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Report of the individual review of the greenhouse gas inventory of Romania 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 Romania, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with decision 19/CP.8. The review took place from 8 to 13 October 2007 in Bucharest, Romania, and was conducted by the following team of nominated experts from the roster of experts: generalist – Ms. Katarina Mareckova (European Community); energy – Mr. Ralph Harthan (Germany); industrial processes – Mr. Domenico Gaudioso (Italy); agriculture – Ms. Fatou Gaye (Gambia); land use, land-use change and forestry (LULUCF) – Mr. Daniel Martino (Uruguay); waste – Mr. Seungdo Kim (Republic of Korea). Ms. Katarina Mareckova and Mr. Daniel Martino were the lead reviewers. The review was coordinated by Mr. Tomoyuki Aizawa and Mr. Harald Diaz-Bone (UNFCCC secretariat).

2. In accordance with the "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention", a draft version of this report was communicated to the Government of Romania, for comment prior to its publication.

B. Inventory submission and other sources of information

3. On 5 May 2006, a complete set of common reporting format (CRF) tables for the time series 1989–2004 and a national inventory report (NIR) were submitted. On 18 May 2007, the complete 2006 inventory was resubmitted. The Party resubmitted its 2006 GHG inventory for the years 1989 and 2004 on 26 November 2007, in response to questions raised by the expert review team (ERT) during the course of the in-country visit. Where needed the ERT also used Romania's 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.

C. Emission profiles and trends

4. In 2004, the most important GHG in Romania was carbon dioxide (CO_2), which contributed 71.6 per cent of total[1] national GHG emissions expressed in CO_2 equivalent (eq), followed by methane (CH_4), 17.2 per cent, and nitrous oxide (N_2O), 10.8 per cent. Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) taken together contributed 0.3 per cent of the overall GHG emissions in the country. The energy sector accounted for 70.2 per cent of the total GHG emissions, followed by agriculture (12.9 per cent), industrial processes (12.0 per cent) and waste (4.7 per cent). Total GHG emissions amounted to 156,109.15 Gg CO_2 eq, and decreased by 43.9 per cent from the base year to 2004. The trends for the different gases and sectors are reasonable and reflect the national circumstances of Romania and its economy in transition.

5. 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, 1989–2004[a]

Greenhouse gases	Gg CO_2 equivalent								Change BY to 2004 (%)
	Base year (Convention)	1990	1995	2000	2001	2002	2003	2004	
CO_2 (with LULUCF)	159 766.4	135 758.3	89 921.4	56 703.0	60 698.4	69 095.9	74 688.0	75 964.3	–44.04
CO_2 (without LULUCF)	192 407.8	171 606.5	129 206.4	95 000.2	100 006.2	105 940.3	111 156.8	111 732.7	–34.89
CH_4	49 312.5	42 989.4	32 642.7	26 606.9	26 214.9	26 824.0	27 620.4	26 927.1	–37.36
N_2O	33 155.4	28 530.0	18 914.5	15 049.2	15 253.7	14 562.5	15 267.6	16 929.2	–40.66
HFCs	NA,NE	NA,NE	0.2	2.9	2.8	3.3	5.1	6.9	NA
PFCs	3 349.5	2 115.8	1 773.7	413.1	428.8	444.6	471.9	513.3	–75.73
SF_6	NA, NE, NO	NA, NE, NO	0.1	0.0	0.0	0.0	0.0	0.1	NA

BY = Base year; LULUCF = Land use, land-use change and forestry; NA = Not applicable; NE= Not estimated; NO = Not occurring

[a] Romania submitted revised estimates for all years in the course of the initial review on 7 December 2007. These estimates differ from the Party's GHG inventory submitted in 2006.

Table 2. Greenhouse gas emissions by sector, 1989–2004[a]

Sectors	Gg CO_2 equivalent								Change BY to 2004 (%)
	Base year (Convention)	1990	1995	2000	2001	2002	2003	2004	
Energy	188 311.6	172 250.2	129 031.8	94 855.4	99 952.3	103 890.2	110 249.1	109 558.97	–41.8
Industrial processes	43 187.6	29 716.3	23 516.3	16 661.7	15 735.2	17 183.0	17 392.4	18 692.08	–56.7
Solvent and other product use	645.8	540.5	229.4	224.3	200.5	222.3	279.9	277.40	–57.0
Agriculture	40 362.0	37 302.2	23 494.0	18 006.7	18 725.5	18 706.7	18 993.3	20 182.19	–50.0
LULUCF	–32 641.2	–35 847.1	–39 284.5	–38 288.1	–39 305.2	–36 835.4	–36 466.9	–35 768.14	9.6
Waste	5 718.0	5 431.4	6 265.6	7 315.2	7 290.2	7 763.5	7 605.2	7 398.51	29.4
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF)	245 583.8	209 393.5	143 252.5	98 775.2	102 598.6	110 930.2	118 052.9	120 341.01	–51.0
Total (without LULUCF)	278 225.0	245 240.6	182 537.0	137 063.3	141 903.8	147 765.7	154 519.8	156 109.15	–43.9

BY = Base year; LULUCF = Land use, land-use change and forestry; NA = Not applicable.

[a] Romania submitted revised estimates for all years after the initial review on 7 December 2007. These estimates differ from the Party's GHG inventory submitted in 2006.

D. Key categories

6. Romania reported a tier 1 key category analysis, both level and trend assessment, as part of its 2006 submission. The key category analysis performed by the Party and the secretariat[2] produced similar results. Romania did not include the LULUCF sector in its key category analysis. At present Romania uses mainly tier 1 methods and default emission factors (EFs), including for key sources. The Party does not use the analysis to prioritize the development of the inventory. The ERT recommends Romania to include LULUCF in the key category analysis in its next submission and to use the key category analysis in the development of its inventory.

E. Main findings

7. The national emission inventory and inventory system have improved notably from previous submissions. However, the completeness of the inventory and consistency of the activity data (AD) should be further improved. The ERT noted that for most key categories tier 1 methods and default EFs were applied. The ERT encourages Romania to move to higher tiers as far as practicable. In addition, the transparency of the inventory should be enhanced (see paragraphs 10–11).

F. Cross-cutting topics

1. Completeness

8. Romania provided GHG inventory data for the base year (1989) and the years 1990–2004, and included all the tables required with data on all relevant gases, sectors and categories. The ERT noted that the CRF Reporter software identified 346 not estimated ("NE") notation keys across all sectors in the CRF tables for 2004. The ERT recommends Romania to complete the inventory as far as practicable in its next submission. Missing estimates were generally explained by unavailability of AD and/or EFs. The inventory is complete in terms of geographic coverage.

9. The ERT assessed the inventory data for the base year (1989) and the years 1990–2004 as complete. Notation keys were used throughout the tables. Those categories that were reported as "NE" or included elsewhere ("IE") were explained in CRF table 9.

2. Transparency

10. The information provided in the NIR and the CRF tables is generally transparent. The ERT noted that the transparency and quality of the information reported in the CRF tables and the NIR have improved since the previous (2005) submission. However, Romania could improve the description of methodologies and information on data selection in the NIR by providing more detailed information. The ERT also noted that sufficient rationale for the selection of methods and EFs in some categories in the energy and agriculture sectors is not provided. The ERT recommends that the Party clearly reference the AD and EFs used and discuss and explain their trends.

11. In general, methods and EFs are used consistently over the entire time series. The ERT noted that AD are not consistently applied throughout the entire time series in a few cases where different types

[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.

of data have been used for different years. For details, see the discussion in the sectoral sections of this report.

3. Recalculations and time-series consistency

12. The national system can ensure that recalculations of previously submitted estimates of GHG emissions by sources and removals by sinks are prepared 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). Recalculations have been undertaken when methods or EFs have changed or been refined, when improved AD have been collected, or when mistakes in the estimates have been identified and corrected. All recalculations have been recorded in the archiving system and are correctly reported in the NIR and the CRF tables.

13. The ERT noted that recalculations of the time series from the base year to 2003 had been undertaken in all sectors, taking into account the recommendations of previous reviews as well as new information on AD and EFs, and reconsideration of the selection of methods and AD. The major changes in emission levels for 2003 include: energy (+2.5 per cent), industrial processes (+15.9 per cent), agriculture (+58.4 per cent), LULUCF (+116.0 per cent) and waste (+49.9 per cent). The total effect of these recalculations is a 10.2 per cent increase for 2003. The rationale for these recalculations was provided during the review and in the NIR. Based on the information provided the ERT judged the recalculations to be warranted.

4. Uncertainties

14. The Party did not provide a complete uncertainty analysis for each source category and for the inventory in total, which is not in accordance with the IPCC good practice guidance. The uncertainty estimates were provided only for a few categories using default parameters from the IPCC good practice guidance. The ERT requested Romania to submit to the secretariat a complete uncertainty analysis within six weeks of the review visit.

15. The ERT appreciated the fact that Romania provided the secretariat with complete quantitative uncertainty analyses based on the IPCC tier 1 method by 26 November 2007. The ERT noted that most of the values used in the analyses are IPCC default values or values derived by expert judgement with only limited explanation. The ERT recommends that Romania obtain country-specific uncertainty parameters, particularly for significant sources, and further improve the uncertainty analyses in line with the provisions in the IPCC good practice guidance. The ERT also recommends that Romania provide tier 1 uncertainty analyses with the next submission.

5. Verification and quality assurance/quality control approaches

16. Romania has elaborated and partly implemented a quality assurance/quality control (QA/QC) plan in accordance with the IPCC good practice guidance. This plan includes general QC procedures (tier 1) as well as source/sink category-specific procedures (tier 2) for a few key categories in industrial processes. The National Environmental Protection Agency is responsible for annual coordination and recording of QA/QC activities, and regular updating of the QA/QC plan. The ERT noted that Romania has nominated one of the inventory experts as the quality manager.

17. Basic QC procedures are in place and to some extent described in the 2006 NIR. Sector-specific QA procedures are not described. The ERT recommends that the Party improve QC by better linking data collection, data processing and emissions estimation, and document QA/QC procedures in more detail in its future submissions. Rather limited QA of the inventory has been carried out by staff not directly involved in the inventory compilation. The ERT therefore recommends that the Party arrange

inventory checks by external experts before its next submission. The ERT also recommends that the Party consider system-level checks, such as cross-checking the AD available from different sources (national statistical office , the European Union (EU) emissions trading scheme (ETS), the EU Large Combustion Plant Directive, the EU IPPC Directive and the European Pollutant Emission Register) to minimize the risks of missing plants/data in future submissions. These QC checks could include an independent sectoral expert review of AD to explain the reasons for the large interannual variations in emissions from key sources (on both a level and a trend basis). The ERT recommends that the Party include in its next NIR a list of the QC checks which are carried out prior to submission.

6. Follow-up to previous reviews

18. The ERT recognizes that Romania continues to improve the quality of its emissions inventory by increasing completeness, improving the quality of AD and correcting errors in response to previous reviews. The use of notation keys has also been improved. Romania has elaborated uncertainty analyses, set up an archiving system and developed a QA/QC plan.

G. Areas for further improvement

1. Identified by the Party

19. In its response to questions raised by the ERT during the in-country review, Romania explained that it is working towards improving its estimates in several categories (see the sectoral sections of this report below). Romania also informed the ERT that all the relevant inventory data will be gradually included in the centralized archiving system and that a catalogue of all archived information will be developed. Romania is in the process of advancing the implementation of its national QA/QC plan and is considering broader involvement of external experts in its inventory review.

20. The NIR identifies the following areas for further improvement:

(a) Improve the consistency and accuracy of the time-series AD in the energy sector;

(b) Back up existing information and obtain new information on international aviation and navigation;

(c) Further increase the accuracy of the EF for nitric acid production on the basis of measurements and a longer data series;

(d) Further refine data for the consumption of halocarbons and SF_6, primarily as regards final use;

(e) Further verify both the AD and the background inventory information for the forest land category.

2. Identified by the ERT

21. The ERT identifies the following cross-cutting issues for improvement and recommends that Romania:

(a) Involve a broader range of sectoral experts, for example from industry, universities and local agencies, in order to develop country-specific methods and EFs;

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

(c) Obtain information for uncertainty analyses;

(d) Further develop and then implement the QA/QC procedures for each sector, and in particular implement tier 2 QA/QC procedures for identified key categories.

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

II. Energy

A. Sector overview

23. In 2004, the energy sector accounted for 70.2 per cent of total GHG emissions in Romania. Energy industries is the major source category in the sector, contributing 43.3 per cent to sectoral emissions, followed by manufacturing industries and construction, transport, energy use in other sectors, and fugitive emissions (which contributed 23.5 per cent, 12.9 per cent, 10.7 per cent and 9.6 per cent, respectively). Emissions from the energy sector decreased by 40.5 per cent between 1989 and 2004, owing to a decline in fuel combustion in energy industries and manufacturing industries and construction, as well as decreasing fugitive emissions from fuels.

24. The CRF tables for 2004 have been completed. However, several emissions were reported as "NE". During the review, the Party explained that the data available for some categories were not sufficient to produce estimates. For example, no estimates for emissions from other fuels were provided, since no information with respect to disaggregation of fuel types and EFs was available. The ERT encourages the Party to continue its endeavours to collect further AD and make more extensive use of expert judgement in order to improve the completeness of emission estimates.

25. The ERT acknowledges the significant improvement achieved by Romania in its inventory of the energy sector. Major improvements include the correction of a misallocation of fuels within the liquid, solid and gaseous fuel categories, the consistent application of IPCC default EFs for all fuels, the use of more detailed AD in the transport sector and the inclusion of emissions from pipeline transportation in the inventory. Recalculations have been performed accordingly for categories related to fuel combustion (CRF 1.A). In the NIR and during the review, the Party provided all the relevant information for these recalculations.

26. The energy chapter in the 2006 NIR contains basic information on data sources, methodologies and emission trends. However, this information does not allow the full reproduction of estimates. For instance, it is not possible to fully trace how AD were derived from the national energy balance or how the split between international and domestic fuel consumption for aviation and navigation was arrived at. The Party provided satisfactory clarification in most cases during the review. The ERT recommends the Party to improve documentation of data sources, methodological choices and expert judgements in its future submissions.

27. For estimating emissions from the energy sector, a tier 1 approach and constant EFs are used consistently throughout the entire time series. The ERT recommends the Party to increase accuracy by gradually introducing higher-tier approaches, especially for several key categories in the energy sector.

B. Reference and sectoral approaches

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

28. The estimates of energy consumption and CO_2 emissions in 2004 as derived from the reference approach were 1.6 per cent higher and 2.2 per cent lower, respectively, than the equivalent estimates derived from the sectoral approach. The differences between the reference approach and the sectoral approach fluctuated significantly throughout the time series. Part of this fluctuation may be associated

with significant variations in consumption of blast furnace gas over time, which, as clarified by the Party during the review, are not taken into account in the reference approach. The ERT recommends the Party to further investigate and document the reasons for the differences between the reference approach and the sectoral approach in its future submissions.

2. International bunker fuels

29. For 2004, CO_2, CH_4 and N_2O emissions from aviation bunkers are reported as "NE" and CO_2, CH_4 and N_2O emissions from marine bunkers are reported as included elsewhere, not applicable or not estimated ("IE", "NA" or "NE"). CRF table 9 (a) does not provide an explanation for these notation keys, but during the review the Party clarified that all emissions from international bunker fuels are included in the emission estimates for the domestic consumption of fuels for aviation and navigation. Following the recommendations made by the ERT during the review, the Party submitted estimates for this category. In 2004, CO_2 emissions from aviation bunkers are estimated to be 352.4 Gg and CO_2 emissions from marine bunkers are estimated to be 43.4 Gg. CH_4 and N_2O emissions are also quantified, but are of minor magnitude.

30. Since no information regarding international bunker fuels is reported in the Romanian energy balance, the Party assumed that 20 per cent of fuel consumption for aviation and 100 per cent of fuel consumption for navigation is used for domestic purposes. However, these assumptions are not justified in the 2006 NIR. During the review, the Party provided new estimates for shares of domestic and international bunker fuel use for navigation and aviation (see also paragraphs 36 and 40). According to these estimates, 96.3 per cent of the fuel used for aviation and 63.7 per cent of the fuel used for navigation are reported under international bunkers in 2004.

3. Feedstocks and non-energy use of fuels

31. Information on feedstocks and non-energy use of fuels is scant in the 2006 NIR. It states that non-energy fuel use is accounted for as combustion use in the reference approach, and that "a correction is done by the carbon stored from non-energy fuel use". No data on feedstock use in specific sectors are available in the national energy balance. During the review, the Party provided revised estimates for coke consumption in the iron and steel sectors for process and combustion purposes, respectively. The ERT recommends the Party to generally improve and document its understanding of feedstocks and non-energy use of fuels in the national energy balance and the inventory.

C. Key categories

1. Stationary combustion: all fuels – CO_2, CH_4 and N_2O

32. Emissions from stationary combustion encompass three key categories and account for the bulk of the Romanian GHG emissions. The ERT therefore recommends the Party to improve accuracy by using higher-tier approaches for CO_2 emissions from stationary combustion of gaseous, liquid and solid fuels and for CH_4 emissions from stationary combustion of biomass. Improvements should involve the consideration of more disaggregated CO_2 EFs (according to the different fuel qualities used). The ERT encourages the Party to explore possibilities for using available plant-specific and other bottom-up data, such as data from the EU ETS.

2. Manufacturing industries and construction – other (1.A.2.f): coke – CO_2, CH_4 and N_2O

33. Coke consumption is accounted for in both the energy sector (CRF 1.A.2.f) and the industrial processes sector (CRF 2.C.1). There is potential for double counting of coke consumption and related GHG emissions. During the review, the Party examined this issue and found that the definition of coke consumption in the energy balance that was previously used to estimate energy emissions had included

coke used for non-energy purposes for 1992 onwards. The Party therefore provided revised estimates. The Party is encouraged to document this issue in its future submissions.

3. Transport: all fuels – CO_2, CH_4 and N_2O

34. The estimation of GHG emissions in the transport sector is based on a tier 1 method using data from the energy balance and IPCC default EFs. The ERT acknowledges the improved availability of data for the transport category for 1993 onwards since the 2006 inventory submission. Shares of transport fuels in overall fuel consumption from 1993 onwards were used to extrapolate fuel consumption in the different categories for the years 1989 to 1992.

35. Emissions from the use of biofuels in transport are not yet included in the inventory. The ERT encourages the Party to consider including these in its future submissions.

4. Navigation: all fuels – CO_2, CH_4 and N_2O

36. The derivation of the share of domestic fuel consumption for navigation is not fully transparent. The recommendation of a previous review to disaggregate bunker fuel emissions from domestic civil aviation and navigation was not followed in the 2006 NIR. During the review, the Party examined this issue and clarified that statistics on the loading and unloading of goods in Romanian harbours should serve as the basis for disaggregating domestic and international emissions from navigation. Based on these findings, the Party revised the estimates for CO_2, CH_4 and N_2O emissions from navigation for the entire time series. The Party is encouraged to document this new approach accordingly in future submissions.

5. Fugitive emissions – CH_4, CO_2 and N_2O

37. The estimation of fugitive emissions is based on a tier 1 approach using data from the national energy balance and the Romanian Statistical Yearbook as well as IPCC EFs. Several fugitive emissions are "NE". In order to increase accuracy and to improve completeness, the ERT recommends the Party to explore possibilities for estimating further fugitive emission sources and of moving to higher-tier approaches, particularly for key categories.

6. Coal mining and handling – CH_4

38. Romania has estimated CH_4 emissions from coal mining and handling by using AD from the Statistical Yearbook and EFs provided by the IPCC. Of the emissions from this sub-category, a split between 15 per cent from underground mines and 85 per cent from surface mines is based on a study for the years 2002 and 2003. The ERT recommends the Party to verify the share of emissions between underground and surface mines in future submissions.

7. Other leakage: natural gas – CH_4

39. The value for consumption of natural gas used to estimate CH_4 emissions from other leakage is lower than the value used for the transmission of natural gas. The ERT noted that CH_4 emissions from other leakage related to consumption of natural gas may therefore have been underestimated. During the review, the Party examined this issue and clarified that the value for natural gas consumption used to estimate CH_4 emissions from other leakage – natural gas was not aggregated correctly. Based on these findings, the Party revised the estimates for CH_4 emissions from other leakage – natural gas for the entire time series.

D. Non-key categories

Civil aviation: liquid fuels – CO_2, CH_4 and N_2O

40. The calculation of the figure for domestic fuel consumption for civil aviation is not transparent. A previous review recommended Romania to collect the information needed to disaggregate bunker fuel emissions from domestic civil aviation in order to explain and document this calculation. This recommendation was not followed in the 2006 NIR. During the review, the Party examined this issue and developed a new approach to calculate the split between domestic and international civil aviation emissions. Revised estimates were provided. The Party is encouraged to document this new approach accordingly in future submissions.

III. Industrial processes and solvent and other product use

A. Sector overview

41. GHG emissions from industrial processes and solvent and other product use amounted to 19.0 Mt CO_2 eq in 2004, corresponding to 12.2 per cent of overall GHG emissions, not including emissions and removals from the LULUCF sector. Between the base year (1989) and 2004, GHG emissions from this sector decreased by 56.7 per cent.

42. The quality of the submission has been greatly improved over past submissions, mainly in response to previous review reports. However, emission estimates have not yet been provided for the following categories and sub-categories in the industrial processes sector: asphalt roofing (2.5.A); road paving with asphalt (2.6.A); consumption of halocarbons and SF_6: foam blowing (2.F.2); consumption of halocarbons and SF_6: aerosols/MDIs (2.F.4); consumption of halocarbons and SF_6: solvents (2.F.5); and consumption of halocarbons and SF_6: semiconductor manufacture (2.F.7). Furthermore, the estimate for consumption of halocarbons and SF_6 (2.F) does not consider emissions from imported and installed equipment, and the estimate for solvent and other product use includes non-methane volatile organic compounds and CO_2 emissions, but does not include N_2O. As a priority for further improvement of the inventory, the ERT recommends the Party to provide estimates for those categories for which information is still missing or is largely incomplete.

43. Tier 2 estimation methodologies are now used for most key categories. Emission estimates are mainly based on default EFs. The ERT encourages the Party to make efforts to extend the use of tier 2 methodologies at least to key categories.

44. The different elements of the submission are transparent, but the ERT encourages the Party to improve the use of notation keys in the CRF and to provide more detailed information in the NIR.

45. Recalculations have been carried out – mainly to improve the quality of AD and ensure time-series consistency for the following categories: cement production (2.A.1), lime production (2.A.2), limestone and dolomite use (2.A.3), nitric acid production (2.B.2), iron and steel production (2.C.1), ferroalloys production (2.C.2), aluminium production (2.C.3), other production (2.D) and consumption of halocarbons and SF_6 (2.F). Recalculations have increased 2003 GHG emissions by 2,386.80 Gg CO_2 eq (15.61 per cent).

B. Key categories

1. Cement production – CO_2

46. Tier 2 methodology is used to calculate GHG emissions from cement production. Average calcium oxide (CaO) and magnesium oxide contents and clinker production data are provided by

companies. Since cement production is a key category, the ERT encourages the Party to collect information on possible changes in the CaO content of clinker.

2. Lime production – CO_2

47. Emissions from lime production are estimated using a default EF and AD from the National Institute of Statistics. As this is a key category, the ERT encourages the Party to apply the correction for CaO content as specified in the tier 2 methodology.

3. Limestone and dolomite use – CO_2

48. To complete the time series of AD for limestone and dolomite use, the Party has used a correlation with pig iron production. This approach does not ensure completeness and accuracy since it does not consider other possible uses of limestone and dolomite. The ERT encourages the Party to collect information about other possible uses of limestone and dolomite.

4. Ammonia production – CO_2

49. To calculate GHG emissions from ammonia production, the estimation is based on production data provided by the National Institute of Statistics. Since this is a key category, the ERT encourages the Party to use the most accurate estimation method, based on the consumption of natural gas, at least as a comparison with estimates based on production data.

5. Nitric acid production – N_2O

50. Tier 2 methodology is used to calculate GHG emissions from nitric acid production. Production data are supplied by manufacturers and default EFs are used for the different technologies used in each installation. The information is traceable and well documented, but the Party is encouraged to explain in its next submission the large differences that exist between the production data reported by the manufacturers and the information from the National Institute of Statistics.

6. Carbide production – CO_2

51. The default EF used for this estimate is 760 tonnes CO_2 per tonne carbide produced, whereas an EF of 1,100 tonnes CO_2per tonne carbide produced is provided by the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) for the entire production process. The Party is therefore recommended to revise the current estimate for this category.

7. Iron and steel production – CO_2

52. For iron and steel production, tier 2 methodology has been used with plant-level data for AD and a mix of default and country-specific values for EFs (carbon content). The accuracy of the estimate has been checked through comparison with figures reported under the EU ETS, but no cross-checks were performed between the coke consumption data reported by companies and the figures reported in the energy balance. The possibility of double counting with the energy sector cannot be excluded; nor can the possibility of underestimations or overestimations. The ERT recommends the Party to add to the estimation CO_2 emissions released from the consumed electrodes for steel produced in electric arc furnaces, and to check the coke consumption data against the figures reported in the energy balance.

8. Aluminium production – PFCs

53. Tier 1 methodology, which uses default EFs, has been used to estimate PFCs from aluminium production. As this is a key category, the ERT encourages the Party to make efforts to apply higher-tier methods based on a smelter-specific relationship between emissions and operating parameters.

C. Non-key categories

1. Soda ash production and use – CO_2

54. To complete the time series of AD for soda ash use, linear interpolation has been replaced by a correlation with soda ash production. The ERT encourages the Party to check the accuracy of this correlation using available import and export data.

2. Asphalt roofing/road paving with asphalt – CO_2

55. Estimates of emissions for asphalt roofing and road paving with asphalt have not been provided. The ERT recommends the Party to make efforts to include estimates for these two categories in its next submission, possibly through the use of proxy AD if no other information is available.

3. Other: carbon black – CO_2

56. No CO_2 emissions are provided for this category, since the corresponding cell in the CRF table is shaded. However, these emissions do occur and an EF is available in the 2006 IPCC Guidelines. Further information might also be available in the EPER database.[3]

4. Ferroalloys production – CO_2

57. AD for ferroalloys production for 1989–1991 are calculated using a trend extrapolation. The ERT has verified that the relevant assumptions led to a conservative estimate for the base year. However, the ERT encourages the Party to collect historical data concerning the contribution of production of the different alloys to total emissions of this sub-category in the early years (1989–1991).

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

58. Both potential and actual emissions are reported for this sub-sector. Potential emissions are estimated using import and export data from trading companies. The amount of chemicals imported each year into the Romanian market has also been used to estimate actual emissions. Despite the recommendation of previous review reports, emissions estimates are not provided for several uses of fluorinated gases, and the estimates provided for other uses are not complete. The methodologies and assumptions used to estimate emissions from fire extinguishers and electrical equipment are not available in the NIR or in the CRF background data tables. The ERT recommends the Party to make efforts to cover this sub-sector completely, to take into account emissions from imported and installed equipment and to provide more detailed information in the next submission.

IV. Agriculture

A. Sector overview

59. The agriculture sector accounted for 12.9 per cent of total national GHG emissions in 2004. In the sector, GHG emissions decreased by 51.8 per cent between 1989 and 2004, owing to the decline in the animal population and a decrease in the amount of chemical fertilizers applied to soils. The sectoral emissions are complete in terms of the years, gases and sources covered, except for the prescribed

[3] "European Environment Agency. European Pollutant Emission Register <http://eper.eea.europa.eu/eper/>.

burning of savannahs, which does not occur in Romania. The ERT recognizes the improvements in the agriculture sector over previous inventory submissions.

60. The ERT noted that Romania has recalculated emissions from enteric fermentation, manure management and agricultural soils for the entire time series. The total effect of these recalculations in the agriculture sector is a 32.6 per cent increase in estimated emissions for the base year. Recalculations were carried out for all gases and categories, consistent with the IPCC good practice guidance. The AD used in the calculations was provided by the NIR. The EFs used are all default values provided in the Revised 1996 IPCC guidelines. All the time-series recalculations were based either on interpolation or extrapolation of data provided by the NIS for the years 2004 and 2005. The sources of the AD are not properly explained and documented in the NIR, and this has raised transparency questions. The national expert responded satisfactorily to the questions of the ERT during the review. The ERT recommends that Romania improve its documentation of AD and recalculations in its next submission.

61. Tier 1 methods were applied for all categories because of the lack of relevant country data required for more sophisticated methods. Romania used the EFs for developing countries provided in the Revised 1996 IPCC guidelines for calculating CH_4 emissions from enteric fermentation. The national expert has indicated plans to improve the quality of estimates in the agriculture sector in Romania's next submission.

B. Key categories

1. Enteric fermentation – CH_4

62. CH_4 from enteric fermentation is one of the main sources of CH_4 emissions in the agriculture sector. In 2004 it contributed 3.5 per cent of the total GHG emissions in Romania. The 2004 and 2005 data were the only data available and were used to extrapolate the entire time series, and to split the cattle population into dairy cattle, non-dairy cattle and buffaloes.

2. Manure management – CH_4 and N_2O

63. Romania has applied a tier 1 method and the IPCC default values for developing countries. As this is a key category, Romania is encouraged to apply a higher-tier method, assuming the availability of data and resources.

64. The inconsistent split between dairy and non-dairy cattle reported in the base year affects the estimates of emissions under manure management and consequently N_2O emissions on agricultural soils. The ERT requested Romania to revise the animal population data and recalculate the emissions accordingly. The Party followed this recommendation and revised the emission estimates for the entire time series. The total effect on N_2O emissions in 2004 was a decrease of 9.1 per cent for manure management and a decrease of 1.4 per cent for agricultural soils.

65. Romania used IPCC default values for partitioning the animal waste management systems , which is not consistent with the presentations made and discussions held during the review. These indicated that for six months of the year the animals graze on pasture, paddock and range, which are not catered for in the IPCC default values. Discrepancies were not significant but the ERT recommends that Romania further enhance the accuracy of the information on the most important sub-categories in agriculture (dairy cows, other cattle and swine) and on manure management practices in its next submission.

3. Agricultural soils – N_2O

66. Romania uses a tier 1 method with default parameters to estimate emissions from this category. The ERT recognizes an improvement over previous submissions, but encourages Romania to develop country-specific EFs and parameters for this category, assuming the availability of data and resources.

C. Non-key categories

Rice cultivation – CH_4

67. An IPCC tier 1 method was used for this calculation. CH_4 emissions from rice cultivation decreased by almost 98 per cent between the base year and 2004.

V. Land use, land-use change and forestry

A. Sector overview

68. In 2004, the LULUCF sector in Romania was a net sink of 35,768.1 Gg CO_2 eq. The category forest land remaining forest land was responsible for this sink effect. Romania did not report carbon stock changes for other land use or land-use change categories. Biomass burning in wildfires was the only source of emissions reported, and is a very minor contributor (3.4 Gg CO_2 eq in 2004, with extreme values of 1.9 and 98.4 Gg CO_2 eq in 1997 and 2000, respectively).

69. The ERT noted the major improvements achieved by Romania from previous submissions. However, several deficiencies were detected regarding completeness, QA/QC and consistency. The QA/QC plan was not implemented, with the exception of some basic checks as reported in the NIR. Inconsistencies were identified in the time series for land-use areas. The Party is encouraged to continue its efforts to resolve these problems.

70. Romania has reported the inventory categories of LULUCF in accordance with decision 13/CP.9. The ERT noted the efforts made by Romania to improve its reporting of AD on land-use categories, having achieved full coverage of land-use transitions. However, some inconsistencies were identified in the conversion of country-specific land-use categories to the IPCC land-use categories, and the ERT encourages the Party to resolve these inconsistencies for future submissions. Romania has provided a complete set of CRF tables for the LULUCF sector, as required by decision 13/CP.9, covering the entire time series 1989–2004. The data reported in the NIR and the CRF tables do not include estimates for the categories 5B (cropland), 5C (grassland), 5D (wetlands), 5E (settlements), 5F (other land), 5.III (emissions of N_2O from disturbance associated with land-use conversion to cropland) and 5.IV (carbon emissions from agricultural lime application). The activities corresponding to these categories do occur in Romania and their reporting is recommended in future submissions in order to improve the completeness of the inventory.

B. Key categories

Forest land – CO_2

71. The area of forest land in Romania remained relatively constant within a range of 6,457–6,791 kha during the period 1989–2004. However, some inconsistencies were detected in the time series of land areas under forest. The ERT identified outlier values for the area of forest land remaining forest land in the years 1989, 1990, 2000, 2001 and 2004; and for the area of land converted to forest land in the years 1990, 1999, 2001 and 2003. The Party did not provide an explanation for these variations in the NIR. It is recommended that Romania follow the IPCC good practice guidance on the consistent representation of land use. In particular, it is suggested that the Party revise some unlikely figures (e.g. the conversion of 120,000 ha of settlements to forest land in a single year) and that specific

land areas affected by a change in land use remain in the "land converted to" category for the default period of 20 years.

72. The estimation of carbon stock change in forest biomass was based on country-specific I_v (annual increments in commercial wood volume per hectare) values. These values were derived from the latest national forest inventory published in 1985. Values derived from measurements taken at least 20 years before the relevant GHG inventory year may not apply to the entire time series, particularly considering possible changes in the age/class distribution of Romania's forests. The ERT welcomes the information received during the review that Romania plans to implement a new national forest inventory starting in 2008, and recommends that it consider adopting remote sensing and geographic information tools in order to make better use of the information collected.

73. A slight modification of the tier 1 method was developed by the Party for estimation of carbon losses due to harvest and fuel wood collection. The modification consisted of multiplying the mass of carbon contained in the wood removed from the forest by a newly introduced biomass expansion factor (BEF_{roots}) to account for the instant oxidation of below-ground biomass at the time of wood removal. This may cause an overestimation of the losses (or an underestimation of the net CO_2 removals). The values chosen for BEF_{roots} are not consistent with the root-to-shoot ratios used for estimating the biomass increments in the same forests. The ERT noted the efforts made by the Party to develop country-specific factors and methods, and encourages future improvement in the accuracy of the estimates.

C. Non-key categories

1. Cropland and grassland – CO_2

74. No carbon stock changes were reported for cropland and grassland, which extend over a combined area of almost 15 million ha – or two thirds of Romania's territory. According to AD provided in tables 5B and 5C of the CRF, there were changes in land use to cropland and grassland in 2004 and other years (although not in the base year) which, according to IPCC tier 1 methods, would have caused changes in carbon stocks. Given the large extent of the land represented by these two categories, it is likely that carbon stock changes also occur in areas not affected by changes in land use. The ERT recommends Romania to consider attributing cropland and grassland areas to different land-use sub-categories (e.g. perennial crops, annual crops, set-aside land, etc.) and management systems (e.g. unique combinations of different practices), and applying carbon stock factors at a disaggregated level (i.e. for each combination of land-use sub-category and management system) in order to improve the completeness of the inventory for future submissions.

2. Forest fires – CH_4 and N_2O

75. The ERT welcomes the reporting by Romania of this mandatory source for the first time. The Party reported emissions of CO_2, CH_4 and N_2O using the IPCC tier 1 method. Two errors were detected in the application of this method, leading to an overestimation of emissions. Firstly, a 100 per cent combustion efficiency was assumed, while the IPCC default factor is a fraction of that. Secondly, CO_2 emissions were erroneously calculated, since these only apply to cases where the forest fires imply a change in land use. In spite of the fact that this is a relatively minor source, the ERT encourages Romania to apply the IPCC method correctly in its future submissions.

VI. Waste

A. Sector overview

76. In 2004, GHG emissions from the waste sector amounted to 7,398.51 Gg CO_2 eq, representing 4.7 per cent of the total GHG emissions of Romania. Solid waste disposal on land, wastewater handling and waste incineration shared 58.9 per cent, 40.0 per cent and 1.1 per cent, respectively, of total emissions from the waste sector. CH_4 accounted for 90.1 per cent of emissions from the sector, CO_2 for 1.1 per cent and N_2O for 8.8 per cent. GHG emissions from the sector increased by 25.9 per cent between 1989 and 2004. This increase is ascribed to the steep increase in CH_4 emissions from solid waste disposal on land – CH_4 emissions increased by 66.5 per cent in the time series. However, the GHG emissions from wastewater handling and waste incineration have decreased.

B. Key categories

1. Solid waste disposal on land – CH_4

77. Romania has applied the IPCC tier 1 methodology to estimate CH_4 emissions from solid waste disposal on land. Estimates of CH_4 emissions displayed inconsistency over the period 1989 to 2004 as a result of the Party applying three different estimation methods for AD to three corresponding periods: 1989–1994, 1995–1997 and 1998–2004. No information was available on the industrial waste that has been landfilled. The ERT recommends Romania to adopt the tier 2 methodology to improve the quality of emissions data. It also encourages the Party to extrapolate AD on the two early periods from those on the third period (1998–2004) which were obtained from on-site measurements, and to derive information on the degradable organic compound and landfilled amounts of industrial waste in order to enhance the accuracy of CH_4 emission from solid waste disposal on land.

2. Wastewater handling – CH_4

78. Romania has used methodologies in accordance with the IPCC good practice guidance. Default values were mostly adopted from the Revised 1996 IPCC Guidelines, except for the methane conversion factor (MCF). The abnormally high MCF value of 0.46 used by Romania may overestimate the CH_4 emissions from this sub-sector. On the other hand, CH_4 emissions from domestic and commercial wastewater were underestimated because of the use of lower CH_4 EFs. The ERT encourages Romania to refer to the default values in the IPCC good practice guidance rather than those in the Revised 1996 IPCC Guidelines in those cases where different default values are provided for the same parameter. The ERT recommends Romania to provide an explanation for the abnormally high MCF value and to correct the CH_4 EF for domestic and commercial wastewater handling.

C. Non-key categories

1. Wastewater handling – N_2O

79. The IPCC default methodology has been used to estimate N_2O emissions from human sewage. Romania used the value of 104 g/person/day for the per capita protein consumption over the entire time series. However, the United Nations Food and Agriculture Organization Statistical Database (FAOSTAT) gives 91 g/person/day for the Romanian per capita protein consumption value for the period 1989 to 1991 and 109 g/person/day for 2001 to 2003. Thus, the per capita protein consumption value used by Romania overestimates the N_2O emissions from human sewage in the base year and underestimates the N_2O emissions in 2004. The ERT encourages Romania to use the per capita protein consumption value in FAOSTAT to estimate N_2O emissions from human sewage.

2. Waste incineration – CO_2

80. The IPCC methodology was applied to assess the CO_2 emissions from hazardous and clinical waste incineration along with the default values in the IPCC good practice guidance. Estimates of CO_2 emissions from waste incineration exhibited high uncertainties originating from incorrect assumptions and a lack of AD during the period 1989 to 1994. The ERT recommends Romania to focus on improving the reliability of emissions data by developing proper methods for estimating the incinerated quantities and by applying QA/QC procedures.

VII. Conclusions and recommendations

81. Romania has provided its GHG inventory data for the base year 1989 and the years 1990–2004, and has included the tables required with data on all relevant gases and categories. Romania's GHG inventory is in general accurate, as defined in the UNFCCC reporting guidelines, and is consistent with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. During the in-country review the ERT identified a number of categories where methods or EFs used were not fully in accordance with the IPCC good practice guidance. The ERT recommended that Romania revise its estimates for these categories, which Romania did after the in-country review.

82. In the course of the review, the ERT formulated a number of recommendations relating to the completeness, consistency and transparency of the information provided by Romania. Most of the recommendations were implemented during the review process, including those relating to the national system. The key recommendations[4] are that Romania:

(a) Further elaborate the existing QA/QC plan in line with the requirements of the IPCC good practice guidance, including extensive tier 2 checking procedures for key categories, a procedure for external review and QA/QC procedures for activities related to Article 3, paragraphs 3 and 4, of the Kyoto Protocol, and additionally develop guidelines for prioritizing inventory improvements;

(b) Complete the GHG inventory as far as practicable in its next submission by reducing the number of missing estimates, particularly in the energy and LULUCF sectors;

(c) Provide a more detailed description of the approaches taken and the underlying assumptions used to select EFs and AD;

(d) Improve the consistency of its reporting by cross-checking the information provided by the national statistical office with alternative data sources;

(e) Develop a detailed inventory manual for inventory planning and management, reflecting national circumstances;

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

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

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

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/>.

IPCC. Good practice guidance for land use, land-use change and forestry, 2003. Available at: <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

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UNFCCC. 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/2004/8. Available at: <http://unfccc.int/resource/docs/2004/sbsta/08.pdf>.

UNFCCC. 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>.

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

UNFCCC secretariat. Synthesis and assessment report on the greenhouse gas inventories submitted in 2005. FCCC/WEB/SAI/2006. Available at: <http://unfccc.int/resource/docs/webdocs/sai/sa_2006.pdf>.

UNFCCC secretariat. Romania: Report of the individual review of the greenhouse gas inventory submitted in the year 2005. FCCC/WEB/ARR/2005/ROU. Available at: <http://unfccc.int/resource/docs/2006/arr/rom.pdf>.

B. Additional information provided by the Party

Decision on establishing a national system for the assessment of anthropogenic greenhouse gas emissions under the Kyoto Protocol (based on Article 108 of the Romanian Constitution).

Responses/information by the Party following the list of potential problems formulated by the expert review team in the course of the in-country review of Romania's initial report under the Kyoto Protocol and its 2006 inventory submission.

Uncertainty analyses 1989–2004, calculation sheets.

Explanatory note on coke consumption and recalculation sheets.

Ministerial note on the share of international navigation.

Revised Common Reporting Format tables 1989–2004.

Protein consumption data – FAOSTAT table D1.

Romanian National Energy Balance, 1989 (extracts, paper copy).

Romanian Statistical Yearbook, 1989–2004 (extracts, paper copy).
Responses to questions during the review were received from Mr. Vlad Trusca (Ministry of the Environment and Sustainable Development) and Mr. Sorin Decanou (Romanian National Environmental Protection Agency) including additional material on the methodology and assumptions used.

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