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ROMANIA

REPORT OF THE INDIVIDUAL REVIEW OF THE GREENHOUSE GAS INVENTORY SUBMITTED IN 2003[1]

(In-country review)

EXECUTIVE SUMMARY

1. This report describes the findings of the technical review of the 2003 inventory submission of Romania, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat in accordance with decision 19/CP.8 of the Conference of the Parties. The submission contained a national inventory report and common reporting format tables for 2001.

2. The review took place from 29 September to 3 October 2003 in Bucharest, Romania, and was conducted by the following team of nominated experts from the roster of experts: Generalist – Mr. William Irving (USA), Energy – Mr. Ignacio Sanchez Garcia (Spain), Industrial Processes – Mr. Marius Țăranu (Republic of Moldova), Agriculture – Ms. Anna Romanovskaya (Russian Federation), Land-use Change and Forestry – Mr. Aquiles Neuenschwander (Chile), Waste – Ms. Sirintornthep Towprayoon (Thailand). Mr. Irving and Ms. Towprayoon were the lead reviewers of this review. Ms. Damijana Marolt (Slovenia) participated in the review as an observer. The review was coordinated by Ms. Sevadalina Todorova-Brankova (UNFCCC secretariat).

3. In accordance with the UNFCCC "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, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

4. In the year 2001, the most important greenhouse gas in Romania was carbon dioxide (CO_2), contributing 75.9 per cent to total[2] national greenhouse gas emissions expressed in CO_2 equivalent, followed by methane (CH_4) – 19.3 per cent – and nitrous oxide (N_2O) – 4.4 per cent. Perfluorocarbons (PFCs) contributed less than 1 per cent of the overall greenhouse gas emissions in the country. There were no estimates for hydrofluorocarbons (HFCs) or sulphur hexafluoride (SF_6). The Energy sector accounted for 79.1 per cent of the total greenhouse gas emissions, followed by Agriculture with 8.1 per cent, Waste with 6.5 per cent and Industrial Processes with 6.3 per cent.

5. Total greenhouse gas emissions (excluding Land-use Change and Forestry) amounted to 148,202 Gg CO_2 equivalent in 2001 and decreased by 43.9 per cent from 1989[3] (the base year) to 2001.

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[1] In the symbol for this document, 2001 refers to the year in which the inventory was submitted, and not to the year of publication. The number (2) indicates that this is an in-country review report.

[2] In this report, the term total emissions refers to the aggregated national GHG emissions expressed in terms of CO2 equivalent excluding Land-use Change and Forestry, unless otherwise specified.

[3] According to the provisions of Article 4.6 of the Convention and decisions 9/CP.2 and 11/CP.4, Romania, as an Annex I Party undergoing the process of transition to a market economy is allowed to use the year 1989 as its base year.

Tables 1 and 2 provide data on emissions by gas and by sector from 1989 to 2001. Over the period 1989–2001, CO_2 emissions decreased by 42.3 per cent, mainly because of decreased emissions from stationary combustion of fossil fuels. CH_4 emissions decreased during the same period by 41.7 per cent, mainly from fugitive emissions; N_2O emissions decreased by 68.3 per cent over the same period because of lower emissions from agricultural soils. Emissions from PFCs increased by 52.2 per cent from 1992 (first reported year).

6. In 2003, Romania submitted its second annual inventory to the UNFCCC. The inventory includes a national inventory report – first submitted on 26 May 2003 and resubmitted with revisions on 18 July 2003 – and common reporting format tables for the year 2001 – submitted on 14 May 2003 and resubmitted on 16 June 2003.

7. The Romanian Ministry of Agriculture, Forests, Waters and Environment (MAFWE) has overall responsibility for the national inventory. The national inventory report and the common reporting format are prepared by the National Research and Development Institute for Environmental Protection (ICIM) under temporary contracts for each inventory. A small team of two full-time experts at ICIM with responsibilities across all the Intergovernmental Panel on Climate Change (IPCC) sectors prepared the two latest submissions.

8. The national inventory report covers all sectors and the majority of the IPCC source categories, and, in most cases, includes estimates for the complete time series from the 1989 base year until 2001. The common reporting format tables are also largely complete when considered in conjunction with the tables for 1992–2000 submitted in December 2002.

9. Source-specific gaps in the inventory include: emissions of SF_6 and HFCs, CO_2 emissions and removals from agricultural soils, a separate estimate of emissions from iron and steel production for 2001, a separate estimate of international bunker fuels. Emissions of PFCs are provided only for aluminium production, and only for the years 1992–2001. In most cases, the Romanian team concluded that data were not available to generate estimates for these sources. The expert review team makes specific recommendations on ways to fill these gaps in the sector-specific sections of this report.

10. Romania conducted a tier 1 IPCC key source analysis, which identified 12 priority sources (six of them in the Energy sector). Romania used tier 1 IPCC methodologies to estimate emissions for all key source and non-key source categories. Although the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) recommends the use of higher-tier methods for key source categories, as an economy in transition (EIT) Party to the UNFCCC, Romania[4] has an additional two years to implement these recommendations.

11. Romania did not provide quantitative uncertainty estimates but did for the first time complete common reporting format table 7 on qualitative uncertainty. The inventory team has established a basic centralized system for archiving references and worksheets. There is no formal quality assurance/quality control plan in place, but the national experts expressed an interest in establishing a quality assurance/quality control system.

12. Since the September 2003 in-country review was the first annual inventory review, there are no previous review results to provide a comparison and track improvement. Romania has also not provided any recalculations for previously reported years.

13. The expert review team identified four priority areas for improvement in order for the Romanian inventory to conform fully to the UNFCCC reporting guidelines: transparency, times-series consistency,

[4] According to the relevant conclusions of the Subsidiary Body for Scientific and Technological Advice (SBSTA), Annex I Parties with economies in transition may phase in the good practice guidance two years later than other Annex I Parties (see FCCC/SBSTA/2000/5, para. 48 (c)).

quality assurance/quality control and institutional arrangements. These areas are interrelated in that improvements in one area will help Romania make improvements in another (e.g., the quality assurance/quality controlwill help with time-series consistency). Specific examples in these areas are provided in the sector-specific sections of the report, along with recommendations for improvement. A general discussion is provided below:

(a) *Transparency:* The national inventory report does not provide detailed descriptions of methodologies, assumptions, activity data or emission factors for individual source categories. It was necessary for the expert review team to review the IPCC worksheets and data sources alongside the Romanian inventory experts to determine how emissions were estimated. The expert review team recommends that Romanian experts review national inventory reports from other Annex I Parties and consult the new UNFCCC inventory reporting guidelines for guidance on the type of information that should be presented in the national inventory report.

(b) *Time-series consistency:* A major inconsistency in the 1989–2001 time series is due to the fact that emission estimates for 1989–1991 have not been recalculated since the 1994 inventory. These estimates were prepared according to a previous version of the IPCC Guidelines, while subsequent estimates were prepared according to the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC Guidelines). The ERT believes that it is a high priority for Romania to calculate a complete time series for all source categories from 1989 to the most recent year. Estimates for each year should be calculated using the same methods and data sources. The recommendations in chapter 7 of the IPCC good practice guidance are designed to assist countries in recalculating time series and the Romanian inventory team is encouraged to use them.

(c) *Basic quality assurance/quality control:* The expert review team identified incorrect entries in the common reporting format tables which in some cases lead to misreporting of emissions and background data. The expert review team and the Romanian inventory team concluded that some of these errors were due to technical problems in exporting data from IPCC software to the common reporting format tables. Some basic quality assurance/quality control procedures, data checks and manual input can minimize these errors.

(d) *Institutional arrangements:* The expert review team believes that a foundation for a strong national inventory system exists in Romania. The realization of this potential depends in part on additional institutional support and on implementation of the recommendations listed in this report. The main recommendations include: the establishment of a permanent national inventory team; and encouragement of experts with knowledge of different sectors to contribute advice, data and review comments to the national inventory team (e.g., energy experts from the National Institute of Statistics and forestry experts from the Forest Research and Development Institute). In addition, Romania is encouraged to facilitate the participation of the inventory experts in IPCC inventory meetings, UNFCCC review training, and UNFCCC reviews to the extent possible. The inventory team finds it difficult to meet the 15 April submission deadline because the Energy Balance is published at the beginning of the year and the Statistical Yearbook is published in March. Romania should consider options for obtaining provisional data earlier to allow timely completion of the inventory.

14. Romania's 2003 inventory submission is a significant accomplishment, particularly in the light of the limited resources, experience and staff available for the task. Consequently, the view of the expert review team is that the national inventory report provides a good basis for future improvement and elaboration.

Table 1. Greenhouse gas emissions by gas 1989–2001

GREENHOUSE GAS EMISSIONS	Gg CO_2 equivalent													Change 1988–2001 %
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	
CO_2 (including LUCF)	191 901	166 864	129 070	146 045	136 941	135 767	153 858	150 495	147 636	127 980	106 457	103 976	103 427	–46.1
CO_2 (excluding LUCF)	194 826	172 510	135 660	153 875	145 798	144 894	161 892	158 301	155 349	138 049	115 403	112 150	112 459	–42.3
CH_4	48 966	41 031	36 059	44 950	43 008	39 310	42 205	41 246	38 330	35 113	33 923	34 735	28 565	–41.7
N_2O	20 489	14 969	7 558	8 187	8 269	6 074	8 077	7 234	7 189	5 596	5 435	8 193	6 501	–68.3
HFCs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PFCs	0	0	0	445	435	452	532	536	607	652	648	671	678	NA
SF_6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (including LUCF)[a]	261 355	222 864	172 687	199 628	188 654	181 602	204 672	199 510	193 762	169 341	146 463	147 576	139 171	–46.8
Total (excluding LUCF)	264 280	228 510	179 277	207 458	197 511	190 729	212 706	207 316	201 475	179 410	155 410	155 750	148 202	–43.9

[a] LUCF = Land-use Change and Forestry

Table 2. Greenhouse gas emissions by sector 1989–2001

SOURCE/SINK CATEGORY	Gg CO_2 equivalent													Change 1988–2001 %
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	
Energy	220 900	194 103	154 777	161 784	153 742	149 593	168 234	164 294	159 626	141 462	118 728	115 156	117 104	–47.0
Industrial Processes	17 150	11 378	7 348	13 758	13 411	13 557	13 965	14 319	12 665	10 582	9 886	11 145	9 359	–45.4
Solvent & Other Product Use	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	21 170	18 197	12 344	16 890	15 249	12 479	14 988	13 691	13 890	12 808	12 137	14 348	12 060	–43.0
LUCF[a]	–2 925	–5 646	–6 590	–7 815	–8 844	–9 120	–8 028	–7 799	–7 708	–10 064	–8 939	–8 166	–9 023	208.4
Waste	5 060	4 832	4 809	15 012	15 096	15 093	15 513	15 004	15 288	14 552	14 651	15 092	9 670	91.1
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (including LUCF)	220 900	194 103	154 777	161 784	153 742	149 593	168 234	164 294	159 626	141 462	118 728	115 156	117 104	–47.0

[a] LUCF = Land-use Change and Forestry

I. OVERVIEW

A. Inventory submission and other sources of information

15. Romania submitted a national inventory report (NIR) on 26 May 2003 and a revised version on 18 July 2003. In its 2003 submission, Romania submitted common reporting format (CRF) tables for the year 2001. The CRF was submitted on 14 May 2003 and resubmitted on 16 June 2003. The expert review team (ERT) focused its work on the revised versions of the documents for the year 2001. Where needed the ERT also used previous years' submissions, including the CRF tables for the years 1992–2000 from the 2002 submission.

16. During the review Romania provided the ERT with additional information sources. These documents are not part of the inventory submission but are in many cases referenced in the NIR (e.g., the Romanian *Statistical Yearbook*). The full list of materials used during the review is provided in annex 1 to this report.

B. Key sources

17. Romania reported a tier 1 key source analysis, level assessment as part of its 2003 submission. The key source analysis performed by the secretariat[5] produced slightly different results. Romania used CRF summary 2 categories, whereas the secretariat used the Intergovernmental Panel on Climate Change (IPCC) good practice source categories. The main difference is with stationary combustion, which the secretariat analysed by fuel type (e.g. coal, gas, oil) and Romania analysed by sector (e.g. energy industries, manufacturing industries and construction). The secretariat's key source analysis is more disaggregated for the Industrial Processes sector and subsequently identifies ammonia production and lime production as key sources, while Romania identified the entire source category 2.b Chemical Production as a key source. With a small number of exceptions, however, the two key source analyses covered the same emission sources once the level of analysis is taken into consideration. The only source identified by the secretariat but not by Romania was CH_4 from manure management.

18. Romania has not begun to use source-specific IPCC good practice recommendations and therefore does not use the key source analysis to prioritize the development of the inventory. The Romanian inventory team indicated that it will begin to use the analysis as a tool for prioritizing improvements next year, and also that it plans to focus on key sources first when performing recalculations and assessments of time-series consistency.

C. Cross-cutting topics

Completeness

19. Romania submitted an NIR that covered all sectors and the majority of the IPCC source categories, and, in most cases, included estimates for the complete time series from the 1989 base year until 2001. Emissions are presented by sector, by subsector and by gas in both tabular and chart format. There are descriptions of the institutional arrangements for the preparation of the inventory, and a separate annex on the key source analysis. The NIR also provides brief trend analyses for each IPCC sector (e.g., Energy) and subsector (e.g., combustion and fugitives), but does not go down to the source category level. For cross-cutting topics, the Romanian NIR provides a general description of methodological choice,

[5] The secretariat had identified, for each individual Party, those source categories which are key sources in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance. Key sources according to the tier 1 trend assessment were also identified for those Parties providing a full CRF for the year 1990. Where the Party has performed a key source analysis, the key sources presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key source assessment conducted by the secretariat.

qualitative uncertainty assessment and recalculations, but does not address these topics at the source category level.

20. Source-specific gaps in the inventory include: all actual and potential emissions of sulphur hexafluoride (SF_6) and hydrofluorocarbons (HFCs), carbon dioxide (CO_2) emissions and removals from agricultural soils, a separate estimate of emissions from iron and steel production for 2001, and a separate estimate of international bunker fuels. Emissions of perfluorocarbons (PFCs) are provided only for aluminium production, and only for the years 1992–2001. Emissions of nitrous oxide (N_2O) from manure management and of CO_2 from commercial harvest of forests are provided only for 1992–2001.

21. In 2003 Romania submitted CRF tables for the year 2001. CRF tables for 1992–2000 were submitted in 2002. Romania has not yet submitted CRF tables for 1989–1991. For the 2003 submission, all CRF tables were completed except the recalculation tables.

Transparency

22. Romania's NIR is a significant accomplishment, particularly in the light of the limited resources, experience and staff it has available for the task. Consequently, the NIR provides a good basis for future improvement and elaboration.

23. The methodological tier for all methods is identified as IPCC tier 1. Apart from this, the NIR does not provide further description of methodologies, assumptions, activity data (AD) and emission factors (EFs) for individual source categories. In all these cases, the ERT was unable to determine how estimates were calculated solely on the basis of the information in the NIR. For example, the NIR does not describe how Romania accounted for feedstocks and emissions from iron and steel production.

24. The ERT reviewed data in the IPCC worksheets alongside the Romanian inventory experts and crosschecked the worksheets with the *Statistical Yearbook* in order to determine how emissions were estimated. On the basis of this review technique, it was possible for the ERT to determine the methods, data and assumptions used. The ERT concluded that improving the transparency of the NIR should be a high priority for Romania.

25. In preparing the CRF tables, Romania has made extensive use of the notation key "IE" (included elsewhere). Although table 9 of the CRF was filled in, the ERT was not always able to determine where these emissions were included without asking further questions to the Romanian experts. Within the completed CRF tables for 1992–2000 and 2001 there is a lack of disaggregation in many cases and inconsistent use of notation keys, although the situation has improved for the 2003 submission. Romania should make better use of the available documentation boxes to document any explanations, assumptions, omissions or other information necessary for reviewers to understand the data in the CRF tables.

Recalculations and time-series consistency

26. The ERT noted that the time series 1992–2000 from the December 2002 submission was not recalculated for the May 2003 submission. In most cases the methodologies and data sources are the same and it is possible to consider the 1992–2001 combined time series (using the last two submissions) to be consistent. There are some notable exceptions, however, such as CO_2 emissions from iron and steel production, the sectoral breakdown of CO_2 emissions between energy industries and manufacturing, and CH_4 emissions from landfills, in which there are abrupt changes in emissions from 2000 to 2001 that cannot be explained by AD trends. The ERT worked closely with the Romanian inventory team to identify problems and propose solutions to these time-series inconsistencies. These results are discussed in more detail in the sectoral sections of the report.

27. A major inconsistency in the 1989–2001 time series is due to the fact that emission estimates for 1989–1991 have not been recalculated since the 1994 inventory. These estimates were prepared according to the previous version of the IPCC Guidelines, while subsequent estimates were prepared according to the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the

IPCC Guidelines). The current inventory team at the National Research and Development Institute for Environmental Protection (ICIM) does not have access to sufficient documentation of the methodologies and data used for the 1989–1991 estimates to allow for a detailed assessment of specific inconsistencies. In the view of the ERT, it should be a high priority for Romania to recalculate the entire time series for 1989–2002 for the inventory submission due in 2004, using consistent methods and data. This is particularly important for CO_2 emissions from fossil fuel combustion, which account for the bulk of the emissions in the country.

28. As a general recommendation, Romania will benefit from following the procedures outlined in chapter 7 of the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) as a guide for recalculating estimates and ensuring time-series consistency. In cases where it is difficult to obtain AD for 1989–1991, Romania may be able to use the procedures for splicing methods, extrapolation and interpolation.

29. In some cases apparent discontinuities in the time series may be the result of actual changes in economic activities, and do not indicate time-series inconsistency. For example, in discussions with the Romanian review team, the ERT learned that an increase in emissions in 1995 was the result of a growth in fuel consumption and output. A detailed explanation for this type of change should be clearly documented in the NIR.

30. The overall time series for Romania is typical of an economy in transition (EIT) country. There has been a significant decline in overall emissions after 1989 (the base year) followed by a levelling off in more recent years. This is particularly true in the Energy sector. While here it is very important for Romania to recalculate the whole time series 1989–2002 for the inventory due in 2004 so that it is consistent, it is reasonable to expect that the general trend in emissions will not change significantly.

Uncertainties

31. Romania provided qualitative uncertainty estimates for the first time in the CRF table 7. All sources are assessed as being of either high or medium quality. For example, Romania ascribed high quality to the CO_2, CH_4 and N_2O estimates in all energy source categories except for transport, where the estimates are considered to be of medium quality. Some of the assessments are likely to be optimistic given the "low" ratings assigned by other Parties to inherently uncertain sources such as N_2O from agricultural soils. The CRF tables for 1992–2000 do not contain uncertainty assessments in table 7.

32. Romania has not estimated quantitative uncertainty as described in the IPCC good practice guidance, but did indicate that, because only tier 1 methods are used, the uncertainty estimates are the same as those discussed in the IPCC Guidelines. The ERT recommends that Romania include a qualitative discussion of the sources of uncertainty for the estimate of each source category in the NIR, and consider using the default quantitative uncertainty estimates provided in the IPCC good practice guidance.

Verification and quality assurance/quality control approaches

33. Romania does not have a formal quality assurance/quality control (QA/QC) plan in place, but the national experts expressed an interest in establishing a QA/QC system. An obstacle to establishing such a system is the short time period between the availability of national statistics (December) and the due date for the inventory (15 April). The Ministry of Agriculture, Forests, Waters and Environment (MAFWE) conducts some basic checking of the inventory before submitting it to the UNFCCC secretariat.

34. During the review, the Romanian inventory team and the ERT identified a number of cases in which the IPCC software incorrectly exported data from the IPCC worksheets to the CRF Excel tables. This problem was the source of a number of data errors in the CRF. Since it may take some time to amend the software, the Romanian inventory team should enter data into the CRF tables manually in these cases and check the CRF data for errors in all cases.

Institutional arrangements

35. The MAFWE has overall responsibility for the national inventory. The NIR and CRF are prepared by ICIM, under temporary contracts for each inventory. The MAFWE hopes to have a permanent contract with ICIM so that the inventory can be prepared and submitted annually, as required under the Convention. A small team of two full-time experts at ICIM with responsibilities across all IPCC sectors prepared the last two submissions.

36. A protocol is in place between the MAFWE and the National Institute of Statistics (NIS) – the organization that publishes the official Romanian *Statistical Yearbook* each year. Under this protocol, the NIS provides additional data in written form if the necessary data are not already published in the *Statistical Yearbook*. The *Statistical Yearbook* is not updated until March two years after. Because it is the main source of national AD, it is difficult for ICIM to meet the inventory submission deadline of 15 April. AD may be available from the NIS before December, but they are not considered to be official.

37. The ERT requested interviews with experts from the Forest Research and Development Institute (ICAS) and the NIS, and experts in waste management from ICIM, who provided useful sectoral information and pointed out available data sources and other background data. While these experts were not involved in the preparation of the 2003 inventory submission, the ERT concluded that their sectoral expertise and knowledge of AD would be very helpful for the improvement of the Romanian inventory. The ERT encourages Romania to take advantage of this expertise.

38. In the view of the ERT, the institutional arrangements for preparing the annual Romanian greenhouse gas (GHG) inventory should be strengthened. The small inventory staff at ICIM and the UNFCCC focal point at the MAFWE are very knowledgeable and have done a commendable job despite limited inventory training, minimal input from experts outside ICIM, a lack of continuity with previous inventory teams, and scarce financial and human resources. The ERT believes that a foundation for a strong national inventory system exists at the MAFWE and ICIM but the realization of this potential depends in part on additional institutional support, as well as the implementation of the recommendations listed in this section and the specific recommendations in the review report section on areas for further improvement.

Record keeping and archiving

39. Romania has a basic centralized system for archiving references and worksheets. The archive is kept at ICIM, and includes historical copies of the *Statistical Yearbook*, previous inventories, IPCC worksheets, CRF tables and other inventory-related information. The ERT was able to see all archived information upon request. Unfortunately, not all records from the first inventory in 1994 were kept because the staff members involved in that project have left the Institute.

Follow-up to previous reviews

40. As this was the first inventory review for Romania, there were no previous review reports to consult. The review team had access to copies of the review report of the Second National Communication (2000), which contained a general overview of the completeness of the inventory chapter and a general assessment of methodologies and data. However, the ERT did not follow up on specific questions raised in the Second National Communication review because of the discontinuity in the preparations for the inventory in Romania since that report. The ICIM inventory team expressed an eagerness to learn from this in-country review and the ERT expects that they will attempt to address many of the issues raised in this report.

41. Romania provided written responses to most of the source-specific issues raised in the previous stages of the 2003 review for Romania, and the remainder were discussed during the in-country visit.

D. Areas for further improvement

Identified by the Party

42. In its response to the issues raised during the review, Romania indicated that it is working to develop country-specific EFs, recalculate emissions for 1989–1991, and provide more secure funding to the inventory team. Romania also plans to make many of the improvements and corrections identified by the ERT during the discussions.

Identified by the ERT

43. The ERT identified the following high priority cross-cutting issues for improvement:

(a) *Recalculation and time-series consistency*: As noted above, the ERT believes that it is a high priority for Romania to calculate a complete time series for all source categories from 1989 to the most recent year. Estimates for each year should be calculated using the same methods and data sources. The recommendations in chapter 7 of the IPCC good practice guidance are designed to assist countries in recalculating time series and the team is encouraged to use them.

(b) *Documentation and transparency*: The NIR should contain detailed explanations of methods, AD, EFs, assumptions, references and sources of uncertainty related to each source category. The ERT recommends that Romanian experts review NIRs from other Annex I Parties that are available on the UNFCCC web site for examples of documentation and transparency. In addition, the revised UNFCCC inventory reporting guidelines[6] provide a more detailed table of contents and a description of the type of information that should be presented in the NIR.

(c) *Basic QA/QC and error checking*: Some problems identified by the ERT resulted from problems in exporting data from IPCC worksheets to the CRF tables, incorrect units, and other errors. Some basic QA/QC procedures, error checking and manual input can minimize these errors.[7]

(d) *Participation of other ministries and institutes*: A comprehensive national inventory system requires the full-time participation of inventory coordinators and the part-time participation of experts with knowledge of specific sectors and sources. The Romanian government should ensure that experts from different sectors are encouraged to contribute advice and data to the national inventory team, and also participate as reviewers of draft estimates. This is particularly important for energy, industrial production and agricultural experts from the NIS, forestry experts from the ICAS, experts on the Montreal Protocol and waste management from the MAFWE and ICIM, and the local environmental protection agencies.

(e) *Resources and institutional support*: The Romanian inventory will improve if additional resources and institutional support are provided to the review team. This is particularly important for achieving the long-term sustainability of the national system.

(f) *Training and international contacts*: There is an active network of international GHG inventory experts who attend IPCC, UNFCCC and other specialized meetings. The ERT encourages the participation of the Romanian inventory team in UNFCCC reviews, review training and IPCC inventory meetings, because it would provide important opportunities to enhance the skills and expertise of Romanian experts.

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[6] "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC Reporting guidelines on annual inventories" adopted with decision 18/CP.8.

[7] This is not a specific recommendation for the immediate formal adoption of a comprehensive QA/QC system as outlined in the IPCC good practice guidance but rather a pragmatic and intermediate step in the longer-term development of a QA/QC system. The paragraph below makes a recommendation for a longer-term phasing in of a comprehensive QA/QC system.

(g) *Selection of more appropriate default EFs*: The Romanian inventory team typically used the average of IPCC default EFs for source categories, but the average might not be the most appropriate value. Working with sectoral experts, Romania can improve the inventory by taking into account national circumstances when selecting from a range.

44. The ERT identified the following longer-term cross-cutting areas for improvement:

(a) *Implementation of higher-tier methods and source-specific IPCC good practice guidance*: As an EIT country, Romania has two additional years to phase in the implementation of the IPCC good practice guidance. The Romanian inventory team should take note of the source category decision trees and assess the feasibility of implementing higher-tier methods in the future. It is also useful to consider collecting available data now so that the time series can be recalculated to the extent possible when new methods are introduced.

(b) *Country-specific EFs*: The development of country-specific EFs can be expensive and time-consuming. The ERT recommends that Romania prioritize the EFs and take advantage of existing data sources such as the IPCC EF database and any relevant regional projects (e.g., the United Nations Development Programme (UNDP) regional projects for Eastern Europe and Central Asia).

(c) *Setting up of a QA/QC management system*: As part of longer-term planning, the Romanian inventory team should review the guidance on QA/QC in the IPCC good practice guidance and plan for the development of a national QA/QC system over the next few years.

(d) *Quantitative uncertainty assessments*: Under the revised UNFCCC reporting guidelines, Annex I Parties should report quantitative uncertainty estimates for each source category. The IPCC good practice guidance provides default values for each source category which Romania can use for reporting. Given Romania's limited resources, the ERT does not consider tier 2 Monte Carlo uncertainty estimates to be an immediate high priority for Romania.

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

II. ENERGY

A. Sector overview

46. Fuel combustion and fugitive emissions accounted for 117,104 Gg CO_2 equivalent in 2001, representing 79 per cent of total national GHG emissions. Within the sector, 53.3 per cent of the emissions correspond to 1.A.1 Energy Industries, 20.3 per cent to 1.A.2 Manufacturing Industries and Construction, 10.0 per cent to 1.A.3 Transport, 6.8 per cent to 1.A.4 Other Sectors, and 9.6 per cent to 1.B Fugitive Emissions. Because of the large share of overall emissions from the Energy sector, most of the key sources are within the sector: CO_2 emissions from stationary combustion of coal, oil, gas and other fuels; CO_2 emissions from mobile combustion – road transport; CH_4 emissions from oil and gas operations; and CH_4 emissions from coal mining and handling.

47. In the year 2001, the largest share of combusted fuels was accounted for by gaseous fuels, with 39.8 per cent, followed by 28.5 per cent for solid fuels, 22.6 per cent for liquid fuels, 5.8 per cent for biomass and 3.2 per cent for other fuels. No trend analysis is included here since the ERT concluded that there is a great need for recalculation of the Energy sector estimates for the entire time series.

Completeness

48. The CRF tables include estimates of CO_2, CH_4 and N_2O emissions from the Energy sector, as recommended by the UNFCCC reporting guidelines. Emission estimates of indirect GHGs and sulphur dioxide (SO_2) are also reported. However, the ERT could not fully assess whether all emission sources are appropriately addressed. For the year 2001, Romania does not include emissions from other fuels or

brown coal because of a lack of information about their nature and properties. Both fuels are listed in the national energy balance and should be considered in the next inventory. The ERT encouraged Romania to enhance coordination with the NIS, the agency in charge of preparing the national energy balance, in order to obtain further information on the Other Fuels category and make a decision on how to include it in the inventory. Brown coal, although it represents a small amount in terms of total solid fuel consumption (less than 2 per cent), should be included in future calculations of fuel combustion emissions.

49. The ERT noted that, according to the Romanian National Plan for Waste Management, 1.3 per cent of the total amount of waste generated in 2000 was burned to produce energy. Romania has not reported emissions from waste combustion for energy purposes, but should do so if data are available. The ERT does not expect that these emissions will be significant.

50. The inventory does not provide any estimates for military use of fuel.

Transparency

51. The Energy sector information included in the NIR was limited to a general overview of the sector and a trend analysis. During the review, ICIM provided the ERT with the national energy balance and the national *Statistical Yearbook* for the years 1992–2001. In addition, ICIM staff explained how the fuel categories and sectors in the national energy balance are matched with the fuels and sectors in the IPCC worksheets. All this information was essential in understanding the process for obtaining the emissions estimates.

52. The ERT recommended that the Romanian team include the explanations provided during the in-country review in the next NIR, as well as basic AD from the national *Statistical Yearbook*. The ERT also suggested incorporating the national energy balance as an annex to the NIR.

Methodologies, EFs and AD

53. Romania applied IPCC tier 1 methodologies for both fuel combustion and fugitive emissions. IPCC default EFs were used and, in most of the cases, the intermediate values were chosen whenever the IPCC guidelines provide a range of possible factors.

54. For fuel combustion, the national energy balance is the only source of AD. The energy balance is fairly complete; however, further disaggregation of fuel categories would facilitate full compliance with the IPCC guidelines. In addition, the national energy balance is only available to the inventory team after a time lag of more than one year, making it difficult to comply with the 15 April UNFCCC reporting deadline. The Romanian inventory team does not have access to preliminary energy data, which could be used to speed up preparation of the inventory.

55. For fugitive emissions, Romania uses fuel production AD compiled in the *Statistical Yearbook*.

Recalculations and time-series consistency

56. The ERT detected abrupt changes in fuel consumption and implied emission factors (IEFs) during the period 1992–2001. In some cases, the time-series irregularities were attributed to data entry errors. In addition, there were variations in both the interpretation of the national energy balance and the transfer of fuel consumption data from the energy balance to the IPCC worksheets. The Romanian inventory team recognized the need to recalculate the whole emission time series.

57. Romania did not submit CRF tables for 1989–1991 (see section I, Overview). For those years, the inventory team does not have access to the national energy balances. Energy experts from the Romanian NIS informed the ERT that fuel consumption data do exist for 1989–1991, although methodologies applied at that time were different. Methodological changes would mainly affect sector definitions and thus would make it difficult to ensure consistent allocation of fuels to end-use sectors over time. If different methodologies and/or assumptions are to be applied when Romania calculates emission estimates for

1989–1991, the ERT recommended Romania to follow directions from the IPCC good practice guidance on recalculations and time-series consistency.

58. The ERT encouraged Romania to recalculate the emission estimates for the period 1989–2001 as soon as possible, improve internal verification procedures, and ensure that assumptions are consistent over time. As Romania uses the same AD sources for the reference and sectoral approaches, and IPCC default EFs are applied, both approaches should result in close CO_2 emissions estimates. This could help the inventory agency in identifying possible inconsistencies in the time series.

B. Reference and sectoral approaches

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

59. For the year 2001, emissions obtained using the sectoral approach are 2.9 per cent higher than the estimate using the reference approach. However, significantly greater differences are found for the period 1992–2000. An extreme case is 1997, where the reference approach estimate is 38.9 per cent lower than the sectoral approach estimate. These very considerable differences indicate the need for recalculation of the emission time series.

60. The ERT found discrepancies related to data entry errors; and to the exclusion of emissions from "own energy use" in the Energy sector in the sectoral approach before 2001. Statistical differences in the national energy balance, which are sometimes significant, might also influence comparison between the reference approach and the sectoral approach.[8] Finally, it is worth noting that in the Romanian inventory the reference approach provided lower estimates than the sectoral approach, while the reverse situation is found in most Parties.

61. There are some significant differences between the International Energy Agency (IEA) data and the values in the CRF tables. Fuel consumption is always higher in the CRF tables. The differences are: 5.6 per cent for total consumption, 2.9 per cent for liquid fuels, 15.1 per cent for solid fuels and 1.1 per cent for gaseous fuels. These discrepancies could be explained by the use of different net calorific values and disaggregation level of fuels.

International bunker fuels

62. Romania included emissions from international civil aviation and navigation under the respective domestic source categories. No distinction is made between domestic and international fuel use, and all emissions are included in the national total. In this regard, Romania is applying a conservative approach, since the national total is overestimated.

63. Nevertheless, the ERT recommends that Romania begin reporting emissions from bunker fuels separately. Data from Eurostat and IEA indicate that an important fraction of emissions from civil aviation corresponds to international flights (more than 80 per cent). Romania should analyse these data and try to develop assumptions to separate bunkers from domestic emissions in civil aviation. For marine bunkers, no information was found by the ERT in the IEA and Eurostat sources.

Feedstocks and non-energy use of fuels

64. The information provided in this area is limited to aggregated data on non-energy use of fuels reported in the national energy balance. However, there are no data regarding feedstocks or the specific sectors in which they are used.

[8] The term "statistical differences" refers here to discrepancies between "energy available for final consumption" and "final energy consumption". In the Romanian energy balance, "statistical differences" = "energy available for final consumption" – "final energy consumption" – "non-energy use."

65. Taking into account these limitations, for 2001 the available data are used in accordance with the IPCC guidelines: the IPCC fractions of carbon stored are applied, and estimates are appropriately subtracted in the reference approach.

66. The ERT encouraged Romania to collect more data on feedstocks and non-energy use of fuels and check that double counting is avoided.

C. Key sources (fuel combustion and fugitive emissions)

Stationary combustion: coal – CO_2

67. Romania did not include emissions from own energy use by the Energy sector from 1992 to 2000, although the AD were available in the national energy balance. However, this problem was solved in 2001, and those emissions were included.

68. Romania does not disaggregate emissions within the source category 1.A.1 Energy Industries. All emissions are reported under 1.A.1a Public Electricity and Heat Production. The Romanian team explained that the reason for this was lack of background information. Similarly, all emissions within 1.A.2 Manufacturing Industries and Construction are allocated under 1.A.2.f Other, the reason being again lack of data. The ERT encouraged Romania to exploit data contained in the national energy balance to disaggregate emissions. Although this might require some assumptions, the ERT noted that Romania could achieve a higher level of disaggregation in future submissions.

69. Romania did not consider sub-bituminous coal consumption in the estimates of emissions from coal combustion in stationary sources for years before 2001. This omission was also corrected by Romania for the 2001 estimates.

70. The ERT noted significant fluctuations of solid fuels consumption between 2000 and 2001: an increase of 120 per cent in 1.A.1 Energy Industries, a decrease of 75 per cent in 1.A.2 Manufacturing Industries and Construction and a decrease of 44 per cent in 1.A.4 Other Sectors. Including all sub-source categories, emissions from stationary combustion of coal increased by 26 per cent. This increase could be explained by the inclusion of own energy use by the Energy sector and emissions from sub-bituminous coal.

71. The IEF in 1.A.2 Manufacturing Industries and Construction increased from 67.20 t CO_2/TJ in 2000 to 93.45 t CO_2/TJ in 2001. The value for 2001 falls within the range of IPCC default values for solid fuels and is similar to those reported by other Parties. The ERT observed that the IEFs for Romania are expected to be in line with the IPCC default EF for solid fuels, as Romania is applying the latter to obtain estimates. The ERT noted that fluctuations in fuel consumption and IEFs might indicate changes in allocation criteria from 2000 to 2001, and encouraged Romania to recalculate the time series using the same assumptions.

72. Comments in paragraphs 67 and 68 apply to all key sources in stationary combustion, and will not be repeated below.

Stationary combustion: oil – CO_2

73. The IEF for liquid fuels combustion in 1.A.4 Other Sectors increased from 21.65 t CO_2/TJ in 2000 to 66.47 t CO_2/TJ in 2001. The former is far below the range of default EFs provided by the IPCC for liquid fuels, while the latter is within this range and compares well with figures reported by the other Parties.

74. In 1997 the IEF in the sub-source category 1.A.1 Energy Industries dropped to 49.29 t CO_2/TJ, while for the rest of the years from 1992 to 2001 it remains very close to 75 t CO_2/TJ. The ERT found that this irregularity was related to the big difference between the reference and sectoral approaches in 1997, and is probably due to a data entry error.

Stationary combustion: gas – CO_2

75. The IEFs for all three sub-source categories 1.A.1 Energy Industries, 1.A.2 Manufacturing Industries and Construction and 1.A.4 Other Sectors increased from values in the range 37–45 t CO_2/TJ in 2000 to values within 56–59 t CO_2/TJ in 2001. Romania's figures for 2000 are far below the IPCC default EF for natural gas, whereas the values for 2001 are more in line with the corresponding parameters for other Parties. The ERT recommends the inventory team to examine the 2000 EFs used and revise them as appropriate.

Stationary combustion: other fuels – CO_2

76. Romania reports emissions from other petroleum products as emissions from "other fuels". Apparently, this category is rather broad in the national energy balance, including for example bitumen and lubricants. The ERT noted that, in order to enhance comparability and consistency between inventories, these fuels should be considered as liquid fuels.

77. Romania explained that some allocation problems were due to problems with the automatic export of data from the IPCC worksheets to the CRF tables. In fact, N_2O and CH_4 emissions had been correctly assigned to liquid fuels. In such cases, the ERT recommended Romania to proceed manually for proper allocation of fuel quantities and CO_2 emissions in the CRF.

78. Romania also explained that no other fuels were considered here. Therefore, if Romania determines that data on other petroleum products can be moved to liquid fuels, this source category might not be a key source in future submissions by Romania.

Mobile combustion: road vehicles – CO_2

79. Romania clarified that the national energy balance has not disaggregated fuel consumption as between road, aviation, navigation and rail transport since 1999. For that reason, the relative shares obtained in 1999 for each type of fuel and transport were held constant for 2001. The ERT noted that fuel consumption might be changing at different rates in different sub-source categories within transportation (in most countries, road and aviation emissions are increasing more rapidly).

80. The IEF for diesel oil is very low for the period 1992–2000. It increased from 36.66 t CO_2/TJ in 1992–2000 to 73.33 t CO_2/TJ in 2001. The value for 2001 is in line with the IPCC guidelines. Regarding gasoline, Romania takes the general default EF for gasoline in fuel combustion. The ERT noted that an EF specific for mobile combustion would be more appropriate.

Fugitive emissions: oil and gas operations – CH_4

81. Romania does not report venting and flaring emissions from oil production because no regional EF is available in the IPCC guidelines. The ERT encouraged Romania to apply other available EFs.

82. Regarding emissions from venting and flaring in gas production, Romania uses the lower end of the range provided by the IPCC for East European countries (6000–30,000 kg/PJ of gas produced). The ERT recommended that Romania reconsider its selection and analyse whether a higher value would be more appropriate if old equipment is in operation.

Fugitive emissions: coal mining and handling – CH_4

83. Romania uses a study covering the years 1989–1991 to separate coal production from underground and surface mines. The ERT noted that it was unclear how this study was used and whether a constant share of production from underground and surface mines along the time series is applicable. In this regard, the ERT encouraged Romania to obtain information on the split between lignite and hard coal production from the NIS.

D. Non-key sources (fuel combustion and fugitive emissions)

Mobile combustion: road vehicles – N_2O

84. Romania applies a constant EF throughout the time series for both gasoline and diesel oil: 0.6 kg/TJ. This EF is rather low compared to the IEFs of other Parties. In addition, a constant EF together with the IPCC tier 1 methodology does not take into account the effect of changing technologies. The ERT recommends that Romania consider moving to higher-tier methods in the future, so that N_2O emissions are appropriately estimated when the share of new cars with catalytic converters increases in the Romanian vehicle fleet.

Mobile combustion: civil aviation – CO_2

85. Emissions from civil aviation increased by 2193 per cent from 2000 to 2001. After checking the energy balances Romania confirmed that combustion of kerosene was missing in the estimate for the year 2000.

Fugitive emissions – CO_2

86. Romania does not estimate emissions from these source categories, since the IPCC guidelines do not contain default EFs. The ERT suggested that Romania should consider, in the longer run, using the EFs included in the IPCC good practice guidance.

E. Areas for further improvement

Identified by the Party

87. During the review, the Romanian inventory team explained that, once the necessary funds are available, the first priority for developing country-specific EFs will be the Energy sector. Romania also acknowledged that there is a need to recalculate the emissions estimates not only for the period 1989–1991 but also for 1992–2001.

Identified by the ERT

88. The irregularities found in the Energy sector along the time series regarding fuel consumption and IEFs indicate a need for recalculations to be carried out as soon as possible, regardless of the development of national EFs and the implementation of higher-tier methods.

89. The ERT noted that a deeper understanding of the information contained in the national energy balance should be a high priority for the inventory team. In this regard, further involvement of energy balance experts in the inventory preparation is of great importance. Otherwise, it will be difficult for the inventory team to make full use of the national energy balance.

90. The ERT recommends that Romania further analyse the data contained in the national energy balance, with the object of disaggregating emissions within 1.A.1 Energy Industries and 1.A.2 Manufacturing Industries and Construction. For this purpose, and in order to develop the necessary assumptions, the participation of Romanian energy experts and the appropriate use of additional data from the *Statistical Yearbook* would be helpful.

91. The ERT encouraged Romania to enhance the use of notation keys and documentation boxes. Transparency would also be notably improved by making available in the next inventory submission a copy of the national energy balance and more explanations on the methodological assumptions employed (i.e., disaggregation of emissions in transport, and the distinction between coal production from underground and surface mines). Such explanations should be included in the NIR, and the national energy balance could be attached as an annex.

92. In order to implement higher-tier methods for fugitive emissions in the future, the Romanian inventory team should consider collection of infrastructure data for later use.

93. The ERT recommended that Romania implement internal verification procedures to minimize data entry errors and changing interpretations of the national energy balance.

III. INDUSTRIAL PROCESSES AND SOLVENT USE

A. Sector overview

94. In 2001, emissions in the Industrial Processes sector accounted for 6.3 per cent of total CO_2 equivalent emissions (without LUCF), 0.2 per cent less than in 1989 (the base year). Emissions of CO_2 represented 81.7 per cent of emissions in Industrial Processes in 2001. Cement production was responsible for 37.0 per cent of total CO_2 emissions, while lime production contributed 26.5 per cent and ammonia production contributed 24.2 per cent (other subsectors were significantly smaller). Emissions of N_2O represented 10.9 per cent of total CO_2 equivalent emissions in 2001. Nitric acid production was responsible for 51.2 per cent of N_2O emissions andddipic acid production accounted for the remaining 48.8 per cent. Emissions of PFCs from aluminium production accounted for 7.2 per cent of the emissions from the sector, and emissions of CH_4 from chemical industry and metal production accounted for the remaining 0.2 per cent.

95. During the period 1989–2001, industrial process emissions decreased by 45.4 per cent. The decrease was mainly due to a fall in N_2O emissions from nitric acid production (–92.4 per cent) and in CO_2 emissions from the production of cement (–53.6 per cent) and lime (–35.2 per cent). The emissions trend is reasonable, despite the use of different methodologies for 1989–1991 (Draft IPCC Guidelines) and 1992–2001 (IPCC Guidelines). This is due to the fact that, for whole period under review (1989–2001), the EFs used for the largest source categories (nitric acid production, cement production and lime production) were constant.

Completeness

96. The CRF includes all tables required (except for table 3.A–D) and estimates of most gases and sources in the Industrial Processes sector, as recommended by the IPCC Guidelines. Notable exclusions are (a) for gases: HFCs and SF_6 and (b) for source categories: 2.E Production of Halocarbons and SF_6 and 2.F Consumption of Halocarbons and SF_6. It was specified in the NIR that the HFCs, SF_6 and other PFCs (except those from aluminium production) could not be calculated because of lack of statistical data referring to halocarbons consumption and the confidentiality of data.

97. The ERT noted also that the CRF does not specify the AD used (with the exception of cement production) where options are provided (table 2(I)). For iron and steel production, Romania reported AD for 2001 but no emissions. At the same time, for the period 1992–1998 AD were not provided for 2.B.5 Other Emissions, although CH_4 emissions from this source were included in the CRF tables. For 1998–2000, AD were not available for 2.B.3 Adipic Acid Production.

Transparency

98. The ERT concluded that the information provided in the NIR for the Industrial Processes sector was not sufficiently detailed for a thorough review (i.e., the NIR lacked transparent descriptions of methods and EFs used). The ERT worked alongside the Romanian inventory team to assess the underlying assumptions and rationale for choices of data, methods and other inventory parameters. In addition, no references or external data sources used within this sector were provided in the NIR.

99. Notation keys were used throughout the CRF tables for the Industrial Processes sector for 2000 and 2001 (with minor exceptions in some sectoral background data tables), but they were not used for the 1992–1999 tables. In future submissions, Romania should use the notation keys to fill in the blanks in all tables in the CRF tables for the Industrial Processes sector for the whole time series.

100. Romania used IPCC default EFs and methodologies for the entire sector. Inconsistencies were identified between the data provided in the NIR trend table 5.2.1 and the CRF summary 2 tables, which are probably due to rounding.

Time-series consistency

101. According to Romania, CO_2 emissions from iron and steel production were included in the Energy sector for the years 1989–1991 and 2001, and in the Industrial Processes sector for 1992–2000. There are large fluctuations in total CO_2, CH_4, N_2O and PFCs emissions (greater than 10 per cent) from 1989–2001 for all the sources under consideration. The ERT recommends that in future submissions Romania should include CO_2 emissions from iron and steel production and ammonia production within the Industrial Processes sector each year to ensure time-series consistency, and explain the noted fluctuations in emissions over the time series.

B. Key sources

Cement production – CO_2

102. During the period 1989–2001, CO_2 emissions from cement production decreased by 53.6 per cent. The NIR did not provide sufficient information with which to reproduce this estimate, but the ERT learned that Romania was using cement production as AD. Romania should explore the possibility of estimating CO_2 emissions by using the more accurate clinker production method, taking into account the types of cement produced in the country (tier 1 method).

Lime production – CO_2

103. Carbon dioxide emissions from lime production declined by 35.2 per cent between 1989 and 2001. The IEF for CO_2 from lime production for the period 1992–2000 was 0.79 t/t, while for 2001 it was 0.82 t/t (the latter being a weighted average between the EFs for quicklime – 0.79 t/t – and dolomitic lime – 0.91 t/t). It was also noted that for 1992–2000 Romania reported only the amount of quicklime produced, but in the IPCC worksheets this was included by mistake as dolomitic lime. Thus, CO_2 emissions from lime production were overestimated (i.e., the EF for dolomitic lime is higher than that for quicklime). The ERT recommends that Romania review its AD, check the EF used and include in its future submissions in the NIR more specific and detailed information on lime production, lime structure data, the use of lime produced as a non-marketed intermediate, and the calculation of the emissions, as well as on the methodology and EFs used to estimate them.

Ammonia production – CO_2

104. Carbon dioxide emissions from ammonia production were reported in the Energy sector for 1989–1991 – when emissions were estimated by using data on the amount and composition of gas and oil used in the process (tier 1a method) – and within the Industrial Processes sector for 1992–2001, by using the amount of ammonia produced (tier 1b method). During this period, CO_2 emissions from ammonia production decreased by 33.4 per cent. The ERT recommends that Romania include emissions from ammonia production in the Industrial Processes sector and apply the same methodology for the entire time period to ensure consistency.

C. Non-key sources

Iron and steel production – CO_2

105. Iron and steel production was not identified as a key source for 1989–1991 and 2001 because it was included in the Energy sector, but it was identified as a key source within the Industrial Processes sector for 1992–2000. The EF (0.507 t/t) applied for 1992–2000 is lower than the range of default EFs provided for the tier 1 method (1.5 – 1.6 t/t). The ERT encourages Romania to provide explanations on the choice of this EF in its NIR. The ERT also recommends that Romania provide AD and emissions for the

whole period following the same methodology, from 1989 to current year, including specifications within the sub-sources in the Iron and Steel source category. The ERT noted that the AD for steel production presented by Romania in the CRF for 2000 are 5.7 per cent higher than those reported by the United Nations (UN). The ERT encourages Romania to explore the reasons for the difference between the CRF data and the UN AD. Romania can improve the accuracy of the estimate by gathering data on the amount of reducing agent used in iron and steel production.

Aluminium production – PFCs

106. The EFs for tetrafluoromethan (CF_4) and hexafluoroethane (C_2F_6) are within the range of default EFs provided for the tier 1 method, although the value of the IEF for CF_4 (0.5 kg/t) for aluminium production is among the highest of reporting Parties. The ERT recommends that Romania provide an explanation for the choice of EFs in its NIR.

Adipic acid production – N_2O

107. Nitrous oxide emissions from adipic acid production were reported only for the period 1992–1997 and 2001. The Romanian inventory team explained that it was not possible to estimate emissions for 1998–2000 because of a lack of official production data. For 1992–1997, the EF was within the range of default EFs provided by the IPCC good practice guidance (300 kg ± 10 per cent per tonne), with the exception of 1994 when it was 800 kg/t, the highest value among reporting Parties. The ERT recommends that Romania obtain or estimate production data for the missing years to ensure that the time series is complete and consistent. Romania should also provide more information in the NIR on the production data and capacity, the methodology used to estimate emissions from adipic acid production, and the type of reduction technology used for N_2O emissions.

Limestone and dolomite use – CO_2

108. For 1992–2000 Romania reported all limestone and dolomite use as dolomite use (the value of the CO_2 IEF was 477 kg/t), while for 2001 it was all reported as limestone use (the value of the CO_2 IEF was 442 kg/t). The ERT recommends that Romania use the same approach for the entire time series to ensure consistency.

Ferroalloys production – CO_2

109. Carbon dioxide emissions from ferroalloys production were not estimated for 2001. The inter-annual changes for CO_2 emissions from ferroalloys production are greater than 10 per cent for all years under review (e.g., from 1999 to 2000, +11,099 per cent). The ERT recommends that the Party explain these large fluctuations in the NIR to show that the time series is consistent.

Solvent and other product use

110. Emissions for CO_2 and N_2O were reported as not estimated ("NE") for all categories of this sector. Also, although non-methane volatile organic compound (NMVOC) emissions from 3.A to 3.D application were reported, the associated background AD were not provided. It was noted that no notation keys were used in table 3.A–D. The ERT recommends that Romania estimate the missing emissions and make use of notation keys to complete the information in this sector.

D. Areas for further improvement

Identified by the Party

111. Romania noted in the NIR that it plans to begin developing national EFs, tailored to Romanian conditions, in November 2003. Romania also intends to recalculate its 1989–1991 estimates in accordance with the IPCC Guidelines as part of a complete and consistent time series for the next submission.

Identified by the ERT

112. The ERT recommends that Romania include the following information in subsequent inventory submissions:

(a) A brief description of the process of inventory preparation for the Industrial Processes sector (e.g., data collection, data processing and data storage);

(b) A description and interpretation of emission trends for aggregated GHG emissions within the sector;

(c) A more detailed overview of the sector (e.g., a quantitative overview, a source category description, methodological issues, an assessment of the completeness and the sources of GHG excluded, uncertainties and time-series consistency, source-specific QA/QC and verification, recalculations and planned improvements);

(d) Additional annexes to the NIR including relevant or useful reference information.

113. The ERT also recommends that Romania recalculate the estimate for CO_2 emissions from 2.B.1 Ammonia Production and 2.C.1 Iron and Steel Production for the whole period under review following the IPCC Guidelines and the good practice guidance, including them within the Industrial Processes sector.

IV. AGRICULTURE

A. Sector overview

114. The Agriculture sector accounted for 8.1 per cent of total national GHG emissions in 2001, reaching 12,060 Gg CO_2 equivalent. Over the period 1992–2001, the emissions decreased by 28 per cent. In 2001 CH_4 emissions contributed 60.7 per cent to the total agricultural CO_2 equivalent emissions. N_2O emissions accounted for the remaining 39.3 per cent. Enteric fermentation, agricultural soils and manure management were the major agricultural source categories, contributing 44.4 per cent, 38.3 per cent and 14.7 per cent, respectively. From 1992 to 2001, CH_4 emissions from enteric fermentation decreased by 34.7 per cent because of a reduction of the livestock population in the country. Emissions from manure management systems also declined, by approximately 78.4 per cent, from 1992 to 2001. In 2001, CH_4 emissions from rice cultivation were 2.3 per cent of the 1992 level because of a reduction in the cultivated rice area. N_2O emissions from agricultural soils have decreased by 9.7 per cent since 1992 because of lower inputs of synthetic fertilizers to agricultural crops. Over the period 1992–2001, GHG emissions from field burning of agricultural residues declined by 25 per cent.

Completeness

115. For the year 2003 submission, the 2001 CRF tables contain information on CH_4, N_2O, nitrogen oxide (NO_X) and carbon monoxide (CO). CO_2 emissions were reported as "NE" (for other years in the previous submission these cells were left blank). Romania completed all the relevant Agriculture tables for 2001. In 2001, the category 4.E Prescribed Burning of Savannas was reported as "NO" (not occurring). Different notation keys were used for mules and asses in 2001 ("IE" – estimated elsewhere) and 2000 ("NA" – not available). Additional information on the assumptions used in the statistics for mules and asses was not provided in the documentation boxes of tables 4.A, 4.B (a) and 4.B(b) in the CRFs of 1992–2000. Over the period 1992–1999, no notation keys for mules and asses were provided.

116. For the 2002 submission, Romania did not fill in table 4.E for the years 1992–2000 or table 4.F for the years 1992–1999. The values of GHG emissions from field burning of crop residues (table 4.F) were not provided, and IEFs were therefore not calculated.

117. The ERT recommends that Romania complete all background tables throughout the Agriculture sector for the period 1992–2001, using notation keys correctly and providing additional information in documentation boxes.

Transparency

118. According to the NIR, the source of all AD for the Agriculture sector is the Romanian *Statistical Yearbook*. The NIR and the CRF (summary 3) indicate that the tier 2 methodology and EFs were applied for CH_4 and N_2O emissions from manure management systems. However, the Romanian inventory team explained that the NIR and CRF summary 3 contain incorrect information. Tier 1 and default EFs were in fact used in the calculations. The ERT encourages Romania to report fully the methodology used in the NIR and CRF of its next submission.

Recalculations and time-series consistency

119. According to the 2003 NIR, Romania recalculated emissions of CH_4 from rice cultivation for the period 1992–2000. However, the updated values were not incorporated in the CRF tables. In the previous submission, the cultivated area of rice was incorrectly reduced as a result of a misunderstanding of the required units. The recalculation improved the consistency of the time series and reduced the fluctuation of CH_4 emissions between 1991 and 1992 from 99.4 per cent to 36.8 per cent. The recalculation for 1989–1991 will increase the correlation between the emissions trend and the cultivated area of rice for the whole period. The ERT recommends that Romania report correct values in the CRF tables of its next submission and recalculate the CH_4 emissions from rice cultivation for the period 1989–1991.

B. Key sources

Enteric fermentation – CH_4

120. The 2001 AD for cattle population were 4.5 per cent lower than those published by the Food and Agriculture Organization (FAO). Romania experts explained that the national statistics provide summary AD on both cattle and buffalo populations under cattle category. In the CRF Romania used the assumption that buffalo contribute approximately 4.5 per cent of these aggregated population data and cattle and buffalo are separately reported. In contrast, the FAO reports combined the data for cattle and buffalo, and this is probably the source of the difference. The ERT recommends that Romania include the relevant assumptions used in splitting the aggregated AD in the NIR and provide notes in the documentation boxes of the CRF.

121. No information is provided in the Romanian *Statistical Yearbook* on whether or not AD for mules and asses are included in the Horse category. Romania explained that it made this assumption on the basis of the first inventory of the country for 1989–1991. The ERT recommends that Romania check this information and provide relevant explanations in the NIR and CRF for the next submission. Romania is encouraged to obtain the proportion of mules and asses in the Horse category.

122. Some AD on animal populations were incorrectly entered in the CRF (the sheep population in 1999 and all livestock populations in 1993). Romania plans to correct the AD to the next submission. The ERT encourages this work.

Manure management – CH_4

123. The NIR does not provide information on the split of animal waste management systems (AWMS) in the country. After reviewing the IPCC worksheets for 2001, the ERT learned that the default proportions of AWMS for Eastern Europe were used. The ERT recommends that Romania provide this information in background tables of the CRF and the NIR of future submissions.

Direct emissions from agricultural soils – N_2O

124. The AD on the input of synthetic fertilizers do not correspond to the values reported in the Romanian *Statistical Yearbook* in 1992, 1993, 1994 and 1998 (the differences amount to +10 per cent, +20 per cent, –99.8 per cent and +13 per cent, respectively). Romania indicated that it plans to review and correct the AD by the time of its next submission. The ERT recommends that Romania provide

information in the documentation box on whether or not the AD on the input of fertilizers reported in table 4.D were previously adjusted for nitrogen oxides (NOx) and ammonia (NH_3).

125. The values for $Frac_{BURN}$ and $Frac_R$ reported are higher than the IPCC default values, but in its IPCC worksheets for 2001 Romania entered the IPCC default values for both. The value for $Frac_{GASM}$ reported in IPCC worksheets for 2001 and used for actual calculations is lower than the default value, even though the correct value was indicated in the CRF for 2001. The ERT recommends that Romania examine the $Frac_{GASM}$ throughout the time series 1992–2001 and recalculate relevant emissions by the next submission.

126. The data on nitrogen (N) input from manure applied to soil appear to be underestimated owing to mistakes in the calculation of N excretion from AWMS (see Non-key sources, Manure management – N_2O). The ERT recommends that Romania recalculate N_2O emissions from this source category using the correct values. AD on annual production of N-fixing and non-N-fixing crops do not correspond to the values reported in the Romanian *Statistical Yearbook* for 1992–2001. The ERT encourages the inventory team to examine the AD and recalculate the relevant N_2O emissions throughout the time series. The IEFs for N_2O emissions from N fixation vary over the years 1992–2001. Romania is encouraged to check the methodology used to estimate N_2O emissions from N fixation and revise the estimate for the next submission.

127. The Romanian *Statistical Yearbook* does not provide information on the area of histosols cultivated in the country. In response to a question by the ERT, Romanian experts explained that the area of histosols indicated in the CRF (1992–2000) was provided by mistake. AD for histosols are not available and the N_2O emissions could not be estimated for the period 1992–2001. Romania will exclude this source category from calculations in its future submissions. The ERT recommends that the area of histosols in the country be checked and documented in the next NIR.

C. Non-key sources

Manure management – N_2O

128. The AD on animal populations reported in table 4.B(b) for 1992–2000 are an order of magnitude lower than data provided in tables 4.A and 4.B(a) for those years and for all tables for 2001. After reviewing the IPCC worksheets and discussing the issue with Romanian experts, the ERT concluded that the difference was due to a lack of familiarity on the part of the Romanian inventory team with implementation of the section on manure management in the IPCC Guidelines. The number of animals was incorrectly split across AWMS throughout all inventory years.

129. Additionally, over the period 1992–2001, the calculations of N excretion values per AWMS are not complete and data for different animal categories or AWMS are not reported. For example, in 2001 N excretions of non-dairy cattle from anaerobic lagoon, solid storage and other AWMS, sheep on pastures, and swine from liquid system and pastures are omitted. Nitrogen excretions of poultry are also not reported. Romania is encouraged to check all AD used and perform calculations in accordance with tier 1 of the IPCC Guidelines consistently throughout the time series. The N excretion rates indicated in the CRF are below the default values that Romania reported using. The Romanian inventory team explained that the correct default N excretion rates were used and reported in the IPCC worksheets for 2001. Romania will correct the N excretion rates in the CRF of its next submission.

130. Some animal categories were not included in the calculation of N excretion in AWMS (horses, mules and asses, and goats). The ERT recommends that Romania report N_2O emissions from these animals under subcategory Other and perform the calculations for its next submission. Over the period 1992–2001, table 4s2 of the CRF reports N_2O emissions from the additional source category 'Other from IPCC'. However, there is no related information on this sub-source in the NIR or in the background table. Romania explained that this sub-source could have been incorporated in table 4 by mistake. Romania plans to examine these calculations prior to the next submission. The ERT encourages this work and

recommends that Romania recalculate N excretion values and N_2O emissions associated with AWMS for the period 1992–2001.

Animal production – N_2O

131. Data for the N input from animal grazing to soils appear to be underestimated as a result of mistakes in the calculation of N excretions from AWMS (see Manure management – N_2O). Romania is encouraged to recalculate the N_2O emissions from these sources for its future submissions.

Indirect emissions from nitrogen used in agriculture – N_2O

132. Indirect N_2O emissions appear to be underestimated owing to mistakes in the assessment of direct N_2O emissions (see Direct emissions from agricultural soils – N_2O). Romania should recalculate the N_2O emissions from these source categories by the next submission.

Field burning of agricultural residues – CH_4, N_2O

133. The NIR indicates that there is a lack of AD for this source category. However, the ERT learned that the Romanian *Statistical Yearbook* does provide the necessary AD for implementing a tier 1 method. Romania plans to revise the text in the NIR for its next submission. The inventory team believes that the default value for the proportion of crop residues burned in fields in Romania could probably lead to an overestimate. The ERT encourages Romania to obtain a country-specific value for this parameter.

134. Some parameters for oats and sugar beet differ from the IPCC default values. The ERT recommends that Romania review these parameters and recalculate the estimates for 1992–2001. In the CRF, Romania reports data on nitrogen/carbon ratio in column G, "Nitrogen fraction in biomass of residues", that are different from the values used in the IPCC worksheets 2001 (where the correct calculations were performed). The ERT also recommends that Romania add estimates of the data on the maize used for silage and fodder root over the period 1992–2001 for its next submission.

D. Areas for further improvement

Identified by the Party

135. Romania indicated that it plans to reflect recalculations of CH_4 emissions from rice cultivation in the CRF of the next submission.

Identified by the ERT

136. The ERT recommends Romania to recalculate all the sources as indicated in the sections above in order to correct the errors detected and ensure consistency of the time series reported. In addition, the ERT encourages Romania to develop an enhanced characterization of the livestock population and implement a tier 2 method for the assessment of CH_4 emissions from enteric fermentation. Romania may wish to obtain country-specific information on manure management practices from state and private farms as an input to estimation of country-specific EFs for manure management. Romania may also wish to develop country-specific values on the proportion of crop residues burned in the country using expert assumptions. The ERT recommends better documentation of methods and assumptions used in the emission estimates.

V. LAND-USE CHANGE AND FORESTRY

A. Sector overview

137. In Romania, the LUCF sector constituted a net sink in 2001 with removals of 9,023 Gg CO_2 equivalent. This sink offset 6.1 per cent of the 148,202 Gg CO_2 equivalent gross emissions.

138. Net reported CO_2 uptake in the base year 1989 was 2,925 Gg CO_2, and rose to 9,023 Gg CO_2 in 2001, indicating a threefold increase over a period of 12 years. The trend in LUCF net removals between

1989 and 2001 shows important annual changes, such as increases of 93 per cent from 1989 to 1990 and of 30.5 per cent from 1997 to 1998. The largest annual reduction in removals occurred from 1998 to 1999, representing an 11.1 per cent decrease. According to the NIR, the main factors influencing CO_2 removals are the annual growth rate and the commercial harvest rate.

Completeness

139. The CRF includes estimates of all gases and sources and sinks from the LUCF sector, as recommended by the IPCC Guidelines. However, some gaps are noted (forest conversion, forest fires, abandonment of managed lands, soil carbon changes). Estimates are provided in tables 5.A Changes in forests and other woody biomass stocks and 5.B Forest and grassland conversion. The rest of the sources/sinks are noted as "NO" or "NE".

Transparency

140. No description of the LUCF methodology is provided in the NIR. The NIR states that sinks were calculated using data from the *Statistical Yearbooks* and additional data from the Forest Research and Development Institute (ICAS), and the EFs were the IPCC default recommended values. The ERT was provided with the IPCC worksheets where the calculations were easier to follow. For improving transparency in reporting of the data, a detailed description of LUCF methodology has to be included in the next NIR.

Recalculations and time-series consistency

141. No major improvements compared with previous years were reported for the LUCF sector.

B. Sink and source categories

Changes in forests and other woody stocks

142. The area of commercial forests, as published in the *Statistical Yearbook*, has remained almost the same from 1989 to 2001, decreasing by only 0.4 per cent. Romania applied IPCC default values for annual average above-ground biomass uptake by natural regeneration in temperate forests. The ERT recommends that Romania develop country-specific wood density and biomass expansion factors, in accordance with the available data.

143. Amounts of harvested wood decreased sharply in the period 1989–2001, from 19.5 Mm^3 in 1989 to 13.4 Mm^3 in 2001, representing a gross decrease of 31.1 per cent, concentrated mainly between the years 1989 and 1993.

Forest and grassland conversion

144. A total area of 2.73 kha of forest conversion was reported in 2001, which is based on the data for "plane cuttings" published in the *Statistical Yearbook*. According to ICAS, plane cutting is not a common forest management practice in Romania, and these areas are quickly reforested (i.e., this does not represent a land use change). It is therefore likely that the values reported in table 5.B have been overestimated.

145. On grassland conversion, no data are available.

Abandonment of managed lands

146. ICAS confirmed that no information on abandonment of managed lands is available, but the extent of the activity could be considered negligible. Nevertheless, it is recommended that Romania collect information related to possible emissions from this source.

CO_2 emissions and removals from soils

147. CO_2 emissions and removals from soils were reported as "NE" in 2001 and for previous years. ICAS informed the ERT that organic soils in Romania are scarce and therefore emissions and removals could be considered negligible. On the basis of discussions with Romanian experts, the ERT concluded that it will be possible to obtain information on the cultivation of mineral soils and the liming of agricultural soils in order to assess emissions and removals from soils.

C. Areas for further improvement

Issues identified by the Party

148. Romania plans to recalculate the entire LUCF time series from 1989 to 2001 for its next submission.

Issues identified by the ERT

149. The ERT supports the need for comprehensive recalculations of the entire time series 1989–2001, and particularly the years 1989–1991, because the current estimates were calculated using provisional IPCC EFs. In addition, the criteria applied to plane cuttings and grassland conversion should be revised for the years 1992–2001.

150. In conducting the recalculations, the inventory team should account for the following issues identified by the ERT:

(a) *Commercial forests*: The *Statistical Yearbook* includes data on forest land divided mainly into coniferous and broadleaf forests. It is necessary to define the total forest area under management, as well as the area of protected or reserved forests. According to ICAS, the last forest inventory was developed in 1985 and there is sufficient information to make it possible to delineate the extent of the main species in Romanian forests. There are also enough data to establish country-specific wood density factors for evergreen and deciduous forests in CRF table 5.A, instead of using the IPCC default factors. In the same sense, average annual growth rates can be determined as country-specific factors. In relation to the biomass expansion factor, ICAS informed the ERT that the available annual growth increment data considers only stem wood above bark for conifers, and stem wood above bark plus branches for broadleaf forests. It is preferable to use country-specific biomass expansion factors to use these data.

(b) *Plantations*: The *Statistical Yearbook* includes data on afforestation for coniferous and broadleaf forests, segregated into plantations and direct sowing. ICAS informed the ERT that most of this area actually corresponds to reforestation after harvest and only a small part to afforestation. It is recommended that only tree growth on lands with no previous forests be considered as yearly afforestation.

(c) *Non-forest trees*: ICAS informed the ERT that the forest service promotes the use of windbreaks and rows of trees in rural areas. If data are available, Romania should investigate the feasibility of including estimates for biomass existing in non-forest trees.

(d) *Forest and grassland conversion*: ICAS stated that forest conversion is very limited in Romania because of legal restrictions, and forests fires are rare. In any case, it would be convenient to detail in the NIR the information currently available on forest and grassland conversion and forest fires, including CO_2 and non-CO_2 emissions.

(e) *Abandonment of managed lands*: ICAS noted that this practice is rare or non-existent in Romania. This information should be included in the NIR.

(f) *CO_2 emissions and removals from soils*: The ERT recommends that Romania include data on land area and related information on the cultivation of mineral and organic soils and the liming of agricultural soils, in order to balance total emissions and removal in the GHG inventory.

VI. WASTE

A. Sector overview

151. The Waste sector accounted for 6.5 per cent of total national emissions in the year 2001. CH_4 emissions from solid waste disposal sites (SWDS) were the sixth-largest source in the Romanian inventory, accounting for one-third of all CH_4 emissions. The two key sources identified from the sector are CH_4 from solid waste disposal on land and from waste-water handling. The trends for these subsectors indicate abrupt changes over the period 1989–2001 due to changes in methodologies.

Completeness

152. The CRF includes estimates of all gases and sources of emissions from the Waste sector, as recommended by the IPCC Guidelines, except for emissions from waste incineration and from handling of industrial sludge. Waste incineration was not included because of lack of AD. No CH_4 recovery was reported, and the value used for CH_4 oxidation was also not reported.

Transparency

153. The estimates for the Waste sector are insufficiently documented in the NIR. There are no detailed descriptions of methodologies, AD or EFs. The information requested in the additional information tables in the CRF is also not completely provided.

Recalculations and time-series consistency

154. The time series fluctuated significantly, from a range of 228.6 to 240.6 Gg of CH_4 (from 1989 to 1991) to 444.8 to 722.9 (from 1992 to 2001). The NIR indicated that a different methodology was used for the first period. The Romanian inventory team indicated that it intends to recalculate the estimates for 1989–2001. Also, in the year 2001, CH_4 emissions decreased sharply compared to 2000, even though the same method was used. The ERT concluded that the decline was due to a large difference in the estimation of the waste generation rate between 2000 (1.7 kg/capita/day) and 2001 (0.93 kg/capita/day). Recalculation with consistent and documented data is strongly recommended.

B. Key sources

Solid waste disposal on land – CH_4

155. Romania used the tier 1 method to estimate CH_4 emissions from SWDS for the period 1992–2001. The method was applied consistently during this period except for 2001, when a different approach for obtaining the per capita waste generation rate was used. This led to an implausible decrease in CH_4 emissions from 2000 to 2001, by a factor of 2. In addition, the ERT discovered a data entry error on table 6.A of the CRF for population size.

156. The value for degradable organic carbon (DOC) used was 0.77, which is the IPCC default factor when lignin is excluded. If lignin is included in the waste stream calculation, the appropriate IPCC default value should be in the range of 0.5–0.6, according to the IPCC good practice guidance. During the review, the ERT had the opportunity to discuss AD for this sector with national waste management experts at ICIM, and learned that there are sufficient data on waste generation and the waste stream composition to develop country-specific values for the waste generation rate and DOC.

157. Disposal of sewage sludge in SWDS was not considered in the Romanian inventory. Romania should investigate the occurrence of this practice to determine if it should be counted in the next inventory.

Waste-water handling – CH_4

158. Emissions of CH_4 from waste-water handling were estimated using the IPCC default method. However, the ERT concluded that the MCF (methane conversion factor) for primary treatment was

overestimated because the most common means of primary treatment of waste water in Romania are aerobic. This explains the high IEF and high emissions per capita identified in the previous stage of the 2003 review for Romania. At the same time the MCF for anaerobic treatment was underestimated by half, because the IPCC Guidelines recommend an MCF default value of 1 for the complete anaerobic system.

159. The main sludge disposal practice for domestic waste water was identified as primary aerobic treatment, which indicates that the MCF for this subcategory was also overestimated. The IPCC Guidelines recommend a default value of 0 for the aerobic treatment. Information about the sludge disposal practice in industrial waste-water treatment was omitted.

160. According to the NIR, the value for the DOC of domestic waste water was 19,710 kg BOD/1000persons/day, but the value used in the CRF calculated from the IPCC worksheet is the IPCC default value of 18,250 kg BOD/1000persons/day. For industrial waste water, data on waste water from iron and steel production were excluded in the 2001 CRF but included in the 2000 CRF.

C. Non-key sources

Waste-water handling – N_2O

161. Romania used the IPCC default method and parameters to estimate emissions from this source category. The population used in the CRF was the total national population and not the urban population, which could potentially lead to emissions being overestimated.

D. Areas for further improvement

Identified by the Party

162. Romania identified the lack of country-specific data as the main area for improvement.

Identified by the ERT

163. Romania should consider taking advantage of the wealth of high-quality background information on the Waste sector published in the National Plan for Waste Management, particularly for estimating country-specific parameters.

164. Although municipal solid waste incineration was excluded in the CRF, the National Waste Management Plan indicates that industrial waste incineration with energy recovery accounted for 1.3 per cent of the total waste generated in 2000. It is suggested that the Party should take these amounts into account in its future submissions and report them under the Energy and Waste sectors, as appropriate.

165. The ERT recommends that Romania make use of country-specific information to estimate more appropriate values for its waste generation rate, the DOC of municipal solid waste, the DOC for domestic waste-water handling and the DOC in industrial waste-water handling. For example, the amount of waste produced and the waste generation rate can be consistently developed from the National Plan for Waste Management.

166. Romania plans to establish landfill gas recovery projects at newer landfill sites in the near future. Romania may wish to begin establishing the necessary data collection system to track reductions of CH_4 emissions. The IPCC good practice guidance recommends that countries use the tier 2 method for key sources. Romania may wish at this point to begin collecting detailed historical data on waste disposal with a view to starting implementing tier 2 method in the future.

ANNEX 1: MATERIALS USED DURING THE REVIEW

A. Support materials on the CD-ROM and the web page for the review

2003 Inventory submission of Romania, including CRF for 2001 and an NIR.
2002 Inventory submissions of Romania, including CRF for the years 2000 and an NIR.
UNFCCC secretariat. "2003 Status reports for Romania" (available at http://unfccc.int/program/mis/ghg/statrep03/rou03.pdf).
UNFCCC secretariat. *Synthesis and assessment report of the greenhouse gas inventories submitted in 2003. Part I.* FCCC/WEB/SAI/2003 (available at http://unfccc.int/program/mis/ghg/s_a2003.html) and Part II – the section on Romania (unpublished).
Romania's comments on the draft "Synthesis and assessment report of the greenhouse gas inventories" submitted in 2003 (unpublished).
UNFCCC secretariat. "Review findings for Romania" (unpublished).
UNFCCC secretariat. "Handbook for review of national GHG inventories". Draft 2003, (unpublished).
UNFCCC secretariat. "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/CP/1999/7 (available at http://www.unfccc.int/resource/docs/cop5/07.pdf).
UNFCCC secretariat. "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. Database search tool – *Locator* (unpublished).
IPCC. *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, 2000* (available at http://www.ipcc-nggip.iges.or.jp/public/gp/gpgaum.htm).
IPCC/OECD/IEA. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, volumes 1–3, 1997* (available at http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm).

B. Additional materials received during the in-country visit

NIS. *Statistical Yearbook* of Romania for the years 1992–2001.
IPCC Worksheets 2001 of Romania (unpublished).
Romanian Ministry of Waters, Forests and Environmental Protection, Research and Engineering Institute for Environment. *Inventory of Romania Greenhouse Gas Emissions and Sinks 1989–1991. Annexes*. 1997.
NIS. *Energy balances*. Since 1992 (2000 and 2001 were photocopied and considered in details).
IEA. 2001 *Energy balance* of Romania (unpublished).
U.S. Department of Energy - Office of Fossil Energy (available at http://www.fe.doe.gov/international/romnover.html).
Romania's *Second National Communication to the UNFCCC*. Bucharest. 1998 (available at http://unfccc.int/resource/docs/natc/romnc2.pdf).
Romanian Ministry of Waters and Environmental Protection. *National Plan for Waste Management* (available electronically).
UNFCCC secretariat. *Report on the in-depth review of the second national communication of Romania. 2000* (available at http://unfccc.int/resource/docs/idr/rom02.pdf).

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