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Report of the individual review of the greenhouse gas inventory of Poland submitted in 2006*

* In the symbol for this document, 2006 refers to the year in which the inventory was submitted, and not to the year of publication.

CONTENTS

I. Overview

A. Introduction

1. This report covers the in-country review of the 2006 greenhouse gas (GHG) inventory submission of Poland, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with decision 19/CP.8. The review took place on 11–16 June 2007 in Warsaw, Poland, and was conducted by the following team of nominated experts from the roster of experts: generalist – Ms. Barbara Muik (Austria); energy – Mr. Matej Gasperic (Slovenia); industrial processes – Mr. Justin Goodwin (United Kingdom); agriculture – Ms. Batima Punsalmaa (Mongolia); land use, land-use change and forestry (LULUCF) – Mr. Risto Sievanen (Finland); waste – Mr. Eduardo Calvo (Peru). Mr. Justin Goodwin and Mr. Eduardo Calvo were the lead reviewers. The review was coordinated by Mr. Javier Hanna (UNFCCC secretariat).

2. In accordance with the "Guidelines for the technical review of GHG inventories from Parties included in Annex I to the Convention" (hereinafter referred to as UNFCCC review guidelines), a draft version of this report was communicated to the Government of Poland, for comment prior to its publication.

B. Inventory submission and other sources of information

3. In its 2006 submission, Poland submitted a set of common reporting format (CRF) tables for the years 1988–2004 and 17 national inventory reports (NIR), one for each reported year. Where needed, the expert review team (ERT) also used the previous submission (2005), additional information provided during the review and other information. The full list of materials used during the review is provided in the annex to this report.

4. After the in-country review, following the recommendations of the ERT, Poland submitted a complete set of revised CRF tables for the years 1988–2004 as well as documentation and additional information. Poland submitted final revised estimates for the entire time series on 14 November 2007.

C. Emission profiles and trends

5. In 2004, the most important GHG in Poland was carbon dioxide (CO_2), which contributed 82.2 per cent to total[1] national GHG emissions expressed in CO_2 eq., followed by methane (CH_4), 9.7 per cent, and nitrous oxide (N_2O), 7.3 per cent. Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) taken together contributed 0.7 per cent of the overall GHG emissions in the country. The energy sector accounted for 83.0 per cent of the total GHG emissions followed by agriculture, 8.3 per cent, industrial processes, 6.1 per cent, waste, 2.4 per cent, and solvents and other product use, 0.2 per cent. Total GHG emissions amounted to 388,482.16 Gg CO_2 eq. in 2004 and decreased by 31.0 per cent from 1988 (base year) to 2004.

6. Tables 1 and 2 show the GHG emissions by gas and by sector, respectively.

[1] In this report, the term total emissions refers to the aggregated national GHG emissions expressed in terms of CO_2 eq. excluding LULUCF, unless otherwise specified.

Table 1. Greenhouse gas emissions by gas, 1990–2004[a]

GHG emissions	Gg CO_2 eq.								Change BY–2004 (%)
	Base year Convention	1990	1995	2000	2001	2002	2003	2004	
CO_2 (with LULUCF)	436 209.10	344 435.30	330 952.43	292 042.47	289 830.41	279 311.74	294 619.16	292 742.70	–32.9
CO_2 (without LULUCF)	469 143.82	377 160.79	363 736.62	320 090.18	320 900.43	307 804.86	320 270.82	319 470.10	–31.9
CH_4	53 672.51	47 913.56	43 330.88	39 181.86	38 345.57	37 636.76	38 330.46	37 846.19	–29.5
N_2O	40 334.29	37 565.51	30 842.08	29 505.13	29 594.80	28 114.83	28 211.90	28 436.67	–29.5
HFCs	NA,NE,NO	NA,NE,NO	26.44	594.67	1 073.35	1 519.44	1 816.23	2 425.13	100.0
PFCs	NA,NE,NO	NA,NE,NO	250.18	224.40	269.95	286.50	278.34	285.05	100.0
SF_6	NA,NE,NO	NA,NE,NO	23.77	21.12	21.81	23.21	20.94	23.09	100.0

Note: BY = base year; LULUCF = land use, land-use change and forestry; NA = not applicable; NE = not estimated; NO = not occurring.

[a] Poland submitted revised estimates for the entire time series in the course of the initial review on 14 November 2007. These estimates differ from Poland's GHG inventory submitted in 2006.

Table 2. Greenhouse gas emissions by sector, 1990–2004 [a]

Sectors	Gg CO_2 eq.								Change BY–2004 (%)
	Base year Convention	1990	1995	2000	2001	2002	2003	2004	
Energy	470 309.06	379 049.84	367 062.86	322 388.12	325 091.52	312 027.63	323 492.66	322 246.64	–31.5
Industrial processes	32 531.80	24 545.58	23 505.33	22 829.18	20 974.94	19 534.25	22 456.57	23 715.58	–27.1
Solvent and other product use	1 006.46	629.23	524.80	616.09	637.21	664.25	647.39	704.67	–30.0
Agriculture	50 893.90	49 748.18	37 813.00	34 589.77	34 213.23	33 798.73	33 018.11	32 368.33	–36.4
LULUCF	–32 926.48	–32 721.66	–32 781.68	–28 043.22	–31 066.73	–28 490.51	–25 647.36	–26 723.32	–18.8
Waste	8 401.16	8 663.20	9 301.47	9 189.71	9 285.73	9 358.13	9 309.65	9 446.94	12.4
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	530 215.91	429 914.37	405 425.79	361 569.64	359 135.90	346 892.47	363 277.02	361 758.83	–31.8
Total (without LULUCF)	563 142.38	462 636.03	438 207.47	389 612.86	390 202.63	375 382.99	388 924.38	388 482.16	–31.0

Note: BY = base year; LULUCF = land use, land-use change and forestry; NA = not applicable.

[a] Poland submitted revised estimates for the entire time series in the course of the initial review on 14 November 2007. These estimates differ from Poland's GHG inventory submitted in 2006.

D. Key categories

7. Poland reported a tier 1 key category analysis, both level and trend assessment, for 2004 as part of its 2006 GHG inventory submission. Poland has not included the LULUCF sector in its key category analysis and did not apply a qualitative approach in determining its key categories.

8. The key category analyses performed by the Party and the secretariat[2] produced similar results for both 1988 and 2004. However, the fact that the LULUCF sector was not included in Poland's key category analysis resulted in some LULUCF categories being identified only by the secretariat in 2004, namely forest land remaining forest land, cropland remaining cropland, grassland remaining grassland and settlements . In its analysis, Poland identified one additional key category for 2004, CO_2 emissions from 2.A.2 lime production in the trend assessment, which is not considered a key category in the secretariat's analysis. Poland identified 26 key categories for the year 2004, 16 of which were in the level assessment, and 21 of which were in the trend assessment. Poland's key category analysis guides its inventory preparation and is used to set priorities for the development of more advanced methodologies.

E. Main findings

9. The ERT acknowledges the significant improvements that have been made in the inventory based on the recommendations of the previous review (2005). An almost complete set of CRF tables were submitted in 2006; and revised LULUCF tables in accordance with decision 13/CP.9 and a full time series covering the entire period from 1988 were submitted for the first time.

10. The ERT noted the need to further improve the transparency and completeness of the reporting by providing a single NIR (instead of the current 17), covering the entire time series and following the structure outlined in the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines), including description and interpretation of emission trends, information on quality assurance/quality control (QA/QC) activities for the inventory preparation, general and category-specific information on recalculations and improvements, and source/sink category-specific information on uncertainties and time-series consistency. Furthermore, the ERT encourages Poland to improve transparency in the inventory by including additional information in the NIR with regard to comprehensive and precise methodological descriptions in individual sectors, and explanations of the selection of methodologies and the emission factors (EFs) used.

11. The inventory is generally in line with the *Revised 1996 IPCC* (Intergovernmental Panel on Climate Change) *Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance). However, the ERT identified a number of cases where the methods, activity data (AD) and EFs used were not fully in line with the guidance mentioned above. These cases include, first, the incorrect use of AD, EFs or methodologies or their insufficient documentation: (a) the use of poorly documented country-specific oxidation factors for CO_2 emissions from solid fuels in the energy industries (1.A.1); (b) the inclusion of imported natural gas in the calculation of CH_4 and CO_2 emissions from natural gas

[2] The secretariat identified, for each Party, those source categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance for LULUCF. Key categories according to the tier 1 trend assessment were also identified for those Parties that provided a full set of CRF tables for the base year or period. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

processing (1.B.2.b.ii); (c) the inclusion of GHG emissions from non-energy products in the commercial/institutional category (1.A.4.a); (d) the use of poorly documented country-specific EFs for CO_2 emissions from coke, gasoline, fuel oil, coke oven gas, town gas, blast furnace gas and high methane natural gas in fuel combustion (1.A.); (e) the use of an assumed split between fuel for navigation (1.A.3.d) and marine bunkers, without supporting information on levels of international versus domestic shipping activity; (f) the inconsistency between total domestic coke supply in the energy balance and the sum of coke consumption used for the calculation of GHG emissions from coke in the relevant inventory categories (in particular fuel combustion (1.A.)); (g) the inconsistencies between total energy use of (high methane) natural gas, liquefied petroleum gas (LPG) and coke oven gas in the energy balance and the total energy use of (high methane) natural gas, LPG and coke oven gas used for the calculation of GHG emissions from fuel combustion (1.A.); (h) the EFs for CO_2 estimation from railways (1.A.3c); (i) the AD for CO_2 estimation from ammonia production (2.B.1); (j) the AD and EFs for CO_2 estimation from steel production (2.C.1); (k) the use of inconsistent data sources for milk production by dairy cattle for the calculation of CH_4 emissions from enteric fermentation (4.A.); (l) the use of total peat land area instead of cultivated peat area to calculate N_2O emissions from cultivation of histosols (4.D.1.5); (m) the use of poorly documented country-specific parameters for CH_4 emissions from solid waste disposal sites (6.A.); and (n) the AD and method used for CH_4 emissions from for industrial wastewater (6.B.1). Second, the LULUCF sector estimations were made according to the Revised 1996 IPCC Guidelines instead of the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories for Land use, Land-use change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). Third, some categories or gases are not estimated, such as: CO_2 from underground mines (1.B.1.a.i) and surface mines (1.B.1.a.ii); CH_4 from post-mining activities in surface mines (1.B.1.a.ii); emissions of CO_2, CH_4 and N_2O from oil refining/storage (1.B.2.a.iv), distribution of oil products (1.B.2.a.v), natural gas – other leakage (1.B.2.b.v) and venting and flaring (1.B.2.c); CH_4 from other (industrial solid waste) (6.A.3); and CH_4 recovery from managed waste disposal on land (6.A.1).

12. The ERT acknowledges that most of these problems were corrected during the review and recommends Poland to reflect these improvements and changes in its next inventory submission.

13. The ERT recommends Poland to provide estimates for categories not currently estimated, and to revise a number of categories where the methods were found to be not consistent with the IPCC guidelines, for example, poorly documented EFs and assumptions, or where inconsistent data sources were used. The ERT also recommends Poland to include the LULUCF categories in its key category analysis, and to develop further the estimates for the LULUCF sector by estimating emissions/removals from all LULUCF categories following the IPCC good practice guidance for LULUCF.

F. Cross-cutting topics

1. Completeness

14. The 2006 inventory submission covers all the years from 1988 (the base year) to 2004. Poland has included most of the tables required with data on all the relevant gases, sectors and main categories. The inventory is complete in terms of geographic coverage. Notation keys are used throughout the tables.

15. However, the ERT noted several categories for which GHG emissions occur in Poland but emissions have been reported as not estimated ("NE"). Poland explained that in such cases either not enough information was available or the emissions are considered to be minor. Moreover, Poland has not submitted complete CRF tables 8(a) and 8(b) (recalculations) and tables 9(a) and 9(b) (completeness), or explanations for the differences between the reference and sectoral approaches in table 1.A(c). There are also reporting gaps in some of the sectoral tables (e.g. potential emissions in the industrial processes sector), and information in table 7 (key categories) is not consistent with information

provided in the NIR. In addition, some mandatory LULUCF categories, including land converted to forest land, land converted to cropland, and land converted to settlements, are reported as "NE". No notation keys were used for other categories (e.g. land converted to grassland and land converted to wetlands). The incompleteness of the reporting in the LULUCF sector is linked to the use of the Revised 1996 IPCC Guidelines, which is not in accordance with the IPCC good practice guidance and the latest UNFCCC reporting requirements. The ERT encourages Poland to provide estimates for all categories where emissions occur in the country, even if they are minor, and to estimate emissions/removals from all mandatory LULUCF categories following the IPCC good practice guidance for LULUCF. The ERT noted the efforts made by Poland to resolve most of the abovementioned problems in the course of the review, such as including estimates for CO_2 emissions from ammonia, steel and zinc production; CH_4 emissions from oil refining/storage, from other industrial solid waste and industrial wastewater; and SF_6 from magnesium casting; as well as providing revised estimates for the LULUCF sector in accordance with the IPCC good practice guidance.

16. Poland submitted 17 NIRs (one for each inventory year) but the NIR lacks some chapters that form part of the structure of the NIR recommended in the UNFCCC reporting guidelines, such as description and interpretation of emission trends, general and category-specific information on recalculations and improvements, and source/sink category-specific information on QA/QC, uncertainties and time-series consistency.

2. Transparency

17. The ERT noted that the transparency and quality of the information reported by Poland in the NIRs have improved since the previous (2005) submission. However, the ERT encourages Poland to provide a single NIR (instead of the current 17) that covers the entire time series and follows the structure of the UNFCCC reporting guidelines (see paragraph 16 above). Furthermore, the ERT encourages Poland to improve transparency in the inventory by including in the NIR comprehensive and precise methodological descriptions in individual sectors, such as fuel combustion, and iron and steel production, and explanations of the selection of methodologies and EFs. Any country-specific data (EFs and parameters) should be identified and referenced, and the basic assumptions on how these data are derived should be documented in the NIR. Documentation on recalculations, qualitative information and assumptions on uncertainties, the areas for improvement identified as well as a description of the QA/QC plan and information on QA/QC procedures already implemented or to be implemented in the future should also be included in the NIR.

18. The ERT found that in table 9(a) only limited information was provided on the use of notation keys. The NIR states that for categories where emissions do not occur or are not estimated the notation key "NE" was used in the CRF tables. However, according to the UNFCCC reporting guidelines the notation keys not occurring ("NO") and "NE", respectively, should be used. The ERT recommends that Poland use the notation keys in a manner that is consistent with the UNFCCC reporting guidelines and provide clear explanations of the use of the notation keys in its next submission. The ERT encourages Poland to include all relevant information in the documentation boxes of the CRF tables or to make reference to the respective chapter in the NIR.

3. Recalculations and time-series consistency

19. The ERT noted that the recalculations reported by Poland in its 2006 submission of the time series from 1988 to 2003 had been undertaken to take into account the recommendations of the 2005 in-country review. The recalculations covered all sectors and led to an increase in the national total of between 2.1 and 8.4 per cent over the 1988–2003 period. The recalculation between the 2005 and 2006 submissions resulted in an increase in the estimates of total GHG emissions of 4.0 per cent for 1988 and 4.9 per cent for 2003. The major changes include revised CO_2 emissions from fuel combustion (1.A) and iron and steel production (2.C.1); revised CH_4 emissions from fugitive emissions from solid fuels (1.B.1),

manure management (4.B), solid waste disposal on land (6.A) and wastewater handling (6.B); and revised N_2O emissions from agricultural soils (4.D). The rationale for these recalculations is not provided in the NIR or in the CRF tables.

20. During the in-country review, Poland provided a qualitative overview of the improvements in inventory methodologies since the 2005 submission, but no overview of the quantitative changes at the level of categories was provided. Poland stated that the recalculations for 1988 were triggered by time-series inconsistencies (previous emission calculations were based on different methodologies carried out by a different institution) and transparency problems due to a lack of documentation of the methods, EFs and AD used. The ERT noted that a complete CRF for 1988 was provided for the first time in the 2006 submission and acknowledges the efforts made by Poland to improve time-series consistency. Nonetheless, the ERT noted that the recalculations were not always made in accordance with the IPCC good practice guidance, mainly concerning the consistent use of data sources (e.g. milk production for dairy cattle). The ERT recommends Poland to ensure that any future recalculations are made in accordance with the IPCC good practice guidance and that Poland report recalculations in a transparent manner in the CRF tables. The ERT emphasizes the need to establish a transparent and well documented process with regard to recalculations, and to report recalculations comprehensively in the NIR.

4. Uncertainties

21. Poland provided a tier 1 uncertainty analysis for each category and for the inventory in total, following the IPCC good practice guidance. However, the analysis is based to a great extent on the default uncertainties included in the IPCC good practice guidance. The ERT encourages Poland to use more country-specific information and to request the institutions providing AD to estimate relevant uncertainty data as well.

22. The information on uncertainties provided in the NIR does not include any qualitative discussion on the uncertainty of the data used for all categories. This is particularly important for the key categories. The ERT encourages Poland to include documentation on uncertainties, including the assumptions made and references to these assumptions, in the respective chapters of its next NIR.

23. Poland revised its assumptions on uncertainty data between the 2005 and the 2006 submissions, following the recommendation of the review of the 2005 submission. This revision and the inclusion of uncertainty data on HFCs, PFCs and SF_6 emissions for the first time produced a much higher overall level of uncertainty in the inventory. Thus, the overall improvement in the inventory is not reflected in a reduction in overall uncertainty.

5. Verification and quality assurance/quality control approaches

24. Poland indicates in its NIR that it has not yet implemented a formal QA/QC procedure, including verification plan, for the national GHG inventory. In the NIR Poland states that general and sector-specific QC procedures are performed regularly and that the QA-related activities referred to external reviews are performed occasionally under the auspices of the Ministry of Environment (MoE). The draft inventory data are usually checked by National Emission Centre (NEC) experts and consultations with data providers are undertaken. Before the data are forwarded to the UNFCCC secretariat, the MoE and the Main Inspectorate for Environmental Protection carry out an additional review. However, during the in-country review the ERT noted that the results of QC checks and reviews are not well documented and archived. The ERT therefore suggested that Poland introduce better documentation of its QC activities at all stages of inventory preparation within the NEC, as well as for the other institutes/experts that contribute to inventory preparation, and in calculation spreadsheets and other supporting documents.

25. At the request of the ERT, Poland provided a draft QA/QC plan during the in-country review. However, the ERT considered this plan to be too general and insufficient to ensure the quality of the GHG inventory. Therefore, the ERT requested Poland to provide a more detailed draft of its QA/QC

plan. After the in-country review, in response to the recommendations made by the ERT, Poland provided the ERT with its National Programme for Quality Assurance and Quality Control. This programme contains all the relevant elements such as general and specific QC procedures, QA procedures, a timetable for inventory preparation and QA/QC, defined responsibilities for inventory preparation and QA/QC, and tier 1 and tier 2 QC checklists. The ERT considers the programme to be in line with the IPCC good practice guidance and expects that it will be implemented by Poland. Poland also provided a summary of the QA/QC activities implemented for its 2006 inventory submission.

26. The ERT encourages Poland to document QA/QC activities in the NIRs of its future submissions in accordance with the UNFCCC reporting guidelines, to use review findings to improve the inventory and to archive the findings/results of the QA/QC procedures together with the inventory data.

6. Follow-up to previous reviews

27. Major improvements to the inventory have resulted from previous reviews such as: improvements in time-series consistency from recalculations in all sectors; the submission of a complete set of the CRF tables for the entire time series (1988–2004); and revised quantitative uncertainty estimates.

28. Major issues still pending from previous reviews are: that the structure of the NIR does not follow the UNFCCC reporting guidelines; that the transparency of the submission is limited by insufficient and non transparent documentation in the NIR of methodologies, EFs and AD as well as of the underlying assumptions used; and the development of a formal QA/QC plan and its full implementation.

G. Areas for further improvement

1. Identified by the Party

29. The NIR does not identify any areas for improvement. After the in-country review, in response to the issues raised during the review, Poland indicated that it is working to improve its estimates in the LULUCF sector using the methodologies in the IPCC good practice guidance for LULUCF, and is planning improvements to the transparency of the NIR and revisions to methods for a number of categories in other sectors (e.g. iron and steel, and industrial wastewater).

2. Identified by the ERT

30. The ERT identified the following cross-cutting issues for improvement and recommends that Poland:

(a) Implement the QA/QC plan and include information on the QA/QC plan in its future NIRs;

(b) Submit a single NIR covering the entire time series and following the structure outlined in the UNFCCC reporting guidelines, including more comprehensive and precise descriptions and documentation of methodologies and EFs that differ from those of the IPCC, and providing better explanations of the emissions trends;

(c) Improve transparency of reporting by further elaboration of the NIR and inclusion of the relevant sections on trends, recalculations, future improvements and category-specific information on QA/QC, uncertainty and time-series consistency;

(d) Include reporting of recalculations, their rationale, and explanation of methodological changes, ensuring that any future recalculations are consistently made, presented for all the years of the inventory, prepared in accordance with the IPCC good practice guidance and fully documented in its future NIRs;

(e) Improve AD consistency and applied methods for a number of categories to bring them in line with the requirements of the IPCC good practice guidance and the UNFCCC reporting guidelines;

(f) Collect country-specific AD and develop well documented country-specific EFs for use with higher tier methods for key categories;

(g) Use more country-specific information in calculations of uncertainties and include the qualitative discussions on uncertainty of the data used for all categories, and in particular for key categories, in its next NIR;

(h) Improve the completeness of CRF tables by including tables 8(a) and 8(b) (recalculations) and tables 9(a) and 9(b) (completeness), and improve the transparency of reporting by the systematic and consistent use of notation keys and the inclusion of relevant information in the documentation boxes in the CRF tables;

(i) Provide estimates for the LULUCF sector according to the IPCC good practice guidance for LULUCF;

(j) Include LULUCF categories in the key category analysis.

31. Recommended improvements relating to specific source/sink categories are presented in the relevant sector sections of this report.

II. Energy

A. Sector overview

32. In 2004 the energy sector in Poland accounted for 83.0 per cent of total national GHG emissions. Fuel combustion contributed 79.0 per cent to the total national emissions and 95.3 per cent to total GHG emissions from the sector. Total GHG emissions from the energy sector decreased by 31.5 per cent from 1988 to 2004, from 470,309.06 Gg CO_2 eq. in 1988 to 322,246.64 Gg CO_2 eq. in 2004, due to a significant decline in emissions from energy industries (by 32.3 per cent) and other sectors (1.A.4) (by 51.9 per cent). These categories are the most important, contributing 56.6 and 16.8 per cent, respectively, to the energy emissions in 2004. Fugitive emissions contributed 4.7 per cent of the total energy emissions. The percentage changes between the base year and 2004 for each gas from the energy sector are: CO_2 (–31.4 per cent), CH_4 (–36.4 per cent) and N_2O (+4.0 per cent).

33. Poland indicates in the NIR that the most important decrease in emissions occurred in the period 1988–1990, largely as a consequence of the decline in industrial activities. The remaining reduction is mostly ascribable to fuel use switching and, to a lesser degree, to an increase in energy efficiency in the industrial sector.

34. The methodologies applied in the calculations for fuel combustion are mainly IPCC tier 2 with CO_2 country-specific EFs and tier 1 methods for fugitive emissions.

35. The NIR and the CRF tables provided for the energy sector inventory estimates are generally complete. The estimates are complete in terms of geographic coverage for all gases and for the entire time series. However, emissions from fuel combustion in some minor categories are missing: CO_2 emissions from mining and post-mining activities (underground and surface mines); CH_4 emissions from surface mines – post-mining activities; CH_4 and CO_2 emissions from oil refining/storage, distribution of oil products, other (oil), exploration (oil and natural gas), venting and flaring (oil, gas and combined), and from other leakage (natural gas) at industrial plants and power stations and residential and commercial sectors. After the in-country review, Poland made significant efforts to provide the majority of the missing estimates, including CH_4 emissions from oil – refining/storage and CO_2 and CH_4 from

other leakage (natural gas), and to revise the estimates for a number of categories. Poland informed the ERT that emissions from aviation gasoline from civil aviation reported originally as "NE" were included under other – mobile (1.A.5b). However, some minor categories are still not estimated, such as fugitive emissions from: distribution of oil products (1.B.2.a.v), other leakage of natural gas in residential and commercial sectors (1.B.2.b.v) and venting and flaring (1.B.2.c). The total revisions during the review resulted in a decrease in the GHG emissions estimates for the sector of 1.4 per cent or 4,666.68 Gg CO_2 eq. in 2004 (from 326,913.31 Gg CO_2 eq. to 322,246.64 Gg CO_2 eq.).

36. Besides the general problem of inventory transparency linked to the submission of an NIR for each inventory year, another issue linked to transparency is the improper use of notation keys. Thus, for example, emissions from other fuels in all categories of fuel combustion (from 1.A.1 to 1.A.5) are reported as "NE" and "not applicable" ("NA") while the proper notation key should be "NO". After the in-country review, Poland made significant efforts to use notation keys properly in the sectoral approach, but notation keys in the reference approach still need to be corrected as appropriate.

37. Time-series consistency is very difficult to assess since Poland submitted an NIR for each inventory year. However, during the in-country review the ERT managed to compile a relevant time series for the energy sector and found some isolated cases of inconsistency, such as GHG emissions from energy use of non-energy products in the residential category (some GHG emission estimates between 1988 and 1996 were reported). During the review process, Poland recognized the inconsistency and decided to remove emissions from non-energy products from the total estimates.

38. An uncertainty analysis was performed using the IPCC tier 1 method. The estimated uncertainties for the energy sector in 2004 are 2.3 per cent for CO_2, 13.1 per cent for CH_4 and 3.7 per cent for N_2O. As is noted in the previous review report (2005), the calculated uncertainty values, particularly those for N_2O and CO_2, appear to be rather low.

39. Poland indicates in the NIR that AD uncertainty depends on the consumption level (the higher the consumption, the lower the associated uncertainty) and that EF uncertainties are based on expert judgment and also on an analysis made by the inventory team of the GHG inventories of other countries. Concerning AD uncertainty, the ERT reiterates the recommendations of the previous review report (2005) that Poland include in its future NIRs a discussion of the quality of fuel consumption data and the uncertainty values adopted. For EF uncertainties, the ERT recommends that Poland re-examine the values adopted to perform the analysis and compare these values with other available information for different countries, and include in the NIR the rationale for adopting the values as well as the procedures used for eliciting expert judgment.

40. The ERT welcomed the efforts made by Poland to improve reporting in the energy sector, providing a consistent time series for the first time and including emission estimates in some categories where emissions previously were not estimated. Poland has made significant efforts to develop country-specific methods and EFs, but this information has not been included in the NIR. This is unfortunate because it impairs transparency and denies other Parties access to these data.

41. The ERT also encourages the inventory team to play the key role in reviewing, critically assessing, reporting and documenting the information required for compiling the inventory and also in trying to reconcile the data provided by different information sources and further strengthening the data QA/QC procedures for the energy sector.

B. Reference and sectoral approaches

1. Comparison of the reference approach with the sectoral approach and international statistics

42. In the 2006 inventory submission only the sectoral approach is reported for 2004. In the revised set of tables provided after the in-country review, the reference approach was also included. The sectoral

approach CO_2 emission estimates were 1.6 per cent higher than those of the reference approach. However, the comparison of fuel consumption by fuel types shows discrepancies of 31.4 per cent for gaseous fuels and –15.1 per cent for solid fuels. There is no discussion of the differences between, or comparison of, the reference approach and sectoral approach estimates in the NIR.

43. During the in-country review, Poland informed the ERT that the reference approach is prepared not by the inventory team but by an independent expert in cooperation with the Energy Market Agency (ARE). Therefore, no substantial additional background information on the differences was available to the ERT. The ERT recognized that some differences may arise from how non-energy use of fuels is handled, both in the reference approach and in the sectoral approach. Therefore, the ERT recommends Poland to establish the necessary institutional arrangements to clearly set out the overall responsibility for preparing the emissions estimates for the energy sector, which will facilitate timely preparation of the reference approach and provide full discussion of and justification for the possible differences between the two approaches in the NIR.

44. As is noted in the previous in-country review (2005), Poland has added two extra rows to CRF table 1.A(b) to deal with the two types of natural gas (high-methane and nitrified). Although these two types of fuel are dealt with in a transparent manner, for comparability purposes it is recommended that Poland provide the information on natural gas in an aggregated form without modifying the CRF table, leaving the disaggregated treatment of gaseous fuels for the NIR.

45. The ERT also noted that for all fuels, except coking coal, values are only reported under apparent consumption (in TJ) in the reference approach, while for production, import/export, stock changes and international bunkers only notation keys “NE”, “NO” and “NA” are used. The ERT encourages Poland to continue the process of improvements and corrections to the reference approach, to provide information on production, import/export, and stock changes of fuels in its next submissions and to use relevant notation keys in table 1(A)b.

2. International bunker fuels

46. No information is provided in either the NIR or the documentation box of CRF table 1.C about the methodology for allocating fuel consumption between domestic and international transportation. Marine bunkers data are based on IEA and Eurostat energy statistics for Poland. During the in-country review, Poland provided additional information and revised estimates for navigation (see paragraph 66). The revisions resulted in a change to the split between fuel consumption for domestic use and international marine transport in the base year from 58.0 per cent (domestic) and 42.0 per cent (international) to 8.0 per cent and 92.0 per cent, respectively. The change for 2004 is from 19.5 per cent (domestic) and 80.5 per cent (international) to 1.1 per cent and 98.9 per cent, respectively. Polish statistics also include fuel purchased abroad by the Polish fleet. This fuel was correctly excluded from the emissions estimates.

3. Feedstocks and non-energy use of fuels

47. AD on feedstocks and non-energy use of fuels are available from the Central Statistical Office (GUS) and the ARE. In the Polish energy statistics, the so-called non-energy products include bitumen, kerosene, lubricants, motor oil, naphtha, paraffin, raw benzole, solvents, tar, tar residues, vaseline, wax and other oil products. A fraction of these products is combusted for energy purposes in different energy transformation and industrial activities. Poland reported some fuels, such as natural gas, gas/diesel oil, ethane, butane, LPG and asphalt, as “NE” in table 1.A(d). The ERT encourages Poland to make the necessary efforts to report the amount of these fuels used as feedstock or used for other non-energy purposes in this CRF table or to use the appropriate notation key.

C. Key categories

1. Stationary combustion: solid fuels – CO_2

48. Stationary combustion of fossil fuels is dominated by domestic other bituminous coal (brown coal) and lignite consumption in thermal power plants (1.A.1a public electricity and heat production). The CO_2 EFs for lignites, hard coal, coke, fuel oil, coke oven gas, town gas, blast furnace gas and high methane natural gas used in fuel combustion were estimated using a country-specific equation,[3] which correlates the net calorific values (NCVs) of the fuel with its carbon content. Following the recommendation of the 2005 review report, Poland revised the equation for lignite and hard coal based on analysis of lignite and hard coal samples taken in 2005 and 2006.[4]

49. The ERT recommended Poland to provide the necessary and substantive supporting documentation used for the analyses employed to derive the equations for estimation of carbon content in fuels for the entire time series 1988–2004, including the range of applicability of each correlation in terms of the NCV of the corresponding fuel and the corresponding confidence limits as recommended in the 2005 review report.

50. After the in-country review, in response to the ERT's recommendations, Poland applied default EFs taken from recently published recognized international literature for the following fuels: coke, gasoline, fuel oil, coke oven gas, town gas, blast furnace gas and high methane natural gas.

51. During the in-country review, the ERT noted that the range for the lignite NCV from the analysed samples varies from 7.72 MJ/kg to 12.45 MJ/kg. However, 97 per cent of lignite used in energy industries has an NCV in the range of 8.01–8.74 MJ/kg in the time series 1988–2004. The range of NCVs of the analysed lignite samples is significantly higher than the range of NCVs for the majority of fuel consumed in the energy industries and the dataset appears to be biased towards the higher NCV values. Information on the range of applicability of correlation in terms of the NCV and the corresponding confidence limits was not available during the in-country review.

52. In the absence of the necessary substantive supporting documentation for the analyses of the representativeness of the 2005–2006 samples used to derive the equation for lignite for the time series 1988–2004 in Polish national conditions, the ERT was not able to draw conclusions during the in-country review on the appropriateness of the methodology used to estimate CO_2 EFs for lignite.

53. The ERT recommended Poland to provide: detailed information with regard to lignite samples dating from 2005–2006; background materials to demonstrate the representativeness of the analysed samples for the entire time series and predominant sectors; the distribution of NCV of lignite produced in Poland around the mean value; and the rationale behind the decision to derive relevant country-specific functions from samples with NCVs of between 7.72–12.45 MJ/kg.

54. After the in-country review, following the recommendation of the ERT, Poland decided to revise and improve the procedure for obtaining carbon EFs for the combustion of lignite by deriving a new empirical relationship linking carbon content in raw samples with the corresponding NCV. The revised formula reflects the concerns raised by the ERT about the representativeness of selected samples since it is derived from a much bigger set of relevant lignite samples. The revised NCVs were in the range of 8.0–8.5 MJ/kg and the carbon content factors were recalculated at 30.0–31.0 t C/TJ. The ERT was provided with the background information requested to support the new estimates.

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[3] Referenced in Opracowanie krajowego zbioru paliw kopalnych I ich pochodnych wg klasifykaciji OECD (IEA), Zasanie2, FEWE, Katowitze 1994.

[4] Opracowanie I analiza danych dotyczacych zawartosci wegla pierwiaskowego w paliwach stalych, Gliwice, 31.05.2006.

55. During the in-country review, the ERT also noted that the range of carbon content factors for brown coal derived from a correlation equation based on brown coal samples taken in 2005–2006 varies from between 26.2 t C/TJ and 26.5 t C/TJ (in 1.A.1 energy industries and in 1.A.5a other – stationary). All these values are equal to or just above the IPCC default value of 26.2 t C/TJ for sub-bituminous coal and in the range of the CO_2 EF for energy industries (92.8 t CO_2/TJ (25.3 t C/TJ) – 100 t CO_2/TJ (27.3 t C/TJ)) provided in recently published recognized international literature. Nonetheless, the ERT strongly encourages Poland to further improve the process for determining national EFs for sub-bituminous coal and to fully utilize the results of new domestic legislation.

56. Furthermore, during the in-country review, the ERT noted that the oxidation factor used to estimate CO_2 emissions from solid fuels in energy industries (0.984) differed from the IPCC default oxidation factor (0.98), and that justification and background documentation was not available. Poland was requested to provide justification and adequate background information on the country-specific oxidation factor or to use the IPCC default oxidation factor for solid fuels (0.98). After the in-country review, in the absence of adequate background information, Poland decided to follow the ERT's recommendation and revised its estimates using the default IPCC oxidation factor for solid fuels (0.98).

57. The ERT encourages Poland to present in its subsequent submissions a full carbon balance of inputs and outputs of fuel used in the iron and steel category (1.A.2a) and to describe the links to the fuel reported under the industrial processes sector in order to increase transparency and avoid possible underestimation or overestimation of related emissions.

58. The overall impact of all the revisions indicated above for this category in 2004 was a decrease in the emissions of 0.8 per cent from 223,358.16 Gg CO_2 eq. to 221,639.62 Gg CO_2 eq.

2. Stationary combustion: liquid fuels – CO_2

59. During the in-country review, the ERT noted some discrepancies in calculations for this category, in particular between Poland's calculation sheets for 1988 and data presented in the Polish energy statistics (Energy Balance 1988–1989). The ERT recommended Poland to provide explanations and, if appropriate, correct the estimates for LPG combusted and revise the related CO_2, CH_4 and N_2O emissions. After the in-country review, following the recommendation of the ERT, Poland explained that the discrepancy was because the non-energy use of LPG was not reported separately in the balance and was not subtracted in the CRF tables and revised emission estimates for the entire time series 1988–2004.

60. The impact of the revisions made in this category, including AD, revision of EFs (see paragraph 50) and appropriate allocation of non-energy use of LPG, was a decrease by 13.0 per cent from 32,574.60 Gg CO_2 eq. to 28,336.02 Gg CO_2 eq. in 2004.

3. Stationary combustion: gaseous – CO_2

61. The calculation sheets provided to the ERT by Poland during the in-country review showed that total energy use of high methane natural gas for 1988 was 471 TJ higher than data presented in the Polish energy statistics (Energy Balance 1988–1989). The ERT requested Poland to explain the reasons for the difference and to correct, if appropriate, the estimates for high methane natural gas consumption and related CO_2, CH_4 and N_2O emissions. Poland explained that the difference resulted from it taking the amount of high methane natural gas use in the agriculture/forestry/fisheries category (1.A.4c) from the OECD balance (532 TJ) and not from the Energy Balance 1988–1989 (60 TJ). This was because the agriculture sector in the Energy Balance 1988–1989 only includes collective agriculture and does not include agricultural cooperatives. Following the recommendation of the ERT, the same data source (OECD balance) was applied consistently for the entire time series.

62. As is mentioned above (see paragraph 48), natural gas CO_2 EFs were estimated using a country-specific equation,[5] which correlates the NCVs of the fuel with its carbon content, but after the in-country review these were changed to the IPCC default values. The result of the abovementioned revisions for the category for 2004 was an increase in GHG emissions estimates of 3.9 per cent, from 20,374.96 Gg CO_2 eq. to 21,161.83 Gg CO_2 eq.

4. Road transportation – CO_2 and N_2O

63. A country-specific model is used to estimate CO_2 emissions from road transportation. The NIR does not include a discussion of the key assumptions and the input data used to run the model. During the in-country review, Poland provided the ERT with information about the model and the background references (ITS, 2004). The model uses distance-based AD to estimate the disaggregated fuel consumption of vehicles organized in the following subcategories: passenger cars, light-duty vehicles, heavy-duty vehicles, buses, motorcycles and tractors. In the relevant subcategories, vehicles are further disaggregated according to the presence or absence of catalytic converters. However, the NIR does not contain enough information on the methodology applied. To improve the transparency of the methodology used for the calculations, the ERT strongly encourages Poland to follow the recommendations of the previous review report (2005) and provide in its future submissions information on the main characteristics of the model, including at least a summary of the relevant AD and decisions/expert judgments made about the key features, such as fuel use balance.

64. The same model is also used to estimate CH_4 and N_2O emissions. In this case, the EFs applied are not derived from country-specific measurements but based on CORINAIR and the Revised 1996 IPCC Guidelines. In order to improve transparency, the ERT recommends that Poland provide in its future submissions information on the rationale for the selection of EFs, and a summary of the EFs used and the manner in which catalyst deterioration is accounted for by the model. It also recommends that Poland specify appropriately in the CRF, summary table 3, the use of EFs adopted from the guidelines indicated above.

65. Given the increasing trend in N_2O emissions from road transportation, which are a key category in trend assessment, the ERT recommends that Poland follow the development of these emissions closely.

5. Navigation – CO_2

66. Navigation appears as a key category in the secretariat's trend analysis. Poland reports a relatively high proportion of fuel used in navigation (1.A.3d) (57.97 per cent) in 1988 (30,135.54 TJ, compared to fuel accounted for in marine bunkers, 21,846.30 TJ). No supporting information or evidence is provided in the NIR on levels of international versus domestic shipping activity. Discussions during the in-country review indicated that the allocation of consumption was based on the nationality of the ship. The ERT and Poland came to the conclusion that the ship's flag was not an appropriate driver for disaggregation of fuel used in navigation and international marine bunkers, and is not in accordance with the recommendations of the IPCC good practice guidance. After the in-country review, Poland provided additional information and revised estimates based on GUS data in the Questionnaire/Report G-03, selected data from the energy statistics system (GUS, 1990) and statistical data on levels of international and domestic shipping activity.[6] As these levels fluctuate throughout the time series an average level of domestic shipping activity of 2 per cent was assumed for 1988–1996 and 1 per cent for 1997–2005. The overall impact of the revisions for 2004 was a decrease in the GHG emissions by 95.2 per cent from 196.97 Gg CO_2 eq. to 9.43 Gg CO_2 eq. The ERT appreciates the additional efforts

[5] Referenced in Opracowanie krajowego zbioru paliw kopalnych I ich pochodnych wg klasifykaciji OECD (IEA), Zasanie2, FEWE, Katowitze 1994.

[6] Cargo traffic in Polish seaports by handling directions published in: Tendencies in Polish maritime economy in the 1990's. Statistical Office in Szczecin. Warszawa, Szczecin, 2001.

made by Poland to revise GHG estimates and encourages Poland to make further efforts to improve its estimates using detailed fuel statistics in its subsequent submissions and to provide additional background information in the NIR in order to increase transparency.

6. Other – CO_2

67. Poland initially allocated in other – mobile (1.A.5b) motor fuels used by industry and construction, including municipal economies, and aviation fuel used in agriculture. The ERT recommended Poland to allocate liquid fuels under the appropriate sectors. Poland followed this recommendation and reallocated all fuels previously allocated to 1.A.5 to the appropriate categories (1.A.2, 1.A.3 and 1.A.4).

7. Coal mining and handling – CH_4

68. The amount of other bituminous coal and coking coal produced in the period 1998–2004 was selected as the AD to estimate CH_4 emissions from underground coal mining and handling, while emissions from surface mines were estimated on the basis of the production of lignite.

69. During the in-country review, Poland informed the ERT that emission estimates for underground mining include degasification and ventilation systems, post-mining activities, process waste dumps and abandoned mines while estimates for surface mines only take into account ventilation systems from the coal seam and the surrounding rocks. EFs for ventilation emissions are taken for the period 1988–1997 from Gawlik et al. (1994)[7], for the period 1998–2000 from Gawlik and Grzybek (2001) and for the period 2001–2004 from Kwarciński (2005). In Kwarciński (2005) CH_4 emissions from 42 Polish underground mines were compiled in order to estimate the corresponding CH_4 EFs. The same study also contains EFs for CH_4 for mining and post-mining activities.

70. EFs for surface mines were adopted from Gawlik et al. (1994). The country-specific EFs for surface mines (0.01273 kg/t) are one order of magnitude lower than both the IPCC default EFs (0.20–1.34 kg/t) and the implied emission factors (IEFs) of reporting Annex I Parties (except Germany). The ERT recommends that Poland re-examine the adoption of these EFs and, if it considers them satisfactory, provide a description of their derivation and make efforts to provide access to this information in its next NIR.

71. To improve current time-series consistency, especially for CH_4 emissions from ventilation systems, the ERT encourages Poland to analyse the differences in EFs from the different national studies and, if appropriate, to consider using interpolation for emission estimates for the years where Poland assumed a constant EF, starting from the year in which the study was conducted. To improve transparency, it is recommended that Poland provide in its future submissions a full description of the method used to estimate these emissions, as well as the supporting information.

72. To improve completeness for this category, the ERT encourages Poland to estimate CH_4 emissions from surface post-mining activities, CO_2 emissions from all 1.B.1.a coal mining and handling activities, and the emissions from solid fuel transformation currently reported as "NE".

8. Oil and natural gas – CH_4

73. Poland reports emissions from the production and transportation of oil, and the production, transmission and distribution of natural gas. All other sources are reported as "NE". The ERT encouraged Poland to estimate CH_4 and CO_2 emissions from categories where emissions were currently not estimated, such as other leakages from industrial plants and power stations and in residential and commercial sectors. After the in-country review, Poland included estimates for refining/storage of oil

[7] Gawlik et al., *Establishment of GHG Sources Related to Handling of Coal (hard and brown coal) System and Estimation of Emission Factors in Emission System Sources.*

and from other leakages of natural gas. The impact of these inclusions was an increase in emissions of CH_4 of 1.79 Gg (37.6 Gg CO_2 eq., taking into account the small amount of CO_2 emissions from other leakages) in 2004.

74. Emissions are estimated using a tier 1 method and country-specific EFs (Radwański, 1995). To improve transparency, the ERT recommends that Poland provide the whole set of country-specific EFs and the main features of the way in which they are derived in its next NIR. Fugitive emissions of CH_4 for natural gas – production/processing (1.B.2.b.ii) are calculated on the basis of total (high methane) natural gas consumption, which includes imported natural gas. It is common practice for imported gas to be processed prior to transportation and export. Therefore, the ERT during the in-country review recommended that only emissions from gas produced in Poland should be included in production/processing estimates. Poland followed the recommendation of the ERT and, after the in-country review, provided revised emission estimates using only the national production of natural gas as AD. Overall emissions from this category are relatively low so the impact on the emissions was a reduction of only 5.3 Gg of CO_2 (a 58.6 per cent reduction) in 2004.

75. Together, the revisions discussed for this category in the paragraphs above, including corrections of other AD, resulted in a minor increase in GHG emissions of 0.2 per cent in 2004 from 5,303.64 Gg CO_2 eq. to 5,312.45 Gg CO_2 eq.

76. Emissions from transmission and distribution systems are estimated using the amount of natural gas consumed as AD. The ERT recommends that Poland follow the recommendation of the IPCC good practice guidance and estimate these emissions on the basis of the length of pipelines. The ERT appreciates that Poland followed the recommendation from the previous review report (2005) and reallocated fugitive emissions from coke gas systems from 1.B.2.c venting to 1.B.1c other (under fugitive emissions from solid fuels), significantly improving comparability and transparency.

D. Non-key categories

Civil aviation, railways and other transportation – CO_2, CH_4 and N_2O

77. The NIR does not provide information on the methods, AD and EFs used to estimate emissions in these categories. During the in-country review, Poland explained that tier 1 methods have been used to estimate these emissions. To improve transparency and consistency, it is recommended that Poland include a brief discussion of this information in its future submissions and that it also report appropriately in CRF summary table 3 the use of tier 1 methods and non-country specific EFs.

78. After the in-country review, when Poland provided revised estimates following the ERT recommendations, these categories were also affected by changes in EFs and AD that were applied consistently to the inventory estimates. As a result, 2004 GHG emissions for civil aviation increased by 106.5 per cent from 21.11 Gg CO_2 eq. to 43.58 Gg CO_2 eq., while the GHG emissions from railways decreased by 8.6 per cent, from 573.72 Gg CO_2 eq. to 524.33 Gg CO_2 eq.

III. Industrial processes and solvent and other product use

A. Sector overview

79. In 2004 the industrial processes sector contributed 6.1 per cent of Poland's total GHG emissions, while the solvents and other product use sector is estimated to have contributed 0.2 per cent. The main categories in the industrial processes sector include cement production, which contributed 21.4 per cent of total emissions from the sector; ammonia production, which contributed 18.7 per cent; iron and steel production, 17.9 per cent; and nitric acid production, 17.6 per cent. The inventory covers the main sources of GHG emissions in the sector, but some minor categories are reported as "NE", including CO_2 emissions from limestone and dolomite use, asphalt roofing, road paving with asphalt, food and drink and

glass production; CH_4 emissions from dichloroethylene, methanol, styrene, and ferroalloys production; CO_2, CH_4 and N_2O emissions from non-ferrous metals, and SF_6 used in aluminium and magnesium foundries. For limestone and dolomite use the notation key "NE" was used instead of included elsewhere ("IE"). After the in-country review, in response to the ERT's comments, Poland amended its CRF tables, resolving some of the abovementioned issues. Potential emissions of fluorinated gases (F-gases) are only reported for some years and there are no estimates for 1988 (the base year). The ERT recommends Poland to verify the use of notation keys in its inventory and to further improve the completeness of the estimates in its next GHG inventory submission.

80. In general, Poland has estimated emissions according the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. A number of improvements were recommended by the ERT during the in-country review, as explained in detail in the paragraphs below, and many of these were implemented by Poland during the review process (e.g. ammonia production – CO_2 (2.B.1), steel production – CO_2 (2.C.1)). To improve transparency, Poland's NIR requires improvements to a number of sectoral methodological descriptions and a description of the trends for the six GHGs emitted by the sector. The ERT encourages Poland to implement improvements to the remaining categories, and to include the detailed descriptions provided to the ERT and a full description of trends in its future NIRs.

81. The QA/QC activities implemented by Poland were described to the ERT during the in-country review and are considered appropriate for the industrial processes sector. However, the activities are poorly documented in the NIR and in the calculations spreadsheets presented to the ERT. The ERT encourages Poland to improve the description of QA/QC activities for the industrial processes sector in future NIRs.

82. Poland has addressed a number of the issues raised in the 2005 review report. However, Poland has not implemented the recommendations contained in the report in a number of other cases, for example, to provide the calcium oxide (CaO) content of limestone, the primary references for the cement sector and descriptions of country-specific AD for nitric acid production. The ERT reiterates the recommendations that such information be provided in Poland's next NIR.

83. In the 2006 inventory submission, recalculations of the 2005 inventory submission are reported only for the years 2000–2003 and these show significant changes to the 2003 emissions for the industrial processes sector as a whole, and in particular for CO_2 emissions from the cement, metal and chemical industries – contributing to overall national changes of +0.80 (the industrial processes sector as a whole), and –0.51, +1.04 and +0.28 per cent, respectively, for these categories.

84. Uncertainties in the sector are estimated to be 6.0, 15.4 and 26.4 per cent for CO_2, CH_4 and N_2O emissions, respectively. There is no documentation in the NIR of improvements undertaken or planned for the sector. The ERT recommends that Poland provide complete recalculations of the CRF tables (ensuring that these are recalculations compared to the previous submission), descriptions of the recalculations, and clear explanations of the improvements, including the rationale for the improvements, in future NIRs.

85. After the in-country review, Poland submitted revised estimates for a number of categories (ammonia production, iron and steel, SF_6 from non ferrous alloys) and additional estimates from ferroalloys production and zinc and lead production. These revisions have resulted in a 3.8 per cent increase for 2004 in estimated emissions from the industrial processes sector from 22,843.21 Gg CO_2 eq. to 23,715.58 Gg CO_2 eq.

86. Poland estimates emissions from solvent use using its non-methane volatile organic compounds (NMVOC) inventory and a fixed assumed ratio of CO_2 to NMVOC of 85 per cent. As these sources make up only a very small component of Poland's emissions inventory, and because more important improvements to the inventory are required, this approach is considered acceptable by the ERT. Estimates of N_2O emissions from medical use are reported in Poland's inventory but there is very little

description of the estimation method in the NIR. The ERT recommends that Poland provide a more detailed description of emissions of N_2O from medical use.

B. Key categories

1. Cement production – CO_2

87. Poland used a combination of default EFs and country-specific data for estimates of emissions from the cement industry. The IEFs reported in the CRF tables show that a single value was used for the estimates between 1988 and 2000 (0.525 t CO_2/t clinker) and a variable country-specific EF for 2001–2004 (0.527–0.531 t CO_2/t clinker). During the in-country review, Poland provided copies of the cement feedstock analyses to illustrate the high CaO content of the limestone used in order to substantiate the country-specific EFs used, and clarified that the constant value of 0.525 t CO_2/t clinker was based on industry estimates using the default factor for tier 1 cement emissions calculated from the guidelines for GHG emissions monitoring and reporting pursuant to Directive 2003/87/EC of the European Community. As there is a significant difference between the default EF used for 1988–2000 and the country-specific EFs used for 2001–2004, the ERT recommended during the in-country review that Poland revise its emissions estimates from cement production using an average for the years 2001–2004 applied to the entire time series 1988–2000, and provide documentation on the emissions, EFs and assumptions used. The ERT also noted a lack of transparency in the NIR for this category. The ERT encourages Poland to revise its estimates for this category in future submissions and to fully document the methods, data sources and assumptions used in the NIR.

2. Ammonia production – CO_2

88. Poland estimated emissions using an IPCC default EF (1.5 t/t) and national statistics on ammonia production for the entire time series in its 2006 GHG inventory submission estimates. During the review, the ERT recommended that Poland use detailed statistics on the feedstocks in the ammonia production process. After the in-country review, in response to the ERT's recommendation, Poland provided revised estimates using national statistics on natural gas and coke oven gas consumption in the ammonia production process along with associated industry-specific data on emissions. The impact for 2004 was an increase in CO_2 emissions of 16.0 per cent from 3,613.69 Gg to 4,190.97 Gg and an increase in the overall emissions from ammonia production of 15.1 per cent from 3,861.59 Gg CO_2 eq. to 4,443.23 Gg CO_2 eq. The ERT concluded that this revised method and the associated documentation were in accordance with the IPCC good practice guidance and considered the revised method and estimates appropriate. The ERT encourages Poland to use this method for future estimations and to provide a suitable explanation of the methods, data sources and assumptions in future NIRs, including the assumptions used in calculating CO_2 emissions.

3. Nitric acid production – N_2O

89. Poland describes its emission estimates as based on a country-specific EF. The approach used is based on a single EF provided in a national study,[8] which is calculated on the basis of the individual data from all Polish facilities for nitric acid production which is applied for the entire time series. The NIR does not provide sufficient documentation on the methods used to derive the country-specific EF or any information on the abatement levels in the plants. The ERT encourages Poland to revise the methods used to derive the country-specific EF to ensure that it is consistent over the entire time series, and to provide a more detailed description of the methods and AD in its next NIR.

[8] Kozłowski K. Strategy of reduction of N_2O emission in industry processes, 2001.

4. Iron and steel production – CO_2

90. Following the review, a number of revisions were made to the iron and steel production category. These revisions are in accordance with the IPCC good practice guidance and contribute to a 1.7 per cent increase in CO_2 emissions from the iron and steel production category in 2004 from 4,138.53 Gg CO_2 to 4,210.83 Gg CO_2 and to an overall increase in the GHG emissions from iron and steel production of 1.1 per cent from 4,192.40 Gg CO_2 eq. to 4,236.61 Gg CO_2 eq., when CH_4 emissions are included. The majority of the increase is due to the addition of emissions from limestone and dolomite use in open-hearth furnaces and to revisions of the EFs for coke oven emissions.

91. Poland used country-specific EFs derived from a 1994 study for the steel subcategories. The EFs for steel cast, basic oxygen furnace steel and electric arc furnace steel production are 62 kg CO_2/Mg steel produced, 11.26 kg CO_2/Mg steel produced and 4.3 kg CO_2/Mg steel produced, respectively; and for iron cast the EF is 61 kg CO_2/ Mg iron produced. During the in-country review, the ERT recommended Poland to estimate emissions using the difference in carbon contents of inputs to and outputs from the processes, in order to improve the transparency and accuracy of the inventory for these processes, and to include the use of limestone and dolomite for open-hearth furnaces. Following the in-country review, Poland revised its estimates for steel cast, basic oxygen furnace steel and electric furnace steel production, as well as iron cast and open-hearth steel using the recommended approach. The ERT considers these revisions appropriate and encourages Poland to include in its future NIRs the full documentation relating to the revisions that was provided to the ERT.

92. For the sinter subcategory, Poland used a country-specific approach relying on plant-specific data to derive EFs and AD. There is significant variability in the EFs calculated for individual plants based on country-specific data. These variations result from the different fractions of limestone and dolomite used in the feedstock. The methods are not transparently reported as there is limited description of them in the NIR. The ERT encourages Poland to check the time-series consistency of the data from the sinter plants and to provide a more detailed description of methods and assumptions in its next NIR. It also encourages that, where possible, emissions from the use of limestone and dolomite be reported separately under 2.A.3.

93. After the in-country review, Poland revised its emissions estimates for the coke subcategory in response to the revisions requested by the ERT in the energy sector. New values for carbon contents are used according to the recommendations of the ERT for the manufacture of solid fuels and other energy industries category (1.A.1.c). The revisions increased the CO_2 emissions from coke production in 2004 by 39.0 per cent from 1,585.91 Gg to 2,203.67 Gg, and overall emissions by 35.3 per cent, from 1,628.81 Gg CO_2 eq. to 2,203.69 Gg CO_2 eq. when CH_4 emissions are included. The ERT considers these changes appropriate and encourages Poland to include such revised estimates and the necessary documentation in its future GHG inventory submissions.

94. The emissions for the pig iron subcategory were estimated using a carbon budget approach for the blast furnace processes based on pig iron production, coke consumption and industry-based assumptions on the ratios of iron produced to the other raw material inputs. However, the ratios of the feedstock materials were fixed and based on industry data rather than national statistics. In addition, the small emissions from the carbon content of the feed sinter and industry-based sinter production estimates were excluded from the estimates. The trend in CO_2 IEFs from pig iron fluctuates between 0.18–0.42 t/t. In response to recommendations from the ERT made during the in-country review, Poland provided revised estimates using corrected data supplied by the ARE. Consistent with the 2006 submission, the output of blast furnace gas was taken from the Energy Balance and expressed in energy units, and the level of pig iron production for the new carbon balance was taken from Questionnaire/Report G-03. The carbon content in the coke and coke oven gas was estimated based on the default carbon content in these fuels given in the Revised 1996 IPCC Guidelines to ensure consistency with the corrected category 1.A . The revisions resulted in a substantial reduction in CO_2 emissions from this category for 2004, by

61.2 per cent, from 1,788.05 Gg to 693.98 Gg. The ERT accepts these revised estimates and recommends Poland to check its detailed energy balances and statistics for future inventory submissions and to provide further explanations of the methods used in its future NIRs.

C. Non-key categories

1. Limestone and dolomite use – CO_2

95. This category is reported as "NE" in the CRF tables. Evidence of limestone and dolomite use and estimates were provided for the iron and steel calculations. However, the total use of limestone and dolomite could not be reconciled as there are no national statistics on the total level of supply of limestone and dolomite in Poland. After the in-country review, following the ERT's recommendations, Poland added estimates of limestone and dolomite use in open-hearth furnaces and revised its notation key for this category to "IE". The ERT considers these revisions to be consistent with good practice. However, where emissions from limestone production and use are estimated separately, the ERT encourages Poland to report these under 2.A.3. In addition, Poland should review the use of limestone and dolomite in industries such as non-iron and steel metallurgy, glass manufacture, LULUCF, construction and environmental pollution control and include these in its estimates for future submissions.

2. Carbide production – CO_2

96. Poland estimates emissions for carbide (CaC_2) production based on national production statistics and an IPCC default EF (1.1 kg/kg). However, this default EF only includes carbide use. This EF has been applied to carbide production statistics and the factor of 1.8 t CO_2/t CaC_2 produced is not included. The ERT encourages Poland to review its estimates for its next inventory submission, to calculate fully the emissions from CaC_2 production and use, to attempt to estimate emissions using feedstock statistics and to fully describe the methods used in its next NIR.

3. Ferroalloys production – CH_4

97. Poland reported CH_4 emissions from this category in its 2006 submission as "NE". The ERT notes the efforts made by Poland after the in-country review to calculate these emissions (0.08 Gg CH_4 in the base year and in 2004). The ERT encourages Poland to include these revised estimates in its future emission inventory submissions and to provide suitable documentation on methods and EFs in future NIRs.

4. Other (zinc and lead production) – CO_2

98. Emissions from this category were reported as "NE" in the 2006 inventory submission for the entire time series. After the in-country review, Poland provided CO_2 emissions from zinc and lead production using the IPCC default EFs applied to AD for zinc and lead production from the GUS. The ERT notes that these estimates are in accordance with the IPCC good practice guidance and improve the completeness of the inventory. These sources added 255.44 Gg CO_2 in 2004. The ERT accepts these estimates and encourages Poland to include them with supporting documentation in its future inventory submissions.

5. Consumption of Halocarbons and SF_6 – HFCs, PFCs and SF_6

99. Emissions from the consumption of halocarbons and SF_6 are estimated using national statistics and surveys of importers and exporters. Although sufficient detail and explanations were presented during the in-country review, there is a lack of transparency in the NIR on the methods, assumptions and data sources. The ERT encourages Poland to provide a more detailed description of methods, data sources and assumptions in its next NIR and to report potential emissions for F-gases for the entire time series, and in particular for 1988 and the latest reported years.

100. Along with the F-gases with global warming potential (GWP) adopted by the COP, Poland has reported in this category emissions from HFC-365mfc and HFC-245fa. These estimates should be reported for information purposes only in table 9(b), but should not be included in the national totals. During the in-country review, the ERT recommended that Poland exclude these gases from the CRF tables on the industrial processes sector and report them in accordance with the UNFCCC reporting guidelines. In response to this recommendation, after the in-country review, Poland excluded these emissions from the industrial processes sector.

IV. Agriculture

A. Sector overview

101. In 2004, emissions from the agriculture sector accounted for 8.3 per cent of total GHG emissions in Poland. Emissions from this sector decreased by 36.4 per cent from 1998 to 2004. Agricultural soils, manure management and enteric fermentation were the major agriculture source categories, contributing 44.7 per cent, 28.1 per cent and 27.1 per cent, respectively, to total agriculture sector emissions in 2004. The categories rice cultivation and prescribed burning of savannas are reported using notation keys in the CRF tables, as rice is not cultivated and there are no savannas in Poland. However, they were reported as both "NE" and "NA" in the CRF tables. The ERT recommends Poland to correct the use of notation keys in its next submission.

102. The time series for the remaining categories was estimated consistently for the first time in the 2006 GHG inventory submission. For 2003 the impact of the recalculations was a 37.2 and 34.9 per cent increase in CH_4 and N_2O emissions, respectively, which affected all categories. The recalculations take into account the recommendations of the 2005 review report, were performed for the entire time series and were explained during the in-country review. As is described in detail in the paragraphs below, revisions to the estimates were made after the in-country review that resulted in a decrease in the estimates of GHG emissions of 5.5 per cent in 2004, from 34,261.71 Gg CO_2 eq. to 32,368.33 Gg CO_2 eq.

103. The NIR includes summary sector and category emissions data as well as reference lists for the methodologies used to develop estimates. However, information reported in the NIR on the methodologies, assumptions and key input parameters used to calculate emissions is not transparent enough. Notation keys are not always properly used and no information is provided in the documentation boxes in the CRF tables. The ERT recommends Poland to use appropriate notation keys and provide information in the documentation boxes.

B. Key categories

1. Enteric fermentation – CH_4

104. Poland uses a combination of tier 2 (for cattle and sheep) and tier 1 (for other animals) methods to estimate CH_4 emissions from enteric fermentation. For all categories of livestock populations the AD used are in agreement with Food and Agriculture Organization of the United Nations (FAO) published data. A combination of IPCC default and country-specific input parameters was used to develop the tier 2 EFs for cattle and sheep. To estimate emissions from cattle, Poland used an enhanced characterization of the population, taking into account the age of the animals. However, the CRF tables include information on basic characterization that subdivides cattle only into dairy and non-dairy. During the in-country review, the key country-specific input parameters used to develop the EFs and the enhanced characterization data were made available to the ERT from background documents. The background documents show that the age splits of young animals were different for the 1988–1997 and 1998–2004 periods, introducing inconsistency into the time series. The ERT recommends Poland to improve the consistency of reporting livestock characterization in its next NIR and CRF tables and to ensure the consistency of AD used over the entire time series.

105. Poland used different sources of information for milk production for dairy cattle for 1988 and 1989 compared to the rest of the years in the time series. For 1990–2004, the values published in the Statistical Yearbook are used. During the in-country review, the ERT requested Poland to revise emissions estimates using consistent data sources over the entire time series and to provide clear documentation of the data sources used. After the in-country review, and following the recommendations of the ERT, Poland revised its estimates for this category. Data on milk production for dairy cattle from the Statistical Yearbook were used to revise the estimates. The revision resulted in a 0.1 per cent increase in 2004 (from 260.71 to 261.03 Gg). The ERT considers this revision of estimates appropriate and encourages Poland to provide all the parameters and background information used for these estimates in the NIR of its next submission.

2. Manure management – CH_4 and N_2O

106. Poland used the tier 2 method for CH_4 emission estimates for cattle, sheep and swine and a tier 1 method for other animal categories. In response to the comments from the previous (2005) review report, Poland revised the value for the methane correction factor for liquid management systems from 10 per cent (as in the Revised 1996 IPCC Guidelines) to 39 per cent (as in the IPCC good practice guidance). To estimate N_2O emissions from manure management, Poland used a combination of country-specific and default parameters such as national data for manure managed in animal waste management systems (AWMS) for dairy cattle, non-dairy cattle and swine, and IPCC default EFs and default values for nitrogen (N) excretion per head. The estimates are based on a basic characterization of animals due to the lack of country-specific data for manure managed in AWMS for young animals. The ERT encourages Poland to try to obtain such information for its next submission in order to ensure consistent use of animal characterization for the enteric fermentation and manure management categories in line with the IPCC good practice guidance.

107. CH_4 emissions from this category were not a key category in 1988 (base year) but have become a key category in 2004. The emissions decreased by only 0.03 per cent in the period 1998–2004 but the ERT identified high inter-annual fluctuations in emissions and IEFs, in particular for non-dairy cattle. These fluctuations were explained by changes in the share of different AWMS during this period. The share of liquid systems increased by 63.7 per cent from 1998 to 1999 and by 54.1 per cent from 2001 to 2002. The ERT encourages Poland to provide such detailed background information on manure management in AWMS in its next submission.

3. Direct soil emissions – N_2O

108. Emissions from this category decreased by 29.7 per cent in the period 1988–2004. Poland applied the IPCC default methodology combined with country-specific EFs for synthetic fertilizers, animal manure applied to soils, N-fixing crops, and crop residue categories. Background documentation provided to the ERT during the in-country review shows that these parameters were derived from the results of regional measurement studies.[9] The ERT encourages Poland to document clearly in the NIR information on the derivation of country-specific EFs and to use the documentation box of CRF table 4.D for relevant information and references.

109. N_2O emissions from the animal manure applied to soils category (4.D.1.2) are estimated using methodology from the Revised 1996 IPCC Guidelines instead of the IPCC good practice guidance for the entire time series. The ERT considered that this may result in underestimation of the emissions in the latest reported year. During the in-country review, the ERT recommended Poland to use equation 4.23 in the IPCC good practice guidance to estimate N_2O emissions from this category. After the in-country review, and following the recommendations of the ERT, Poland revised its estimates from this category for the entire time series using the recommended equation. This revision resulted in an increase in N_2O

[9] Mercik, S. et al. 2001. Study on GHG emissions and sinks from arable land soil; Myczko A., 2001. Study on GHG emissions from enteric fermentation and animal manure in 1999 (in Polish).

emissions in 2004 of 1.3 per cent (from 8.96 Gg to 9.08 Gg). The ERT considers this revision appropriate and encourages Poland to provide all the parameters and background information used for these estimates in the NIR of its next submission.

110. Poland used total peat land area in the country to calculate N_2O emissions from the cultivation of histosols category (4.D.1.5) instead of the cultivated area of histosols. This may lead to an overestimation of the emissions from this category over the entire time series, including the base year. During the in-country review, the ERT recommended Poland to provide revised estimates for the entire time series based on the cultivated area of histosols and clear documentation of the data sources used. After the in-country review, and following the recommendations of the ERT, Poland revised its estimates for this category using the data available for two years (1983 and 1999) from material published in 1988 (Oświt et al., 1989) and 2000 (Czaplak et al., 2000). Interpolation was used to estimate data for the period 1988–1999 and extrapolation was used to estimate data for 2000–2004. The revision resulted in a decrease in N_2O emissions from the cultivation of histosols category in 2004 of 39.2 per cent (from 15.95 Gg to 9.71 Gg). The ERT considers this revision and the background material provided appropriate and encourages Poland to include the new estimates and all the parameters and background information used for these estimates in the NIR of its next submission.

4. Indirect soil emissions – N_2O

111. Indirect soil emissions were estimated for the first time in the 2006 inventory submission. Poland applied the IPCC default method (tier 1a) in accordance with the comments in the previous (2005) review report. The ERT welcomes the efforts made by Poland to improve the completeness of its inventory in this category.

C. Non-key categories

Field-burning of agricultural residues – CH_4 and N_2O

112. A detailed subcategorization of crops and associated country-specific emission parameters are used to estimate CH_4 and N_2O emissions from burning of agricultural residues in fields. The country-specific values are close to the IPCC defaults and within the ranges of values reported by other Parties for similar crop categories.

V. Land use, land-use change and forestry

A. Sector overview

113. The LULUCF sector was a net sink of 26,723.32 Gg CO_2 eq. in 2004, offsetting 6.9 per cent of total national GHG emissions in Poland. The net removals of the LULUCF sector decreased almost linearly from 1988 to 2004 by 18.8 per cent. The sector is dominated by the category forest land remaining forest land, which is a net sink for the entire time series. In 2004, the sink of forest land remaining forest land was 36,398.99 Gg CO_2, consisting of living biomass (19,770.69 CO_2) and soils (16,628.30 Gg CO_2). The decrease in the net removals of the LULUCF sector from the base year to 2004 was caused mainly by the decrease in net removals by living biomass in forest land remaining forest land by 16.6 per cent from the base year value of 23,709.17 Gg CO_2, and by soils of forest land remaining forest land by 12.5 per cent from the base year value 18,996.03 Gg CO_2. In 2004 settlements remaining settlements was a sink of 10,611.24 Gg CO_2, cropland remaining cropland was a source of 13,044.68 Gg CO_2 and grassland remaining grassland was a source of 7,238.15 Gg CO_2.

114. The sector was recalculated in the 2006 submission in order to achieve a consistent time series from 1988 to 2004 and in response to the recommendations of the 2005 review. However, the methodology used for the estimates was still not in compliance with the IPCC good practice guidance for LULUCF, since the calculations for all years were carried out using the Revised 1996 IPCC Guidelines.

Applying this methodology, Poland used national AD and EFs that are partly country-specific and partly defaults from the Revised 1996 IPCC Guidelines. Thus, for example, emissions and removals from soil were calculated using methods in the Revised 1996 IPCC Guidelines and then divided into the categories of the IPCC good practice guidance for LULUCF: forest land remaining forest land, cropland, grassland, and settlements. In calculating carbon stock changes in soils, different soil types (high activity, low activity, sandy and wetland) were distinguished as required by the Revised 1996 IPCC Guidelines. However, the total area of different soil types needs to be constant in order to produce correct results using this method. The time that soil carbon stocks take to adjust after land-use change should also be considered (the default value in the Revised 1996 IPCC Guidelines is 20 years).

115. The results of the inventory were entered into the CRF tables using a transition matrix that defines the correspondence of cells in the current CRF tables with those of the Revised 1996 IPCC Guidelines. Because the CRF tables for LULUCF in the 2006 submission used by Poland take account of decision 13/CP.9, and the methodology and category split contained in the IPCC good practice guidance for LULUCF, the vast majority of the cells in the CRF tables for LULUCF do not contain any values, but are instead left empty or filled in with notation keys. In tables 5.A, 5.B, 5.C, and 5.E numerical data are reported on biomass and soil organic carbon only for land categories that maintain their land use. There are no estimates for dead organic matter. All other tables (5.D, 5.F, 5(I) – 5(V)) and the cells for land transition (land converted to) in the abovementioned tables contain "NE" or "IE" notation keys.

116. During the in-country review, the ERT recommended that the inventory be prepared according to the IPCC good practice guidance for LULUCF for the entire time series. Recalculations should be made using methods based on choices according to the decision trees in the IPCC good practice guidance for LULUCF, AD, EFs and key category analysis. The reporting should be expanded to cover the categories currently not reported by Poland, such as the land conversions. Implementation of QA/QC procedures, improved institutional cooperation and better documentation of the calculation procedures are essential to the improvement of the overall quality of the estimates in this sector.

117. After the in-country review, Poland provided a full set of CRF tables for LULUCF covering the period 1988–2004 calculated according to the IPCC good practice guidance for LULUCF, as well as a document describing the calculations. The revisions provided were not considered in this review and the values used in the report are those from the original 2006 submission. However, the ERT notes that the new estimates seem to resolve the problem related to the methodology used by Poland being inconsistent with the IPCC good practice guidance for LULUCF. New subcategories, for example, land converted to forest land and wetlands are also covered. However, the ERT could not review these new estimates and recommends Poland to include them in its future inventory submission. It should be noted that the overall result of the revisions is an increase in net removals from the sector from 26,723.32 Gg CO_2 eq. to 34,679.80 Gg CO_2 eq. in 2004[10].

118. As is mentioned above, Poland applied a simplified tier 1 uncertainty analysis and a key category analysis which do not include the LULUCF sector. For this reason, this section of the report follows the key category analysis performed by the secretariat. The ERT recommends Poland to carry out key a category analysis that includes the LULUCF sector and to further analyse uncertainties in LULUCF subcategories for its next submission.

119. The LULUCF section of the NIR is rather brief and does not follow the structure suggested in the UNFCCC reporting guidelines. The calculations according to the Revised 1996 IPCC Guidelines are briefly explained, but there is not always a direct link between the values reported in the CRF tables and

[10] These revised figures for the LULUCF sector were included in interim CRF tables provided to the ERT on 31 July 2007. Following the recommendation of the ERT, in the final version of the CRF tables dated 14 November 2007 the LULUCF sector values are as in the original 2006 GHG inventory submission.

those in the NIR since the values have been entered into the CRF through a transition matrix, which may map a sum of two categories in one cell. The documentation boxes of the CRF have not been used to increase the transparency of the information reported. In addition, the use of notation keys is not always appropriate and is not explained in table 9(a). It is not possible, for example, to track where emissions from biomass burning have been reported. The ERT identified a number of mistakes in filling in the CRF tables (e.g. wrong cells filled, inappropriate use of notation keys) that were rectified during the in-country review. References to the background documents and literature are also almost completely missing in the NIR. As a result, the reporting is not transparent. The ERT recommends Poland to make further efforts to improve the transparency of reporting for the LULUCF sector, following closely the UNFCCC reporting guidelines, including detailed references to AD and EF sources, verifying the use of notation keys in the CRF tables and making use of the documentation boxes. The ERT notes that in the revised CRF tables that Poland provided to the ERT after the in-country review, some of these recommendations had already been taken into consideration, such as the use of documentation boxes.

B. Key categories

1. Forest land remaining forest land – CO_2

120. Forest land remaining forest land represents a net sink for the entire time series which decreased by 14.8 per cent in the 1988–2004 period (from 42,705.20 Gg CO_2 in 1988 to 36,398.99 Gg CO_2 in 2004). The estimates for forest land remaining forest land include carbon stock change in living biomass and in soils. The decrease in the net removals by living biomass reflects the changes in growth rates and harvests. However, the carbon stock change in soils remained almost unchanged during the period 1988–2004.

121. The carbon stock change in living biomass was estimated using country-specific AD and EFs on the basis of information from the Statistical Year Book for Forestry for both state-owned and private forests. The data included forest area and volume tables with age classes. As national forest inventories (e.g. in 2000 and 2003) are undertaken in Poland and detailed data are therefore available, the ERT encourages Poland to use these data to further disaggregate (e.g. climatic regions) the calculations in its future GHG inventory submissions.

122. The revised estimates for this category provide the information subdivided into forest land remaining forest land and land converted to forest land. The carbon stock change in dead organic matter is considered to be zero and reported as "NO", while estimates for carbon stock changes in living biomass and soils resulted in an overall increase of net CO_2 removals for 2004.

2. Cropland remaining cropland – CO_2

123. Only soil carbon stock changes were reported under this category. These represented a net source of CO_2 emissions for the entire time series, increasing by 59.8 per cent in the period 1988–2004 from 8,165.36 Gg CO_2 in 1988 to 13,044.68 Gg CO_2 in 2004. The main reasons for this increase are changes both in the area of cropland and in soil types. The emissions and removals from soil were calculated using the methods contained in the Revised 1996 IPCC Guidelines and then divided into the categories of the IPCC good practice guidance for LULUCF, including cropland remaining cropland. During the in-country review, the ERT recommended that Poland make its estimates using the land use categories in the IPCC good practice guidance for LULUCF (cropland remaining cropland and land converted to cropland) as well as the methods specified for those land use categories.

124. The ERT notes that the revised estimates for this category provided after the in-country review were made following the IPCC good practice guidance for LULUCF and also include carbon stock changes in living biomass. The ERT recommends Poland to include all this information in its next inventory submission.

3. Grassland remaining grassland – CO_2

125. Only soil carbon stock changes were reported under this category. These represented a net source of CO_2 emissions throughout the entire time series, increasing by 59.8 per cent in the period 1988–2004 from 4,530.68 Gg CO_2 in 1988 to 7,238.15 Gg CO_2 in 2004. These results are consistent with the approach of the Revised 1996 IPCC Guidelines being applied to estimate soil emissions. During the in-country review, the ERT recommended that Poland make its estimates using the land use categories in the IPCC good practice guidance for LULUCF (grassland remaining grassland and land converted to grassland) as well as the methods specified for those land use categories.

126. Following this recommendation, after the in-country review, Poland provided information on changes for this category, reporting that the emission and removal balance for this category is zero. This statement needs further justification and documentation and the ERT recommends Poland to include the estimates, AD, parameters and further supporting information in its next NIR.

4. Settlements – CO_2

127. Settlements are identified as a key category for 2004 in the secretariat's key category analysis both by level and trend assessment, but are not a key category for 1988. For this category, only the estimates for carbon stock changes in soils are reported. This category was reported as a net sink that increased by 262.7 per cent over the period 1988–2004 (2,925.46 Gg CO_2 eq. in 1988 to 10,611.24 Gg CO_2 eq. in 2004). Settlements (as defined in the mapping of categories of the inventory made using the Revised 1996 IPCC Guidelines to the categories of the IPCC good practice guidance for LULUCF) comprise land areas that have been included in order to keep total land area constant. Highly diverse areas have therefore been included under the settlements category. The total area of settlements has increased in the period 1988–2004 by 35.3 per cent from 4,262.50 kha in 1988 to 5,770.50 kha in 2004. During the in-country review, the ERT recommended that Poland make its estimates using the land use categories of the IPCC good practice guidance for LULUCF (settlements remaining settlements and land converted to settlements) as well as the methods specified for those land use categories.

128. After the in-country review, and following the ERT's recommendation, this category was also revised, which resulted in a significant change. For 2004, the carbon stock changes in soils were reported as "NA" and "NE" and only carbon stock changes in living biomass from settlements remaining settlements were reported as a net sink of 71.02 Gg CO_2 eq. The ERT recommends Poland to include this information in its next inventory submission.

C. Non-key categories

Wetlands, other land and biomass burning – CO_2, CH_4 and N_2O

129. The inventory estimates reported by Poland for the LULUCF sector are not complete, since they exclude wetlands, other lands and biomass burning categories. The ERT recommends Poland to make efforts to estimate emissions/removals from these categories in its next inventory submission. The ERT also notes that biomass burning from forest land remaining forest land is properly reported in table 5(V) in the revised estimates, which also includes estimates for CH_4 and N_2O emissions.

VI. Waste

A. Sector overview

130. The waste sector contributed 2.4 per cent of the total GHG emissions in 2004. Emissions from this sector increased by 12.4 per cent between 1988 (base year) and 2004, mainly due to the increase in emissions in the solid waste disposal on land category. Reporting of the waste sector is almost complete with the exception of N_2O emissions from industrial wastewater. There is room for improving transparency in the NIR, for example, by including references for EFs and detailing country-specific

methodologies with better documented country-specific parameters (e.g. for solid waste disposal on land). No readily accessible information on recalculations was provided for the sector, although the figures in the CRF tables indicate important recalculations for 2003 in the sector (e.g. +1,462.1, –1.5 and +41.6 per cent changes in the level of emission estimates for CO_2, CH_4 and N_2O, respectively). The ERT encourages Poland to provide recalculation information in accordance with the UNFCCC reporting guidelines in its next submissions, including numerical information on and detailed reasons for the changes made to the CRF and the NIR. Basic QC procedures are in place, but no QA/QC procedures for the sector were reported in the NIR. A tier 1 uncertainty analysis was provided for 1988 and subsequent years and the results are provided in the NIRs, indicating uncertainty in the sector in the order of 50 per cent for CO_2 and N_2O emissions and over 70 per cent for CH_4 emissions. The NIR does not include information on sector-specific improvements. The ERT recommends Poland to develop a QA system (using, e.g. universities, research institutes, etc.) and the application of tier 2 uncertainty analysis where country-specific EFs and/or methodologies are used for its next submission.

131. As is described in detail in the paragraphs below, revisions to the estimates were made after the in-country review that resulted in a decrease of GHG emissions from the sector of 20.8 per cent in 2004, from 11,927.75 Gg CO_2 eq. to 9,446.94 Gg CO_2 eq.

B. Key categories

1. Solid waste disposal on land – CH_4

132. The methodology used by Poland to estimate CH_4 emissions from solid waste disposal on land is considered a tier 3 method. Poland applied a model to estimate the emissions for the first time and the ERT notes the efforts made by the Party to apply a higher tier consistent with the recommendations of the IPCC good practice guidance for key categories. However, the ERT analysed some of the country-specific EFs used and found that they were not well documented in the NIR. The references indicated in the NIR did not show the calculations used to obtain the country-specific values. This is particularly important for the values of the methane generation rate constant (k values) applied in calculations, which for the various waste types were generally lower than the IPCC default values (e.g. for food waste the default value is 0.184, while the country-specific value is 0.086). During the in-country review, the ERT recommended Poland to document these country-specific parameters or to apply the IPCC good practice guidance default values in cases where the country-specific parameters cannot be documented. In response to this recommendation, after the in-country review, Poland revised its estimates using IPCC default k values for the entire time series (e.g. 0.184 for food waste, 0.1 for garden wastes, 0.06 for paper, 0.03 for wood and straw and 0.06 for textiles).

133. Industrial solid waste was not included separately in the estimates, and estimates for it are based on statistical data and IPCC default EFs. The waste composition used in the estimates was based on the National Plan on Waste Management and did not reflect the changes in composition over the time series. The ERT recommended Poland to make efforts to collect data on present and previous waste composition, as well as the fraction of landfilled municipal waste for its next submissions. In response to the recommendation, Poland provided a new country-specific data source for waste distribution in 1985 (Podstawy Gospodarki Odpadami). Based on these data, and on data from the National Plan on Waste Management for 2001, an interpolation for the 1970–2004 period was made and emissions estimations were revised. The revisions made by Poland in this category resulted in an almost negligible increase in CH_4 emissions for 2004 (0.8 per cent), from 321.32 Gg to 323.95 Gg. The ERT agreed with the revised values. However, for technical reasons revisions based on changes of waste composition were not included in the revised CRFs and the ERT recommends that Poland further refine these estimates and include them in future submissions.

2. Wastewater handling – CH_4

134. During the in-country review, Poland provided information on the data for CH_4 emission estimates for domestic and commercial wastewater handling based on a national study,[11] which was not sufficiently documented in the NIR. Poland has developed and improved its methodology for CH_4 emission estimates for industrial wastewater handling, but this methodology was only applied for the base year which creates inconsistency in the time series. Poland also provided the ERT with information related to industrial wastewater AD and EFs, which were not reconciled with those used in the methodology applied. The ERT recommended Poland to revise the entire time series and to better document the methodology applied in the NIR, as well as to verify the values used for industrial wastewater handling. Following the recommendation of the ERT, after the in-country review, Poland provided revised estimates using the Revised 1996 IPCC Guidelines and AD from the Statistical Yearbooks. The revision resulted in a decrease in the CH_4 emissions from the industrial wastewater treatment of 92.9 per cent in 2004 from 130.06 Gg to 9.30 Gg. The new methodology accounts for sludge and CH_4 recovery. The ERT agreed with the revised values.

C. Non-key categories

1. Wastewater handling – N_2O

135. N_2O emissions from wastewater handling only include emissions from human sewage, which are estimated in line with the Revised 1996 IPCC guidelines. N_2O from industrial wastewater is reported as "NE". The ERT encourages Poland to consider the methodology used by other countries with similar conditions and to include emissions estimates for this category in its future submissions.

2. Waste incineration – CO_2 and N_2O

136. Poland applies the IPCC good practice guidance methodology to estimate the emissions from this category in combination with default and country-specific EFs and AD from national statistics and national studies.[12] Estimates are made for municipal, industrial and medical waste incineration as well as sewage sludge incineration, and the resulting CO_2 and N_2O emissions are reported in the CRF tables. The ERT recommends Poland to apply the IPCC good practice guidance consistently in its next inventory submission, specifically in the use of consistent time-series data, and to revise the entire time series for industrial waste incineration for both CO_2 and N_2O. The energy sector statistics show the use of waste for energy purposes but no indication was provided of such use in the NIR in the waste sector methodological description part, which requires a clear indication of where information for this category can be found in the NIR. The NIR requires more transparency in reporting information for this category, in particular for the country-specific EFs used and the methodologies applied. Clear references should also be included in the next Polish NIR for incinerated waste with and without energy recovery.

VII. Conclusions and recommendations

137. Poland has provided its GHG inventory data for the years 1988–2004, including most of the tables required with data on all relevant gases and categories. The ERT noted that this was the first inventory reported by Poland providing a full time series using the CRF tables and applying methodologies consistent with the UNFCCC reporting guidelines, the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. However, during the in-country review, the ERT identified various inventory-related problems and, in particular, a number of categories where the methods, EFs or AD used were not fully in accordance with the IPCC good practice guidance, which might lead to an

[11] Bernacka J., Pawłowska L. Elaboration and analysis of data regarding GHG emissions from municipal wastewater management. Institute of Environmental Protection, 2005 (in Polish).

[12] Wielgosiński G. Estimation of data and update of methodology for pollutants emissions inventory from waste combustion (in Polish).

overestimation of emissions in 1988 (base year) or an underestimation of emissions in the most recent years. The ERT recommended Poland to revise its estimates for these categories.

138. The ERT takes note of the continuous improvement of the Polish GHG inventory. Recommendations from previous reviews have been followed, for example, revising and recalculating estimates in several categories in the 2006 submission.

139. After the in-country review, Poland provided revised estimates and/or additional documentation, including improved estimation methods, AD and/or enhanced transparency for a number of categories for the entire time series and particularly for 1988 and 2004. As a result of the revisions, the GHG emission estimate decreased by 4.0 per cent in 1988, by 23,459.86 CO_2 eq., and by 2.1 per cent in 2004, by 8,168.49 CO_2 eq.

140. The ERT notes that Poland provided timely and thorough replies to the ERT's questions and identification of problems, following the ERT's recommendations and in line with the relevant reporting guidelines, in particular with the IPCC good practice guidance and the UNFCCC reporting guidelines. In all cases the information provided by Poland satisfied the ERT.

141. The ERT recommends Poland to include in its future submissions the revisions of emissions that were made during this review together with the necessary supporting information and documentation. The additional cross-sectoral recommendations[13] are that Poland:

(a) Formalize and document procedures for prioritizing inventory improvements;

(b) Further document QA/QC activities in accordance with the UNFCCC reporting guidelines, and elaborate and implement the QA/QC plan;

(c) Strengthen its institutional capacity by ensuring adequate long-term financial support for inventory-related contracts and arrangements and by encouraging inventory experts to attend UNFCCC training courses and participate in the review process;

(d) Collect country-specific AD and develop well-documented country-specific EFs for use with higher-tier methods for key categories;

(e) Use more country-specific information in calculation of uncertainties and include qualitative discussion on uncertainty of the data used for all categories, and in particular for key categories, in its next NIR;

(f) Ensure that any future recalculations are consistently made, presented for all years of the inventory, prepared in accordance with the IPCC good practice guidance and fully documented in its future NIRs;

(g) Submit a single NIR covering the entire time series and following the structure of the UNFCCC reporting guidelines, including more comprehensive and precise descriptions and documentation of methodologies and EFs that differ from those of the IPCC, and providing better explanations of the emissions trends and information on cross-cutting issues;

(h) Improve the completeness of CRF tables by including tables 8(a) and 8(b) (recalculations) and tables 9(a) and 9(b) (completeness) as well as systematic use of notation keys and better use of documentation boxes;

(i) Improve the consistency of its reporting by cross-checking the information provided in the NIR with that included in the CRF tables.

[13] For a complete list of recommendations, the relevant sections of this report should be consulted.

142. In addition, Poland has to address the sector-specific issues listed in this report, giving priority to the provision of LULUCF sector estimates in accordance with the IPCC good practice guidance for LULUCF for the entire time series, and ensuring the robustness of the energy balance data and consistent use of its energy data throughout the inventory.

Annex

Documents and information used during the review

A. Reference documents

IPCC. Good practice guidance and uncertainty management in national greenhouse gas inventories, 2000. Available at: <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

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UNFCCC secretariat. Status report for Poland. 2006. Available at: <http://unfccc.int/resource/docs/2006/asr/pol.pdf>.

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UNFCCC secretariat. Poland: Report of the individual review of the greenhouse gas inventory submitted in the year 2005. FCCC/WEB/IRI/2005/POL. Available at: <http://unfccc.int/resource/docs/2006/arr/pol.pdf >.

B. Additional information provided by the Party

During the review, responses to questions were received from Mr. Krzysztof Olendrzynski, Ms. Anna Olecka, Ms. Iwona Kargulewicz and the other members of the inventory team in the National Emission Centre, including additional material on the methodology and assumptions used. Excel working files and access to the reference materials were also provided to the ERT for all sectors as required.

References used for cross-cutting issues

Act of 22 Dec 2004 (Art.9) on the emission allowance trading system for greenhouse gases and other substances (Dz. U. Nr 281, p.2784)

Agreement Nr 04/Wn50/D on the detailed tasks of the National Administration of the Emission Trading Scheme resulting from Article 9 § 2 of the Act of 22 Dec 2004, signed in Warsaw on 21 February 2006 between the Minister of Environment, Institute of Environmental Protection, and the National Fund for Environmental Protection and Water Management.

Draft act on instruments supporting the reduction of GHG emissions, 12 April 2007 National Emission Centre (Anna Olecka, Krzysztof Olendrzynski). Draft of the National programme for Quality Assurance and Quality Control of the Polish Greenhouse Gas emission inventory, Warsaw 2007

Letter of approval of the National Programme for QA/QC sent by the Ministry of Environment, Warsaw 14 November 2007.

National Emission Centre (Anna Olecka, Krzysztof Olendrzynski). National programme for Quality Assurance and Quality Control of the Polish Greenhouse Gas emission inventory ver.1.2, Warsaw 2007

National Emission Centre (Jacek Skoskiewicz). Data Management Manual, Warsaw 2007

Ordinance of Council of Ministers of 13/09/2005 to the Act of 22 Dec 2004

References used for the energy sector

Carbon emission factors of coal and lignite: analysis of Czech coal data and comparison to European values, Pavel Fott, Environmental science & Policy 2 (1999) 347-354

GOSPODARKA PALIWOWO-ENERGETYCZNA w latach 1998–1999, Warszawa, lipiec 1990,

Opracowanie I analiza wybranych danych dotyczacych zuzycia paliw w gospodarce polskej u latach 1998–2005

Original background calculation files 1.A.1.xls, 1.A.2.xls, 1.A.3.xls, 1.A.4.xls, 1.A.5.xls, GPe 88–89.dpf, C balance for coke production 1988–2005.xls, Zuz nieenerget 88-branze i dzialy.xls, G03 – 1988.xls, 1BEmisja lotna gaz i ropa.xls, bilans paliw 1988.xls

Poland response to ERT list of potential problems final 19-10-07.doc; Poland response to ERT list of potential problems ver-2.doc; Poland response to ERT list of potential problems ver-4 response PL.doc

Updated background calculation files: 1.A.1.-cor-x.xls, 1A2-cor-X.xls, 1A2 coke correction-X.xls, 1A3-cor-X, 1A4-cor-X+A5.xls, C balance for coke production -GPE-Revised.xls, BF-12X- Revised 1996.xls

References used for the industrial processes sector

A number of files and their dates, times of update and sizes have been provided including: 1988 comparison of previous and new submissions.xls; BF input correction.pdf; BF-12X- Revised 1996.xls; BF-12X-EN.xls; BF-correction-1.xls; bilans C dla koksowni 1988–2005 – korekta wg GPE EN.xls; bilans C dla koksowni 1988–2005.xls; Blast Furnaces Process correction 18-09-07.doc; C balance for coke oven -new.xls; C balance for coke production -GPE-Revised.xls; cast production – Holtzer.doc; cement – analiza EF z materialow do HE.xls; CO_2-Emission PL HIPH.pdf; GPE 88-89.pdf; MG-08-instrukcja.doc; Mg_08.xls; NH3 production.xls; NH3- according to G03-1.xls; NH3- according to G03-26-09-07.xls; NH3- according to G03.xls; NH3- according to G03_1.xls; POL-2007-1988-v2.1.xls; Poland response to ERT list of potential problems final 19-10-07.doc; Poland response to ERT list of potential problems ver-2.doc; Poland response to ERT list of potential problems ver-4 response PL.doc; Produkcja stali martenowskiej 1988.jpg; Produkcja stali martenowskiej cd 1988.jpg; Sector 2 88-05.-

new-X.xls; Sector 2 88-05.-new.xls; Sektor 2 88-05.xls; spiekalnie - obliczenia EF.xls; Steel Association report-ERT.xls; Steel Association report.xls; Strona tyt. wewnetrzna 1988.jpg; Strona tytulowa 1988.jpg; Wiwlkie piece-bilans C.xls; Wskazniki stalownia konwertorowa 1988.jpg

References used for the agriculture sector

Czaplak I., Dembek W. Torfowiska Polski jako źródło emisji dwutlenku węgla (EN: Peatlands in Poland as a source of carbon dioxide emissions). Rolnictwo polskie i ochrona jakości wody. Zeszyty edukacyjne, nr 6. 2000. Wyd. IMUZ, Falenty

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Oświt J., Dembek W., Żurek S. Stan zagrożenia degradacją gleb organicznych i torfowisk oraz kierunki ich ochrony (EN: Threats and degradation of histosols and peatlands as well as ways of their protection). Wiadomości melioracyjne i łąkarskie, nr 4, 1988. IMUZ, Falenty

References used for the LULUCF sector

Explanation concerning Sector 5. LULUCF, submitted by Poland in response to a recommendation under the review of the greenhouse gas inventory carried out by the experts' team from the UNFCCC Secretariat on 11-16.06.2007 in Poland. Print of four pages.

Forests in Poland 2006. The State Forests Information Centre. Warszawa 2006. ISBN 83-89744-47-3

K.J. Tomazewski, T. Sawiła-Niedźwiecki & P. Strzeliński. Carbon balance in biomass of main forest tree species in Poland. Description of a research project. A Powerpoint presentation.

Lasy Państwowe, Raport Roczny 2005. Państwowe Gospodarstwo Leśne. Warszawa 2006, ISSN 1641-3210.

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List of country-specific and default (IPCC 1997) factors applied in the inventory of the LULUCF sector (one page print).

Obliczanije emisji pierwiastika węgla c z wapnowanija gleb rolniczych i leśnyh na podstawie rocznego zużycia wapienia (CaMg(CO3)2) Print of six pages.

Ochrona środowiska 2005. Główny Urząd Statystyczny. Informacje I Opracowania Statystyczne, Warszawa 2005.

Poland. Country Report, Draft, April, 2005. Global Forest Resources Assessment 2005. Forestry Department, FAO.

Statistical Yearbook of The Rebublic of Poland 2005. Central Statistical Office, Warzawa 2005. ISSN 1506-0632

The State Forests in Figures 2006. The State Forests Information Centre. ISBN 83-89744-49-X

Transition Matrix from IPCC 1997 Revised to new IPCC GPG LULUCF 2003 (one page print).

Trends in LULUCF GHG source and sink categories (two page print of an Excel sheet)

WYNIKI AKTUALZCJI stanu powierzchni leśnej zasobów dzrzewnych w Lasach Państwowych – na dzień 1 stycznia 1988 r. Warzawa, wrzesień 1988 roku.

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References used for the waste sector

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