	0.080	0.080	0.120	0.080	0.120	0.080	0.064	0.029
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	2.877	2.282	2.338	1.909	1.768	1.110	0.626	0.854	0.825	0.684	0.454
Liquid petroleum gas (LPG)	0.782	1.472	1.104	1.104	1.242	1.334	1.334	1.242	1.150	1.196	0.966
Motor gasoline	0.360	0.315	0.180	0.135	0.225	0.180	0.180	0.225	0.135	0.090	0.135
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.086	0.086	0.086	0.043	0.043	0.043	0.043	0.086	0.086	0.043	0.043
Diesel oil	11.455	10.767	9.867	9.780	10.168	9.609	10.468	11.067	9.952	9.138	9.092
Fuel oil	3.560	3.600	3.080	2.840	2.720	2.880	2.920	2.640	1.480	1.280	1.280
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.006	0.004	0.020	0.016	0.117	0.436	0.110	0.062	0.059	0.047	0.033
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.013	0.013	0.000	0.000	0.000	0.006
Gas works gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuels											
Liquid fuels	16.603	16.480	14.357	13.982	14.478	14.166	15.025	15.380	12.883	11.811	11.545
Gaseous fuels	16.354	18.545	18.319	19.273	21.156	22.595	23.325	23.290	23.541	26.265	22.861
Solid fuels	53.094	43.187	34.504	28.893	26.985	23.495	20.805	18.958	17.446	14.889	11.734
Other fuels	1.482	2.075	1.802	2.078	2.503	1.661	1.700	3.789	0.938	1.154	1.392
Biomass	8.604	10.105	10.716	12.300	11.897	12.184	11.918	11.030	13.171	14.044	14.007
Total	**96.137**	**90.392**	**79.698**	**76.526**	**77.019**	**74.101**	**72.773**	**72.447**	**67.979**	**68.163**	**61.539**

Table 10. (cont.) Fuel consumption [PJ] in 1.A.2.g category

Fuels	2010	2011	2012	2013	2014	2015
Hard coal	11.348	10.096	7.619	7.288	6.676	7.793
Lignite	0.089	0.363	0.269	0.432	0.158	0.157
Hard coal briquettes (patent fuels)	0.000	0.029	0.000	0.000	0.000	0.003
Brown coal briquettes	0.080	0.200	0.100	0.040	0.040	0.037
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	24.964	23.876	23.019	26.036	23.395	22.751
Fuel wood and wood waste	17.901	20.051	20.854	24.842	25.929	27.937
Biogas	0.000	0.000	0.000	0.000	0.000	0.044
Industrial wastes	0.070	0.052	0.069	0.098	0.064	0.045
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.090	0.090	0.093	0.064	0.096	0.093
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.715
Coke	0.370	0.228	0.171	0.199	0.142	0.120
Liquid petroleum gas (LPG)	1.150	1.196	0.966	1.150	1.334	1.170
Motor gasoline	0.270	0.135	0.090	0.090	0.176	0.301
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.043	0.043	0.000	0.043	0.043	0.022
Diesel oil	8.661	8.703	7.101	6.538	6.668	6.347
Fuel oil	1.480	1.480	0.960	0.560	0.560	0.261
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.020	0.025	0.010	0.010	0.004	0.003
Blast furnace gas	0.009	0.012	0.004	0.004	0.002	0.000
Gas works gas	0.000	0.000	0.000	0.000	0.000	0.000
Fuels						
Liquid fuels	11.694	11.647	9.210	8.445	8.877	8.910
Gaseous fuels	24.964	23.876	23.019	26.036	23.395	22.751
Solid fuels	11.916	10.953	8.173	7.973	7.022	8.113
Other fuels	0.070	0.052	0.069	0.098	0.064	0.045
Biomass	17.901	20.051	20.854	24.842	25.929	27.981
Total	**66.545**	**66.579**	**61.325**	**67.394**	**65.287**	**67.801**

Table 11. Fuel consumption [PJ] in 1.A.4.a category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Hard coal	207.335	163.251	54.547	62.166	54.214	50.334	34.666	34.267	25.608	18.696	16.200
Lignite	0.540	0.390	0.000	0.000	0.000	0.017	0.091	0.025	0.026	0.009	0.009
Hard coal briquettes (patent fuels)	5.749	1.581	0.000	0.000	0.000	0.000	0.000	0.322	0.000	0.000	0.000
Brown coal briquettes	0.548	0.476	0.420	0.000	0.000	1.780	1.820	1.940	0.240	0.540	0.120
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	13.079	12.601	13.787	10.977	11.190	11.548	9.573	13.260	18.771	24.256	32.769
Fuel wood and wood waste	0.000	0.000	4.501	2.945	0.000	12.312	11.719	11.560	10.046	9.028	8.437
Biogas	0.084	0.123	0.379	0.187	0.206	0.062	0.249	0.423	0.579	0.599	0.648
Industrial wastes	2.135	0.144	0.504	0.081	0.011	0.352	0.089	0.000	0.124	0.000	0.003
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	80.500	77.450	34.712	28.264	40.068	33.402	27.332	25.878	26.220	28.642	13.480
Liquid petroleum gas (LPG)	0.000	0.000	0.000	0.000	0.000	0.000	1.334	0.782	0.782	1.748	1.564
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.987	4.290	6.220
Fuel oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080	0.000
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	1.417	1.135	1.224	1.088	0.877	0.428	0.123	0.053	0.034	0.127	0.000
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.937	0.330	0.312	0.554	0.576	0.091	0.014	0.014	0.014	0.072	0.040
Fuels											
Liquid fuels	0.000	0.000	0.000	0.000	0.000	0.000	1.334	0.782	1.769	6.118	7.784
Gaseous fuels	13.079	12.601	13.787	10.977	11.190	11.548	9.573	13.260	18.771	24.256	32.769
Solid fuels	297.025	244.614	91.215	92.072	95.735	86.052	64.046	62.499	52.142	48.086	29.849
Other fuels	2.135	0.144	0.504	0.081	0.011	0.352	0.089	0.000	0.124	0.000	0.003
Biomass	0.084	0.123	4.880	3.132	0.206	12.374	11.968	11.983	10.625	9.627	9.085
Total	**312.322**	**257.481**	**110.386**	**106.262**	**107.142**	**110.326**	**87.010**	**88.524**	**83.431**	**88.087**	**79.490**

Table 11. (cont.) Fuel consumption [PJ] in 1.A.4.a category

Fuels	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Hard coal	15.104	13.354	13.460	21.677	21.539	22.502	25.405	29.320	25.291	28.763	31.393
Lignite	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.520	0.380	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	37.696	38.567	49.971	61.001	67.057	69.570	68.410	63.517	65.488	71.250	75.746
Fuel wood and wood waste	8.553	8.514	5.736	5.747	5.752	6.028	6.171	4.580	5.482	5.020	7.104
Biogas	0.663	0.678	0.860	0.683	0.700	0.558	0.343	0.505	1.081	1.795	1.675
Industrial wastes	0.004	0.004	0.091	0.092	0.060	0.002	0.022	0.000	0.000	0.000	0.092
Municipal waste - non-biogenic fraction	0.000	0.020	0.000	0.009	0.011	0.000	0.000	0.000	0.000	0.037	0.031
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.640	0.880	3.000	0.360	1.720	2.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	12.226	8.265	3.819	8.122	8.180	5.928	2.679	2.878	2.594	2.080	2.138
Liquid petroleum gas (LPG)	2.070	2.300	3.266	3.358	5.520	5.014	4.600	5.244	4.922	4.462	3.772
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	7.636	13.342	15.015	19.090	16.774	14.286	13.213	23.252	22.866	22.866	21.910
Fuel oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.002
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.005	0.005	0.004	0.003	0.004	0.003	0.003	0.003	0.014	0.018	0.017
Fuels											
Liquid fuels	10.346	16.522	21.281	22.808	24.014	21.300	17.813	28.496	27.788	27.328	25.682
Gaseous fuels	37.696	38.567	49.971	61.001	67.057	69.570	68.410	63.517	65.488	71.250	75.746
Solid fuels	27.864	22.004	17.283	29.822	29.723	28.433	28.087	32.202	27.900	30.862	33.550
Other fuels	0.004	0.024	0.091	0.101	0.071	0.002	0.022	0.000	0.000	0.037	0.123
Biomass	9.216	9.192	6.596	6.430	6.452	6.586	6.514	5.085	6.563	6.815	8.779
Total	**85.126**	**86.309**	**95.222**	**120.162**	**127.317**	**125.891**	**120.846**	**129.300**	**127.739**	**136.292**	**143.880**

Table 11. (cont.) Fuel consumption [PJ] in 1.A.4.a category

Fuels	2010	2011	2012	2013	2014	2015
Hard coal	34.503	31.119	32.855	30.116	27.068	25.606
Lignite	1.475	0.702	0.531	0.515	0.402	0.328
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	83.433	78.278	80.888	76.501	67.429	71.822
Fuel wood and wood waste	8.029	7.818	6.833	7.433	6.556	6.530
Biogas	1.830	1.963	2.280	2.127	2.258	2.361
Industrial wastes	0.021	0.011	0.009	0.388	0.079	0.145
Municipal waste - non-biogenic fraction	0.005	0.035	0.028	0.033	0.152	0.050
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.060	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000
Coke	2.109	1.824	0.741	1.083	0.570	0.687
Liquid petroleum gas (LPG)	3.404	3.312	4.048	2.852	3.726	2.853
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.002
Diesel oil	27.409	25.634	18.402	15.155	14.722	14.477
Fuel oil	0.080	0.040	0.000	0.000	0.000	0.000
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.001	0.001	0.001	0.000	0.001	0.000
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.017	0.018	0.014	0.010	0.002	0.000
Fuels						
Liquid fuels	30.953	28.986	22.450	18.007	18.448	17.332
Gaseous fuels	83.433	78.278	80.888	76.501	67.429	71.822
Solid fuels	38.105	33.664	34.142	31.724	28.043	26.621
Other fuels	0.026	0.046	0.037	0.421	0.231	0.195
Biomass	9.859	9.781	9.113	9.560	8.814	8.890
Total	**162.376**	**150.755**	**146.630**	**136.213**	**122.965**	**124.862**

Table 12. Fuel consumption [PJ] in 1.A.4.b category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Hard coal	543.559	489.774	272.689	358.521	351.542	372.347	309.920	305.701	326.681	271.980	213.584
Lignite	2.911	1.180	0.526	0.042	0.000	2.956	4.403	4.279	3.420	2.626	1.772
Hard coal briquettes (patent fuels)	17.200	4.742	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	1.627	1.427	1.240	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	102.581	107.619	122.204	133.674	141.212	141.590	151.671	159.559	143.057	150.022	138.268
Fuel wood and wood waste	33.615	32.351	34.335	27.721	33.969	106.000	104.715	105.000	101.000	100.000	100.700
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industrial wastes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	31.927	30.721	14.866	12.110	26.732	30.752	27.788	27.502	28.044	32.775	19.950
Liquid petroleum gas (LPG)	6.762	7.452	1.702	1.012	1.840	6.072	8.970	12.834	16.100	18.400	18.400
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.145	6.435	8.580
Fuel oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	15.996	15.134	15.155	13.706	11.334	6.779	3.560	1.723	0.226	0.000	0.000
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	4.655	3.697	3.088	1.307	0.739	0.431	0.418	0.258	0.222	0.181	0.164
Fuels											
Liquid fuels	6.762	7.452	1.702	1.012	1.840	6.072	8.970	12.834	18.245	24.835	26.980
Gaseous fuels	102.581	107.619	122.204	133.674	141.212	141.590	151.671	159.559	143.057	150.022	138.268
Solid fuels	617.874	546.675	307.564	385.686	390.347	413.265	346.089	339.463	358.593	307.562	235.470
Other fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	33.615	32.351	34.335	27.721	33.969	106.000	104.715	105.000	101.000	100.000	100.700
Total	**760.831**	**694.097**	**465.805**	**548.093**	**567.368**	**666.927**	**611.445**	**616.856**	**620.895**	**582.419**	**501.418**

Table 12. (cont.) Fuel consumption [PJ] in 1.A.4.b category

Fuels	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Hard coal	223.330	166.012	184.730	209.771	207.214	219.654	249.994	284.628	257.388	276.073	279.808
Lignite	1.286	1.169	1.373	1.482	1.605	1.919	2.006	2.168	1.972	2.565	2.219
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	135.995	127.611	133.737	127.093	127.629	126.376	135.111	138.686	132.622	131.450	134.857
Fuel wood and wood waste	95.000	95.000	104.500	104.500	103.075	103.360	100.700	104.500	102.000	102.500	102.500
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industrial wastes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	18.525	11.685	11.970	8.550	8.550	7.125	2.992	3.278	1.425	1.140	5.928
Liquid petroleum gas (LPG)	19.320	20.240	20.700	21.390	25.300	23.920	23.000	23.000	23.920	24.380	25.254
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	9.781	17.160	21.450	22.952	22.952	21.450	19.305	19.305	15.444	11.583	8.010
Fuel oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.163	0.158	0.151	0.134	0.128	0.113	0.095	0.099	0.081	0.071	0.069
Fuels											
Liquid fuels	29.101	37.400	42.150	44.342	48.252	45.370	42.305	42.305	39.364	35.963	33.264
Gaseous fuels	135.995	127.611	133.737	127.093	127.629	126.376	135.111	138.686	132.622	131.450	134.857
Solid fuels	243.304	179.024	198.224	219.937	217.497	228.811	255.087	290.173	260.866	279.849	288.024
Other fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	95.000	95.000	104.500	104.500	103.075	103.360	100.700	104.500	102.000	102.500	102.500
Total	**503.400**	**439.035**	**478.611**	**495.872**	**496.453**	**503.917**	**533.203**	**575.664**	**534.852**	**549.762**	**558.645**

Table 12. (cont.) Fuel consumption [PJ] in 1.A.4.b category

Fuels	2010	2011	2012	2013	2014	2015
Hard coal	319.753	275.817	291.964	280.095	257.420	253.500
Lignite	4.035	3.593	3.619	4.022	3.214	3.101
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.000
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	148.427	135.471	141.397	143.187	131.598	132.202
Fuel wood and wood waste	112.746	115.000	116.850	116.850	105.450	105.450
Biogas	0.000	0.000	0.000	0.000	0.000	0.000
Industrial wastes	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000
Coke	6.526	5.700	5.415	5.700	4.845	4.200
Liquid petroleum gas (LPG)	24.840	23.000	23.000	21.620	22.540	21.396
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.000
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	4.546	4.763	3.767	3.464	3.031	3.010
Fuel oil	0.000	0.000	0.000	0.000	0.000	0.000
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.000	0.000	0.000	0.000	0.000	0.000
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.067	0.059	0.040	0.047	0.036	0.002
Fuels						
Liquid fuels	29.386	27.763	26.767	25.084	25.571	24.406
Gaseous fuels	148.427	135.471	141.397	143.187	131.598	132.202
Solid fuels	330.381	285.169	301.038	289.864	265.515	260.803
Other fuels	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	112.746	115.000	116.850	116.850	105.450	105.450
Total	**620.940**	**563.403**	**586.052**	**574.985**	**528.134**	**522.861**

Table 13. Fuel consumption [PJ] in 1.A.4.c category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Hard coal	38.608	38.489	36.365	57.356	62.959	62.501	60.542	58.583	62.611	52.483	46.050
Lignite	1.581	1.139	0.844	1.018	0.911	0.814	1.642	1.698	1.299	1.292	1.419
Hard coal briquettes (patent fuels)	0.598	0.527	0.645	0.146	0.088	0.059	0.059	0.000	0.000	0.000	0.000
Brown coal briquettes	0.106	0.106	0.040	0.020	0.020	0.000	0.000	0.000	0.000	0.000	0.000
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	0.507	0.445	0.448	0.275	0.055	0.132	0.212	0.243	0.428	0.571	0.868
Fuel wood and wood waste	0.039	0.113	0.039	0.278	0.583	20.057	18.367	18.500	17.567	17.000	17.100
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industrial wastes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	1.786	1.754	1.568	1.168	0.684	0.570	4.018	4.018	4.104	5.130	5.700
Liquid petroleum gas (LPG)	0.000	0.000	0.000	0.000	0.000	0.000	0.460	0.690	1.150	1.380	1.380
Motor gasoline	0.000	0.000	0.000	0.000	0.000	0.674	1.122	1.122	1.122	1.212	1.122
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	53.967	51.972	53.968	51.995	60.661	74.989	81.381	85.457	94.380	109.481	99.099
Fuel oil	10.264	9.469	9.175	8.125	7.076	18.020	21.999	13.905	8.200	10.930	8.831
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.012	0.010	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.001	0.002	0.001	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.001
Fuels											
Liquid fuels	64.230	61.441	63.143	60.120	67.737	93.683	104.962	101.174	104.852	123.003	110.432
Gaseous fuels	0.507	0.445	0.448	0.275	0.055	0.132	0.212	0.243	0.428	0.571	0.868
Solid fuels	42.691	42.026	39.465	59.710	64.662	63.946	66.261	64.299	68.014	58.905	53.170
Other fuels	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	0.039	0.113	0.039	0.278	0.583	20.057	18.367	18.500	17.567	17.000	17.100
Total	**107.467**	**104.025**	**103.095**	**120.383**	**133.037**	**177.818**	**189.802**	**184.216**	**190.861**	**199.479**	**181.570**

Table 13. (cont.) Fuel consumption [PJ] in 1.A.4.c category

Fuels	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Hard coal	49.162	33.231	36.975	30.820	29.693	31.728	35.673	42.074	37.748	41.640	41.538
Lignite	1.097	0.939	1.236	1.395	1.528	2.086	2.188	2.489	2.125	2.770	2.485
Hard coal briquettes (patent fuels)	0.000	0.000	0.000	0.000	0.000	0.029	0.000	0.000	0.000	0.059	0.029
Brown coal briquettes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.040	0.040
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	0.476	0.536	0.777	0.914	1.197	1.182	1.084	1.492	1.840	1.900	1.577
Fuel wood and wood waste	17.100	17.100	19.043	19.010	19.017	19.878	19.038	19.977	19.061	19.024	19.030
Biogas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.094	0.097
Industrial wastes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste - non-biogenic fraction	0.006	0.012	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke	5.130	3.420	3.705	2.850	2.850	1.995	1.140	1.425	0.855	0.826	0.855
Liquid petroleum gas (LPG)	1.610	1.840	2.300	2.760	3.220	3.220	3.220	2.300	2.300	2.346	2.070
Motor gasoline	1.347	1.392	0.943	0.269	0.314	0.224	0.269	0.314	0.224	0.224	0.225
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	101.458	111.969	104.590	104.247	105.105	107.207	109.395	81.510	75.075	75.075	73.610
Fuel oil	8.642	8.400	8.191	6.776	8.172	8.579	9.432	3.825	3.375	3.453	4.311
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuels											
Liquid fuels	113.057	123.601	116.024	114.052	116.811	119.230	122.316	87.949	80.974	81.098	80.216
Gaseous fuels	0.476	0.536	0.777	0.914	1.197	1.182	1.084	1.492	1.840	1.900	1.577
Solid fuels	55.389	37.590	41.916	35.065	34.071	35.838	39.001	46.028	40.728	45.335	44.947
Other fuels	0.006	0.012	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	17.100	17.100	19.043	19.010	19.017	19.878	19.038	19.977	19.061	19.118	19.127
Total	**186.028**	**178.839**	**177.771**	**169.041**	**171.096**	**176.128**	**181.439**	**155.446**	**142.603**	**147.451**	**145.867**

Table 13. (cont.) Fuel consumption [PJ] in 1.A.4.c category

Fuels	2010	2011	2012	2013	2014	2015
Hard coal	47.291	41.488	43.715	41.611	39.003	36.400
Lignite	1.667	1.337	1.327	1.609	1.286	1.142
Hard coal briquettes (patent fuels)	0.029	0.059	0.205	0.293	0.264	0.133
Brown coal briquettes	0.000	0.000	0.020	0.520	1.360	0.613
Crude oil	0.000	0.000	0.000	0.000	0.000	0.000
Natural gas	1.486	1.531	1.796	1.501	1.438	1.144
Fuel wood and wood waste	21.088	23.931	20.948	20.937	19.310	19.116
Biogas	0.039	0.223	0.252	0.286	0.328	0.385
Industrial wastes	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste - non-biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Municipal waste – biogenic fraction	0.000	0.000	0.000	0.000	0.000	0.000
Other petroleum products	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum coke	0.000	0.000	0.000	0.000	0.000	0.000
Coke	0.940	0.998	0.285	0.570	0.627	0.252
Liquid petroleum gas (LPG)	2.300	2.346	2.300	2.300	2.760	2.622
Motor gasoline	0.045	0.045	0.045	0.045	0.044	0.036
Aviation gasoline	0.000	0.000	0.000	0.000	0.000	0.000
Jet kerosene	0.000	0.000	0.000	0.000	0.000	0.000
Diesel oil	73.480	74.130	74.692	73.177	70.579	69.657
Fuel oil	3.451	3.926	4.039	3.436	3.096	3.172
Feedstocks	0.000	0.000	0.000	0.000	0.000	0.000
Refinery gas	0.000	0.000	0.000	0.000	0.000	0.000
Coke oven gas	0.000	0.000	0.000	0.000	0.000	0.000
Blast furnace gas	0.000	0.000	0.000	0.000	0.000	0.000
Gas works gas	0.000	0.000	0.000	0.000	0.000	0.000
Fuels						
Liquid fuels	79.276	80.447	81.076	78.958	76.479	75.488
Gaseous fuels	1.486	1.531	1.796	1.501	1.438	1.144
Solid fuels	49.927	43.882	45.552	44.603	42.540	38.541
Other fuels	0.000	0.000	0.000	0.000	0.000	0.000
Biomass	21.127	24.154	21.200	21.223	19.638	19.501
Total	**151.816**	**150.014**	**149.624**	**146.285**	**140.095**	**134.674**

Table 14. CO2 EFs [kg/GJ] for coal and lignite in 1.A.1.a category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Hard coal	95.58	95.57	95.25	95.11	94.97	94.97	94.95	94.98	94.96	94.95	94.91	94.92
Lignite	111.47	110.88	109.87	109.76	109.28	109.90	110.03	108.95	109.04	108.90	108.41	108.31
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Hard coal	94.97	94.97	94.94	94.93	94.98	94.95	94.92	94.97	94.98	94.90	94.96	95.01
Lignite	108.72	108.21	108.64	108.56	108.84	107.83	107.88	107.54	107.20	107.52	108.62	109.56
	2012	**2013**	**2014**	**2015**								
Hard coal	94.99	94.98	94.96	94.92								
Lignite	109.76	109.91	110.77	110.69								

Table 15. CO2 EFs [kg/GJ] for coal and lignite in 1.A.1.b category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Hard coal	94.70	94.76	94.64	94.76	94.64	94.81	94.72	94.86	94.64	94.59	94.58	94.55
Lignite												
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Hard coal	94.62	94.57	94.64							94.73	94.69	94.69
Lignite												109.53
	2012	**2013**	**2014**	**2015**								
Hard coal	94.70	94.73	94.74	94.77								
Lignite	109.74	109.91	109.75	106.72								

Table 16. CO2 EFs [kg/GJ] for coal and lignite in 1.A.1.c category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Hard coal	95.30	95.37	94.70	94.73	94.65	94.81	94.71	94.86	94.60	94.55	94.55	94.51
Lignite	111.39	110.71	103.84	105.02	106.21	104.86	103.76	108.93	109.01	105.71	108.39	103.45
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Hard coal	94.59	94.54	94.51	94.53	94.59	94.34	94.52	94.36	94.55	94.54	94.67	94.22
Lignite	104.58	105.50	104.33	105.94	105.96	105.87	105.62	106.15	106.87	106.39	108.60	109.53
	2012	**2013**	**2014**	**2015**								
Hard coal	93.88	93.88	93.85	93.67								
Lignite	109.74	109.91	109.75	108.01								

Table 17. CO2 EFs [kg/GJ] for coal and lignite in 1.A.2.a category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Hard coal	94.70	94.68	94.70	94.73	94.65	94.81	94.71	94.86	94.63	94.58	94.58	94.54
Lignite				104.75						106.72		
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Hard coal	94.62	94.57	94.55	94.53	94.59	94.34	94.52	94.45	94.68	94.52	94.65	94.64
Lignite												
	2012	**2013**	**2014**	**2015**								
Hard coal	95.37	94.90	94.91	94.58								
Lignite												

Table 18. CO2 EFs [kg/GJ] for coal and lignite in 1.A.2.b category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Hard coal	94.70	94.68	94.70	94.73	94.65	94.81	94.71	94.86	94.63	94.59	94.58	94.55
Lignite												
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Hard coal	94.52	94.37	94.49	94.53	94.59	94.43	94.43	93.64	0.00	0.00	0.00	94.71
Lignite												
	2012	**2013**	**2014**	**2015**								
Hard coal	94.69	94.73	94.70	94.24								
Lignite												

Table 19. CO2 EFs [kg/GJ] for coal and lignite in 1.A.2.c category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Hard coal	94.70	94.68	94.70	94.73	94.65	94.81	94.71	94.86	94.63	94.59	94.58	94.55
Lignite	105.16	104.93	103.84	104.75	106.72	105.13	104.14	108.93	109.01	105.66	108.39	103.47
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Hard coal	94.62	94.56	94.55	94.53	94.59	94.34	94.52	94.45	94.70	94.75	94.68	94.70
Lignite												
	2012	**2013**	**2014**	**2015**								
Hard coal	94.70	94.74	94.73	95.09								
Lignite												

Table 20. CO2 EFs [kg/GJ] for coal and lignite in 1.A.2.d category .

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Hard coal	94.70	94.68	94.70	94.73	94.65	94.81	94.71	94.86	94.63	94.59	94.58	94.55
Lignite												
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Hard coal	94.62	94.57	94.55	94.53	94.59	94.34	94.52	94.45	94.70	94.75	94.68	94.70
Lignite												
	2012	**2013**	**2014**	**2015**								
Hard coal	94.70	94.74	94.73	94.56								
Lignite												

Table 21. CO2 EFs [kg/GJ] for coal and lignite in 1.A.2.e category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Hard coal	94.70	94.68	94.70	94.73	94.65	94.81	94.71	94.86	94.63	94.58	94.58	94.55
Lignite	105.14	104.92	104.14	104.75	106.72	104.90	103.84	108.93	109.01	105.67	108.39	103.40
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Hard coal	94.62	94.57	94.55	94.53	94.59	94.34	94.52	94.44	94.69	94.75	94.67	94.70
Lignite	104.57	105.47	104.38	105.87	105.85	105.91	105.71					
	2012	**2013**	**2014**	**2015**								
Hard coal	94.70	94.74	94.73	94.52								
Lignite												

Table 22. CO2 EFs [kg/GJ] for coal and lignite in 1.A.2.f category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Hard coal	94.70	94.68	94.70	94.73	94.65	94.81	94.71	94.86	94.63	94.58	94.58	94.55
Lignite	105.15	104.93	103.84	105.22	106.31	104.86	103.84	108.93	109.01	105.71	108.39	103.47
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Hard coal	94.62	94.57	94.55	94.53	94.59	94.34	94.52	94.45	94.69	94.75	94.68	94.70
Lignite	104.75	106.72	104.75						106.72		108.60	109.53
	2012	**2013**	**2014**	**2015**								
Hard coal	94.70	94.74	94.73	94.12								
Lignite	109.74	109.91	109.74	110.66								

Table 23. CO2 EFs [kg/GJ] for coal and lignite in 1.A.2.g category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Hard coal	94.70	94.68	94.70	94.73	94.65	94.81	94.71	94.86	94.63	94.58	94.58	94.55
Lignite	105.15	104.92	104.53	105.13	106.31	104.83	103.97	108.93	109.01	105.66	108.39	103.60
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Hard coal	94.62	94.57	94.55	94.53	94.59	94.34	94.52	94.45	94.70	94.75	94.68	94.70
Lignite	104.86	105.47	104.78	106.04	106.72	106.72	106.72		106.72	106.49	108.60	109.53
	2012	**2013**	**2014**	**2015**								
Hard coal	94.70	94.74	94.73	94.55								
Lignite	109.74	109.91	109.75	110.56								

Table 24. CO2 EFs [kg/GJ] for coal and lignite in 1.A.4.a category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Hard coal	94.70	94.76	94.76	94.76	94.57	94.75	94.82	94.89	94.44	94.71	94.64	94.80
Lignite	111.07	110.71				108.93	110.02	109.72	108.16	106.72	106.72	106.72
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Hard coal	94.84	94.94	94.87	94.68	94.34	94.14	93.99	94.20	94.04	94.05	93.90	94.06
Lignite											109.72	109.61
	2012	**2013**	**2014**	**2015**								
Hard coal	93.96	94.04	94.05	94.12								
Lignite	111.17	111.16	111.20	110.56								

Table 25. CO2 EFs [kg/GJ] for coal and lignite in 1.A.4.b category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Hard coal	94.70	94.76	94.76	94.76	94.57	94.75	94.82	94.89	94.44	94.72	94.65	94.80
Lignite	111.07	110.71	109.64	109.40		108.61	109.92	108.97	108.20	108.42	108.46	108.59
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Hard coal	94.85	94.94	94.87	94.68	94.34	94.14	93.99	94.20	94.04	94.05	93.90	94.06
Lignite	108.78	108.55	107.94	108.96	109.67	108.09	108.14	108.93	107.15	107.25	109.70	109.61
	2012	**2013**	**2014**	**2015**								
Hard coal	93.96	94.04	94.05	94.05								
Lignite	111.19	111.18	111.22	110.58								

Table 26. CO2 EFs [kg/GJ] for coal and lignite in 1.A.4.c category

Fuels	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Hard coal	94.70	94.76	94.76	94.76	94.57	94.75	94.82	94.89	94.44	94.71	94.65	94.80
Lignite	111.07	110.71	109.61	109.01	108.12	108.61	109.92	108.97	108.19	108.41	108.47	108.60
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Hard coal	94.84	94.94	94.87	94.68	94.34	94.14	93.99	94.20	94.04	94.05	93.90	94.06
Lignite	108.76	108.54	107.93	108.98	109.67	108.09	108.14	108.93	107.15	107.25	109.71	109.61
	2012	**2013**	**2014**	**2015**								
Hard coal	93.96	94.04	94.05	94.05								
Lignite	111.19	111.17	111.21	110.58								

Table 27. CO_2 EFs [kg/GJ] applied for other fuels in the years 1988-2015 for stationary sources in 1.A.1, 1.A.2 and 1.A.4 categories [IPCC 2006]

Fuels	**EF**
Hard coal briquettes (patent fuels)	97.50
Brown coal briquettes	97.50
Crude oil	73.30
Natural gasl	56.10
Fuel wood and wood waste	112.00
Biogas	54.60
Industrial wastes	143.00
Municipal waste - non-biogenic fraction	91.70
Municipal waste – biogenic fraction	100.00
Other petroleum products	73.30
Petroleum coke	97.50
Coke	107.00
Liquid petroleum gas (LPG)	63.10
Motor gasoline	69.30
Aviation gasoline	70.00
Jet kerosene	71.50
Diesel oil	74.10
Fuel oil	77.40
Feedstocks	73.30
Refinery gas	57.60
Coke oven gas	44.40
Blast furnace gas	260.00
Gas works gas	44.40

Table 28. CH_4 EFs [kg/GJ] applied for the years 1988-2015 for stationary sources [IPCC 2006]

Fuels	1.A.1	1.A.2	1.A.4.a	1.A.4.b-c
Hard coal	0.0010	0.0100	0.0100	0.3000
Lignite	0.0010	0.0100	0.0100	0.3000
Hard coal briquettes (patent fuels)	0.0010	0.0100	0.0100	0.3000
Brown coal briquettes	0.0010	0.0100	0.0100	0.3000
Crude oil	0.0030	0.0030	0.0100	0.0100
Natural gasl	0.0010	0.0010	0.0050	0.0050
Fuel wood and wood waste	0.0300	0.0300	0.3000	0.3000
Biogas	0.0010	0.0010	0.0050	0.0050
Industrial wastes	0.0300	0.0300	0.3000	0.3000
Municipal waste - non-biogenic fraction	0.0300	0.0300	0.3000	0.3000
Municipal waste – biogenic fraction	0.0300	0.0300	0.3000	0.3000
Other petroleum products	0.0030	0.0030	0.0100	0.0100
Petroleum coke	0.0030	0.0030	0.0100	0.0100
Coke	0.0010	0.0100	0.0100	0.3000
Liquid petroleum gas (LPG)	0.0010	0.0010	0.0050	0.0050
Motor gasoline	0.0030	0.0030	0.0100	0.0100
Aviation gasoline	0.0030	0.0030	0.0100	0.0100
Jet kerosene	0.0030	0.0030	0.0100	0.0100
Diesel oil	0.0030	0.0030	0.0100	0.0100
Fuel oil	0.0030	0.0030	0.0100	0.0100
Feedstocks	0.0030	0.0030	0.0100	0.0100
Refinery gas	0.0010	0.0010	0.0050	0.0050
Coke oven gas	0.0010	0.0010	0.0050	0.0050
Blast furnace gas	0.0010	0.0010	0.0050	0.0050
Gas works gas	0.0010	0.0010	0.0050	0.0050

Table 29. N_2O EFs [kg/GJ] applied for the years 1988-2015 for stationary sources in 1.A.1, 1.A.2 and 1.A.4 categories [IPCC 2006]

Fuels	EF
Hard coal	0.0015
Lignite	0.0015
Hard coal briquettes (patent fuels)	0.0015
Brown coal briquettes	0.0015
Crude oil	0.0006
Natural gasl	0.0001
Fuel wood and wood waste	0.0040
Biogas	0.0001
Industrial wastes	0.0040
Municipal waste - non-biogenic fraction	0.0040
Municipal waste – biogenic fraction	0.0040
Other petroleum products	0.0006
Petroleum coke	0.0006
Coke	0.0015
Liquid petroleum gas (LPG)	0.0001
Motor gasoline	0.0006
Aviation gasoline	0.0006
Jet kerosene	0.0006
Diesel oil	0.0006
Fuel oil	0.0006
Feedstocks	0.0006
Refinery gas	0.0001
Coke oven gas	0.0001
Blast furnace gas	0.0001
Gas works gas	0.0001

Annex 3.1. Calculation of CO_2 emission from 2.A.4.d subcategory: Other processes uses of carbonates - other

Table 1. Estimation of CO_2 emission from calcite use as limestone sorbents to desulfurize the off-gases by wet method (lime WFGD) in the years 1988-2015 (all values in the table are expressed in kilotons [kt])

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Desulphurization plaster production in lime wet FGD	0	0	0	0	0	0	0	175	474	583	674	860	1140	1134	1038	1109	1250
Consumption of limestone sorbents to desulfurize the off-gases by wet method (lime WFGD)	0	0	0	0	0	0	0	104	282	346	400	511	677	673	617	659	742
Limestone consumption in lime WFGD	0	0	0	0	0	0	0	99	268	329	380	485	643	640	586	626	705
CO2 emission from decomposition of calcium carbonate in WFGD	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**43**	**118**	**145**	**167**	**214**	**283**	**281**	**258**	**275**	**310**

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Desulphurization plaster production in lime wet FGD	1177	1240	1338	1596	2076	2389	2505	2572	2768	2768	2768
Consumption of limestone sorbents to desulfurize the off-gases by wet method (lime WFGD)	699	736	795	948	1233	1418	1487	1527	1644	1644	1644
Limestone consumption in lime WFGD	664	700	755	900	1171	1347	1413	1451	1561	1561	1561
CO2 emission from decomposition of calcium carbonate in WFGD	**292**	**308**	**332**	**396**	**515**	**593**	**622**	**638**	**687**	**687**	**687**

Table 2. Estimation of CO_2 emission from decomposition of calcite use to desulfurize the off-gases in fluid bad boilers (FGD in FBB) and in other method of flue gas desulfurization (FGD other than lime WFGD) in the years 1988-2015 (all values in the table are expressed in kilotons [kt])

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
SO2 emission captured by FGD in power plants and autoproducers CHP	916	924	766	786	857	900	990	1048	1178	1321	1379	1426	1620	1630	1699	1881	1939
SO2 captured with use of lime wet FGD method	0	0	0	0	0	0	0	65	176	217	251	320	424	422	386	413	465
SO2 captured with use of other FGD method	916	924	766	786	857	900	990	983	1002	1104	1128	1106	1196	1208	1313	1468	1474
Consumption of limestone sorbents to desulfurize the off-gases in FBB and in FGD other than lime wet FGD	1574	1588	1317	1351	1473	1547	1702	1689	1721	1898	1939	1901	2055	2076	2256	2524	2533
Limestone consumption in FGD in FBB and in FGD other than lime wet FGD	1543	1556	1290	1324	1444	1516	1668	1656	1687	1860	1900	1863	2014	2035	2211	2473	2482
CO2 emission from calcium carbonate in FGD in FBB and in FGD other than lime WFGD	**679**	**685**	**568**	**583**	**635**	**667**	**734**	**728**	**742**	**818**	**836**	**820**	**886**	**895**	**973**	**1088**	**1092**

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
SO2 emission captured by FGD in power plants and autoproducers CHP	1967	2075	2091	2178	2136	2299	2524	2297	2302	2322	2275
SO2 captured with use of lime wet FGD method	438	461	498	594	773	889	932	957	1030	1030	1030
SO2 captured with use of other FGD method	1529	1614	1593	1584	1363	1410	1592	1340	1272	1292	1245
Consumption of limestone sorbents to desulfurize the off-gases in FBB and in FGD other than lime wet FGD	2628	2773	2738	2723	2343	2424	2736	2303	2186	2220	2140
Limestone consumption in FGD in FBB and in FGD other than lime wet FGD	2575	2718	2683	2668	2297	2375	2681	2257	2142	2176	2097
CO2 emission from calcium carbonate in FGD in FBB and in FGD other than lime WFGD	**1133**	**1196**	**1181**	**1174**	**1010**	**1045**	**1180**	**993**	**943**	**957**	**923**

Table 3. CO_2 emission values from carbonate use in 2.A.4.d subcategory for the years 1988-2015 (all values in the table are expressed in kilotons [kt])

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Sum of limestone use presented in the tables 1-2	1543	1556	1290	1324	1444	1516	1668	1754	1954	2189	2281	2348	2657	2674	2797	3099	3188
CO2 emission from carbonate use in 2.A.4.d subcategory	**679**	**685**	**568**	**583**	**635**	**667**	**734**	**772**	**860**	**963**	**1003**	**1033**	**1169**	**1177**	**1231**	**1363**	**1403**

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Sum of limestone use presented in the tables 1-2	3239	3417	3438	3569	3468	3723	4094	3708	3704	3737	3658
CO2 emission from carbonate use in 2.A.4.d subcategory	**1425**	**1504**	**1513**	**1570**	**1526**	**1638**	**1802**	**1631**	**1630**	**1644**	**1610**

Annex 3.2. Calculation of CO_2 process emission from ammonia production (2.B.1)

Table 1. Calculation of CO_2 process emission from ammonia production

		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Activity/emission data	**Unit**												
Natural gas consumption	[10^3 m3]	2 184 552	2 230 523	1 447 064	1 447 326	1 337 619	1 401 804	1 688 887	1 942 704	1 907 689	1 937 127	1 789 006	1 587 228
Natural gas consumption	TJ	76 413	77 862	50 625	50 911	47 044	49 522	60 161	69 070	67 919	69 049	64 163	56 105
Coke oven gas consumption	[10^3 m3]	183 960	113 672	30 560									
Coke oven gas consumption	TJ	3 204	1 970	537									
CO_2 emission from natural gas use	kt	4 357	4 449	2 886	2 887	2 668	2 796	3 369	3 875	3 805	3 864	3 568	3 166
CO_2 emission from coke oven gas use	kt	142	87	24									
Process CO_2 emission from ammonia production	kt	4 500	4 537	2 910	2 887	2 668	2 796	3 369	3 875	3 805	3 864	3 568	3 166
Ammonia production	kt	2389.353	2433.726	1531.552	1560.883	1480.798	1630.946	1945.470	2248.317	2185.188	2251.616	2047.948	1784.726
		2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Activity/emission data	**Unit**												
Natural gas consumption	[10^3 m3]	1 965 162	1 873 685	1 455 329	2 122 465	2 177 127	2 310 818	2 197 622	2 186 299	2 221 406	1 814 589	1 881 957	2 061 524
Natural gas consumption	TJ	70 483	68 096	52 144	76 053	77 817	82 219	78 591	78 072	79 351	63 478	67 234	73 798
Coke oven gas consumption	[10^3 m3]												
Coke oven gas consumption	TJ												
CO_2 emission from natural gas use	kt	3 920	3 737	2 903	4 234	4 343	4 609	4 384	4 361	4 431	3 620	3 754	4 112
CO_2 emission from coke oven gas use	kt												
Process CO_2 emission from ammonia production	kt	3 920	3 737	2 903	4 234	4 343	4 609	4 384	4 361	4 431	3 620	3 754	4 112
Ammonia production	kt	2243.108	2103.805	1594.797	2246.505	2451.557	2523.790	2326.621	2417.543	2485.148	2010.891	2059.437	2321.849
		2012	**2013**	**2014**	**2015**								
Activity/emission data	**Unit**												
Natural gas consumption	[10^3 m3]	2 242 281	2 207 620	2 295 270	2 363 754								
Natural gas consumption	TJ	81 150	79 269	83 391	86 145								
Coke oven gas consumption	[10^3 m3]												
Coke oven gas consumption	TJ												
CO_2 emission from natural gas use	kt	4 473	4 403	4 565	4 720								
CO_2 emission from coke oven gas use	kt												
Process CO_2 emission from ammonia production	kt	4 473	4 403	4 565	4 720								
Ammonia production	kt	2467.458	2228.303	2634.506	2720.446								

Table 2. CO_2 amount connected with fertilizer urea production deducted from CO_2 process emission from ammonia production

		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Activity/emission data	**Unit**												
Fertilizer urea production	kt	775.527	808.932	771.812	660.998	606.719	567.208	698.866	824.372	742.790	588.957	496.479	512.603
CO_2 amount used in fertilizer urea production which is deducted from CO_2 emission generated in ammonia production	kt	568.720	593.217	565.996	484.732	444.928	415.953	512.502	604.539	544.713	431.901	364.084	375.909
Total CO_2 emission from 2.B.1	kt	3930.885	3943.317	2344.257	2402.200	2223.177	2380.178	2856.265	3270.508	3260.490	3432.021	3204.386	2790.081
		2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Activity/emission data	**Unit**												
Fertilizer urea production	kt	565.795	368.552	486.326	628.048	618.41	700.642	705.319	734.52	781.464	867.261	723.719	979.722
CO_2 amount used in fertilizer urea production which is deducted from CO_2 emission generated in ammonia production	kt	414.916	270.271	356.639	460.569	453.501	513.804	517.234	538.648	573.074	635.991	530.727	718.463
Total CO_2 emission from 2.B.1	kt	3504.927	3467.105	2546.256	3773.041	3889.141	4095.508	3866.290	3822.291	3857.892	2983.509	3223.150	3393.590
		2012	**2013**	**2014**	**2015**								
Activity/emission data	**Unit**												
Fertilizer urea production	kt	1078.683	1036.753	1122.85	1158.011								
CO_2 amount used in fertilizer urea production which is deducted from CO_2 emission generated in ammonia production	kt	791.034	760.286	823.423	849.208								
Total CO_2 emission from 2.B.1	kt	3681.569	3643.181	3741.539	3870.485								

Fertilizer urea production amount was estimated according to data from [GUS 1989e-2016e]. CO_2 amount used in fertilizer urea production and deducted from CO_2 emission generated in ammonia production was calculated based on assumption on the complete conversion of NH_3 and CO_2 to urea, what means that 0,733 t of CO_2 per tonne of urea produced was required (2006 GLs, box 3.3, p. 3.16).

Annex 4. Energy balance data for main fuels in 2015

Energy balances for several main fuels: lignite, natural gas, coke oven gas and blast furnace gas are given below. Similar balance data for hard coal are presented in Chapter 1.4.

Lignite consumption

National fuel balance	Lignite - Eurostat	
	kt	TJ
In	63 410	517 231
From national sources	63 128	514 936
1) Indigenous production	63 128	514 936
2) Transformation output or return	0	0
3) Stock decrease	0	0
Import	281	2 295
Out	63 410	517 231
National consumption	63 046	513 416
1) Transformation input	62 410	507 993
a) input for secondary fuel production	0	0
b) fuel combustion	62 410	507 993
2) Direct consumption	635	5 423
Non-energy use	0	0
Combusted directly	635	5 423
Combusted in Poland	63 046	513 416
Stock increase	164	1 335
Export	198	1 617
Losses and statistical differences	2	864

Net calorific value	MJ/kg	8.14

Natural gas consumption

National fuel balance	Natural gas - Eurostat
	TJ
In	572 555
From national sources	154 196
1) Indigenous production	154 196
2) Transformation output or return	0
3) Stock decrease	0
Import	418 358
Out	572 555
National consumption	581 553
1) Transformation input	87 122
a) input for secondary fuel production	0
b) fuel combustion	87 122
2) Direct consumption	494 431
Non-energy use	88 740
Combusted directly	405 690
Combusted in Poland	492 812
Stock increase	-6 111
Export	1 901
Losses and statistical differences	-4 788

Coke oven gas consumption

National fuel balance	Coke Oven Gas - Eurostat
	TJ
In	71 337
From national sources	71 337
1) Indigenous production	0
2) Transformation output or return	71 337
3) Stock decrease	0
Import	0
Out	71 337
National consumption	71 337
1) Transformation input	20 883
a) input for secondary fuel production	0
b) fuel combustion	20 883
2) Direct consumption	50 454
Non-energy use	0
Combusted directly	50 454
Combusted in Poland	71 337
Stock increase	0
Export	0
Losses and statistical differences	0

Blast furnace gas consumption

National fuel balance	Blast furnace gas - Eurostat
	TJ
In	26 470
From national sources	26 470
1) Indigenous production	0
2) Transformation output or return	26 470
3) Stock decrease	0
Import	0
Out	26 470
National consumption	26 470
1) Transformation input	16 242
a) input for secondary fuel production	0
b) fuel combustion	16 242
2) Direct consumption	10 229
Non-energy use	0
Combusted directly	10 229
Combusted in Poland	26 470
Stock increase	0
Export	0
Losses and statistical differences	0

Annex 5.
Methological notes related to elaboration of representative research on livestock animals performed by Central Statistical Office [GUS R1(2015)]

METHODICAL NOTES

I. SOURCES OF DATA

The data in this publication were compiled on the basis of:

- generalized results of sample surveys[a/] on cattle, sheep, poultry and pigs, as well as, the animal output in private farms,
- statistical reports in the scope of livestock in state and cooperative farms and companies with public and private property share,
- statistical reports from slaughter houses of farm animals,
- statistical reports from poultry hatcheries,
- information on the livestock of poultry from voivodship experts,
- own estimates.

Surveys on cattle, sheep, poultry and animal output were conducted in approx. of the sample of private farms breeding the above-listed species of animals; this sample amounted to 30 thousand farms.

Surveys on pigs and production of pigs for slaughter were carried out in a sample of private farms breeding pigs; this sample amounted to 30 thousand farms.

The results of the survey of farm animal stocks and animal output were compiled by voivodship according to the residence of the land user, i.e. for private farms – according to the official residence (place of residence) of the land user, while for state owned farms, cooperative farms and companies – according to the official residence of the enterprise (farm).

II. MAJOR DEFINITIONS, TERMS AND ENUMERATION RULES

An agricultural farm is understood as an organised economic and technical unit with separate management (a user or a manager), conducting agricultural activity.

An agricultural activity shall include activity related to cultivation of plants and rearing and breeding of animals, which covers: all field crops (including mushrooms), vegetable gardening and horticulture, nurseries, cultivation and seed production of agricultural and horticultural crops as well as activity related to rearing and breeding of animals (cattle, sheep, goats, horses, pigs, poultry, rabbits, fur-covered animals, game kept

a/ The surveys on cattle, sheep and poultry stock are conducted twice a year, i.e. in June and in December, while the survey on pigs – three times a year, i.e. in April, August and December.

for slaughter), bees as well as activity consisting in maintaining the land no longer used for production purposes in accordance with cultivation principles with respect for environment protection requirements (according to the norms).

A natural person is holding (private farm) is understood as a farm owned or used by a natural person of the area of at least 1.0 ha and more of agricultural land or a farm of the area of less than 1.0 ha, excluding agricultural land, which meets at least one of the thresholds mentioned below:

- 0,5 ha of fruit-bearing trees plantation,
- 0,5 ha of fruit-bearing shrubs plantation,
- 0,3 ha of fruit and ornamental nurseries,
- 0,5 ha of soil-grown vegetables,
- 0,5 ha of soil-grown strawberries,
- 0,1 ha of vegetables under cover,
- 0,1 ha of strawberries under cover,
- 0,1 ha of flowers and ornamental plants under cover,
- 0,5 ha of hop,
- 0,1 ha of tobacco,
- 25 m^2 of edible mushrooms,
- 10 head of cattle in total,
- 5 head of cows in total,
- 50 head of pigs in total,
- 10 head of sows,
- 20 head of sheep in total,
- 20 head of goats in total,
- 100 head of poultry for slaughter in total,
- 80 head of poultry for laying in total,
- 5 head of horses in total,
- 50 head of female rabbits,
- 80 beehives.

A legal person's or organizational unit without legal status is understood as farm run by a legal person or an organization unit without legal personality, the basic activity of which is rated, according to the Polish Classification of Activities, to Section A, division 01, group:

- growing of non perennial,

- 01.2 – growing of perennial plants,
- 01.3 – plant propagation,
- 01.4 – livestock production and breeding,
- 01.5 – cultivation of plants combined with rearing and breeding of animals (mixed agricultural activity),
- 01.6, class 01.61 – service activities supporting plant production (maintaining the lands in accordance with cultivation principles with respect for environment protection requirements), and also, irrespective of the basic activity classification, when the area of agricultural land per the lands used by an individual is 1 ha and more or when livestock is reared and bred.

A holder is understood as a natural person or a legal person or an organisational unit without legal personality, actually using the land, regardless of whether as owners or leaseholders, or using the land in any other respect, regardless of whether this land is situated in one or in several gminas.

Livestock

The survey covered the livestock staying in the farm during the survey period, as well as animals sent to herding, grazing and shepherd's huts. All animals were registered, i.e. the ones owned by an agriculture holding user or members of his household, as well as animals temporarily or permanently kept in the farm, i.e. taken for raising, fattening, etc., irrespective of the fact whether they were taken from private farms, state-owned farms, cooperative entities, or companies.

Dairy cows are understood as cows which, due to their breed, species or particular qualities, are kept in a farm exclusively or mainly for production of milk to be consumed or to be processed into dairy products. Dairy cows rejected from breeding, kept in a farm for the period regarded as pre-slaughter pasturing, after which they are sent to slaughter, are also included in this group.

Suckling cows are understood as cows which, due to their breed (beef breed cows and cows born from a cross-breed with beef breeds) or particular qualities, are kept in a farm exclusively or mainly for calves for slaughter, and whose milk is used to feed calves or other animals. Suckling cows rejected from breeding, kept in a farm for the period regarded as pre-slaughter pasturing, after which they are sent to slaughter, are also included in this group.

In the case of farms engaged in production of poultry on a large scale (such as a large-scale farm producing broilers or hen eggs), in which no poultry has been recorded on the survey day due to the current technological break in production, whenever such break does not exceed 8 weeks, the poultry stocks from the period before emptying the rooms (poultry houses) have been adopted.

Information on the number of cattle, sheep and poultry contained in this publication referes to the stocs in June and December 20112, while the data of pigs to the stocs in March, July and November 2012.

III. MAJOR GROUPS AND THE SCOPE OF PUBLISHED DATA

The data regarding the farm animals stocks as well as the elements of cattle and pigs turnover were classified according to ownership forms, i.e. for the private sector, as well as the public one.

The **private sector** includes: entities of state domestic ownership (private farms, cooperative farms and private domestic companies), foreign ownership and mixed ownership.

The **public sector** includes state owned farms (of the State Treasury and state legal persons), farms owned by self-governments (gminas) and entities of mixed ownership (companies with a predominance of public property).

As regards the private sector the data in this publication are presented for the following farms:

- of state domestic ownership, including:
    - private farms,
    - agricultural production cooperatives,
- of foreign ownership,
- of mixed ownership.

As regards the public sector the data were compiled for farms:

- of state ownership (state owned farms), including farms of the State Treasury ownership,
- farms owned by self-governments.

The percentages are presented with one decimal point and due to the electronic technique of rounding may not sum up into 100%. These figures are substantially correct.

IV. SAMPLING SCHEME

Survey on cattle, sheep and poultry stock

1. Introductory notes

The purpose of the surveys conducted by the Central Statistical Office twice a year (i.e. in June and in December) is to obtain detailed information on the number of cattle and poultry, both by voivodships and for Poland, and on the number of sheep for Poland only. The surveyed population consists of private agricultural farms which, according to the results of the Agricultural Census 2010, were keeping cattle, or poultry, or sheep, and farms with the area of agricultural land of 15 ha or more, which did not keep the above mentioned species of animals. The surveyed population in 2012 consisted of 909, 523 farms, of which approx. 854 thousand farms keeping cattle, poultry, or sheep. It was decided that the sample for the survey would consist of approx. 30 thousand private farms.

2. Sampling frame

The results of the Agricultural Census 2010 were used for establishing the sampling frame. An individual agricultural farm constituted a sampling unit. The following information was recorded for each farm:

- voivodship code,
- farm number (Nr_gos),
- total farm area,
- agricultural land in the farm ,
- number of cattle,
- number of poultry,
- number of sheep.

3. Sampling scheme

Before sampling, the population of farms was divided into three parts. **The first part** included farms fulfilling at least one of the following criteria, i.e. farms with at least one head of cattle or farms with more than 50 head of poultry and without any sheep. This part of population included 574, 901 farms. **The second part** consisted of farms with no cattle or sheep, and with no more than 50 head of poultry. Furthermore, the farms which did not keep the above mentioned animals at all, but having the area of agricultural land of 15 ha or more were also included in this group. The second part amounted to 323, 335 farms. Finally, **the third part** included farms keeping sheep, and It amounted to 11, 287 farms.

Sample drawing was done with a stratified and optimal sampling scheme. The number of cattle and poultry was used in the first part of the population as the criteria for stratification and allocation of the sample between the strata. In the second part, the strata were established on the basis of the agricultural land, whereas in the third part – on the basis of the number of head of sheep. There were created 12 strata in each voivodship, of which 7 related to farms from the first part, and 5 related to farms from the second part. In the third part, 6 national strata were established, i.e. strata that covered farms from all voivodships.

It was decided that a sample consisting of approx. 21 thousand farms be drawn from **the first part** farms.

The following assumptions were made while drawing the sample from this category of farms:

(1) the size of **n** sample is established for the population of farms in Poland, and not for individual voivodships, where n consists of approx. 21,000 farms,

(2) the sample is drawn in individual voivodships according to the stratified and optimal sampling scheme, with the use of the Neyman method,

(3) the population in each voivodship is first divided into 7 strata (h = 1, 2, …., 7), and the sample is then allocated between these strata,

(4) stratum no. 7 (i.e. h = 7) in each voivodship consists of such sampling units for which the value of variables adopted as the stratification basis is above the specified threshold. The stratum created in this way, so called the upper stratum, includes the units which are not drawn, but which are all included in the sample,

(5) it has been assumed that the expected accuracy of the survey results, measured with the variation coefficient of the livestock of cattle or poultry, will be identical for each voivodship and will be approximately equal to 1.0%.

The above problem was solved with the use of the numerical optimization method[1]. The population was divided into strata whose (upper) boundaries expressed in the number of cattle and poultry were presented in Table 1.

Table 1. Boundaries of strata by voivodship in the survey on cattle, sheep, and poultry stocks in 2012.

WOJ.	B – cattle D - poultry	b_1	b_2	b_3	b_4	b_5	b_6
02	B	5	12	23	40	65	111
	D	413	452	527	942	1,598	17,998
04	B	9	19	32	50	76	133
	D	213	264	279	407	513	7,393
06	B	4	10	20	34	55	93
	D	101	122	127	170	217	3,029
08	B	8	18	30	48	75	116
	D	1,185	1,445	2,165	4,995	16,525	41,995
10	B	5	12	22	35	55	122
	D	164	211	357	429	519	9,919
12	B	2	5	10	17	30	53
	D	101	123	123	173	174	3,049
14	B	9	18	32	58	92	144
	D	187	217	233	386	530	10,199
16	B	8	17	29	46	72	116
	D	350	373	660	807	1,532	29,998
18	B	1	2	4	9	20	27
	D	42	82	101	102	135	453
20	B	9	21	29	32	52	144
	D	66	78	79	104	109	1,002
22	B	7	15	27	42	64	102
	D	413	427	507	673	892	16,998
24	B	5	11	21	37	60	101
	D	455	510	572	1,032	3,198	19,998
26	B	2	3	5	6	14	48
	D	39	64	73	119	163	316
28	B	13	27	43	69	107	175
	D	430	567	795	992	5,998	18,998
30	B	10	21	36	58	91	153
	D	417	525	594	1,084	1,699	21,099
32	B	7	16	29	45	69	115
	D	322	432	437	747	773	13,998

[1] The description of the solution to this problem was published in the article written by B. Lednicki and R. Wieczorkowski “Optimal Stratification and Sample Allocation Between Subpopulation and Strata”, Statistics in Transition”, book 10, 2003, Warsaw

The boundaries of stratum 6, i.e. b_6, presented in Table 1, constitute also a **threshold** above which the farms are included in stratum 7, which means that they are not subject to sampling, but are all included in the sample. For other strata, i.e. h = 1, 2, … , 6, the Neyman optimal allocation method was applied for establishing the values of n_{wh}, i.e. size of the samples drawn from the h-stratum in w-voivodship.

After that, 20, 807 farms were drawn to the sample, based on the assumed allocation, including 3,861 farms from stratum no. 7.

Before sampling, 5 strata were established in each voivodship in **the second part** (h = 8, 9,…., 12). These strata were created in respect of agricultural land, i.e.: h = 8: farms of less than 1 ha, h = 9: farms of 1 ha to 4.99, h = 10: farms of 5 ha to 14.99 ha, h = 11: farms of 15 ha to 49.99 ha, h = 12: farms of 50 ha or more. Identical accuracy of the number of poultry in this part of the population was adopted as the criterion for allocation of the sample between voivodships, while within voivodships the sample was allocated by means of the Neyman optimal method. From this part of the population 6,938 farms were drawn.

In **the third part**, in which 6 national strata were established (h = 13, 14, ..., 18), 2,255 farms were drawn for the sample. **All farms from stratum 18 were included in the sample.** These were farms keeping sheep and simultaneously 50 or more head of cattle, or at least 400 head of poultry. The boundaries of other strata, and the assumed number of the sample allocated between these strata, were established with the above mentioned numerical optimisation method. The upper stratum (h = 17) was also established, from which no farms were drawn. This stratum included farms which had not been previously included in stratum 18, and which kept more than 75 head of sheep. The upper boundaries of the remaining strata were the following: $b_{13} = 2$, $b_{14} = 6$, $b_{15} = 13$, $b_{16} = 24$. The aim of establishing this category of farms as a separate one, as well as optimising the division into strata, was to accurately estimate the data on the livestock of sheep in country terms, with no regional breakdown.

Eventually, the entire sample for the survey on cattle, poultry, and sheep consisted of 30000 farms.

4. Results generalization and the accuracy assessment method

The sum of X variable value, such as cattle stock in total, is the basic parameter estimated in the survey of livestock of cattle, sheep and poultry.

This parameter for w-voivodship is calculated according to the formula:

(1) $\hat{x}_w = \sum_h \sum_i W1_{whi} * x_{whi}$, (i = 1, 2, ... , n_{wh}; h = 1, 2, ... , 9)

where:

x_{whi} – the value of X variable in i-farm (sampling unit) drawn from h-stratum in w-voivodship,

$W1_{whi}$ – the weight assigned to i-farm drawn from h-stratum of w-voivodship,whereas this weight is calculated according to this formula:

(2) $$W1_{whi} = \frac{N_{wh}}{n_{wh}},$$

N_{wh} – the number of sampling units in h-stratum of w-voivodship,

n_{wh} – the number of sampling units drawn for the sample from h-stratum of w-voivodship.

The $W1_{whi}$ weight might be used to estimate the survey results only if the survey is completed. This weight must be corrected if some of the sampled farms refuse to participate in the survey. For this purpose, the drawn sample is divided into 4 groups based on information on the survey performance:

(1) the surveyed farms,

(2) farms that refused to participate in the survey,

(3) closed down farms etc.,

(4) farms with which the contact was not established during the survey performance.

For each stratum separately in each voivodship, the size of the above groups, namely $n1_{wh}$, $n2_{wh}$, $n3_{wh}$ and $n4_{wh}$ is established, and then the likelihood function of surveyed and not surveyed among the farms with a determined status is established, that is:

(3) $$c_{wh} = \frac{n1_{wh} + n2_{wh}}{n_{wh} - n4_{wh}},$$

Then the number of the n_{awh} active farms in h-stratum of w-voivodship is calculated for the drawn sample:

(4) $$n_{awh} = n1_{wh} + n2_{wh} + c_{wh} * n4_{wh}$$

On this basis, the R_{wh} correction factor is calculated for a given stratum:

(5) $$R_{wh} = \frac{n_{awh}}{n1_{wh}},$$

The purpose of this factor is to correct the $W1_{whi:}$ weight in order to obtain final $W_{hi:}$ weight:

(6) $$W_{whi} = R_{wh} * W1_{whi},$$

The sum of X variable value for Poland is the sum of values obtained for particular voivodships, i.e.:

(7) $\hat{x} = \sum_{w} \hat{x}_w, \qquad (w = 1, 2, \ldots , 16)$

Original weights resulting from sampling are corrected not only due to incompleteness of the survey but also due to the occurrence of so called outliers, that is unusual farms. This pertains to farms with high assigned weight (drawn with a high likelihood function) and, at the same time, with relatively high values for some of the analysed variables. In this case, the weight correction is to prevent significant overestimation of the value of the surveyed variable.

For the selected major assessments of the parameters, their variation coefficients were calculated as the accuracy measures. For an estimator expressed by formula (1) i.e. for w-voivodship, its variation coefficient estimation is expressed in the following formula:

(8) $v\left(x_w\right) = \dfrac{\sqrt{d^2\left(\hat{x}_w\right)}}{\hat{x}_w} * 100,$

while:

(9) $d^2\left(\hat{x}_w\right) = \sum_{h} n_{awh}\left(1 - \dfrac{n_{wh}}{N_{wh}}\right) * s^2_{wh},$

where:

(10) $s^2_{wh} = \dfrac{1}{n_{awh} - 1} \sum_{i}\left(y_{whi} - \dfrac{1}{n_{awh}} * \hat{y}_{wh}\right)^2,$

while:

(11) $y_{whi} = W_{whi} * x_{whi},$

and:

(12) $\hat{y}_{wh} = \sum_{i} y_{whi},$

For Poland the variation coefficient of the sum X estimated with the formula (7) is expressed by the following formula:

(13) $v\left(\hat{x}\right) = \dfrac{\sqrt{d^2\left(\hat{x}\right)}}{\hat{x}},$

whereas:

$$(14)\quad d^2(\hat{x}) = \sum_w d^2(\hat{x}_w),$$

Survey on pigs

1. Introductory notes

The purpose of the surveys on pigs stocks, conducted by the Central Statistical Office three times a year (i.e. in April, in August and in December), is to obtain detailed information on the number of pigs by voivodships and for Poland. The surveyed population consists of individual farms which, according to the data of the Agricultural Census 2010, were keeping pigs, as well as farms with the area of agricultural land of 15 ha or more, but with no pigs. The surveyed population consisted of 499,284 farms, of which approx. 359.3 thousand of farms keeping pigs. It was decided that the sample for the survey would consist of approx. 30 thousand farms.

2. Sampling frame

Individual results of the Agricultural Census 2010 were employed in establishing the sampling frame. An individual agricultural farm constituted a sampling unit. The following information was recorded for each farm:

- voivodship code,
- farm number (Nr_gos),
- total farm area,
- agricultural land,
- number of pigs.

3. Sampling scheme

In order to draw sample, a stratified sampling and optimal scheme was used with respect to farms which, according to the sampling frame, reared pigs. In contrast, the stratified and proportional sampling was applied in each voivodship with respect to the population of farms which did not keep pigs. 2.0% of farms with the area of agricultural land of 15.00 – 49.99 ha, and 5.0% of farms with the area of agricultural land of 50.00 ha or more were drawn for the sample. In total, a sample consisting of 2,770 farms was drawn from this part of the population.

It was decided that a sample consisting of approx. 27 thousand farms be drawn from all farms breeding and rearing pigs.

The following assumptions were made while drawing the sample from this category of farms:

(1) the size of **n** sample is established for the population of farms in Poland, and not for individual voivodships, where n consists of approx. 27 thousand farms,

(2) the sample is drawn in individual voivodships according to the stratified and optimal sampling scheme, by means of the Neyman method,

(3) the population in each voivodship is first divided into 7 strata (h = 1, 2, …. , 7), and then the sample is allocated between these strata,

(4) stratum no. 7 (i.e. h = 7) in each voivodship consists of such sampling units, for which the value of at least one of the variables adopted as the stratification basis is above the specified threshold. The stratum created this way, regarded as the upper stratum, includes the units which are not drawn, but which are all included in the sample,

(5) it has been assumed that the expected accuracy of the survey results, measured with the variation coefficient of the livestock of pigs, will be identical for each voivodship and will be equal approximately to 0.3%.

The above problem was solved with the use of the numerical optimization method[2]. The population was divided into strata whose (upper) boundaries expressed in the number of pigs were presented in Table 2 below.

Table 2. Boundaries of strata by voivodship in the survey on pigs stock in 2012.

VOIV.	b_1	b_2	b_3	b_4	b_5	b_6
02	4	9	17	27	45	68
04	16	33	59	95	153	269
06	4	8	16	28	51	106
08	5	13	24	37	53	76
10	6	16	28	47	85	174
12	3	7	14	24	37	63
14	6	15	29	54	104	203
16	12	29	48	76	115	175
18	-	-	8	16	27	50
20	4	9	17	30	58	110
22	9	19	37	57	93	146
24	6	15	25	40	64	97
26	4	9	17	28	47	80
28	7	20	38	68	113	180
30	16	38	67	113	191	371
32	7	18	37	69	146	1,286

[2] The description of the solution to this problem was published in the article written by B. Lednicki and R. Wieczorkowski “Optimal Stratification and Sample Allocation Between Subpopulation and Strata”, Statistics in Transition, book 10, 2003, Warsaw

The boundary of stratum 6, i.e. $\mathbf{b_6}$, presented in Table 2, also constitutes a **threshold, above which** the sampling units are included in stratum 7, which means they are not subject to sampling, but are all included in the sample. For other strata, i.e. h = 1, 2, … , 6, the Neyman optimal allocation method was employed for establishing the values of $n_{wh,}$ i.e. size of the samples drawn from the h-stratum in w-voivodship. In the case of one voivodship ("18"), as a result of applying numerical optimization procedures, the lower strata obtained were numerically too small, which caused strata 1 and 2 to be necessarily combined in one stratum no. 3. After that, 27, 230 farms were drawn to the sample, based on the assumed allocation, including 10,246 farms from stratum no. 7. Together with farms not keeping pigs (according to the sampling frame) fron stratum no. 8 (i.e. farms of the area of 15.00 ha to 49.99 ha of agricultural land) and stratum no. 9 farms (i.e. farms of 50 ha or more), the sample consisted of 30,000 farms.

4. Results generalization and the accuracy assessment method

The sum of X variable value, such as pigs stock in total, is the basic parameter estimated during the survey on the livestock of pigs.
This parameter for w-voivodship is calculated according to the formula:

(1) $$\hat{x}_w = \sum_h \sum_i W1_{whi} * x_{whi}, \quad (i = 1, 2, ... , n_{wh}; h = 1, 2, ... , 9)$$

where:

x_{whi} – the value of X variable in i-farm (sampling unit) drawn from h-stratum in w-voivodship,

$W1_{whi}$ – weight assigned to i-farm drawn from h-stratum in w-voivodship, calculated on the basis of the following formula:

(2) $$W1_{whi} = \frac{N_{wh}}{n_{wh}},$$

N_{wh} – the number of sampling units in h-stratum of w-voivodship,

n_{wh} – the number of sampling units drawn from h-stratum of w-voivodship.

Weight $W1_{whi}$ can be used for the estimation of survey results only when the survey is complete. The weight must be adjusted when a part of farms drawn for the survey refuse to participate in the survey. For this purpose, the drawn sample is divided into 4 groups on the basis of information on carrying out the survey:

(1) the surveyed farms,

(2) farms which refused to participate in the survey,

(3) closed down farms etc.

(4) farms with which there was no contact during carrying out the survey.

For each stratum, separately for each voivodship, the size of the above groups, i.e. $n1_{wh}$, $n2_{wh}$, $n3_{wh}$ and $n4_{wh}$ is established, then the likelihood function of surveyed and not surveyed among the farms with a determined status is established, i.e.:

(3) $$c_{wh} = \frac{n1_{wh} + n2_{wh}}{n_{wh} - n4_{wh}},$$

Next, the number of the n_{awh} active farms in h-stratum of w-voivodship is calculated for the drawn sample:

(4) $$n_{awh} = n1_{wh} + n2_{wh} + c_{wh} * n4_{wh}$$

On the basis of this, the R_{wh} correction factor is calculated for a given stratum:

(5) $$R_{wh} = \frac{n_{awh}}{n1_{wh}},$$

The function of this factor is the correction of the $W1_{whi}$ weight in order to achieve final weight W_{hi}:

(6) $$W_{whi} = R_{wh} * W1_{whi},$$

The evaluation of the sum of X variable value for Poland is the sum of values obtained for particular voivodships, i.e.:

(7) $$\hat{x} = \sum_{w} \hat{x}_w, \qquad (\text{ w} = 1, 2, \ldots , 16)$$

Primary weights resulting from sample drawing are corrected not only due to the incompleteness of the survey but also due to the occurrence of the so called outlier farms. This pertains to farms with high assigned weight (drawn with a high likelihood function) and, at the same time, with relatively high values for some of the analysed variables. Weight correction is aimed at preventing substantial overestimation of the value of the analysed variable.

For the selected major assessments of the parameters, their variation coefficients were estimated as the accuracy measures. For an estimator expressed by formula (1), i.e. for w-voivodship, its variation coefficient is estimated with the following formula:

(8) $$v\,(x_w) = \frac{\sqrt{d^2(\hat{x}_w)}}{\hat{x}_w} * 100,$$

while:

(9) $d^2(\hat{x}_w) = \sum_h n_{awh}\left(1 - \frac{n_{wh}}{N_{wh}}\right) * s^2_{wh}$,

where:

(10) $s^2_{wh} = \frac{1}{n_{awh} - 1} \sum_i \left(y_{whi} - \frac{1}{n_{awh}} * \hat{y}_{wh} \right)^2$,

while:

(11) $y_{whi} = W_{whi} * x_{whi}$,

and:

(12) $\hat{y}_{wh} = \sum_i y_{whi}$,

For Poland the variation coefficient of the sum X estimated with the formula (7) is expressed by the following formula:

(13) $v(\hat{x}) = \frac{\sqrt{d^2(\hat{x})}}{\hat{x}}$,

whereas:

(14) $d^2(\hat{x}) = \sum_w d^2(\hat{x}_w)$,

The values of the relative standard error of selected attributes for Poland – based on the results of a sample survey of the livestock of cattle, sheep and poultry as well as the results of a survey of pigs – conducted in December 2012.

No. of the attribute	Name of the attribute	Relative standard error
1.	Cattle total	0.74
2.	Cows	0.83
3.	Pigs total	0.67
4.	Sows total	0.69
5.	Hens	0.41
6.	Laying hens	0.76

Annex 6.1.
UNFCCC land transition matrix

Poland 2017

Land Use, Land-Use Change and Forestry Land Transition Matrix

4. Land Use, Land-Use Change and Forestry Land Transition Matrix	Unit	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Forest land (managed)															
Remaining Forest land (managed)	kha	8659,18	8665,68	8677,82	8693,29	8705,94	8714,49	8714,45	8723,54	8741,13	8778,29	8808,85	8860,76	8876,74	8902,84
Converted to Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Cropland	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Settlements	kha	1,32	1,32	0,68	0,61	0,36	3,71	0,57	0,67	0,40	0,42	0,58	0,49	0,40	0,72
Converted to Other land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area	kha	8660,50	8667,00	8678,50	8693,90	8706,30	8718,20	8715,02	8724,22	8741,53	8778,71	8809,43	8861,25	8877,14	8903,56
Final area	kha	8667,00	8678,50	8693,90	8706,30	8718,20	8715,02	8724,22	8741,53	8778,71	8809,43	8861,25	8877,14	8903,56	8915,63
Forest land (unmanaged)															
Remaining Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Cropland	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Settlements	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Other land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Final area	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Cropland															
Remaining Cropland	kha	14702,00	14678,50	14652,72	14644,85	14620,95	14607,09	14581,06	14567,42	14536,31	14518,16	14446,69	14467,34	14438,73	14405,47
Converted to Forest land (managed)	kha	6,04	9,90	12,42	10,05	9,47	0,41	7,54	13,90	29,03	24,06	40,48	12,66	20,71	9,88
Converted to Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (managed)	kha	23,30	5,94	5,94	3,29	9,42	13,32	11,76	1,12	1,38	0,75	34,92	8,74	6,19	0,00
Converted to Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Settlements	kha	7,66	7,66	7,33	5,94	5,22	6,58	7,69	6,37	1,42	1,21	0,98	1,32	1,72	1,50
Converted to Other land	kha	NO	NO	0,58	NO	NO	NO	NO	NO	NO	NO	NO	5,98	NO	25,81
Converted to Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area	kha	14739,00	14702,00	14679,00	14664,13	14645,06	14627,39	14608,05	14588,80	14568,14	14544,17	14523,07	14496,04	14467,34	14442,66
Final area	kha	14702,00	14679,00	14664,13	14645,06	14627,39	14608,05	14588,80	14568,14	14544,17	14523,07	14496,04	14467,34	14442,66	14405,47

Poland 2017

Land Use, Land-Use Change and Forestry Land Transition Matrix

4. Land Use, Land-Use Change and Forestry Land Transition Matrix	Unit	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Grassland (managed)															
Remaining Grassland (managed)	kha	4306,90	4317,26	4303,56	4298,62	4291,43	4293,56	4301,64	4306,59	4301,49	4298,73	4287,06	4308,00	4302,05	4287,29
Converted to Forest land (managed)	kha	1,78	2,92	3,66	2,96	2,79	0,12	2,22	4,09	8,55	7,09	11,92	3,73	6,10	2,91
Converted to Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Cropland	kha	NO	NO	11,88	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (managed)	kha	1,41	5,01	1,52	2,51	0,99	1,58	0,03	2,72	2,47	0,07	1,02	3,66	3,64	0,68
Converted to Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Settlements	kha	5,61	5,01	2,58	5,41	6,70	5,59	2,99	NO	NO	NO	4,18	6,59	4,96	NO
Converted to Other land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	17,36
Converted to Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area	kha	4315,70	4330,20	4323,20	4309,50	4301,91	4300,86	4306,88	4313,41	4312,51	4305,88	4304,18	4321,98	4316,74	4308,24
Final area	kha	4330,20	4323,20	4309,50	4301,91	4300,86	4306,88	4313,41	4312,51	4305,88	4304,18	4321,98	4316,74	4308,24	4287,29
Grassland (unmanaged)															
Remaining Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Cropland	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Settlements	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Other land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Final area	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Wetlands (managed)															
Remaining Wetlands (managed)	kha	1322,09	1323,49	1328,47	1329,91	1332,40	1333,38	1334,92	1334,91	1337,17	1338,19	1338,05	1338,98	1341,90	1341,62
Converted to Forest land (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Cropland	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	1,39	NO	NO	NO	NO
Converted to Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Settlements	kha	0,01	0,01	0,03	0,08	0,02	0,01	0,04	0,04	0,47	0,07	0,20	0,10	0,74	0,68
Converted to Other land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	3,24
Converted to Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area	kha	1322,10	1323,50	1328,50	1329,99	1332,42	1333,39	1334,97	1334,95	1337,63	1339,64	1338,25	1339,08	1342,63	1345,53
Final area	kha	1323,50	1328,50	1329,99	1332,42	1333,39	1334,97	1334,95	1337,63	1339,64	1338,25	1339,08	1342,63	1345,53	1342,30
Wetlands (unmanaged)															
Remaining Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Cropland	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Settlements	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Other land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Final area	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

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Land Use, Land-Use Change and Forestry Land Transition Matrix

4. Land Use, Land-Use Change and Forestry Land Transition Matrix	Unit	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Settlements															
Remaining Settlements	kha	1944,90	1958,40	1972,40	1983,02	1995,06	2007,36	2023,24	2029,74	2033,81	2032,78	2034,47	2040,41	2048,90	2028,64
Converted to Forest land (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Cropland	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (managed)	kha	NO	NO	NO	NO	NO	NO	NO	4,80	3,01	3,32	NO	NO	NO	NO
Converted to Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Other land	kha	3,20	1,10	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	28,08
Converted to Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area	kha	1948,10	1959,50	1972,40	1983,02	1995,06	2007,36	2023,24	2034,54	2036,82	2036,10	2034,47	2040,41	2048,90	2056,72
Final area	kha	1959,50	1972,40	1983,02	1995,06	2007,36	2023,24	2034,54	2036,82	2036,10	2034,47	2040,41	2048,90	2056,72	2031,53
Other land															
Remaining Other land	kha	282,90	286,60	287,20	287,75	281,30	280,33	272,59	271,87	264,01	259,10	209,75	209,75	211,79	211,79
Converted to Forest land (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Cropland	kha	NO	NO	NO	0,04	6,44	0,97	7,75	0,72	7,86	4,90	49,35	NO	3,95	NO
Converted to Grassland (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Settlements	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area	kha	282,90	286,10	287,20	287,78	287,75	281,30	280,33	272,59	271,87	264,01	259,10	209,75	215,74	211,79
Final area	kha	286,10	287,20	287,78	287,75	281,30	280,33	272,59	271,87	264,01	259,10	209,75	215,74	211,79	286,30
Total unmanaged land															
Remaining Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Cropland	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Settlements	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Other land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Final area (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Net change															
Forest land (managed)	kha	6,50	11,50	15,40	12,40	11,90	-3,18	9,19	17,31	37,18	30,72	51,82	15,90	26,41	12,07
Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Cropland	kha	37,00	23,00	14,87	19,07	17,67	19,34	19,25	20,66	23,97	21,11	27,03	28,70	24,68	37,19
Grassland (managed)	kha	-14,50	7,00	13,70	7,59	1,05	-6,02	-6,52	0,89	6,63	1,70	-17,79	5,23	8,51	20,95
Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Wetlands (managed)	kha	-1,40	-5,00	-1,49	-2,43	-0,97	-1,58	0,01	-2,68	-2,00	1,39	-0,82	-3,56	-2,90	3,23
Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Settlements	kha	-11,40	-12,90	-10,62	-12,04	-12,30	-15,88	-11,29	-2,28	0,72	1,63	-5,94	-8,49	-7,82	25,19
Other land	kha	-3,20	-1,10	-0,58	0,04	6,44	0,97	7,75	0,72	7,86	4,90	49,35	-5,98	3,95	-74,50
Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total															
Initial area	kha	31268,30	31268,30	31268,30	31268,80	31268,33	31268,50	31268,50	31268,50	31268,50	31268,50	31268,50	31268,50	31268,50	31268,50
Final area	kha	31268,30	31268,30	31268,30	31268,80	31268,33	31268,50	31268,50	31268,50	31268,50	31268,50	31268,50	31268,50	31268,50	31268,50

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Land Use, Land-Use Change and Forestry Land Transition Matrix

4. Land Use, Land-Use Change and Forestry Land Transition Matrix	Unit	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Forest land (managed)															
Remaining Forest land (managed)	kha	8915,10	8967,74	9030,40	9105,71	9152,43	9163,49	9223,51	9250,78	9275,14	9304,21	9328,57	9353,24	9368,63	9381,84
Converted to Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Cropland	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Settlements	kha	0,53	0,42	0,69	0,65	0,47	0,60	0,60	0,62	0,64	0,55	0,60	0,49	0,78	0,74
Converted to Other land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area	kha	8915,63	8968,16	9031,09	9106,37	9152,91	9164,08	9224,11	9251,40	9275,78	9304,76	9329,18	9353,73	9369,40	9382,58
Final area	kha	8968,16	9031,09	9106,37	9152,91	9164,08	9224,11	9251,40	9275,78	9304,76	9329,18	9353,73	9369,40	9382,58	9395,17
Forest land (unmanaged)															
Remaining Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Cropland	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Settlements	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Other land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Final area	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Cropland															
Remaining Cropland	kha	14345,13	14282,17	14331,94	14332,27	14329,35	14278,60	14281,33	14261,48	14216,30	14182,92	14138,13	14103,69	14011,29	13997,87
Converted to Forest land (managed)	kha	40,98	48,94	58,68	36,46	9,00	46,83	21,54	19,31	22,88	19,29	19,44	12,49	10,78	10,30
Converted to Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (managed)	kha	17,48	35,91	5,14	NO	3,92	NO	9,77	7,65	11,52	7,89	6,77	5,76	NO	NO
Converted to Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Settlements	kha	1,88	1,77	1,88	2,24	6,72	3,92	3,92	6,61	10,79	6,21	18,59	11,56	81,63	3,11
Converted to Other land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	4,63	NO	NO
Converted to Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area	kha	14405,47	14368,79	14397,64	14370,97	14348,99	14329,35	14316,55	14295,06	14261,48	14216,30	14182,92	14138,13	14103,69	14011,29
Final area	kha	14368,79	14397,64	14370,97	14348,99	14329,35	14316,55	14295,06	14261,48	14216,30	14182,92	14138,13	14103,69	14011,29	14023,26

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Land Use, Land-Use Change and Forestry Land Transition Matrix

4. Land Use, Land-Use Change and Forestry Land Transition Matrix	Unit	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Grassland (managed)															
Remaining Grassland (managed)	kha	4272,30	4260,51	4274,39	4262,08	4235,22	4210,11	4182,86	4175,85	4167,46	4165,15	4162,81	4156,36	4153,20	4150,16
Converted to Forest land (managed)	kha	12,07	14,41	17,28	10,74	2,65	13,79	6,35	5,69	6,74	5,68	5,72	3,68	3,17	3,03
Converted to Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Cropland	kha	NO	NO	NO	2,43	NO	0,39	13,73	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (managed)	kha	2,91	14,87	4,74	1,69	1,27	5,39	3,42	1,96	4,78	2,21	1,05	2,08	NO	NO
Converted to Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Settlements	kha	NO	NO	NO	2,59	6,69	10,06	3,76	9,13	7,35	5,94	3,46	5,76	5,75	NO
Converted to Other land	kha	NO	NO	NO	NO	16,26	NO	NO	NO	NO	NO	NO	1,69	NO	NO
Converted to Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area	kha	4287,29	4289,79	4296,42	4279,53	4262,09	4239,75	4210,11	4192,62	4186,32	4178,98	4173,03	4169,58	4162,12	4153,20
Final area	kha	4289,79	4296,42	4279,53	4262,09	4239,75	4210,11	4192,62	4186,32	4178,98	4173,03	4169,58	4162,12	4153,20	4172,97
Grassland (unmanaged)															
Remaining Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Cropland	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Settlements	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Other land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Final area	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Wetlands (managed)															
Remaining Wetlands (managed)	kha	1341,24	1343,06	1357,08	1360,61	1360,05	1359,72	1363,51	1362,18	1362,92	1366,59	1367,74	1368,78	1366,39	1366,39
Converted to Forest land (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Cropland	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (managed)	kha	NO	NO	NO	NO	0,99	NO	NO	2,80	NO	NO	NO	NO	NO	NO
Converted to Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Settlements	kha	1,05	1,09	0,85	1,21	1,27	1,60	1,60	1,96	1,22	1,10	1,06	0,00	4,48	NO
Converted to Other land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area	kha	1342,30	1344,16	1357,93	1361,82	1362,30	1361,32	1365,11	1366,93	1364,14	1367,70	1368,80	1368,78	1370,86	1366,39
Final area	kha	1344,16	1357,93	1361,82	1362,30	1361,32	1365,11	1366,93	1364,14	1367,70	1368,80	1368,78	1370,86	1366,39	1369,75
Wetlands (unmanaged)															
Remaining Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Cropland	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Settlements	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Other land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Final area	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Poland 2017

Land Use, Land-Use Change and Forestry Land Transition Matrix

4. Land Use, Land-Use Change and Forestry Land Transition Matrix	Unit	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Settlements															
Remaining Settlements	kha	2019,00	2007,01	1999,60	2003,02	2009,71	2024,86	2041,03	2060,04	2080,44	2104,30	2120,23	2145,62	2157,31	2198,39
Converted to Forest land (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Cropland	kha	12,53	15,44	10,68	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	25,39
Converted to Grassland (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	22,81
Converted to Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	3,36
Converted to Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Other land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	6,13	NO
Converted to Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area	kha	2031,53	2022,45	2010,29	2003,02	2009,71	2024,86	2041,03	2060,04	2080,44	2104,30	2120,23	2145,62	2163,44	2249,94
Final area	kha	2022,45	2010,29	2003,02	2009,71	2024,86	2041,03	2060,04	2080,44	2104,30	2120,23	2145,62	2163,44	2249,94	2209,03
Other land															
Remaining Other land	kha	275,17	175,15	146,81	132,51	132,33	111,03	101,89	99,80	95,94	93,81	92,13	92,13	98,45	97,79
Converted to Forest land (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Cropland	kha	11,12	100,03	28,34	14,29	NO	37,56	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (managed)	kha	NO	NO	NO	NO	NO	NO	NO	0,03	NO	NO	NO	NO	NO	NO
Converted to Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Settlements	kha	NO	NO	NO	NO	NO	NO	9,14	2,06	3,87	2,13	1,68	NO	NO	6,79
Converted to Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area	kha	286,30	275,17	175,15	146,81	132,33	148,59	111,03	101,89	99,80	95,94	93,81	92,13	98,45	104,58
Final area	kha	275,17	175,15	146,81	132,33	148,59	111,03	101,89	99,80	95,94	93,81	92,13	98,45	104,58	97,79
Total unmanaged land															
Remaining Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Cropland	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (managed)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Settlements	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Converted to Other land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Initial area (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Final area (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Net change															
Forest land (managed)	kha	52,53	62,93	75,28	46,54	11,18	60,03	27,29	24,38	28,98	24,41	24,56	15,67	13,17	12,59
Forest land (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Cropland	kha	36,68	-28,85	26,67	21,98	19,64	12,80	21,50	33,57	45,18	33,38	44,79	34,44	92,40	-11,98
Grassland (managed)	kha	-2,50	-6,63	16,88	17,45	22,34	29,63	17,49	6,30	7,35	5,95	3,45	7,45	8,93	-19,77
Grassland (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Wetlands (managed)	kha	-1,86	-13,77	-3,89	-0,49	0,99	-3,79	-1,83	2,80	-3,56	-1,10	0,01	-2,08	4,48	-3,36
Wetlands (unmanaged)	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Settlements	kha	9,08	12,16	7,27	-6,69	-15,15	-16,17	-19,01	-20,41	-23,86	-15,94	-25,39	-17,82	-86,50	40,92
Other land	kha	11,12	100,03	28,34	14,48	-16,26	37,56	9,14	2,08	3,86	2,13	1,68	-6,32	-6,13	6,79
Total unmanaged land	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total															
Initial area	kha	31268,50	31268,50	31268,50	31268,50	31268,50	31268,32	31267,94	31267,94	31267,94	31267,97	31267,97	31267,97	31267,97	31267,97
Final area	kha	31268,50	31268,50	31268,50	31268,50	31268,50	31268,32	31267,94	31267,94	31267,94	31267,97	31267,97	31267,97	31267,97	31267,97

Annex 6.2.
KP LULUCF land transition matrix

Poland 2017

KP LULUCF Land Transition Matrix

7. KP LULUCF	Unit	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Afforestation and reforestation															
Remaining afforestation and reforestation	kha	NO	NO	NO	16,08	29,10	41,36	41,89	51,65	69,64	107,21	138,35	190,75	207,13	233,95
Changed to deforestation	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total area at the end of the previous year	kha	NO	NO	NO	16,08	29,10	41,36	41,89	51,65	69,64	107,21	138,35	190,75	207,13	233,95
Total area at the end of the current year	kha	NA,NO	NA,NO	16,08	29,10	41,36	41,89	51,65	69,64	107,21	138,35	190,75	207,13	233,95	246,74
Deforestation															
Remaining deforestation	kha	NO	NO	NO	0,68	1,30	1,66	5,36	5,93	6,61	7,01	7,42	8,00	8,49	8,89
Total area at the end of the previous year	kha	NO	NO	NO	0,68	1,30	1,66	5,36	5,93	6,61	7,01	7,42	8,00	8,49	8,89
Total area at the end of the current year	kha	NA,NO	NA,NO	0,68	1,30	1,66	5,36	5,93	6,61	7,01	7,42	8,00	8,49	8,89	9,61
Forest management															
Changed to deforestation	kha	NO	NO	0,68	0,61	0,36	3,71	0,57	0,67	0,40	0,42	0,58	0,49	0,40	0,72
Remaining forest management	kha	8659,18	8691,32	8677,82	8677,20	8676,85	8673,14	8672,57	8671,89	8671,49	8671,08	8670,50	8670,01	8669,61	8668,89
Total area at the end of the previous year	kha	8659,18	8691,32	8678,50	8677,82	8677,20	8676,85	8673,14	8672,57	8671,89	8671,49	8671,08	8670,50	8670,01	8669,61
Total area at the end of the current year	kha	8667,00	8704,14	8677,82	8677,20	8676,85	8673,14	8672,57	8671,89	8671,49	8671,08	8670,50	8670,01	8669,61	8668,89
Cropland management															
Changed to afforestation and reforestation	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to forest management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Remaining cropland management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to grazing land management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to revegetation	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to wetland drainage and rewetting	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total area at the end of the previous year	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total area at the end of the current year	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Grazing land management															
Changed to afforestation and reforestation	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to forest management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to cropland management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Remaining grazing land management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to revegetation	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to wetland drainage and rewetting	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total area at the end of the previous year	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total area at the end of the current year	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Revegetation															
Changed to afforestation and reforestation	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to forest management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to cropland management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to grazing land management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Remaining revegetation	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to wetland drainage and rewetting	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total area at the end of the previous year	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total area at the end of the current year	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wetland drainage and rewetting															
Changed to afforestation and reforestation	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to forest management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to cropland management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to grazing land management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to revegetation	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Remaining wetland drainage and rewetting	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total area at the end of the previous year	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total area at the end of the current year	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Other															
Changed to afforestation and reforestation	kha	NA	NA	16,08	13,01	12,26	0,53	9,76	17,99	37,58	31,14	52,40	16,38	26,81	12,79
Changed to deforestation	kha	NA	NA	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Changed to forest management	kha	7,82	12,82	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Changed to cropland management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to grazing land management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to revegetation	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to wetland drainage and rewetting	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Remaining Other	kha	22607,80	22601,80	22573,75	22577,67	22548,65	22548,12	22538,35	22520,37	22482,79	22451,65	22399,25	22382,87	22356,06	22343,25
Total area at the end of the previous year	kha	22615,62	22614,62	22589,83	22590,69	22560,91	22548,65	22548,12	22538,35	22520,37	22482,79	22451,65	22399,25	22382,87	22356,05
Total area at the end of the current year	kha	22607,80	22601,80	22573,75	22577,67	22548,65	22548,12	22538,35	22520,37	22482,79	22451,65	22399,25	22382,87	22356,06	22343,25

Poland 2017
KP LULUCF Land Transition Matrix

7. KP LULUCF	Unit	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Afforestation and reforestation															
Remaining afforestation and reforestation	kha	246,74	299,79	363,14	439,11	486,30	497,95	558,57	586,46	611,46	641,08	666,05	691,21	707,37	721,32
Changed to deforestation	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total area at the end of the previous year	kha	246,74	299,79	363,14	439,11	486,30	497,95	558,57	586,46	611,46	641,08	666,05	691,21	707,37	721,32
Total area at the end of the current year	kha	299,79	363,14	439,11	486,30	497,95	558,57	586,46	611,46	641,08	666,05	691,21	707,37	721,32	734,65
Deforestation															
Remaining deforestation	kha	9,61	10,13	10,55	11,24	11,89	12,36	12,96	13,56	14,18	14,82	15,37	15,98	16,47	17,24
Total area at the end of the previous year	kha	9,61	10,13	10,55	11,24	11,89	12,36	12,96	13,56	14,18	14,82	15,37	15,98	16,47	17,24
Total area at the end of the current year	kha	10,13	10,55	11,24	11,89	12,36	12,96	13,56	14,18	14,82	15,37	15,98	16,47	17,24	17,98
Forest management															
Changed to deforestation	kha	0,53	0,42	0,69	0,65	0,47	0,60	0,60	0,62	0,64	0,55	0,60	0,49	0,78	0,74
Remaining forest management	kha	8668,37	8667,95	8667,26	8666,61	8666,14	8665,54	8664,94	8664,32	8663,68	8663,13	8662,52	8662,03	8661,26	8660,52
Total area at the end of the previous year	kha	8668,89	8668,37	8667,95	8667,26	8666,61	8666,14	8665,54	8664,94	8664,32	8663,68	8663,13	8662,52	8662,03	8661,26
Total area at the end of the current year	kha	8668,37	8667,95	8667,26	8666,61	8666,14	8665,54	8664,94	8664,32	8663,68	8663,13	8662,52	8662,03	8661,26	8660,52
Cropland management															
Changed to afforestation and reforestation	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to forest management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Remaining cropland management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to grazing land management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to revegetation	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to wetland drainage and rewetting	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total area at the end of the previous year	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total area at the end of the current year	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Grazing land management															
Changed to afforestation and reforestation	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to forest management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to cropland management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Remaining grazing land management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to revegetation	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to wetland drainage and rewetting	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total area at the end of the previous year	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total area at the end of the current year	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Revegetation															
Changed to afforestation and reforestation	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to forest management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to cropland management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to grazing land management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Remaining revegetation	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to wetland drainage and rewetting	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total area at the end of the previous year	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total area at the end of the current year	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wetland drainage and rewetting															
Changed to afforestation and reforestation	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to forest management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to cropland management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to grazing land management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to revegetation	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Remaining wetland drainage and rewetting	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total area at the end of the previous year	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total area at the end of the current year	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Other															
Changed to afforestation and reforestation	kha	53,05	63,35	75,97	47,19	11,65	60,62	27,89	25,00	29,53	24,97	25,16	16,17	13,95	13,33
Changed to deforestation	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Changed to forest management	kha	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Changed to cropland management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to grazing land management	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to revegetation	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Changed to wetland drainage and rewetting	kha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Remaining Other	kha	22290,21	22226,86	22150,90	22103,71	22091,87	22030,87	22002,98	21977,97	21948,39	21923,42	21898,26	21882,09	21868,14	21854,81
Total area at the end of the previous year	kha	22343,27	22290,21	22226,86	22150,90	22103,52	22091,49	22030,87	22002,98	21978,01	21948,39	21923,42	21898,26	21882,09	21868,14
Total area at the end of the current year	kha	22290,21	22226,86	22150,90	22103,71	22091,87	22030,87	22002,98	21977,97	21948,39	21923,42	21898,26	21882,09	21868,14	21854,81

Annex 7. Quality Assurance and Quality Control

Quality Assurance / Quality Control and Verification programme for the Polish annual greenhouse gas inventory has been elaborated and updated if needed. It has been elaborated in line with the 2006 ***IPCC Guidelines for National GHG Inventories***. The QA/QC programme aiming at improving and assuring the high quality of GHG inventories contains tasks, responsibilities as well as time schedule for performance of the QA/QC procedures. Detailed domestic QA/QC plan is a part of QA/QC programme.

Quality Control (QC) activities are carried out by the personnel directly responsible for the inventory and are aimed at keeping its high standards and quality.
Within the national inventory the main activities underlying Quality Control process are conducted using *Tier 1* method and relate to all source/sink categories. Tier 2 procedures are carried out for main key categories with special attention to the energy sector.

Following the Chapter 6 of the 2006 *IPCC Guidelines for National GHG Inventories*, Quality control (QC) covers routine technical activities carried out with the aim of quality control of national emissions and removals inventories allowing for:

- Maintaining the correctness and completeness of data,
- Elimination of errors and determination of potential deficiencies.

Quality Control activities contain: checks for accuracy of data and estimations acquiring as well as application of approved procedures for calculation of emissions, uncertainty, archiving of information and reporting.

Activities aiming at **quality assurance (QA)** cover procedural system for control carried out by experts not involved directly in elaborating GHG inventory in a given sector. QA activities are conducted over a completed inventory and allow to ensure that national inventory represents top level of emissions and removals assessment at the present knowledge and available data and effectively support quality control (QC).

Verification activities – where possible - include comparisons with external emission analyses estimates and databases conducted by independent bodies or teams. They allow to improve inventory methods and outcomes in both short and long terms.

The Polish inventory is directly based on sectoral activity data and carried out in two main steps. First, calculations are produced around 12 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 up to 15 months after given year. Additionally the recalculations of the previous inventories for selected categories are performed because of methodological changes and improvements. The timetable for inventory preparation and QA/QC activities conducted at respective stages of the inventory preparation are presented in Table 1.

The basic elements of QA/QC plan which are to be implemented and co-ordinated by the National Centre for Emission Balancing and Management (KOBiZE), the unit responsible for Polish GHG inventory preparation. It follows the 2006 *IPCC Guidelines for National GHG Inventories* recommendations. The main procedures for QA/QC activities are described in the *National Quality Assurance / Quality Control and Verification Programme of the Polish Greenhouse Gas Inventory* and the detail check procedures are contained below as the examples of QC procedures performed by KOBiZE experts.

General timeframes of annual inventory preparation (including checking procedures), approval and submission are presented in the table 1. The dates for particular stages are established based on country specific availability of statistical data as well as national (legal) and international obligations.

Table 1. Timetable for inventory preparation and check (n – submission year)

Timing	Activity
June -15 December (year n–1)	→ Data and emission factors collection (estimation) → Check for consistency and correctness of the emission data, trends and factors, using all the relevant methods of both QC and verification outlined in the Programme (points 6-8 and 10) → Initial calculations and checks of GHG emissions considering ERT recommendations → Submission to the Ministry of Environment for acceptance
15 January (year n–2)	→ Submission of PL GHG inventory for the year n-2 and elements of NIR to the EIONET CDR (required by regulation (EU) No 525/2013 Article 7.1)
15 December – 15 February (year n–2)	→ Emission results and methodology verification based on remarks and comments made by ministerial emission experts (QA methods applied) → Elaboration of final inventory, additional checks and final corrections to the inventory, preparation of NIR and CRF tables (QC and verification methods applied) → Additional CRF and NIR quality upgrading on the basis of EEA control questions and remarks - corrections of any possible mistakes or deficiencies if found (QA methods applied) → Submission to the Ministry of the Environment for acceptance
15 March (year n–2)	→ Emission results and methodology verification based on remarks and comments made by external sectoral experts within inter-ministerial and inter-institutional check of the report (QA methods applied) → Submission of complete National Inventory Report and CRF tables to the EIONET CDR (required by regulation (EU) No 525/2013 Article 7.3)
15 April (year n–2)	→ Submission of GHG inventory for the year n-2 to the UNFCCC Secretariat (CRF and NIR) (required by decision 24/CP.19)

Each IPCC sector undergoes detail QC procedure which is carried out by expert responsible for given category/subcategory. Check for correctness of data, emission factors and calculation results are performed several times during the following stages of inventory elaboration: during its preparation, after completing the calculations, after CRF tables generation and after NIR report completing. Additionally part of the data, especially for Energy sector, are checked by other KOBiZE experts than those making inventory who are responsible for other sectors. As a part of QA activity the inventory team cooperates with specialists from different institutes, associations and individual experts who are involved in verification of data and assumptions to the inventory.

Procedures for quality assurance of the national inventories cover both actions performed by domestic agencies as well as by foreign (EU, UNFCCC). The National Inventory Report is delivered to the Ministry of Environment, where it is consulted in two stages: internally, among suitable departments, and externally - in inter-ministerial dialogue. In this second stage branch institutes supervised by ministers are engaged to review the inventory.

After including obtained comments and amendments into the NIR, according to recommendations delivered during the inter-ministerial compliance, the Ministry of the Environment initiates the procedure for governmental acceptance of the NIR by the Committee for the European Affairs after which both NIR and underlying CRF tables are conveyed to the UNFCCC. The same report and data are sent earlier to the European Commission pursuant to the timeline determined in the regulation (EU) No 525/2013.

The inventory results and methodology applied for emission estimation are also subject to wide discussions during domestic conferences and seminars. Additionally National Inventory Reports are available, in Polish, at the website of KOBIZE. Broader participation of academic circles in reviewing the overall inventory is planned under the QA procedures. For the time being such reviews were conducted occasionally.

The national inventory results are also verified by the European Union. Since 2012 this verification, being the element of inventory quality control, is performed in a wide range using the *EEA Emission Review Tool (EMRT)* available through the website. This verification is made in February and March after submission of emission results following Article 7.1 of the regulation (EU) No 525/2013. In the given time detail explanations are prepared what is accompanied by additional check of data and calculations. If the problem is acknowledged as solved, such information is set in the communication table. Potential corrections of data resulting from EU verification are introduced into emission inventory.

Two-stage procedures controlling the results of the national inventory submitted in the form of CRF files performed by the UNFCCC Secretariat also constitute important element for quality assurance of the Polish emission inventory. When analysis of questions sent is prepared under the stage 2 of the UNFCCC check, the inventory experts perform additional check of data and results and prepare the response for comments. This is the first step for international review performed by Expert Review Team. The international review of the Polish GHG inventory made on an annual basis under UNFCCC constitutes one of the key elements in the process of further improvement the quality of reported data.

There are also internal deliberations on the usefulness of an idea to engage systemically external reviewers from R&D Institutes, Branch Associations, Industrial Chambers, individual plants as well as independent experts in verification of the inventory assumptions and results. Such a scrutiny should help find cost-utility balance of this kind of an extensive review process.

Depending on methodology used for emission estimation within categories Tier 1 or Tier 2 check procedures are carried out. The extended QC procedure for checking the correctness of emissions estimations is used for these categories where country specific emission factors are established. This concerns the key categories especially for such sectors like: fuel combustion (1.A), transport (1.A.3), cement production (2.A.1), enteric fermentation (3.A), manure management (3.B), and others. For GHG emission sources for which Tier 1 method is used for emission calculation also Tier 1 method is applied for inventory checks.

Data Management Manual has been elaborated in KOBiZE-ZIE for the purpose of efficient governance with all important information containing databases, software, worksheets, final reports as well as QA/QC documentation regarding to inventory process. For the purposes of documentation of data and calculations QC the files are archived in electronic and hardcopy forms.

Annex 8. Uncertainty assessment of the 2015 inventory

Uncertainty analysis for the year 2015 was performed with use of Approach 1 provided in *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Chosen methodology is based on the assumptions that every value is independent (there is no correlation between values) and probability of underestimation and overestimation is the same.
Conclusions from the previous centralized reviews and in-country review in 2013 were taken into account.
Latest major changes applied to uncertainties follow the changes in estimation methodology and new revised classification in CRF reporting tables. Uncertainty calculation model was extended to provide separate result for assessments including and excluding LULUCF sector. Another improvement triggered by ERT recommendation was calculation of overall uncertainty of inventory including information about uncertainties involved in estimation of Global Warming Potentials.

Additionally, since submission 2015 was provided uncertainty analysis of emission trend with use of 1998 emission inventory as a base year.

For industrial gases (HFC, PFC, SF6) due to lack of appropriate information, uncertainty estimates were applied directly to emission values on the basis of expert's opinion. No NF3 emission sources were identified in Poland thus, it was excluded from the analysis.

First stage of the estimates was to assign uncertainty to each activity data and emission factor. Next step was to estimate error propagation and its influence on national total emissions. To estimate error propagation from activity and emission factor to emission values, formula (1) was used.

$$U_{emission}= \text{square root } (U_{act}^2 + U_{EF}^2) \qquad (1)$$

where: $U_{emission}$ – uncertainty of emission value
U_{act} – uncertainty of activity value
U_{ef} – uncertainty of emission factor value

To estimate error propagation from sectoral emissions to national total, formula (2) was used

$$U_{emission}= \text{square root } (\Sigma\, (\text{Emission} * U_{emission})^2)/ \Sigma \text{ Emission} \qquad (2)$$

where: $U_{emission}$ – uncertainty of emission value in sector
Emission – emission from sector

As the base bottom level of analysis the following sectors were chosen:

- sector 1. Energy: categories on levels 1.A.1, 1.A.2, 1.A.3., 1.A.4, 1.A.5 with disaggregation by fuel type (liquid, solid, gaseous, biomass etc.)
- sector 2. IPPU: subcategories 2.A.1, 2.A.2 .... 2.C.3
- sector 3. Agriculture: subcategories 3.A.1, 3.A.2 .... 3.F.5 with further disaggregation
- sector 4. LULUCF: main subcategories 4.A, 4.B….4.E
- sector 5. Waste: 5.A.1, 5.A.2; 5.B with further disaggregation

Most of the estimates were based on default assumption described in methodology, but after investigation of socio-economic parameters literature data was applied to selected activities in sector *1. Energy* and for activities and emission factors in sector *2. Industrial processes and product use.* Selected uncertainties for activities and factors in 5.C Waste/Waste Incineration were estimated with help expert's opinion in Emission Balancing and Reporting Unit (former National Emission Centre).

Results of analysis of error propagation of uncertainty of national totals for 2015 were shown below:

	CO_2	CH_4	N_2O	HFC	PFC	SF_6	All GHG recalculated to CO_2 eq.
Total uncertainty Including IPCC 4. LULUCF	3.4%	22.8%	45.7%	47.0%	85.0%	92.5%	**4.9%**
Emission recalculated to CO2 eq [kt] Including IPCC 4. LULUCF	281 122.76	45 483.29	20 030.35	8 924.04	13.90	52.79	355 627.13
Total uncertainty Excluding IPCC 4. LULUCF	1.8%	22.8%	48.0%	47.0%	85.0%	92.5%	**4.0%**
Emission recalculated to CO2 eq [kt] Excluding IPCC 4. LULUCF	311 118.96	45 451.44	18 937.13	8 924.04	13.90	52.79	384 498.27

Activity data

Most uncertain values of activity were assigned in category 3.*F Agriculture/Field Burning of Agricultural Residues* and in *5.B Waste/Domestic and Commercial Wastewater* (30%). Lowest uncertainty values were assigned to *1.A.1 Energy/ Fuel Combustion,* especially in subsector 1.A.1 *Energy Industries* (2%,). In general Polish energy sector is responsible for 90 % of GHG emission and is covered with detailed national statistics, which allows to keep overall uncertainty of inventory at low level.

CO_2 emission factors

Most uncertain values for CO_2 emission factors were assigned in sector 5.*C Waste incineration* (50%), *2.A. Cement Production* (15%) and *2.C Metal Industry* (10%), the most precise values were reported in *1.A Fuel Combustion* (1-2%).

Low level of uncertainty of national total of CO_2 (3.4%) comes from the fact, that major part of emission comes from sector *1.A Fuel Combustion* where input data for activities and factors is the most precise (relatively 1-5% and 1-3%, excluding biomass).

CH_4 emission factors

Most uncertain values for CH_4 emission factors were assigned in sector 5.A Solid Waste Disposal (100%), and 5.C. Waste incineration (100%), *1.A Fuel Combustion* (75%), 1.B Fugitive Emission from fuels (75%), 3.*A. Enteric Fermentation* and 3.*B Manure Management (50%).* The most precise values were in *2. Industrial Processes and Product Use* (20%) and 3.*F Field Burning of Agricultural Residues* (20%). In 2009 new sources were included to analysis in *2.C. Metal Production (sinter, electric furnaces, pig iron and basic oxygen furnaces)* as a result of incorporating to national emission inventories data from reporting for EU Emission Trading Scheme.

Uncertainty of CH_4 emission is app. 22.8% which is result of share of agriculture and waste sectors in national totals – emission factors in those sectors have high relatively uncertainty.

N_2O emission factors

Most uncertain values for N_2O emission factors were assigned in sector 3.*B Manure management* (150%), *3.D Agricultural Soils* (150%) and in *3.F Agriculture/Field Burning of Agricultural Residues* (150%), most precise values were applied in sector *2.C Metal Industry (20%)*. Data available from polish part of EU Emission Trading Scheme reporting were taken into account during this analysis with relatively low uncertainty.

Highest value of uncertainty of national total occurred in N_2O (45.7%) and is a result of high uncertainty of the emission factors in sector of *Agriculture* (3.B *Liquid systems*, 3.B *Solid Storage and Dry Lot, 3.D Agricultural Soils* and *3.Field Burning of Agricultural residues* – 150%).

Industrial Gases

Simplified analysis were made for industrial gases HFC, PFC and SF6, where uncertainty assumptions were applied directly to emission values of each pollutant. Final results of analysis where as follows: HFC – 47.0%, PFC – 85.0% and SF6 – 92.5%. Due to lack of information, simplified approach has to be used and country recognizes need of additional analysis in this sector as planned improvement for future inventories.

Uncertainty introduced into the trend in total national emissions

In submission 2017 uncertainty analysis is providing information on uncertainty introduced into the trend in total national emissions. First step of the analysis was assessing of level uncertainty introduced to national total in base year (1988). Methodology used to assess trend uncertainties is the same as mentioned for analysis for 2015. Results of level uncertainty analysis for base year with and without IPCCC 4.LULUCF are presented below.

	CO_2	CH_4	N_2O	HFC	PFC	SF_6	All GHG recalculated to CO_2 eq.
Total uncertainty Including IPCC 4. LULUCF	2.4%	23.6%	42.4%		85.0%		**4.2%**
Emission recalculated to CO2 eq [kt] Including IPCC 4. LULUCF	453 921.17	68 555.14	29 514.97		147.26		552 138.55
Total uncertainty Excluding IPCC 4. LULUCF	2.0%	23.6%	42.7%		85.0%		**4.0%**
Emission recalculated to CO2 eq [kt] Excluding IPCC 4. LULUCF	470 942.43	68 511.01	29 344.69		147.26		568 945.38

On the basis of results of analysis made for the base year and latest reported year analysis for trend was done and results are presented below:

	CO_2	CH_4	N_2O
Trend uncertainty with IPCC 4.LULUCF	1.25%	2.75%	2.31%
Trend uncertainty without IPCC 4.LULUCF	1.14%	2.75%	2.30%

Planned improvements for next years

- further investigation of data for industrial gases
- revising uncertainty model used for Approach 2 (Monte Carlo analysis)
- collection of data and setting up model for KP art 3.3 and 3.4 uncertainty estimates

GHG inventory 2015 – Uncertainty analysis, part 1, sector IPCC 1 Energy.

2015	Activity [TJ]	Activity uncertainty [%]	EF CO_2 Uncertainty [%]	EF CH_4 Uncertainty [%]	EF N_2O Uncertainty [%]	CO2 [kt]	CH4 [kt]	N2O [kt]	CO_2 Emission uncertainty [%]	CH_4 Emission uncertainty [%]	N_2O Emission uncertainty [%]	CO2 Emission absolute uncertainty [kt]	CH4 Emission absolute uncertainty [kt]	N2O Emission absolute uncertainty [kt]
TOTAL (without LULUCF)						**311 118.96**	**1 818.06**	**63.55**	**1.8%**	**22.8%**	**48.0%**	5 566.77	414.25	30.52
TOTAL (with LULUCF)						**281 122.76**	**1 819.33**	**67.22**	**3.4%**	**22.8%**	**45.7%**	9 657.20	414.26	30.73
1. Energy						**291 301.91**	**909.56**	**7.83**	**1.9%**	**34.1%**	**12.5%**	**5526.38**	**310.61**	**0.98**
A. Fuel Combustion						**286 866.05**	**144.41**	**7.83**	**1.9%**	**11.3%**	**12.5%**	5512.11	16.33	0.98
1. Energy Industries						162 679.76	4.70	2.59	2.6%	16.5%	29.8%	4298.50	0.78	0.77
Liquid Fuels	62 674	2.0%	1.0%	10.0%	20.0%	4 451.37	0.15	0.03	2.2%	10.2%	20.1%	99.54	0.02	0.01
Solid Fuels	1 523 332	2.0%	2.0%	13.5%	35.0%	151 854.31	1.52	2.17	2.8%	13.6%	35.1%	4295.09	0.21	0.76
Gaseous Fuels	110 675	2.0%	1.0%	17.0%	40.0%	6 208.88	0.11	0.01	2.2%	17.1%	40.0%	138.83	0.02	0.00
Other fossil fuels	1 416	5.0%	5.0%	25.0%	75.0%	165.19	0.04	0.01	7.1%	25.5%	75.2%	11.68	0.01	0.00
Peat	NO					NO	NO	NO						
Biomass	101 978	10.0%	5.0%	24.0%	37.0%	11 059.09	2.88	0.38	11.2%	26.0%	38.3%	1236.44	0.75	0.15
2. Manufacturing Industries and Construction						28 180.03	4.26	0.59	2.4%	11.4%	23.7%	678.61	0.48	0.14
Liquid Fuels	31 939	3.0%	1.0%	10.0%	20.0%	2 175.46	0.06	0.01	3.2%	10.4%	20.2%	68.79	0.01	0.00
Solid Fuels	150 468	3.0%	2.0%	13.5%	35.0%	15 740.17	1.70	0.25	3.6%	13.8%	35.1%	567.52	0.23	0.09
Gaseous Fuels	135 225	4.0%	1.0%	17.0%	40.0%	7 586.14	0.14	0.01	4.1%	17.5%	40.2%	312.78	0.02	0.01
Other fossil fuels	20 168	5.0%	5.0%	25.0%	75.0%	2 678.26	0.61	0.08	7.1%	25.5%	75.2%	189.38	0.15	0.06
Peat	NO					NO	NO	NO						
Biomass	59 041	10.0%	5.0%	20.0%	37.0%	6 562.62	1.76	0.23	11.2%	22.4%	38.3%	733.72	0.39	0.09
3. Transport						45 267.65	4.33	1.64	5.7%	10.4%	20.2%	2592.91	0.45	0.33
Liquid Fuels	638 056.91	3.0%	5.0%	10.0%	20.0%	44 459.24	4.30	1.64	5.8%	10.4%	20.2%	2592.40	0.45	0.33
Solid Fuels	NO	3.0%	5.0%	13.5%	35.0%				5.8%	13.8%	35.1%			
Gaseous Fuels	15 047.00	4.0%	5.0%	17.0%	40.0%	808.41	0.02	0.00	6.4%	17.5%	40.2%	51.76	0.00	0.00
Other fossil fuels	NA,NO	10.0%	5.0%	25.0%	75.0%				11.2%	26.9%	75.7%			
Biomass	28.40	10.0%	5.0%	24.0%	37.0%	2.01	0.00	0.00	11.2%	26.0%	38.3%	0.22	0.00	0.00
4. Other Sectors						50 738.61	131.12	3.00	4.3%	12.4%	16.0%	2173.14	16.29	0.48
Liquid Fuels	117 226.08	4.0%	5.0%	10.0%	20.0%	8 401.15	0.63	1.97	6.4%	10.8%	20.4%	537.94	0.07	0.40
Solid Fuels	325 965.19	4.0%	5.0%	13.5%	35.0%	30 802.20	90.07	0.49	6.4%	14.1%	35.2%	1972.30	12.68	0.17
Gaseous Fuels	205 168.16	4.0%	5.0%	17.0%	40.0%	11 509.93	1.03	0.02	6.4%	17.5%	40.2%	737.00	0.18	0.01
Other fossil fuels	195.00	4.0%	5.0%	25.0%	75.0%	25.32	0.06	0.00	6.4%	25.3%	75.1%	1.62	0.01	0.00
Peat	NO					NO	NO	NO						
Biomass	133 841.53	10.0%	5.0%	24.0%	37.0%	14 832.62	39.34	0.52	11.2%	26.0%	38.3%	1658.34	10.23	0.20
5. Other						0.00	0.00	0.00	0.0%	0.0%	0.0%	0.00	0.00	0.00
Liquid Fuels	NO	5.0%	3.0%	100.0%	20.0%				5.8%	100.1%	20.6%	0.00	0.00	0.00
Solid Fuels	NO	5.0%	5.0%	80.0%	35.0%				7.1%	80.2%	35.4%	0.00	0.00	0.00
Gaseous Fuels	NO	5.0%	5.0%	90.0%	40.0%				7.1%	90.1%	40.3%	0.00	0.00	0.00
Biomass	NO	20.0%	5.0%	95.0%	37.0%				20.6%	97.1%	42.1%	0.00	0.00	0.00
B. Fugitive Emissions from Fuels						**4435.86**	**765.16**	**0.00**	**8.9%**	**40.5%**	**70.86%**	396.96	310.19	0.00
1. Solid Fuels						2347.94	676.40		15.0%	45.8%		351.95	309.96	0.00
1. B. 1. a. Coal Mining and Handling												0.00	0.00	0.00
i. Underground Mines [Activity in Mt, EF in kg/t]		2.0%		50.0%			616.97			50.0%		0.00	308.73	0.00
ii. Surface Mines [Activity in Mt, EF in kg/t]		2.0%		50.0%			54.99			50.0%		0.00	27.52	0.00
1. B. 1. b. Solid Fuel Transformation [Activity in Mt, EF in kg/t]	NA					2346.36	0.00		15.0%	25.0%		351.95	0.00	
1. B. 1. c. Other [CO2 Emisson from Coking Gas Subsystem]	720.04	2.0%	10.0%	50.0%		1.58	4.44		10.2%	50.0%		0.16	2.22	
2. Oil and Natural Gas						2087.93	88.76	0.00	8.8%	13.2%	70.86%	183.60	11.74	0.00
1. B. 2. a. Oil												0.00	0.00	
2. Production [Activity in PJ, EFs in kg/PJ]	39.57	2.0%	6.6%	50.0%		249.872	2.45		6.9%	50.0%		17.23	1.22	
3. Transport [Activity in kt]	27 420.00	2.0%	6.6%	50.0%		0.016	0.17		6.9%	50.0%		0.00	0.09	
4. Refining/storage [kt]	1 110.87	2.0%	6.6%	50.0%		NA	1.25		6.9%	50.0%			0.63	
1. B. 2. b. Natural Gas												0.00	0.00	
2. Production [Activity in PJ, EF in kg/PJ]	154.20	2.0%	6.6%	50.0%		0.368	10.31		6.9%	50.0%		0.03	5.16	
3. Processing [Activity in PJ, EF in kg/PJ]	154.20	2.0%	6.6%	50.0%		3.893	4.62		6.9%	50.0%		0.27	2.31	
4. Transmission and storage [Activity in PJ, EF in kg/PJ]	418.36	2.0%	6.6%	50.0%		0.011	5.84		6.9%	50.0%		0.00	2.92	
5. Distribution [Activity in PJ, EF in kg/PJ]	418.36	2.0%	6.6%	50.0%		0.620	13.38		6.9%	50.0%		0.04	6.70	
6. Other leakage [Activity in PJ, EF in kg/PJ]	418.36	2.0%	6.6%	50.0%		0.001	0.30		6.9%	50.0%		0.00	0.15	
1. B. 2. c. Venting - Oil	928.00	5.0%	6.6%	50.0%		0.161	0.86		8.3%	50.2%		0.01	0.43	
1. B. 2. c. Venting and flaring - oil [kt]	928.00	5.0%	6.6%	50.0%	100.0%	0.027	44.19	0.00	8.3%	50.2%	100.1%			0.00
1. B. 2. c. Venting and flaring - natural gas [10^6 m3]	4 483.77	5.0%	6.6%	50.0%	100.0%	43.798	5.38	0.00	8.3%	50.2%	100.1%			0.00
1. B. 2. d. Other (Process emission from refineries and flaring)			NA			1789.159			10.0%					

GHG inventory 2015 – Uncertainty analysis, part 2, IPCC sector 2 Industrial processes and product use

2. Industrial processes and product use						**18 558.88**	**2.62**	**2.91**	**3.4%**	**31.6%**	**39.6%**	632.50	0.83	1.15
A. Mineral Industry						10 088.56			5.7%			570.03	0.00	0.00
1. Cement Production [Activity in kt, EF in t/t]	11 278.40	5.0%	5.0%			6 341.81			7.1%			448.43	0.00	0.00
2. Lime Production [Activity in kt, EF in t/t]	2 036.80	5.0%	10.0%			1 495.21			11.2%			167.17	0.00	0.00
3. Glass production [activity in kt, EFs in t/t]	2 715.07	8.0%	10.0%			434.41			12.8%					
4.a Ceramics [Activity in kt, Ef in t/t]	2 575.99	5.0%	10.0%			131.35			11.2%					
4.b Other uses of soda ash [Activity in kt, EF in t/t]	183.53	10.0%	15.0%			76.15			18.0%			13.73	0.00	0.00
4.d Other [Activity in kt, EF in t/t]	3 658.24	10.0%	15.0%			1 609.63			18.0%			290.18	0.00	0.00
B. Chemical Industry						5 141.13	2.02	2.51	4.2%	40.6%	45.4%	215.99	0.82	1.14
1. Ammonia Production [Activity in kt, EF in t/t]	2 720.45	2.0%	5.0%			3 870.48			5.4%			208.43	0.00	0.00
2. Nitric Acid Production [Activity in kt, EF in t/t]	2 396.26	2.0%	5.0%		60.0%			1.73			60.0%	0.00	0.00	1.04
3. Adipic Acid Production [Activity in kt, EF in t/t]	NO	2.0%						NO						
4. Caprolactam production [Activity in kt, EF in t/t]	164.70	2.0%	10.0%		60.0%			0.78			60.0%		0.00	0.47
5. Calcium carbide production [Activity in kt, EF in t/t]	NO					NO								
6. Titanium oxide production [Activity in kt, EF in t/t]	32.42	2.0%	10.0%			NO								
7. Soda ash production [Activity in kt, EF in t/t]	1 203.27	2.0%	10.0%			NO								
8.a Methanol [Activity in kt, EF in t/t]	0.24	2.0%	5.0%	50.0%		0.16	0.00		5.4%	50.0%				
8.b Ethylene [Activity in kt, EF in t/t]	545.12	2.0%	5.0%	50.0%		1 037.35	1.64		5.4%	50.0%				
8.c. Ethylene Dichloride and Vinyl Chloride Monomer [Activity in kt, EF in t/t]	320.01	2.0%	5.0%	30.0%		94.18	0.01		5.4%	30.1%				
8.d. Ethylene oxide [Activity in kt, EF in t/t]	33.16	2.0%	5.0%	25.0%		28.61	0.06		5.4%	25.1%				
8.e Acrylonitrile [Activity in kt, EF in t/t]	NO													
8.f Carbon black production [Activity in kt, EF in t/t]	42.12	5.0%	5.0%	20.0%		110.34	0.00		7.1%	20.6%		7.80	0.00	0.00
8.g Other / Styrene [Activity in kt, EF in t/t]	79.54	2.0%		20.0%			0.32			20.1%		0.00	0.06	0.00
C. Metal Industry						2 596.25	0.60		5.1%	18.1%		132.40	0.11	0.00
1. Iron and Steel Production												0.00	0.00	0.00
1.b Pig iron [Activity in kt, EF in t/t]	5 620.85	5.0%	10.0%			682.66			11.2%			76.32	0.00	0.00
1.d Sinter [Activity in kt, EF in t/t]	7 429.86	5.0%	10.0%	20.0%		357.28	0.52		11.2%	20.6%		NA	NA	0.00
1.f Open-heart Steel [Activity in kt, EF in t/t]	NO													
1.f. Basic Oxygen Furnace Steel [Activity in kt, EF in t/t]	5 358.99	5.0%	10.0%			789.19			11.2%			88.23	0.00	0.00
1.f. Electric Furnace Steel [Activity in kt, EF in t/t]	3 978.10	5.0%	10.0%			207.67			11.2%			23.22	0.00	0.00
2. Ferroalloys Production [Activity in kt, EF in t/t]	77.14	5.0%	10.0%	20.0%		308.55	0.08		11.2%	20.6%		34.50	0.02	0.00
3. Aluminium Production [Activity in kt, EF in t/t]	NO											0.00	0.00	0.00
4. Magnesium production [Activity in kt, EF in t/t]	0.10	5.0%	10.0%			NA							0.00	0.00
6. Lead production [Activity in kt, EF w t/t]	68.79	5.0%	10.0%			35.77			11.2%			4.00		
7. Zinc production [Activity in kt, EF w t/t]	125.07	5.0%	10.0%			215.13			11.2%			24.05		
D. Non-energy Products from Fuels and Solvent Use						732.941			14.3%			104.59	0.00	0.00
1. Lubricant use	220.52					135.82			20.0%					
2. Paraffin Wax Use	144.00					84.48			20.0%					
3.a Solvents use	NE					497.67			20.0%					
3.b Urea used as catalyst	61.17					14.97			20.0%					
G. Other Product Manufacture and Use								0.40			40.3%	0.00	0.00	0.16
3.a N2O from product uses	0.40	20.0%			35.0%			0.40			40.3%			

GHG inventory 2015 – Uncertainty analysis, part 3, IPCC sector 3. Agriculture

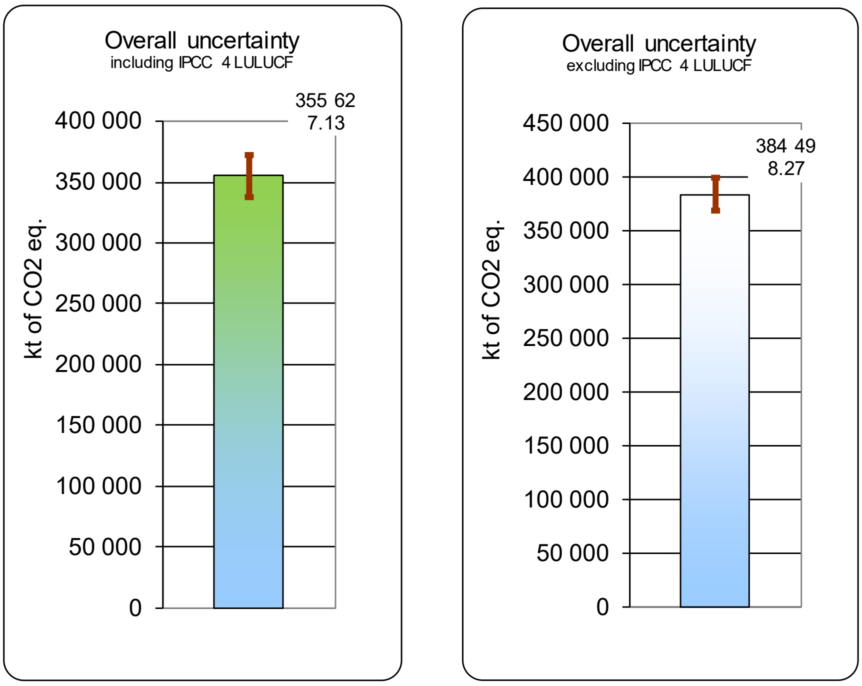
3. Agriculture						**770.57**	**562.50**	**49.72**	18.9%	29.5%	60.8%		166.16	30.24
A. Enteric Fermentation							496.78			32.5%			161.45	0.00
1. Cattle													0.00	0.00
Dairy Cattle [Activity in 1000 heads, EF in kg/head]	2 444.5	5.0%		50.0%			298.80			50.2%			150.15	0.00
Non-dairy young cattle (younger than 1 year) [Activity in 1000 he	1 668.7	5.0%		50.0%			53.58			50.2%			26.92	0.00
Non-dairy young cattle 1-2 years [Activity in 1000 heads, EF in k	1 528.8	5.0%		50.0%			102.87			50.2%				
Non-dairy heifers (older than 2 years) [Activity in 1000 heads, EF	221.8	5.0%		50.0%			10.79			50.2%				
Bulls (olther than 2 years)	96.8	5.0%		50.0%			7.32			50.2%				
2. Sheep [Activity in 1000 heads, EF in kg/head]	227.6	5.0%		50.0%			1.82			50.2%			0.91	0.00
3. Swine [Activity in 1000 heads, EF in kg/head]	11 639.8	5.0%		50.0%			17.46			50.2%			8.77	0.00
4.a Goats [Activity in 1000 heads, EF in kg/head]	81.7	5.0%		50.0%			0.41			50.2%			0.21	0.00
4.b Horses [Activity in 1000 heads, EF in kg/head]	207.1	5.0%		50.0%			3.73			50.2%			1.87	0.00
B. Manure Management							64.77	7.01		60.7%	40.0%		39.31	2.80
1. Cattle													0.00	0.00
Dairy Cattle [Activity in 1000 heads, EF in kg/head]	2 444	5.0%		50.0%	100.0%		29.03	1.43		50.2%			14.59	0.00
Non-Dairy Cattle [Activity in 1000 heads, EF in kg/head]	3 516	5.0%		50.0%	100.0%		7.55	0.84		50.2%			3.79	0.00
2. Sheep [Activity in 1000 heads, EF in kg/head]	228	5.0%		50.0%	100.0%		0.04	0.01		50.2%			0.02	0.00
3. Swine [Activity in 1000 heads, EF in kg/head]	11 640	5.0%		50.0%	100.0%		23.16	0.95		50.2%			11.64	0.00
kg/head]	768	5.0%		50.0%	100.0%		0.29	0.02		50.2%			0.15	0.00
4.b Goats [Activity in 1000 heads, EF in kg/head]	82	5.0%		50.0%	100.0%		0.01	0.00		50.2%			0.01	0.00
4.c Horses [Activity in 1000 heads, EF in kg/head]	207	5.0%		50.0%	100.0%		0.32	0.07		50.2%			0.16	0.00
4.d Poultry [Activity in 1000 heads, EF in kg/head]	159 422	5.0%		50.0%	100.0%		4.37	0.14						
5.a Indirect emission [emission in kt]	NA							3.55			40.0%		0.00	1.42
D. Agricultural Soils								42.68			70.6%			30.11
a. Direct Soil Emissions														0.00
1. Inorganic N fertilizers [Activity in kg N, EF inkg N2O-N/kg N]	1 003 600 000	5.0%			150.0%			15.77			150.1%			23.67
2. Organic N fertilizers [Activity in kg N, EF inkg N2O-N/kg N]	307 514 328	5.0%			150.0%			4.83			150.1%			7.25
3. Urine and dung deposited by grazing animals [Activity in kg N	39 259 395	5.0%			150.0%			1.18			150.1%			1.76
4. Crop residues [Activity in kg N, EF inkg N2O-N/kg N]	255 108 605	5.0%			150.0%			4.01			150.1%			6.02
5. Mineralization/immobilization associated with loss/gain of so	NO	5.0%			150.0%						150.1%			0.00
6. Cultivation of organic soils (i.e. histosols) [Activity in kg N, E	680 000	5.0%			150.0%			8.55			150.1%			12.83
b. Indirect N2O Emissions from managed soils														
1. Atmospheric deposition [Activity in kg N, EF inkg N2O-N/kg	169 714 745	20.0%			150.0%			2.67			151.3%			4.04
2. Nitrogen leaching and run-off [Activity in kg N/yr, EF inkg N2	481 644 699	20.0%			150.0%			5.68			151.3%			8.59
F. Field Burning of Agricultural Residues							0.95	0.04		18.6%	99.8%		0.18	0.04
1. Cereals													0.00	0.00
Wheat [Activity in t of crop production, EF in kg/t dm]	37.52	30.0%		20.0%	150.0%		0.12	0.00		36.1%	153.0%		0.04	0.00
Barley [Activity in t of crop production, EF in kg/t dm]	9.17	30.0%		20.0%	150.0%		0.03	0.00		36.1%	153.0%		0.01	0.00
Maize [Activity in t of crop production, EF in kg/t dm]	3.84	30.0%		20.0%	150.0%		0.01	0.00		36.1%	153.0%		0.00	0.00
Oats [Activity in t of crop production, EF in kg/t dm]	4.15	30.0%		20.0%	150.0%		0.01	0.00		36.1%	153.0%		0.00	0.00
Rye [Activity in t of crop production, EF in kg/t dm]	10.91	30.0%		20.0%	150.0%		0.03	0.00		36.1%	153.0%		0.01	0.00
Triticale [Activity in t of crop production, EF in kg/t dm]	22.73	30.0%		20.0%	150.0%		0.07	0.00		36.1%	153.0%			
Cereals mixed [Activity in t of crop production, EF in kg/t dm]	6.27	30.0%		20.0%	150.0%		0.02	0.00		36.1%	153.0%		0.01	0.00
Millet and buckwheat [Activity in t of crop production, EF in kg/t	0.26	30.0%		20.0%	150.0%		0.00	0.00		36.1%	153.0%			
2 Pulses	0.66	30.0%		20.0%	150.0%		0.00	0.00		36.1%	153.0%		0.00	0.00
3 Tuber and Root													0.00	0.00
Potatoes [Activity in t of crop production, EF in kg/t dm]	13.42	30.0%		20.0%	150.0%		0.04	0.00		36.1%	153.0%		0.01	0.00
5 Other													0.00	0.00
Rape and other oil-bearing [Activity in t of crop production, EF i	81.22	30.0%		20.0%	150.0%		0.24	0.01		36.1%	153.0%		0.09	0.01
All straw and hey [Activity in t of crop production, EF in kg/t dm	0.20	30.0%		20.0%	150.0%		0.00	0.00		36.1%	153.0%		0.00	0.00
Vegetables [Activity in t of crop production, EF in kg/t dm]	2.61	30.0%		20.0%	150.0%		0.01	0.00		36.1%	153.0%		0.00	0.00
Fruits [Activity in t of crop production, EF in kg/t dm]	118.64	30.0%		20.0%	150.0%		0.36	0.02		36.1%	153.0%		0.13	0.03
G. Liming						373.84			21.7%					
Limestone $CaCO_3$ [Activity in t, EF in t CO2-C/t]	360 641.19	30.0%	5.0%			158.68			30.4%					
Dolomite $CaMg(CO_3)_2$ [Activity in t, EF in t CO2-C/t]	451 379.48	30.0%	5.0%			215.16			30.4%					
H. Urea application	540 994.61	30.0%	5.0%			396.73			30.4%					

GHG inventory 2015 – Uncertainty analysis, part 4, IPCC sector 4 Land use, land-use change and forestry and IPCC sector 5.Waste

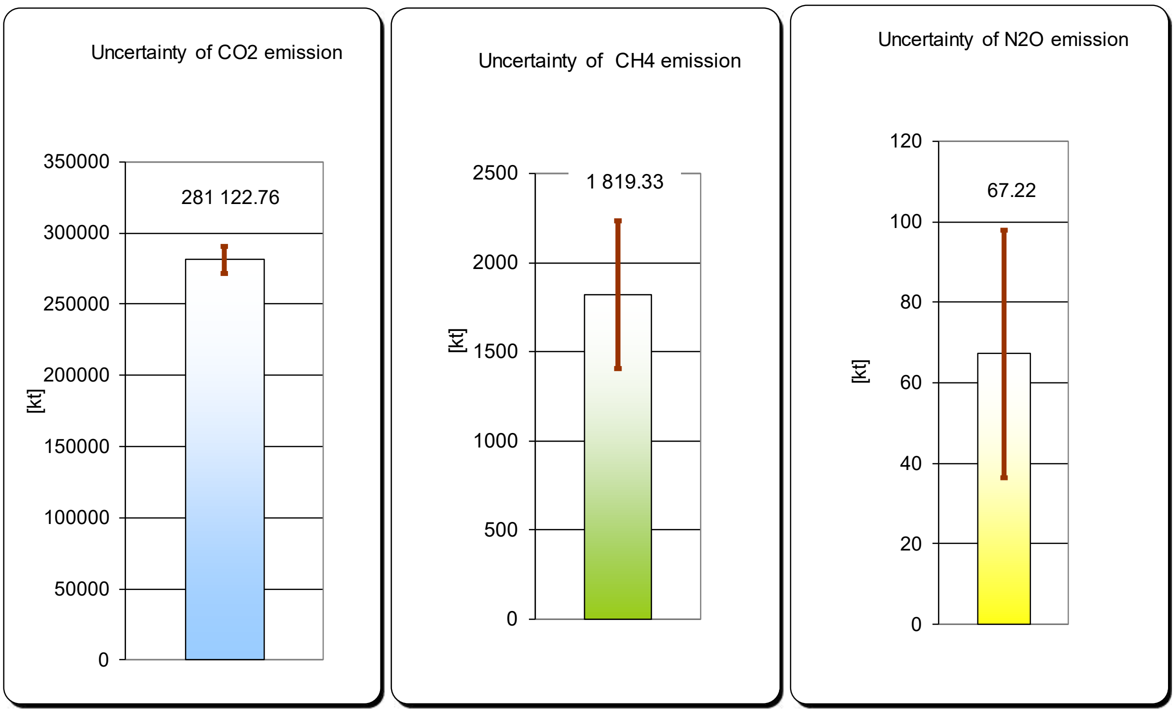
4. Land-Use, land-use change and forestry						**-29 996.20**	**1.27**	**3.67**	26.3%	80.2%	99.6%	-7891.30	1.02	3.652
A. Forest Land [Activity in kha, EF in kt/kha]	9 395.17	5.0%	20.0%	80.0%	100.0%	-30 622.92	1.27	0.02	20.6%	80.2%	100.1%	-6313.08	1.02	0.020
B. Cropland [Activity in kha, EF in kt/kha]	14 023.26	5.0%	20.0%		100.0%	362.12		0.00	20.6%		100.1%	74.65	0.00	0.001
C. Grassland [Activity in kha, EF in kt/kha]	4 172.97	5.0%	20.0%	80.0%	100.0%	-568.12			20.6%	80.2%	100.1%	0.00	0.00	0.000
D. Wetlands [Activity in kha, EF in kt/kha]	1 369.75	5.0%	20.0%			4 526.55			20.6%			933.17	0.00	0.000
E. Settlements [Activity in kha, EF in kt/kha]	2 209.03	5.0%	20.0%		100.0%	1 646.71		3.65	20.6%		100.1%	339.48	0.00	3.652
F. Other Land [Activity in kha, EF in kt/kha]	97.79	5.0%											0.00	0.000
G. Other [Activity in kt C, EF in kt/kha]	NA	5.0%	20.0%			-5 340.55			20.6%			-1100.98		
5. Waste						**487.60**	**343.38**	**3.08**	33.5%	63.5%	122.2%	163.55	217.98	3.77
A. Solid Waste Disposal							326.02			66.7%		0.00	217.61	0.00
1 Managed waste disposal sites [Activity in kt, EF in t/t MSW]	4 884.60	23.0%		100.0%			178.64			102.6%		0.00	183.30	0.00
2 Unmanaged waste disposal sites [Activity in kt, EF in t/t MSW]	NO	23.0%		100.0%			106.90			102.6%		0.00	109.69	0.00
3 Uncategorized waste disposal sites [Activity in kt, EF in t/t MS	NO	23.0%		100.0%			40.49			102.6%		0.00	41.54	0.00
B. Biological treatment of solid waste							7.34	0.44		104.4%	153.0%	0.00	7.67	0.67
1. Composting [Activity in kt DC(1), EF in kg/kg DC]	1 835.60	30.0%		100.0%	150.0%		7.34	0.44		104.4%	153.0%	0.00	7.67	0.67
2. Anaerobic digestion in biogas installations [Activity in kt DC(1),	NO	30.0%										0.00	0.00	0.00
C. Waste Incineration						487.60	0.00	0.18	33.5%	101.1%	150.7%			
1. Waste incineration [Activity in kt, EF in kg/t waste]	595.10	15.0%	30.0%	100.0%	150.0%	487.60	0.00	0.18	33.5%	101.1%	150.7%	163.55	0.00	0.28
2. Open burning of waste [Activity in kt, EF in kg/t waste]	NA													
D. Wastewater treatment and discharge							10.02	2.46		99.7%	150.3%	0.00	9.99	3.70
1. Domestic wastewater [Activity in kt DC(1), EF in kg/kg DC]	841.78	10.0%		100.0%	150.0%		0.08	2.46		100.5%	150.3%	0.00	0.08	3.70
2. Industrial wastewater [Activity in kt DC(1), EF in kg/kg DC]	373.43	10.0%		100.0%			9.94			100.5%		0.00	9.99	0.00

F- gases inventory 2015 – Uncertainty analysis for HFC, PFC and SF_6.

	Emission HFC [kt of CO2 eq.]	Emission PFC [kt of CO2 eq.]	Emission SF6 [kt of CO2 eq.]	Uncertainty of emission HFC [%]	Uncertainty of emission PFC [%]	Uncertainty of emission SF6 [%]	Absolute emission uncertainty for HFC [kt of CO2 eq.]	Absolute emission uncertainty for PFC [kt of CO2 eq.]	Absolute emission uncertainty for SF6 [kt of CO2 eq.]
TOTAL	**8 924.04**	**13.90**	**52.79**	**47.0%**	**85.0%**	**92.5%**	**4 195.76**	**11.82**	**52.79**
2. Industrial processes and product use	8 924.04	13.90	52.79	47.0%	85.0%	92.5%	4 195.76	11.82	52.79
C. Metal industry		0.00	4.15		85.0%	100.0%		0.00	4.15
3. Aluminium production		NO			85.0%				
4. Magnesium production			4.15			100.0%			4.15
F. Product uses as substitutes for ODS	8 924.04	13.90		47.0%	85.0%		4195.76	11.82	0.00
1. Refrigeration and Air Conditioning Equipment	8 383.22			50.0%			4191.61		
2. Foam Blowing	343.83			50.0%			171.92		
3. Fire protection	71.13	13.90		50.0%	85.0%		35.57	11.82	
4. Aerosols/ Metered Dose Inhalers	125.45			50.0%			62.72		
5. Solvents	0.41			50.0%			0.21		
G. Other Product Manufacture and Use			48.64			100.0%			48.64
1. Electrical Equipment			48.64			100.0%			48.64

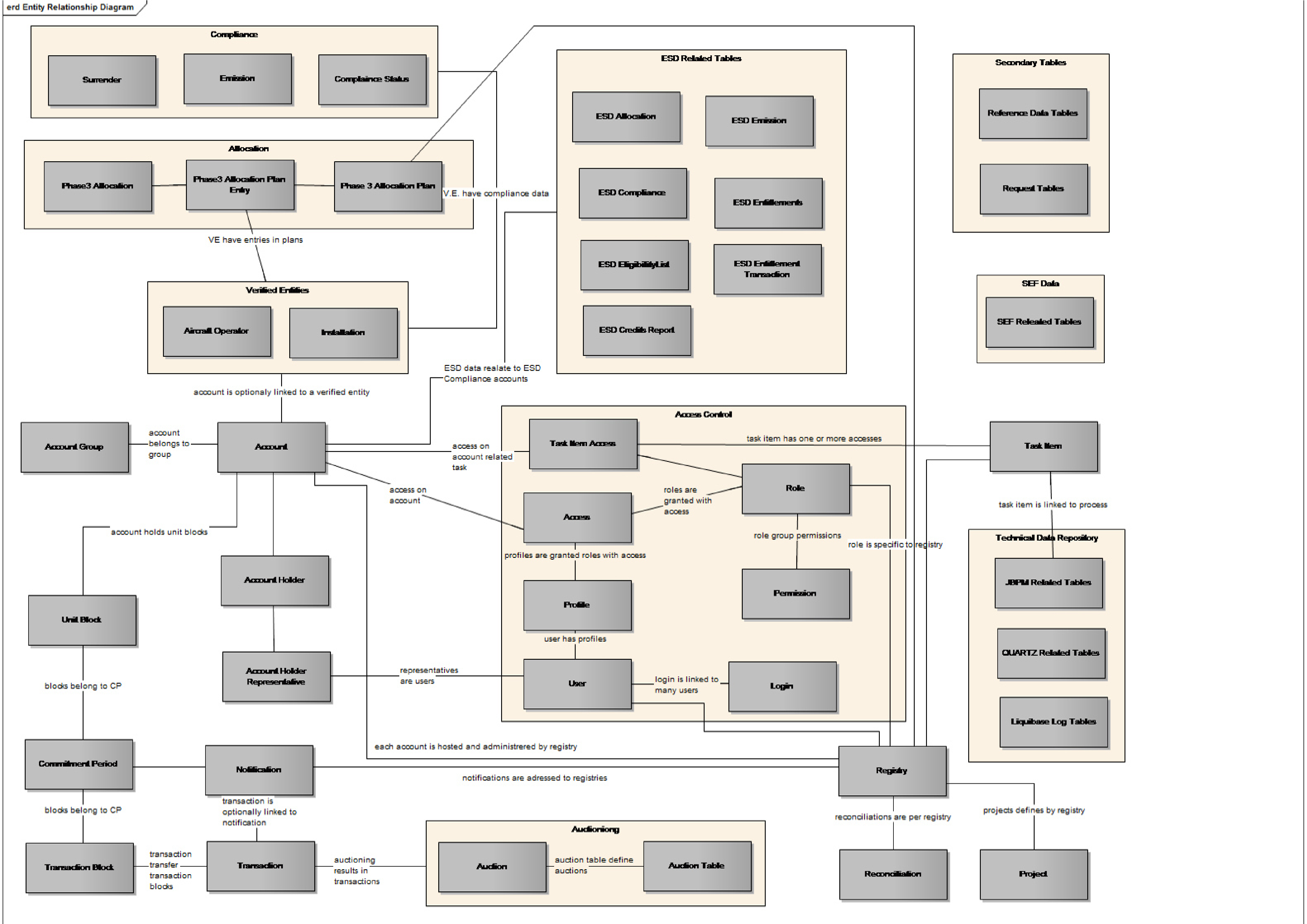


Overall emission results for 2015 including and excluding IPCC 4.LULUCF with uncertainties bars



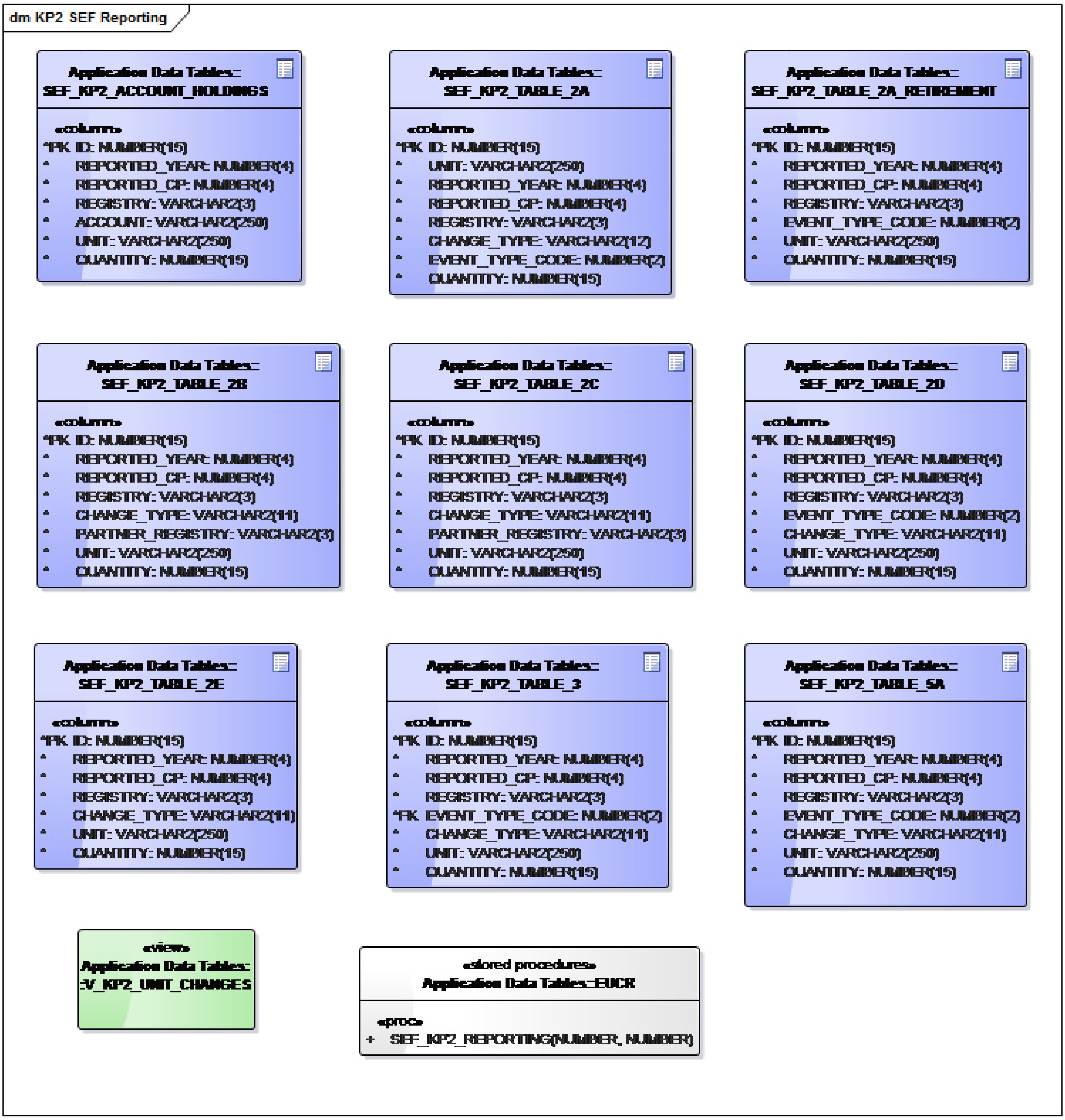
Emission results for 2015 including IPCC 4.LULUCF with uncertainties bars

Annex 9.
Additional information on national registry



erd Entity Relationship Diagram
Compliance
Surrender
Emission
Compliance Status
Allocation
Phase3 Allocation
Phase3 Allocation Plan Entry
Phase 3 Allocation Plan
V.E. have compliance data
VE have entries in plans
Verified Entities
Aircraft Operator
Installation
ESD Related Tables
ESD Allocation
ESD Emission
ESD Compliance
ESD Entitlements
ESD EligibilityList
ESD Entitlement Transaction
ESD Credits Report
Secondary Tables
Reference Data Tables
Request Tables
SEF Data
SEF Related Tables
ESD data realate to ESD Compliance accounts
account is optionaly linked to a verified entity
Account Group
account belongs to group
Account
Access Control
Task Item Access
task item has one or more accesses
Task Item
access on account related task
Role
roles are granted with access
Access
access on account
task item is linked to process
account holds unit blocks
role group permissions
role is specific to registry
Technical Data Repository
profiles are granted roles with access
Account Holder
Permission
JBPM Related Tables
Unit Block
Profile
user has profiles
QUARTZ Related Tables
Account Holder Representative
representatives are users
User
login is linked to many users
Login
blocks belong to CP
Liquibase Log Tables
each account is hosted and administrered by registry
Commitment Period
Notification
Registry
notifications are adressed to registries
blocks belong to CP
transaction is optionally linked to notification
reconciliations are per registry
projects defines by registry
Auctioniong
Transaction Block
transaction transfer transaction blocks
Transaction
auctioning results in transactions
Auction
auction table define auctions
Auction Table
Reconciliation
Project

CP2 SEF Tables



Changes from EUCR v7.0.1-v8.0.7				
Feature	**Summary**	**Description**	**Test Cases**	**SAT Status**
JBPM console deployment fails	The JBPM console is non functional in one of two applciation servers; this has been fixed.	The JBPM console is non functional in one of two applciation servers.	Solution confirmed by CLIMA	PASSED
Accounts requested to be opened (but not yet approved) can be added in TALs of other accounts. Rejecting these account opening requests should remove these accounts from TALs automatically.	Europe - Account pending for opening approval added to trusted list but not removed after rejection of the opening request	For details see [https://webgate.ec.europa.eu/etsis/browse/ETS-2384]	Execute UC_AM_70_TC_08 UC_AM_70_TC_09 UC_AM_70_TC_10	PASSED
Helpdesk users can create new accounts referencing existing account holders.	Helpdesk employees (role: Service Desk) should be able to open an account under an exisiting account holder	For details see [https://webgate.ec.europa.eu/etsis/browse/ETS-5403]		PASSED
An executed allocation did not appear correctly in task history; this is now fixed.	Wrong details in historic tasks 'Approve Allocation Settings Delivery'	For details see [https://webgate.ec.europa.eu/etsis/browse/ETS-6726]		PASSED
Incorporation of manual adjustment in ICE values.	Calculation of remaining entitlement for 1.4 cases	Refer to https://webgate.ec.europa.eu/etsis/browse/ETS-6762		PASSED
Account exclusion flag is corrected so as to be propagated to the next year correctly; propagation happens via a job on 1-JAN.	Europe - Account exclusion issue	For details see [https://webgate.ec.europa.eu/etsis/browse/ETS-7272]		PASSED
Modify the screen so that monitoring plan cannot be updated.	AOHA - The Monitoring plan first year of applicability should not be updatable.	imported on 23/7/2015 see [https://webgate.ec.europa.eu/etsis/browse/ETS-7345]	Execute UC_AM_220_TC_01	PASSED

If an AR replacement request the user is requested to be un-enrolled and the un-enrolment request is rejected, then the AR replacement request failed. This is now fixed.	Account Representative Replacement/removal workflow issue	For details see [https://webgate.ec.europa.eu/etsis/browse/ETS-7362] ===== Also -797 One problematic scenario we have spotted is the following: One AR/AAR is requested to be removed/replaced from an account. The user is marked as SUSPENDED on the account. The AR/AAR is proposed to be un-enrolled. The un-enrolment request is rejected The user is marked as ACTIVE on all accounts The request of step 1 is approved. The system searches for SUSPENDED users on the account but all are ACTIVE. Another scenario 1. Log in as NA1 to registry and go to any account 2. Request AR1 to be suspended from given account 3. As User AR1 request un-enrolment. 4. As NA reject un-enrolment task. AR1 accesses are activated including access to account where he was manually suspended		PASSED
If all years of an operator become excluded, then aggregate compliance surrenders/emissions do not appear; this is now fixed.	Compliance table is empty after excluding AOHA	For details see [https://webgate.ec.europa.eu/etsis/browse/ETS-7457]		PASSED
Change of task description for "Merger of aircraft operators" task	Europe - Wrong information in the "Merger between Aircraft Operators" task	For details see [https://webgate.ec.europa.eu/etsis/browse/ETS-7478]	Execute UC_AP_123_TC_01	PASSED
Correction of bug raised when processing an ITL notification update, while the original ITL notification is missing.	ITL Notification Update Error - No acquiring account to fulfil the request	For details see [https://webgate.ec.europa.eu/etsis/browse/ETS-7506]	Execute UC_IN_002_TC_01	PASSED
Correction of appearance of dates in transaction PDF	Transaction PDF formats	For details see [https://webgate.ec.europa.eu/etsis/browse/ETS-7766]		PASSED
If an allocation task is approved and not yet executed (allocations appearing yellow) then prohibit upload of new allocation for the same installations.	Yellow boxes in already allocated installations	For details see [https://webgate.ec.europa.eu/etsis/browse/ETS-7782]	Execute UC_AP_110_TC_02	PASSED

If an operator does not yet have calculated compliance, then the compliance screen does not show aggregate surrenders/emissions either. This is now fixed.	Missing information on stationary installation compliance tab	For details see [https://webgate.ec.europa.eu/etsis/browse/ETS-7808]	Current date = Jan 2018 Test Case 1: - Account with YFE 2014, YLE 2015 and no emissions. The DCS is C - Exclude years 2014, 2015 - The DCS becomes blank Test Case 2: - Account with YFE 2014, YLE blank, emissions entered for 2014 only. The DCS is C - Exclude 2014 - Change YLE to 2014 - The DCS becomes blank Test Case 3: - Account with YFE 2014, YLE blank, emissions entered for 2014 only. The DCS is C - Exclude all years from 2014 to 2018 - The DCS becomes blank Test Case 4: - Account with YFE = 2017, YLE blank, no emissions. The DCS is C - change YFE to 2018 - The DCS becomes blank	PASSED
Correct the account statements so that AAUs and RMUs appear correctly.	Account statements display incorrectly CP1 AAUs	For details see [https://webgate.ec.europa.eu/etsis/browse/ETS-8143]		PASSED
Correct the message explaining an ITL error check.	Missing description for new ITL check	https://webgate.ec.europa.eu/etsis/browse/-1005?filter=10404	Ensure message.properties file contains prescribed messaged for 5121 and 5129	PASSED
Regression issue: cancellations crashed due to tokens. This is now fixed.	Cancellations reversal crash	While testing reversals of cancellations: • I entered a new cancellation (GB166) • I tried to reverse it • I get the following red screen I also tried reversing another cancellation and got a similar red screen {code} An unrecoverable error has occurred. Please retry later or contact your help desk if the problem persists. Refer to the error GB-E9B0983F-08/03/2018 10:17:44 in your communications with the help desk. {code}		PASSED

Approved "Allocation Delivery Settings" request displayed all allocations not only approved one. This is now fixed.	Approved "Allocation Delivery Settings" request displays all allocations not only approved one.	For details see [https://webgate.ec.europa.eu/etsis/browse/-734]		PASSED
The date after which allocations for past year are allowed is now a parameter. This used to be fixed at 1-FEB.	Allocation minimum date to be a parameter	For details see [https://webgate.ec.europa.eu/etsis/browse/-790]	Execute UC_AL_115_TC_09	PASSED
InstallationId link in "Approve allocation delivery" from History Tab is not working. This is now fixed.	InstallationId link in "Approve allocation delivery" from History Tab is not working	For details see [https://webgate.ec.europa.eu/etsis/browse/-861]		PASSED
Change in the SEF Procedure to Handle CP1 and CP2 separately	Change in the SEF Procedure to Handle CP1 and CP2 separately		UC_SEF_010_TC_01: DISPLAY THE SEF REPORITNG PAGE	PASSED
Error while suspending unit blocks; this is now fixed.	IllegalArgumentException while suspending/restoring unit blocks	In our internal version, ETS 6.7.3, this issue is not reproducible.	The issue is not reproducible. Test cases are available in Issue Links tab of EUCR-2196 (linked issue)	PASSED
Enhance system logs so that allocation is better monitored.	Logging requirements	Implement all logging requirements found in the TOKENS specification	Confirm that that the logs for signature with tokens are saved to the DB under the table: REQUEST_SIGNATURE_LOG.	PASSED
Regression issue: Issue when suspending unit blocks. This is now fixed.	EUCR-2196 null values stored to the flash will not be available on the next request.		Select UnitBlocks under Administration select a Unit Block and suspend/restore 3 times. the 3rd time there will be the below issue:	PASSED
Modification of text pertaining to error 7214.	Modify label of Check 7214	Check 7214 reads now "The number of allowances transferred is not strictly equal to the number foreseen in the NAP for the specified installation and specified year." has to be modified to something else, to be in-line with the implementation of EUTL-34 Check 7214 to read: "The number of allowances transferred is not less or equal to the number foreseen in the NAP for the specified installation and specified year."		PASSED

A single digit change in a message, while suspending unit blocks	A single digit change in a message	In unit block suspension/restoration confirmation, use singular, since only one unit block may be affected.	Connect as NA, navigate to Administration->Unit Blocks and suspend a unit block. Ensure the message appears in singular.	PASSED
Allocation execution job is split into batches. The size of each batch is defined via the parameter allocationBatchSize.	Split Allocation Night Job	Allocation execution job is split into batches. The size of each batch is defined via the parameter allocationBatchSize.	EUCR-2296	PASSED
Allocation logging is enhanced so that NULL permit status and insufficient unit in allocation account are logged.	Issues with the allocation workflow	Execute UC_AL_115_TC_10	EUCR-2300, EUCR-2301	PASSED
Two issues regarding account creation are resolved: * one pertaining to hiding the users connected on account when not applicable * and one issue of Internet Explorer when creating OHA	Account Request > Both panels appear when you add an AR without having selected if the AR is related to the Account Holder or not, AND "Problem with your request" message while creating account	Refer to -297 and -991 Known issue regarding -297: ========================= When I set "Account Holder is already recorded in the registry" and I enter an account holder ID and click on the users of this AH, sometimes the users combobox is not initialised correctly and users cannot be added. Note: A fix for this issue has already been prepared and is pending internal testing.	Regarding -297: Executed UC_AM_10_TC_13 as defined in TC.01 Addendum v0.10. Regarding -991: # Create a new OHA using Internet Explorer. # At installation creation, contact person on installation information, click repeatedly on "Address Provided" link. # Enter contact person information and address details and submit # Ensure account creation request is submitted normally by approving as NA and ensuring the new account is created.	PASSED
Regression issue: The CSV containing manual adjustment has invalid structure. This is now fixed.	The CSV containing manual adjustment has invalid structure	Refer to the screenshot; the generated CSV has invalid headers	1. Connect to EUCR -> Entitlements and click on Export CSV. 2. Paste the generated file in Excel, distribute text to columns 3. Ensure that columns correspond to data correctly	PASSED
Regression issue: Manual adjustment is not subtracted from the ICE value This is now fixed.	Manual adjustment is not subtracted from the ICE value	Refer to the attachment; manual adjustments are not being subtracted from the ICE value.	1. Ensure that the value uploaded in manualAdjustment column is subtracted from the loaded ICE value, in Account Holdings screen.	PASSED
Regression issue: The entitlement values in the exported XML are wrong This is now fixed.	The entitlement values in the exported XML are wrong	When viewing ICE entitlements and clicking export XML, the generated XML is wrong.	1. Connect to GB which has accounts with ICE values without manual adjustments. 2. Navigate to ETS->Entitlements 3. Click on Export XML; ensure the file contains loaded ICE values and no manual adjustments. 4. Repeat the test for Romania, which has accounts with ICE values and manual adjustments; ensure XML contains that manual adjustments.	PASSED

Regression issue: Holdings screen: entitlement appears equal to remaining entitlement This is now fixed.	Holdings screen: entitlement appears equal to remaining entitlement	Related to EUCR-2273. Testing EUCR-2236	1. Connect as NA and navigate to account holdings of an account with ICE. 2. Ensure entitlement is the loaded ICE value and remaining entitlement contains the IC value minus exchanges minus surrenders minus manual adjustments.	PASSED
Regression testing: Account creation fails. This is now fixed.	Cannot create account via "Account Request" (regression testing)	I submit an account opening request and get red screen. Please see attachment. An unrecoverable error has occurred. Please retry later or contact your help desk if the problem persists. Refer to the error GB-388D79C6-08/03/2018 15:05:54 in your communications with the help desk. This is a legacy issue. The cause of this issue has been located; if a date of the form 1/1/20013 is entered while requesting an account opening then an unhandled error is generated.	1. Create an OHA; in installation information screen enter Permit Expiry Date = 1/1/20020 2. In the Permit Entry into Force Date set it to 1/1/20015 3. Click on Next, Next, Submit 4. Ensure the mentioned fields are highlighted and validation rule "Invalid date. Date format: dd/mm/yyyy" appears. 5. Correct both of the fields to 1/1/2020 and 1/1/2015 respectively and click on Next, Next, Submit 6. Approve the account open request 7. Ensure the account is created with the entered Permit Expiry Date and Permit Entry into Force Date	PASSED
Regression testing: ICE XML without manual adjustment failed to upload. This is now fixed.	An ICE XML without manual adjustment is ignored when uploaded	Related to EUCR-2273 and EUCR-2236	1, Upload ICE XML with and without manualAdjustments in EUCR and EUTL. 2. Ensure the upload is successful in each system.	PASSED
Regression issue: Addition to TAL via tokens fails. This is now fixed.	Cannot add to TAL via Tokens	When adding to TAL via tokens, I get the error: *80205: The account EU-100-10002986-0-47 is already on the trusted account list.* The account is added to the TAL in APPROVAL_PENDING state and there is no approval task generated. Refer to the TAL of account 310 for Finland; account EU-100-10002986-0-47 is added in APPROVAL_PENDING state but no task is generated. This issue was due to tokens code integration and was resolved.	Ensure a TAL addition via GSM and Tokens is completed successfully.	PASSED
Regression issue: Exchange reversal crashes This is now fixed.	Exchange reversal	Reverse EU1104042; it crashes with the attached error.		PASSED

Regression issue: ESD entitlement transaction approval crashes. This is now fixed.	At ESD Entitlement trx approval, red screen error	At approval of ESD entitlement transaction, I get red screen error: *An unrecoverable error has occurred.* *Please retry later or contact your help desk if the problem persists.* *Refer to the error ED-1C63D460-12/03/2018 15:07:47 in your communications with the help desk.*	1. Propose an ESD entitlements transaction as ESDCA; sign in ECAS. 2. Approve the transactions as ESDCA1; sign in ECAS. 3. Ensure the transaction is completed.	PASSED
Regression issue: Personal details approval crashes. This is now fixed.	Approve personal details update: red screen (regression testing)	Approve personal details crashes screen at approval.	A. Personal details update 1. Connect as NA and navigate to Administration->Roles 2. Locate a user and click Edit. 3. Modify personal details and click Submit 4. As another NA approve the task 5. Locate again the user and ensure the personal details are updated B. Administration roles update 1. Connect as NA and navigate to Administration->Roles 2. Locate a user and click Edit. 3. Add an administration role to the user via the tab "Administration Roles". 4. Click Submit and sign via ECAS 5. Approve the task as another NA and sign via ECAS 6. Locate again the user and ensure the administration roles are updated	PASSED
Regression issue: Entitlement calculations are wrong. This is now fixed.	Wrong values in Entitlement Calculation for Account	The formula to add/subtract the manual adjustment as seen in the documentation is: entitlement -= (manualAdj==null?0D:manualAdj.doubleValue()); The code for some reason subtracts it from calculatedVE which is the value for the Verified Emissions multiplied by the factor.	1. Exclude year with emissions to force recalculation of entitlements 2. Unexclude year with emissions to "enable" emissions and recalculate entitlements 3. Goto entitlements screen and verify at the Entitlement Calculation for Account that the VE Emissions is 4,5(OHA) or 1,5(AOHA)% of emissions.	PASSED
Regression issue: At account exclusion, errors are logged. This is now fixed.	At account exclusion an error is logged in the logs due to entitlement re-calculation	I exclude OHA 10002975 of GB. The account appears excluded but the attached error is logged. The workflow of account exclusion is stuck in SUSPENDED mode and the remaining ICE is never recalculated.	# Locate OHA 10002975 of GB. # Approve emissions 1000 for 2017 # Upload ICE with flag 1 # Ensure entitlement is 45 # Update entitlement to manualAdjustment -3 # Ensure entitlement is 48 # Exclude year 2017; ensure entitlement becomes zero # Unexclude year 2017; ensure entitlement becomes again 48 # Exchange 5 CERs of CP2 of this account; ensure entitlement becomes 43 # Reverse the exchange; ensure entitlement becomes 48.	PASSED

SEF mechanism did not count correctly all ERU units; this is now fixed.	ERUs not handled correctly by the SEF process	The SEF code is not able to handle the presence of both types of ERUs in a registry i.e. ERU_FROM AAUs and ERU_FROM_RMUs. Only one type is calculated which means that the ERU values are under-reported.	1. Locate a Registry with SEF values for 2013 for ERU_from_RMU and ERU_from_RMU units. This can be done with the query: select registry, count(*) from sef_table_5c where year=2013 and cp=1 and unit in ('ERU_FROM_AAU', 'ERU_FROM_RMU') group by registry having count(*) > 1; If such a registry does not exist, the data can be entered as follows (e.g. for Romania): INSERT INTO sef_table_5c(sef_table_5c_id, year, cp, registry, unit, quantity) VALUES (sef5c_seq.NEXTVAL, 2013, 1, 'RO', 'ERU_FROM_AAU', 10); INSERT INTO sef_table_5c(sef_table_5c_id, year, cp, registry, unit, quantity) VALUES (sef5c_seq.NEXTVAL, 2013, 1, 'RO', 'ERU_FROM_RMU', 20); 2. Connect as NA and navigate to Administration -> SEF Reporting 3. Click on "2013" 4. On the opened text document search for "Table2a" and then for "Retirement" 5. Just below, search for "UnitQty type=ERU" and ensure the ERU value is the sum of the values located or inserted in step [1]. Alternatively, the XML can be opened with the UN SEF tool.	PASSED
No user can have more than one admin role; this rule is now imposed via a check and module redesign	One user should only have one admin role.	UNSCONS response: Users possessing multiple administration roles is not explicitly covered in use cases, refer to “UC_UA_060: Request administration roles update”. Practically only two users in Production have 2 administration roles. ETS v.7.0.2 handles multiple administration roles; all actions must be performed sequentially due to the tokens mechanism. [FL] Please refer to -8849 and the relevant author's position ("UCS 02 - Users v1 80_rev_DK_FL_CP Authors Position")	Execute UC_UA_060_TC_02 from TC.01.	PASSED

In this release, a log entry is added for the case of aircraft operator with null permit status.	Issues with the allocation workflow	Imported on 22/7/2015 For details see [https://webgate.ec.europa.eu/etsis/browse/ETS-7365].	Execute UC_AL_115_TC_10. Testing for ETS 7.0.4 (allocations.log entry for air operator permit_status=null). 1. Upload a NAAT for an air.operator in EUCR and EUTL. 2. Propose and approve the allocation. 3. Perform the following to set permit status to null: update aircraft_operator set permit_status = null where verified_entity_id = 35757; 4. Ensure entries similar to the following appear in the allocations.log <INFO > <2018-05-22 12:25:02,919> <ALLOCATION_LOG> <> The following is a list of aircraft operators with NULL or REVOKED permit status checked for allocation(Number: 4): <INFO > <2018-05-22 12:25:02,919> <ALLOCATION_LOG> <> AIRCRAFT_NON_ACTIVE_PERMIT- Permit status was null:[Year:(2015), Registry:(RO), Identifier:(10002626), AcquiringAccountId:(36055),Phase 3 Snapshot: Free(99999970) - Reserved(null) - Transitional(null)] See Tests EUCR-2300, EUCR-2355, EUCR-2356, EUCR-2357, EUCR-2358, EUCR-2359, EUCR-2361	PASSED
Screen change for unit blocks.	Suspend/restore unit block: button should be renamed	The button "Suspend/Restore" should be called either "Suspend" or "Restore".	1. Log in as NA in EU registry 2. Navigate to Administration -> Unit blocks 3. Choose a unit block by clicking its Unit Block ID 4. Ensure that below the unit block there exists a "Suspend" button. 5. Click the "Suspend" button and sign via ECAS. 6, Ensure the button "Suspend" does not appear; ensure the button "Restore" appears. 7. Click the "Restore" button and sign via ECAS. 8. Ensure that below the unit block there exists a "Suspend" button. Check with I.E., Firefox, Chrome.	PASSED
With some versions of Internet Explorer there were issues when clicking repeatedly on checkbox.	"Problem with your request" message while creating account	Regarding -991: # Create a new OHA using Internet Explorer 9 and IE 11; repeat with Chrome and Firefox. # At installation creation, contact person on installation information, click repeatedly on "Address Provided" link. # Enter contact person information and address details and submit # Ensure account creation request is submitted normally by approving as NA and ensuring the new account is created.	# Create a new OHA using Internet Explorer 9 and IE 11; repeat with Chrome and Firefox. # At installation creation, contact person on installation information, click repeatedly on "Address Provided" link. # Enter contact person information and address details and submit # Ensure account creation request is submitted normally by approving as NA and ensuring the new account is created.	PASSED
With some versions of Internet Explorer there were issues when requesting a new account and specifying the account holder.	Account Request > Both panels appear when you add an AR without having selected if the AR is related to the Account Holder or not, AND "Problem with your request" message while creating account	When the Step for adding AR loads, two different panels are visible, see attached screenshot. These two panels should load as hidden and each one of them should become visible only when the respective option above ("Representative is Related" vs "Representative is not yet related")is selected. Having both panels visible probably misleads the users, for example we display many different fields as mandatory	Using I.E.9 and I.E.11 execute the following test cases. Repeat with Chrome 48 and Firefox 43. * UC_AM_10_TC_13 as defined in TC.01 document.	PASSED

		but whether they really are only depends on which option was selected.		
Account statement issues; now fixed.	CP1 AAU retirement transaction not covered in account statement PDF and CSV	Imported on: 01/02/2016 From: https://webgate.ec.europa.eu/etsis/browse/-1219	EUCR-2454	PASSED
Account statement issues; now fixed.	CP1 AAU unit displayed as eligible on account statement screen	Imported on: 29/01/2016 From: https://webgate.ec.europa.eu/etsis/browse/-1218	EUCR-2454	PASSED
While an allocation is ticked but not yet allocated, the user cannot upload a new NAT/NAAT for the specific type, year, installation/air.operator	Allocations with no value marked as "to be delivered"	As discussed, we should lock and not allow NAT update once the cells are ticked (even before approving).	A. Upload NAT for uploaded but not yet approved installation allocation (installation 101 of Romania was used) 1. Locate an installation with uploaded but not yet approved allocation 2. Upload NAT file for the specific installation and year and allocation type. 3. Ensure EUCR check 80214 is triggered and upload is prohibited. 4. Repeat the upload for another allocation type for the same installation and year and ensure it can be uploaded. B. Upload NAT for approved and not yet executed installation allocation 1. Locate an installation with approved but not yet executed allocation 2. Upload NAT file for the specific installation and year and allocation type. 3.Ensure EUCR checks 80213 and 80214 are triggered and upload is prohibited. 4. Repeat the upload for another allocation type for the same installation and year and ensure it can be uploaded. C. Upload a NAAT for uploaded but not yet approved aircraft allocation (air.operator 12409 of Romania was used) 1. Locate an air.operator with uploaded but not yet approved allocation 2. Upload NAAT file for the specific air.operator and year and allocation type. 3.Ensure EUCR check 80214 is triggered and upload is prohibited. 4. Repeat the upload for another allocation type for the same air.operator and year and ensure it can be uploaded. D. Upload a NAAT for approved but not yet executed aircraft allocation (air.operator 12409 of Romania was used) 1. Locate an air.operator with approved but not yet executed allocation. 2. Upload NAAT file for the specific air.operator and year and allocation type. 3.Ensure EUCR check 80213 and 80214 are triggered and upload is prohibited. 4. Repeat the upload for another allocation type for the same air.operator and year and ensure it can be uploaded.	PASSED

Entitlements export in CSV is fixed to display correctly remaining value.	Inconsistency while displaying "Remaining" value in Entitlement CSV export	Imported on: 01/02/2016 From: https://webgate.ec.europa.eu/etsis/browse/-1210	1. Log in MT registry as NA (this registry has some installations with phase 3 verified emissions but no uploaded ICE values) 2. Go to Entitlements tab 3. Click Search 4. Click Export CSV 5. Check the exported file and ensure it does not contain negative values in the Remaining column, but shows zero instead.	PASSED
ICE screen were enriched to show the calculation method in more detail.	Inconsistent description for entitlement calculation method	Descriptions in the ICE calculation details: Method 0 - Value in XML Method 1 - 4,5% of Phase 3 VE	1. Connect as NA and navigate to EUETS -> Entitlements. 2. Find a record with Calculation Method = 0; click on "View Calculation"; ensure the lowest row which has a number has label: "Entitlement (Value in XML):" 3. Find a record with Calculation Method = 1; click on "View Calculation"; ensure the lowest row which has a number has label: "Entitlement (4,5% of Phase 3 VE)" 4. Find a record with Calculation Method = 2; click on "View Calculation"; ensure the lowest row which has a number has label: "Entitlement (maximum of value in XML and 4.5 % of VE)" 5. Find a record with Calculation Method = 3; click on "View Calculation"; ensure the lowest row which has a number has label: "Entitlement (sum of value in XML and 1.5 % of VE):"	PASSED
A screen was corrected to show remaining entitlement.	Wrongly calculated "Entitlement" in propose Exchange transaction screen	Imported on: 29/01/2016 From: https://webgate.ec.europa.eu/etsis/browse/-1203	1.Log in RO as NA 2.For OHA account with identifier 655, perform an "Exchange transaction" 2.1 First check at Holdings tab, the table with the entitlements, for value Entitlement (4) and Remaining Entitlements (3). 2.2 Propose an Exchange transaction; in the confirmation box check that Entitlement and Remaining Entitlement are identical to those noted in step 2.1.	PASSED
A task approval screen was enriched with current/proposed values.	No current / proposed columns for manual adjustments In "Approve Proposed ICE Table" task screen	Imported on: 21/01/2016 From: https://webgate.ec.europa.eu/etsis/browse/-1200	1. Log in to RO registry, as NA 2. Go to EU ETS tab and click "ICE Upload Table" 3. Click Browse and upload xml with values: -registryCode = "RO" -identifier="101", action = "U", flag="0", ice="6000" 4. Log in as another NA in RO, claim the task, and go to "Approve Proposed ICE Table" page 5. Submitted Value, Calculation Method and Manual adjustment columns should appear with current and proposed values.	PASSED

The ICE screen was modified so as to hide the Export XML button under some conditions.	ICE XML export leads to blank page	Imported on: 21/01/2016 From: https://webgate.ec.europa.eu/etsis/browse/-1199	1. Log in to RO registry as NA 2. Go to "Entitlements" page, in EU ETS tab 3. In "Entitlements" drop-down list click "Not set" 4. Ensure export button is disabled and the message "It is not possible to export in XML the installations whose entitlements are not set. Please use the "export in CSV" instead." appears at the top. 5. In "Entitlements" drop-down list click "All" 6. Ensure export button is enabled and the no messages appears at the top. 7. In "Entitlements" drop-down list click "Has Entitlements" 8. Ensure export button is enabled and the no messages appears at the top.	PASSED
The screen of unit block management was modified.	RedBox while creating new UnitBlock	Imported on: 15/01/2016 From: https://webgate.ec.europa.eu/etsis/browse/-1194	1. Log in GB as NA 2. Go to Administration -> Unit Blocks 3. Click Search and then Add 4. Enter the numbers provided for start and end blocks: (12345678901330 and 12345678901340) , unit type: CER 5. Insert an account ID that does not exist in GB (e.g. 383) 6. The following message appears at the top of the screen and the insertion is prohibited: "80102: The holding account does not belong to the registry: 383"	PASSED
The screen of unit block management was modified.	Unit block suspend / restore confirmation window has no enough information	Imported on: 14/01/2016 From: https://webgate.ec.europa.eu/etsis/browse/-1190	1. Log in to registry as NA 2. Navigate to Administration -> Unit Blocks 3. Click on a unit block 4. Click the "Suspend" button. 5. Ensure a confirmation box similar to the one below appears: "This action will change the unit block table of the registry. Please confirm that you want to suspend 1 unit block. Unitblock start: 35000005 Unitblock end: 35000006 Originating country: Romania (RO)" 6. Confirm and aign the request via ECAS. 7. Ensure the button "Restore" appears now and not the button "Suspend". 8. Click on button "Restore" 9. Ensure a confirmation box similar to the one below appears:"This action will change the unit block table of the registry. Please confirm that you want to restore 1 unit block. Unitblock start: 35000005 Unitblock end: 35000006 Originating country: Romania (RO)" 10. Confirm and Sign the request via ECAS.	PASSED

Suspended ESD AR is not considered privileged user anymore; this is now fixed	Suspended ESD AR is not considered privileged user anymore	Imported on: 14/01/2016 From: https://webgate.ec.europa.eu/etsis/browse/-1187	1.Check that "esdca3" ESD AR user can log in with Token. 2.Log in ESD registry as esdca 3.At Users tab with filter ESD AR, view all accounts of enrolled esdca3 user (check that the user is indeed the one of step 1, ensuring the URID is the same). 4.For each account, suspend the ESD AR user 5.Log in with esdca3 via token; it should not result in message prompting to log in with GSM.	PASSED
Specific flow leads to "Administrative Roles Update" task is locked in "User approved" status; this is now fixed	Specific flow leads to "Administrative Roles Update" task is locked in "User approved" status	There is a flow that leads to situation when "Administrative Roles Update" task is locked in "User approved" status. It happens when a NA requests adding administrative role to the user and before this request is signed, another NA requests the very same thing. In this situation two requests are created to perform same task and when approved, the second one is locked in "User approved" status and can't be completed due to unique constraint violation. As a result there is no way modify user's role anymore ("Only one administration roles update request can be active for the same user at any given time."). This is not a new bug I believe and also not very probable to be seen in real file, hence low priority.	A. No two concurrent admin roles updates can be approved. 1. Locate a user without any admin roles. 2. Propose to add role "National Administrator" to this user 3. Reach ECAS but do not sign yet. 4. Via another browser propose to add role "Central Administrator" to this user 5. Reach ECAS but do not sign yet. 6. Sign the request of step 3 7. Ensure the request is signed and a green message box appears: "Your administration roles update request has been submitted for approval. The request identifier is <<request_id>>." 8. Sign the request of step 5. 9. Ensure an orange alert box appears and this request cannot be approved: "Only one administration roles update request can be active for the same user at any given time." B. No admin role task approval can be approved if the specific user is already administrator. 1. Locate a user without any admin roles. 2. Propose to add role "Service Desk" to this user 3. Reach ECAS but do not sign yet. 4. Add via script the role "National Administrator" to this user: INSERT INTO ACCESSES (access_id, account_id, profile_id, role_id, state) VALUES (ACCESS_SEQ.NEXTVAL, -1, (select PROFILE_ID from profile where URID = 'EU724332260059'), (select role_id from roles where role_name = 'NATIONAL_ADMINISTRATOR' and registry_code=(SELECT REGISTRY_CODE FROM USERS WHERE urid = 'EU724332260059')), 'ACTIVE'); 5. Sign this task 6. Via another NA claim and approve this task. 7. Ensure the message appears in an orange box: "User has already an admin role. You can only Reject the task" 8. Reject this task. Ensure the task is rejected normally and no further admin roles are applied to the user via the query: select * from accesses where profile_id = (select	PASSED

			PROFILE_ID from profile where URID = 'EU724332260059') order by 1 desc;	
Text of EUTL Check 7861 incorrect; this is now fixed	Text of EUTL Check 7861 incorrect	https://webgate.ec.europa.eu/etsis/browse/-1180 Text of check to be modified to: "Acquiring Account should be an ESD Compliance account for year *greater or equal to the* Active Year and ESD Member State other than the ESD Member State of the Transferring Account. For reversal Transferring Account should be an ESD Compliance Account for year *greater or equal to the* Active Year and ESD Member State other than the ESD Member State of the Acquiring Account."	Navigate to deployment files, message.properties file: Ensure the following line appears in this file: error.message.check.7861=Acquiring Account should be an ESD Compliance account for year greater or equal to the Active Year and ESD Member State other than the ESD Member State of the Transferring Account. For reversal Transferring Account should be an ESD Compliance Account for year greater or equal to the Active Year and ESD Member State other than the ESD Member State of the Acquiring Account.	PASSED
If the user has different mobile in ECAS and in Union Registry, a 404 error appeared; this is now fixed, presenting a message and two buttons. Idem for changing registry.	At login with GSM, if the GSM in EUCR <> GSM in ECAS, Error 404 appears.	If the user has different mobile in ECAS and in Union Registry, a 404 error appeared; this is now fixed, presenting a message and two buttons. Idem for changing registry.	EUCR-2469, EUCR-2470	PASSED

Screen correction for display of address	Displaying Addresses in Task with HTML tags	When checking Tasks in History Tab for some group of tasks which are displaying information with Addresses of Authorised Representative, or Holders Addresses, then this is displayed with HTML tags.
		In related places like for example account details/AR tab those address information looks correct.
			1. Connect as NA and navigate to task history.
			2. Find a task of type "Approve Account Representative Addition"
			3. Click it and ensure the address does not appear with bullets
			4. The actual data in the database can be confirmed as follows:
			select * from account_holder_rep_add_req where request_id = <<the request id of the chosen task>>;
			select * from account_holder_representative where ID = 10062;
			select * from business_details where business_details_id = 10062;
			select * from contact where ID = 10123;
			5. Ensure the address details of the contact do not contain bullets and the screen does not contain bullets either.
				PASSED

Administration roles management issue	Unrecoverable error (FacesException) when changing user role	Given user has a role assigned (e.g. National Administrator) it is possible to attempt to remove this role and assign different one in one step. Example: 1. User is NA in FI 2. As another NA go to FI registry and edit this user 3. Uncheck checkbox next to National Administrator - all checkboxes become enabled 4. Check checkbox next to Auditor for NA 5. Click [Next] button 6. Click [Submit] button Unrecoverable error is displayed since this operation	After the implementation of ETS-8849 and the re-design of admin roles management, it is impossible for an end-user to remove and add a role in one request. Via technical means, the following tests were done: The following scenarios were tested: Sign in as 'na' Administration -> Users -> Search -> URID GR900000000001 Modified directly from National Administrator to Service Desk / SD Agent / Auditor for NA fails with the following	PASSED

		should be atomic and broken into 2 steps - remove NA role and add Auditor role	error message " ERROR You are not allowed to add more than 1 Administration role." When the same was tested from National Administrator to Central / System Administrator the error message is : " ERROR You are not allowed to upgrade your (or another users) role to a higher level than the one you currently have." It seems that the permission check is in higher priority. However when the application was enforced to modify the current role to a role that does not exist in the radio buttons (e.g. TRADER, VERIFIER), the modification fails without any error message to highlight the problem. Finally, attempts to assign double roles by adding two selectionsRadio values in the same HTTP request fail as well. Regarding the aforementioned tests, Burp Suite Pro was utilized https://portswigger.net/burp/download.html Burp is a software operating as a proxy between the browser and the application. It has the ability to intercept HTTP requests and perform man in the middle attacks in terms of replaying modified requests from the web interface to the server. Every request was intercepted for the above scenario. The key test was to understand the reactions of the backend code, based on the manipulated parameter ''selectionsRadio'' which reflects the choice of the user in the radio button list. This parameter was manipulated as part of the POST data sent with the "Next" button in the role management page. The plan was to test the following: Test case 1: Going from one role (e.g. National Administrator) to ONE other by skipping the "none" mandatory option. To do this, I changed the value of the selectionsRadio in the POST data of the request from 10223 which is the value of the NA, to a value which represents another role (e.g. 10421, SD Agent). Test case 2: Going from one role (e.g. National Administrator) to MANY others. In other words assign multiple roles to the same user. To do that I added two parameters named selectionsRadio, one keeping the value of my current role, and one more with a new valid value (e.g. 10421, SD Agent). With this scenario I wanted to simulate the previous check box functionality under the new radio button list. Test case 3: Going from 'None' role, to multiple users again with the same technique mentioned in the Test case 2 above. Test case 4: Ask for a role that does not exist in the radio button list. I tried to change my role from NA to Trader (value: 10313). Of course this option is not available in the list. The test successfully failed similar to all the previous test cases,	

			but I didn't receive any error message for this situation. Just a short note for the test cases 1,2,3. I received a permission error when I attempted to change from NA -> CA or SA. The error was related to the prohibited change of the higher privileges of the target roles (CA, SA). In modifications that had a lower privilege role as a target, I was correctly receiving the following error: ERROR You are not allowed to add more than 1 Administration role.	
Correction of text for check	7214 check text should be alligned with -364 fix for EUTL 6.8.1	After implementing -364 in EUTL 6.8.1 �Allocation transacted volume *<=* volume in NAT/NAVAT in EUTL - any already allocated volume + any returned volume�. It means that text displayed in terminated transaction as a result of check 7214: "7214: The number of allowances transferred is not strictly equal to the number foreseen in the NAP for the specified installation and specified year." is *no longer accurate*	1. Navigate to deployment files, message.properties file: 2. Ensure the following line appears in this file: error.message.check.7214 = 7214: The number of allowances transferred is greater than the number foreseen in the NAT/NAAT for the specified installation/aircraft operator and specified year.	PASSED
Wrongly calculated values for transitional and NER allocations in Allocation Delivery Task	Wrongly calculated values for transitional and NER allocations in Allocation Delivery Task	Given the OHA account that received transitional and NER allowances. When there is a change in NAT related to transitional and NER values. Then values in Allocation Delivery task are wrongly calculated. Example: OHA received allowances per following NAT: Free: 100 Transitional: 200 NER: 300 NAT is updated with following values: Free: 110 Transitional: 210 NER: 310 When Allocation Delivery task is created it will display following summary: Total of allocations to be delivered: 530 (10 free, 210 transitional, 310 the NER) So it seems to work fine for free but transitional nad NER values are wrong. This is only display issues - when allocation transaction is generated, proper number of allowances is transferred (in this case 10 per allocation type).	Installation 12408 of Romania has the following values in allocation tables for 2016: Free: Allocation: 12, Allocated: 10 Transitional: Allocation: 36, Allocated: 30 NER: Allocation: 24, Allocated: 20 1. Connect as NA to RO 2. Navigate to EUETS -> Allocation Phase 3 3. Choose to propose allocation to installation 12408 4. Ensure the quantities 2, 6, 4 appear for each of Free, Transitional, NER 5. Claim the task "Approve allocation delivery settings" as another NA. 6. The task approval task mentions the quantities 2,6,4 and sums the total quantity of 12 units to be allocated. 7. Approve the task. 8. Ensure 12 units are allocated.	PASSED

The "reversal" button should be hidden in voluntary cancellation for all roles and permissions	The "reversal" button should be hidden in voluntary cancellation for all roles and permissions		1. Connect as NA and navigate to EUETS -> Transactions. 2. Search for transactions of type "4-0". 3. Click on a voluntary cancellation which is completed and whose completion date is less than the configuration parameter TRANSACTION_REVERSAL_WORKING_DAYS_LIMIT (because if it was older, it would already be prohibited to reverse it). 4. Ensure no "Reverse" button appears. Repeat for an account's AR, an account's AAR and all administrative roles: SD, SDA, Auditor, CA. Repeat for a voluntary cancellation just completed (executed with EU1160464 of EU).	PASSED
Technical issue referring to a directive specifying the compatibility mode of Internet Explorer browser.	Change in compatibility mode only when IE9 is used, and leave it as is when IE10+	for the: EUCR-2008 and for EUCR-2411 (corresponding to -991) the following change was made: the <meta http-equiv="X-UA-Compatible" content="IE=EmulateIE8" />, was added at the main_layout.xhtml. This results to enforcing the change in compatibility mode only when IE9 is used, and leave it as is case of any subsequent IE version.	Use IE 9 to perform this test or alternatively: Use IE11 and click Development Tools. Set compatibility mode to IE9 to emulate IE9. Scenario: 1. Log in to RO registry as NA 2. Request opening the account (OHA) 3. Fill in data until Contact Person Information screen is displayed 4. Click on "Address Provided" checkbox 5. Repeat step 4 many times to check for intermittence 6. Submit the OHA creation request and ensure the account request is normally submitted. Repeat with IE10, Firefox, Chrome.	PASSED
Account statement issues; now fixed.	Conversion of CP1 AAUs are displayed as eligible in account statement screen	Conversion of CP1 AAUs are displayed as eligible in account statement screen. e.g. account PT 643 transaction PT154		PASSED
At issuance of CP1 KP units, these units are now marked ineligible for ETS.	IssueOfAAUsAndRMUs does not set the IS_INELIGIBLE flag	IssueOfAAUsAndRMUs does not set the IS_INELIGIBLE flag in auto_unit_selection_constraint nor in transaction_block.	1. Login as NA in EU and navigate to KP -> Issuance 2. Propose an issuance of KP1 RMU units 3. As another NA approve the issuance 4. Get the transaction identifier of the approved transaction request 5. Browse the transactions and ensure the transaction is COMPLETED. 6. Run the two following queries and ensure the IS_INELIGIBLE flag is 1: select * from transaction_block where transaction_id = (select transaction_id from transactions where transaction_identifier = '<<transaction_identifier>>'); select * from auto_unit_selection_constraint where transaction_identifier = '<<transaction_identifier>>';	PASSED
Account statement issues; now fixed.	EUCR-2407 Correction of Account Statements PDF	Correction of Account Statements PDF		PASSED

Account statement issues; now fixed.	Script which corrects AAUs & RMUs is not correct	Script which corrects AAUs & RMUs is not correct.
		
		"case when" in fixed_res are not correct.
			This is a technical issue.
			
			This issue is implemented via a script which migrates account statement data. It is called via:
			
			BEGIN
			PKG_ACCST_CORR_AFTER_20150331.p_fix_account_statements (to_date('1/4/2015', 'dd/mm/yyyy');
			END;
				PASSED

Account statement issues; now fixed.	Account statements for AAU and RMU	The following are pending: # Show correctly AAU, RMU at screen and PDF # Migration script should include screen and PDF # Migration script should be optimised # New indices should be created for the script to run faster	EUCR-2287, EUCR-2454,	PASSED
It was not possible to allocate to reserve allocation without having transitional allocation.	Red screen when allocating to installation	I have an installation with reserve allocation and no transitional allocation. I try to allocation to reserve and I get red screen.	Find an installation which has Free and NER allocation but not transitional. This is installation 12406 for RO in FAT. 1. Connect as NA for RO and navigate to EUETS->Allocation Phase 3. 2. Filter for year=2016 and allocate the NER quantity to installation 12406. 3. Confirm and approve as another NA. 4. Ensure the allocation is completed. (Transaction EU1160232 in our FAT).	PASSED
Admin roles management screen is modified so as to allow only one admin role per user.	Change of role selection in roles administration		From TC.01 Users-Basic Functionality-Account creation test document, execute the following: * UC_UA_060_TC_01, * UC_UA_060_TC_02, * UC_UA_060_TC_03, * UC_UA_060_TC_04	PASSED
Roles and permissions management screen optimizations.	The refresh following a tick in the Roles and Permission screen takes 5 seconds		Open a web browset and delete cache and all temporary internat files. Restart the browser. Repeat with IE and Firefox and Chrome. 1. Log in EU registry as NA 2. Navigate to Administration -> Roles and Permissions tab tick a box 3. An "update" icon appears; the screen is refreshed to disable all other checkboxes; update of the screen lasts less than 5 seconds. 4. User clicks "Next" button.	PASSED
Suspend/restore unit block pop-up window approval did not appear in Internet Explorer; this is now fixed.	Suspend/restore unit block pop-up window approval does not appear in Internet Explorer		Connect with IE11; repeat with Firefox and Chrome: 1. Log in EU registry 2. Administration -> Unit Blocks 3. Click on a unit block 4. Click suspend or restore 5. Pop-up window must appear	PASSED

Allocations technical issue; it is now fixed	Clicking on a new allocation setting delivery task causes screen to crash	I click on a new allocation in NA's exclusice task list and screen crashes. Refer to attachments.		PASSED
Inclusion of translation strings	Integrate MS translations for v7.0.4 (v6.7.3 --> v7.0.4 delta)			PASSED
Revert the changes performed via EUCR-2459 of EUCR 7.0.4. This added some HTTP headers in all pages of the application.	Revert APPREQ-23	Remove meta tags added by APPREQ-23	1. Log in EUCR 2. Click "View source" on the browser 3. Ensure the following meta tags have been removed: <meta http-equiv="Cache-Control" content="max-age=0" /> <meta http-equiv="Cache-Control" content="no-cache, no-store" /> <meta http-equiv="expires" content="0" /> <meta http-equiv="expires" content="Tue, 01 Jan 1980 1:00:00 GMT" /> <meta http-equiv="pragma" content="no-cache" />	PASSED
This package fixes the account statement records for AAU, RMU, ERU_FROM_RMU, lCER, tCER. It accepts a date parameter, which must be greater of equal to 01-APR-2015.	Account statements correction since 01-Apr-2015 for five unit types of KP1	This issue corrects account statements generated from 01-Apr-2015 onwards for the units: * AAU * RMU * ERU_FROM_RMU * LCER * TCER It is tested via a series of SQL statements, and a procedure which is integrated in a package. It must also be tested that the correct package contained in Liquibase in committed in the database.		PASSED
Handling of error in case a wrong XML is uploaded in NAT/NAAT upload screen.	Unrecoverable error on allocation XML upload (incorrect xml)	1. Log in to registry as NA 2. Go to Allocation Tables Phase 3 3. Upload entitlement xml Description When incorrect xml is uploaded in Allocation Tables Phase 3 unrecoverable error is thrown. This is happened when entitlements xml was used instead of allocations xml (please see attached).	*Test Case 1:* 1. At Allocations Tables Phase 3 link, nat section, upload an entitlements xml. 2. Red screen should not appear, only message "The content of the XML file is invalid" *Test Case 2* (about additional error discovered when uploading nat xml with value e.g. +++ instead of a number) 1. At Allocations Tables Phase 3 link, nat section, upload a nat xml which contains: <ns1:allocation year="2014" type="free">+++</ns1:allocation> 2. Red screen should not appear, only message "The content of the XML file is invalid" *Test Case 3:* Repeat Test Case 1 and Test Case 2 for naat *Test Case 4* (Regression) 1.Upload a nat with correct format in GB registry as NA. Submit some types of units for next allocation job 2.Upload a naat with correct format in GB registry as NA. Submit some types of units for next allocation job	PASSED

A question mark should appear in allocation screen, for installations or aircraft operators which have been excluded for the allocation year.	Wrong "Allocation disabled ..." indication in allocation delivery task	1. Create Allocation delivery task 2. Check if question mark appears only if installation is excluded for given year Description In Allocation delivery task every value has question mark icon indicating that "Allocation disabled because installation is excluded for this year". It doesn't matter if it is really excluded. Same for OHA and AHOA, different years, different allocation types, adding or removing allocation.	*Test Case 1: Allocation to aircraft operator* - Aircraft case - All years in Compliance are Not Excluded for AOHA 10930 1. Log in GB as NA 2. Find an "Approve Allocation Delivery Settings" task in tasklist (request id = 495579, account identifier = 10930) 3. Check that in the task confirmation window there is no "?" marking in green boxes. 4. Set all years to Excluded for this aircraft operator. 5. Check that in the task confirmation window there is no "?" marking in green boxes. *Test Case 1 - Sub-Case 1* : Check 2015 as Excluded year, and go to task to check that there is not a "?" mark. *Test Case 1 - Sub-Case 2* : Check 2015 as Excluded year, upload allocation xml for 10930 and year 2016, and check there are no "?" marks in job submission page. *Test Case 1 - Sub-Case 3* : Check 2015 as Excluded year, upload allocation xml for 10927 and year 2015, and check there are "?" marks in job submission page. *Test Case 2: Allocation to installation* - All years in Compliance are Not Excluded - Installation case 1. Log in GB as NA 2. Find an "Approve Allocation Delivery Settings" task in tasklist (request id = 495558, account id=102) 3. Check that in the task confirmation window there is no "?" marking in green boxes. 4. Set all years to Excluded for this installation. 5. Check that in the task confirmation window there is no "?" marking in green boxes. *Test Case 2 - Sub-Case 1* : Make 2015 Excluded, upload allocation xml for 102 and year 2016, and check there are no "?" marks in job submission page. *Test Case 2 - Sub-Case 2* : Make 2015 Excluded, upload allocation xml for 102 and year 2015, and check there are "?" marks in job submission page. *Test Case 3 - Regression for allocation to installation* 1. Log in EU as NA 2. Check that account 101 has Excluded year 2015 3. Upload allocation xml for 101 4. Uploaded units can not be submitted - there must be a "?" mark, and checkbox is disabled *Test Case 4 - Regression for allocation to aircraft* 1. Log in EU as NA 2. Check that account 103 has Excluded year 2016 3. Upload allocation xml for 103 4. Uploaded units can not be submitted - there must be a "?" mark, and checkbox is disabled *Test Case 5 - Exclude/Unexclude between phases of	PASSED

			proposal-approval of allocation* Installation accounts (FR): 12347, 12349, 12356 1. Go to allocation screen, check three installations to receive allocation and submit request (the request XML is created with info that all accounts are not excluded) 2. Go to one of the accounts and exclude the year you just previously checked. 3. Go to tasklist and check that this account does not appear with question-mark (information is read from request XML and not from DB) 4. Approve the request, go to history and check that this account does not appear with question-mark and the others not (information is read from request XML and not from DB) 5. Go to this account and unexclude the excluded year. 6. Go to tasklist history and check that this account does not appear with a question-mark (information is read from request XML and not from DB) Repeat for aircraft. (FR accounts: 12358, 12359, 12360)	
Addition of permission for SDA in ESD registry.	'Manage ESD Account Search' should be granted to SERVICE_DESK_AGENT role	1. Check the script 2. Check if 'Manage ESD Account Search' is granted to SERVICE_DESK_AGENT role Description Liquibase changeset "7_0_4_EUCR-956_PERM_ESD_ACCOUNT_SEARCH1" doesn't cover granting 'Manage ESD Account Search' permission to SERVICE_DESK_AGENT role. If this change was done in PROD, script should be updated to reflect that.	Execute the following query (which returns the roles of ESD who have the permission PERM_ESD_ACCOUNT_SEARCH) and ensure the Service Desk Agent role appears in the resultset. select a.*, role_name from permissions a, role_permission b, roles c where a.permission_id = b.permission_id and b.role_id = c.role_id and perm_key = 'PERM_ESD_ACCOUNT_SEARCH' and registry_code = 'ED' order by 3;	PASSED
New transactions of CER or ERU_FROM_AAU will be characterized as ineligible in account statements.	Ineligible units shown as eligible on account statement page	This issue corrects account statement calculations for new transactions for the units types: * CER * ERU_FROM_AAU New transactions must be entered with the above units in CP1 in positive and negative lists, and ensure that always the units appear as ineligible in account statements.	*Test Case 1: CER* 1. Log in GB as NA 2. Transfer 2 CER of CP1 from account with identifier=356 to trusted account with id=360 3. At Holdings tab of acquiring account, there should be 2 more CER units, as ineligible 4. Account statement of account 360 shows 2 CER ineligible *Test Case 2: ERU_FROM_AAU* 1. Repeat with same data except from unit type which will be ERU_FROM_AAU. 2. Transfer 3 units from account with identifier=356 to trusted account with id=360 3. Check new 3 units are added as ineligible in acquiring account. 4. Account statement of account 360 shows 3 ERU_FROM_AAU ineligible *Test Case 3: CERs which are in General Positive list* Repeat Test Case 1 but for a project which is in General Positive List. The transacted units are characterised as red (ineligible, because they are in CP1) in account holdings, account	PASSED

			statement screen and account statement PDF. Transaction EU1190910 is completed between account 356 and 360 and transfers CP1 CER contained in GB1 project, which is in General Positive List. The units are marked as red in account statements of both accounts.	
In NAAT allocation, special reserve value to be allocated did not appear correctly in allocation delivery approval screen. This is now fixed.	Value for AOHA Special Reserve allocation not displayed in Allocation Delivery Task	1. Upload NAAT with vales for Free and Special reserve 2. Tick and submit allocations 3. Display Allocation Delivery task and check if Special Reserve value is taken into account in summaries and grid *Description* When NAAT with value for Free and Special Reserve allocations is uploaded for aircraft operator and Allocation Delivery task created than Special reserve value is not taken into account on task display page. What is interesting that if Special reserve is the only allocation type it is displayed properly.	1. Upload the following NAVAT in FAT, Romanian registry: <?xml version="1.0" encoding="UTF-8"?> <ns1:navat registry="RO" xsi:schemaLocation="urn:eu:europa:ec:clima:ets:1.0 ../navat.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:ns1="urn:eu:europa:ec:clima:ets:1.0"> <ns1:aircraftOperator action="A" identifier="12453"> <ns1:allocation year="2016" type="free">46</ns1:allocation> <ns1:allocation year="2017" type="reserve">16</ns1:allocation> <ns1:allocation year="2018" type="free">10</ns1:allocation> <ns1:allocation year="2018" type="reserve">20</ns1:allocation> </ns1:aircraftOperator> </ns1:navat> 2. Upload the same file in EUTL. 3. Perform an allocation for 2018, ensure the value in approval screen appearing is Free=10, Reserve=20 4. Perform an allocation for 2017, ensure the value appearing in approval screen is Reserve=16 5. Perform an allocation for 2016, ensure the value appearing in approval screen is Free=46	PASSED

A user who is un-enrolled from ESD and does not hold any other administrative role should not be considered as privileged. This is now enforced.	User still considered as privileged after un-enrolling from ESD	If given user is AR in EUCR registry and AR in ESD, than it is considered privileged. Now when this user un-enrols from ESD, than should be considered as non-privileged. Unfortunately this is not the case and user still needs to have record in TMS. The reason for that is the query in Authentication Provider doesn't take into account ESD user status at all.	For below cases, a new user creation in userDatabase.xml, is proposed (nadmin11, nadmin12 already exist, also make sure that the chosen nadmin in unenrolled in ESD and GR) *Test Case 1* 1.Register the user nadmin11 in GR and enrol. 2.As NA in GR, grant user an admin role. 3. In FAT DB enter flag=T for the user 4. User should be able to log in with Token *Test Case 2* 5. Unenrol the user 6. Cannot log in with Token *Test Case 3* 7. For the above user, give role=None if needed, and assign him as AR of an account in GR (GR-121-383-0-27) 8. In ESD, log in as the new user and enrol. 9. Make him an AR of an ESD account (EU-100-10001864-0-31) 10. User should log in with Token *Test Case 4* 12. Unenrol from ESD, 13. User shouldn't be able to log in with Token anymore	PASSED
Under some circumstances the ICE XML did not contain full data. This is now fixed.	ICE XML export takes into account only items currently displayed in the list	1. Upload and approve IE for more than 10 installations 2. Go to Entitlements screen display only 10 items in the list 3. Export XML and check if all installations have been exported.	*Test Case 1* 1. In GR registry as NA, in Entitlements, click Search. 2. Results are returned, but only 3 records have an ICE value uploaded 3. Go to 7nth page (where only one row will appear in XML) 4. Click Export XML 5. Check in XML that 3 entitlements appear 6. Repeat by paging in other pages, exporting always creates a file with 3 records. 7. Return to the ICE screen and ensure paging works normally, after creating and closing the XML file. Repeat the above for CSV file generation but all the records are returned, both those having ICE value and those not having ICE value.	PASSED

When a user is logged in ECAS with both GSM in Token the system detected this and prompted to return to a wrong page of ECAS. This is now fixed, and used is returned to the standard ECAS logout screen.	User logged in ECAS with both GSM in Token - inconsistent logout procedure	Two issues for this: 1.1. As privileged user log in to EUCR with Token 1.2. Log out from EUCR (bot not from ECAS) 1.3. Log in using GSM (expected behaviour - user cannot log in with GSM) 1.4. Check the error description page 1.5. Logout from EUCR and ECAS 2.1 As non-privileged user with Assigned token log in using GSM 2.2. Log out from EUCR (bot not from ECAS) 2.3. Log in using Token (expected behaviour - user cannot log in with Token) 2.4. Check the error description page 2.5. Logout from EUCR and ECAS Refer to -1224	A. Test a privileged user having logged in with both Token and GSM 1. As privileged user log in to EUCR with Token 2. Log out from EUCR (bot not from ECAS) 3. Log in using GSM 4. Check the error description page; the main Logout screen of ECAS is depicted 5. Click the Logout button presented on the EUCR screen 6. Ensure the screen reached in ECAS is the one depicted in step 4 above. 7. Click Logout in ECAS. The user is now logged out of both systems. B. Test a non-privileged user who has a token in ECAS and has logged in ECAS with both GSM and Token. This can be accomplished by assigning a token to a user who is NOT defined with flag T in TMS. 1. Log in with GSM 2. Log out from EUCR (but not ECAS) 3. Log in with Token 4. Check the error description page; the main Logout screen of ECAS is depicted 5. Click the Logout button presented on the EUCR screen 6. Ensure the screen reached in ECAS is the one depicted in step 4 above. 7. Click Logout in ECAS. The user is now logged out of both systems.	PASSED

The prefix "00" or "+" is now mandatory at edit or insert of user's GSM.	Mobile phone update issues	1. As NA go to "Edit your personal details" page and update phone with one that is not starting with + nor 00 2. As NA go to "Edit your personal details" page and check if there is reminder that GSM number should be the same as in ECAS 3. As NA using token go to new registry and request new user to be created 3.1 Fill all required data including GSM 3.2 Click Next and then Back button 3.3 Check is GSM field is enabled *We reproduced only step 1. Step 1 is in scope for fixing*	A. Test "Edit your personal details" screen 1. Log in as NA to a registry where you have a profile 2. Click on "Edit your personal details" 3. Enter telephone: 123456789 and click Next. 4. Ensure the validation rule for telephone fires: "International format including country code (prefix: "00" or "+"), e.g. for Belgium +32123456789" B. Test "Fill in your personal details" screen 1. Log in with Token 2. Switch to a registry to which you do not have a profile 3. Click "Fill in your personal details" 4. Enter telephone: 123456789 and click Next. 5. Ensure the validation rule for telephone fires: "International format including country code (prefix: "00" or "+"), e.g. for Belgium +32123456789" C. Test personal details update screen 1. Log in as NA 2. Navigate to Administration-->Users--> Search and locate a user. 3. Click on a user and navigate to Personal Details tab. 4. Click Edit 5. Enter telephone: 123456789 and click Next. 6. Ensure the validation rule for telephone fires: "International format including country code (prefix: "00" or "+"), e.g. for Belgium +32123456789" For all the above cases A,B,C ensure the only allowed telephone format is the following, parentheses are omitted: **(+ or 00)(1 digit of 1..9)(9,10 or 11 numeric digits)** +1123456789 is permitted +11234567891 is permitted +112345678911 is permitted +1123456789111 is not permitted 1123456789 is not permitted 0123456789 is not permitted 11234a6789 is not permitted a123456789 is not permitted 112345678a is not permitted z12345678a is not permitted -1123456789 is not permitted ++112345678 is not permitted 00112-456789 is not permitted 00112.456789 is not permitted 00112456789 is permitted 000000000000 is not permitted 001000000000 is permitted 00z000000000 is not permitted	PASSED

Reversal of allocation crashed at submission. This is now fixed.	Reversal of Allocation - RedBox - Unrecoverable Error	While proposing Reversal of Allocation units in EUCR-DEV (v 7.0.4, REGISTRY=BG) on OHA account I got few times "Unrecoverable Error". See the pictures attached. This is happening when user will open specific Allocation transaction and there is displayed [Reverse] button,	A. Reverse an allocation to installations. 1. Successfully reversed allocation EU1188316 for GB. 2. Approval was done by NA (Token), NADMIN1 (Token), CA (GSM) B. Reverse an allocation to aircraft operators. 1. Successfully reversed allocation EU1188401 for GB. 2. Approval was done by NA (Token), NADMIN1 (Token), CA (GSM) C. Regression testing: Reverse a surrender 1. Successfully reversed surrender EU1188413. 2. Approval was done by NA (Token), NADMIN1 (Token), CA (GSM)	PASSED
Split of user's details in four tabs: personal details, business details, admin roles, accounts.	Unrecoverable error when requesting change of user contact data	1. Log in as NA with token (same flow for GSM) 2. Go to Users and open user details 3. Go to Administration roles tab 4. Click [Edit] button 5. Change any Contact details and click [Next] 6. Click [Submit] 7. Unrecoverable error is thrown	General test data: New users: nadmin11, nadmin12 Registry tested: GR *Test Case 1* View user details: -For NA user, Auditor, CA, Service Desk, Service Desk Agent -For simple user (AR, AAR) *Test Case 2* Personal details update -Request approved and applied -Request rejected -Double submissions are not permitted *Test Case 3* Business details update -Request approved and applied -Request rejected -Double submissions are not permitted *Test Case 4* Admin roles update -Request approved and applied -Request rejected -Double submissions are not permitted -If applied on REGISTERED user, user becomes VALIDATED and enrolment keys are generated. -Remove a role -Add an admin role -Cannot add an admin role while having another admin role. *Test Case 5* Repeat tests in ESD --> Administration --> Users. -Personal details -Business details -Admin roles *Test Case 6*	PASSED

			-Unenrol enrolled user -Cannot Edit any of the Personal Details, Business Details or Administration Roles tabs *Test Case 7 - Task History - Old tasks* -Log in GR as NA -In Task List History, open request 366572 -There should be a Business Details tab *Test Case 8 - Task History - New tasks* -Log in GR as NA -In Task List History, open request 499029 (type is Update Of User Business Details) -There should ne only a Business Details tab -Repeat for type: "Administration Roles Update", check newest -There should be only Role and User tabs	
During log in, the system could mix user's profiles, if user held more than one profile; this is now fixed.	Authenticator Provider query which returned EUCR user info returns wrong row	The query which returns the EUCR user info selects all rows of user, even rows with status Unenrolled. The query does not have an order by clause and therefore it is possible that the first row is not the correct one since oracle returns the rows in an arbitrary way. Modify query FIND_EUCR_USER_BY_EID_AND_REGISTRY, and add an order by clause to bring first the non unenrolled status row.		PASSED
It is not possible to generate CAPTCHA images, used during account request for not logged-in user.	Unrecoverable error when requesting new account as not-logged-in user (CAPTCHA issue)	As not logged-in user: 1. Go to registry page and click on "Account request" 2. Check if Captcha image is properly displayed on "Account Opening Account Details" 3. Select account, fill all required data and request new account Description When not logged-in user tries to request new account unrecoverable error it thrown. There seems to be 2 bugs which might be related. When not logged-in user goes to registry page and click on "Account request" link "Account Opening Account Details" page is displayed. Now: 1. Captcha image is broken (NoClassDefFoundError) 2. When user selects any type of account unrecoverable error is thrown (IndexOutOfBoundsException) This issue also exists in version 7.0.4	Deploy EUCR in Production mode. 1. Navigate to a regirtry's homepage withough having logged in. 2. Click on "Account Request" 3. Type an invalid CAPTCHA code and click "Next" 4. Ensure the error "Invalid code typed" appears 5. Click "Try another image" 6. Type the correct CAPTCHA code; enter account type and name and click "Next" 7. Enter new account holder details 8. Provide the rest of the account details, according to the account type chosen. 9. Submit the account creation request. 10. As an NA approve the account creation request and note the new account identifier. 11. Ensure the account has been created by searching for the new account identifier. Repeat for OHA (EU section), trading account (EU section), person account in national registry (KP section).	PASSED

Business details update task does not contain user details; this is now fixed.	There is no user information on Business Details Update task details screen	There is no user information on Business Details Update task details screen	1. Log in as NA1 2. Propose Business Details Update 3. Verify there is user related information on task details screen in the form of a table containing URID, name, login. 4. Log in as NA2 5. Approve the task 6. Verify there is user related information on task details screen in the form of a table containing URID, name, login. 7. Search the task in history 8. Verify there is user related information on task details screen in the form of a table containing URID, name, login.	PASSED
KP2 requirements	CLONE - Unrecoverable error when requesting change of user contact data	1. Log in as NA with token (same flow for GSM) 2. Go to Users and open user details 3. Go to Administration roles tab 4. Click [Edit] button 5. Change any Contact details and click [Next] 6. Click [Submit] 7. Unrecoverable error is thrown	General test data: New users: nadmin11, nadmin12 Registry tested: GR *Test Case 1* View user details: -For NA user, Auditor, CA, Service Desk, Service Desk Agent -For simple user (AR, AAR) *Test Case 2* Personal details update -Request approved and applied -Request rejected -Double submissions are not permitted *Test Case 3* Business details update -Request approved and applied -Request rejected -Double submissions are not permitted *Test Case 4* Admin roles update -Request approved and applied -Request rejected -Double submissions are not permitted -If applied on REGISTERED user, user becomes VALIDATED and enrolment keys are generated. -Remove a role -Add an admin role -Cannot add an admin role while having another admin role. *Test Case 5* Repeat tests in ESD --> Administration --> Users. -Personal details -Business details -Admin roles *Test Case 6* -Unenroll enrolled user	PASSED

			-Cannot Edit any of the Personal Details, Business Details or Administration Roles tabs *Test Case 7 - Task History - Old tasks* -Log in GR as NA -In Task List History, open request 366572 -There should be a Business Details tab *Test Case 8 - Task History - New tasks* -Log in GR as NA -In Task List History, open request 499029 (type is Update Of User Business Details) -There should ne only a Business Details tab -Repeat for type: "Administration Roles Update", check newest -There should be only Role and User tabs	
KP2 requirements	Message enrichment when logging out due to Token+GSM	The message "Please authenticate using your GSM" should be enriched as: “Please logout from ECAS and then authenticate with your GSM.” The button “Login” to be renamed as “Go to ECAS”. The same for the message "Please authenticate using your Token"	Test Case 1: 1.User is configured to log with GSM 2.User logs in with Token. 3.System informs the user with the "GSM Expected" screen (result1.png): •Title: "Authentication Error" •Message: "Please logout from ECAS and then authenticate with your GSM." •Button 1: "Go to ECAS" •Button 2: "OK" Test Case 2: 1.User is configured to log with Token. 2.User logs in with GSM. 3.System informs the user with the "Token Expected" screen (result2.png): •Title: "Authentication Error" •Message: "Please logout from ECAS and then authenticate with your Token." •Button 1: "Go to ECAS" •Button 2: "OK"	PASSED
KP2 requirements	New Account - PPSR	Create PPSR Account, only by NA of MS, only one open per registry, account type code 130, applicable for CP2 only	Possible CP is only 2. Can be created in any KP registry, including EU registry. Related use case: UC_AM_10: REQUEST ACCOUNT OPENING	PASSED
KP2 requirements	PPSR - Allowed unit types	PPSR Accounts can only hold AAUs with originating CP = (current CP = 1) and applicable CP = 2 (Check 7029)	Executed UC_HT_170_TC_01: Transfer AAUs from GB PPSR account to FR PPSR account	PASSED
KP2 requirements	PPSR - Available transactions	Allow only transactions retirement and transfer to another PPSR	Executed UC_HT_170_TC_01: Transfer AAUs from GB PPSR to FR PPSR account	PASSED
KP2 requirements	Carry-Over of CP1 AAUs - Transaction availability	Carry-Over AAU transaction is not available if PPSR account does not exist		PASSED

KP2 requirements	Unit block flag Subject / Not subject to SOP	New flag in unit block for all AAUs with Originating CP2 must bear either "Subject to SOP" or "Not subject to SOP" - Unit block - add flag	UI flag: See EUCR-2482 DB flag: IN FAT database, check if table unit_block has column "SOP" with values 1="Subject to SOP", 2="Not Subject to SOP"	PASSED
KP2 requirements	Unit block view - add "Subject to SOP" or "Not subject to SOP" flag	Unit block view/add/edit - add "Subject to SOP" or "Not subject to SOP" flag The name of the column will be "SOP", the same column could be used by ERU_FROM_AAUs to mark "Converted for SOP" units Changes must be made to export CSV as well	1. Connect as NA and navigate to Administration -> unit blocks. 2. Click on a unit block hyperlink 3. Ensure the fields "Subject to SOP" and "Converted for SOP" exist. 4. Locate an account with both Subject to SOP and Not Subject to SOP and export its unit blocks as CSV. 5. Copy and paste the exported file in Excel and ensure a new right-most column exists, SOP, which contains the SOP value appearing on screen.	PASSED
KP2 requirements	Unit block search - add "Subject to SOP" or "Not subject to SOP" flag	Unit block search - add "Subject to SOP" or "Not subject to SOP" flag	*Test Case 1* 1. Log in GR as NA 2. In Unit Blocks click Search 3. In column "SOP" there should be some records with values "Subject to SOP" / "NotSubject to SOP"	PASSED
KP2 requirements	Holding screen - CP2 AAUs must be split into two rows	Holding screen - CP2 AAUs must be split into two rows There are various versions of this screen depending on the account type, all versions must be changed	Prerequisite: For account PT-643 exist AAU units with both markings (Subject to SOP, Not Subject to SOP) *Test Case 1* 1. Log in PT as NA 2. Go to account 643 -> Holdings 3. There should be rows with: AAU (Not Subject to SOP), and AAU (Subject to SOP) unit type columns	PASSED
KP2 requirements	Auto/Manual unit selection constraint - add "Subject to SOP" or "Not subject to SOP" flag	Auto/Manual unit selection constraint - add "Subject to SOP" or "Not subject to SOP" flag	Type "select * from auto_unit_selection_constraint;" Ensure a new last column exists named: "SOP"	PASSED
KP2 requirements	Transaction Block - add "Subject to SOP" or "Not subject to SOP" flag	Transaction Block - add "Subject to SOP" or "Not subject to SOP" flag	1. Check column SOP exists in table TRANSACTION_BLOCK. 2. Check a transaction which transferred AAU units subject to SOP --> units must be marked as Subject to SOP. 3. Check a transaction which transferred AAU units Not subject to SOP --> units must be marked as Not Subject to SOP. 4. Check a transaction which transferred ERU units Converted for Transfer to SOP --> units must be marked as Converted for Transfer to SOP. Note: the exact value of column SOP can be queried via: select * from transaction_block where transaction_id = (select transaction_id from transactions where transaction_identifier = 'PT184');	PASSED

KP2 requirements	Transaction Details - add "Subject to SOP" or "Not subject to SOP" flag	Transaction Details - add "Subject to SOP" or "Not subject to SOP" flag	1. Locate a transaction with AAU units (subject to SOP) as located via the transaction_blocks table with SOP = 1 --> Ensure it appears as Subject to SOP on transaction details screen. 2. Locate a transaction with AAU units (subject to SOP) as located via the transaction_blocks table with SOP = 0 --> Ensure it appears as Not Subject to SOP on transaction details screen. 3. Locate a transaction with AAU units (subject to SOP) as located via the transaction_blocks table with SOP = null --> Ensure it appears as Not Subject to SOP on transaction details screen. 4. Locate a transaction with ERU units (subject to SOP) as located via the transaction_blocks table with SOP = 1 --> Ensure it appears as Converted for SOP on transaction details screen.	PASSED
KP2 requirements	Transaction PDF - add "Subject to SOP" or "Not subject to SOP" flag	Transaction PDF - add "Subject to SOP" or "Not subject to SOP" flag	1. Locate a transaction with AAU units (subject to SOP) as located via the transaction_blocks table with SOP = 1 --> Ensure it appears as Subject to SOP on transaction PDF. 2. Locate a transaction with AAU units (subject to SOP) as located via the transaction_blocks table with SOP = 0 --> Ensure it appears as Not Subject to SOP on transaction PDF. 3. Locate a transaction with AAU units (subject to SOP) as located via the transaction_blocks table with SOP = null --> Ensure it appears as Not Subject to SOP on transaction PDF. 4. Locate a transaction with ERU units (subject to SOP) as located via the transaction_blocks table with SOP = 1 --> Ensure it appears as Converted for SOP on transaction PDF.	PASSED
KP2 requirements	Account Statements - add "Subject to SOP" or "Not subject to SOP" flag (db, code, screen, pdf)	Account Statements - add "Subject to SOP" or "Not subject to SOP" flag - add extra columns for amount & balance - add code to support breaking of amount/balance - modify account statement PDF		PASSED
KP2 requirements	Issuance of CP2 AAUs - default marking is "subject to SOP"	Issuance of CP2 AAUs - default marking is "subject to SOP"		PASSED
KP2 requirements	Database Script to mark CP2 AAUs when installation of application	Database Script to mark CP2 AAUs when installation of application - A script will be created which will run at the GO LIVE of the version which will update all CP2 AAUs for NON-ETS registries with the flag “Not subject to SOP”. - Also, all CP2 AAUs from ETS registries which have left ETS and returned back will be marked as “Not subject to SOP”. The latter units can be found as AAU units contained in TRANSACTION_BLOCK table where the transferring registry is a NON-ETS registry		PASSED

KP2 requirements	"Transfer to SOP Adaptation Fund for First External Transfer of AAUs" - New transaction	- New transaction "Transfer to SOP Adaptation Fund for First External Transfer of AAUs" - Acquiring account for "Transfer to SOP Adaptation Fund for First External Transfer of AAUs"" is "SOP Adaptation Fund " - The acquiring account is prefilled and cannot be changed - The "SOP Adaptation Fund " account must be kept in a parameter - Only available to NA, subject to 4 eyes principle - is NOT reversible - is immediate - Only available to Account type with code 100 that holds Orig & Applic CP2 AAUs marked as "Subject to SOP" (check UC for all rules) - Check UC for the visibility of the link for the transaction - Check UC for all checks that need to be enforced for the creation of the account proposal - MUST SHOW all AAU units on the screen, BUT only those marked as "Subject to SOP" must be editable - PPSR accounts do not have this type of transaction - At finalization: - Units changed to "NOT Subject to SOP" - Entitlement for first external transfer of AAUs is increased by the amount of the transfer - On completion of "Transfer to SOP Adaptation Fund for First External Transfer of AAUs" the units that were transferred are marked as "not subject to SOP". - The units that are "NOT subject to SOP" must be stored in a different table as they leave the ETS - The value "Entitlement for First External Transfer of AAUs" is increased by 49x the amount of the transaction	Executed UC_HT_180_TC_01: Transfer to SOP for First External Transfer of AAUs	PASSED
KP2 requirements	Incoming external transfers - mark CP2 AAUs as "not subject to SOP"	Incoming external transfers - mark CP2 AAUs as "not subject to SOP" - All CP2 AAUs that are inserted in unit block from an external transfer with a transferring account outside Union Registry will be marked as "not subject to SOP"	Executed UC_HT_180_TC_01: Transfer to SOP for First External Transfer of AAUs	PASSED
KP2 requirements	Create table - handling for registry values	Create table - BE handling for registry values Create enumeration with various values Main table with registry - value type - value, child table with movements and statuses pending, completed etc (like exchange info) - value list contains: - "Entitlement for First External Transfer of AAUs" - "Remaining Entitlement for First External Transfer of AAUs"		PASSED
KP2 requirements	Check at proposal & Transaction finalization - transfer of Kyoto units with orig & applic CP2 AAUs - update value	For each Transfer of Kyoto units with Orig & Applic CP2 AAUs with marking "Subject to SOP", if Hosting registry of transferring and acquiring accounts is different, the value of "Remaining Entitlement for First External Transfer of AAUs" must be checked for all "subject to SOP" units - information like exchange_info should be kept for value "Remaining Entitlement for First External Transfer of AAUs" - at the finalization of the transaction the remaining entitlement should be decreased.		PASSED

KP2 requirements	"Transfer to SOP Adaptation Fund for First External Transfer of AAUs" - Finalization of transaction	- On completion of "Transfer to SOP Adaptation Fund for First External Transfer of AAUs" - The similar exchange_info table is updated - the value of "Remaining Entitlement for First External Transfer of AAUs" is updated - the unit blocks are marked as "NOT subject to SOP" in the unit block table and other table	Executed UC_TF_040_TC_232	PASSED
KP2 requirements	New menu under "Kyoto Protocol" with name "KP2 Entitlements" - new screen for NA	- New menu for NA under "Kyoto Protocol" with name "KP2 Entitlements" - The NA views only the values of Share of Proceeds transferred, Entitlement, Used Entitlement, Pending Entitlement, and Remaining Entitlement for First External transfer of AAUs.		PASSED
KP2 requirements	New screen/functionality to upload PPSR / CER/ERU Entitlements	New screens functionality to upload PPSR (AAU) and one for CarryOver (CER/ERU_FROM_AAU) Entitlements for registries, available only to EU-CA Script to add permission to CA The CER/ERU screen should have a drop down with the two types of entitlements (UC were modified), an extra check should be made that the value from the drop down corresponds to the uploaded XML. Check UC for all the checks that need to be enforced on xml upload. History data must be kept. All three types of entitlements must be kept in the same table.	TC.26 UC_EN_040_TC_01: Upload KP2 entitlements in Union Registry	PASSED
KP2 requirements	PPSR Account - Holdings tab - add table with entitlement values	PPSR Account - Holdings tab - add table with entitlement values ("PPSR Initial Transfer Entitlement", "Available PPSR Entitlement")		PASSED
KP2 requirements	"Transfer AAU to PPSR account" - Finalization - update value of "Available PPSR Entitlement"	- On the finalization of the transfer from one PPSR to another PPSR, the "Available PPSR Entitlement" of the acquiring account is DECREASED with the quantity of the transaction - This will create a row on the child table of entitlements, with movement type DECREASE, and also update the parent table with the correct amount (sum of all children)		PASSED
KP2 requirements	Transfer AAU to PPSR account - New transaction	- New transaction Transfer AAU Between PPSR Accounts (either within ETS or outside) - EUCR will NOT check on the proposal of transfer from one PPSR to another PPSR that the "Available PPSR Entitlement" of the acquiring account does not go below 0 - The screen is another issue - Check UC for screen + finalization actions		PASSED

KP2 requirements	Transfer AAU to PPSR account - Proposal/Confirmation Screen	Transfer AAU Between PPSR Accounts - Proposal /Confirmation Screen - The screen includes a list of all OPEN PPSR accounts	*Test Case 1 - Transfer 1 unit to EU PPSR account* : UC_HT_170_TC_01: Transfer AAUs from GB PPSR account to FR PPSR account 1. Log in GB as NA 2. Accounts -> Type:PPSR -> Holdings -> Propose transaction -> Transfer AAU to PPSR account 3. Choose 1st radio button, and select GB account. Quantity to Transfer =1. 4. Complete the proposal and the approval 5. GB account now should have 1 less, and FR 1 more AAU unit. *Test Case 2 - Transfer externally* : UC_HT_170_TC_02: Transfer AAUs from GB PPSR account to Japanese PPSR account - Repeat process of Test Case 1 except for choosing 2nd radiobutton and providing an account e.g. "JP-130-4444-{0,1,2}" - Check unit distribution *Test Case 3 - Retirement* : UC_TF_080_TC_01: RETIRE UNITS - Repeat process of previous test case 1, except for choosing "Retirement" instead of "Transfer AAU to PPSR account", for 1 unit. - Check loss of 1 unit *Test Case 4 - Transfer from any other PHA is not possible* - Send units from GB PHA to GB PPSR. It is not possible. - Send units from FR PHA to GB PPSR. It is not possible. - Send units from Japan to GB PPSR. It is possible.	PASSED
KP2 requirements	Incoming transaction from PPSR account - check Available PPSR Entitlement	- When non-EU PPSR is the transferring account, if Available PPSR Entitlement of the acquiring account goes below 0, the transaction must be rejected - Missing ITL error		PASSED
KP2 requirements	"PPSR account" - Retirement transaction available from PPSR account	- Retirement transaction from PPSR account subjects to 4-eyes principle - Some checks concerning the amount are checked by ITL		PASSED
KP2 requirements	New screen for NA (same screen as REQ-46) - add conversion values	- New menu for NA under "Kyoto Protocol" with name "KP2 Entitlements" (same as REQ-46) - The NA views only the values of Converted for Transfer to SOP, Transferred to SOP for Conversion, Entitlement for Conversion, Used Entitlement for Conversion, Pending Entitlement for Conversion and Remaining Entitlement for Conversion. The NA should see these values in total for his registry, as well as a breakdown per each project		PASSED
KP2 requirements	JI Projects - edit limit for TRACK 2 projects	- NA can view and modify limit for track 2 projects - NA can view the Conversion Limits of track 2 projects per project (JI project search screen) - add logging, history - Permission	Tested by: UC_CV_010_TC_03: EDIT PROJECT LIMIT from TC.15 JI Projects document	PASSED

KP2 requirements	New transaction "Conversion of AAUs or RMUs to ERUs prior to Transfer to SOP" (Conversion A)	- New transaction "Conversion of AAUs or RMUs to ERUs prior to Transfer to SOP" (Conversion A) - Available to all type 100 accounts with orig & applic CP2 AAUs or RMUs, except PPSR accounts - Acquiring account of conversion is the same as the transferring account - It is not permitted to convert AAUs and RMUs in the same transaction, also only one project - Outcome is ERU_FROM_AAU or ERU_FROM_RMU depending on the original units (like CP1 conversion) - AAUs involved in conversion may have marking "subject to SOP" or "NOT subject to SOP" (i.e. we do not care if they have been subjected to SOP) - The user must be able to choose "subject to SOP" or "NOT subject to SOP" units (different rows on the screen) - On completion (transaction finalization) of the conversion transaction for ERUs, the ERUs are marked as "Converted for SOP", - unit block marking "subject to SOP", "not subject to SOP" is removed from converted ERUs - Check UC for more info about preconditions, and list of available projects. - Each project corresponds to a unit type (it must be shown next to the project number in the drop down) - Only host country of JI project can initiate conversion - Conversion screen includes some calculation display (check UC) - Screen is a different jira	Tested by executing UC_HT_195_TC_01: CONVERT UNITS TO ERUS PRIOR TO TRANSFER TO SOP (“CONVERSION A”). In addition, the steps defined in this issue's description were followed. Unit blocks created in EUCR were tested via the EUCR screens. Unit blocks created in EUCR were tested via the query: select end_block-start_block+1, sop from unit_block where block_id in (select block_id from account_holding where account_id = (select account_id from account where account_identifier = 643)) and unit_type_code = 3; Note1: Conversion A of Track 2 projects returns the following ITL error codes which are due to ITL configuration. Correct ITL configuration with regard to JI projects will allow this transaction to complete: * 5063 * 5061 Note2: Conversion entitlements are reviewed via EUCR screens and EUTL screens.	PASSED
KP2 requirements	Conversion A - Proposal /Confirmation Screen	Conversion A - Proposal /Confirmation Screen	Tested by executing UC_HT_195_TC_01: CONVERT UNITS TO ERUS PRIOR TO TRANSFER TO SOP (“CONVERSION A”).	PASSED
KP2 requirements	Conversion A - Finalization	Conversion A - Finalization	Tested by executing UC_HT_195_TC_01: CONVERT UNITS TO ERUS PRIOR TO TRANSFER TO SOP (“CONVERSION A”).	PASSED
KP2 requirements	Holdings screen - display number of units with the marking "Converted for SOP"	- Holdings screen, display number of units with the marking "Converted for SOP"	tested successfully UC_HT_195_TC_01 & UC_HT_200_TC_01	PASSED
KP2 requirements	"Converted for SOP" units can ONLY be used in "Transfer to SOP for Conversion" - exclude from other "Transfer Kyoto Units" or related transactions	- "Converted for SOP" units can ONLY be used in "Transfer to SOP for Conversion" Those units must be EXCLUDED from other "Transfer Kyoto Units" etc transactions. Many transactions involved. This must be implemented in a) filter the unit blocks when proposing transaction b) new extra check in all transactions related to ERUs c) unit block reservation		PASSED

KP2 requirements	New transaction "Transfer to SOP for Conversion"	- New transaction "Transfer to SOP for Conversion" - Available only if "Converted for SOP" units exist on account - Available only from KP accounts of type 100, except PPSR - Unit types: ERU_FROM_AAU or ERU_FROM_RMU with marking "Converted for SOP" - Only one unit type must be present in the transaction - The quantity of the transaction must match a previous Conversion A for the respective project (user selects project) (for track 2 projects) - Destination account is a preselected and not modifiable(parameter in system) (New check must be created to check acq account) - not reversible, not subject to delay, holidays, working hour, 4 eyes, NA --> NA - Check UC for full set of checks which must run - transaction finalization: - increase the variable "Transferred to SOP for Conversion" - increase the variable "Entitlement for Conversion" with 49x the value of the transition "Transfer to SOP for Conversion" of the same project - removal of the marking "Converted for SOP" - new check: - For track 2 projects, conversion quantity must be EXACTLY EQUAL TO the quantity of the last successful "Conversion A" - The value of "Entitlement for Conversion" should always be 49x the value "Transferred to SOP for Conversion"		PASSED
KP2 requirements	Transfer to SOP for Conversion - Proposal/Confirmation screen	Transfer to SOP for Conversion - Proposal/Confirmation screen		PASSED
KP2 requirements	Transfer to SOP for Conversion - Finalization	Transfer to SOP for Conversion - Finalization		PASSED
KP2 requirements	New parameter for the target account of "Transfer to SOP for Conversion"	New parameter for the target account of "Transfer to SOP for Conversion" Check UC for name		PASSED

KP2 requirements	New transaction "Conversion of AAUs or RMUs into ERUs" ("Conversion B", 2_57)	- New transaction "Conversion of AAUs or RMUs into ERUs" ("Conversion B") - For track 2 projects, the conversion quantity must be equal to the project conversion limit (i.e. entitlement because someone may modify the limit) - any KP 100 account that holds CP2 AAUs (marked "subject to SOP" or "not subject to SOP") or CP2 RMUs - only one project - only possible after "Transfer to SOP for Conversion" - there is no pending "Transfer to SOP for Conversion" - After proposal - increase "Pending entitlement for conversion" - decrease ""Remaining entitlement for conversion" for project - decrease "Remaining entitlement for conversion" - After completion - decrease "Pending entitlement for conversion" for project - increase "Used Entitlement for Conversion" - not reversible, not subject to delay, holidays, working hours, NA --> NA, 4 eyes - Mandatory cycle: "Conversion A" --> "Transfer to SOP" --> "Conversion B" - check UC for full check list - conversion quantities: - Track 1 (no limit) - conversion A amount X - Transfer to SOP amount X - Conversion B amount 49X - Track 2 (with limit) - conversion A amount = 2% of Limit - Transfer to SOP amount = same as conversion A amount - conversion B amount = 49x Conversion A amount	Tested successfully UC_HT_205_TC_01 without Track 2 (it was no possible to specified track2 project on ITL)	PASSED
KP2 requirements	Conversion B - Proposal/Confirmation screen	Conversion B - Proposal/Confirmation screen	tested successfully UC_HT_205_TC_01 (with Track1 projects)	PASSED
KP2 requirements	Conversion B - Finalization	Conversion B - Finalization	Tested successfully UC_HT_205_TC_01 (only for track 1 projects)	PASSED
KP2 requirements	Carry-Over of CP1 AAUs - New transaction	- New transaction "Carry-Over of CP1 AAUs" - Available to accounts PHA, Former OHA, Personal HA (100, 120, 121) with AAU applicable CP1 units - Target account is the CP2 PPSR account that is hosted by the same KP registry of the transferring account - PPSR account must exist and OPEN - transaction available between dates - no limit - on completion unit type applicable CP modified from CP1 to CP2 - not reversible, not subject to delay, holidays, working hours, NA --> NA, 4 eyes - Check UC for full check list (other issue)		PASSED
KP2 requirements	Carry-Over of CP1 AAUs - Proposal/Confirmation screen	Carry-Over of CP1 AAUs - Proposal/Confirmation screen		PASSED
KP2 requirements	Carry-Over of CP1 AAUs - Finalization	Carry-Over of CP1 AAUs - Finalization		PASSED

KP2 requirements	Carry-Over of CP1 AAUs - Checks for transaction	Checks for transaction "Carry-Over of CP1 AAUs" - For the full check list check UC		PASSED
KP2 requirements	"Carry-Over of CP1 ERUs and CERs" - New parameter for availability of transaction	New parameter for availability of transaction "Carry-Over of CP1 EURs & CERs" Used by transaction "Carry-Over of CP1 EURs & CERs"		PASSED
KP2 requirements	"Carry-Over of CP1 ERUs and CERs" - New transaction	- New transaction "Carry-Over of CP1 ERUs and CERs" - Available to 100, 120, 121 accounts that hold CP1 ERU_FROM_AAU and CER - Not available for EU-hosted accounts - Transaction available between dates (check parameter) - Transaction not available if there is no "Carry-Over Entitlement" - Acquiring account is the same as transferring account - The quantity of ERUs and CERs that may be carried-over is limited by the "Carry-Over Entitlement" loaded by CA		PASSED
KP2 requirements	"Carry-Over of CP1 ERUs and CERs" - Proposal/Confirmation screen	Carry-Over of CP1 ERUs and CERs - Proposal/Confirmation screen		PASSED
KP2 requirements	"Carry-Over of CP1 ERUs and CERs" - Finalization	Carry-Over of CP1 ERUs and CERs - Finalization		PASSED
KP2 requirements	"Carry-Over of CP1 ERUs and CERs" - Checks	Checks for transaction "Carry-Over of CP1 ERUs and CERs" - For the full check list check UC includes - new check if a "Carry-Over" exceeds the remaining Carry-Over Entitlement is proposed, the transaction will not be allowed to begin		PASSED
KP2 requirements	New screen for NA under "Kyoto Protocol" to view various Carry-Over /Entitlement values	- New screen for NA under "Kyoto Protocol" to view: - For CERs and ERUs: Carry-Over Entitlement, Pending Carry-Over-Entitlement, Used Carry-Over Entitlement - For AAUs: Quantity carried over, Pending carry-over quantity		PASSED
KP2 requirements	"Carry-Over of CP1 ERUs and CERs" - Display values in proposal screen	- Proposal screen of "Carry-Over of ERUs & CERs" shows the following values: ERU Remaining Carry-Over Entitlement, CER Remaining Carry-Over Entitlement		PASSED
KP2 requirements	"Carry-Over of CP1 ERUs and CERs" - Transaction proposal affects variables	Proposal of "Carry-Over of ERUs & CERs" affects the following variables: * Pending Carry-Over Entitlement (for CERs or ERUs depending on the units selected) is increased by the amount of the respective unit type in the transaction * Remaining Carry-Over Entitlement is decreased with the quantity of the transaction		PASSED
KP2 requirements	"Carry-Over of CP1 ERUs and CERs" - New check: If a proposed "Carry-Over" exceeds the remaining Carry-Over Entitlement, then the transaction will not be allowed to begin	new check if a "Carry-Over" exceeds the remaining Carry-Over Entitlement is proposed, the transaction will not be allowed to begin		PASSED
KP2 requirements	"Carry-Over of CP1 ERUs and CERs" - Finalization of transaction	Transaction finalization "Carry over of ERUs & CERs" - After approval from EUTL the following variables change: - Pending Carry-Over entitlement (for ERUs and CERs) is decreased - Used Carry-Over entitlement (for ERUs and CERs) is increased - At finalization of transaction, the unit blocks of the transaction change from applicable CP1 to applicable CP2		PASSED

KP2 requirements	Carry-Over of CP1 AAUs - Finalization of transaction	Transaction finalization "Carry over of CP1 AAUs" After approval from EUTL the following variables change: * Quantity Carried-Over (for AAUs) is increased * At finalization of transaction, the unit blocks of the transaction change from applicable CP1 to applicable CP2		PASSED
KP2 requirements	New LULUCF activity	- New LULUCF activity - add in enumeration - visible at unit block search/edit - visible wherever else there exists a LULUCF list - issuance screen	Tested by: UC_IS_003_TC_01: ISSUE KP UNITS of TC.09 Issuance Allocation document Repeat testing by selecting the last radiobutton: "RMU - Wetland, Drainage and Rewetting (WDR)"	PASSED
KP2 requirements	Issuance Limit Screen - Edit RMU issuance limits	- New screen (or modify existing one?) for NA to modify CP2 RMU issuance limits - Message to NA explaining that it is his responsibility - For EU, CA modifies issuance limits	Tested by: UC_IS_020_TC_01:EDIT ISSUANCE LIMIT UC_IS_020_TC_02: EDIT ISSUANCE LIMIT – NEGATIVE TESTING from TC.09 Issuance-Allocation document	PASSED
KP2 requirements	CY & MT have their own Kyoto Registries	- CY & MT have their own Kyoto Registries - modification in the code is simple, more complex is the testing which should include: - creation of the same account types as other Kyoto Registries - connection with ITL, certificates - ESD behaviour as all other Kyoto Registries. ESD specific internal transfers will be obsolete, and also the two parameters with EU KP accounts must be removed	1. Test issuance limits for CY, MT 2. Test issuance for CY, MT 3. Create all KP accounts for CY, MT 4. KP transfers FR-->CY 5. KP transfers FR-->MT 6. KP transfers CY-->FR 7. KP transfers MT-->FR 8. Test Translations <-- why ? 9. Test Reconciliations both ITL & EUTL 10. Check that KP menu is visible 11. Check creation of JI Projects 12. Check notifications 13. Check export Government Accounts 14. Check conversion of AAU / RMU 15. Transfer from CY KP account to ESD-CY account 16. Transfer from ESD-CY account to CY KP account 17. Transfer from MT KP account to ESD-MT account 18. Transfer from ESD-MT account to MT KP account 19. Transfer from JP to CY 20. Transfer from JP to MT	PASSED
KP2 requirements	Investigate if a script is needed for CY & MT	Investigate if a script is needed for CY & MT e.g. for setting up issuance limits default rows etc - create script		PASSED
KP2 requirements	Screen Issuance Limits - Edit AAU issuance limits	- New screen (or modify existing one?) for NA to modify CP2 AAU issuance limits - Message to NA explaining that it is his responsibility - For EU, CA modifies issuance limits - Script to add permissions	Tested by: UC_IS_020_TC_01:EDIT ISSUANCE LIMIT UC_IS_020_TC_02: EDIT ISSUANCE LIMIT – NEGATIVE TESTING from TC.09 Issuance-Allocation document	PASSED
KP2 requirements	Liquibase script to initialize CP2 issuance limit to 0 for all registries	Liquibase script to initialize CP2 issuance limit to 0 for all registries (if needed)		PASSED
KP2 requirements	Liquibase script to give permissions to NA/CA to edit issuance limits	Liquibase script to give permissions to NA/CA to edit issuance limits		PASSED

KP2 requirements	Screen issuance limits	- Screen CP2 issuance limits - Menu under Kyoto Protocol for NA / CA of EU - will display the values: - issuance limit - issuance level (the sum of all issue CP2 AAUs)		PASSED
KP2 requirements	New account "AAU Account" (27)	- new account "EU AAU Account" - holds originating CP2 AAUs - Kyoto type 100 - only one - cannot initiate new if there exists a pending request - can open in EU, LI, NO - Account names: "EU AAU Account", "LI AAU Account", "NO AAU Account" - EU opened by CA, LI, NO opened by NA	1. Can be opened in EU, NO, LI only (/) 2. Only one AAU account can be created per registry. (/) - Request one AAU account; a second one cannot be requested. (/) - Create one AAU account; a second one cannot be requested. (/) - Close the AAU account; a new AAU account can be created. (/) 3. It cannot be opened in any other registry. (/) 4. In EU it is created by CA (/) 5. In NO, LI it is created by NA (/) 6. Can only hold CP2 AAUs. (/) - Try to send from another PHA allowances to an AAU account --> transfer must fail. - Try to send from another PHA CP1 AAU units to an AAU account --> transfer must fail. - Try to send from another PHA CER units to an AAU account --> transfer must fail. - Try to send from another PHA ERU units to an AAU account --> transfer must fail.	PASSED
KP2 requirements	"Carry-Over of CP1 ERUs and CERs" - New configuration parameter "End of Carry-Over CP1 -> CP2"	- Configuration parameter "End of Carry-Over CP1 -> CP2". After that date all CERs, ERUs, lCERs, tCERs will become ESD ineligible - affects a lot of transactions/parameters/account statements/account holdings etc (other issues)		PASSED
KP2 requirements	Holdings screens - after comfit param "End of Carry-Over CP1 -> CP2" all CERs, ERUs, lCERs, tCERs will become ESD ineligible	Holdings screen - after config param "End of Carry-Over CP1 -> CP2" all CERs, ERUs, lCERs, tCERs will become ESD ineligible	FAT LV-100-551 has: - CER 1-1 appearing as Limit 1 - CER 1-2 appearing as Limit 1 - CER 2-2 appearing as Limit 1 Modify parameter carry.over.end.date to a date before "now" in FAT Check that - CER 1-1 do not have a Limit specification under column ESD Eligibility - CER 1-2 appearing as Limit 1 - CER 2-2 appearing as Limit 1	PASSED
KP2 requirements	Transaction proposal screens where ESD ineligible is applied- after config param "End of Carry-Over CP1 -> CP2" all CERs, ERUs, lCERs, tCERs will become ESD ineligible	Transaction proposal screens - after config param "End of Carry-Over CP1 -> CP2" all CERs, ERUs, lCERs, tCERs will become ESD ineligible		PASSED
KP2 requirements	Add all new transactions in drop down of related screens	Add all new transactions in drop down of related screens + labels.properties		PASSED
KP2 requirements	New transactions - add in TransactionType Enum	New transactions - add in TransactionType Enum	By navigating to a PHA with CP1 AAU and CER and ERU units, of a registry possessing open PPSR accounts, we see the respective transactions appearing as possible	PASSED

			transaction types, given that the rest of the conditions are met (e.g. Conversion A, Conversion B etc.)	
KP2 requirements	Insert Check7889 description in EUCR	"Amount of CERs or ERUs transferred by “Carry Over” should be up to the Remaining Carry-Over Entitlement of transferring registry"		PASSED
KP2 requirements	KP2 Entitlements Upload - DB Tables	KP2 Entitlements Upload - DB Tables	In FAT's DB mentioned tables(3) and sequences(3) must exist	PASSED
KP2 requirements	RedBox - Account Request when error appears on first step	A RedBox appears when trying to create a new Account Request and an error appears on the first step. How to reproduce: Login as CA in EU registry Click "Account Request" Select "International Credit Account" Write some name Click "Next" The message " ERROR CODE:10148It is not permitted to have more than two open accounts of types: International Credit Account, Credit Exchange Account " appears. If the user clicks "Next" or any menu item, a Red Screen appears. In the logs the following appears: javax.faces.FacesException: Unexpected error restoring state for component with id mainForm:accountCreationCaptcha:captcha. Cause: java.lang.IndexOutOfBoundsException: Index: 1, Size: 1.	Tested successfully. 1.Give CA of EU permission with name "Open management account" 2.Follow steps of Description section. No red screen appears, and no exception is produced in logs.	PASSED
KP2 requirements	Forbid project limit update when between Conversion A and Conversion B	It is not possible to update a project's limit when a Conversion A has been proposed and its Conversion B has not been completed yet.	Tested successfully UC_CV_015_TC_01: DELETE PROJECT	PASSED
KP2 requirements	Unit block reservation - after config param "End of Carry-Over CP1 -> CP2" all CERs, ERUs, lCERs, tCERs will become ESD ineligible	Unit block reservation - after config param "End of Carry-Over CP1 -> CP2" all CERs, ERUs, lCERs, tCERs will become ESD ineligible		PASSED
KP2 requirements	Transaction proposal screens - add "Subject to SOP" or "Not subject to SOP" flag	Transaction proposal screens - add "Subject to SOP" or "Not subject to SOP" flag	tested successfully UC_HT_180_TC_01	PASSED
KP2 requirements	Forbid project deletion when between Conversion A and Conversion B		Tested successfully UC_CV_015_TC_01: DELETE PROJECT	PASSED
KP2 requirements	New KP2 Entitlements link screen	New KP2 Entitlements link screen Check UC. this is the main CA/NA screen for KP2 entitlements with links to all other screens		PASSED
KP2 requirements	JI Projects Delete Check - cannot delete if pending CP2 Conversion	JI Projects Delete Check - cannot delete if pending CP2 Conversion. It is not possible to delete a project if there is CP2 Conversion pending for that project. - a pending Conversion A - a completed Conversion A (/) - a pending Transfer to SOP for Conversion - a pending Conversion B - remaining entitlement to be finalized when db tables for conversion are created	Tested successfully UC_CV_015_TC_01: DELETE PROJECT	PASSED

KP2 requirements	KP2 Entitlements - Export CSV	KP2 Entitlements - Export CSV In all KP2 Entitlement screens there exists a button "Export CSV" which should export in CSV format the contents of the respective table.	Tested by executing UC_EN_030_TC_01: View KP2 entitlements in Union registry	PASSED
KP2 requirements	Auto/Manual unit selection constraint - add "Subject to SOP" or "Not subject to SOP" flag - Proposal/Confirmation Screens	Auto/Manual unit selection constraint - add "Subject to SOP" or "Not subject to SOP" flag - Proposal/Confirmation Screens		PASSED
KP2 requirements	Project limit must be >= converted quantity	I should not be able to updated project limit to a value < converted quantity. Refer to GB in FAT	1. Log in GB registry 2. In JI Projects change the value of Conversion Limit column to be less than Converted Quantity column. 3. Message should appear:" 80407: The conversion limit cannot be less than the converted quantity"	PASSED
KP2 requirements	Forbid JI Project limit update, when new limit is less than Converted Quantity		To be tested by EUCR-2507 test case	PASSED
KP2 requirements	JI Projects - The column Limit to be renamed to "Conversion Limit".	While reviewing Test Cases, CLIMA asked the column Limit to be renamed to "Conversion Limit".	To be tested by: To UC_CV_010_TC_01: DISPLAY THE PROJECTS LIST PAGE of TC.15 JI Projects document	PASSED
KP2 requirements	Conversion CP1 - Remove from drop down CP2 option	Conversion CP1 - Remove from the drop down CP2 In the transaction proposal for Conversion of CP1 units (existing screen), remove from the drop down CP2. CP1 should be preselected. Make sure that CP2 cannot be "added" by non conventional means, used to select unit blocks and create a transaction request. Add extra check to the original Conversion transaction which will forbid the creation of the request if the selected unit blocks are CP2	1. Navigate to an account with CP1 and CP2 KP units. 2. Propose a transaction 3. Choose "Conversion of AAU or RMU to ERU" and ensure CP2 does not appear in the Commitment Period drop-down list. When a CP is selected, ensure that unit blocks of this CP appear in the holdings screen. 4. Choose "Conversion of AAUs or RMUs to ERUs prior to Transfer to SOP (Conversion A)" and ensure only CP2 appears in the Commitment Period drop-down list. Ensure that unit blocks of CP2 appear in the holdings screen.	PASSED
KP2 requirements	Acquiring Accounts list in Issuance screen - Add AAU Account type in list	In issuance screen, the drop down should contain accounts of type AAU Account.	1. Kyoto Protocol --> Issuance (GR registry) 2. Choose Commitment Period 2 3. Check that all the OPEN AUU Accounts appear	PASSED
KP2 requirements	Transfer PPSR --> PPSR out of ETS, enable CP field	Rightmost field is enabled. Validation: must a valid CP period UPDATE TC, UC		PASSED
KP2 requirements	EUCR-2512 Converted for SOP - unit block reservation	Converted for SOP units must be only used in Transfer to SOP for conversion transaction - modify unit block reservation	Tested by executing UC_HT_200_TC_01: Transfer to SOP for Conversion	PASSED
KP2 requirements	EUCR-2512 Converted for SOP - transaction proposal	Converted for SOP units must be only used in Transfer to SOP for conversion transaction - modify transaction proposal of all transactions which relate to ERU_FROM_AAU and ERU_FROM_RMU	Tested by executing UC_HT_200_TC_01: Transfer to SOP for Conversion	PASSED
KP2 requirements	EUCR-2512 Converted for SOP - extra check in all transactions	Converted for SOP units must be only used in Transfer to SOP for conversion transaction - extra check in all transactions that the selected unit block should not be flagged as "Converted for SOP"		PASSED

KP2 requirements	Insert Check7871 description in EUCR	Check Message: Only one Account of this Account type can be open per Registry.		PASSED
KP2 requirements	Insert Check7872 description in EUCR	Check Message: PPSR Account can only hold AAUs with originating CP =(current CP-1) and applicable CP = current CP		PASSED
KP2 requirements	Insert Check7876 description in EUCR	Check Message: Destination Account for Transfer to SOP for Conversion and Transfer to SOP for First External Transfer of AAUs should be "SOP Adaptation Fund" Account in CDM Registry		PASSED
KP2 requirements	Insert Check7878 description in EUCR	Check Message: Transfer to SOP for Conversion and Transfer to SOP for First External Transfer of AAUs should include units marked as "Subject to SOP" or "Converted for SOP" accordingly.		PASSED
KP2 requirements	Insert Check7879 description in EUCR	Check Message: Amount of CP2 AAU transferred by a Transfer of Kyoto Units between different hosting registries, should be up to the "Remaining Entitlement of First External Transfer of AAU" of the transferring registry.		PASSED
KP2 requirements	Insert Check7880 description in EUCR	Check Message: Transfer to PPSR Account should be up to the remaining "PPSR Entitlement" of the acquiring registry.		PASSED
KP2 requirements	Insert Check7882 description in EUCR	Check Message: AAUs and RMUs cannot be converted in the same transaction.		PASSED
KP2 requirements	Insert Check7883 description in EUCR	Check Message: Conversion A can only convert a single project per transaction		PASSED
KP2 requirements	Insert Check7884 description in EUCR	Check Message: Units marked as "Converted for SOP" can only be transferred by a "Transfer to SOP for Conversion" transaction		PASSED
KP2 requirements	Insert Check7884 description in EUCR	Check Message: Units marked as "Converted for SOP" can only be transferred by a "Transfer to SOP for Conversion" transaction		PASSED
KP2 requirements	Insert Check7885 description in EUCR	Check Message: Conversion A not allowed if converted for transfer to SOP quantity minus transferred to SOP for conversion quantity is not 0		PASSED
KP2 requirements	Insert Check7886 description in EUCR	Check Message: Conversion A and Transfer to SOP for Conversion not allowed if remaining conversion entitlement is not 0		PASSED
KP2 requirements	Insert Check7887 description in EUCR	Check Message: Conversion B amount should be up to the remaining conversion entitlement. For track 1 projects it should be exactly equal to the remaining conversion entitlement		PASSED
KP2 requirements	Insert Check7888 description in EUCR	Check Message: Unit Type is not valid for the transaction type		PASSED
KP2 requirements	Insert Check7897 description in EUCR	Check Message: Only one Account of this ETS Account Type can be open per EU, NO, LI KP Registry		PASSED
KP2 requirements	Insert Check7898 description in EUCR	Check Message: EU AAU Account can only hold CP2 AAUs issued by EU		PASSED
KP2 requirements	Insert Check7899 description in EUCR	Check Message: CERs, ERUs, tCERs and lCERs with applicable period CP1 are ESD ineligible after the "End Of Carry Over CP1 CP2 date"		PASSED
KP2 requirements	Transaction Request Approval - add "Subject to SOP" or "Not subject to SOP" flag	Screen Transaction Request Approval - add "Subject to SOP" or "Not subject to SOP" flag		PASSED

KP2 requirements	Net Source Cancellation Notification - managed to transfer units from PPSR account	Net Source Cancellation Notification - managed to transfer units from PPSR account Try to fulfil a Net Source Cancellation Notification, select as source the PPSR account of the registry. The transaction is completed and units are removed from PPSR account. Check must be added in Notification check package to forbid such a transfer		PASSED
KP2 requirements	PPSR Account - Create from EU can be opened by CA and not NA	PPSR Account - Create from EU can be opened by CA and not NA. DES should be modified accordingly Use Case should be updated as well. UC does not mention that this account is NA only!	Testing component: "UC_AM_10_TC_14:OPEN ACCOUNT REQUEST"	PASSED
KP2 requirements	Screen - First External Transfer of AAU Entitlements View	New screen to display First External Transfer of AAU Entitlements The screen shows values for “Remaining entitlement for First External Transfer of AAUs”, “Pending entitlement for First External Transfer of AAUs”, “Used entitlement for First External Transfer of AAUs”. If the user is a CA, the screen will have a drop down with all registries to serve as a filter for the table with all registries	Tested by executing UC_EN_030_TC_01: View KP2 entitlements in Union registry	PASSED
KP2 requirements	Screen - Conversion Entitlements	New Screen to display Conversion Entitlements The screen is split into two tables. The top table shows values of the following values for all projects of each registry: “Registry Code”, “Remaining Entitlement for Conversion”, “Converted for Transfer to SOP”, “Transferred to SOP for Conversion”, “Pending Entitlement for Conversion” and “Used Entitlement for Conversion”. There will be a filter with all the registries. The bottom table shows the same values, but per project. A column with the “Registry Code” must always be present in the table. Also, unit type of project, track and project limit if needed. Entity KP2ConversionEntitlements can be used to view all the necessary data for this screen.	Executed UC_EN_030_TC_01: View KP2 entitlements in Union registry confined to Conversion entitlements.	PASSED
KP2 requirements	Screen - AAU Carry-over Quantities	New Screen to display AAU Carry-over Quantities AAU Carry-over quantities screen shows values for the value “Quantity carried over (for AAU)”. If the user is the CA of EU, values for all registries are shown and if the user is the NA of some other registry, only value for the registry of the user is shown.	Tested by executing UC_EN_030_TC_01: View KP2 entitlements in Union registry	PASSED
KP2 requirements	Issuance limit update should consider also "Pending" column	When updating limit in Issuance tab, new limit should be equal or greater than Issued + Pending column units		PASSED
KP2 requirements	Unit block search / CSV - after config param "End of Carry-Over CP1 -> CP2" all CERs, ERUs, lCERs, tCERs will become ESD ineligible	Unit block search / CSV - after config param "End of Carry-Over CP1 -> CP2" all CERs, ERUs, lCERs, tCERs will become ESD ineligible		PASSED

KP2 requirements	Import message description of validation rules of ITL	The following message descriptions where imported from ITL database into EUCR, so that error descriptions appears correctly. Wherever a description already existed, it was overlapped by the new definition.	Ensure the above messages appear in message.properties.	PASSED
KP2 requirements	Insert Check7881 description in EUCR	"Transfer to SOP for Conversion" should include only ERUs marked as "Converted for SOP".		PASSED
Change in transaction pages sorting.	Filter transaction list by default on starting date (most recent ones at the top)	added by: Pieter Baeten impacted env: UR-PROD version: 3.2.3.5 Scenario to reproduce: Look at the transaction list. Incident Description: Transactions seem to be sorted randomly by default. This is very confusing for everyone. Possible cause: - Solution: Please sort transactions on their start date, from recent towards old ones (most recent ones should be shown at the top).	1. Navigate to Accounts-->Transactions and click "Search" 2. Ensure the records presented are initially sorted descending on the column "Started"	PASSED
Change in permissions for closure of Person account in National Registry	We have a customer who is trying to close their Person Account National Registry down. We have the permission "Close person holding account or verifier or trading platform account" enabled for ARs. However, they have sent us a screenshot which clearly shows there is no "Close" hyperlink showing against their GB-121-xxxx-0-yy account. There is one against their EU-100-nnnnnnnnnn-0-pp account which confirms that the permission is workign correclty. We can't give ARs "Close account (of any type)" as that would also enable the permission to close an (A)OHA which we don't want as that is reserved for us. Although we don't have anyone trying to close a FOHA we suspect the same might be true there as well. Have we missed something? We know the work around is for us to submit the Account Close request on their behalf, which we have done, but that is not how we wish to work in the long term. ARs ought to be able to submit account closure requests for all accounts excelt for OHAs and AOHAs as all the rest can be closed voluntarily by the Account Holder at any time.	Imported on: 16/12/2014 \\ From: [https://webgate.ec.europa.eu/etsis/browse/ETS-2051]	Tested successfully. 1. Locate a user who is only AR on a registry. 2. Ensure the AUTHORISED_REPRESENTATIVE has permission PERM_ACC_REP_CLS_REQUEST but not permission PERM_ACC_ADM_CLS_REQUEST. Permissions can be browsed via the query: select distinct perm_level, role_name, b.* from permissions a, role_permission b, roles c where a.permission_id = b.permission_id and b.role_id = c.role_id and perm_key = 'PERM_ACC_REP_CLS_REQUEST' and role_name = 'AUTHORISED_REPRESENTATIVE' and registry_code in ('MT') order by 1; 3. Log in as this user and navigate to an account which is of type "Person Account in National Registry" and has no holdings. 4. Ensure the button "close" appears in the account details. 5. Remove the permission PERM_ACC_REP_CLS_REQUEST from the role AR in this registry. 6. Repeat steps 3-4; the "close" button should not appear for the same account.	PASSED
Change in date depiction in transaction list	Transactions - Date started and last updated date should have the time	Hi, The date in which a transaction is started and last updated should have the time. Currently it has only the DD-MM-YYYY. This is important to help predict when a transaction will be completed. Thanks.	Tested successfully. Navigate to Accounts -> Transactions. Ensure the columns Started and Last Updated contain value in the form: 30/08/2018 18:20 EEST	PASSED
Addition of information in account holdings scren	Account holdings should show number of units per unit type	Imported on: 16/12/2014 \\ From: [https://webgate.ec.europa.eu/etsis/browse/ETS-5098]	*Test Case 1* 1. Log in EU, as NA 2. In account 285 check sum of units of second table with each unit quantity in first table (with columns: Unit Type and Balance)	PASSED

Request to have possibility to add comment to deletion/cancellation	Request to have possibility to add comment to deletion/cancellation	It is currently not possible to add comments to a deletion or a cancellation. As account holders often perform these type of transactions on behalf of someone else, it would be very nice if they could add a comment (e.g. deletion of 1.000 allowances on behalf of company X) which they could then use to proof that the transaction has been performed.	The following transactions have enabled comments functionality. The comment is visible by the approved while approving and in history. Voluntary Cancellation Art 3.7ter Cancellation Deletion of Allowances Mandatory Cancellation Surrender of Allowances Ambition Increase Cancellation	PASSED
Add transaction comment - Surrender	EUCR-2807 Add transaction comment - Surrender	Add transaction comment - Surrender	*Test Case* 1. Log in EU as NA 2. For EU 285 perform a surrender of 1 unit with comment 3. Check in transactions the comment integration after it's completed	PASSED
Add transaction comment - Voluntary Cancellation	EUCR-2807 Add transaction comment - Voluntary Cancellation	Add transaction comment - Voluntary Cancellation	*Test Case 1* Repeat test of EUCR-2807 with account 296 and transaction: Voluntary cancellation	PASSED
Add transaction comment - Delete Allowances	EUCR-2807 Add transaction comment - Delete Allowances	Add transaction comment - Delete Allowances	*Test Case 1* - Delete Allowances comment 1. Log in EU, as NA 2. In account 291 delete 1 allowance after entering a comment 3. Approve and in Transactions page, check that comment exists and remaining units are reduced by 1.	PASSED
Request to add information to the 'Enter Emissions' screen	Request to add information to the 'Enter Emissions' screen	Imported on: 16/12/2014 \\ From: [https://webgate.ec.europa.eu/etsis/browse/ETS-6521]	*Test Case* 1. Log in PT, as NA 2. For account 642 (OHA), click Compliance 3. Click in an icon of a year. 4. There should be: installation and account holder name, also for all types of emissions there should be explanatory sentences with asterisk. Finally, user shouldn't be allowed to enter other than positive or zero value.(orange error message) Repeat for an AOHA.	PASSED
Improvement on account list: make account nr, balance and installation/AO id clickable	Improvement on account list: make account nr, balance and installation/AO id clickable	In the account list it would make sense to make the "account number", the "balance" and the "installation/aircraft operator ID" hyperlinks. Each link would bring the user to the account details, but to a different tab: hence respectively to the tab "Account main", "Holdings" and "Installation" tab. This avoids scrolling to the right and reduces the number of clicks if one would liek to consult for example the balance of an account. If a compliance symbol would be added to the account list (other JIRA issue raised earlier), clicking on this symbol could than direct to the "Compliance" tab in the account details.	*Test Case 1* 1. Log in PT, as NA 2. In Accounts, click Search. Each row should contain hyperlinks: account id, balance, installation/aircraft id 3. Click on each link, user should redirect to Account Main, Holdings, Installation tab, respectively.	PASSED

Add estimated time of execution as tiptext to delayed status in transactions screen	Add estimated time of execution as tiptext to delayed status in transactions screen	added by: Pieter Baeten impacted env: UR-PROD; UR-UT version: 6.2.6.4 Scenario to reproduce: - Incident Description: It is hard for users and administrators to determine when a transaction will be executed if the delay is applicable. The estimated time of execution is already displayed when the transaction is approved by the AAR (or introduced by an AR if no AAR is needed) as described in ETS-4153. It would therefor be very valuable if the estimated time of execution would be displayed in the transaction details. This time has now been added to the transaction details screen. This is fine already, but the user needs to click through to the transaction details to get this time. It would even be more user-friendly if the user could just hover the "30-Delayed" status of the transaction in the transaction overview list (Page ref. #061) and directly get the estimated time of completion as tiptext. This would avoid an additional click and is very useful if one has multiple transactions in status delayed. Possible cause: - Proposed solution: It would even be more user-friendly if the user could just hover the "30-Delayed" status of the transaction and directly get the estimated time of completion as tiptext. This would avoid an additional click and would be very useful if one has multiple transactions in status delayed.	*Test Case 1* 1. Log in PT as NA 2. Perform a transfer of units from PT 643 to GR 383 3. In Transactions, locate transaction and hover over status. 4. Completion info must be provided	PASSED
Request approval for account holder VAT change.	Account Holder VAT number changed without NA approval	Imported on: 16/12/2014 \\ From: [https://webgate.ec.europa.eu/etsis/browse/ETS-6868]	Tested successfully. 1. Navigate to an account and to its "Account Main" tab. 2. Click on "Update" button below the account holder details. 3. Modify the VAT number. 4. Ensure an AH update request is created. 5. Approve the request as another NA. 6. Ensure the requested change is applied by navigating to the account of step 1.	PASSED
Typo in ESD permission label	Typo in ESD permission label	We spotted a typo in an ESD label in the Production database, inside the Permissions table: ||Permission Key ||Permission Label || |PERM_ESD_TR_ENT_APPROVE |{color:red}Propose{color} Esd entitlements Transfer transaction|	Perform the following query and ensure there are values in all columns: select * from permissions where perm_key = 'PERM_ESD_TR_ENT_APPROVE';	PASSED
Request approval for some business details	Business details update without approval	General ticket to gather all business updates that need to be set as major change, so that NA approval will be required.		PASSED
It was not possible to cancel CP1 units if no open CP2 cancellation account existed; this is now fixed.	Cannot Voluntarily Cancel CP1 units although CP1 cancellation account exists	FAT, registry IT. If I suspend the CP2 Voluntary Cancellation account (or if CP2 Volun. Canc. account does not exist), I cannot propose a Voluntary Cancellation (the link is no longer available) for units of CP1 of account with identifier 460	*Test Case 1* 1. Log in EU as NA 2. Suspend the 2 voluntary cancellation accounts 3. Should be unable to see transaction voluntary cancellation of EU 296	PASSED

Transaction towards a requested account was possible; this is now fixed.	Transaction to requested account stuck in proposed		Tested successfully. 1. Request the creation of an OHA and do not approve it yet. 2. Find the details of the just requested account via the query: select * from account order by account_id desc; and note the identifier and check digits. 3. Navigate to a PHA and enter a transfer towards the requested account. 4. Ensure this validation rule appears and forbids the transction submission: 80756: The acquiring account must be active	PASSED
Change in the "About this site" destination link	Wrong Link - About this site	On EUCR there is the "About this site" link. This shows to http://ec.europa.eu/clima/policies/ets/registries/index_en.htm, but this gives an error message. This is because there is a typo in the link: I assume this page was meant: http://ec.europa.eu/clima/policies/ets/registry/index_en.htm	Tested successfully. From any page of the site, ensure the link "about this site" leads to: http://ec.europa.eu/clima/policies/ets/registry/index_en.htm	PASSED
Change in the "Contacts" destination link	EUCR Contacts link	EUCR Contacts link should direct here: http://ec.europa.eu/clima/contact/index_en.htm. Currently it directs here: http://ec.europa.eu/dgs/clima/contact_en.htm	*Test Case 1* 1. Log in EU, as NA 2. Click Contact link 3. Click again Contact link 4. Should get redirected to http://ec.europa.eu/clima/contact/index_en.htm	PASSED
Allow SD users to view more task types in the tasklist.	SD cannot see others accounts' tasks	Our ServiceDesk staff workers should be able at least to see tasks of type "personal details update"/"business details update". Currently this seems not to be the case. Currently the verification of the documents received for these kind of updates is done by our ServiceDesk staff worker, hence she would need to be able to access the corresponding task in the registry. Can you confirm these tasks are not available for ServiceDesk staff workers (has this changed recently)? It seems as well that these tasks kind not be assigned to ServiceDesk staff workers neither, can you please confirm (probably this is related to our first question)? Is there any role besides the RegAdmin who can see (and act) for these kind of tasks? Thank you for the clarifications! KR, Pieter	1. Connect as NA and locate a user who is only SD in a registry. 2. Navigate to Roles and Permissions and give permission "Read-only" to role SD; approve it as another NA. 3. Navigate to Roles and Permissions and give permission "Approval of AR Addition" to role SD; approve it as another NA. 4. As NA, submit an addition of AR to an account. 5. Connect as SD and locate this task in the tasklist. Claim and ensure it cannot be approved or rejected via the buttons, the message "You are not authorised for this action" appears instead.	PASSED
Add a footnote in External Transfers of Kyoto Units	Footnote - External Transfers of Kyoto Units	In External Transfer of Kyoto Units proposal screen a footnote should be added: "Kyoto units with originating CP1 are not eligible for use in ETS".	In External Transfer of Kyoto Units proposal screen a footnote is added: "Kyoto units with originating CP1 are not eligible for use in ETS".	PASSED
Wrong time depiction for some transactions; this is now fixed.	Incorrect time displayed for transactions	If a transaction is proposed or approved between midnight and 1am hour part of the time shows as 24 instead of 00 Example - look at EU347852 from the "Transactions" side menu. Click on the "Request Details" tab and look at the "User Approved" Action date and time.	*Test Case 1* 1. Log in EU, as NA 2. In Transactions click Search and navigate through the page results 3. There should be no greater value than 23:59 in Started and Last Updated column	PASSED

The system now detects and warns if an AR attempted to be attached on an account is already an AR for a verified connected on the same account.	Inconsistent view of whether or not a user is already related to an account holder	Imported on: 26/01/2016 From: https://webgate.ec.europa.eu/etsis/browse/-1008?filter=10404	1. Attach a verifier on an OHA. 2. Attach the AR of the verifier on the OHA of step 1. 3. Ensure the error message appears: "The relationship with the Account Holder already exists, please consult the available list" and step 2 is not allowed.	PASSED
Country code entered in external transfer screen should be automatically upper-cased.	Country code should be automatically upper-cased	Raised to replace SDB-277 When entering a transaction of Project Credits/AAUs etc. the user has to enter the countrycode of the acquiring Registry. This is case sensitive and error 10120 is generated if the user enters all details of the transaction correctly apart from the fact that the have entered the countrycode in lowercase letters. This really should not be an error. In fields such as this the application should automatically uppercase the countrycode for the user and only display 10120 if the user has entered something incorrect in this field. It is unusual behaviour because it allows a completely invalid countrycode to be entered provided it is uppercase (e.g. ZZ) but throws an error if the user has entered something correct but in lowercase (e.g. gb). If anything it should have rejected the ZZ completely and uppercased the gb.	1. Connect as NA 2. Navigate to a PHA and enter a transaction towards the account "jp-100-999" 3. Approve the transaction request 4. Ensure the transaction is received in ITL --> Transaction Mgt screen	PASSED
Correction in export of government accounts functionality.	incorrect Export of Government Accounts	Imported on: 26/01/2016 From: https://webgate.ec.europa.eu/etsis/browse/SDB-3170	Tested successfully. 1. Propose and do not approve a Party Holding Account. 2. Query the just created accounts and locate identifier and check digits. select * from account order by account_id desc; 3. Export Government Accounts and ensure the identifier is not contained. Note: Accounts in any STATE other than ACTIVE will not be contained (e.g. REQUESTED, REMOVED etc.) because this clause has been added in the query.	PASSED
Enable mandatory cancellations	Mandatory Cancellation enabling (4-48)		Tested successfully. Refer to transaction MT225.	PASSED
Correction in emissions correcction screen.	Correct Emissions says Enter Emissions	When you open up the little tick to correct emissions figures the box says Enter Emissions. It should really say Correct Emissions or Update Emissions: It would also be good to have a view of the current and corrected figures just before you send the request to the task list;	Tested successfully. 1. Navigate to an OHA with submitted emissions. 2. Click on the little pencil icon. 3. Ensure the screen is titled "Correct emissions" Repeat with AOHA	PASSED
Correction in ITL notifications screen	ITL Notifications screen - next page/filter does not work	ITL Notifications screen - next page/filter does not work in FAT-BE there exist > 20 notifications. Click select, go to page 2, it displays only 2, go page 3 it displays none, go to page 1 again, it displays none. Filter not working: go to ITL Notification screen, choose "Non Submission Of Certification Report" and click select. 20 found. go to page 2, it displays only two instead of 10 with one being "Unit Carry Over".	1. Locate a registry with several ITL notifications, more than 10 of one specific type (e.g. Non Submission Of Certification Report). 2. Filter for Non Submission Of Certification Report. 3. Go to the next page. 4. Return to the first page 5. Confirm the filter set in step 1 is still applicable.	PASSED

Correction in ITL notifications search mechanism	ITL Notifications - sorting search results disregards filter values	When search is performed in ITL Notifications with specified filter value (e.g. Identifier = 1005406359) and then results are sorted, all results are displayed again disregarding filter value. Same happens after any change to result list component such as increasing number of visible rows or moving to next page.	1. Navigate to Kyoto Protocol -> ITL Notifications. 2. Search for record with and without entering criteria 3. Sort the records and ensure the provided search criteria are respected.	PASSED
Error detection when importing ICE XML.	Wrong error message while importing ICE to holding account	Imported on: 02/02/2016 From: https://webgate.ec.europa.eu/etsis/browse/-1214	1. Log in EU registry as na 2. In EU ETS tab, click ICE Table Upload 3. Browse and Import xml: <?xml version="1.0" encoding="UTF-8" standalone="no"?> <entitlements registryCode="EU" xmlns="urn:eu:europa:ec:clima:ets:1.0"> <installation identifier="101"> <action>U</action> <flag>0</flag> <ice>6066</ice> </installation> <installation identifier="103"> <action>A</action> <flag>0</flag> <ice>7077</ice> </installation> </entitlements> 4. After uploading xml, message is: The content of the XML file is invalid 90101: The Installation identifier 103 does not exist in the registry.	PASSED
Correction in KP2 entitlements screens	Registry filter in "Transfer to PPSR Entitlements" (EU) doesn't work	Given I'm logged as CA in EU When I go to KP2 entitlement / Transfer to PPSR Entitlements page And select one MS in Registry filter And press Search button Then values for all Member States are displayed (instead of one line just for selected MS)	*Test case* 1. Log in EU as CA 2. At KP2 Entitlements, Transfer to PPSR, check that filter works.	PASSED
JI projects screen correction	NumberFormatException when trying to update JI project convesion limit with empty value	Given I'm logged in as NA in registry And there are JI projects Track 2 defined When I go to JI projects page And update conversion limit of given track 2 project with empty value Then unrecoverable error is thrown <INFO > <2016-05-11 16:59:12,304> <EU> <HRHC:8543768 SHC:903856848 UN:kierecki1 REG:EU> [20160511165912.303][BF_UC04_LOG10][kierecki1][10.219.40.205][EUCR_TESTmanaged1][EU][Unrecoverable error][ERROR_ID: DBFC139C][ERROR_DETAIL: --------------------------------- # Unknown macro: {jiProjectListViewBean.submitLimitUpdate} : java.lang.NumberFormatException: null --------------------------------- javax.faces.FacesException: # : java.lang.NumberFormatException: null	*Test Case 1* 1. In EU registry, Ji Projects tab, click Search 2. Select a row with convertion limit, click on the pencil mark, delete the value 3. Click Submit 4. Should get error message:" Unit quantities may only be positive integers."	PASSED

Addition of label for permission	No label for PERM_KP_ISS_LIMITS permission	There is no label for PERM_KP_ISS_LIMITS permission. Instead of label such as "Set Kyoto Protocol issuance limits", following text "?permission_PERM_KP_ISS_LIMITS?" is displayed.	Ensure the following query returns a value in all fields: select * from permissions where perm_key = 'PERM_KP_ISS_LIMITS';	PASSED
No title displayed in confirmation popup box - deletion of allowances; this is now fixed	No title displayed in confirmation popup box - deletion of allowances	While performing Transaction of Deletion of Allowances there is not displayed title in confirmation popup. This was in the previous version. The conrrect title which was before: "Transfer Confirmation"	*Test Case* 1. Log in Germany, as NA 2. Initiate a allowance deletion for account 199 3. After clicking Next the pop-up appears. 4. Title "Transfer Confirmation" should exist	PASSED
Corrections in voluntary cancellation screen	Red Screen - Voluntary Cancellation from Trading Account - Check 80741	Red Screen - Voluntary Canceallation from Trading Account - Check 80741 It crashes with "nested exception is: java.lang.RuntimeException: java.lang.IllegalArgumentException: Transferring account must be present on the check context." CheckContextParam.TRANSFERRING_ACCOUNT has not been added to the context.	*Test Case 1* - Perform Voluntary cancellation 1. Log in GR as NA 2. In Accounts, Trading Accounts, select EU-100-10040-0-77 3. Perform a voluntary cancellation of e.g. 10 units. 4. After transaction completion, units should be removed and no red screen should appear.	PASSED
Correction in ESD entitlement transactions	Red Box Error while Performing Entitlement Transfer/CarryOver in Phase 3 (After Compliance Status Calc.)	Perform Proposal for Transaction of Transfer of Credit Entitlement or CaryOver of Credit Entitlement for ESD Compliance Account while having actual phase in period after compliance status calculation. All of those propositions are resulting with RedBox error. See attached pictures and log file *This happens only with disabled ECAS signature*	1. Set the parameter registryConfig.ALL.ECAS_SIGNATURE_ENABLED = true 2. Perform an ESD transaction and ensure it is submitted with signature 3. Approve the ESD transaction and ensure it is approved with signature 4. Perform an ESD entitlement transaction and ensure it is submitted with signature 5. Approve the ESD entitlement transaction and ensure it is approved with signature 6. Set the parameter registryConfig.ALL.ECAS_SIGNATURE_ENABLED = false 7. Perform an ESD transaction and ensure it is submitted without signature 8. Approve the ESD transaction and ensure it is approved without signature 9. Perform an ESD entitlement transaction and ensure it is submitted without signature 10. Approve the ESD entitlement transaction and ensure it is approved without signature	PASSED

CP1 RMU activity codes are removed from Conversion A screen because these units cannot be converted any more.	CP1 RMU LULUCF displayed in Conversion A proposal screen	Given I'm logged in as NA And there is PHA account with CP1 RMU (Forest management (FM)) and CP2 RMU (Wetland, Drainage and Rewetting (WDR)) When I propose Conversion A Then on transaction proposal screen I can choose one of above LULUCFs In this case only LULUCFs related to CP2 RMU units should be displayed. When user tries to propose Conversion A using LULCF that is not related to CP2 RMU units, transaction is not proposed but there is no error displayed (nothing happens).	1. Locate an account with RMUs. 2. Set all its RMUs to orig CP1 and appl CP1. 3. Ensure the Conversion A is not possible to be submitted for this account. 4. Set all its RMUs to orig CP2 and appl CP2. 5. Ensure the Conversion A is not possible to be submitted for this account. 6. Set some RMUs to orig CP1 and appl CP1 and some RMUs to orig CP2 and appl CP2. 7. Ensure the Conversion A is possible to be submitted only for the CP2 RMU units for this account (with originatining country code the current MS). The following queries were users for these updates. select * from unit_block where account_id in (select account_id from account where identifier = 644) and unit_type = 'RMU' order by last_modified_time desc; update unit_block set original_period = 2, applicable_period = 2 where ID in (480, 479, 478, 477);	PASSED
KP2 Demo Comment: Issuance: the "Available Limit" should be replaced with "Initial Limit"	KP2 Demo Comment: Issuance: the "Available Limit" should be replaced with "Initial Limit"	In the Issuance section the label "Available Limit" is used incorrectly. It should read "Initial Limit" as that is the Issuance Limit that was initially defined.		PASSED
CP1 issuance and issuance limits are disabled	KP2 Demo Comment. For CP1 we should not be able to set the limits nor to issue units	For CP1 we should not be able to set the limits nor to issue units. It is obsolete and confusing to have this functionality included in the release, as the CP1 issuance is no longer available.	1. Connect as NA and navigate to Kyoto Protocol -> Issuance Limits 2. Chooce CP1 and ensure the screen is view-only 3. Chooce CP2 and ensure the issuance limits for PC2 and chosen unit type is set normally. 4. Navigate to Kyoto Protocol -> Issuance 5. Chooce CP1 and ensure the screen is view-only 6. Chooce CP2 and ensure the issuance request is submiited normally; after approval by another NA the units are issued normally in the acquiring account. Note: The screen no longer allows setting issuance limits for CP1. In case the user tampers the DOM of the page using Firebug and manages to submit a proposal for CP1, then the following message is displayed: "Cannot set issuance limits for Commitment Period 1."	PASSED
Transfers to SOP account (except the explicit transaction Transfet to SOP) are disabled.	KP2 Demo Comment: Any direct normal 03-00 transfer to the SOP account in the CDM registry should be forbidden	Any direct normal 03-00 transfer to the SOP account in the CDM registry should be forbidden. It would create massive confusion if a member state tries to pay his SoP dues by a normal transfer to the SoP account (maybe he knows the number from a previous transaction or from another MS or from the ITL directly) and does not get any entitlement for first external transfer of AAUs.	1. Connect as NA and navigate to a PHA with KP units. 2. Propose an external transfer towards the SOP account as defined in eucr-configuration.properties. 3. Ensure the following validation rule appears and the transaction cannot be submitted: 80215: External Transfers cannot have CDM SOP Adaptation Fund as an acquiring account	PASSED

KP2 Demo Comment: On the transfers of KP Units page you should see the Available Entitlement for First Transfer of AAUs	KP2 Demo Comment: On the transfers of KP Units page you should see the Available Entitlement for First Transfer of AAUs	On the transfers of KP Units page you should see the Available Entitlement for First Transfer of AAUs. We should see it only on the transfer of KP units page, not on transfer of allowances or other transactions.	1. Propose a transfer to SOP for first external transfer 2. Ensure in the proposal screen that the entitlement appears in the form: " Remaining Entitlement for First External Transfer of AAUs: <<entitlement>> "	PASSED
KP2 Demo Comment: In the drop down list of PPSR accounts the account numbers should not be displayed	KP2 Demo Comment: In the drop down list of PPSR accounts the account numbers should not be displayed	When you choose a transfer from a PPSR account to another European PPSR account the account number is displayed in parenthesis. This should not happen for confidentiality reasons. We should see GR PPSR Account.	*Test Case 1* 1. Log in PT as NA 2. From PPSR account transfer unit to EU PPSR: In Transfer AAU to PPSR account panel, the drop-down list (enabled when choosing first radiobutton) should contain no identifiers.	PASSED
KP2 Demo Comment: conversion of CP1 units should be obsolete.	KP2 Demo Comment: conversion of CP1 units should be obsolete.	Conversion of CP1 units should not be available in the transactions anymore.	Tested successfull. 1. Navigate to an account with CP1 units. 2. Navigate to the account holdings and propose a transaction 3. Ensure "Conversion for CP1" does not appear as an option	PASSED
KP2 Demo Comment: - In JI Projects instead of Limit = -1, track 1 projects should have the label Not Applicable	KP2 Demo Comment: - In JI Projects instead of Limit = -1, track 1 projects should have the label Not Applicable	In JI Projects instead of Limit = -1, track 1 projects should have the label "Not Applicable"	*Test Case* 1. Log in PT as NA 2. Perform a conversion A,B with track 1 project, for PT 643 3. There should be N/A in Limit column	PASSED
KP2 Demo Comment: The word transferred has a type in a message. It's written tranfered	KP2 Demo Comment: The word transferred has a type in a message. It's written tranfered	.	1. Conect as NA 2. Propose a Conversion A, a Transfert to SOP for Conversion and a Conversion B. 3. Ensure the word "transferred" appearing in messages is spelled correctly.	PASSED
Screen change	KP2 Demo Comment: conversion B quantity	Conversion B should have a mandatory quantity, not a recommended one. Q = Limit – Transferred to SOP – quantity converted in previously completed cycles. This is no longer recommended; any other quantity you would enter would trigger the rejection of the transaction.	1. Perform a Conversion A -> Transfer to SOP for Conversion -> Conversion B for a Track 2 project 2. Ensure the messages below the Conversion A and Conversion B screen refer to "mandatory" quantity and not to "recommended" quantity.	PASSED
Screen change	KP2 Demo Comment: in Conversion A / B proposal screen there is combobox with commitment period – this should be replaced by label	In Conversion A / B proposal screen there is combobox with commitment period – this should be replaced by label because only CP2 units undergo conversion A or B.	1. Perform a Conversion A -> Transfer to SOP for Conversion -> Conversion B. 2. Ensure the CP appears as a label and not as a drop-down box in Conversion A and Conversion B.	PASSED

Upload of PPSR entitlements created an error if a section was missing; this is now fixed.	NPE when uploading PPSR entitlement without entitlement tag	1. Log in to EU as CA 2. Got to KP2 Entitlements / PPSR entitlement 3. Upload xml that misses entitlements tag Description When user uploads PPSR entitlement xml with missing entitlement tag there is NullPointerException thrown: <?xml version="1.0" encoding="UTF-8" standalone="no"?> <kp2Entitlements unitType="AAU" xmlns="urn:eu:europa:ec:clima:ets:1.0"> <kp2Entitlement> <registryCode>EU</registryCode> <action>A</action> </kp2Entitlement> </kp2Entitlements>	1. Connect as EU-CA and navigate to Kyoto Protocol --> KP2 Entitlements 2. Upload the following file and ensure the validation error appears: "The content of the XML file is invalid" <?xml version="1.0" encoding="UTF-8" standalone="no"?> <kp2Entitlements unitType="AAU" xmlns="urn:eu:europa:ec:clima:ets:1.0"> <kp2Entitlement> <registryCode>EU</registryCode> <action>A</action> </kp2Entitlement> </kp2Entitlements>	PASSED
Screen change	IllegalArgumentException in Unit Blocks when sorting by SOP flag	1. Log in to registry as NA 2. Go to Administration / Unit Blocks 3. Search for unit blocks 4. Click on "SOP" column header to sort unit blocks by SOP flag 5. Click [Search] button again When user tries to sort Unit blocks by SOP flag there are two failures: 1. After clicking the table header "SOP" all values from table disappear 2. Then, if user clicks [Search] button again, unrecoverable error is thrown	1. Log in to registry as NA 2. Go to Administration / Unit Blocks 3. Search for unit blocks 4. Click on "SOP" column header to sort unit blocks by SOP flag 5. Click [Search] button again 6. Browse through pages and reach the last page then back to the first page; ensure the provided search criteria remain as set during step [4].	PASSED

Change in account statements for AAU units which are subject to SOP	AAU Subject to SOP units displayed as Not Subject to SOP on Transaction request tab of Account Statement	TC1. Given there is a transaction request for transfer of CP2 AAUs that are subject to SOP and CP2 AAUs that are Not subject to SOP When I go to Account statement page of transferring account And Search for this transaction request using start/end date filters Then request data is displayed And AAU Subject to SOP units are displayed in Subject to SOP column And AAU Not Subject to SOP units are displayed in Not Subject to SOP column TC2. Given there is a transaction pending for transfer of CP2 AAUs that are subject to SOP and CP2 AAUs that are Not subject to SOP When I go to Account statement page of transferring account And Search for this pending transaction using start/end date filters Then transaction data is displayed And AAU Subject to SOP units are displayed in Subject to SOP column And AAU Not Subject to SOP units are displayed in Not Subject to SOP column Description Given there is a transaction request for transfer od CP2 AAUs that are subject to SOP When I go to Account statement page of transferring account And Search for this transaction request using start/end date filters Then request data is displayed And AAU Subject to SOP units are displayed in Not Subject to SOP column Same issue is with Pending Transactions tab of Account statement. The result if this bug is also that if there are CP2 AAU Not Subject to SOP units in request/transaction they are not displayed at all.	Tested successfully with the following data: Transferring account: PT 643 Acquiring account: GR 383 The following are visible in the account statement of the transferring account: * Transaction Request phase 22 units requested for transfer units with flag Subject to SOP, are visible in Account Statements' Transaction Request tab, at the column of Subject to SOP. Not Subject to SOP column is unaltered. * Pending transaction phase After approving, 22 units exists in Pending tab, as Subject to SOP. Not Subject to SOP column is unaltered. * Completed transaction phase After approving the transaction request, 22 units are visible only in Completed tab, as Subject to SOP. Not Subject to SOP column is unaltered.	PASSED
Correction in account statements for carry-over	Carry over account statements: wrong balance	After a CER carry-over I get an account inbalance.	1. Connect as NA and navigate to an account with CER carry-over entititlement and CP2 CERs. 2. Carry-over 1 CER. 3. Approve the transaction and ensure it is completed. 4. Generate the account statement of the account for the specific date. 5. Ensure the account statement correctly adds up, i.e. the CER quantity BEFORE is equal to the CER quantity AFTER. Repeat the same for ERU.	PASSED

Remaining CER/ERU carry-over entitlement is 0 until first transaction is proposed (EU view only)	Remaining CER/ERU carry-over entitlement is 0 until first transaction is proposed (EU view only)	Given I'm logged as EU CA When I upload new CER / ERU entitlement for some registry e.g. BG Then value for remaining entitlement should be set to uploaded (initial) value Given I'm logged as EU CA When I upload new CER / ERU entitlement for some registry e.g. BG Then value for remaining entitlement is not set to uploaded (initial) value This issue is a display issue observed only in EU registry (in MS registry remaining entitlement is displayed properly). The value displayed in EU is updated after proposal of first carry-over transaction in given registry for particular unit type.	*Test Case* 1. Log in EU as NA 2. At KP2 entitlements, upload CER entitlements for EU with xml: <?xml version="1.0" encoding="UTF-8"?> <kp2Entitlements xmlns="urn:eu:europa:ec:clima:ets:1.0" unitType="CER"> <kp2Entitlement> <registryCode>EU</registryCode> <action>A</action> <entitlement>9000</entitlement> </kp2Entitlement> </kp2Entitlements> 4. After submitting the import, value 9000 should be visible in CER Initial Carry-Over Entitlement and CER Remaining Carry-Over Entitlement columns	PASSED
Message logs table screen functionality change	Message logs table screen functionality change	Loading the message logs screen is very slow. We guess it has to do with the number of records in the table. There is only a primary index on the message_logs table. Maybe an extra index is needed, as we have the impression that a full table scan is happening. there could be a relative quick win by: Add index: CREATE INDEX "MSG_LOG_IDX" ON "MESSAGE_LOG" ("DATE_TIME" DESC, "REGISTRY_CODE" DESC) We suggest using a solution similar to the one we use in Task List. Once the user clicks "Message Logs" he just sees the filters. Here he needs to fill in From and To and he gets the list. If he leaves the fields blank it will still work, but it will be very slow. After 3-4 tries the user will understand it's better to fill in From and To and get used to it. Creating an index on the time field will also help.	*Test Case 1* 1. Log in GR, as NA 2. In Message Logs, fill From and To fields and click Filter 3. There should be a minimal delay on displaying the results	PASSED
User lost access to Task List page before it's AAR removal request was accepted; this is now fixed	User lost access to Task List page before it's AAR removal request was accepted	At AAR removal submission request and while approval is still pending. AAR can still access the tasklist page AAR cannot view any task related to the account from which the AAR is being removed.	1. In browser (a) login as AAR and make sure there are some "Add to TAL list" requests which AAR can pick and execute, get Account number from one that request 2. In browser (b) login as NA and remove this AAR from account - do not approve this removal AAR, leave this task in "waiting for approval state" 3. Go back to browser (a) and click home page in menu, than click Task List in menu Result: Every time Task Page is clicked in menu - The tasks related with the account from which the AAR is being removed are not shown	PASSED

CDM accounts implementation	Create the three CDM account types, configuration parameters, add in transaction search	- New account type CCS Net Reversal Cancellation Account (241) (only visible in transaction search) - belongs to CDM - New account type Non-submission of Verification Report Cancellation Account (242) (only visible in transaction search) - belongs to CDM - Account type for SoP Adaptation Fund is 100 - belongs to CDM - Parameter for CCS Project Reserve Account in CDM to be used as prefilled acquiring account for notification - Method to return the account identifier stored in parameter - Search transactions must be able to search with this account type - check UC Nofitications for parameter name	1. Navigate to Accounts->Transactions 2. Ensure the account type Non-submission of Verification Report Cancellation Account exists as an option 3. Ensure the account type CCS Project Reserve Account exists as an option 4. Navigate to EUTL->Transaction Mgt 5. Ensure the above mentioned account types exist in both originating and destination account types drop-down lists.	PASSED
PPSR checks	Acquiring account check for PPSR account - for all transactions	- PPSR accounts can receive AAUs from ONLY another PPSR account - Transfers between PPSR accounts are NOT subject to "Share of Proceeds"(SOP) levy - Transfers between PPSR accounts subject to 4-eyes principle	Tested successfully. Refer to transaction: EU1218338	PASSED
KP2 accounts/transactions setup	CP1 ETS Central Clearing Account - Allowed transaction - Carry-Over AAU	CP1 ETS Central Clearing Account - Allowed transaction - Carry-Over AAU Carry-Over of AAUs transaction is allowed from CP1 ETS Central Clearing Account to the CP2 PPSR Account in EU Registry	Tested successfully. Refer to transaction: EU1218338	PASSED
KP2 accounts/transactions setup	EU AAU Account - Available unit types	EU AAU Account - Available unit types EU AAU account should be able to receive/transfer only CP2 AAUs of the same registry.	*Test Case 1 - AAU account sends CP2 AAU units* (/) 1. Log in EU, as NA 2. Transfer AAU CP2 from AAU account to EU 296 3. Check transaction status is completed and units are transferred. *Test Case 2 - AAU account receives CP2 AAU units* (/) 1. Log in EU, as NA 2. Transfer AAU CP2 from EU 296 to AAU account 3. Check transaction status is completed and units are transferred. *Test Case 3 - AAU account cant receive CP1 AAU units* (/) 1. Log in EU, as NA 2. Transfer AAU CP1 from EU 296 to AAU account 3. Check transaction status is terminated/haulted (error code: 7029) and units are not transferred. *Test Case 4 - AAU account cant receive from external registry* (/) 1. Log in PT, as NA 2. Transfer AAU CP2 from PT 643 to EU AAU account 3. Check transaction status is terminated(error code: 7898) and units are not transferred.	PASSED

KP2 accounts/transactions setup	EUCR-2850 EU AAU Account - Available transactions	EU AAU Account - Available transactions	*Test cases* (EU, NA admin) 1. Issue AAU CP2 units to EU AAU account, check new units. 2. Transfer from EU 296, AAU CP2 units, to EU AAU account 3. Retire unit from AAU account, check units reduction. 4. Repeat for cancellation.	PASSED
KP2 accounts/transactions setup	New transactions - confirm permissions and roles	New transactions - add permissions		PASSED
KP2 accounts/transactions setup	Article 3.7ter Cancellation - New Account	Create Art 3.7ter Cancellation Account, only by NA of MS, in any MS, only one, account type code 270, applicable for CP2 only	Refer to account PT-270-10003400-2-23	PASSED
KP2 accounts/transactions setup	Article 3.7ter Cancellation - Available transactions	Art 3.7ter Cancellation Account can only be an acquiring account, no transactions can be initiated from this account	Test Case 1. Log in PT as NA 2. Locate an Article 3.7ter Cancellation account with units. 3. Check that for Article 3.7ter Cancellation account, no transaction can be initiated.	PASSED
KP2 accounts/transactions setup	Article 3.7ter Cancellation - New transaction	- New transaction from any KP account "Article 3.7ter Cancellation", only if account exists in MS (similar to Voluntary Cancellation) - Initiated by NA only - Any kyoto unit type except "Former EUA" - Units must not be "ESD Used" - add other rules and checks from UC	Tested successfully (LV196). Known Issue: =========== In order to complete the transaction and not get ITL errors only CP2 AAUs with originating country code = transferring registry had to be used. All the unit blocks of the account with different originating country code where marked as "RESERVED_FOR_TX" from the database, so that only the desired ones were available. It would be beneficial if this was be added as a filter to the unit blocks presented to the user.	PASSED
KP2 accounts/transactions setup	Article 3.7ter Cancellation - Transaction proposal/confirmation screen	Transaction proposal/confirmation screen - Article 3.7ter Cancellation Should be similar or the same as voluntary cancellation	Tested successfully with execution transaction "512189-Art 3.7ter cancellation of Kyoto Units" from PHA PT (643) to PT-270-10003435-2-42(as anquiring account.	PASSED
KP2 accounts/transactions setup	Ambition Increase Cancellation - New Account	Create Ambition Increase Cancellation Account, only by NA, any KP registry, only one, account type code 280, applicable for CP2 only	Refer to account : PT-280-10003401-2-25	PASSED
KP2 accounts/transactions setup	Ambition Increase Cancellation - Allowed unit types	Ambition Increase Cancellation Account - Allowed unit types - check UC	Refer to PT-280-10003401-2-25 The NA-PT registry supports a new KP account type called Ambition Increase Cancellation Account. The account type code – 280. (second part of account number) This account type is applicable only for CP2. This constraint enforces at account opening request.(no display drop down list & display on the account number)	PASSED
KP2 accounts/transactions setup	Ambition Increase Cancellation - Account available transactions	No transactions can be initiated from this account, can only be an acquiring account	No transactions can be initiated from an Ambition Increase Cancellation .(the button "Propose a transaction" is not available). These accounts types are only acquiring accounts.(executed transaction Ambition Increase Cancellation from a PHA (PT) to the specific account PT-280-10003401-2-25)	PASSED

KP2 accounts/transactions setup	Ambition Increase Cancellation - New transaction	- New transaction from any KP account "Ambition Increase Cancellation" (similar to Voluntary Cancellation) - Initiated by NA only - for unit types and other rules check UC	tested successfully UC_AM_70_TC_01: APPROVE ACCOUNT OPENING REQUEST Created account : PT-280-10003401-2-25	PASSED
KP2 accounts/transactions setup	Ambition Increase Cancellation - Transaction proposal/confirmation screen	Transaction proposal/confirmation screen - Ambition Increase Cancellation Should be similar or the same as voluntary cancellation	- executed transaction for transaction type called "Ambition Increase Cancellation" by the National Administrator (PT) from any KP account (PHA -PT-643) (the correspondingTransaction proposal/confirmation screen is displayed) This transaction had as destination account the Ambition Increase Cancellation account (PT-280-10003401-2-25)	PASSED
KP2 accounts/transactions setup	Export Government Accounts - CSV - add new accounts	- PPSR, Article 3.7ter Cancellation Account and Ambition Increase Cancellation account are considered "Government Accounts" and should be exported in the CSV file 'Export Government Accounts'	1. Propose and approve an ambition increase cancellation account. 2. Propose and approve an Art3.7 cancellation account. 3. Propose and approve a PPSR account. 4. Navigate to Accounts -> Export Government Accounts 5. Ensure the identifiers of the accounts created in step 1,2,3 are included in the list of accounts of step 4.	PASSED
Implementation of Unit block CSV functionality	Search unit blocks - add new CSV - des-req-21	- New CSV file containing serial numbers of all KP units held in accounts of account type (100, 120, 121) for specific unit types - Button visible for NA only in Unit Block Search screen - Contents of the CSV are the same as the existing unit block CSV	1. Navigate to Administration -> unit blocks to a registry with retirement account. 2. Click on "export KP units in KPaccounts" 3. Copy the contents of the created file 4. Ensure the contents are identical to the records returned via the following query: select end_, start_, unit_type, unit_block.* from unit_block where account_id in (select account_id from account where registry_code = 'MT' and kyoto_account_type = 'HOLDING_ACCOUNT', 'PERSON_ACCOUNT_NATIONAL_REG', 'FORMER_OPERATOR_HOLDING_ACCOUNT') and unit_type in ('CER', 'ERU_FROM_AAU', 'AAU', 'LCER', 'TCER');	PASSED
Implementation of Unit block CSV functionality	Search unit blocks - add new CSV - des-req-22	- New CSV file containing serial numbers of all KP units held in retirement account for specific unit types. All retirement accounts of all commitment periods - Button visible for NA only in Unit Block Search screen - Contents of the CSV are the same as the existing unit block CSV - Retirement accounts maybe of type 300	1. Navigate to Administration -> unit blocks to a registry with retirement account. 2. Click on "export KP units in retirement accounts" 3. Copy the contents of the created file 4. Ensure the contents are identical to the records returned when searching units blocks via the account identifier of the retirement account.	PASSED

KP2 accounts/transactions setup	New / Fulfill notification - "Net Reversal of Storage of a CDM CCS Project"	- New notification type "Net Reversal of Storage of a CDM CCS Project" (type code 12) - Fulfill notification "Net Reversal of Storage of a CDM CCS Project", target account is "CCS Net Reversal Cancellation Account (type 241)" - External transfer - transferring account is any KP account from the registry (with some exceptions) - if the parameter for the acquring account is not filled, then we cannot fulfill the notification - Unit types AAU, CER, ERU_FROM_AAU, ERU_FROM_RMU and RMU - The notification fulfillment has to be done in ONE transaction - Check that the transferring account holds enough units of notification project - Subject to 4-eyes principle, proposed by NA, approved by NA - The acquiring account must be prepopulated and cannot be changed by the user	Executed UC_IN_012_TC_01: FULFIL NET REVERSAL OF STORAGE OF A CDM CCS PROJECT	PASSED
KP2 accounts/transactions setup	New / Fulfill notification "Non-submission of Verification Report for a CDM CCS Project" unit type AAU, CER, ERU, AAU	- New notification type "Non-submission of Verification Report for a CDM CCS Project" (code type 13) - Fulfill notification "Non-submission of Verification Report for a CDM CCS Project" creates an external transfer - Transferring account is any KP account from the registry (with some exceptions) - Acquiring account is "Non-Submission of Verification Cancellation Account (type 242) " - if the parameter for the acquiring account is not filled, then we cannot fulfill the notification - The notification fulfillment has to be done in ONE transaction - Check that the transferring account holds enough units of notification project - Subject to 4-eyes principle, proposed by NA, approved by NA - The acquiring account must be prepopulated and cannot be changed by the user	Executed UC_IN_013_TC_01: FULFIL NON SUBMISSION OF VERIFICATION REPORT FOR A CDM CCS PROJECT	PASSED
KP2 accounts/transactions setup	Modify all notification transactions to 4 eyes	Modify all notification transactions to 4 eyes	1. Connect as NA and navigate to Kyoto Protocl -> Notifications. 2. Locate an ITL Notitication (in our example: Net source cancellation) and click "fulfill". 3. Enter transferring account by typing its full identifier. 4. Locate an acquiring account and enter quantity on the desired acquiring account. 5. Click "Submit" and ensure a request is created, for approval by another NA (the green confirmation box appears referencing a transaction request ID). 6. As another NA approve the transaction request. 7. If the business rules pertaining to this notification are met, then this notification is completed, otherwise it is terminated.	PASSED

KP2 accounts/transactions setup	New account type: "ESD AAU Deposit Account"	- New account type: "ESD AAU Deposit Account" - Holds only originating CP2 AAUs - Kyoto Type 100 - only one - in any KP - if there exists a pending opening request do not allow a new one to initiate - opened by NA	Account Request 1. Login to Union Registry (Role : NA) Go to «Accounts»- «Account Request» to open a new account. 2. At the screen «Account Opening Account Details» choose theType "ESD AAU Deposit Account" 3. Enter the name (ESD_AAU_NA) 4. Click on the button "Next" 5. At the screen "Account Opening Account Holder Information" choose Account Holder is already linked to the user 6. Select Account Holder from drop-down list 7.Click on the button "Next" 8. At the screen choose the "Account Opening - Authorised Representative Information" 9. Select any Representative from the corresponding list 10. Click on the button "Add" 11. At the screen choose the"Account Opening - Authorised Representatives Linked to Creation Request" 12. Click on the button "Next " 13. At the screen "Account Opening - Authorized Representatives - click on the button "next" with default value 14. At the screen " Account Opening - Additional Authorized Representatives" with default value Expected Results Union Registry validates the entered data and displays the request id. Forwards the request for approval. Approval Request • Login to Union Registry (as nadmin1) • Select the Task List page, • Claim the specific request, and • Click the “Request id” link. • Click on “Approve” button. Expected Results Union Registry receives the approval of the update request from the Administrator, forwards the request to EUTL, receives the approval from EUTL and: • Sets the status of the account type to “EUTL approved” and completes the request process.	PASSED
KP2 accounts/transactions setup	ESD AAU Deposit Account - Allowed unit types	ESD AAU Deposit Account - Allowed unit types	The specific scenario has covered from test cases of EUCR-2575	PASSED
KP2 accounts/transactions setup	EUCR-2850 ESD AAU Deposit Account - Available transactions	ESD AAU Deposit Account - Available transactions - "Retirement Transaction" available anytime from account ESD AAU Deposit Account	Tested successully. Refer to transaction PT363	PASSED
KP2 accounts/transactions setup	Holdings tab of "ESD AAU Deposit Account" - display clearing values	- holdings tab of "ESD AAU Deposit Account" displays the following values: - ESD Clearing Value - AAUs to Retire - AAUs available for transfers	1. Connect as NA and navigate to an ESD AAU deposit account. 2. Navigate to its holdings. 3. Ensure a table appears at the bottom containing ESD clearing value, AAUs to retire, AAUs available for transfers.	PASSED

<table>
<tr><td>KP2 clearing implementation</td><td>ESD/ETS clearing values BE</td><td>ESD clearing value BE -</td><td></td><td>PASSED</td></tr>
<tr><td>KP2 clearing implementation</td><td>EUCR-2838 "ESD Clearing Value" - Update ESD Clearing value - Finalization of AEA Transfer</td><td>- at the finalization of AEA transfers with transferring registry different than aquiring registry the ESD clearing value of the two registries is affected</td><td>1) Search transaction for the specific type 'EsdAEATransfer'
2) Search ent_type_cd = 'ESD_CLEARING_VALUE' with STATUS='COMPLETED'
3) check the result for the specific country "CY" (31 increase + 6 decrease)

The above steps describes on the following screens
select sum(k.tr_amount) k_amnt , sum(t.quantity)tr_amt, k.registry_code, k.action
from kp2_ent_transaction_log k, transactions t
where t.request_id = k.request_id and t.status_code = 'COMPLETED'
and k.ent_type_cd = 'ESD_CLEARING_VALUE' AND K.STATUS='COMPLETED' and type='EsdAEATransfer'
group by k.registry_code, k.action;</td><td>PASSED</td></tr>
<tr><td>KP2 clearing implementation</td><td>EUCR-2838 "ESD Clearing Value" - Update ESD Clearing value - Finalization of External Transfer Kyoto Units</td><td>At the finalization of an “External Transfer of Kyoto units” from ESD AAU Deposit Account to ESD Central Clearing Account a RegistryEntitlementTransactionLog entity will be created with action “INCREASE” and status “COMPLETED”.
At the finalization of an “External Transfer of Kyoto units” from ESD Central Clearing Account to ESD AAU Deposit Account a RegistryEntitlementTransactionLog entity will be created with action “DECREASE” and status “COMPLETED”.</td><td>test successfully

refers to transaction ID NO114</td><td>PASSED</td></tr>
<tr><td>KP2 clearing implementation</td><td>Update actions of "AAUs to Retire"</td><td>The following actions affect the value of "AAUs to Retire".
||Transaction||From||Phase||Record||Action||Status||Registry||
EsdKPUnitsReturnAfterCompliance	ESD Compliance	Finalization	New	DECREASE	COMPLETED	Transferring ESD Member State
Retirement	ESD AAU Deposit	Proposal	New	DECREASE	PENDING	Current
Retirement	ESD AAU Deposit	Cancellation	Update	DECREASE	REJECTED	Current
Retirement	ESD AAU Deposit	Finalization	Update	DECREASE	COMPLETED	Current	</td><td>test successfully the below script check the test successfully the below screen on the related tables select sum(k.tr_amount) k_amnt , sum(t.quantity)tr_amt from kp2_ent_transaction_log k, transactions t where t.request_id = k.request_id and t.status_code = 'COMPLETED' and k.ent_type_cd = 'AAUS_TO_RETIRE' AND K.STATUS='COMPLETED' and k.registry_code ='IT';</td><td>PASSED</td></tr>
</table>

KP2 clearing implementation	Calculation of "AAUs to Retire"	- value of AAUs to Retire is increased by a forumula	test successfully refer to MS-BE (see screen) - AAUst_to_Retire=0 & MS-IT (-87) select sum (tr_amount),registry_code, status, action from kp2_ent_transaction_log where ent_type_cd = 'AAUS_TO_RETIRE' --and status ='COMPLETED' --and action = 'INCREASE' group by registry_code,registry_code, status, action; select COMP_DATE_EMISSIONS, a.account_id, a.esd_member_state, a.esd_year, d.* from ESD_COMPLIANCE_HISTORY ch, account a, esd_compliance_dates d where ch.account_id = a.account_id and sysdate >= d.comp_closure_date and a.esd_year = d.comp_year and a.esd_member_state = 'BE'; and also test successfully the below script check the select sum(k.tr_amount) k_amnt , sum(t.quantity)tr_amt from kp2_ent_transaction_log k, transactions t where t.request_id = k.request_id and t.status_code = 'COMPLETED' and k.ent_type_cd = 'AAUS_TO_RETIRE' AND K.STATUS='COMPLETED' and k.registry_code ='IT'; (also BE) (on the corresponding tables)	PASSED
KP2 clearing implementation	footnote - Holdings screen of ESD AAU Deposit Account	footnote	1. Connect as NA and navigate to an ESD AAU deposit account. 2. Navigate to its holdings. 3. Ensure the footnote appears at the bottom: "AAUs to Retire = AAUs that correspond to ESD emissions that had not been covered by other international credits."	PASSED

KP2 clearing implementation	New check for "Retirement Transaction" from ESD AAU Deposit Account	- Maximum amount for "Retirement Transaction" from ESD AAU Deposit Account is the value of the parameter AAUs to Retire	Tested successfully refers to ESD AAU Deposit Account of Portugal (PT-100-10003434-0-31) , which has available AAU (Not Subject to SOP) - 18 with the parameter value "AAU to Retire" is equal to "98" 1) Select the transaction "Retirement" 2) Enter the value 99 on the "Quantity to retire" 3) Click on the button "Submit" Result The Union Registry display the following message 80757: The quantity to retire (99) must be less or equal to the value of "AAUs to Retire" for this registry (98). Repeat the above steps with value on the field quantity to retire "98" that equal to the value of "AAUs to Retire" for this registry (98). Result : The request is submitted successfully Notice: we suggest to discuss if we need to enhancement the current implementation with new check on the the field quantity in order to retire must be less or equal to the value of available units of the ESD AAU Deposit Account	PASSED
KP2 clearing implementation	Retirement transaction from ESD AAU Deposit account proposal/finalization	Retirement transaction from ESD AAU Deposit account proposal/finalization should do the following: - value AAUs to Retire is decreased when retirement transaction is initiated (a pending value will be kept) - NA may choose AAUs that are "subject to SOP" or "not subject to SOP", both must be visible on screen	Refer to transaction PT-363.	PASSED
KP2 clearing implementation	Calculation of "AAUs Available for Transfers"	- calculation method of value "AAUs Available for Transfers"	a1. sum the calculation with the ent_type_cd = 'AAUS_AVAILABLE_FOR_TRANSFERS' select sum (tr_amount),registry_code, status, action from kp2_ent_transaction_log where ent_type_cd = 'AAUS_AVAILABLE_FOR_TRANSFERS' group by registry_code,registry_code, status, action; a2. calculation emission (see field COMP_DATE_EMISSION) select COMP_DATE_EMISSIONS, a.account_id, a.esd_member_state, a.esd_year, d.* from ESD_COMPLIANCE_HISTORY ch, account a, esd_compliance_dates d where ch.account_id = a.account_id --and sysdate >= d.comp_closure_date and a.esd_year = d.comp_year and a.esd_member_state = 'GB';	PASSED

KP2 accounts/transactions setup	New check to be added to Cancellation, Internal Transfers, External Transfers initiated from ESD AAU Deposit Account	- new check to be added to Cancellation, Internal Transfers, External Transfers initiated from ESD AAU Deposit Account	test successfully 1. external transfer from PT ESD AAU Deposit Account ---> any registry parameteAAUs available for Transfers 49219 80758: The quantity (49220) must be less or equal to the value of "AAUs Available for Transfer" for this registry (49219). & also cancellation with 80000: The amount 49220 of AAU is not available in the account: 10003434 80758: The quantity (49220) must be less or equal to the value of "AAUs Available for Transfer" for this registry (49219).	PASSED
KP2 accounts/transactions setup	Creation of ESD AAU Deposit Account - initialize various values	- Values of "AAUs to Retire" and "AAUs available for transfers" must be initialized based on all existing ESD transactions - ESD Clearing Values are 0 by default		PASSED

KP2 accounts/transactions setup	New Account Type "ESD Central Clearing Account"	- new Account Type "ESD Central Clearing Account" - holds only originating CP2 AAUs - Kyoto Type 100 - opened in EU KP registry - opened by CA	Account Request 1. Login to Union Registry (Role : CA) Go to «Accounts»- «Account Request» to open a new account. 2. At the screen «Account Opening Account Details» choose theType "ESD Central Clearing Account" 3. Enter the name (ESD_CCA). Ensure only CP2 can be chosen. 4. Click on the button "Next" 5. At the screen "Account Opening Account Holder Information" choose Account Holder is already linked to the user 6. Select Account Holder from drop-down list 7.Click on the button "Next" 8. At the screen choose the "Account Opening - Authorised Representative Information" 9. Select any Representative from the corresponding list 10. Click on the button "Add" 11. At the screen choose the"Account Opening - Authorised Representatives Linked to Creation Request" 12. Click on the button "Next " 13. At the screen "Account Opening - Authorized Representatives - click on the button "next" with default value 14. At the screen " Account Opening - Additional Authorized Representatives" with default value Expected Results Union Registry validates the entered data and displays the request id. Forwards the request for approval. Approval Request • Login to Union Registry (as nadmin1) • Select the Task List page, • Claim the specific request, and • Click the “Request id” link. • Select the Request , • Claim the specific request, and • Click on “Approve” button. Expected Results Union Registry receives the approval of the update request from the Administrator, forwards the request to EUTL, receives the approval from EUTL and: • Sets the status of the account type to “EUTL account approval” and completes the request process. • The account is created for CP2.	PASSED
KP2 clearing implementation	Checks looking parameter "AAUs Available for Transfer" should allow transfers from MS ESD Deposit Account to ESD Central Clearing Account	Checks looking parameter "AAUs Available for Transfer" should allow transfers from MS ESD Deposit Account to ESD Central Clearing Account	test successfully refers to transaction ID NO114	PASSED

KP2 clearing implementation	EUCR-2838 "ESD Clearing Value" - Transaction finalization of transfer from ESD AAU Deposit to ESD Central Clearing Account	- Finalization of transactions from MS ESD AAU Deposit Accounts to ESD Central Clearing Account, the ESD Clearing Value of the ESD AAU Deposit Account will increase with the value of the transaction - exceptions may exist!	test successfully refer to transaction ID NO114	PASSED
KP2 clearing implementation	EUCR-2850 ESD Central Clearing Account to an ESD AAU Deposit - allowed transfers	- For a given MS transfers from ESD Central Clearing Account to an ESD AAU Deposit Account is allowed	*Test Case* 1. Log in EU as NA 2. Transfer AAU units from ESD Central Clearing 1000 3408 to ESD AAU Deposit 10003404. 3. Check transferred units.	PASSED
KP2 clearing implementation	EUCR-2838 "ESD Clearing Value" - Transaction finalization of transfer from ESD Central Clearing to ESD AAU Deposit Account	- Finalization of transfers from ESD Central Clearing Accounts to an ESD AAU Deposit Account, the ESD Clearing Value of the respective ESD AAU Deposit Account is decreased with the quantity of the transaction	test successfully refer to transaction id EU1218401	PASSED
KP2 clearing implementation	Calculation of "ESD Clearing Value"	ESD Clearing value is impacted by AEA transfers between ESD Compliance accounts belonging to different MS Transaction finalization, Transaction proposal CHECKS	test successfully as below a1.sum the calculation select sum (tr_amount),registry_code from kp2_ent_transaction_log where ent_type_cd = 'ESD_CLEARING_VALUE' and status ='COMPLETED' and action = 'INCREASE' group by registry_code; a2. sum the calculation (decrease) select sum (tr_amount),registry_code from kp2_ent_transaction_log where ent_type_cd = 'ESD_CLEARING_VALUE' and status ='COMPLETED' and action = 'DECREASE' group by registry_code;	PASSED
KP2 clearing implementation	EUCR-2838 Transfers of AAUs from and to ESD Central Clearing Account	Transfers of AAUs from and to ESD Central Clearing Account - transaction proposal, transaction finalization	Tested successfully as duplicate of issue EUCR-2600	PASSED
KP2 clearing implementation	New ESD Clearing Screen showing various values / comments - add footer	- new clearing page showing various values / comments	*Test Case* 1. Log in IS registry as NA 2. In Kyoto Protocol, ESD Accounting And Clearing for CP2, check that these labels exist: - Negative ESD Clearing Value: The Member-State needs to send AAUs to the ESD Central Clearing Account - Positive ESD Clearing Value: The Member-State needs to receive AAUs from the ESD Central Clearing Account	PASSED
KP2 clearing implementation	No blocking for transfers from and to ESD Central Clearing Account	- no blocking for transfers from and to ESD Central Clearing Account - transactions are manual	*Test Case 1* 1. Log in EU as NA 2. Transfer CP2 AAU from 10003408(clearing) to 296 3. Check transaction is completed and units are transferred *Test Case 2* 1. Log in EU as NA 2. Transfer CP2 AAU from 296 to 10003408 3. Check transaction is completed and units are transferred	PASSED

KP2 clearing implementation	New Account Type "ETS AAU Deposit Account"	- new Account Type "ETS AAU Deposit Account" - holds originating CP2 AAUs - Kyoto type 100 - only one open - if pending cannot create new request - open only in NO, LI, EU - only NA can open this account or CA for EU	The specific scenario also covers the EUCR-2602 Account Request 1. Login to Union Registry (Role : CA) Go to «Accounts»- «Account Request» to open a new account. 2. At the screen «Account Opening Account Details» choose theType "ETS AAU Deposit Account" 3. Enter the name (ETS_AAU) 4. Click on the button "Next" 5. At the screen "Account Opening Account Holder Information" choose Account Holder is already linked to the user 6. Select Account Holder from drop-down list 7.Click on the button "Next" 8. At the screen choose the "Account Opening - Authorised Representative Information" 9. Select any Representative from the corresponding list 10. Click on the button "Add" 11. At the screen choose the"Account Opening - Authorised Representatives Linked to Creation Request" 12. Click on the button "Next " 13. At the screen "Account Opening - Authorized Representatives - click on the button "next" with default value 14. At the screen " Account Opening - Additional Authorized Representatives" with default value Expected Results Union Registry validates the entered data and displays the request id. Forwards the request for approval. Approval Request • Login to Union Registry (as nadmin1) • Select the Task List page, • Claim the specific request, and • Click the “Request id” link. • Click on “Approve” button. Expected Results Union Registry receives the approval of the update request from the Administrator, forwards the request to EUTL, receives the approval from EUTL and: • Sets the status of the account type to “EUTL approved” and completes the request process.	PASSED

KP2 clearing implementation	ETS AAU Deposit Account - Allowed unit types	ETS AAU Deposit Account - Allowed unit types	Account Request 1. Login to Union Registry (Role : CA) Go to «Accounts»- «Account Request» to open a new account. 2. At the screen «Account Opening Account Details» choose theType "ETS AAU Deposit Account" 3. Enter the name (ETS_AAU) 4. Click on the button "Next" 5. At the screen "Account Opening Account Holder Information" choose Account Holder is already linked to the user 6. Select Account Holder from drop-down list 7.Click on the button "Next" 8. At the screen choose the "Account Opening - Authorised Representative Information" 9. Select any Representative from the corresponding list 10. Click on the button "Add" 11. At the screen choose the"Account Opening - Authorised Representatives Linked to Creation Request" 12. Click on the button "Next " 13. At the screen "Account Opening - Authorized Representatives - click on the button "next" with default value 14. At the screen " Account Opening - Additional Authorized Representatives" with default value Expected Results Union Registry validates the entered data and displays the request id. Forwards the request for approval. Approval Request • Login to Union Registry (as nadmin1) • Select the Task List page, • Claim the specific request, and • Click the “Request id” link. • Click on “Approve” button. Expected Results Union Registry receives the approval of the update request from the Administrator, forwards the request to EUTL, receives the approval from EUTL and: • Sets the status of the account type to “EUTL approved” and completes the request process.	PASSED
KP2 clearing implementation	EUCR-2850 ETS AAU Deposit Account - Allowed transactions	ETS AAU Deposit Account - Allowed transactions - Retirement transaction available from ETS AAU Deposit Account	1. Navigate to an ETS AAU deposit account which holds KP units. 2. Ensure retirement transaction is available. 3. Refer to EU1218341	PASSED
KP2 clearing implementation	New screen - ETS Accounting and Clearing for CP2 + JBPM to transfer to EUTL	- new ETS screen Accounting and Clearing for CP2 - displays value - if the user has the upd role, can update that value (CA can update for EU, NO, LI) - CA only can view values for all registries including NO & LI. - New JBPM to transfer ETS Clearing Values to EUTL - values must not be saved unless an OK is received from EUTL (like account exclusion)	see attached file related to TC_CL_020_MODIFY_ETS_CLEARING_CP2_INFO	PASSED

KP2 clearing implementation	Holdings tab of ETS AAU Deposit Account - show the value of ETS Clearing Value	- holdings tab of ETS AAU Deposit Account must show the value of ETS Clearing Value	1. Connect as NA and navigate to ETS AAU Deposit Account of the registry. 2. Navigate to account holdings. 3. Ensure that below the account holdings a table appears containing Initial and Current ETS Clearing Value	PASSED
KP2 clearing implementation	ETS Clearing values are default = 0	ETS Clearing values are default = 0		PASSED
KP2 clearing implementation	New account "ETS Central Clearing Account for CP2"	- new account "ETS Central Clearing Account for CP2" - holds originating CP2 AAUs - Kyoto type 100 - created only in EU - opened by CA	The specific scenario also covers the EUCR-2608. Account Request 1. Login to Union Registry (Role : CA) Go to «Accounts»- «Account Request» to open a new account. 2. At the screen «Account Opening Account Details» choose theType "ETS Central Clearing Account for CP2" 3. Enter the name (ETS_CCA_CP2) 4. Click on the button "Next" 5. At the screen "Account Opening Account Holder Information" choose Account Holder is already linked to the user 6. Select Account Holder from drop-down list 7.Click on the button "Next" 8. At the screen choose the "Account Opening - Authorised Representative Information" 9. Select any Representative from the corresponding list 10. Click on the button "Add" 11. At the screen choose the"Account Opening - Authorised Representatives Linked to Creation Request" 12. Click on the button "Next " 13. At the screen "Account Opening - Authorized Representatives - click on the button "next" with default value 14. At the screen " Account Opening - Additional Authorized Representatives" with default value Expected Results Union Registry validates the entered data and displays the request id. Forwards the request for approval. Approval Request • Login to Union Registry (as nadmin1) • Select the Task List page, • Claim the specific request, and • Click the “Request id” link. • Click on “Approve” button. Expected Results Union Registry receives the approval of the update request from the Administrator, forwards the request to EUTL, receives the approval from EUTL and: • Sets the status of the account type to “EUTL approved” and completes the request process.	PASSED

KP2 clearing implementation	ETS Central Clearing Account for CP2 - Allowed unit types	ETS Central Clearing Account for CP2 - Allowed unit types	Account Request 1. Login to Union Registry (Role : CA) Go to «Accounts»- «Account Request» to open a new account. 2. At the screen «Account Opening Account Details» choose theType "ETS Central Clearing Account for CP2" 3. Enter the name (ETS_CCA_CP2) 4. Click on the button "Next" 5. At the screen "Account Opening Account Holder Information" choose Account Holder is already linked to the user 6. Select Account Holder from drop-down list 7.Click on the button "Next" 8. At the screen choose the "Account Opening - Authorised Representative Information" 9. Select any Representative from the corresponding list 10. Click on the button "Add" 11. At the screen choose the"Account Opening - Authorised Representatives Linked to Creation Request" 12. Click on the button "Next " 13. At the screen "Account Opening - Authorized Representatives - click on the button "next" with default value 14. At the screen " Account Opening - Additional Authorized Representatives" with default value Expected Results Union Registry validates the entered data and displays the request id. Forwards the request for approval. Approval Request • Login to Union Registry (as nadmin1) • Select the Task List page, • Claim the specific request, and • Click the “Request id” link. • Click on “Approve” button. Expected Results Union Registry receives the approval of the update request from the Administrator, forwards the request to EUTL, receives the approval from EUTL and: • Sets the status of the account type to “EUTL approved” and completes the request process.	PASSED
KP2 clearing implementation	EUCR-2850 ETS Central Clearing Account for CP2 - Allowed transactions	ETS Central Clearing Account for CP2 - Allowed transactions	*Test Case* 1. Log in EU as NA 2. In Accounts panel choose ETS Central Clearing account type, and Search 3. In available transactions below types should exist: "Transfer of AAU, RMU, ERU, CER, ICER and tCER" and "Transfer to SOP for First External Transfer"	PASSED

KP2 clearing implementation	EUCR-2839 Transaction finalization for ETS AAU Deposit Account to ETS Central Clearing Account must increase the value of ETS Clearing Value	- Finalization of tranfers from ETS AAU Deposit Account to ETS Central Clearing Account must increase the value of ETS Clearing Value	test successfully. Refers to transaction EU1218382 see attached file increase ETS Clearing parameter	PASSED
KP2 clearing implementation	Transfers between ETS Central Clearing Account and ETS Deposit Account and the reverse will be allowed and they will ignore ETS Clearing Values	- All transfers between ETS Central Clearing Account and ETS Deposit Account and the reverse will be allowed and they will ignore ETS Clearing Values		PASSED
KP2 clearing implementation	Transfers to/from ETS Central Clearing Account and ETS AAU Deposit Account will not be blocked by ETS Clearing Value	Transfers to/from ETS Central Clearing Account and ETS AAU Deposit Account will not be blocked by ETS Clearing Value		PASSED
KP2 clearing implementation	EUCR-2839 Transaction finalization from ETS Central Clearing Account to ETS AAU Deposit Account decreases the value of ETS Clearing value	- Finalization of transfer from ETS Central Clearing Account to ETS AAU Deposit Account decreases the value of ETS Clearing value	test successfully Refers to corresponding accounts EU-100-10003407-0-76 ETS AAU DEPOSIT EU-100-10003403-0-96 ETS Central Clearing Account for CP2 execution the below tranasactions EU1218344 (2 units) EU1218346 (1 unit) results check the print screen	PASSED
KP2 clearing implementation	Calculation of "ETS Clearing Value"	ETS clearing value is affected by transfers of AAUs from and to the ETS Central Clearing Account	test successfully step1 execution two transaction from ETS AAU DEPOSIT(EU-100-10003407-0-76) to ETS Central Clearing Account for CP2 (EU-100-10003403-0-96) (2 units) and reverses step 2 checks the transfers amounts select sum (tr_amount),registry_code, action from kp2_ent_transaction_log where ent_type_cd = 'ETS_CLEARING_VALUE' and status ='COMPLETED'group by registry_code,action; 2 records (2 units - increase & 1 unit decreases) select * from KP2_REGISTRY_ENTITLEMENT where ent_type_cd = 'ETS_CLEARING_VALUE' (there is no exist record) step 3 checks the corresponding screen (see attached file)	PASSED
Enable cancellations from Aviation Surrender Set-Aside	Cancellation transaction from Aviation Surrender Set-Aside for CERs and ERUs will be allowed without any time limit	- Cancellation from Aviation Surrender Set-Aside for CERs and ERUs will be allowed without any time limit	Tested successfully. Refer to transaction EU1218347.	PASSED

Ensure CER, ERU units become ESD ineligible after the lapse of the relevant config parameter	ESD related transaction checks - after config param "End of Carry-Over CP1 -> CP2" all CERs, ERUs, lCERs, tCERs will become ESD ineligible	ESD related transaction checks - after config param "End of Carry-Over CP1 -> CP2" all CERs, ERUs, lCERs, tCERs will become ESD ineligible	1. Set the confifuration parameter carry.over.end.date to a date later than current server date. 2. Upload in ESD registry -> ESD Eligibility List upload a General list containing projects and unit types. 3. Locate an account in a registry containing the projects/unit types contained in the list uploaded in step 2. 4. Ensure the uploaded unit type/project contains "Limit 1" in column "ESD Eligibility" 5. Update the parameter set in step 1 to a past date. 6. Wait 5 minutes. 7. Repeat step 4 and ensure the holdings contained in the list do NOT contain a reference to a list type.	PASSED
Translations	Duplicate i18n entries	The following entries in messages.properties have duplicate values. "Your request to update your mobile phone number has been recorded with identifier" * info.message.update.mobile.number.request.submitted * info.message.update.mobile.number.request.submitted.detail "Your request to update your mobile phone number has not been submitted, because there is a pending personal details update request for this user" * info.message.update.mobile.number.request.pending * info.message.update.mobile.number.request.pending.detail This fact causes confusion to the client, who considers that two different messages have the same text. Actually, these texts are not two separate messages; the first key is the summary and the second key is the details of the same message. These entries are used as error messages inside /EUCR/eucr-ui/src/main/webapp/index.xhtml, where it is clear that the message details are ignored: {code:title=index.xhtml|borderStyle=solid} <p:messages id="errors" globalOnly="true" showSummary="true" showDetail="false"/> {code}		PASSED
KP2 accounts/transactions setup	Check 80000 - Add SOP flag - bring up to date	Check 80000 - Add SOP flag - bring up to date check how TransactionServicesBean.reserveUnitsAutoSelected reserves unit blocks. This check must be in synch with that method. Most probably must use constructSelectionCriteria (change to public) and then selectUnitBlocks as the reserveUnitsAutoSelected Various flags regarding esd are missing also.	*Test Cases* 1. Log in PT as NA 2. Check for all transaction types(see comment), proposal and approval phase, that there are no errors/red screens.	PASSED

Addition of account type as possible destination for issuance	Acquiring Accounts list in Issuance screen - Add ESD AAU Deposit account	ESD AAU Despotit accounts must be added in the drop down of issuance screen	*Test Case 1* 1. Log in EU, as NA 2. Make sure account(ESD AAU Deposit) 10003404 exists 3. In Issuance the above should exist in drop-down list	PASSED
Correction in issuance screen	Red Screen - While trying to cancel an issuance of AAU/RMU units	Red Screen - While trying to cancel an issuance of AAU/RMU units unblockIssuanceByCancellingUsersRequest does not have code to handle cancellation of issuance of AAU/RMU units, only allowances.	*Test Case 1* - RMUs 1. Log in Latvia Registry 2. In Kyoto Protocol -> Issuance, select CP2 and account 551 3. Select radiobutton of RMU-Afforestation(AR) and submit 2 units issuance 4. Redirect to Issuance page, check again same radiobutton radiobutton of RMU-Afforestation(AR), and make sure input field is not editable 5. Check anotherRMU radiobutton and make sure to get error: "80300: There can exist no other pending transaction with the same type in the hosting registry" *Test Case 2* - AAUs Repeat above steps in RO registry, account 666 and AAU units issuance(step 3).	PASSED
Correction in KP2 entitlements CSV export	KP2 Entitlements - CSV export should include all rows	This applies to Conversion screen, where a dynamic table with pager is used.	*Test Case 1* 1. Log in EU as CA 2. In KP2 Entitlements, check exported CSV for Conversion and another section, with UI info 3 . All rows should be the same.	PASSED
Correction in Transfer to SOP transaction	After submitting a transfer to SOP for first external transfer, user can submit another one	1. Submit a Transfer to SOP for first ext transf 2. Sign in ECAS 3. When returning in the screen shown in the attachment, user can submit another transfer to SOP for first ext transf	1. Submit a Transfer to SOP for first ext transf 2. Sign in ECAS 3. When returning in the screen enter another value and click "submit". 4. The validation rule appears: "The proposal cannot proceed, because its preconditions failed. Please retry starting from the holdings tab." and the second transaction cannot be submitted.	PASSED
KP2 accounts/transactions setup	New check in Cancellation transactions	According to UCS.13 - Holdings and Transfers v2.60.docx: bq. It is not permitted to cancel AAUs more than the quantity “AAUs available for Transfer” This check is involved in the following use cases: * UC_HT_070: CANCEL KYOTO UNITS * UC_HT_071: PERFORM MANDATORY CANCELLATION OF KYOTO UNITS * UC_HT_072: PERFORM AMBITION INCREASE CANCELLATION * UC_HT_073: PERFORM ART3.7TER CANCELLATION	test successfully the UC_TF_070_TC_01: CANCEL KYOTO UNITS for the following cancellation types Voluntary Cancellation UC_TR_071_TC_01: Mandatory cancellation is available from Excluded account for Mandatory cancellation UC_TR_071_TC_01: Ambition Increase Cancellation is available from Excluded account Ambition Increase Cancellation UC_TR_071_TC_01: Art 3.7ter Cancellation is available from Excluded account the AAUs units of cancellation < = current units for CP2 & < = the value of parameter of AAUs available for Transfer for specific country	PASSED

KP2 accounts/transactions setup	Transfer to PPSR: cannot confirm transaction	If I transfer from PPSR --> to PPSR and enter quantity = -5, quantity = 5.5 and click confirm, there is an orange error message If I then re-try and enter quantity = 1 I cannot click confirm.	1. Connect as NA and propose a transfer PPSR --> PPSR 2, Enter quantity = -5, quantity = 5.5 and click confirm, there is an orange error message 3. Enter value 1 and click submit. The transaction is submitted normally.	PASSED
KP2 accounts/transactions setup	Allow only one mandatory canc. account and one volunt canc. account is allowed per registry per CP		*Test Case* 1. Log in registry as NA 2. a. If mandatory and cancellation accounts do not exist, make sure only one of each is created for each CP. 2. b. If mandatory and cancellation accounts exist already, make sure no second for each type and CP, can be created	PASSED
KP2 clearing implementation	New screen - ESD Accounting and Clearing for CP2	New screen for CA - Display all ESD Clearing Values UC does not mention the location of the screen nor the permission. To be defined at implementation.	1. Connect as EU-CA. 2. Navigate to ESD accounting and clearing for CP2. 3. Ensure the screen shows the columns: "ESD Clearing Value", "AAUs to Retire" and "AAUs Available for Transfers".	PASSED
KP2 accounts/transactions setup	Transfer to SOP for First External Transfer of AAUs - Add Originating Country Code	In order to be precise about ITL check 5115 and avoid sending wrongly marked units to CDM, in transaction Transfer to SOP for First External Transfer of AAUs Originating Country Code must be added in the filter of units and be equal to the transferring registry. (ITL check 5115: AAUs transferred to the SOP Adaptation Fund account must be AAUs that have never been transferred and have been issued by the Party concerned.)	Tested successfully. 1. Locate an account with CP2 AAUs. 2. Query its unit blocks via the query: select (end_ - start_ + 1), unit_block.* from unit_block where account_id = (select account_id from account where identifier = 10003336) and unit_type = 'AAU' order by last_modified_time desc; 3. Switch the originating country code to another country and ensure this quantity is not available for Transfer to SOP for first external transfer update unit_block set originating_country_code = 'GB' where ID = 562002; 4. If all such units get another originating country code then this transaction is not available. 5. Restore the originating country code to the country of the current user and ensure the transaction is available again and the unit blocks are available to be transacted. The above test is only applicable to CP2 AAU units. All other units are irrelevant to this test.	PASSED
KP2 accounts/transactions setup	Issuance of CP2 units add extra check for AAU related accounts	A check must be added to the check package "Issuance of Kyoto units 1-0" which will check that issuance to AAU Account or ESD AAU Deposit Account are valid unit types for those two accounts. Check if 7029 can be added or some similar check must be created.	1. Connect as NA and perform an issuance to PHA. 2. Repeat issuing to ESD AAU deposit account 3. Repeat issuing to AAU account Ensure all transactions are completed. All succeeded for EU (EU1218368, EU1218367, EU1218366)	PASSED
"Kyoto Protocol Public Reports" configuration for Malta	If I click on link "Kyoto Protocol Public Reports" from the Home page of Malta I get error (pending configuration)		Tested successfully. Redirection is performed without errors. Note: CSRF Guard configuration is necessary if the file is new.	PASSED

Correction in Conversion B messages	Mutually exclusive messages for Conversion B	When Converting with Conversion B and entitlement = 49 and I enter quantity = 50 then I get two messages for the same quantity.	1. Locate an account which is able to receive a Conversion B. 2. The holdings of the account are 100 and the entitlements 49. 3. Enter 999 as transaction quantity and click Next. 4. Ensure the validation rule 82108 appears only.	PASSED
KP2 clearing implementation	Update actions of "ESD Clearing Value"	The following actions affect the value of "ESD Clearing Value". ||Transaction||From||To||Phase||Record||Action||Status||Registry|| |EsdAEATransfer|ESD Compliance|-|Finalization|New|DECREASE|COMPLETED|Transferring ESD Memeber State| |EsdAEATransfer|ESD Compliance|-|Finalization|New|INCREASE|COMPLETED|Acquiring ESD Memeber State| |EsdReversalAEATransfer|ESD Compliance|-|Finalization|New|DECREASE|COMPLETED|Transferring ESD Memeber State| |EsdReversalAEATransfer|ESD Compliance|-|Finalization|New|INCREASE|COMPLETED|Acquiring ESD Memeber State| |Internal Transfer|ESD AAU Deposit|ESD Central Clearing|Finalization|New|INCREASE|COMPLETED|Transferring| |Internal Transfer|ESD Central Clearing|ESD AAU Deposit|Finalization|New|DECREASE|COMPLETED|Acquiring|	test successfully as below a1.sum the calculation select sum (tr_amount),registry_code from kp2_ent_transaction_log where ent_type_cd = 'ESD_CLEARING_VALUE' and status ='COMPLETED' and action = 'INCREASE' group by registry_code; a2. sum the calculation (decrease) select sum (tr_amount),registry_code from kp2_ent_transaction_log where ent_type_cd = 'ESD_CLEARING_VALUE' and status ='COMPLETED' and action = 'DECREASE' group by registry_code; c. a1 - a2 see attached file	PASSED
KP2 clearing implementation	Update actions of "ETS Clearing Value"	The following actions affect the value of "ETS Clearing Value". ||Transaction||From||To||Phase||Record||Action||Status||Registry|| |Internal Transfer|ETS AAU Deposit|ETS Central Clearing|Finalization|New|INCREASE|COMPLETED|Transferring| |Internal Transfer|ETS Central Clearing|ETS AAU Deposit|Finalization|New|DECREASE|COMPLETED|Acquiring|	test successfully the following test cases a. creation two accounts EU-100-10003407-0-76 ETS AAU DEPOSIT EU-100-10003403-0-96 ETS Central Clearing Account for CP2 b. execution two transactions b1 request& transaction_id : 512293 & EU1218344 (transfers 2 units from ETS AAU DEPOSIT --> ETS CENTRAL CLEARING) b2 request& transaction_id :512298 --- EU1218346 (transfers 1 units from ETS CENTRAL CLEARING -> ETS AAU DEPOSIT -->) EU-100-10003403-0-96 (1) to EU-100-10003407-0-76 as nadmin1 After completion the above transaction , checks the table kp2_ent_transaction_log select sum (tr_amount),registry_code, action from kp2_ent_transaction_log where ent_type_cd = 'ETS_CLEARING_VALUE'group by registry_code,action; --> exists 2 records based on the business rule (3.7.2) The value of the parameter ETS Clearing value = 2-1 = 1 check corresponding screen see attached file	PASSED

KP2 clearing implementation	Update actions of "AAUs Available for Transfers"	The following actions affect the value of "AAUs Available for Transfers". ||Transaction||From||Phase||Record||Action||Status||Registry|| |EsdAEADeletionAfterCompliance|ESD Compliance|Finalization|New|INCREASE|COMPLETED|Transferring ESD Member State| |EsdAEADeletionAfterOverallocation|ESD Compliance|Finalization|New|INCREASE|COMPLETED|Transferring ESD Member State| |EsdKPUnitsReturnAfterCompliance|ESD Compliance|Finalization|New|INCREASE|COMPLETED|Transferring ESD Member State| |Cancellation|ESD AAU Deposit|Proposal|New|DECREASE|PENDING|Transferring| |Cancellation|ESD AAU Deposit|Cancellation|Update|DECREASE|REJECTED|Transferring| |Cancellation|ESD AAU Deposit|Finalization|Update|DECREASE|COMPLETED|Transferring| |Internal Transfer|ESD AAU Deposit|Proposal|New|DECREASE|PENDING|Transferring| |Internal Transfer|ESD AAU Deposit|Cancellation|Update|DECREASE|REJECTED|Transferring| |Internal Transfer|ESD AAU Deposit|Finalization|Update|DECREASE|COMPLETED|Transferring| |External Transfer|ESD AAU Deposit|Proposal|New|DECREASE|PENDING|Transferring| |External Transfer|ESD AAU Deposit|Cancellation|Update|DECREASE|REJECTED|Transferring| |External Transfer|ESD AAU Deposit|Finalization|Update|DECREASE|COMPLETED|Transferring|	Test case 1) Search request_id from the table kp2_ent_transaction_log select * from kp2_ent_transaction_log WHERE ent_type_cd = 'AAUS_AVAILABLE_FOR_TRANSFERS' AND STATUS='COMPLETED' and registry_code ='CY'; 2) check the type of the specific transaction select * from transactions where request_id =224782; /*EsdAEADeletionAfterCompliance*/ select * from transactions where request_id =224783; /*EsdAEADeletionAfterCompliance*/ 3) check the action & amount of the action between transaction table & kp2_entitlement table select sum(k.tr_amount) k_amnt , sum(t.quantity)tr_amt, k.registry_code from kp2_ent_transaction_log k, transactions t where t.request_id = k.request_id and t.status_code = 'COMPLETED' and k.ent_type_cd = 'AAUS_AVAILABLE_FOR_TRANSFERS'AND K.STATUS='COMPLETED' group by k.registry_code;	PASSED
KP2 clearing implementation	Translation - Mandatory Cancellation missing	see attached file (translation issue)	Translation appears correctly in transaction types.	PASSED
KP2 clearing implementation	ETS Central Clearing & ESD Central Clearing are not valid accounts for Cancellations	ETS Central Clearing & ESD Central Clearing are not valid accounts for Cancellations	1. Ensure Mandatory cancellation and Ambition increase cancellation accounts have been created for EU registry. 2. Navigate to PHA of EU (which has some KP units) and ensure Mandatory cancellation and Ambition increase cancellation are available transaction types. 3. Navigate to ETS Central Clearing (which has some KP units) and ensure Mandatory cancellation and Ambition increase cancellation are NOT available transaction types. 4. Navigate to ESD Central Clearing (which has some KP units) and ensure Mandatory cancellation and Ambition increase cancellation are NOT available transaction types.	PASSED

KP2 accounts/transactions setup	All new 8.0.x accounts are Kyoto Accounts	All five accounts added in 8.0.1 & 8.0.2 will be Kyoto Account: AAU Account ETS AAU Deposit Account ETS Central Clearing Acount ESD AAU Deposit Account ESD Central Clearing Account In ETSAccountTypeEnum a new boolean needs to be added and return true for NONE and those five accounts. a new method isKPAccount will be added in the enumeration.	1. Connect as NA of Norway 2. Request an AAU account, an ETS AAU deposit account, an ESD AAU deposit account 3. As another NA approve them 4. Note the identifiers and locate them in the database. 5. Ensure in the database that the hosting registry of all three accounts is Norway. Repeat for Liechtenstein.	PASSED
KP2 accounts/transactions setup	Allowed transactions of KP2 accounts	Parent ticket for allowed transactions of all new KP2 account types. Transactions which a KP2 account can launch: {panel:title=PPSR account} Kyoto Specific: * Retirement * Transfer AAU to PPSR account {panel} {panel:title=AAU Account} Regular Transfers: * Transfer of AAU, RMU, ERU, CER, lCER and tCER Destruction of Units: * Voluntary cancellation of AAU, RMU, CER, ERU, lCER and tCER * Mandatory cancellation of AAU, RMU, CER, ERU, lCER and tCER * Art 3.7ter cancellation of AAU, RMU, CER, ERU, lCER and tCER * Ambition increase cancellation of AAU, RMU, CER, ERU, lCER and tCER Kyoto Specific: * Retirement * Transfer to SOP for First External Transfer {panel} {panel:title=ESD AAU Deposit Account} Regular Transfers: * Transfer of AAU, RMU, ERU, CER, lCER and tCER Destruction of Units: * Voluntary cancellation of AAU, RMU, CER, ERU, lCER and tCER * Mandatory cancellation of AAU, RMU, CER, ERU, lCER and tCER * Art 3.7ter cancellation of AAU, RMU, CER, ERU, lCER and tCER * Ambition increase cancellation of AAU, RMU, CER, ERU, lCER and tCER	The transactions mentioned in this issue's sub-tasks have been tested successfully.	PASSED

		Kyoto Specific: * Retirement * Transfer to SOP for First External Transfer {panel} {panel:title=ESD Central Clearing Account} Regular Transfers: * Transfer of AAU, RMU, ERU, CER, lCER and tCER Kyoto Specific: * Transfer to SOP for First External Transfer {panel} {panel:title=ETS AAU Deposit account} Regular Transfers: * Transfer of AAU, RMU, ERU, CER, lCER and tCER Destruction of Units: * Voluntary cancellation of AAU, RMU, CER, ERU, lCER and tCER * Mandatory cancellation of AAU, RMU, CER, ERU, lCER and tCER * Art 3.7ter cancellation of AAU, RMU, CER, ERU, lCER and tCER * Ambition increase cancellation of AAU, RMU, CER, ERU, lCER and tCER Kyoto Specific: * Retirement * Transfer to SOP for First External Transfer {panel} {panel:title=ETS Central Clearing Account for CP2} Regular Transfers: * Transfer of AAU, RMU, ERU, CER, lCER and tCER Kyoto Specific: * Transfer to SOP for First External Transfer {panel} {panel:title=Ambition increase cancellation account} No available transactions {panel} {panel:title=Voluntary cancellation account} No available transactions {panel} {panel:title=Mandatory cancellation account} No available transactions {panel} {panel:title=Art3.7 Cancellation account} No available transactions {panel}		

KP2 accounts/transactions setup	Red Screen - ETS AAU Deposit Account		This issue has been resolved in the context of EUCR-2604.	PASSED
Integration of new ECAS clieant	Upgrade ECAS Client to latest version 4.6.0		Transactions were signed normally using the new client. Login was performed normally.	PASSED
Addition of time zone in transaction lists	UC comment: CET to appear in transaction dates and times	CLIMA confirmed that the time and "CET" (or the server time zone if this is more correct?) should be added in the transaction search screen.	Tested successfully. 1. Connect as NA and navigate to Accounts --> Transactions. 2. Ensure all references to time are in the format DD/MM/YYYY HH:MM plus the server time zone acronym. 3. Ensure this covers: Transaction details page Transaction status history Transaction details page – Request details Transaction PDF 4. Switch to ESD registry; ensure the same holds for: ESD transactions ESD entitlement transactions	PASSED
Disable fulfillment of a deprecated ITL notificationb	Notification Carry-Over - Hide button Fulfill	Notification - Carry Over button "Fulfill" should be invisible	Tested successfully. 1. Connect as EU NA and navigate to Kyoto Protocol --> ITL notifications. 2. Locate a notification of type "unit carry over" which is Incomplete. 3. Click on this notification; ensure the button "Fulfill" does not appear.	PASSED
KP2 accounts/transactions setup	View Account - Close/Suspend/etc buttons do not work if user arrives from screen other than account search	View Account - Close/Suspend/etc buttons do not work if user arrives from screen other than account search If a user navigates to Transaction Search, then clicks on an account and then clicks "Suspend" an error 404 appears. The buttons only work if the user navigates from "Account Search" to the account.		PASSED
KP2 accounts/transactions setup	KP2 New notifications should create Cancellation Transaction Request + run 4-0 checks	KP2 New notifications should create Cancellation Transaction Request + run 4-0 checks	1. Connect as NA and locate an ITL notification 2. Request to fulfill the ITL notification 3. Copy the request ID 4. Query the transaction request as follows: select * from transaction_request where request_id =512442 ; 5. Ensure that the column TRANSACTION_TYPE of the record of step 4 is CancellationKyotoUnits.	PASSED
KP2 clearing implementation	ESD Clearing Values - NA can see values for ALL registries	ESD Clearing Values - NA can see values for ALL registries which is not correct. The NA should see only see values for his own registry.	1. Connect as NA 2. Navigate to "ESD accounting and clearing for CP2" of NO, LI 3. Ensure only one row appears, pertaining to the current registry. 4. For any other registry (PT, DE, GR, FR, RO etc.), also this menu entry does appear for NA, SD, SDAgent. 5. For EU-CA, the menu entry appears, and the screen contains all registries.	PASSED

KP2 clearing implementation	ETS Clearing Values - SD, SD Agent, NA Auditor can see values for ALL registries	ETS Clearing Values - SD, SD Agent, NA Auditor can see values for ALL registries Those roles should only see values for their own registry only.	1. Connect as NO-NA, NO-SD, NO-SDA 2. Navigate to ETS-->ETS Accounting and Clearing for CP2 3. Ensure only the values for Norway appear. Repeat as LI-NA, LI-SD, LI-SDA	PASSED
KP2 clearing implementation	AAUS_TO_RETIRE (MS-BE)	During the testing of EUCR-2584, we have identified a different approach on the calculation of the parameter AAUS_TO_RETIRE The below scripts include the calculation on the db level select sum (tr_amount),registry_code, status, action from kp2_ent_transaction_log where ent_type_cd = 'AAUS_TO_RETIRE' --and status ='COMPLETED' --and action = 'INCREASE' group by registry_code,registry_code, status, action; select COMP_DATE_EMISSIONS, a.account_id, a.esd_member_state, a.esd_year, d.* from ESD_COMPLIANCE_HISTORY ch, account a, esd_compliance_dates d where ch.account_id = a.account_id --and sysdate >= d.comp_closure_date and a.esd_year = d.comp_year and a.esd_member_state = 'BE'; the attached screen the display info from corresponding screen	Check the calculation of parameter AAUS_TO_RETIRE 1)Login to Union Registry as (be- no) 2)User navigate to menu Kyoto Protocol ---> ESD Accounting and Clearing for CP2 2) Check the value of AAUS_TO_RETIRE 3) Execute transaction (Retirement) for more value on the pararameter AAUS_TO_RETIRE (step 2)	PASSED
KP2 accounts/transactions setup	Notification Transaction Request - Missing APPROVED BY, APPROVER_ROLE	Notification Transaction Request - Missing APPROVED BY, APPROVER_ROLE When creating a transaction request for a notification - column APPROVER_ROLE must contain NATIONAL_ADMINISTRATOR - column APPROVED_BY must contain the NEW permission PERM_NOTIF_FULFIL_APPROVE - add liquibase script to add to all NAs the permission PERM_NOTIF_FULFIL_APPROVE	1. Connect as NA and fulfill an ITL notification. 2. Copy the request ID in the green box and locate the transaction request via the query: select * from transaction_request where request_id =512442 ; 3. Ensure the APPROVED_BY and APPROVER_ROLE contain PERM_NOTIF_FULFIL_APPROVE and NATIONAL_ADMINISTRATOR respectively.	PASSED
KP2 accounts/transactions setup	Notification Transaction Request - Message after returning from ECAS does not contain request id	Notification Transaction Request - Message after returning from ECAS does not contain request id. The green message which is displayed to the user after returned from ECAS does not contain the request id like the other transactions.	1. Connect as NA and navigate to KP -> ITL Notifications 2. Fulfill a notification, and ensure the green mesage box states: "Your transfer proposal has been recorded and assigned the identifier PT435 . The transaction request with id 512454 has been submitted for approval."	PASSED

KP2 accounts/transactions setup	Transfer to SOP for First External Transfer - Input text field is displayed for CP1 Units	In DEV: # Log-in as NA/GR. # Open holdings of account GR-100-390-0-84. # Propose a "Transfer to SOP for First External Transfer". # Input field should not be displayed for AAUs with Original CP = 1 and Applicable CP = 1 # See attached image "DEV-390-GR (before)". In FAT: # Log-in as NA/EU. # Open holdings of account EU-100-296-0-6. # Propose a "Transfer to SOP for First External Transfer". # Input field should not be displayed for AAUs with Original CP = 1 and Applicable CP = 1 # See attached image "FAT-EU-296 (before)".		PASSED
KP2 accounts/transactions setup	EUTL Message 7892 missing description	The transaction PT387 is failed to transfer units from PT-100-10003434-0-31 to EU-100-10003408-0-71 with the following error code & message 7892 (???error.message.check.7892???) see attached file for futher info		PASSED
KP2 accounts/transactions setup	Incoming transactions - suspended workflow	Incoming transactions - suspended workflow When trying to transfer units from JP to PT, the workflow becomes suspended.	Successfully transferred from JP -> PT CERs via transaction: JP9900021 Successfully transferred from JP -> PT ERUs via transaction: JP9900025	PASSED

KP2 accounts/transactions setup	Notification - Net Source Cancellation - Retrieves wrong target account	Notification - Net Source Cancellation - Retrieves wrong target account The code which retrieves the target account does not take into consideration the account.status column	1. Locate a registry with one Net Source Cancellation Account. 2. Navigate to Kyoto Protocol -> Notifications and locate a Net Source Cancellation notification. 3. Update the account of step 1 to account_status = CLOSED. 4. Fulfill the notification of step 2. 5. The error message appears "Your registry is missing an open Net source cancellation account for the current commitment period.Please try again once this issue has been addressed." and the notification cannot be fullfilled. 6. Update the account of step 1 to account_status = CLOSED. 7. Repeat step 4. 8. Ensure the notification is fullfilled normally using the Net Source Cancellation account of step 1. 1. Locate a registry with no Net Source Cancellation Account. 2. Navigate to Kyoto Protocol -> Notifications and locate a Net Source Cancellation notification. 3. Try to fulfill the notification 4. The error message appears "Your registry is missing an open Net source cancellation account for the current commitment period.Please try again once this issue has been addressed." and the notification cannot be fullfilled. 5. Create a request to open a Net Source Cancellation Account but do not approve. 6. Fulfill the notification of step 2 7. The error message appears "Your registry is missing an open Net source cancellation account for the current commitment period.Please try again once this issue has been addressed." and the notification cannot be fullfilled. 8. Approve the account opening request 9. Fulfill the notification of step 2 10. The acquiring account is filled with the newly opened Net Source Cancellation Account	PASSED
KP2 ITL notifications implementation	Red Screen - ITL Notifications search - enter string in field "Identifier"	Red Screen - ITL Notifications search - enter string in field "Identifier"	*Test Case* 1. Log in EU as NA 2. In ITL Notifications, in Identifier field check that no red error screen is produced due to any string type input.(negative, alphanumeric r, mixed, empty, huge number) 3. Check negative input returns: "An ITL notification identifier must be a number > 0 (maximum 12 digits)." 4. Check alphanumeric returns: "Identifier: the value provided must be numeric." 5. Enter huge number 100000000000 - no message 6. Enter valid and existing 10001 id - should get 1 result	PASSED

KP2 ITL notifications implementation	New ITL Notifications CANNOT be Cancellations - ITL error code 2026	New ITL Notifications CANNOT be Cancellations - ITL error code 2026 2026 For all transactions, except for external transfers, the Initiating and Acquiring Registries must be the same. The two new notifications must be converted to External Transfers. Cancellation transaction needs to have the same transferring and acquiring registry.	1. Fulfill an ITL notificaiton of type "Non-submission of Verification Report for a CDM CCS Project" 2. Locate the transaction request pertaining to this and ensure the column TRANSACTION_TYPE is equal to ExternalTransferKyotoUnits. 3. Fulfill an ITL notificaiton of type "Net Reversal of Storage of a CDM CCS Project" 4. Locate the transaction request pertaining to this and ensure the column TRANSACTION_TYPE is equal to ExternalTransferKyotoUnits.	PASSED
KP2 clearing implementation	Initial ETS Clearing Value may be negative	According to current implementation, in "ETS Accounting and Clearing for CP2" screen, CA can set only zero or positive amounts to "Initial ETS Clearing Value". CA should be able to also set a negative amount for "Initial ETS Clearing Value".	*Test case* 1. Log in EU as CA 2. In ETS Clearing value link, update Initial ETS Clearing value with a negative value. 3. Green box should appear "The update request for registry <Registry> has been sent successfully to EUTL." 4. Log in EUTL and check in ETS Clearing value link that negative value exists.	PASSED
KP2 clearing implementation	Clearing Parameted: ESD AAU for Transfers - Do not affect if transfer is towards EU ESD CCA	Value ESD AAU for Transfers - Do not modify if ESD Dep to ESD CCA	Tested successfully Refer to transaction_id = NO115	PASSED

Allow Unenrol & validate from within a user record	Allow Unenrol & validate from within a user record	We are currently tidying up some validated and enrolled users who no longer have any active account associations. Before finally selecting un-enrol we are going into each user record so we can double check that we are about to un-enrol the correct URID. However, once we have checked all the tabs we then have to go back out to the User Search in order to be able to Un-enrol. It would be useful to have a note of the URID & current status at the top of each tab and then the Un-enrol and Validate buttons available next to the Edit button as well as them being available from the search list as at present.	*Test Case 1 - Check new table data* 1. Log in EU as NA 2. In Users, click one. 3. There should be three new columns: - URID - User Name - User Status 4. Check the above also when navigating on tabs: - Personal Details - Business Details - Administration roles - Accounts *Test Case 2 - Check buttons according to user status* 1. Log in IT, as NA and check that for a registered user, there are two buttons available: Un-enroll and Validate. 2. Log in FI, as NA and check that for a validated and enrolled user, only Un-enroll button appears 3. Log in GR, as NA and check for a Unenrollment-Pending and Unenrolled user, there are no Un-enroll and Validate buttons available. *Test Case 3 - Check Back button functionality* 1. Log in GR, as NA and for a enrolled user, click Unenroll button. 2. Click Cancel 3. Redirection should present User Details page, not User Search. 4. Repeat above 3 steps for Validate button in DE registry, for a registered user *Test Case 4 - Regression* 1. In "User search" screen make sure that all search fields, filtering and paging combinations work as expected. 2. Use Case UC_UA_030: Request Un-Enrolment 3. Use Case UC_UA_012: Validate Use	PASSED

Popup-up window on surrender	Popup-up window on surrender	Imported on: 16/12/2014 \\ From: [https://webgate.ec.europa.eu/etsis/browse/ETS-6575]	*Test Case 1 - Propose as AR in account with ACTIVE and ENROLLED AAR* 1. Login as AR: (FR) 2. Propose a Surrender of Allowance of an OHA(10002564) which has at least one active and enrolled AAR → Message B should be displayed after proposal : Your surrender proposal has been recorded and assigned the identifier {0}. The transaction request {1} has been submitted for approval. One of the additional authorized representatives ({2}) needs to approve this task with id {1} via his task list. *Test Case 2 - Propose as AR in account with NOT ACTIVE and ENROLLED AAR* 1. Login as AR: (FR) 2. Propose a Surrender of Allowance of an OHA(10002564) which has no active(suspend the AAR as NA) and enrolled AAR → Message C should be displayed after proposal: Your surrender proposal has been recorded and assigned the identifier {0}. The transaction request {1} has been submitted for approval. The other authorized representative ({2}) needs to approve this task with id {1} via his task list. *Test Case 3 - Propose as NA in account with ACTIVE and ENROLLED AAR* 1. Login as NA (FR) 2. Propose a Surrender of Allowance of an OHA(10002564) which has at least one active and enrolled AAR → Message A should be displayed after proposal: Your surrender proposal has been recorded and assigned the identifier {0}.The transaction request with id {1} has been submitted for approval. *Test Case 4 - Propose as NA in account with NOT ACTIVE and ENROLLED AAR* 1. Login as NA (FR) 2. Propose a Surrender of Allowance of an OHA(10002564) which has no active(suspend the AAR as NA) and enrolled AAR → Message A should be displayed after proposal. Your surrender proposal has been recorded and assigned the identifier {0}.The transaction request with id {1} has been submitted for approval.	PASSED

Update Installation Details task is enriched with more information	More information needed on Update Installation Details task needs more information	Imported on: 16/12/2014 \\ From: [https://webgate.ec.europa.eu/etsis/browse/ETS-705]	*Test Case 1 - New installation info* 1. Log in PT as NA 2. Update Installation tab info for PT 632- Propose the task 3. Before approving it check request data panel. 4. There should be the new "installation - Current Details" tab *Test Case 2 - New aircraft operator info* 1. Log in PT as NA 2. Update aircraft operator tab info for PT 10000696- Propose the task 3. Before approving it check request data panel. 4. There should be the new "Aircraft operator - Current Details" tab *Test Case 3 - Check older tasks* 1. Log in PT as NA 2. In Task List, History check tasks with request ids (383611 for installation and 226777 for aircraft operator) 3. Request panel info should be include the new additions	PASSED
Screen detail correction when adding AR/AAR.	Message repeated (when emails do not match)		*Test Case* 1. Log in PT as NA 2. Navigate to "Additional Authorised Representative Addition" page in order to add another AAR, for an open account 3. In "E-mail Address" and "Confirm E-mail Address "fields insert different character sequences. 4. Screen should resemble the attached one (Only one yellow highlighting appears in first field and the message is: "Confirm E-mail Address")	PASSED
Screen design issue when proposing transactions with CER/ERU units	Transfer of KP units - wrong balances		1. Navigate to an account with multiple CER or ERU units of multiple projects of CP1 and CP2 (in our test: 643 of Portugal). 2. Click on "Holdings" tab. 3. Ensure CER and ERU holdings appear in multiple lines, one line per project. 4. Click on "Propose a transaction" 5. Click on "Transfer of AAU, RMU, ERU, CER, lCER and tCER" 6. In the next screen ensure that CER and ERU units appear grouped per CP; the units are not grouped per project; the projects appear in the drop-down list "Project".	PASSED

Account statement screen shows CP1 units as eligible if contained in white list; this is now fixed	Account statement screen shows CP1 units as eligible if contained in white list	After 31/3/2015, all CER/ERU_from_AAU of CP1 are ineligible regardless of ICH list. This does not happen in FAT-->account statement screen, where the units are shown eligible if they are in FAT e.g. PT 643 May 2018	Repeat the following for CER, ERU from AAU units *Test Case 1 - Transfer units not belonging to White List* 1. Log in RO as NA 2. Transfer units not belonging to white list from account 666 to 667 (both are PHA) 3. In Transactions, transaction id => Transaction PDF, check that units are ineligible. Repeat for CER *Test Case 2 - Transfer units belonging to White List* 1. Log in RO as NA 2. For account 666, insert a project into ICH Lists (Positive) 3. Repeat the transfer as above, result should be the same - ineligible units *Test Case 3 - Check that only CER/ERU_FROM_AAU have eligible/ineligible flag in Approve Transaction Request* 1. Log in PT as NA. Use account 643 as transferring, and 10000956 as acquiring. 2. Propose transaction for CER and ERU_FROM_AAU units and a third for RMU 3. Check in Approve Transaction Request that in first and second case, there are ineligible and eligible units, while in third, units contain no flag	PASSED
Unrecoverable error proposing a transaction in a trading account with a validated AAR; this is now fixed	Unrecoverable error proposing a transaction in a trading account with a validated AAR	An unrecoverable error occurs when a transaction to a non-trusted account is proposed in a trading account that has an AAR in validated status. The error occurs after clicking on the "confirm" button in the transaction page.	*Test Case - Unrecoverable error* 1. Log in GR as NA 2. In account 10040(Trading) add AAR GR900000000005 which must be Validated 3. Perform a CER unit transaction from PT 643 to GR 10040. 4. No red screen should appear at Confirm button *Test Case - Regression tests* 1. Log in RO as NA. For RO 655, make sure an exchange transaction is completed. 2. Log in PT as NA. For PT 643, perform an external transaction to JP-100-100. 3. Log in EU as CA, and in EU ETS, Pre-Allocation link, perform a transfer. Approve as another CA and check completion of transaction.	PASSED

Change in "Preferred Language" for AH is now submitted without triggering a workflow for approval	Change in "Preferred Language" for AH	Dear service desk Right now when an account holder wants to change Preferred Language in the registry we as NA has to approve this in the task list. That should not be something we should approve. This change has no influence on our work and it is not in any matter a security issue nor something we need documentation for. So I will suggest that this kind of change can be performed by the account representatives without a NA has to approve the task. Kind regards Anita	*Test Case 1 - Update only language* 1. Log in GR as NA 2. In account 383 update only Preferred language field 3. "Preferred language has been successfully set to XX" message should be returned to user and hitting Back should reveal the update. *Test Case 2 - Update postcode and language* 1. Log in GR as NA 2. In account 383 update Postcode field and Preferred Language field. 3. "Your request to update account holder information has been submitted under identifier xxxxx." and "Preferred language has been successfully set to XX." messages should appear 4. Clicking Back should show the change on language. 5. Approve the request and confirm the Postcode change *Test Case 3 - Update only postcode* Repeat above test without dealing with the language. Expected result should exclude any language change. *Test Case 4 - Submit without any edit* 1. Log in GR as NA 2. In account 383 don't update anything and click "Submit" 3. "Please modify some data before proceeding." message should appear in yellow font. *Test Case 5 - Edit only identity document data* 1. Log in GR as NA 2. In account 383 update identity document data and click "Submit" 3. "Your request to update account holder information has been submitted under identifier XXXXX" should be returned and clicking "Back" reveals the identity document change. *Test Case 6 - Regression* Make sure not another request can occur if else is pending Changing the preferred language is forbidden if else request is pending	PASSED

Include information on the AAR approval task as to whether or not the transfer is to a Trusted Account	Include information on the AAR approval task as to whether or not the transfer is to a Trusted Account	Imported on: 16/12/2014 \\ From: [https://webgate.ec.europa.eu/etsis/browse/SDB-1556]	*Test Case 1 - Message when transaction is Transfer Of Allowances* 1. Log in PT as NA 2. For a Trading account, propose a Transfer Of Allowances by writing the full account in appropriate fields. (EU-100-634-0-62) 3. In approval screen, appropriate message must exist: "The acquiring account is outside of the Trusted Account List" Repeat 2 more times, for cases of selecting acquiring account from Trusted accounts, both tabs, with expected message: "The acquiring account is on the Trusted Account List" *Test Case 2 - Message when transaction is Transfer of AAU, RMU, ERU, CER, lCER and tCER* Repeat first test cases Expected messages are the same as above. *Test Case 3 - Account other than trading* 1. Log in registry as NA 2. Initiate a transaction from 643 to EU-100-637-0-47 3. In approval screen no message (test case 1 - step 3) must exist *Test Case 4 - History tab* 1. Log in registry as NA 2. Propose and approve previous transactions for any account. (Trading and not) 3. In History tab, no message should exist	PASSED
If an AR has appointed a verifier to his account and the verifier account is being closed before the appointment has been confirmed the AR cannot appoint a new verifier	If an AR has appointed a verifier to his account and the verifier account is being closed before the appointment has been confirmed the AR cannot appoint a new verifier	I wanted to check what happens when a verifier account is being closed. Result: the verifier gets removed from all accounts were he was appointed verifier and the AR of all these account have to appoint new verifiers. However in one case the appointment was still pending. And here the appointment is not automatically rejected but the account still has the screen showing: "There is already a pending appointment request with id: 19216". This basically means that the account is stuck as no new verifier can be appointed and the only verifier cannot reject any longer as he no longer can no longer access the system.	1. Locate an OHA and request addition of a verifier by clicking "Appoint Verifier" in the Verifier tab. Note the request ID mentioned in the green confirmation window. 2. Repeat for an AOHA, requesting addition of the same verifier. Note the request ID mentioned in the green confirmation window. 3. Close and approve closing of the verifier account. 4. Connect as NA and navigate to tasklist -> History. 5. Search for the request IDs noted in steps 1 and 2 and ensure they have outcome REJECTED.	PASSED

Cancelled tasks appear in the active task list; this is now fixed	Cancelled tasks appear in the active task list	Imported on: 26/01/2016 From: https://webgate.ec.europa.eu/etsis/browse/SDB-2814	*Test Case 1 - Change request to not OPEN and check it does not exist in Exclusive/General Task List* 1. Execute query like: select * from task_item where request_id = 481587; update task_item set IS_OPEN = 0 where request_id = 481587 2. Log in registry and in task list check request 481587 is non existing. *Test Case 2 - Additional testing* (Log in GB registry) 1. Create an account under Account Holder A (account name: SDB-2814_Test) 2. Create an account under Account Holder B (account name: SDB-2814_Test_C) 3. Log in as an AR of "SDB-2814_Test" account and request the addition of "SDB-2814_Test_C" account to your trusted account list 4. Close "SDB-2814_Test_C" account 5. Log in again as the other AR of Account A. 6. On the Trusted Account page you can no longer see the request to add B to the TAL 7. Go to the Task List. You should not see the TAL addition request in a cancelled state. It should not exist at all.	PASSED
Login with a 14-digits GSM number was not allowed; this is now fixed.	CLONE - Login is not possible due to mobile phone number length	Dear colleagues, the login to the ACC environment is not possible, as the following error occurs. KR Günter	*Test Case* 1. Set as GSM number to a user in UserData.xml in ECAS; the user is NA 2. Set it as MOBILE_PHONE_NUMBER in USER_DETAILS record corresponding to a USER corresponding to the user of step [1]. 3. Log in normally. 4. Propose a transaction (use acquiring account PT-100-643-10) and reject it using the GSM. 5. Click "Edit Personal Details" and propose to change the mobile phone number and add one more digit. 6. Submit the update request. 7. Reject the update request. Repeat test case for: +29821 +48510608586111 +298213772 +436648031631380 +4312345678912345678912345678 9 +431234567891234567891234567891234567891	PASSED

Searching users via wildcard in firstname/lastname is implemented.	CLONE - Using wildcard in user search is not possible anymore	If I search for a user in the acceptance environment by entering part of his first or last name with an asterisk, I receive the attached error "A name may contain maximum 140 characters, dots and dashes". It is important to be able to find a user by entering part of his name.	*Test case* 1. Log in EU as NA 2. In Administration tab, in Users, in First and Last name fields, try: - Last name: nadmin* => 2 results - First name: *enafname => 1 result - First name: *adm* => 3 results - First name: *se*, Last name: *change => 1 result - First name: Esd, Last name: CENTRAL=> 1 result - First name: Esd, Last name: cEntral => 1 result - Last name: *en*ral => 1 result	PASSED
Update of error messages when pending account management requests exist	List of pending requests per account - (update error messages)	Scenario: Sometimes you need to know whether a request is pending for an account. Problem: This should be done via (the task list #151 and/or) the list of account requests (#047), but you can not search on this page for a specific account or account range. Possible solution: Add the account name and ID in the task list and list of account requests and allow filtering on both.	*Test Case 1 - Personal details update there is pending request* 1. Log in RO as NA in one browser and as nadmin1 in another browser concurrently. 2. Navigate NA and nadmin1 in Administration -> User Management, in the personal details of the same user. 3. Propose a personal detail update - Check green confirmation message 4. As nadmin1, repeat the process. Ensure the following message appears: "Only one personal details update request can be active for one user at any given time. There is a personal details update request attached to this user which has not yet been completed. Its Request ID is 512890. You can check your task list for who is able to confirm or to reject this task. You may also be able to reject the update request task by yourself, if no longer needed." A Jira issue was created (EUCR-2934) to implement this issue in a future release for the following other requests: - Addition of AAR (also for ESD) - Replacement of AR (also for ESD) - Replacement of AAR (also for ESD) - Removal of AR (also for ESD) - Removal of AAR (also for ESD) - Account closure	PASSED
Clicking on URID link in Personal Details task does not let you return; this is now fixed	Clicking on URID link in Personal Details task does not let you return	If you submit a "Personal Details Update" task there is a hyperlink to the full user details. If you click this in order to bring up the users contact details you cannot then get back to the Task other than pressing the browser Back button.	1. Connect as NA and navigate to Administration -> Users 2. Click on a user's URID 3. Submit a modification of personal details 4. Navigate to tasklist -> exclusive tab and click on the top task 5. Click on the URID and ensure a pop-up window appears with the user's personal details, business details and account in three tabs corresponding to the clicked URID. As a regression ensure the user's personal details, business details and business details update function normally.	PASSED

If an ITL request for reconciliation, for a country, does not arrive on EUCR/EUTL the second request from ITL will generate issues on both systems because a reconciliation snapshot does not exist; this is now fixed	If an ITL request for reconciliation, for a country, does not arrive on EUCR/EUTL the second request from ITL will generate issues on both systems because a reconciliation snapshot does not exist.	https://webgate.ec.europa.eu/etsis/browse/-1026 Please find below the concluded approach: {quote}a) If the first request for reconciliation does not exists in our databases {quote} EUTL and EUCR will ensure that in such a case no exception will be thrown. The message will be stored in message log table. No response will be send back to ITL. {quote} b) In the second case, if the first request for reconciliation exists in our databases and the reconciliation snapshot is not created yet {quote} In cases where the message fails to be processed due to missing snapshot data, both in EUTL and EUCR it will be retried as defined by the queues' retry policy and if no success, will finally end up to an error queue, as to be implemented in the scope of -1028, -1029. An email can be send as to be implemented in the scope of -1030, -1031. The queue retry policy for reconciliations in both systems to be analysed and re-configured as needed. These details will be finalized during design and implementation. {quote}c) In the third case, and last one, first request for reconciliation exists in our databases and the reconciliation snapshot was created{quote} Proceed as normal	Issue tested with JUnit: ReconciliationProvideTotalsTest	PASSED

CP1 RMU LULUCF displayed in "Conversion A" and "Conversion B" proposal screens; this is now fixed	REGRESSION - CP1 RMU LULUCF displayed in "Conversion A" and "Conversion B" proposal screens	Given I'm logged in as NA And there is PHA account with CP1 RMU (Forest management (FM)) and CP2 RMU (Wetland, Drainage and Rewetting (WDR)) When I propose Conversion A Then on transaction proposal screen I can choose one of above LULUCFs In this case only LULUCFs related to CP2 RMU units should be displayed. When user tries to propose Conversion A using LULCF that is not related to CP2 RMU units, transaction is not proposed but there is no error displayed (nothing happens).	1. Locate an account with RMUs. 2. Set all its RMUs to orig CP1 and appl CP1. 3. Ensure the Conversion A is not possible to be submitted for this account. 4. Set all its RMUs to orig CP2 and appl CP2. 5. Ensure the Conversion A is possible to be submitted for this account. 6. Set some RMUs to orig CP1 and appl CP1 and some RMUs to orig CP2 and appl CP2. 7. Ensure the Conversion A is possible to be submitted only for the CP2 RMU units for this account (with originating country code the current MS). The following queries were users for these updates. select * from unit_block where account_id in (select account_id from account where identifier = 644) and unit_type = 'RMU' order by last_modified_time desc; update unit_block set original_period = 2, applicable_period = 2 where ID in (480, 479, 478, 477);	PASSED
Screen design issue for CP2 AAU units.	KP2 Demo Comment: CP2 AAU units has no value in eligibility column on transaction proposal screen (inconsistent with other units e.g. CP1 AAU)	CP2 AAU units has no value in eligibility column on transaction proposal screen (inconsistent with other units e.g. CP1 AAU)	*Test Case* 1. Log in as NA 2. For an account which contains AAUs, propose a transaction of type "Transfer of AAU, RMU, ERU, CER, ICER and tCER" 3. Ensure the "Eligibility" column is blank in the transaction proposal screen, for all AAUs	PASSED
No country code in projects for Transfer to SOP for Conversion; this is now fixed	No country code in projects for Transfer to SOP for Conversion	When choosing the transaction Transfer to SOP for Conversion, the drop down list of projects does not contain the country code. This is inconsistent with conversion A, JI Projects and other places where projects are listed. Projects should have the country code everywhere.	*Test Case* 1. Log in PT as NA 2. Click on Transfer to SOP for Conversion transaction for account 643 3. In dropdown list, country code should be visible (PT302 (TRACK_1))	PASSED

Change of message in footer for conversions	Conversion B of quantity below the mandatory one is allowed by EUCR (Implementation + Documentation)	1. Project GRXXX has a conversion limit of 100 under track 2 2. Make a conversion A of 2. 3. Try a transfer to SOP. Any quantity other than 2 is forbidden. 4. Make a transfer to SOP of 2. 5. Conversion Entitlement = 98 6. Try a Conversion B Try 20 units. EUCR allows me to propose and approve. It is only ITL check 5065: For the second conversion of AAUs or RMUs for an applicable commitment period for a given track 2 JI project, the quantity to be converted must be equal to the conversion limit for that project less any quantity of ERUs converted under the project during previous conversion cycles and less the quantity of ERUs converted under the associated "conversion A" transaction and transferred to the SOP Adaptation Fund account for that project. that stops the transaction. The behaviour should be consistent. The code below from chapter 29.6.2 of UCS.13 Holdings and Transfers is not implemented. <<new_code>> For Track_2 projects: The quantity must be equal to: Limit – Sum(Completed Conversion A of this Project) – Sum(Completed Conversion B of this Project)	1. Initiate a Conversion B for a Track_2 project 2. Ensure below the account holdings, the footer states: The mandatory quantity for this transaction is: Project Limit - Converted Quantity (including quantity transferred to SOP) = .. .	PASSED
AAU units are not properly marked on the transaction breakdown screen; this is now fixed	AAU units are not properly marked on the transaction breakdown screen	When the transaction exceeds maximum number of unit blocks, EUCR displays a screen suggesting how transactions should be broken into smaller pieces. In hat screen AAU units are not market neither Subject to SOP nor Not subject o SOP.	1. Locate an account with CP2 AAU units; some are subject to SOP and some are not subject to SOP. 2. Mark all AAU CP2 unit blocks of this account as reserved except 10 unit blocks. This is done with a query such as: update unit_block set reserved_for_tx = 'PT999' where ID in (561758, 562287, 562286, 505242); 3. Set the configuration parameter itlIntegrationSettings.maxTransactionUnitBlocks = 5 and restart the application server. 4. Propose a transfer to another registry of all available CP2 AAU units of this account. 5. Afetr ECAS confirmation, EUCR presents an alternative transaction screen where AAU units are characterised as either "Subject to SOP" or "Not Subject to SOP".	PASSED

Screen design issue for account holdings	Please align the unit holdings panel in the holdings tab to the left and set it to 30% of the width of the screen	Please align the unit holdings panel in the holdings tab implemented for ETS-5098 to the left and set it to 30% of the width of the screen. As per mail discussion on 10/06.	*Test Case* 1. Log in GR as NA 2. For an account check in Holdings tab, that view resembles the one in attached file. 3. First table with columns Unit Type and Balance should be placed left and set to 30% of the screen width	PASSED
A blank issuance limit produced an error; this is now fixed.	NumberFormatException in Issuance Limits	1. Go to EU ac CA 2. Go to Kyoto protocol / issuance limits 3. Remove value from Issuance Limit field 4. press [Submit] button	*Test Case 1: Test empty values* 1. Go to EU as CA 2. Go to Kyoto protocol / issuance limits 3. Remove value from one or more Issuance Limit fields 4. press [Submit] button 5. Should get message; "Unit quantities may only be positive integers." *Test Case 2 - Regression: Test negative values* Repeat TC1 with negative value and with the same expected message. *Test Case 3 - Regression: Test alphabetic values* Repeat TC1 with value equal to "sddf" and with the same expected message. *Test Case 4 - Regression: Test non alpha-numeric values* Repeat TC1 with value equal to "+-*/*/" and with the same expected message. *Test Case 5 - Regression: Test numeric values less than issued* 1. Repeat TC1 with value positive integer, less than Issued quantity. 2. The error message appears "You cannot enter an issuance limit (2) less than the issued quantity (28247)." 3. Submission is cancelled *Test Case 6 - Regression: Test numeric values more than issued* 1. Repeat TC1 with value positive integer, more than Issued quantity. 2. The green message appears "The KP issuance limits have been updated." 3. The values are saved.	PASSED
Change in screen message	Correct Emissions says Enter Emissions in confirmation screen	The label in the emissions confirmation screen will be modified to "Correct emissions".	1. Locate an OHA with emissions. 2. Submit an emissions update request 3. Ensure the confirmation screen title is "Correct Emissions" Repeat for AOHA.	PASSED

Upload of auction table error; this is now fixed	Auction Table Error while uploading XML file - after Confirmation Popup	This problem might be related to other -747, and -750, but looks like RedBox error is happening in different moment - after confirming Popup window. See movie attached. Generally while uploading xml file (attached) there is displayed Popup confirmation window, with proper recognising if on xml there is ADD/UPDATE/DELETE and the xml details are also displayed in datatable on popup window. then while clicking Confirm button I got the redBox error. Part of log file : EU/registry_EU.log is attached as well: Since in -747 the problem was with wrong property "id" instead of "identifier", now in this xml this propsrty is correct, but the problem is in different place. After digging little more on this problem: looks like in EU registry there are 3 Auction Delivery Accounts: 5000187, 5000440 and 5001185. And whenever I upload xml file with giving as auction-delivery-account those first two accounts, then there are no errors. If I will use account 5001185 then this error is happening after displaying popup confirmation	*Test Case 1 - Upload xml with wrong DTYPE of account* 1. Log in EU as CA 2. In DB change DTYPE for account identifier 10101 to ineligible value. 3. Set status to ACTIVE 4. Upload xml in Auction tables tab, and click Confirm 5. Should get error: 7760: The account identifier is not that of an Auction Delivery Account. *Test Case 2 - Upload xml with status other than ACTIVE for account* 1. Log in EU as CA 2. In DB change STATUS column for account identifier 10101 to "REQUESTED" value. 3. Set DTYPE to "AuctionDeliveryAccount" 4. Upload xml in Auction tables tab, and click Confirm 5. Should get error: 80209: The account is closed: {0} *Test Case 3 - Upload xml with correct DTYPE and status ACTIVE for account* 1. Log in EU as CA 2. In DB change STATUS column for account identifier 10101 to "ACTIVE" value. 3. Set DTYPE to "AuctionDeliveryAccount" 4. Upload xml in Auction tables tab, and click Confirm 5. Should get success message: "The auction table has been imported."	PASSED
Email is created at user validation by NA.	No email sent to registered user after his manual validation by NA	When the new user (status: REGISTERED) is manually validated by NA there is no emails sent to this user informing that his enrolment was accepted. In case of automatic validation (e.g. when REGISTERED user is added as AR to account) Send Enrolment Key task is created and after its approval "Enrolment Confirmation" email is sent. Same email should be sent when user is validate manually.	1. Connect as NA and navigate to Administration->Users 2. Filter for status = "Registered" 3. Locate a user and click his URID 4. Click the button "Validate" 5. The green message box "Confirmation: The users have been validated." appears. 6. Ensure the following email is created and sent to the user "Dear <<first name last name>>, Your enrolment in the <<registry acronym>> registry has been accepted. An enrolment key will be sent to you soon. When you receive this key please click on the link "Enter your enrolment key" above menu and enter the key to fully activate your access to the registry. Sincerely yours, The registry administrator Do not reply to this email address as the mailbox is not monitored. Please contact your national administration should you require further assistance."	PASSED

Problem with final EUTL response status for Entitlement Transactions in ESD; this is now fixed	Problem with final EUTL response status for Entitlement Transactions in ESD	There is situation in ESD (EUCR-DEV, 6.4.4.1) where after performing Entitlement Transaction EUTL final response stuck in "EUTL Approved", but when looking for this transaction in Entitlement Transactions the response is 4-Completed, which mean this transaction was finished and finally the Entitlement is added on the Acquiring account. At the attached picture , you can see that for regular ESD-AEA transfer final EUTL response is "Approved". So why on Entitlement Transactions this response is "EUTL Approved" which mean: "Not entirely completed" On Unisystems FAT EUCR we see also that some transactions stay in this status. See screenshot.	1. Connect to ESD and propose an ESD Entitlement transaction 2. Approve the transaction request 3. Ensure the transaction is completed. 4. Perform the following query and ensure the column STATE of the last record has value APPROVED: select * from request_state where request_id = <<the request ID created at step 1>> order by 1; Tested in FAT with transaction ED220.	PASSED
Unenrollment confirmation page displays empty table of users; this is now fixed	Unenrollment confirmation page displays empty table of users	Unenrollment confirmation page displays empty table of users. See attachment	*Test Case 1* 1. Log in GR as NA 2. For user GR108411640474, start Unenrollment procedure 3. Appearing screen should contain URID, Name and Login columns in User tab	PASSED
Add all new transactions in drop down of related screens v2	Add all new transactions in drop down of related screens v2	Add all new transactions in drop down of related screens v2	1. Connect to ETS, choose English language and navigate to Accounts -> Transactions 2. Ensure the Transaction Type drop-down box contains the following transaction types spelled as shown below: 01-00 Issue Of AAUs and RMUs 01-22 Issuance of allowance in Art. 63a registry 01-24 Issuance into Art. 63a pool 01-30 Issuance Aviation Allowance 01-31 Issuance General Allowance 01-32 Decoupling 01-33 Issuance Aviation Allowances Banking 01-34 Issuance General Allowances Banking 01-51 Issuance CP0 01-72 Issuance of Allowances for Exchange 02-00 Conversion 02-56 Conversion of AAUs or RMUs into ERUs (Conversion A) 02-57 Conversion of AAUs or RMUs into ERUs (Conversion B) 03-00 External Transfer Kyoto Units 03-02 Surrender Kyoto Units 03-12 ESD Transfer of 03-16 ESD Return of KP units 03-21 External transfer CP0 03-44 ESD Reversal KP 03-47 Transfer to SOP Adaptation Fund for First External Transfer of AAUs 03-49 Transfer to SOP for Conversion 03-75 Set Aside 03-82 Reversal Surrender Kyoto Units 04-00 Cancellation Kyoto Units 04-02 Surrender Kyoto Units Non KP Registry 04-03 Retirement CP0 04-22 Retirement for Article 63a registries	PASSED

			04-26 Cancellation in Art. 63a registry 04-45 Article 3.7ter Cancellation 04-46 Ambition Increase Cancellation 04-48 Mandatory Cancellation 04-91 Cancellation Against Deletion 05-00 Retirement 05-01 Retirement of surrendered former EUA 05-19 Retirement of ESD Used Units 06-00 Replacement 07-00 Carry Over 07-38 Carry Over of ERUs or CERs 07-39 Carry Over of AAUs 08-00 Expiry Date Change 10-00 Internal Transfer 10-01 Cancellation CP0 10-02 Surrender Allowances 10-04 Surrender Kyoto Units (AOHA) 10-104 Reversal Cancellation 10-124 Reversal Cancellation Of Surrender Non Kyoto Units 10-135 Reversal Allocation Aviation Allowances 10-136 Reversal Allocation General Allowances 10-16 ESD Return of KP units (Internal) 10-171 Reversal of Transfer Out of Kyoto Units for Exchange 10-172 Reversal of Receipt of Allowances for Exchange 10-189 Reversal Administrative Deletion 10-190 Reversal Deletion 10-20 Administrative Transfer 10-22 Transfer between Art. 63a registries 10-24 Transfer to Art. 63a gateway 10-25 Transfer from Art. 63a pool 10-26 Transfer from Art. 63a gateway 10-272 Reversal of Issuance of Allowances for Exchange 10-33 Deletion Aviation Allowances Banking 10-34 Deletion General Allowances Banking 10-35 Allocation Aviation Allowances 10-36 Allocation General Allowances 10-37 Auction Delivery 10-41 Cancellation and replacement 10-52 Issuance of former EUA 10-53 Allocation of former EUA 10-54 Issuance of force-majeure allowance 10-55 Correction To Allowances 10-61 Conversion of surrendered former EUA 10-71 Transfer Out of Kyoto Units for Exchange 10-72 Receipt of Allowances for Exchange 10-82 Reversal Surrender Allowances 10-84 Reversal Surrender Kyoto Units (AOHA) 10-86 Return of Excess Allocation 10-89 Administrative Deletion 10-90 Deletion 10-92 Corrective transaction for reversal 10-93 Corrective transaction for reversal	

JiProjects datatable doesn't refresh after confirmation dialog close; this is now fixed	JiProjects datatable doesn't refresh after confirmation dialog close	In JiProjects section, after clicking "Confirm" in deletion dialog, table appears not refreshed.	UC_CV_015_TC_01: DELETE PROJECT Refer to Test Case of EUCR-2884	PASSED
ESD Account Search - Forgets filters; this is now fixed	ESD Account Search - Forgets filters	ESD Account Search - Forgets filters when going from one page to another. If year 2015 is selected and the user tries to go to the next screen, all accounts are retrieved.	*Test Case 1 - Year filtering and sorting* 1. Log in ESD as NA 2. In Accounts link, select a Year (2013) and click Search 3. Note the resulting number 4. Click Next (arrow sign button). (Repeat with dropdown row selections: 10,20,50) 5. Rows found sign should be equal to step's 3, and Year equal to 2013. 6. Clicking on columns headers(Identifier, Member State, Year, Balance, Status) should result in the appearance of the same original data of step 2 *Test Case 2 - XML Export* 1. Log in ESD as NA 2. In Accounts link, select a Year (2013) and click Search 3. Click Search and Export 4. XML and UI info should be the same *Test Case 3 - View Details, Suspend and Close actions* 1. Log in ESD as NA 2. In Accounts link, select a Year (2013) and click Search 3. Close and suspend two different accounts. 4. Re-enter screen and check the update for these accounts. 5. Test View Details function.	PASSED
ESD Entitlements Screen - Forgets filters when going to next page; this is now fixed	ESD Entitlements Screen - Forgets filters when going to next page	ESD Entitlements Screen - Forgets filters generally	*Test Case - Year filtering and sorting* 1. Log in ESD as NA 2. In ESD Transactions link, select a Year(2013) and click Search 3. Note the resulting number 4. Click Next (arrow sign button). (Repeat with dropdown row selections: 10,20,50) 5. Rows found sign should be equal to step's 3, and Year equal to 2013. 6. Clicking on columns headers(MS, Year, Entitlement Limit 1, Entitlement Limit 2, Remaining Limit 1, Remaining Limit 2) should result in the appearance of the same original data of step 2 *Test Case 2 - XML Export* 1. Log in ESD as NA 2. In ESD Transactions link, select a Year (2013) and click Search 3. Click Search and Export 4. XML and UI info should be the same	PASSED

After JI project deletion, the screen should be refreshed; this is now fixed	After JI project deletion, the screen should be refreshed		*Test Case 1* 1. Log in EU as NA 2. In JI Projects, check a project 3. In another browser, include the project identifier in a conversion A (EU 296). 4. Complete the proposal 5. In first browser, click Delete and Confirm. 6. Below message should be returned and project shouldn't be deleted.: 80402: Cannot delete project EUXXX 80408: Project EUXXX participates in a pending or completed conversion cycle 7. Re-enter JI Projects and click Search 8. Reserved project does not have a selection box available. 9. As another NA, reject the task (in step 3) 10. Re-enter JI Projects, click Search 11. Previously reserved project now has a selection box available. *Test Case 2* 1. Log in EU as NA 2. Check a project in JI Projects, which is not included in any Conversion cycle (e.g. identifier = 445) 3. Click Delete and Confirm. 4. Project should be deleted in DB and UI and page refreshes	PASSED
Missing page reference in Account Delegation Edition Confirmation; this is now fixed	Missing page reference in Account Delegation Edition Confirmation	Steps to reproduce A. Delegate Account In "Account Main", press "Delegate". In "Account Delegation - Select External Platform", select an external platform and press "Next". In "Account Delegation", add a representative and press "Submit". In "Account Delegation Confirmation", press "Back". B. Edit Account Delegation In "Account Main", press "Edit Account Delegation". In "Account Delegation Edition", _*remove all representatives*_ and press "Submit". In "Account Delegation Edition Confirmation", the page number does not exist, as in the attached image.	*Test Case* 1. Log in PT, as NA 2. For PT 632, in "Account Main", press "Delegate". 3. In "Account Delegation - Select External Platform", select an external platform and press "Next". 4. In "Account Delegation", add a representative and press "Submit". 5. In "Account Delegation Confirmation", press "Back". 6. In "Account Main", press "Edit Account Delegation". 7. In "Account Delegation Edition", remove all representatives and press "Submit". 8. In "Account Delegation Edition Confirmation", the page number must exist. as in attached image but with non empty field.	PASSED

Cleanup Script - Add retirement, cancellation	Cleanup Script - Add retirement, cancellation	Cleanup Script - Add retirement, cancellation, esd all all translations should clear KP2_ENT_TRANSACTION_LOG	Repeat the following for retirement, ambition increase cancellation, art3.7 cancellation, mandatory cancellation, voluntary cancellation: 1. Submit a transaction request but do not sign it in ECAS 2. Wait 30 minutes 3. Ensure the latest transaction request for this account is REJECTED via the query: select state, tr.* from transaction_request tr, request_state rs where transferring_account_id = <<the id of the used account>> and tr.request_state_id = rs.request_state_id order by datetime desc;	PASSED
"No records found" in un-enrollment confirmation screen	"No records found" in un-enrolment confirmation screen	After proposing un-enrolment of user, his details are not shown. Instead a message "No records found" appears on screen.	*Test Case 1* 1. Log in GR as NA 2. For user GR108411640474, start Unenrollment procedure 3. Appearing screen should contain URID, Name and Login columns in User tab	PASSED

Check 7371 message is added	Check 7371 message	Check 7371 was added in EUTL 8.0.2, but was not included in 7.51 EUTL checks xls.
		
		Added in 7.52 checks xls
		
		Message to be added in EUCR
			1. Locate a terminated transaction in EUCR by navigating to Accounts->Transactions->Filter for status = Terminated.
			2. Update the response code so that 7371 response code is simulated for this transaction. This can be done as follows:
			select * from transactions where transaction_identifier = 'MT192';
			select * from transaction_response where transaction_id = 690491;
			update transaction_response set response_code = 7371 where transaction_id = 690491;
			3. Navigate to the transaction's response codes and ensure the code 7371 appears, with details:
			"7371: Transfers to the CDM SOP Adaptation Fund Account can only be of type "Transfer to SOP for Conversion" or "Transfer to SOP for first External Transfer of AAUs"."
				PASSED

Parent issue to control all changes in AR/AAR actions on accounts	New logic for performing actions in "Authorised Representatives" and "Additional Authorised Representatives" tabs	This parent ticket groups all individual issues which are related to the new mechanism and logic for rendering action buttons in "Authorised Representatives" and "Additional Authorised Representatives" tabs. These issues should be tested simultaneously. The latest analysis document may be found [here|https://sc136.unisystems.gr:4443/jira/secure/attachment/19864/EUCR-495%20-%20Changes%20in%20user%20rights%20on%20accounts_Impl_v6.docx].		PASSED
Checks as per when account management buttons appear	EUCR-2917 Apply mechanism for AR / AAR actions in ESD pages	"Authorised Representatives" and "Additional Authorised Representatives" tabs should be aligned between ETS and ESD. The new mechanism should be applied to ESD as well.	Tested successfully. The cases (see EUCR-495) when each button is rendered is aligned across ETS and ESD.	PASSED

Checks as per when account management buttons work after clicking	EUCR-2917 Post-condition checks for all AR/AAR action buttons in ESD, ETS	After pressing the buttons in AR/AAR tabs, exactly the same checks should be executed, on the post-condition level, according to the new mechanism defined in EUCR-495. It applies to both ESD, ETS and the following buttons: * Remove * Replace * Update * Suspend * Restore	Tested successfully. The related buttons are rendered aligned to the access & user status (see EUCR-495)	PASSED
Allow replacement of unenrolled user	EUCR-2917 Not possible to replace a suspended AR	Imported on: 16/12/2014 \\ From: [https://webgate.ec.europa.eu/etsis/browse/ETS-6577] According to the document on SDB-2139 it should be possible to replace a SUSPENDED AR irrespective of their enrolment statue. This is not possible. The only buttons available (assuming there are at least 2 other ARs) are to REMOVE or RESTORE. If there were only two reps on the account then the only option is to Restore. This means that replacing someone in this state becomes a 2 stage process. The usual scenario is because we have found out that someone has left the company so, if there are only 2 ARs on the account, we suspend the one who has left. the account holder usually wants to replace them but all they can do is add. The removal has to be done as a second change. It ought to be done in one go, exactly as if the AR is not suspended.	*Test Case 1* 1. Log in EU as NA 2. For account 383, suspend authorized representative GR900000000014, confirm, and replace with another. 3. New AR should exist in the place of the old.	PASSED
Checks actions on account	EUCR-2917 Changes in user rights on accounts	This is from CMB of 03/12/2013	Tested successfully - all cases are described on the document (EUCR-495 - Changes in user rights on accounts). Please refer to tab **SDB-2139** in this document.	PASSED

Checks special cases of actions on accounts	EUCR-2917 CLONE - Removal / Replacement / Update / Suspension of ARs and AARs according to the status	We would like to make a comprehensive review of the actions that can be taked towards ARs and AARs taking into consideration their roles and the number of ARs and AARs per account. In the table attached to the issue it's the behaviour we propose so that we are in line with the legislation and we have a common understanding of the issue. Here are the guidelines: - The ARs in Unenrollment Pending should be treated like the ones in Enrolled Status - View Only ARs never count when deciding on MinNrAR - The Unenrolled users are as good as "dead" since this action is irreversible and they won't have access to the account - When removing an unenrolled so that the account remains with one AR in (Enrolled OR Unenrollment Pending OR Verified) you should get a Warning message explaining that this action is allowed, but you are under the threshold of Minimum Number of ARs, you will not be able to make a certain variety of actions and you are advised to appoint another AR as soon as possible	Please refer to the attachment. Results of Tests (I Tests on user Removal) 1a) The button (Remove") is not rendered on the tab "AR" & "AAR" of the account. (" EU-100-10000504-0-41" with Status "Suspended") , (ETS - Union Registry PT) . Also, the other distinct buttons are not rendered (Replace, Update, Suspend, Restore). 1b) The button (Remove") is not rendered on the tab "AR" & "AAR" of account ("EU-100-10001866-0-21" with Status "Suspended") , (ESD - Union Registry BE) Also, the other distinct buttons are not rendered (Replace, Update, Suspend, Restore). 2a) The button (Remove") is not rendered on the tab "AR" & "AAR" of the account. (" EU-100-10000666-0-7" with Status "Transfer Pending") , (ETS - Union Registry PT) Also, the other distinct buttons are not rendered (Replace, Update, Suspend, Restore). 2b) The button (Remove") is not rendered on the tab "AR" & "AAR" of the account. ("EU-100-10001866-0-21" with Status "Transfer Pending"- on the db layer level - on the real time condition, it is not possible any account to change of status "Transfer pending) , (ESD - Union Registry PT) Also, the other distinct buttons are not rendered (Replace, Update, Suspend, Restore). 3a) The button (Remove") is not rendered on the tab "AR" & "AAR" of the account. (EU-100-633-0-67 with Status "CLOSED" (ETS - Union Registry PT) Also, the other distinct buttons are not rendered (Replace, Update, Suspend, Restore). 3b) The t button (Remove") is not rendered on the tab "AR" & "AAR" of the account. EU-100-10001862-0-41 with Status "CLOSED" (EDS - Union Registry BE) Also, the other distinct buttons are not rendered (Replace, Update, Suspend, Restore). 4 a) The button ("Remove") is not rendered on the tab "AR" & "AAR" of the account. EU-100-10000505-0-36 with Status "Open" (ETS - Union Registry: PT) . We have executed a request to update installation information (Installation Id :10869) has been submitted under identifier 512810. Also, the buttons "Replace" & "Restore are not rendered for the following reasons Replace : the pending request is set to "Installation UpdateRequest" Restore : the suspend button is active	PASSED

			5 a) The button ("Remove") is not rendered on the tab "AR" & "AAR" of the account. EU-100-10000510-0-11 with Status "Blocked " (ETS - Union Registry: PT) - We have executed a a request to update installation information (Installation Id :10874) that has been submitted under identifier 512817. Also, the buttons "Replace" & "Restore are not rendered. 5b) The button ("Remove") is not rendered on the tab "AR" of the account for the specific user ED999999911357 with Status "Blocked" (ESD - Union Registry CY) - Update the AR information -(Account HolderRepresentativeUpdateRequest - Refers to specific AR Also, the buttons "Replace" & "Restore are rendered for the other users The specific scenario is repeated on the account EU-100-10001866-0-21 (with same status) for "AccountClosureRequest" with the following results: 1) After the submission of the request, the status of account is set to "Suspended" 2) The distinct buttons are not rendered on the tabs "ESD ARs" & "ESD AARs" 6 a) The button "Replace" is not rendered on the account (PT-121-636-0-50 status : Open) because the number of AR =2. b) You have only rendered the button "Remove" on the View Only Authorised Representative . The specific scenario has been executed on the PT Registry for account (643) and AARs(3) PT900000000004, PT900000000003, PT483028062779 with access status = ACTIVE user status = ENROLLED and only view View Only Authorised Representative the last AR The other AARs have rendered the buttons "Replace, Update, Suspend" c) You have rendered the button "Remove" on any ARs. The specific scenario has been executed on the PT Registry for account (643) and AARs(3) PT900000000004, PT900000000003, PT483028062779 with access status = ACTIVE user status = ENROLLED (we suggest to execute the following sql command: update accesses set role_id=10115 where access_id=64769; in order to check immediately the behaviour of api) d) You have rendered the button "Remove" on the suspended user (PT483028062779). The specific sceranio has been executed on the PT	

			Registry for account (636) and the 3 related ARs(3) PT900000000004 (with access status = ACTIVE,user status = ENROLLED), PT900000000003 (with access status =ACTIVE,user status = ENROLLED), PT483028062779 (with access status =SUSPENDED, user status = ENROLLED). -- II. Tests on rejecting a removal request A) Removal of a user SUSPENDED on an account Test Scenario Registry : PT Account : 636 Authorised Representative: PT483028062779 ---> Request_id : 512891. (as as nadmin1) 1) Submit a removal of a suspended user (PT483028062779 Access State : "Suspended") 2) Reject the removal request (512891) as na 3) The (RO636468991414) is set to Access State :"Suspended" on the account (636) B) Removal of a user ACTIVE on an account Test Scenario Registry : RO Account : 655 Authorised Representative: RO636468991414 ---> Request_id : 512889. (as na) --- 1. Submit a removal of active user (AR : RO636468991414 Access State : "Suspended") 2. Reject the removal request (512889) as nadmin1 3. The user (RO636468991414) is set to Access State :"Active" on the account (655)	
Checks actions on users after sequences of actions	EUCR-2917 AR cannot be updated after remove/update/re-add sequence	see: [https://webgate.ec.europa.eu/etsis/browse/-646]	Tested successfully 1) A) ECUR a) Login to Union Registry (PT) as na b) Navigate to menu Account --> Accountw and searches the Account (643) c) Click on the "tab" AR" and select the button "Update" for the AR1 (PT900000000003 with status "Suspended)) d) Change the values on the fields " Main Phone Number" from 1 --> 4 & Alternate Phone Number on the AR1 (Suspended User) Results : (a) A request to update business details has been submitted under identifier 512828. 1B) ESD - Select the account(EU-100-10001863-0-36 Union Registry : BE Status : Open) - Update the AR information (id ED999999911318 , values on the corresponding Telephone 1 +32774483745 ---> +32774483747 Telephone 2 +32123456785 --- > +32123456788	PASSED

			- Submit the request Results Your request to update business details has been submitted under identifier 512835. 1 c) EUTL FOR EUCR 1) Connect to EUTL 2) Navigate to menu Account Mgt 3) Search the specific account (enter start number = 643 and enter number = 643) before submit the above request from EUCR 4) The specific screen presented the specific account 5) Click on the link "Detail" 6) The system presented the relations ARs with the specific account 7) After the execution of the step d , the related columns are updated immediately. 1 d) EUTL for ESD account (EU-100-10001863-0-36) - Executed the above steps with select account number 10001863 before 1 b Result : The system presented the same values on the specific fields with ESD - Executed the steps of scenarios 1b Result : After the execution of the scenario , the related columns of the AR are updated immediately. 2) The button "Update" is not rendered if there is a pending request for removal or replacement for the AR/AAR. 3.In this case, the NA user should not have been able to execute any action on the AR information because the related buttons are not rendered. 4) In this case, the specific validation has already executed on the previous stage ("Submitted request" - see step 3) in order to avoid the creation duplicate request on the same account. The above modifications have been implemented with same approach in both ETS and ESD pages related to ARs/AARs 5) Case 3 : In this case, NA2 is not be able to initiate the account representative update request since AR1 has already been removed from the account. Case 4 : In this case, the removal request is approved before the approval of the update details request.	

Unit Block Search - AAUs do not appear correctly in the screen & exported CSV file	Unit Block Search - AAUs do not appear correctly in the screen & exported CSV file	Unit block search - column SOP, screen and CSV does not show correctly "Not subject to SOP" units. Both screen and CSV - AAUs with original period = 1 are shown with BLANK in column SOP - AAUs with original period = 2 are shown with "Subject to SOP" or "Not Subject to SOP" in column SOP depending on flag in Database	Perform the following query in EUCR: select max(unit_type), SOP, original_period, applicable_period from unit_block where unit_type = 'AAU' group by sop, original_period, applicable_period; Ensure in the returned results: * Records of OrigCP1 and ApplCP1 -> have NULL SOP value * Records of OrigCP1 and ApplCP2 -> have NULL SOP value * Records of OrigCP2 and ApplCP2 -> have 1 or 0 SOP value	PASSED
The content and structure of the CP2 SEF file is modified so that it can be imported by SEF Tool v6.3.1	CP2 SEF XML format is not compatible with ITL	1. Export CP2 SEF XML from EUCR 2. Import into SEF Report Tool 3. Import CP2 SEF XML from ITL for the same registry. 4. Run the comparsion fucntion in the Report Tool. 5. Compartion function does not work. *For inclusion in V8.0.x* The XML exported from the EUCR for CP2 SEF still uses the CP1 years in table 5b to 5e. These need to be updated to CP2 fomat i.e. the years should run from 2013 to 2023.	1. Export CP2 SEF XML from EUCR 2. Import into SEF Report Tool v.6.3.1 3. The import completes successfully. Note: The SEF report tool does not validate data correctly for CP2. This has been communicated and is followed-up in EUCR-2573.	PASSED
CP2 SEF file contains the new LULUCF activity.	New LULUCF activity - SEF Support	New LULUCF activity - SEF Support	The new LULUCF activity WETLAND_DRAINAGE_AND_REWETTING is referenced in table 2a of SEF report under the section ‘Article 3.3 and 3.4 issuance or cancellation’. Test Case 1: Under additions, there should be reported the RMUs issued with the IssueOfAAUsAndRMUs transaction regarding the WETLAND_DRAINAGE_AND_REWETTING LULUCF activity. Test Case 2: Under subtractions, there should be reported the units that are cancelled because of a NET_SOURCE_CANCELLATION notification referencing the WETLAND_DRAINAGE_AND_REWETTING LULUCF activity.	PASSED

Script which corrects CP1 CER/ERU_FROM_AAU balances in account statements needs to be created and set ineligible those units if transaction is after 31/3/2015. The balances of CER/ERU_FROM_AAU were not calculated correctly if the transaction included CP1 units of those types.	Script which corrects CP1 CER/ERU_FROM_AAU in account statements	Script which corrects CP1 CER/ERU_FROM_AAU balances in account statements needs to be created and set ineligible those units if transaction is after 31/3/2015. The balances of CER/ERU_FROM_AAU were not calculated correctly if the transaction included CP1 units of those types.	1. Execute the CP1 acct. statement correction script Locate an account which has had CP1 CER or CP1 ERU units before 1/4/2015 which are in a positive ICH list. This can be located by querying tmp_fix_accst_log_cp1 where the COMMENTS column begins with "CER FINISHED OK". 2. Browse the holdings of this account and ensure it contains CER units which are in a positive list. 3. Browse the incoming transactions into this account by searching via Accounts -> Transactions and providing the account ID 4. Locate the incoming transaction transferring the specific CERs into this account 5. Generate an account statement including the located transaction date. Ensure the transferred unit blocks are characterised as INELIGIBLE in the generated account statement.	PASSED
EUCR Contacts link from home page to be amended	EUCR Contacts link	EUCR Contacts link should direct here: http://ec.europa.eu/clima/contact/index_en.htm. Currently it directs here: http://ec.europa.eu/dgs/clima/contact_en.htm	Tested successfully. *Test Case 1:ETS, EU registry* 1. Log in EU registry, as NA 2. Click Contact link 3. A pop-up window appears leading to http://ec.europa.eu/clima/contact/index_en.htm *Test Case 2: ESD* Repeat Test Case 1 in ESD as ESD-CA. *Test Case 3:ETS, MS registry* Repeat Test Case 1 as French NA: In this case the destination should be: http://ec.europa.eu/clima/policies/ets/registry/links_en.htm	PASSED

Under certain circumstances, after signature, the system ignores the user's language and reverts to English. This is now fixed.	Messages in wrong language after signature	If the “Preferred language” in the "Edit your personal details" section is "German" then the messages are in English (see attachment). If “Preferred language” is "English" then the messages are in German. It should be the other way around.	The purpose of these test cases is to verify that the language of the messages, after an ECAS signature, always matches the language on the top-right drop-down element. _+Note for Test Cases 1,2,3+: We have used Firefox for proposal and Chrome for approval._ *Test Case 1 - External Transfer - Both users have preferred language English* 1. Make sure menu's language is MT 2. Propose a Transfer Of Allowances from EU-100-754-0-44 (MT) to EU-100-655-0-54 3. Green box's text should be in MT. 4. Change language to English, approve the request, green box's text should be in English. *Test Case 2 - Roles and Permissions change* 1. In NL, make sure proposal user (na) has preferred language "Nederland's" and registry's language is English. 2. Propose a roles and permissions change. 3. Green box's text should be in English. 4. Make sure that approval user (nadmin1) has preferred language "English" 5. Approve the request, green box's text should be in English. *Test Case 3 - TAL addition* 1. In MT, make sure proposal user (na) has preferred language "Malta" and registry's language is English. 2. Propose a TAL addition of EU-100-756-0-34 to MT-121-751-0-62. 3. Green box's text should be in English. 4. Make sure that approval user (nadmin1) has preferred language "English" 5. Approve the request, green box's text should be in English. *Test Case 4 - ESD Transaction* 1. Propose an ESD Transaction 2. Green box should be in English language. 3. Approve the request, green box's text should be in English. _+Note for Test Cases 5,6,7+: We have used Chrome for proposal and Firefox for approval._ *Test Case 5 - Personal details update* 1.In NL, make sure proposal user (nadmin1) has preferred language "English" and registry's language is Nederland's. 2. Propose a personal details update for na's urid 3. Green box should be in NL language. 4. Approval does not present a green box. *Test Case 6 - Administration update* 1.In NL, make sure proposal user (nadmin1) has preferred	PASSED

			language "English" and registry's language is Nederland's. 2. Propose an administration role update for a urid (add role of national administrator) 3. Green box should be in NL language. 4. Approval does not present a green box. *Test Case 7 - TAL deletion* 1.In RO, make sure proposal user (na) has preferred language "English" and registry's language is Romanian. 2. Propose a TAL deletion. 3. Green box should be in Romanian language. 4. Approve the request after ensuring that menu's language is English. 5. Green box should be in English. *Test Case 8 - Unit Block suspension/restoration - Firefox* 1. In RO and Firefox, make sure proposal user (nadmin1) has preferred language "Romanian" and registry's language is English 2. Propose a block suspension/restoration. 3. Green box should be in Romanian language. 4. Approve the request after ensuring that menu's language is English. 5. Green box should be in English. *Additional testing* Above tests should be repeated after changing Firefox's default language to e.g. German The purpose of this additional testing is to make sure that the browser's default language does not affect the language of the messages, after an ECASE signature. In order to add a language to Firefox, please go to {{Options}} → {{Content}} → {{Languages}} → {{Choose...}} → {{Select a language to add}} → {{Add}}, and make sure this language is on the top.	
Hide an obsolete ITL notification type.	ITL Notifications - if carry-over notifications have been removed, they should not be displayed in the type (search)	If carry-over notifications have been removed, they should not be displayed in the type (search). Please check picture attached.	1. Connect as NA of a MS and navigate to its registry home page. 2. Navigate to Kyoto Protocol -> ITL notifications 3. Ensure that no notification name in the Type drop-down list contains the term "carry-over:"	PASSED

Configuration of emails of new KP2 transactions.	Transaction emails with new transaction types have !	The automatic emails that are sent from the EUCR about transactions have a ! after the transaction type. This seems to occur to new transaction types. The ! should not be displayed Please see the emails below. Thanks. – From: CLIMA-EU-ETS-REGISTRY-ACC@ec.europa.eu CLIMA-EU-ETS-REGISTRY-ACC@ec.europa.eu Sent: 8 de julho de 2016 09:20 To: jrs@bluefocus.pt Subject: Transaction Outcome Notification The transaction PT30 of type transactionType_CarryOver_CER_ERU_FROM_AAU between: PT-100-16246 and: PT-100-16246 Involving: Unit Type: CER, Unit Amount: 110 ...has ended with a status Terminated. Do not reply to this email address as the mailbox is not monitored. Please contact your national administration should you require further assistance. Their contact details can be found here: http://ec.europa.eu/clima/policies/ets/registry/links_en.htm – From: CLIMA-EU-ETS-REGISTRY-ACC@ec.europa.eu CLIMA-EU-ETS-REGISTRY-ACC@ec.europa.eu Sent: 8 de julho de 2016 09:21 To: jrs@bluefocus.pt Subject: Transaction Outcome Notification The transaction PT32 of type transactionType_AmbitionIncreaseCancellation between: PT-100-16246 and: PT-280-17005 Involving: Unit Type: AAU, Unit Amount: 800 ...has ended with a status Terminated. Do not reply to this email address as the mailbox is not monitored. Please contact your national administration should you require further assistance. Their contact details can be found here: http://ec.europa.eu/clima/policies/ets/registry/links_en.htm	1. Connect as NA and perform an AAU Transfer; approve it as another NA. 2. Ensure the transaction is completed. 3. Receive the email generated by the transaction. 4. Ensure the first line of the email is: The transaction <<>> of type 07-39 Carry Over of AAUs between: .... 5. Retrieve the last email.properties file and ensure the following excerpt is contained within the file: transactionType_ConversionA = 02-56 Conversion of AAUs or RMUs into ERUs (Conversion A) transactionType_ConversionB = 02-57 Conversion of AAUs or RMUs into ERUs (Conversion B) transactionType_TransferToSOPforFirstExtTransferAAU = 03-47 Transfer to SOP Adaptation Fund for First External Transfer of AAUs transactionType_TransferToSOPforConversion = 03-49 Transfer to SOP for Conversion transactionType_Art37Cancellation = 04-45 Article 3.7ter Cancellation transactionType_AmbitionIncreaseCancellation = 04-46 Ambition Increase Cancellation transactionType_MandatoryCancellation = 04-48 Mandatory Cancellation transactionType_EsdRetirementKPUsed = 05-19 Retirement of ESD Used Units transactionType_CarryOver_CER_ERU_FROM_AAU = 07-38 Carry Over of ERUs or CERs transactionType_CarryOver_AAU = 07-39 Carry Over of AAUs transactionType_ReversalAdminDeletion = 10-189 Reversal Administrative Deletion transactionType_AdminTransfer = 10-20 Administrative Transfer transactionType_AuctionDelivery = 10-37 Auction Delivery transactionType_AdminDeletion = 10-89 Administrative Deletion	PASSED
Correction in display of KP2 entitlements.	KP Entitlements format	KP Entitlements should be separated by thousands = commas preferably as used elsewhere in UR. This is applicable in all KP2 entitlements	1. Connect as CA and navigate to EU registry (note: the same screen is used for all registries, but EU contains the sum of all other registries so the figures are bigger). 2. Navigate to KP --> KP2 Entitlements 3. Click on each of the following and ensure presented quantities appear with a thousands separator: * Transfer to PPSR Entitlements * First External Transfer Of AAUs Entitlements * Conversions Entitlements * Carry-Over Entitlements (CER/ERU from AAU) * Carry-Over Quantities (AAU)	PASSED

Some special characters are allowed for users' first name and last name.	Existing LAST NAME in personal details fails validation	First name and last name validation will be changed so that to allow 4 Special Characters, ROUND OPENING BRACKET, ROUND CLOSING BRACKET, - HYPHEN and . DOT and numbers. In addition, ESAPI validation will be used.	Tested via the test cases EUCR-3000, EUCR-3001, EUCR-3002, EUCR-3003, EUCR-3004.	PASSED
For Conversion B for Track_2 projects: A validation rule to be triggered if qty <> mandatory qty	Conversion B validation check for mandatory quantity for Track_2 projects	For Conversion B for Track_2 projects: A validation rule to be triggered if qty <> mandatory qty	Tested successfully. Test Scenario : Conversion of AAUs or RMUs to ERUs after the Transfer to SOP (Conversion B) for Track_02 Project *TC_01 : Submit Request with entered quantity value which is less than the limit* 1) Login to EUCR (Union Registry : MT as na) 2) Select a PHA (Party Holding Account: MT-100-10003336-0-41) 3) Click on the "Holding: tab 4) Click on the "Propose transaction" button 5) Choose one Project (PT661) of Track 2 with limit = 980 6) Enter AAU quantity to be converted equal to 800 (< limit) 7) Click on the "Confirm" button 8) The EUCR displays the error rule 82110 --- *TC 02: Entered quantity is more than limit* Repeat the steps 6-7 with quantity equal to 981 (> limit) The EUCR displays the error rule 82110, 82106 --- *TC_03 : Enter quantity value is equal to limit* Repeat the steps 6-7 with quantity equal to 980 (= limit) The transaction request is submitted normally. Approve the transaction as another NA. The transaction is completed successfully (MT257).	PASSED
After logout from ECAS user is redirected to EUCR instance instead of URL	CLONE - After logout from ECAS user is redirected to EUCR instance instead of URL	1. As NA log in with token 2. Log out from EUCR but not from ECAS 3. log in with GSM 4. Log out from ECAS Description When privileged user logged out from EUCR and not from ECAS and then tried o log in with GSM an error is displayed. User is advised to log out from ECAS and then log in again. In such flow user is redirected to EUCR instance instead to EUCR URL. Same issue is in ACC with 7.0.6. This seems to be a bit related to -1006 but neither TEST nor ACC run in Development mode.	The issue has been tested successfully. For the needs of this issue, the following configuration parameters will need to be modified, as stored in ecas-config-eucr-ui.properties: edu.yale.its.tp.cas.client.filter.serverName= eu.cec.digit.ecas.client.filter.serverProtocol=http eu.cec.digit.ecas.client.filter.serverPort= eu.cec.digit.ecas.client.filter.serverSSLPort= These are used as destination when returning from ECAS, at both logging in and logging out of EUCR. Choose a user configured in TMS as 'G' so he connects via GSM. *A. Login and logout of EUCR* A1. Set the serverName parameter to europa.eu/ A2. Navigate to EUCR and click "Login"	PASSED

			A3. Authenticate via GSM in ECAS and click "Login" A4. Ensure the next page is an empty page, in server europa.eu A5. Change manually the current URL so that it points to the EUCR server name A6. The normal page of EUCR appears and user is logged in normally A7. Click link "Logout" in EUCR A8. Click "Logout" from ECAS A9. Ensure the next page is an empty page, in server europa.eu A10. Change manually the current URL and point to the EUCR server name A11. The normal page of EUCR appears and user is logged out normally Repeat the above steps using as serverName the appropriate EUCR server address. The user logs in and logs out normally. *B. Attempt to log in EUCR via Tokens and GSM* Repeat steps A1-A7. B1. Navigate again to EUCR and click "Login" *without having logged out from ECAS* B2. Authenticate in ECAS via Tokens. B3. Ensure the next page is an empty page, in server europa.eu B4. Change manually the current URL and point to the EUCR server name B5. The error page specifying the user is logged in with both GSM and Tokens appears. B6. User clicks "Logout" B7. User navigates to ECAS. B8. User clicks logout from ECAS. B9. Ensure the next page is an empty page, in server europa.eu B10. Change manually the current URL and point to the EUCR server name B11. User is navigated to EUCR, being logged off. Repeat the above steps using as serverName the appropriate EUCR server address. The user logs in and logs out normally.	

Roles and Permission checkboxes are disabled after unfinished signature (add to clear-down job)	Roles and Permission checkboxes are disabled after unfinished signature (add to clear-down job)	Propose update of permission in Roles and Permission Stop when comes to providing password and mobile number in ECAS signature. Go back to EUCR and check state of checkbox for the permission There is error in Roles and Permission table when proposing updated of some permission (switching checkbox) and signature is not finished, process of signature breaks in the moment of providing password and mobile number. When from this moment user will click back button and enter again in EUCR to Roles And Permission page, that proposed checkbox is disabled. There are no either pending tasks for Approval R&P Changes. There might be many disabled checkboxes since I can try propose updates many times, and stop before signature.	1. Connect as NA and navigate to Administration -> Roles and Permissions 2. Propose a change in permissions and confirm 3. Do not sign via ECAS; do not approve as another NA 4. Ensure that the modified checkboxes are disabled Get the most recent permissions update request and check its status is SUBMITTED_NOT_YET_APPROVED: select * from role_perm_conf_request order by request_id desc; select * from request_state where request_id = <<request_id>>; 5. Wait for 35 minutes 6. Ensure the modified checkboxes are again enabled. Re-execute the query of step 4 and ensure the status is REJECTED and another status record for USER_REJECTED.	PASSED
PHA to AAU Account transfer terminated with 7031 (KP2 accounts rules). This is now fixed.	PHA to AAU Account transfer terminated with 7031 (KP2 accounts rules)	Implement the rules found in the latest attachment of issue -1339	The transaction rules have been tested, and logged in the comments of issue EUTL-425 in Jira.	PASSED
Display "before" and "after" values on emissions confirmation screen	Display "before" and "after" values on emissions confirmation screen	it would be useful for a user to display "before" and "after" values on emissions confirmation screen	Tested successfully. *Test Scenario : Update emission value* *TC_01 Submit the request* 1) Login to EUCR (Union Registry PT as na) 2) Select an OHA account (10000485) with emissions (tab Compliance) and specific year (2014) 3) Click on the corresponding image The Union Registry display the Correct Emissions page with the current values for emissions as has already defined by the user 4) Update the value on the field 'CO2 Emissions' from 6 to 8 5) Enter the value on the field 'N2O Emissions' (2) 6) Enter the value on the field 'PFC Emissions' (4) 7) Click on the button "Confirm" 8) The EUCR displays the confirmation screen with values of the above fields before & after .Also, the emissions have been recorded and an approval request created under reference: 513244. You will be notified when the emissions are verified. *TC_02 Approval the request* 1) Login to EUCR (Union Registry PT as nadmin1) 2) Search the specific request from the Task list 3) The EUCR displays the confirmation screen 'Approve emissions' with the corresponding info on the emission before & after 4) Click on the button "Approval" 5) Check the value of submission for the specific year 6) The EUCR displays the updated values on the specific fields	PASSED

Wrong label in "Enter Emissions" confirmation screen	Wrong label in "Enter Emissions" confirmation screen	Steps: * Log-in as NA/GR. * Search for account 10148 (OHA). * Open "Compliance" tab. * Propose emissions for a year. * In the "Enter Emissions" screen, enter a value and press "Confirm". * The panel title has changed to "Correct Emissions". The panel title should remain "Enter Emissions". The same happens for an Aircraft Operator.	*Test Case 1* 1.Log-in as NA/GR. 2. Search for account OHA 3. Open "Compliance" tab. 4. Propose emissions for a year. 5. In the "Enter Emissions" screen, enter a value and press "Confirm". The panel title should remain "Enter Emissions". *Test Case 2* Repeat test case 1 for an Aircraft Operator.	PASSED
Filter ESD transaction list by default on Last Updated Date (most recent ones at the top)	Filter ESD transaction list by default on Last Updated Date (most recent ones at the top)	1. Log in to ESD 2. Navigate to ESD--> ESD Transactions and click "Search" 2. Ensure the records presented are initially sorted descending on the column "*Last Updated*" Description Same rule as described in ETS-1007 should be applied to ESD transactions.	1. Log in to ESD 2. Navigate to ESD--> ESD Transactions and click "Search" 2. Ensure the records presented are initially sorted descending on the column "Last Updated"	PASSED
Cannot perform mandatory cancellation from OHA account	Cannot perform mandatory cancellation from OHA account	1. Log in to registry 2. Go to OHA account that has KP CP2 units 3. Propose Mandatory cancellation transaction Description When proposing Mandatory cancellation transaction from OHA account, following error is displayed "80733: The transferring and acquiring registry must be the same". User is not allowed to propose this transaction. Also there seems to be some text missing in the bottom right corner. It says ?cancelPage_MANDATORY_CANCELLATION?	Tested successfully. Test Scenario 1: Mandatory Cancellation from OHA Account EU-100-10000505-0-36 1. Log in to registry (PT as na) 2. Go to OHA account (EU-100-10000505-0-36 (PT)) that has KP CP2 units 3. Propose Mandatory cancellation transaction (04-48 Mandatory Cancellation) 4. The system displays the following message ' Your cancellation proposal has been recorded and assigned the identifier EU1243338. The transaction request with id 513627 has been submitted for approval.' 5. Logout from specific role (na) 6. Login in to registry (as nadmin1) 7. Go to the task list 8. Select the specific request 9. Click on the button "Approve" The status of the transaction is set to "Completed" and the units (2) are transferring to EU-250-10003432-2-50 (EU) Test Scenario 2: Mandatory Cancellation from PHA Account 1. Log in to registry (PT as na) 2. Navigate to a Party Holding Account (account 643) and propose a mandatory cancellation 3. Approve the transaction as another NA 4. The transaction is completed. (Transaction PT518 in Portugal)	PASSED

Correct the voluntary cancellation destination accounts	Voluntary cancellation destination accounts	1. Go to BG registry 2. Suspend all Voluntary Cancellation accounts 3. Go to PHA account with KP units 4. Check is you can propose Voluntary Cancellation Description When voluntary cancellation transaction is performed units are sent to EU Voluntary cancellation account (pending confirmation from Andrei MUNGIU this is expected behaviour). However when system decides if this transaction type is available to the user - cancellation accounts specific to the registry are analysed. Example: When in Bulgaria all cancellation accounts are suspended user cannot propose Voluntary Cancellation transaction because there is no such link transaction proposal screen.	A. Voluntary cancellation for PHA cannot start if MS cancellation accounts are suspended 1. Set to suspended the Finnish Voluntary Cancellation accounts 2. Navigate to a PHA of Finland; voluntary cancellation is not available 3. Navigate to an OHA of Finland; voluntary cancellation is available B. Voluntary cancellation for OHA cannot start if EU cancellation accounts are suspended 1. Set to suspended the EU Voluntary Cancellation accounts 2. Navigate to a PHA of Finland; voluntary cancellation is available 3. Navigate to an OHA of Finland; voluntary cancellation is not available C. Voluntary cancellation of MS PHA is the MS voluntary cancellation account 1. Propose a voluntary cancellation for Finnish PHA. 2. Ensure the acquiring account is Finnish voluntary cancellation account D. Voluntary cancellation of MS OHA is the EU voluntary cancellation account 1. Propose a voluntary cancellation for Finnish OHA. 2. Ensure the acquiring account is EU voluntary cancellation account Note 1: Voluntary cancellation accounts can be located via the query: select * from account where registry_code = 'EU' and kyoto_account_type = 'VOLUNTARY_CANCELLATION_ACCOUNT' and commitment_period_code in (1,2); Note 2: Via the located account_id values, the accounts can be set to OPEN or SUSPENDED update account set account_status = 'OPEN' where account_id in (301, 10221);	PASSED

Repeated error message when updating account holder data. This is now fixed.	Repeated error message when updating account holder data	1. Log in to registry as NA 2. Go to account that has account holder data task pending 3. Try to update account holder data 4. Check if error message is displayed once Description When there is account holder update task pending and user tries to update account holder data again, error message is displayed: Unfortunately error message is repeated twice.	Tested successfully. *Test case 1* 1. Log in to registry as NA , RO registry. 2. Go to account 666 that has account holder data task pending 3. Try to update account holder data 4. Check if error message is displayed once *Test case 2 - Account holder that is Company* 1. Log in to registry as NA , EU registry. 2. Go to account 285 that has account holder data task pending 3. Try to update account holder data 4. Check if error message is displayed once *Test case 3 - Account holder that is plain* 1. Log in to registry as NA , GR registry. 2. Go to account 10220 that has account holder data task pending 3. Try to update account holder data 4. Check if error message is displayed once	PASSED
Installation / Aircraft Operator links in account list don't respect users permission. This is now fixed.	Installation / Aircraft Operator links in account list don't respect users permission	1. Log in to registry as user who has no permission to see Installation tab 2. Go to accounts and search for OHA accounts 3. Click on installation link Description If the user doesn't have permission to so Installation or Aircraft Operator tab in account view, there should be no links pointing to such tabs in account list. Currently the links are visible and when clicked they point no "next available" tab in accounts view (the tab that user has no access to is not displayed)	1. Locate a user who is only AR in a registry. This can be confirmed with the query: select distinct ro.* from roles ro , accesses acc, profile pro where ro.role_id = acc.role_id and acc.profile_id = pro.profile_id and pro.URID = '<<>>'; 2. Retrieve the permissions of the user in the specific registry: select distinct u.urid, u.state as user_state, a.state as access_state, r.role_name as role, pe.perm_key as permission from users u join profile p on p.urid = u.urid join accesses a on a.profile_id = p.profile_id join roles r on a.role_id = r.role_id join role_permission rp on r.role_id = rp.role_id join permissions pe on pe.permission_id = rp.permission_id where u.urid = '<<>>'; 3. Ensure the permission PERM_ACC_INST_SEE is included in the list of permissions. 4. Search for OHA accounts and ensure the installation links are visible. 5. Delete the role_permission pertaining to PERM_ACC_INST_SEE via the query: delete from role_permission where role_id = <<>> and permission_id = <<>>; 6. Search for OHA accounts and ensure the installation links are not visible. Repeat for AOHA accounts and PERM_ACC_AIR_SEE.	PASSED

Correction of the criteria via which accounts are selected in "Export KP units in KP accounts" functionality	Inconsistencies in "Export KP units in KP accounts" functionality	1. Log in to registry 2. Go to Unit blocks 3. Export unit blocks using "Export KP units in KP accounts" button Description There are 2 inconsistencies in "Export KP units in KP accounts" functionality. 1. Button name says "KP accounts" but since in requirements it was stated that this should cover 100 account type - ETS accounts are included as well. Is this expected behaviour? 2. Requirement says that AAU, CER and ERU unit should be exported. Currently systems exports AAU, CER and ERU_FROM_AAU, ERU_FROM_RMU and RMU units. Is this expected behaviour? What about LCERs and TCERs?	A.1. Connect as NA in Romanian Registry A.2. Navigate to Administration -> Unit Blocks and click on "Export KP units" A.3. Ensure holdings of accounts with KP type HOLDING_ACCOUNT(100), FORMER_OPERATOR_HOLDING_ACCOUNT(120), PERSON_ACCOUNT_NATIONAL_REG(121) and unit holdings of AAU, ERU_from_AAU, CER are exported. B.1. Connect as NA in EU Registry B.2. Navigate to Administration -> Unit Blocks and click on "Export KP units" B.3. Ensure unit holdings of AAU, ERU_from_AAU, CER are exported for the following types of accounts: * AAU account * ETS AAU Deposit account * ESD AAU Deposit account * ETS Central Clearing account for CP2	PASSED
This is a legacy issue for Excess Issuance ITL notification.	Notification "Excess Issuance" does not set correctly acquiring account (LEGACY FUNCTIONALITY)	Notification EXCESS_ISSUANCE_CDM_PROJECT does not set correctly acquiring account This notification should have a CDM account as an acquiring account, but it does not set it correctly. Should we add parameter just like the other two new KP notificaitons ?	1. Set the configuration parameter CDM.EXCESS_ISSUANCE_CANCELLATION_ACCOUNT = CDM-100-3567-0 and restart the application server 2. Connect as NA to a registry (in our FAT: Portugal) and navigate to KP -> ITL Notifications 3. Locate an ITL Notification of type EXCESS_ISSUANCE and click on "Fulfil" 4. Enter an acquiring account; the transferring account is retrieved automatically and is set as: CDM-100-3567-0	PASSED
Correction of error during account delegation confirmation.	NPE while Editing Account Delegation Confirmation	For OHA Account click Delegate Button in Account Main tab - Add all external platforms - confirm by Submitting - go back and remove all confirm by Clicking Confirmation Description https://webgate.ec.europa.eu/CITnet/jira/browse/C-886 According to test steps for item: https://sc136.unisystems.gr:4443/jira/browse/EUCR-2889 I got NullPointerException while testing scenario of Adding and removing all entries from existed Account Delegation (Button Remove All) and confirming emptying the list of external platforms	1. Connect as NA and navigate to Accounts -> Accounts 2. Locate an OHA which is not CLOSED 3. Navigate to Account Main and click on "Delegate Account" 4. Click an external platform and click Next 5. Click all the representatives and click Add All; click Submit 6. Ensure a green confirmation message appears informing on the delegation to the external platform. 7. Click button Back 8. Navigate to Account Main and click on "Delegate Account" 9. Click on all the ARs and click on Remove All 10. Click Submit and Confirm; ensure no error appears on screen Repeat for OHA (EU), AOHA (EU), Trading Account (PT 10000954), Person Holding Account (EU), Auction Delivery Account (EU)	PASSED

Correct screen omission when passing from unit block details to account details.	Not displayed all Account Detail Tabs when passing from Unit Blocks page to Account details page	ESD - Accounts Browser : Internet Explorer, Mozilla Firefox, Google Chrome Member State: EU - EUROPE Steps: Find any unit block in Unit block search page. Click Account link in column Holding Account (if link exist) Consult to which page user was redirected Description When user is checking searching Unit Block and at the result there are displayed Account link in the column Holding Account, then clicking on that link user is redirected to Account details page, but instead of all tabs there are displayed only: Account Main Authorised Representatives Additional Authorised Representatives There should be displayed all tab, same way like user is redirected from Account Search Page - after clicking View Details link So, looks like from Unit Block page user is redirected to page: tasklist.xhtml instead of esdAccountDetailsView.xhtml	A. Connect as NA in Polish registry 1. Navigate to Administration -> Unit Blocks 2. Click "Search" 3. Click the identifier of a Holding Account 4. Ensure the destination page presents the information of the account using the ETS accounts screen. Repeat for PHA, OHA, AOHA, PeHA. B. Connect as ESD-CA in ESD registry 1. Navigate to Administration -> Unit Blocks 2. Click "Search" 3. Click the identifier of a Holding Account 4. Ensure the destination page presents the information of the account using the ESD accounts screen.	PASSED
Empty error message when attempting to close an ESD account. This is now fixed.	Empty error message when attempting to close an ESD account	Connect as ESD-CA and navigate to ESD -> Accounts -> Click on a "Close" link of an account without balance. An empty orange box appears (see attachment). You should be able to close accounts as follows: {quote} An ESD-CA can change an account status as follows: • OPEN => CLOSED, if account does not hold any units • OPEN => SUSPENDED • SUSPENDED => OPEN • BLOCKED => SUSPENDED • BLOCKED=> CLOSED • SUSPENDED => BLOCKED The account status change needs an approval by another ESD-CA to become effective only when setting the account status to CLOSED. {quote}	Tested successfully. 1. Connect as ESD-CA and navigate to ESD -> Accounts -> Click on a "Close" link of an account without balance. 2. Sign and submit the account closure request 3. Click again the "Close" link for the same account. 4. Ensure the orange message appears: " Only one account management request can be active for one account at any given time. There is a request attached to this account which has not yet been completed. Its Request ID is <<request_id>>. You can check your task list to see who is able to approve or to reject this task. You may also be able to reject the request by yourself, if no longer needed."	PASSED

No signature is requested for Notification transactions. This is now fixed.	No signature is requested for Notification transactions	How to reproduce: * Make sure the signature is enabled in the relevant configuration property. * Fulfil any notification transaction. * A request is created, but _*no*_ signature is requested.	1. Connect as NA in a registry (in our FAT: PT registry) and navigate to Kyoto Protocol -> ITL Notifications. 2. Locate an incomplete ITL notification and click on Fulfil. 3. Provide account identifier and enter units 4. Click Next and Submit 5. Ensure ECAS signature is needed to sign the transaction request and sign it. 6. Ensure a transaction request is created normally for approval by another NA. 7. Connect as another NA and approve the transaction. 8. Sign the approval via ECAS. 9. Ensure a transaction is created and processed normally via ECAS. In our environment: PT527 transaction was created, after being proposed via ECAS and approved via ECAS.	PASSED
Correction of screen omission when clicking on user URID link in Tasks	Clicking on user URID link in Tasks shows popup with errors	Propose update of User Personal Details Before Approving this task, go to Details Page and click URID link on top When proposing update of Personal Details, which results in creating task request to approve. Approver is claiming this request, and went into Personal Details Update page in Tasks. Then on top there is visible link with URID which is clickable, and popup box is displayed. But on this popup there is no Title and there is no displayed Business Details tab - according to Test Cases in https://sc136.unisystems.gr:4443/jira/browse/EUCR-2797	1. Connect as NA and navigate to Administration -> Users. 2. Click on an enrolled user. 3. Propose an update of personal details. 4. Navigate to the tasklist -> exclusive tasklist and click on the generated task id. 5. Clink on the URID hyperlink of the affected user appearing on the top-left corner 6. A pop-up window appears with the following tabs, each containing data of the affected user: * Personal details * Business details * Administration roles * Accounts	PASSED

SEF CP2 implementation	New CP2 SEF format	New CP2 SEF format	1. Run the SEF job
			2. Connect as NA and navigate to a registry with CP2 transactions and navigate to Administration -> SEF Reporting
			3. Click on a hyperlink pertaining to a year and download the file
			4. Import the file within the SEF Reporting tool, version 3.6.1
			5. Ensure the file is downloaded without an error.
			
			Note: the SEF job can be executed as follows:
			{code}
			exec sef_kp2_reporting (2013, 2, to_date('31/12/2021 23:59:59', 'dd/mm/yyyy hh24:mi:ss'));
			exec sef_kp2_reporting (2014, 2, to_date('31/12/2021 23:59:59', 'dd/mm/yyyy hh24:mi:ss'));
			exec sef_kp2_reporting (2015, 2, to_date('31/12/2021 23:59:59', 'dd/mm/yyyy hh24:mi:ss'));
			exec sef_kp2_reporting (2016, 2, to_date('31/12/2021 23:59:59', 'dd/mm/yyyy hh24:mi:ss'));
			exec sef_kp2_reporting (2017, 2, to_date('31/12/2021 23:59:59', 'dd/mm/yyyy hh24:mi:ss'));
			exec sef_kp2_reporting (2018, 2, to_date('31/12/2021 23:59:59', 'dd/mm/yyyy hh24:mi:ss'));
			exec sef_kp2_reporting (2019, 2, to_date('31/12/2021 23:59:59', 'dd/mm/yyyy hh24:mi:ss'));
			exec sef_kp2_reporting (2020, 2, to_date('31/12/2021 23:59:59', 'dd/mm/yyyy hh24:mi:ss'));
			commit;
			{code}
			The last parameter is the end of carry over.
				PASSED

SEF CP2 implementation	SEF Procedure and carry-over transactions	SEF Procedure - carry-over transactions will be included in CP2 SEF and not CP1 SEF	1. Run the SEF job
			2. Connect as NA and navigate to a registry with CP2 transactions and navigate to Administration -> SEF Reporting
			3. Click on a hyperlink pertaining to a year and download the file
			4. Import the file within the SEF Reporting tool, version 3.6.1
			5. Ensure the file is downloaded without an error.
			6. Ensure the tables presented follow the calculation formulas defined in the attached document SEF CP2 Reporting_v2_2016-07-08.docx
			
			Note: the SEF job can be executed as follows:
			{code}
			exec sef_kp2_reporting (2013, 2, to_date('31/12/2021 23:59:59', 'dd/mm/yyyy hh24:mi:ss'));
			exec sef_kp2_reporting (2014, 2, to_date('31/12/2021 23:59:59', 'dd/mm/yyyy hh24:mi:ss'));
			exec sef_kp2_reporting (2015, 2, to_date('31/12/2021 23:59:59', 'dd/mm/yyyy hh24:mi:ss'));
			exec sef_kp2_reporting (2016, 2, to_date('31/12/2021 23:59:59', 'dd/mm/yyyy hh24:mi:ss'));
			exec sef_kp2_reporting (2017, 2, to_date('31/12/2021 23:59:59', 'dd/mm/yyyy hh24:mi:ss'));
			exec sef_kp2_reporting (2018, 2, to_date('31/12/2021 23:59:59', 'dd/mm/yyyy hh24:mi:ss'));
			exec sef_kp2_reporting (2019, 2, to_date('31/12/2021 23:59:59', 'dd/mm/yyyy hh24:mi:ss'));
			exec sef_kp2_reporting (2020, 2, to_date('31/12/2021 23:59:59', 'dd/mm/yyyy hh24:mi:ss'));
			commit;
			{code}
			The last parameter is the end of carry over.
				PASSED

For some account management requests, the request cannot be submitted when pending request exists for the same account. In that case, the respective button is now hidden.	Message does not appear when pending request exists	A request cannot be submitted if there is another pending request for the same account; this concerns the following request types: * Addition of AAR (also for ESD) * Replacement of AR (also for ESD) * Replacement of AAR (also for ESD) * Removal of AR (also for ESD) * Removal of AAR (also for ESD) * Account closure	*Test Case 1* - Add AAR while same request is pending 1. As NA, submit a AAR addition for RO 666 2. Try to propose a second request for the same account, relevant button should not exist *Test Case 2* - Add AAR while same request is pending (ESD) 1. As NA, submit a AAR addition for ESD 10001864 2. Try to propose a second request for the same account, relevant button should not exist *Test Case 3* - Replace AR while same request is pending 1. As NA, submit a AAR addition for RO 656 2. Try to propose a second request for the same account, relevant button should not exist *Test Case 4* - Replace AR while same request is pending (ESD) 1. As NA, submit a AAR addition for ESD 10001868 2. Try to propose a second request, relevant button should not exist	PASSED

			Test Case 5 - Replace AAR while same request is pending 1. As NA, submit a AAR addition for RO 655 2. Try to propose a second request, relevant button should not exist *Test Case 6* - Replace AAR while same request is pending (ESD) 1. As NA, submit a AAR addition for ESD 10001868 2. Try to propose a second request for the same account, relevant button should not exist *Test Case 7* - Remove AR while same request is pending 1. As NA, submit a AR removal for RO 666, after having suspended an AR for this account 2. Try to propose a second request for the same account, relevant button should not exist *Test Case 8* - Remove AR while same request is pending (ESD) 1. As NA, submit a AR removal for ESD 10001863. 2. Try to propose a second request for the same account, relevant button should not exist *Test Case 9* - Remove AAR while same request is pending 1. As NA, submit a AR removal for RO 666 (make sure no pending AR removal exist) 2. Try to propose a second request for the same account, relevant button should not exist *Test Case 10* - Remove AAR while same request is pending (ESD) 1. As NA, submit a AR removal for ESD 10001867 (make sure no pending AR removal exist) 2. Try to propose a second request for the same account, relevant button should not exist *Test Case 11* - Close account while same request is pending 1. As NA, submit a account closure for an account 2. Try to propose a second request for the same account, relevant button should not exist	
Removal of obsolete XML schema files	Removal of obsolete XML schema files	The following XML schema files are obsolete and are no longer used. * eucr-ui/nap.xsd * eucr-ui/caat.xsd * eucr-commons/nap.xsd * eucr-commons/caat.xsd * eucr-commons/surrenderLimits.xsd After CLIMA approves, we will proceed to their permanent removal from the source code.	This is a technical issue	PASSED

Change in screen information from PPSR->PPSR transfer screen	Transfer PPSR to PPSR - Modify radio button label + drop down	Transfer PPSR to PPSR - Modify radio button label + drop down Radio button label for the first option must be renamed to: "Acquiring PPSR account registry" The drop down must contain only registry codes.	*Test Case 1* 1. Log in EU as NA 2. For a PPSR account, initiate a transfer to PPSR transaction. 3. In "Transfer AAU to PPSR account" screen, check that first radiobutton is titled "Acquiring PPSR account registry " and that the respective dropdown contains only registries pertaining to OPEN PPSR accounts.	PASSED
A set of transactions checking system integrity	Regression: Transactions complete normally	Test transactions complete normally: # OHA -> OHA # ESD -> ESD # PHA -> AAU account # PHA -> PHA # Japan -> PHA (AAU, CER) # Japan -> OHA (AAU, CER)	These transactions were successfully tested. 1. Transaction EU1255876 from OHA -> OHA 2. Transaction EU1255878 from ESD -> ESD 3. Transaction EU1256880 from PHA -> AAU account 4. Transaction PT517 from PHA ->PHA 5. Transaction JP900801 from Japan -> PHA with CER Transaction JP900802 from Japan -> OHA with CER 6. Transaction JP900806 from Japan -> PHA with AAU It is not allowed to send AAU units to OHA; transaction terminated with rule 7036 (correctly)	PASSED
Correction for ITL notification Excess Issuance.	Check 80210 incorrectly fires for ITL notification EXCESS ISSUANCE	I go to PT and fulfil an EXCESS ISSUANCE from PHA 643. The rule 80210 incorrectly fires, PHA 643 has an AAR.	1. Connect as NA and navigate to Kyoto Protocol -> ITL Notifications. 2. Search for an ITL Notification of type "Excess Issuance CDM Project" and click its hyperlink 3. Enter as transferring account the identifier of a PHA of the registry of the user and click Apply. 4. The holdings of the transferring account appear. 5. Enter a quantity of units next to the corresponding unit type and click Next. 6. Click Confirm 7. The green message box appears stating the new transaction request. 8. Navigate to tasklist -> Exclusive Tasklist and ensure a task with request Id equal to the one created in step 7 appears.	PASSED
Correction in text of rule 7892.	Please correct word "except" in rule 7892	Please correct word "except" in rule: 7892: Amount transferred out of "ESD AAU Deposit Account" by Cancelation, Internal and External transfers should not exceed the "AAUs Available for Transfer" limit, except amount transferred to the "ESD Central Clearing Account".	This is a technical issue. Updated relevant message in message.properties file.	PASSED

Three detailed rules for KP2 cancellations are implemented	Additional rules for Cancellations	The following are a series of rules identified during implementation: 1. Art 3.7 Cancellation can only transact AAUs of CP2. 2. Art 3.7 Cancellation can only transact units with originating registry the current user's registry. ~~-3. Ambition Increase Cancellation can only transact units with originating registry the current user's registry.-~~ 4. Voluntary cancelations are blocked after the end of carry over.	A. Test for Art 3.7 Cancellation (Tasks 1 and 2) 1. Locate an account with units of various unit types, of both CP1 and CP2 and originating country code equal to the current registry and other registries as well (in our environment account 551 of Latvia). 2. Propose an Art 3.7 Cancellation Ensure the proposal screen shows **only**: * AAU units of originating CP = 2 * Of originating country code = Current registry B. Test for Voluntary Cancellation (Task 4) 1. Locate an account from which the Voluntary Cancellation is available in the list of transactions (in our environment account 551 of Latvia). 2. Change the configuration parameter carry.over.end.date to the value 01/01/2012 23:59:59 3. Restart the application server 4. Navigate to the transactions list of the account used in step [1]. 5. Ensure Voluntary Cancellation is not available. 6. Change the configuration parameter carry.over.end.date to the value 31/03/2021 23:59:59 7. Restart the application server 8. Navigate to the transactions list of the account used in step [1]. 9. Ensure Voluntary Cancellation is available. Note: Task 3 was rejected and was not implemented	PASSED
While adding an ESD-AR this appears on screen as ESD-AAR. This is now fixed.	There is wrong description in ESD AR Addition Summary.	When you add an ESD-AR to an ESD compliance account, the summary view shows the user to be added with an "ESD-AAR" header.	*Test Case 1* 1. Log in ESD as NA 2. In an open account request the addition of an AR. (Complete proposal) 3. Ensure the addition request specifies the added user labelled "ESD-AR".	PASSED

During XML uploads into EUCR, a maximum file size parameter is introduced.	Lack of file size validation in XML file uploads	There will be a property defined in the eucr-configuration.properties named backingBean.maxFileSize with the value (in bytes) to be defined by business that will control the maximum file size (in bytes). Properties are periodically reloaded by the application.
		The required jsf page will have a javascript function to check the filesize
		
		{code}
		function checkFileSize(inputFile) {
		var max = #{backingBean.maxFileSize}; //max size in bytes
		
		if (inputFile.files && inputFile.files[0].size > max) {
		alert ('#{labels.file_upload_exceeds_size}');
		}
		}
		{code}
		
		The file upload tag will use this like
		<t:inputFileUpload ... onchange="checkFileSize(this)" />
			Test Case 1 - Upload allocation file
			
			1. Change property backingBean.maxFileSize which is in eucr-configuration.properties to 500 and restart the application server
			
			2. Log in GB as NA and upload an allocation file with file size 700 Bytes (this can be found via the document properties of the NAT file)
			
			3. Ensure an orange message appears: "The uploaded file is bigger than the allowed file size (500)."
			
			4. Upload a NAT file with size 400 bytes.
			
			5. Ensure the file uploads successfully.
			
			Repeat for NAAT, ICE, ICH lists, KP2 entitlements, emissions, ESD emissions, ESD allocations, ESD eligibility lists, ESD entitlements.
				PASSED

		On the server side the handleXmlImport() method of every upload backing bean will check the fileInpuream for its size like fileinpuream.getChannel().size()	Note1: The property backingBean.maxFileSize is very important because it constraints the size of uploaded XML files. Note2: NAT is uploaded via: NA login -> EUETS -> NAT -> Batch Administration NAAT is uploaded via: NA login -> EUETS -> NAAT -> Batch Administration Emissions are uploaded via: NA login -> EUETS -> Emissions Upload ICE are uploaded via: NA login -> EUETS -> ICE Table Upload ICH lists are uploaded via: CA login -> EU Registry -> Administration -> Initial List Upload KP2 entitlements: CA login in EU registry -> KP -> KP2 Entitlements -> Carry-Over Entitlements (CER/ERU from AAU) ESD allocations: ESDCA in ESD registry -> ESD -> ESD allocations Upload ESD emissions: ESDCA in ESD registry -> ESD -> ESD Emissions Upload ESD entitlements ESDCA in ESD registry -> ESD -> ESD Entitlements Upload ESD eligibility lists ESDCA in ESD registry -> ESD -> ESD Eligibility List Upload	

During a search of records, the system did not respond correctly; this is now fixed.	Every action done during ongoing transactions searching causes logout from EUCR	1. Log in to EUCR 2. Go to Accounts -> Transactions 3. Press "Search" Button -> the button is grayed out 4. Before searching is complete again press "Search" button Actual Result: 1. The screen with info message is displayed: "There was a problem with your request. Please follow this link back to the homepage." 2. After pressing the link user is logged out Expected Result: Nothing happens	1. Navigate to to Accounts → Accounts 2. Press the "Search" button and immediately press any link on the left navigation menu (for example "List of account requests") 3. Ensure the accounts' records appear normally Repeat the same test for Accounts → Transactions Repeat the same test for Kyoto Protocol → JI Projects	PASSED

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Test Report – ITL Annex H tests for MT and CY initialization

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Introduction

As part of the initialization of the national registries of Malta (MT) and Cyprus (CY), the registry software they intend to use has to successfully pass qualifications tests. These tests are extracted from the ITL DES Annex H (new draft version v0.4).
For their Annex H testing MT and CY were expected to pass the tests from CP1 and CP2 that are applicable to them.

This document is the report of the testing performed on the EUCR software, to be used by MT and CY. The tests were executed in 2 phases. A first phase in August 2016 (for most of the CP2 tests) and a 2nd phase in Jan-2017 (for the CP1 tests).

Test results

Ref	Description	Outcome Pass/Fail	Notes

3.2.4.1	Receive CP1 CERs, tCERs, lCERs from CDM pending account	PASS	
3.2.4.2	Receive CP1 CERs, tCERs, lCERs from CDM Adaptation Fund (AF) account	PASS	
3.2.5.1	Successful voluntary cancellation of CP1 CERs	PASS	
3.2.5.2	Voluntary cancellation of CP1 CERs with wrong account	PASS	
3.2.5.3	Voluntary cancellation of CERs with an unknown account identifier	PASS	
3.2.5.4	Successful voluntary cancellation of other CP1 units	PASS	
3.2.5.5	Reconciliation	PASS	
3.2.6.1	Successful mandatory cancellation of CP1 CERs	PASS	
3.2.6.2	Mandatory cancellation of CP1 CERs with wrong account	PASS	
3.2.6.3	Mandatory cancellation of CP1 CERs with an unknown account identifier	PASS	
3.2.6.4	Successful mandatory cancellation of other CP1 units	PASS	
3.2.6.5	Reconciliation	PASS	

3.2.7.1	External transfer to fulfil excess issuance notification while acquiring account configured to reject the transaction	FAIL	Unexpected issue encountered. After investigation, the EC concluded that the issue is due to an EUTL check which triggers erroneously. It would never happen in Prod and in the unlikely case where it would occur a workaround is in place. All test cases from the test series should be re-run once the issue is permanently addressed.
3.2.7.2	Reconciliation	SKIPPED	
3.2.7.3	Successful external transfer to partially fulfil excess issuance notification	FAIL	Same issue as in 3.2.7.1
3.2.7.4	Successful external transfer to partially fulfil excess issuance notification with other eligible unit types	BLOCKED	Not tried due to issue uncovered in 3.2.7.1 and 3.2.7.3
3.2.7.5	Notification update and successful external transfer to fulfil excess issuance notification	BLOCKED	Not tried due to issue uncovered in 3.2.7.1 and 3.2.7.3
3.2.7.6	Reconciliation	SKIPPED	
3.2.8.1	Reversal of storage notification fulfilled with cancellation	BLOCKED	Because of a known issue in the processing of the notifications in the EUCR/EUTL. Fix will be provided in the Q1-2017 release of the EUCR software

3.2.9.1	Non-submission of certification report notification fulfilled with cancellation	BLOCKED	Because of a known issue in the processing of the notifications in the EUCR/EUTL. Fix will be provided in the Q1-2017 release of the EUCR software
3.2.13.1	Successful lCER Expiry Date Change	PASS	
3.2.14.1	Internal transfer of CP1 units within registry ZZ	PASS	
3.2.14.2	Reconciliation	PASS	
4.2.1.1	Successful CP2 AAU issuance	PASS	
4.2.1.2	CP2 AAU issuance exceeding the limit	PASS	The error scenario couldn't be made to happen in the EUCR software, thanks to the built-in constraints on serial numbers
4.2.1.3	CP2 AAU issuance within the limit	PASS	
4.2.1.4	CP2 AAU issuance exceeding the limit	PASS	
4.2.1.5	Successful CP2 RMU issuance, LULUCF activity 1	PASS	
4.2.1.6	Successful CP2 RMU issuance, LULUCF activity 7	PASS	
4.2.1.7	CP2 RMU issuance exceeding the limit	PASS	
4.2.1.8	CP2 RMU issuance with serial numbers already existing	PASS	The error scenario couldn't be made to happen in the EUCR software, thanks to the built-in constraints on serial numbers

4.2.1.9	Reconciliation	PASS	
4.2.2.1	Initial conversion of CP2 AAU for JI track 2	PASS	
4.2.2.2	Initial conversion of CP2 RMU for JI track 2	PASS	
4.2.2.3	Initial conversion of CP2 AAU for JI track 1	PASS	
4.2.2.4	Initial conversion of CP2 RMU for JI track 1	PASS	
4.2.2.5	Second conversion of CP2 units for JI track 2 projects, before SOP transfer	PASS	This error scenario wasn't possible in the EUCR software, thanks to proper built-in constraints preventing it.
4.2.2.6	Second conversion of CP2 units for JI track 1 projects, before SOP transfer	PASS	This error scenario wasn't possible in the EUCR software, thanks to proper built-in constraints preventing it.
4.2.2.7	Second step of CP2 conversion cycle - SOP transfer	PASS	
4.2.2.8	Second conversion of CP2 AAU for JI track 2	PASS	
4.2.2.9	Second conversion of CP2 RMU for JI track	PASS	
4.2.2.10	Second conversion of CP2 AAU for JI track 1	PASS	
4.2.2.11	Second conversion of CP2 RMU for JI track	PASS	
4.2.2.12	Second conversion cycle of CP2 AAU for JI track 2 with wrong amounts for conversion	PASS	
4.2.2.13	Second conversion cycle of CP2 RMU for JI track 2 with wrong amounts for conversion A	PASS	
4.2.2.14	Second conversion cycle of CP2 AAU for JI track 1 with wrong amounts for conversion B	PASS	
4.2.2.15	Second conversion cycle of CP2 RMU for JI track 1 with wrong amounts for conversion B	PASS	
4.2.2.16	Attempt at conversion of CP2 units for 2 different projects	PASS	
4.2.2.17	Conversion A of CP2 AAU for JI track 2 with rounding amounts	PASS	
4.2.2.18	Conversion A of CP2 RMU for JI track 2 with rounding amounts	PASS	
4.2.2.19	Conversion B of CP2 AAU for JI track 2 where conversion A amount was rounded	PASS	

4.2.2.20	Conversion B of CP2 RMU for JI track 2 where conversion A amount was rounded	PASS	
4.2.2.21	Conversion A of CP2 AAU for JI track 2 with outstanding limit less than 50	PASS	
4.2.2.22	Conversion A of CP2 RMU for JI track 2 with outstanding limit less than 50	PASS	
4.2.2.23	Reconciliation	PASS	
4.2.3.1	First external transfer of CP2 AAU before SOP payment	PASS	This error scenario was prevented from happening in the EUCR thanks to the built-in constraints of the software.
4.2.3.2	SOP payment for CP2 AAU	PASS	
4.2.3.3	First external transfer of CP2 AAU in excess of allowed limit	PASS	This error scenario was prevented from happening in the EUCR thanks to the built-in constraints of the software.
4.2.3.4	Successive external transfers of CP2 AAU within limit	PASS	
4.2.3.5	Attempt at SOP payment with units originating from a different registry	PASS	
4.2.3.6	Attempt at SOP payment with units previously used	PASS	
4.2.3.7	External transfer with CP2 AAU previously used in external transfers	PASS	
4.2.3.8	Reconciliation	PASS	
4.2.5.1	Receive CP2 AAU, ERU from AAU, ERU from RMU and RMU from another registry	PASS	
4.2.5.2	Transfer CP2 AAU, ERU from AAU, ERU from RMU and RMU to another registry	PASS	
4.2.5.3	External transfer to a registry configured to reject them	PASS	
4.2.5.4	Reject incoming external transfer of AAUs from another registry	PASS	This error case couldn't actually be tested, because the 2 test registries instances used were both from the EUCR
4.2.5.5	External transfer to a non-responsive registry	PASS	

4.2.5.6	External transfer to a registry rejected by the EUTL	PASS	
4.2.5.7	External transfer through a non-responsive EUTL	PASS	
4.2.5.8	Reconciliation	PASS	
4.2.5.9	Receive CP2 CERs, tCERs, lCERs from another registry when both registries are CP2 QELRC	PASS	
4.2.5.10	Transfer CP2 CERs, tCERs, lCERs from another registry when both registries are CP2 QELRC	PASS	
4.2.5.11	Transfer CP2 CERs, tCERs, lCERs to a non CP2 QELRC registry	PASS	
4.2.5.14	Reconciliation	PASS	
4.2.6.1	Receive CP2 CERs, tCERs, lCERs from CDM pending account	PASS	
4.2.6.2	Receive CP2 CERs, tCERs, lCERs from CDM Adaptation Fund (AF) account	PASS	
4.2.6.3	Reconciliation	PASS	
4.2.7.1	Cancellation to fulfil a net source cancellation notification for LULUCF 2	PASS	
4.2.7.2	Cancellation to fulfil a net source cancellation notification for LULUCF 7	PASS	
4.2.7.3	Cancellation to fulfil a net Source cancellation notification, that exceeds the outstanding amount of the notification	PASS	
4.2.8.1	Cancellation to fulfil non-compliance cancellation notification in CP2	PASS	
4.2.8.2	Reconciliation	PASS	
4.2.9.1	Successful voluntary cancellation of CP2 AAUs	PASS	
4.2.9.2	Voluntary cancellation of CP2 AAUs with wrong account	PASS	
4.2.9.3	Voluntary cancellation of AAUs with an unknown account identifier	PASS	
4.2.9.4	Successful voluntary cancellation of other CP2 units	PASS	

4.2.9.5	Reconciliation	PASS	
4.2.10.1	Successful mandatory cancellation of CP2 AAUs	PASS	
4.2.10.2	Mandatory cancellation of CP2 AAUs with wrong account	PASS	
4.2.10.3	Mandatory cancellation of CP2 AAUs with an unknown account identifier	PASS	
4.2.10.4	Successful mandatory cancellation of other CP2 units	PASS	
4.2.10.5	Reconciliation	PASS	
4.2.11.1	Successful article 3.7ter cancellation	PASS	
4.2.11.2	Cancellation for article 3.7ter less than the limit	PASS	
4.2.11.3	Cancellation for article 3.7ter greater than the limit	PASS	
4.2.11.4	Cancellation for article 3.7ter with non CP2 AAU	PASS	
4.2.11.5	Cancellation for article 3.7ter with CP2 AAU received from another registry	PASS	
4.2.11.6	Transactions with CP2 AAU before the article 3.7ter cancellation	PASS	
4.2.11.7	Transactions with non CP2 AAU before the article 3.7ter cancellation	PASS	
4.2.11.8	Transactions with CP2 AAU when the article 3.7ter amount is 0	PASS	
4.2.11.9	Transactions with CP2 AAU when the article 3.7ter amount is < 0	PASS	
4.2.11.10	Cancellation for article 3.7ter with non CP2 AAU	PASS	
4.2.11.11	Reconciliation	PASS	
4.2.12.1	Successful ambition increase cancellation	PASS	

4.2.12.2	Cancellation for ambition increase less than the limit	PASS	
4.2.12.3	Cancellation for ambition increase greater than the limit	PASS	
4.2.12.4	Cancellation for ambition increase with CP2 AAU received from another registry	PASS	
4.2.12.5	Cancellation for ambition increase with non CP2 AAU	PASS	
4.2.12.6	Reconciliation	PASS	
4.2.13.1	External transfer to fulfil excess Issuance notification while acquiring account configured to reject the transaction	PASS	
4.2.13.2	Reconciliation	PASS	
4.2.13.3	Successful external transfer to partially fulfil Excess Issuance notification	PASS	
4.2.13.4	Successful external transfer to partially fulfil Excess Issuance notification with other eligible unit types	PASS	
4.2.13.5	Notification update and successful external transfer to fulfill excess issuance notification	PASS	
4.2.13.6	Reconciliation	PASS	
4.2.14.1	Reversal of storage notification (Type 4) fulfilled with cancellation	BLOCKED	For the same reasons as 3.2.8.1
4.2.15.1	Non-submission of certification report notification fulfilled with cancellation	BLOCKED	For the same reasons as 3.2.9.1
4.2.16.1	Retirement of AAUs, ERUs and RMUs	PASS	
4.2.16.2	Retirement of AAUs with an unknown account identifier	PASS	
4.2.16.6	Retirement attempt of CERs, tCERs, lCERs when registry has CP2 QELRC, but Doha amendment hasn't entered into force	PASS	
4.2.16.7	Retirement attempt of CERs, tCERs, lCERs when registry has CP2 QELRC and Doha amendment has entered into force	PASS	
4.2.16.8	Retirement attempt of tCERs, lCERs in excess of tCER/lCER retirement limit	PASS	

4.2.16.9	Retirement of tCERs, lCERs within tCER/lCER retirement limit	PASS	
4.2.16.10	Reconciliation	PASS	
4.2.17.2	Replacement of retired lCER for reversal of storage notification (Type 4) with Lcer	BLOCKED	For the same reasons as 3.2.8.1
4.2.17.3	Replacement of lCER in holding account for reversal of storage notification (Type 4) with lCER	BLOCKED	For the same reasons as 3.2.8.1
4.2.17.4	Replacement of retired lCER for reversal of storage notification (Type 4) with AAU, RMU, ERU, CER	BLOCKED	For the same reasons as 3.2.8.1
4.2.17.5	Replacement of lCER in holding account for reversal of storage notification (Type 4) with AAU, RMU, ERU, CER	BLOCKED	For the same reasons as 3.2.8.1
4.2.17.6	Replacement of retired lCER for non-submission of certification report (Type 5) with lCER	BLOCKED	For the same reasons as 3.2.9.1
4.2.17.7	Replacement of lCER in holding account for non-submission of certification report (Type 5) with lCER	BLOCKED	For the same reasons as 3.2.9.1
4.2.17.8	Replacement of retired lCER for non-submission of certification report (Type 5) with AAU, RMU, ERU, CER	BLOCKED	For the same reasons as 3.2.9.1
4.2.17.9	Replacement of lCER in holding account for non-submission of certification report (Type 5) with AAU, RMU, ERU, CER	BLOCKED	For the same reasons as 3.2.9.1
4.2.17.10	Replacement of retired lCER upon expiry (Type 3)	BLOCKED	Notification type 3 couldn't be triggered in ITL REG. Issue to follow up on
4.2.17.11	Replacement of retired tCER upon expiry (Type 3)	BLOCKED	For the same reasons as 4.2.17.10
4.2.17.12	Replacement of tCER in holding account upon expiry (Type 3)	BLOCKED	For the same reasons as 4.2.17.10
4.2.17.13	Reconciliation	SKIPPED	
4.2.18.1	Successful lCER expiry date change	PASS	

4.2.18.2	Successful tCER expiry date change	SKIPPED	This test requires to change the end date of CP3, which would affect all the registries using the test environment simultaneously
4.2.19.1	Internal transfer of CP2 units within registry ZZ	PASS	
4.2.20.1	Conversion of CP2 AAU for JI track 1 when eligibility parameter 2 is missing	PASS	
4.2.20.2	Conversion of CP2 AAU for JI track 2 when eligibility parameter 2 is missing	PASS	
4.2.20.3	External transfer to another registry	PASS	
4.2.20.5	Retirement attempt of CERs, tCERs, lCERs when registry has CP2 QELRC and Doha amendment has entered into force	PASS	
4.2.21.1	CPR notification when AAU issuance is less than CPR amount	PASS	
4.2.21.2	CPR notification upon setting the CPR limit	PASS	
4.2.21.3	CPR notification upon updating the CPR limit	PASS	
4.2.21.4	Reconciliation	PASS	
5.1	Multiple simultaneous incoming transfers	PASS	
5.2	Incoming transfer ¯ long transaction identifier	PASS	
5.3	Incoming transfer ¯ long serial numbers and small blocks	PASS	
5.4	Incoming transfer ¯ long transferring account number	PASS	
5.5	Successful Retirement	PASS	
5.6	Numerous successive incoming transfers ¯ large block quantities	PASS	

5.7	Reconciliation inconsistency and manual intervention	PASS	
5.8	Handling numerous unit blocks	PASS	
5.9	Reconciliation	PASS	