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Report of the individual review of the greenhouse gas inventories of Romania submitted in 2007 and 2008*

* In the symbol for this document, 2008 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 centralized review of the 2007 and 2008 greenhouse gas (GHG) inventory submissions of Romania, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. In accordance with the conclusions of the Subsidiary Body for Implementation at its twenty-seventh session,[1] the focus of the review is on the most recent (2008) submission. The review took place from 1 to 6 September 2008 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Ms. Barbara Muik (Austria) and Ms. Kristina Saarinen (Finland); energy – Ms. Maria Lidén (Sweden) and Mr. Christo Christov (Bulgaria); industrial processes – Ms. Karin Kindbom (Sweden) and Ms. Sina Wartmann (Germany); agriculture – Ms. Anna Romanovskaya (Russian Federation) and Ms. Fatou Gaye (Gambia); land use, land-use change and forestry (LULUCF) – Mr. Rizaldi Boer (Indonesia) and Mr. Giacomo Grassi (Italy); and waste – Ms. Medea Inashvili (Georgia) and Mr. Faouzi Senhaji (Morocco). Ms. Romanovskaya and Mr. Senhaji were the lead reviewers. The review was coordinated by Mr. Matthew Dudley (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1), a draft version of this report was communicated to the Government of Romania, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

B. Inventory submission and other sources of information

3. The 2008 inventory was submitted on 15 April 2008; it contains a complete set of common reporting format (CRF) tables for the period 1989–2006 and a national inventory report (NIR). This is in line with decision 15/CMP.1. The Party indicated that the 2008 submission is also its voluntary submission under the Kyoto Protocol.[2] In its 2007 submission, Romania included a complete set of CRF tables for the period 1989–2005 and an NIR. The full list of materials used during the review is provided in the annex to this report.

C. Emission profiles and trends

4. In 2006 (as reported in the 2008 annual inventory submission), the main GHG in Romania was carbon dioxide (CO_2), accounting for 70.9 per cent of total GHG emissions[3] expressed in CO_2 eq, followed by methane (CH_4) (18.5 per cent) and nitrous oxide (N_2O) (10.2 per cent). Hydrofluorocarbons, perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 0.4 per cent of the overall GHG emissions in the country. The energy sector accounted for 67.3 per cent of the total GHG emissions, followed by industrial processes (13.3 per cent), agriculture (12.9 per cent), waste (6.4 per cent), and solvent and other product use (0.1 per cent). Total GHG emissions amounted to 156,680.0 Gg CO_2 eq and decreased by 44.4 per cent between the base year[4] and 2006. In 2005 (as reported in the 2007 inventory submission), total GHG emissions amounted to 153,653.8 Gg CO_2 eq. The shares of gases and sectors in 2006 (2008 inventory submission) were similar to those of 2005 (2007 inventory submission).

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

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[1] FCCC/SBI/2007/34, paragraph 104.

[2] Parties may start reporting information under Article 7, paragraph 1, of the Kyoto Protocol from the year following the submission of the initial report, on a voluntary basis (decision 15/CMP.1).

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

[4] Base year refers to the base year under the Kyoto Protocol, which is 1989 for all GHGs. The base year emissions do not include any possible emissions from deforestation; however, if applicable, these are taken into account when the assigned amount is calculated.

D. Key categories

6. Romania has reported a key category tier 1 analysis, both level and trend assessment, as part of its 2008 submission. The key category analyses performed by the Party and by the secretariat[5] produced similar results. Romania has included the LULUCF sector in its key category analysis, which was performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). Romania did not include LULUCF in the key category analysis reported in its 2007 submission. The following key categories were identified in the 2008 submission but not in the 2007 submission: manure management – N_2O, wastewater handling – N_2O and waste incineration – CO_2, and the following key categories were identified in the 2007 submission but not in the 2008 submission: navigation – CO_2 and pasture, range and paddock manure – N_2O. The expert review team (ERT) used the secretariat's key category analysis to determine the key categories and to structure the remainder of this report.

7. The ERT noted that at least one category (adipic acid production – N_2O) was not identified by Romania as key owing to the fact that the algorithm from the IPCC good practice guidance does not identify a category's contribution to the trend if its latest year emissions are zero. In such cases, the ERT encourages Romania to apply the algorithm (equation 5.4.3) included in the IPCC good practice guidance for LULUCF for categories whose latest year emissions are zero.

8. The ERT concluded that Romania used the key category analysis only partly as a driving factor to prioritize improvement of its inventory. This is most evident by Romania not accomplishing the development of higher tier methods for key categories, in line with the IPCC good practice guidance. The ERT recommends that Romania allocate sufficient resources to ensure the collection of data required to calculate emissions by sources and removals by sinks that are identified as key, in accordance with the IPCC good practice guidance. In addition, the ERT recommends that Romania initiate national research to develop higher tier methods for categories identified as key.

[5] The secretariat identified, for each Party, the categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the Intergovernmental Panel on Climate Change *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Key categories according to the tier 1 trend assessment were also identified for Parties that provided a full set of CRF tables for the base year. 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.

Table 1. Greenhouse gas emissions by gas, 1989–2006

Greenhouse gas emissions	Gg CO_2 eq								Change base year–2006 (%)
	Base year[a]	1990	1995	2000	2003	2004	2005	2006	
CO_2	193 118.2	171 999.8	129 511.1	95 264.0	111 382.9	112 141.6	105 853.2	111 011.1	–42.5
CH_4	52 028.0	44 932.2	33 574.9	27 828.2	29 632.0	29 015.9	28 502.2	29 059.4	–44.1
N_2O	33 399.2	28 649.8	19 237.1	15 210.3	15 400.2	17 074.3	17 051.7	15 978.0	–52.2
HFCs	NA, NE, NO	NA, NE, NO	0.2	2.9	5.1	6.9	4.0	21.7	NA
PFCs	3 349.5	2 115.8	1 773.7	413.1	471.9	513.3	569.6	609.6	–81.8
SF_6	NA, NE	NA, NE	0.1	0.0	0.0	0.1	0.1	0.1	NA

Abbreviations: NA = not applicable, NE = not estimated, NO = not occurring.

[a] Base year refers to the base year under the Kyoto Protocol, which is 1989 for all greenhouse gas emissions. The base year emissions do not include any possible emissions from deforestation; however, if applicable, these are taken into account when the assigned amount is calculated.

Table 2. Greenhouse gas emissions by sector, 1989–2006

Sector	Gg CO_2 eq								Change base year–2006 (%)
	Base year[a]	1990	1995	2000	2003	2004	2005	2006	
Energy	188 410.3	172 271.5	129 043.4	94 885.1	110 259.4	109 580.4	102 040.9	105 431.5	–44.0
Industrial processes	43 884.3	30 173.3	23 869.5	16 921.4	17 624.5	19 050.9	19 732.6	20 811.7	–52.6
Solvent and other product use	645.8	540.5	229.4	224.3	279.9	277.4	269.7	208.5	–67.7
Agriculture	40 605.3	37 421.6	23 816.0	18 168.0	19 125.2	20 326.3	20 481.8	20 190.6	–50.3
LULUCF	NA	–35 847.1	–39 284.5	–38 288.1	–36 484.3	–35 768.1	–37 482.8	–37 494.9	NA
Waste	8 349.3	7 290.7	7 138.8	8 519.9	9 603.2	9 517.0	9 455.8	10 037.7	20.2
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	NA	211 850.5	144 812.7	100 430.4	120 407.9	122 984.0	114 498.0	119 185.1	NA
Total (without LULUCF)	281 894.9	247 697.6	184 097.1	138 718.6	156 892.2	158 752.1	151 980.8	156 680 0	–44.4

Abbreviation: NA = not applicable.

[a] Base year refers to the base year under the Kyoto Protocol, which is 1989 for all greenhouse gas emissions. The base year emissions do not include any possible emissions from deforestation; however, if applicable, these are taken into account when the assigned amount is calculated.

E. Main findings

9. The inventory is generally in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines), the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. The ERT identified a number of potential minor under- and overestimates of emissions (see paras. 40, 55, 56 and 68 below). The inventory is generally complete and covers all sectors and most categories (see para. 12 below), all years of the inventory time series, and geographical areas.

10. The ERT noted that Romania reports the notation key not estimated ("NE") extensively across the inventory, which impacts on its completeness and the accuracy of the total GHG emissions. Romania largely attributes this to a lack of activity data (AD) or emission factors (EFs). The ERT found that the transparency of the annual submission has improved since the previous submission, but further improvements are still necessary by the Party (e.g. description of methodology in the NIR and recalculation explanations in the CRF tables). The ERT noted that Romania has not implemented all recommendations from the previous review, particularly in regard to the development of higher tier methods to estimate emissions from key categories (see para. 24 below). The ERT recommends that Romania implement all recommendations from this and previous reviews in its next annual submission.

F. Cross-cutting topics

1. Completeness

11. The inventory generally covers all sectors and most source and sink categories, and is complete in terms of years, gases and geographical coverage. Romania has submitted an NIR based on the structure set out 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), and submitted CRF tables for all years of the inventory time series. The ERT noted that the completeness of the 2008 annual submission has been improved by the inclusion of more comprehensive information on uncertainty estimates and verification activities, and a description of quality assurance/quality control (QA/QC) and verification procedures.

12. The CRF tables are generally complete, with data on all relevant gases and sectors. Nevertheless, the ERT noted the extensive reporting of the notation key NE in the tables. Romania largely attributes this to a lack of AD or EFs. The ERT identified the following categories as important for the Party to explore with respect to reporting of emission estimates: fluorinated gases (F-gases) for several subcategories of consumption of halocarbons and SF_6; other fuels in stationary combustion; cultivation of histosols; carbon removal/emissions from all land except forest land; and industrial wastewater. Even if emissions for those categories reported as NE are considered by Romania to be minor, these activities can occur in the country. Romania is encouraged to explore simple and reasonable approaches, utilizing expert judgement as necessary, to estimate emissions from these categories, or to change the notation key to not occurring (NO) where appropriate.

13. Romania reports actual and potential emissions of F-gases; however, there are gaps in the reporting of emissions within the consumption of halocarbons and SF_6 category.

14. The ERT recommends that Romania: improve the completeness of the inventory by reporting emissions for activities that occur in Romania, but are currently reported as NE; and provide clearer explanation of recalculations in CRF table 8(b).

2. Transparency

15. Romania's inventory is generally transparent, aided to some extent by the structure of the NIR having been prepared in accordance with the UNFCCC reporting guidelines. The ERT noted that the

transparency of the NIR and CRF tables has improved since the 2006 submission; however, the ERT identified a number of areas for further improvement. The ERT recommends that Romania provide in the next NIR: an English translation of the national energy balance; and improved documentation on the rationale of parameter selection (e.g. animal waste management systems in the agriculture sector), methodologies, and references to these methodologies and assumptions used.

3. Recalculations and time-series consistency

16. The ERT noted that recalculations reported by the Party of the time series from 1989 to 2005 have been undertaken to take into account: recommendations from the previous review (lime production – CO_2 and the domestic/international split of navigation and aviation (all gases)); improved AD and EFs (agricultural soils – N_2O, and wastewater handling – CH_4); and improvements of the inventory in general (e.g. manufacturing industries and construction – coke (CO_2), oil and natural gas (1.B.2) – CH_4). Recalculations reported by Romania in its submission of 15 April 2008 have resulted in a decrease of 0.2 per cent in the base year estimates, and a decrease of 1.1 per cent in 2005 estimates. The ERT concluded that the recalculations undertaken by Romania have generally improved the quality of the inventory, were performed in accordance with the IPCC good practice guidance and are time-series consistent. The sector chapters of this report contain the specific information on recalculations performed.

17. The ERT found that only limited explanations on recalculations are reported in CRF table 8(b). However, the rationale for these recalculations is provided in chapter 10 of the NIR, and also in the relevant subsections of the sector sections of the NIR report. The ERT noted that the explanations are not always transparent (e.g. waste sector), thus the ERT was not always able to assess whether the recalculations resulted in an improvement of the emission estimates. The ERT recommends that Romania improve the transparency of its reporting of recalculations in its next annual submission and explain how these recalculations have improved the inventory.

4. Uncertainties

18. Romania has reported a complete IPCC tier 1 uncertainty analysis in its 2008 submission, covering all sources and sinks. The ERT noted that Romania has improved the completeness of its submission by including quantitative information on uncertainty estimates for sectoral or total GHG emissions, and explanations for uncertainties in the sectoral chapters of the NIR. The ERT also noted that most of the values used are IPCC default or expert judgement. The ERT encourages Romania to obtain country-specific uncertainty parameters.

5. Verification and quality assurance/quality control approaches

19. Romania has developed a QA/QC plan in accordance with the IPCC good practice guidance. This plan includes general tier 1 QC procedures as well as source/sink tier 2 category-specific procedures for some key categories. The ERT noted that the implementation of this QA/QC plan has improved the quality of the inventory. The ERT recommends Romania to further extend its tier 2 source/sink category-specific procedures to all key categories.

20. The ERT found that Romania has not yet established an independent review of the inventory by staff not directly involved in its preparation. The NIR states that the National Environmental Protection Agency will develop specific procedural arrangements for including third party reviewers in its QA activities. The ERT encourages Romania to ensure that this planned improvement is implemented and to include information on this activity in the next annual submission.

21. Following the recommendations from the previous review, Romania included in the NIR a list of the QC checks implemented prior to official submission of the inventory, and some documentation on the QA/QC procedures implemented at the category level.

22. The ERT recommends that Romania fully implement QC procedures to ensure consistency in the annual submission, particularly in the reporting of notation keys in the CRF tables (e.g. industrial processes sector (CO_2 recovery)).

6. Follow-up to previous reviews

23. The ERT noted that the 2008 submission is a significant improvement on the previous submission (2006). The ERT was informed by the Party during the review week that the complete transfer of all relevant inventory information to its central archiving system has been completed, as requested by the previous expert review team. Recommendations from the previous review have been implemented by the Party, namely:

(a) Enhanced documentation of QA/QC activities in the NIR;

(b) Inclusion of LULUCF in the key category analysis;

(c) Submission of a complete uncertainty analysis;

(d) Revision of the domestic/international split of navigation and aviation;

(e) Improved documentation in the NIR of inconsistencies in AD (e.g. energy sector and national statistics);

(f) Recalculations performed in the energy, industrial processes, agriculture and waste sectors.

24. The ERT concluded that Romania has not implemented all recommendations from the previous expert review, namely:

(a) Development of higher tier methods to estimate emissions from key categories (e.g. enteric fermentation);

(b) Basic review of the inventory by personnel not directly involved in the preparation of the inventory;

(c) Improved consistency of its reporting by enhancing the cross-checking of information provided by the national statistical office with alternative data;

(d) Improved completeness of the inventory.

G. Areas for further improvement

1. Identified by the Party

25. The NIR identifies several areas for improvement, some in response to issues raised during the previous expert review and other as a result of Romania's own activities. These improvements include:

(a) The provision of more detailed data to support development of methodologies in line with the IPCC good practice guidance;

(b) The development of procedural arrangements for independent review of its inventory;

(c) The enhancement of QC procedures for key categories;

(d) The extension of QA/QC activities to cover QC procedures of main data providers.

2. Identified by the expert review team

26. The ERT identifies the following cross-cutting issues for improvement by the Party:

(a) The improvement of the accuracy of the inventory by developing higher tier methods for key categories;

(b) The allocation of sufficient resources for improving the inventory, giving priority to improving emission estimates of key categories and the completeness of the inventory;

(c) The implementation of all recommendations from the previous review.

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

II. Energy

A. Sector overview

28. In 2006, the energy sector accounted for 67.3 per cent (105,431.5 Gg CO_2 eq) of total GHG emissions. Emissions from this sector increased by 3.3 per cent between 2005 and 2006, and decreased by 44.0 per cent between the base year and 2006. Key drivers of the decline between the base year and 2006 are the 53.9 per cent (57,338.2 Gg CO_2 eq) decrease in emissions from energy industries, and a 48.4 per cent (18,165.4 Gg CO_2 eq) decrease over the same time period in manufacturing industries and construction. Energy industries was the major category in 2006, contributing 46.4 per cent to total sector emissions, while manufacturing industries and construction, other sectors, transport and oil and natural gas (1.B.2) contributed 18.4, 12.7, 11.7 and 8.3 per cent, respectively. CO_2 is the dominant GHG, contributing 88.0 per cent to total sector emissions and 83.6 per cent to total GHG emissions, while CH_4 and N_2O contributed 11.6 and 0.4 per cent, respectively, to total sector emissions.

29. Emissions from the energy sector have been estimated using a tier 1 method and constant IPCC default EFs, including for key categories. The ERT reiterates the recommendation from the previous review regarding the development of higher tier methods to improve the accuracy of emission estimates of key categories, and requests that Romania resolve this problem and report thereon in its next annual submission.

30. The inventory is generally complete. However, the ERT identified a number of gaps in the CRF submission. The ERT recommends that Romania explore the possibility of providing emission estimates in its next annual submission for the following categories: stationary combustion – other fuels (all GHGs); mobile (1.A.5.b) (military) – all fuels (all GHGs); road transport – LPG (CH_4 and N_2O); road transport – biomass (all GHGs); coal mining and handling – CO_2 and N_2O; solid fuel transformation – all GHGs; and various activities under oil and natural gas (1.B.2).

31. The energy sector is generally transparent considering that the Party has used a tier 1 method. QA/QC procedures are used by Romania in preparing the energy inventory and these procedures are adequately described in the NIR. The NIR also provides information on the uncertainties based on the tier 1 approach. Romania has aggregated emissions (and AD) for all categories within manufacturing industries and construction under other (1.A.2.f), and for petroleum refining and manufacture of solid fuels and other energy industries under public electricity and heat production. The ERT recommends that Romania endeavour to improve transparency in the reporting of the above-mentioned aggregated categories in both the CRF tables and the NIR.

32. Romania has performed recalculations in response to recommendations from the previous review. Recalculations include: correction of the double counting of emissions from manufacturing industries and construction – coke (CO_2) for the period 1992–2005; revision of the domestic/international

bunker split of CO_2 emissions from navigation and aviation for the period 1989–2005; and a correction of AD for oil and natural gas (1.B.2) – CH_4 for the period 1989–2005. Recalculations are time-series consistent. However, the ERT noted that other recalculations have been undertaken by the Party (e.g. other sectors) that are not explained in either the NIR or table 8(b).

33. The ERT noted that Romania is planning to conduct a national study in 2009 to develop country-specific EFs for fuel combustion in key source categories, and that it also plans to apply the COPERT transport model. The ERT recommends that Romania provide information on the implementation of these improvements in its next annual submission.

B. Reference and sectoral approaches

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

34. CO_2 emissions from fuel combustion were calculated using the reference approach and the sectoral approach, with differences between the approaches varying between 2.9 and 21.8 per cent. For 2006, the difference is 8.8 per cent and explanations are provided in the CRF documentation box. In addition, the NIR provides explanations for the fluctuations in the differences between the two approaches over the inventory time series. The ERT reiterates the recommendation from the previous review regarding the reporting of the notation key not applicable (NA) in CRF table 1.A(c) for apparent energy consumption that excludes non-energy use and feedstocks, and requests Romania to resolve this problem and to report thereon in its next annual submission.

2. International bunker fuels

35. Romania has revised its calculation of emissions from bunker fuels in response to a recommendation of the previous expert review team. The Party has developed a new approach to splitting domestic and international bunkers for aviation and navigation using new data from the Romanian Civil Aeronautical Authority for aviation, and from the statistical yearbook for navigation. The methodology is tier 1 and in line with the IPCC good practice guidance.

3. Feedstocks and non-energy use of fuels

36. Feedstocks and non-energy use of fuels are reported in the reference approach, using data from the national energy balance. However, apparent energy consumption excluding non-energy use and feedstocks is not provided in CRF table 1.A(c) (see para. 34 above).

C. Key categories

1. Stationary combustion: solid fuel – CO_2

37. The ERT noted that the implied emission factor (IEF) for other (1.A.2.f) increased from 111.1 t per TJ in 1992 to 160.0 t per TJ in 2005. Romania did not provide an explanation in the NIR for this trend, nor any data to verify it. The ERT recommends that Romania provide sufficient documentation and explanation in its next annual submission on such trends.

38. The ERT could not confirm with Romania whether it had rectified the double counting in the energy and the industrial processes sectors identified by the previous expert review team in relation to coke. The ERT recommends that Romania provide sufficient documentation in its next annual submission to confirm that the double-counting issue has been resolved, with a focus on providing data on coking coal, coke (energy and non-energy), coke gas and furnace gas energy and carbon balance in order to show that there is no double counting or omission of any furnace and coke gas in the energy balance.

2. Oil and natural gas – CH_4

39. The ERT noted that Romania did not estimate fugitive emissions from the transit of natural gas through the country. The ERT recommends that Romania explore options for obtaining these data (e.g. National Gas Transmission Company). The ERT also noted that Romania used IPCC default EFs that reflect the technology of the early 1990s and will overestimate fugitive emissions from natural gas distribution for the later years. Considering that this is a key category, the ERT recommends that Romania consider establishing a study to develop country-specific EFs for exploration of oil and gas, distribution of oil products and oil flaring, based on the length, materials and condition of the distribution networks, and encourages Romania to use the tier 2 method.

D. Non-key categories

Road transportation: liquid – CH_4, N_2O

40. The ERT noted that Romania has used a default N_2O EF (0.6 kg N_2O per GJ) for cars with uncontrolled emissions. Recently the Romanian car fleet has more than doubled, with new vehicles having emissions control technologies that increase the N_2O EF by one order of magnitude. The ERT recommends that Romania develop capacity to estimate emissions using the COPERT model.

III. Industrial processes and solvent and other product use

A. Sector overview

41. In 2006, the industrial processes sector accounted for 13.3 per cent (20,811.7 Gg CO_2 eq) of total GHG emissions. Emissions from this sector increased by 5.5 per cent between 2005 and 2006, and decreased by 52.6 per cent between the base year and 2006. A key driver of the decline between the base year and 2006 is the 48.6 per cent (7,702.3 Gg CO_2 eq) decrease in CO_2 emissions from iron and steel production. Metal production was the major category in 2006, contributing 44.3 per cent to total sector emissions, while mineral products and chemical industry contributed 32.0 and 23.6 per cent, respectively. CO_2 is the dominant gas, contributing 84.8 per cent to total sector emissions, while N_2O, F-gases and CH_4 contributed 12.0, 3.0 and 0.1 per cent, respectively. Solvent and other product use contributed 0.1 per cent to total GHG emissions.

42. The CRF tables are complete except for a few categories that are reported as NE, namely asphalt roofing, road paving with asphalt, foam blowing, aerosols/metered dose inhalers, semiconductor manufacture, and the use of N_2O (3.D). The ERT reiterates the recommendation from the previous review regarding the reporting of NE for these categories, and requests Romania to submit a complete inventory for the industrial processes sector in its next annual submission.

43. The ERT concluded that there are a number of issues concerning the accuracy of the inventory. The ERT recommends that Romania develop higher tier methods for categories that have been identified as key, including: ammonia production – CO_2; aluminium production – PFC; and nitric acid production –N_2O. The ERT also recommends that the Party verify that emissions are not double counted, as the ERT found that the double count of coke may not have been resolved by the Party, and noted that there could be double counting in glass production (2.A.7) with respect to soda ash use. In addition, the ERT found that Romania has not implemented the recommendation from the previous review to use the IPCC default EF from the Revised 1996 IPCC Guidelines for carbide production – CO_2.

44. The NIR is, with a few exceptions, transparent and provides relevant information. The method used to estimate emissions from the consumption of halocarbons and SF_6 is stated to be tier 2, but the description of calculation methods could be more detailed in the NIR. For example it is not clear if and how installed and accumulated banks or imported equipment are taken into account in the calculations.

45. Recalculations reported by Romania in its annual submission were achieved through the use of improved data (e.g. data from the European Union emissions trading scheme), implementation of recommendations of the previous expert review team and general improvement of the inventory. Romania has used improved data to recalculate pig iron – CO_2 for the period 1989–2005, soda ash use – CO_2 for the period 2003–2005 and ferroalloys production – CO_2 for the period 1989–1991, and to correct identified errors for 1998, 1999, 2001 and 2005. Romania has implemented recommendations of the previous expert review team to recalculate lime production – CO_2 for the period 1989-2005, limestone and dolomite use – CO_2 for the period 1989–2005 and iron and steel – CO_2 for the period 1989–2005. The recalculations performed by the Party are in accordance with the IPCC good practice guidance and are time-series consistent.

46. The ERT noted that several category-specific QC checks to compare plant-specific AD with national statistics have been performed by the Party, with results of these checks provided in the NIR.

47. The ERT also noted that several improvements have been implemented in response to the previous expert review (e.g. lime production and limestone and dolomite use). The ERT also noted planned improvements reported by Romania, including efforts to obtain more detailed data to estimate emissions in line with the IPCC good practice guidance. The ERT recommends that Romania further these efforts as the Party relies to a large extent on tier 1 methodologies and default EFs.

B. Key categories

1. Cement production – CO_2

48. The ERT found that the average calcium oxide (CaO) and magnesium oxide (MgO) contents in clinker (based on company data) have been used by the Party for all facilities and for the entire time series. The ERT reiterates the recommendation from the previous review that Romania collect information on possible changes in CaO content in clinker in support of the tier 2 methodology in its next annual submission.

49. In response to the previous expert review, cement kiln dust (CKD) is calculated separately for the years 1989–2003 and 2006. Romania explained to the ERT that for 2004 and 2005 the CKD was completely recycled. The ERT recommends that Romania provide improved documentation on CKD in its next annual submission.

2. Lime production – CO_2

50. Romania has recalculated all years of the inventory time series in response to a recommendation from the previous review, with emissions now estimated using default EFs for high-calcium lime and for dolomitic lime from the IPCC good practice guidance, including default values for the CaO and CaO per MgO content. Previously Romania used higher EFs from the Revised 1996 IPCC Guidelines, which did not consider the CaO or CaO per MgO content. The ERT noted that the recalculation has resulted in an average annual decrease of emissions in the order of approximately 5.2 per cent. This category is key and thus the ERT recommends that Romania collect country-specific information for the correction of CaO and CaO per MgO content in its next annual submission.

3. Ammonia production – CO_2

51. The ERT reiterates the recommendation from the previous review regarding the use of a tier 1b method based on ammonia production and default EFs, and recommends that Romania explore the possibility of obtaining data on the consumption of natural gas that can be used, at least in the context of a more accurate method, in comparison with corresponding estimates from the tier 1b method, in its next annual submission.

4. Iron and steel production – CO_2

52. The ERT found significant variations in the CO_2 IEF through the time series, and it is not clear as to whether double counting of coke has been resolved by the Party. Romania explained to the ERT that the tier 2 approach taken by the Party is in accordance with the IPCC good practice guidance, which is based on the calculation of the amount of the reducing agent (coke) used in blast furnaces for the production of iron, the amount of pig iron produced and the carbon content in iron. Romania also explained that this information has been collected at the plant level. In addition, the NIR did not provide information on whether Romania implemented checks on coke consumption data by comparing data provided by companies with data reported in the national energy balance. Given the significant variation in the CO_2 IEF and also the potential double count of coke, the ERT recommends that Romania provide sufficient information in the NIR explaining the trend as well as information on whether other emissions (e.g. from coke production) are included in pig iron emissions.

C. Non-key categories

Ferroalloys production – CO_2

53. Data on the produced type of product are available for 2002–2006. Silicon manganese dominates (at least 94 per cent) and the IPCC default EF for silicon manganese production (1.7 t CO_2 per t) is used for all production, except for 2005 when the share of ferro manganese was higher (16 per cent). Data for 1989–1991, which previously were extrapolated, have according to the NIR been updated with new national data. Corrections have been made in AD due to mistakes for 1998, 1999, 2001 and 2005. The IPCC default EFs for silicon manganese (1.7 t CO_2 per t) and ferro manganese (1.6 t CO_2 per t) are very similar. However, the ERT recommends that the Party use differentiated EFs for the years where data are available (2002–2006) and check if differentiation on specific products before 2002 is possible.

IV. Agriculture

A. Sector overview

54. In 2006, the agriculture sector accounted for 12.9 per cent (20,811.6 Gg CO_2 eq) of the total GHG emissions. Emissions decreased by 1.4 per cent between 2005 and 2006, and by 50.3 per cent between the base year and 2006. A key driver of the decline between the base year and 2006 is the decrease in the use of chemical fertilizer applied to soils, and in domestic animal numbers. Agricultural soils was the major category in 2006, contributing 52.3 per cent to total sector emissions and 6.7 per cent to the total GHG emissions. Enteric fermentation and manure management contributed 28.0 and 19.2 per cent, respectively, to total sector emissions. N_2O is the dominant GHG, contributing 61.2 per cent to total sector emissions, with CH_4 contributing 38.8 per cent.

55. The agriculture inventory is complete with the exception of the cultivation of histosols, which is reported as NE, and the ERT concludes that this could be a potential underestimation of the 2006 inventory. The ERT found that tier 1 methodologies were applied by Romania for all the categories, owing to the lack of detailed data required to implement a higher tier method. The ERT noted the general improvements in this sector compared to previous submissions, including recalculations performed in response to recommendations from the previous review in relation to AD for dairy and non-dairy cattle.

B. Key categories

1. Enteric fermentation – CH_4

56. CH_4 emissions from this category have decreased 49.0 per cent between the base year and 2006, owing to a decline in animal population. Romania has used a tier 1 method to estimate emissions from this key category and constant default EFs. However, default EFs reported in the Revised 1996 IPCC

Guidelines developed for the level of milk production were as high as 2,550 kg per head per year. In response to questions raised by the ERT during the course of the review, Romania provided milk production data. These data are a combination of both dairy cows and buffalo. In addition, the ERT found that milk production increased during 1990–2006, thus the use of a constant EF by Romania may lead to underestimation of emissions for the latter years of the inventory time series. The ERT recommends that Romania develop tier 2 EFs for dairy cattle in order to correlate annual milk productivity and EFs, and to recalculate emissions from enteric fermentation in its next annual submission. If Romania does not agree with the ERT on this recommendation, the ERT strongly recommends that the Party provide documentation that confirms that in 2006 the average milk productivity was not higher than 2,550 kg CH_4 per head. The ERT noted that Romania provided explanations for the lack of AD needed for the tier 2 methodology. The ERT further noted that in the absence of reliable statistical data an expert judgement might be used.

57. In addition, AD for buffalo are not separated into males and females in the inventory. This could lead to potential overestimation of the actual emissions. The ERT encourages Romania to investigate this problem closely and disaggregate the buffalo population.

2. Manure management – CH_4

58. Romania reported IPCC default values for the partitioning of the animal waste management system, and used expert judgement to determine that animals spent 50 per cent of time on pastures for grazing. However, CRF table 4D indicates a fraction of 0.34 allocated to the amount of nitrogen effectively excreted and deposited onto soil during grazing, which is not consistent with the 50 per cent estimate. The ERT recommends that Romania improve the transparency and consistency of reported information in the NIR and the CRF tables.

V. Land use, land-use change and forestry

A. Sector overview

59. In 2006, the LULUCF sector in Romania amounted to a net sink of 37,497.2 Gg CO_2 eq; the LULUCF sector is a net sink for all years of the inventory time series. The net sink increased by 0.03 per cent between 2005 and 2006, and increased by 14.9 per cent between the base year and 2006. The key driver of the increase between the base year and 2006 is the category forest land remaining forest land, which in 1989 removed 32,643.7 Gg CO_2 eq, and then increased quite rapidly to 40,042.1 Gg CO_2 eq in 1994; from 1995 to 2006, the carbon removal fluctuated between 36,000 Gg and 40,000 Gg and in 2006 the removal was 37,497.2 Gg CO_2 eq. On average the CO_2 removals from LULUCF decreased at a rate of about 0.11 per cent per year.

60. Romania has represented all land areas (5A–5F) in the CRF tables. However, the figure given for the total area of land varies slightly from year to year (i.e. $\pm$ 9,300 ha) with a spike in 2003. This total area should remain constant over time and match the official statistics for total national area. The ERT reiterates a finding of the previous expert review team regarding the inconsistent total land area through the inventory time series, and recommends that Romania resolve this problem and report thereon in its next annual submission.

61. The total land area of Romania is about 23,847,000 ha. In 1989 the percentages of land used as forest land, cropland, grassland, wetland, settlement and other lands were 27.5, 42.1, 19.8, 3.8, 5.8 and 1.0 per cent, respectively. The percentages reported for 2006 are slightly different: 28.3, 41.3, 20.5, 3.5, 4.4 and 2.0 per cent, respectively. Thus the dominant land use of Romania is cropland, followed by forest land and grassland. These three land uses account for about 90 per cent of the total land area.

62. The ERT concluded that the LULUCF inventory is incomplete in term of emissions by sources and removals by sinks. Romania reports estimates of carbon removal per emissions only for forest land

and not for other land uses (5.B–5.F), even though AD for other land uses are available. The notation keys NE, NA and NO have been used where appropriate in all source per sink categories (5.A–5.F).

63. Related to paragraph 62 above, the ERT noted with concern that Romania reported only on forest land remaining forest land in the LULUCF sector under the Convention. This could create major problems for reporting in 2010 on mandatory activities under Article 3, paragraph 3, and activities elected under Article 3, paragraph 4, of the Kyoto Protocol (forest management and revegetation).

64. No carbon stock changes were reported for cropland or grassland. As these land uses account for more than half of Romania's territory, it is likely that carbon stock changes also occur in areas not affected by changes in land use. The previous review team recommended that the Party disaggregate these lands into different land-use subcategories (e.g. perennial crops, annual crops, set-aside land, etc.) and management systems (e.g. unique combinations of different practices) and apply carbon stock parameters at a disaggregated level. The ERT noted that Romania explains in the NIR that the estimation of carbon removal per emission was not possible as national data on crop biomass, particularly for perennial crops such as vineyards and orchards, are not available. At present there are many sources of such information. The ERT reiterates the recommendation from the previous reviews regarding the estimation of carbon removals/emissions from cropland and grassland, and requests Romania to resolve this problem and to report thereon in its next annual submission. The ERT recommends that Romania explore potential sources of information for carrying out this request, such as relevant information from neighbouring countries or any available EF database, for example from IGES-Japan (<http://www.ipcc-nggip.iges.or.jp/EFDB/main.php>), or develop a permanent plot sampling to measure biomass change and biomass stock of a number of dominant perennial crops.

65. The NIR reported that QA/QC has been implemented by Romania, and no recalculation is needed following these activities. However, more information is required on the QA/QC process, which Romania has acknowledged in the NIR. The ERT recommends that the Party increase the transparency of the NIR by providing improved information on QA/QC activities specific to LULUCF, and more detailed information on planned LULUCF improvements.

B. Key categories

Forest land – CO_2

66. The figure reported for the area of forest land is relatively constant, but there is a sudden decrease in 2001 and 2002. The ERT also found an inconsistency between the reported total areas of forest land in table 7.5 of the NIR and CRF table 5A. The mean difference is about 1,216 ha, with the highest difference occurring in the figures given for 2003 (i.e. 10,300 ha). The ERT recommends that Romania improve the consistency of reporting between the NIR and the CRF tables.

67. Estimation of carbon stock change in living biomass was based on country-specific I_v (average annual net increment) values that are a constant value throughout the inventory time series. The ERT reiterates the recommendation from the previous review on this issue, and requests Romania to resolve this problem and to report thereon in its next annual submission.

68. Using data given in the NIR, the ERT recalculated the carbon removal from forest land remaining forest land to be lower than that reported by the Party. The average difference is about 17 per cent. Romania explained the difference to be related to the reporting in the NIR of primary data from the National Institute of Statistics which were not included in the format of the land-use change matrix used to estimate emissions/removals or reported in the CRF tables. Romania indicated that this inconsistency in the reporting of carbon removal will be rectified in its next annual submission.

C. Non-key categories

Forest land – CH_4, N_2O

69. For the estimation of GHG emissions from biomass burning, the Party assumed that only biomass on the forest floor is burnt during a wildfire (i.e. about 6.8 t C per ha). This assumption is based on expert judgement. The ERT recommends that Romania provide sufficient documentation in the NIR, including references to literature, to support this assumption.

VI. Waste

A. Sector overview

70. In 2006, the waste sector accounted for 6.4 per cent (10,037.7 Gg CO_2 eq) of total GHG emissions. Emissions from the sector increased by 6.2 per cent between 2005 and 2006, and by 20.2 per cent between the base year and 2006. The key driver of the increase between the base year and 2006 is the 150.7 per cent increase in emissions from solid waste disposal on land. Solid waste disposal on land is also the major category in the waste sector, contributing 58.6 per cent to total sector emissions, and 3.8 per cent to total GHG emissions. Emissions from wastewater handling contributed 38.0 per cent to total sector emissions, while waste incineration contributed 3.4 per cent. CH_4 is the dominant GHG, contributing 89.5 per cent to total sector emissions, while N_2O contributed 7.2 per cent and CO_2 3.4 per cent.

71. The waste sector has been prepared in line with the IPCC good practice guidance. Romania has not reported emissions for industrial wastewater – N_2O or waste incineration – CH_4 and N_2O. The description of the waste sector in the NIR is generally transparent, providing both tables and references to information.

B. Key categories

1. Solid waste disposal on land – CH_4

72. The ERT noted that Romania uses the IPCC tier 1 method to estimate emissions from this key category, which is not in line with the IPCC good practice guidance. Romania explains that it does not have the required historical data to use the tier 2 first-order decay (FOD) model. The ERT reiterates the recommendation from the previous review regarding the use of the tier 2 FOD model, and requests Romania to resolve this problem and to report thereon in its next annual submission.

73. The ERT noted that Romania, in response to recommendations from the previous review, has improved AD for unmanaged landfills that are divided into deep and shallow sites. However, the ERT found that the resultant recalculations reported in the 2008 annual submission show significant differences and fluctuations in comparison with the previous submission. The ERT recommends that Romania check and verify the new AD.

74. Romania is also encouraged to explore the possibility of collecting CH_4 recovery data and to include these in its next annual submission.

2. Wastewater handling – CH_4

75. Romania has used a tier 1 methodology to estimate emissions from this category in line with the IPCC good practice guidance. The ERT noted that sludge and wastewater are combined in this estimate, and that the Party has reported in the CRF table for sludge an incorrect notation key (IE (included elsewhere)). Most of the values used are IPCC default values. However, Romania has reported a country-specific value (0.46) for methane conversion factor (MCF) that was found by the previous expert review team to be high and not well documented. Romania, in response to recommendations from the

previous review, has replaced a number of the default values from the Revised IPCC 1996 Guidelines with corresponding values from the IPCC good practice guidance. The ERT found that there was insufficient documentation in the NIR to justify the Bo (maximum methane-producing capacity) value.

76. Romania reported recalculations performed to reflect the above-mentioned changes and the ERT found that the resultant emission estimates show significant differences and fluctuations in comparison with the previous approach used by the Party. The ERT recommends that Romania provide explanations of such differences and ensure the reliability of the data and EFs used.

3. Wastewater handling – N_2O

77. Romania uses IPCC default methodology to estimate emissions from this category. EFs from Food and Agriculture Organization of the United Nations statistics and country-specific AD for population are used by the Party. The ERT recommends that the Party provide an explanation of the large differences and fluctuations in the recalculations performed due to improved EFs and AD.

4. Waste incineration – CO_2

78. Emissions from this category have been estimated using a default IPCC tier 1 methodology. Romania collects only hazardous and clinical waste data. The ERT found that the AD have been improved with respect to the clinical waste data; however, resultant recalculations show significant differences and fluctuations in comparison with the previous approach used by the Party. The ERT recommends that the Party provide an explanation on the differences and fluctuations, and extend the collection of AD to other industries.

VII. Other issues

1. Changes to the national system

79. The Party has not reported on any changes to its national system in the 2008 submission. In response to questions raised by the ERT during the review the Party confirmed that no changes to the national system have taken place.

2. Changes to the national registry

80. The Party has not reported on any changes to its national registry in the 2008 submission. In response to questions raised by the ERT during the review the Party confirmed that no changes to the national registry have taken place.

3. Commitment period reserve

81. Romania has not reported its commitment period reserve in the 2008 submission. In response to questions raised by the ERT during the review Romania reported its commitment period reserve to be 783,400,098.615 t CO_2 eq based on the national emissions in its most recently reviewed inventory (156,680.0 Gg CO_2 eq). The ERT agrees with this figure. The ERT recommends that Romania include information on its commitment period reserve in its next annual submission.

VIII. Conclusions and recommendations

82. The inventory generally covers all sectors and most source and sink categories, and is complete in terms of years, gases and geographical coverage. Romania has submitted an NIR based on the structure set out in the UNFCCC reporting guidelines, and submitted CRF tables for all years of the inventory time series. The ERT noted that the completeness of the 2008 annual submission has been improved by the inclusion of more comprehensive information on uncertainty estimates and verification activities, and a description of QA/QC and verification procedures. However, the ERT concluded that

completeness of the inventory can be further improved with the reporting of emission estimates for activities that are known to occur in Romania.

83. The inventory is generally in line with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. The ERT identified a number of potential minor under- and overestimates of emissions (see paras. 40, 55, 56 and 68 above). In addition, Romania continues to use tier 1 methods and constant IPCC default EFs for a number of key categories. The ERT reiterates the recommendation from the previous review on this issue, and requests Romania to resolve this problem and to report thereon in its next annual submission.

84. The key recommendations are that Romania:

(a) Improve the completeness of the inventory by reporting emissions for activities that are known to occur (e.g. all activities under LULUCF);

(b) Allocate sufficient resources for improving the inventory, giving priority to developing higher tier methods for key categories (e.g. oil and natural gas, and enteric fermentation);

(c) Improve the transparency of its annual submission by providing detailed information in the NIR on descriptions of methodologies and recalculations performed;

(d) Further improve the transparency of its annual submission by providing information on how it has addressed the recommendations from the previous review (e.g. the recommendations regarding double counting of coke in the energy and industrial processes sectors);

(e) Resolve the inconsistent representation of total land area through the inventory time series.

IX. Questions of implementation

85. No questions of implementation were identified by the ERT during the review.

Annex

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

"Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention". FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

"Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

"Guidelines for review under Article 8 of the Kyoto Protocol". Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

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FCCC/IRR/2007/ROU: Report of the review of the Initial Report of Romania. Available at <http://unfccc.int/resource/docs/2008/irr/rou.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Vlad Trusca (Ministry of Environment and Sustainable Development), including additional material on the methodology and assumptions used.

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