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HUNGARY

REPORT OF THE INDIVIDUAL REVIEW OF THE GREENHOUSE GAS INVENTORY SUBMITTED IN THE YEAR 2004[1]

I. OVERVIEW

A. Introduction

1. This report covers the centralized review of the 2004 greenhouse gas (GHG) inventory submission of Hungary, 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 review took place from 11 to 16 October 2004 in Bonn, Germany, and was conducted by the following team of nominated experts from the roster of experts: Generalists – Ms. Ruta Bubniene (Lithuania) and Mr. Jan Pretel (Czech Republic), Energy – Mr. Christo Christov (Bulgaria), Mr. Amit Garg (India) and Ms. Kristin Rypdal (Norway), Industrial Processes – Mr. Justin Goodwin (United Kingdom) and Ms. Natalya Parasyuk (Ukraine), Agriculture – Mr. Michael McGettigan (Ireland) and Mr. Vitor Gois (Portugal), Land-use Change and Forestry (LUCF) – Mr. Tomas Hernandez-Tejeda (Mexico) and Mr. Walter Oyhantcabal (Uruguay), Waste – Mr. Sabin Guendehou (Benin) and Ms. Maria Paz Cigaran (Peru). Mr. Michael McGettigan and Ms. Maria Paz Cigaran were the lead reviewers. The review was coordinated by Ms. Rocio Lichte (UNFCCC secretariat).

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

B. Inventory submission and other sources of information

3. In its 2004 submission, Hungary has submitted an almost complete set of common reporting format (CRF) tables for the year 2002 and a national inventory report (NIR) which provides general information on methodologies, activity data (AD), emission factors (EFs) and key sources. Descriptions of uncertainties, quality assurance/quality control (QA/QC) procedures and institutional arrangements are also provided in the NIR. The full list of materials used during the review is provided in annex 1 to this report.

C. Emission profiles and trends

4. In the year 2002, the most important GHG in Hungary was carbon dioxide (CO_2), contributing 72.5 per cent to total[2] national GHG emissions. Methane (CH_4) accounted for 12.5 per cent, nitrous oxide (N_2O) for 13.3 per cent and fluorinated gases (F-gases) for 0.8 per cent of total emissions. The Energy sector accounted for 77.1 per cent of total GHG emissions, Industrial Processes and Solvent Use for

[1] In the symbol for this document, 2004 refers to the year in which the inventory was submitted, and not to the year of publication.
[2] In this report, the term total emissions refers to the aggregated national GHG emissions expressed in terms of CO_2 equivalent excluding LUCF, unless otherwise specified.

5.3 per cent, Agriculture for 11.4 per cent and Waste for 6.2 per cent. Total national GHG emissions (excluding LUCF) amounted to 78,002 Gg CO_2 equivalent (on the basis of data in CRF table 10s5) and decreased by 31 per cent from the base year (average of the three years 1985–1987) to 2002.

D. Key sources

5. Hungary has applied a tier 1 key source analysis covering both level and trend assessment. The key source analysis performed by the Party and the secretariat[3] produced similar results. Hungary identified 16 key sources based on level assessment and two additional key sources based on trend assessment. The secretariat identified 17 key sources in the level assessment with broadly similar results to Hungary. The top four key sources (CO_2 emissions from stationary combustion of coal, oil and gas, and from road transport) account for 81 per cent of emissions in Hungary's trend assessment and for 70 per cent of total emissions in the secretariat's level assessment.

E. Main findings

6. Most of the required inventory data and methodological information for 2002 are provided in the CRF and the NIR. However, the lack of complete CRF files for the years 1991–1999 severely limits the review and analysis of emission trends. The Party is therefore urged to complete the work being done on its inventories for the years 1991–1999 and to improve the general transparency of its reporting. Hungary has identified continuous improvements of the methodologies as a reason for recalculation of all time series. The expert review team (ERT) recognized several inconsistencies between data in the NIR and in the CRF (e.g., table Summary 2 and table 10s5). This should be an issue for future improvement of QA/QC procedures.

F. Cross-cutting topics

Completeness

7. Hungary has submitted its GHG inventory data for the year 2002 using the CRF. In the 2003 submission the CRF was provided for the years 1985–1987 as well as for the average of those years (which constitute Hungary's base year) and for 1990, 2000 and 2001. For 1991–1999 only summary data at the level of source and sink categories of the *Revised 1996 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC Guidelines) are provided, without completing a CRF for those years. The Party is advised to harmonize the national database of GHG sources with the CRF categories and provide a complete CRF for all years in accordance with the UNFCCC reporting requirements. The 2004 submission covers all the relevant GHGs (CO_2, CH_4, N_2O, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6)), the indirect GHGs (nitrogen oxide (NO_X), carbon monoxide (CO) and non-methane volatile organic compounds (NMVOCs)), and sulphur oxide (SO_X), as well as all major sources/sinks. Those categories that are reported as "not estimated" ("NE") or "included elsewhere" ("IE") are explained in CRF table 9; however, there are gaps where no data have been entered and notation keys have not been used. The CRF tables are generally complete, with a few exceptions which are described in the sectoral chapters. To facilitate the completion of the time series, Hungary is advised to improve its institutional arrangements and strengthen its administrative capacity for the preparation of the national inventory.

[3] 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.

Transparency

8. The information presented in the CRF for 2002 is sufficiently clear, but the notation keys are not used systematically. The quality of the information in the NIR has improved since the previous submission, but needs further elaboration to eliminate inconsistencies between the CRF and the NIR. Moreover, more detailed descriptions of methodologies are required (e.g., with respect to fuel use for international bunkers, railways and shipping, solid waste disposal on land, and CO_2 emissions and removals from soils). The reporting of several non-energy sources (e.g., 1.A.2) in the Energy sector, the need to account for confidential data in some cases and the lack of documentation on N_2O EFs used in stationary combustion sources contribute to the general lack of transparency.

Recalculations and time-series consistency

9. Hungary has not provided recalculations for any sector in the 2004 submission; a full explanation is given in the NIR. The recalculations reported in 2003 show an attempt to achieve consistency in the inventories for the years 1985–1987, 1990 and the years since 2000. Hungary is currently performing recalculations for the years 1991–1999 in order to produce complete and consistent emissions estimates and CRF time series. Even though Hungary did not report any recalculations in the CRF, comparison with the 2003 submission revealed that recalculations have indeed been undertaken for some years of the time series; however, the lack of a full CRF for the base year, 1990, 2000 and 2001 made assessment of time-series consistency difficult. The Party is reminded that it should fully document the basis on which all recalculations are done, the justification for them and their effects on emissions estimates in both the NIR and the CRF tables, and make the full chronology of recalculations clear in its annual submissions.

Uncertainties

10. Hungary has provided for the first time quantitative uncertainty estimates according to tier 1 of the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) for all sectors. However, many inputs are based on expert judgement only. Uncertainties have been estimated for the quality of statistical AD, the EFs applied and the use of different methodologies. Qualitative uncertainty estimates are included in table 7 of the CRF. According to the NIR, the lowest uncertainty is that associated with CO_2 emissions, and the highest is that for N_2O emissions from fuel combustion. The estimated uncertainty in total emissions is less than 10 per cent while it is 2–4 per cent for CO_2, 15–25 per cent for CH_4 and 80–90 per cent in the case of N_2O. The ERT encourages Hungary to provide a more detailed description of the approaches taken and the underlying assumptions used for the uncertainty estimates in the NIR.

Verification and quality assurance/quality control approaches

11. Hungary does not have any systematic and regular QA/QC system in place. The NIR specifies that AD are verified by their individual providers, but information on their reliability and on the systems used is provided in only a few cases. The inventory agency does not have any QA/QC accreditation yet. There is only occasional checking of certain input data used for the preparation of the inventory. The NIR does not include specific plans to implement QA/QC procedures according to the IPCC good practice guidance. The ERT encourages Hungary to develop QA/QC procedures.

Follow-up to previous reviews

12. Compared with the previous review findings, the transparency and completeness of the inventory have improved slightly. Significant efforts have been made to improve the uncertainty assessment.

G. Areas for further improvement

Identified by the Party

13. The recalculations which were begun in 2003 will continue, based on a systematic plan, and should cover the years 1988–1989 and 1991–1999. Hungary also intends to concentrate on the development of specific local EFs, primarily in the Agriculture sector, and plans to improve overall consistency.

Identified by the ERT

14. The ERT encourages Hungary to improve its formal QA/QC procedures and institutional arrangements as part of the recalculation exercise in order to reduce the inconsistencies that still exist and enhance the transparency of the reporting. Formal QA/QC procedures should be included in the emissions inventory improvement plan.

15. The ERT recommends completion of the inventory time series in the CRF as a priority and encourages the Party to provide the national energy balance data in its inventory submission (as an annex to the NIR). This would significantly improve the transparency of the inventory estimates and facilitate their review. The ERT also suggests that improvements be prioritized in a way that allows the further methodological development of estimates from the key sources. Recommended improvements related to specific source/sink categories are presented in the relevant sector sections of this report.

II. ENERGY

A. Sector overview

16. In the year 2002, the Energy sector accounted for 77.1 per cent of total national GHG emissions. Fuel combustion contributed 74.4 per cent to total national GHG emissions. Total sectoral emissions fell by 30.5 per cent between the base year and 2002 as a result of decreasing emissions from stationary combustion. A decrease of the total sectoral emissions by 2.5 per cent between 2001and 2002 was also due to a decrease in emissions from stationary combustion. Emissions from transportation have been increasing steadily in recent years, and in 2002 the annual increase reached 4.8 per cent. Transport contributed 12.6 per cent to total national emissions.

17. All the main IPCC sources and gases are covered for the Energy sector. The level of disaggregation is according to the IPCC Guidelines. The sectoral background tables are essentially complete for 2002.

18. The reporting of the Energy sector is generally transparent. Calculation methodologies are documented in the NIR, but details on EFs and methodologies are not presented for all source categories. The AD for energy consumption include non-energy use of liquid and other fuels for 1.A.2 Manufacturing Industries and Construction. The Party is recommended to exclude non-energy use from the energy consumption data and to report emissions according to the IPCC Guidelines.

19. There are general inconsistencies in the time series. The NIR states that Energy sector emissions have been recalculated for the base year, 1990, 2000 and 2001 due to significant methodological and data changes. However, recalculated CRF tables for these years are not presented. The ERT welcomes the work initiated by the Party to complete and recalculate its estimates for previous years.

B. Reference and sectoral approaches

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

20. CO_2 emissions from fuel combustion have been calculated using the reference approach and the sectoral approach. Comparing CO_2 emission estimates, there is a difference of 1.5 per cent between the

two approaches for the year 2002 but there are no significant differences in CO_2 emissions for liquid, solid and gaseous fuels. For a number of fuel types no information on apparent consumption (either data or notation keys) has been provided. The ERT would recommend improved use of the notation keys.

21. The reference approach is not documented in the NIR. The ERT would recommend that the Party include a description in its next submission.

International bunker fuels

22. Because of Hungary's geographical location there is no marine bunker fuel use and, in accordance with the IPCC Guidelines, the Party has not reported bunker fuels. Emissions are reported for aviation bunkers. The ERT would encourage Hungary to include in the NIR a description of the basis on which the total fuel use for aviation is estimated, and an explanation of how emissions from domestic aviation (indicated to be included under 1.A.3b Road Transportation) are estimated and how the associated fuel amount relates to that given for aviation bunkers.

C. Key sources

1.A.1 Energy industries

23. Emissions from 1.A.1b Petroleum Refining and 1.A.1c Manufacture of Solid Fuels and Other Energy Industries are not reported in category 1.A.1 but are included instead in 1.A.2 Manufacturing Industries and Construction. The ERT would encourage Hungary to reallocate them in accordance with the IPCC Guidelines and good practice guidance.

1.A.1a Public electricity and heat production

24. The Party has estimated an own N_2O EF for energy combustion based on the international scientific literature. As a result, the implied emission factor (IEF) for N_2O emissions from solid fuels is 14 kg/TJ, which is in the upper range of the IEFs of all the Parties that have reported these emissions. The ERT would recommend the Party to undertake further QA/QC of these data and explain in the NIR the basis for the selection of EFs.

1.A.4b Residential

25. N_2O emissions from gaseous fuels amounted to 3.25 Gg in 2002 and this source is the major contributor to N_2O emissions from stationary combustion, which is a key source category. The IEF is 24 kg/TJ, which is the highest of all the Parties that have reported these emissions. Normally the IEF is below 3 kg/TJ for all Parties over all reporting years. Hungary has used a country-specific EF based on the international scientific literature without providing sufficient justification of its suitability. The ERT is of the opinion that N_2O emissions in this subcategory may be overestimated and would recommend that the Party undertake further QA/QC of these data and explain in the NIR the basis for the selection of EFs, or consider revising these EFs, as needed.

1.B.1a Coal mining and handling

26. The CH_4 EFs for solid fuels have been changed since the previous submission. The EFs are reported to be substantially lower than those used previously. The EFs reported in the 2001 NIR are also different from those in the 2002 NIR. The Party is encouraged to provide more detailed documentation of the national EFs. The Party is also encouraged to indicate whether the estimates for the base year and intermediate inventory years have been recalculated following this change in EFs.

1.B.2 Fugitive emissions – oil and gas

27. In response to previous reviews the Party has revised the methodology for estimating fugitive emissions from its oil and gas systems. In consultation with the industry the Party has concluded that its technologies resemble those of Western Europe more than those of Eastern Europe. This has resulted in significant recalculations. The changes are well described in the NIR, but the ERT would encourage Hungary to include a description of how these changes affect the base years of the inventory and to what extent changes in technology since the late 1980s have influenced the EF.

D. Non-key sources

1.A.3 Transport

28. Hungary should report emissions from domestic aviation under 1.A.3a rather than in subcategory 1.A.3b Road Transportation, as is indicated by CRF table 9. The ERT would welcome a description in the NIR of the estimation methodologies and of the data applied for railways, inland navigation and domestic aviation.

29. The N_2O IEF of 18 g/kg for diesel use in 1.A.3b Road Transport is much higher than that reported by other Parties. It is also higher than the value applied for gasoline. The Party has responded that the value is taken from CORINAIR. However, the CORINAIR value is originally given in g/km and there is no explanation of how the EF has been converted to kg/TJ. The ERT would encourage QA/QC of the whole calculation for this source of N_2O and a much more transparent description of the assumptions made about the technologies that determine the high EF.

30. Emissions from pipeline transport are reported as "IE". It is, however, not clearly indicated where the natural gas combustion-related emissions have been reported. The ERT recommends Hungary to report these emissions in category 1.A.3e in accordance with the IPCC Guidelines.

III. INDUSTRIAL PROCESSES AND SOLVENT USE

A. Sector overview

31. In the year 2002, total GHG emissions from the Industrial Processes sector amounted to 3,900 Gg CO_2 equivalent. Total emissions decreased by 30.7 per cent between the base year and 2002, and by 4.4 per cent between 2001 and 2002. The overall decrease is mainly due to a decrease in emissions from the chemical industry. Emissions of HFCs and SF_6 have increased but they represent only 10 per cent of Industrial Processes emissions and 0.5 per cent of total national emissions for 2002.

32. There are information gaps in the CRF for this sector. Emissions estimates for a number of key sources are not available for years between 1991 and 1998 (e.g., nitric acid production, cement production) and for some non-key sources for the base year and 2002 (e.g., ferroalloys production for CH_4, Solvent and Other Product Use, and 2.F Consumption of Halocarbons and SF_6). Hungary intends to address a number of these issues (as specified in the NIR) as resources become available. The ERT encourages the Party to develop a detailed and consistent time series covering all years, in particular for the key sources, such as cement production. It also suggests that Hungary focus on tier 2 estimates for CO_2 emissions from ammonia production and N_2O from nitric acid production.

33. There are a number of transparency issues with both the reporting of emissions and the description of methods in the NIR. The data reported in the CRF for Minerals and Chemical Industry have been provided at aggregated level for a number of years but without the subsector detail available in the full CRF tables, leading to a lack of transparency between categories. In the NIR there are a number of areas where the methodology for key sources is unclear. The ERT invites Hungary to provide a more

thorough description of the methodology used for chemical industry (which contains key sources) and iron and steel production.

34. Hungary identifies three key sources in the Industrial Processes sector (CO_2 from ammonia production, N_2O from nitric acid production (presented as N_2O from industry) and CO_2 from cement production). In the secretariat's analysis of key sources, only cement production and nitric acid production were identified as key sources. Key sources in the 2003 submission that are no longer identified as key sources in the 2004 submission include consumption of halocarbons and SF_6, CO_2 from limestone and dolomite use, and SF_6 from electrical equipment.

B. Key sources

2.A.1 Cement production – CO_2

35. Hungary has applied a tier 2 method and national EFs are used based on the lime (CaO) content of feedstock and clinker produced.

36. The 2002 IEF for CO_2 from cement production (at 0.53) is slightly higher than the IPCC default (0.51), and higher still for 2000. The NIR explains that the CaO content of clinker ranged from 65.76 to 67.66 per cent, resulting in the higher IEFs and increased emissions estimates. However, even using the maximum CaO content of 67.66 per cent, an IEF of only 0.53 is calculated. It is not clear what the cause of the higher IEFs – of up to 0.55 in 2000 – is for earlier years. The ERT suggests that the Party provide further clarification on the calculation of emissions to justify the high IEFs for all earlier years.

2.B.1 Ammonia production – CO_2

37. The figures for ammonia production published by the UN are 20 per cent lower than the figures reported by Hungary in the CRF. Although Hungary indicated during the review that the data provided in the CRF and used for the estimation of emissions come from the Central Statistical Office (KSH), the ERT still considers that the Party has not provided sufficient information to enable it to resolve this issue. The ERT suggests that Hungary elaborate on the methodology in the NIR in order to provide sufficient transparency. In addition, Hungary uses the lower IPCC default EF and a tier 1 approach to estimate emissions from this key source. The ERT encourages Hungary to use a more accurate tier 2 calculation method that is based on gas consumption.

2.B.2 Nitric acid production – N_2O

38. As indicated in the 2003 review report, Hungary has used the national statistics and the default EF to calculate emissions from nitric acid production. The ERT recognizes that production data are confidential. As this is a key source, Hungary is encouraged to apply a tier 2 plant-specific emissions estimate and QA/QC procedures in accordance with the IPCC good practice guidance.

C. Non-key sources

2.C.1 Iron and steel production – CO_2

39. CO_2 emissions for steel production are reported using a formula in CRF table 2(I)A–G instead of entering a numerical value, while emissions of CO_2 and CH_4 from pig iron, sinter and coke are reported as "IE" and included in the Energy sector. The ERT recommends that Hungary should not modify the CRF cells and should report all relevant emissions under Industrial Processes in accordance with the IPCC Guidelines. The Party should further explain the methodology applied and the rationale for including any process-related emissions under the Energy sector.

2.C.2 Ferroalloys production – CO_2

40. In the NIR Hungary provides a reference on the use of the IPCC default EF (1.3 t CO_2/t product) for ferro-manganese. However, the EF value proposed in the IPCC Guidelines for ferro-manganese is 1.6 t CO_2/t product; the factor of 1.3 is for ferro-silicon. The ERT encourages Hungary to check the use of the default EFs for this source category.

41. CH_4 emissions from ferroalloys production have not been estimated ("NE" is reported). These emissions are likely to be small but could be estimated using IPCC default factors. The ERT suggests that Hungary use the default methodology to estimate CH_4 emissions from this source.

2.F Consumption of halocarbons and SF_6

42. It is difficult to review the emissions related to consumption because the assumptions made about the EF are unclear. The methods used to calculate national AD from trade association data are also unclear and the information provided about those methods suggests that some consumption may be missing from the national total. The ERT suggests that transparency in the estimation of these emissions could be improved in the NIR by providing details about the assumptions made in calculating the EF used and about the methods used to estimate national consumption totals.

IV. AGRICULTURE

A. Sector overview

43. Hungary reports emissions in the year 2002 for categories 4.A, 4.B, 4.C, 4.D and 4.F, amounting to 8,917.5 Gg CO_2 equivalent, which accounted for 11.4 per cent of total national GHG emissions. Within the sector, category 4.A accounted for 18.8 per cent, category 4.B for 19.1 per cent and category 4.D for 61.5 per cent of emissions. Emissions in 2002 were 41 per cent lower than in the base year but three times as high as the lowest reported emissions, which are those for 1997. Hungary identifies five key sources in the Agriculture sector according to its key source analysis for 2002 (NIR appendix 1). The reporting of the Agriculture sector in the CRF for 2002 is complete.

44. The NIR provides a general description of methodologies and data sources, and a number of reports are referenced as supporting material for the estimates. Hungary reported recalculations in the Agriculture sector in the 2003 submission, which showed a major change due to the exclusion of N_2O from the cultivation of organic soils in category 4.D. This particular source is now reported as "not occurring" ("NO"). Table 10s5 of the 2002 CRF indicates that the total emissions in this sector have been changed again in the 2004 submission for the base year and for 1990, 2000 and 2001, even though no recalculations were reported. The revisions amount to an increase of approximately 4 per cent in these years, but no reasons are given for these apparent latest recalculations and it is not clear for which subcategories they have been undertaken.

B. Key sources

45. Agricultural practices and productivity in Hungary are becoming more like those of the European Union (EU) countries and Hungary is attempting to reflect this development in its estimation of emissions in key sources. Since the estimates for the key sources are based to a large extent on the same data, Hungary should ensure that changes in methods and data are made in a systematic manner in order to avoid inconsistencies between source categories and years and between the estimates for CH_4 and N_2O.

4.A Enteric fermentation – CH_4

46. All livestock are taken together as a key source of CH_4. Livestock populations are taken from the KSH data except for the year 1990 for which data are taken from the Food and Agriculture Organization

of the United Nations (FAO). The CRF and FAO values in 2002 are generally in good agreement. Since 2000, the KSH has undertaken surveys three times annually and annual statistics are derived from the three surveys. No clarification is provided as to whether the resultant time series is consistent for the full period. Hungary does not state whether there is three-year averaging of livestock populations.

47. The tier 1 method is applied for enteric fermentation using the EF for Western Europe but with modification in the case of dairy cattle in 2002. A value of 115.2 kg CH_4/head is indicated for dairy cattle in 2002, based on milk yield. Apparently, 100 kg CH_4/head is used for the base year and for 2000 and 2001 (according to the 2003 submission), which may introduce some inconsistency. The associated milk yield in 2002 is not specified in the NIR or CRF tables, but Hungary stated during the review that it is 6,161 kg/head/yr. However, considering this value and the regression equation in the NIR (page 61), the correct EF would be 114.7 kg CH_4/head. As regards non-dairy cattle, there is no explanation to support the choice of 48 kg CH_4/head in preference to the East European default value of 56 kg CH_4/head. The ERT recommends that milk yields be reported in the NIR in future and that the justification for using 48 kg/head for other cattle be made clear.

4.B Manure management – CH_4

48. Hungary reports the distribution of animal wastes to different animal waste management systems (AWMS) in the additional information table to table 4.B(a) as well as in table 4.B(b) but does not apply this information in a tier 2 determination of the EF for 2002. Instead, default IPCC tier 1 values for Eastern Europe are used, except for swine, where West European defaults are chosen. This choice of EF is not consistent with the choice made for 4.A or with the estimation of N_2O from manure management. According to the 2003 submission, the higher default EFs for Western Europe were used for the base year, and also for 1990, 2000 and 2001, resulting in an apparent inconsistency with the 2002 inventory (2004 submission). However, during the review the ERT learned that CH_4 emissions from manure management were recalculated for those years for the 2004 submission using the EF adopted for the 2002 inventory, which explains the lower estimates in the base year and in 1990, 2000 and 2001 given in CRF table 10 compared with the estimates in the 2003 submission. The ERT recommends Hungary to use a tier 2 method using the share of each AWMS reported in table 4.B(a).

4.B Manure management – N_2O

49. West European nitrogen (N) excretion rates have been adopted for all animal types except goats and horses on the basis of consultations with experts and a number of referenced reports. Hungary should substantiate the statement that feeding practices are close to those of West European countries by providing information on diets and associated energy and N contents. From the available information, the N excretion rates for 2002 are significantly higher than those used in 2000 and 2001 and in the base year, which gives rise to an inconsistency that also affects N_2O emissions from agricultural soils. As regards EFs, Hungary has used the IPCC default factors for the AWMS in use in Hungary for all years.

4.D.1 Agricultural soils – direct N_2O

50. The NIR states that the amount of animal manures applied to soils may be only 50 per cent of the manures produced in Hungary. A response from Hungary obtained during the review, referring to studies of the nitrogen, phosphorus and potassium content of manure applied to soils, did not clarify this matter. This statement needs further explanation as it suggests that table 4.B(b) may seriously misrepresent the allocation of animal wastes to the different management systems.

51. The calculation of F_{SN} and F_{AW} values reported in table 4.D can be fully traced using the information on fertilizer use and N excretion by AWMS given in table 4.B(b) and the values of $Frac_{GRAZ}$, $Frac_{FUEL}$, $Frac_{GASF}$ and $Frac_{GASM}$. The IPCC default values are used for $Frac_{GASF}$ and $Frac_{GASM}$ in all years although the NIR states that 0.3 may be more appropriate for $Frac_{GASM}$ in Hungary. The CRF data

on synthetic fertilizer use in the base year (according to the 2003 submission) match the data given in the FAO database but are approximately 20 per cent lower in the years 2000, 2001 (according to the 2003 submission) and 2002 (according to the 2004 submission). Hungary indicated during the review that national statistics have been used for these years. The ERT recommends that in its next NIR Hungary give an explanation for this difference, report the use of synthetic nitrogen fertilizers, and confirm that the source of the data is the KSH.

52. The estimation of N_2O emissions from N-fixing crops and crop residues is based on the tier 1a methodology using the default values of $Frac_{NCRBF}$ and $Frac_{NCRO}$, and the results are correctly reported in table 4.D. However, the crop types and production quantities that generate the residues are not given for this source and it is not clear how the study that is referenced has been used to support the estimates in the case of N_2O emissions from the N-fixing crops relevant in Hungary. The Party is encouraged to include this information in the NIR for future review.

4.D.1 Agricultural soils – indirect N_2O

53. The accounting of nitrogen inputs for indirect emissions is consistent with that in the estimation of direct emissions of N_2O from agricultural soils. The calculation of N inputs from atmospheric deposition and leaching reported in table 4.D can be traced using the information on fertilizer use and N excretion by AWMS given in table 4.B(b) and the values of $Frac_{GASF}$, $Frac_{GASM}$ and $Frac_{LEACH}$.

54. Indirect emissions of N_2O from leaching are the major source of emissions in category 4.D. Hungary uses the default value of 0.3 for $Frac_{LEACH}$ in all years even though there was a decrease of 50 per cent in the use of nitrogenous fertilizers between the base year and 2002. The Party may wish to reconsider the suitability of 0.3 for $Frac_{LEACH}$ in the recalculations being undertaken for the years 1991–1999, especially for those years when the use of fertilizers was much lower than in the base year.

C. Non Key sources

4.C Rice cultivation – CH_4

55. A lack of transparency in reporting that was identified in earlier reviews remains in respect of this source of CH_4. Hungary states in the NIR (page 66) that the IPCC default value of 20 $g/m^2/yr$ is used for EF_C (the EF for continuously flooded fields), along with 0.5 and 1.0 for the scaling factors SF_W and SF_O, respectively, to estimate CH_4 emissions. With these parameters the IEF should be 10 $g/m^2/yr$, but it is reported as 20 $g/m^2/yr$ in the CRF. This suggests that SF_O is 2.0, rather than 1.0 as stated, which is consistent with Hungary's response to an earlier desk review. Assuming that there is some organic amendment to soils, the value of 2.0 is in line with the IPCC Guidelines.

V. LAND-USE CHANGE AND FORESTRY

A. Sector overview

56. In the year 2002, the LUCF sector in Hungary represented a net sink of 2,359 Gg CO_2, equivalent to 4.1 per cent of total CO_2 emissions. This result is the product of net CO_2 removals in 5.A.2 temperate forests (also including 5.B.2), CO_2 emissions from burning and decay of slash under 5.B.5 Other, CO_2 emissions from the cultivation of mineral soils (5.D.1), and emissions from the liming of agricultural lands (5.D.3). The Party indicates that the abandonment of managed lands is an activity that does not occur for its temperate forests. Comparing total net CO_2 removals in 2002 with those for 2001, total CO_2 removals decreased by 48 per cent. This is due mainly to the very large increase in reported emissions from soils (from 296 Gg CO_2 in 2001 to 2,580 Gg CO_2 in 2002). The NIR indicates (in chapter 7.1) that "removals are gradually growing", but this description of the trend is not supported by the data provided. Instead, removals increased from the base year to 1993 and, except for 1997, show small variations until 2001. In

addition, changes in methodologies made by the Party make the trend analysis difficult. Even though stocks of wood in the forests are increasing consistently, harvest seems to offset CO_2 removals.

57. Some uncertainties are found in the AD, which are still unknown and inherent to the national forest inventory system. In addition, conversion factors used need to be assessed. No QA/QC was applied at national level within the sector; however, the NIR mentions that data verification was conducted concerning the AD. Also, the Party plans to make the time series consistent very soon.

B. Sink and source categories

5.A Changes in forest and other woody biomass stocks

58. The methodologies used are stated to be the IPCC tier 1 or tier 2 methods. Emissions and removals estimates as well as the required background data are reported in table 5.A for 1.697 million ha of temperate forest, although the NIR states that there are 1.9 million ha of forest in Hungary. The average annual growth rates are country-specific and lower than the IPCC default values. Country-specific biomass EFs are based on a report which is referenced but the values are not presented in the NIR. For carbon fraction of dry matter, the IPCC default value has been used. The National Forest Database provides good data on commercial harvest and fuel wood consumed, and a nominal amount of other wood use is included.

59. Although non-forest trees are referred to under 5.A.5 Other in table 5, no estimates have been provided ("NE" is reported). There is an inconsistency between table 5 and table 5.A related to the amount of CO_2 emissions, which is 6,656 Gg according to table 5.A and 6,633 Gg according to table 5.

5.B Forest and grassland conversion

60. Table 5 (section Forest and Grassland Conversion) includes data on the burning and decay of slash under 5.B.5 Other; however, these estimates are not supported by the provision of AD or IEFs in table 5B, although the values and methodology are described in the NIR. The NIR states that this activity is reported in category 5.E Other.

5.D CO_2 emissions and removals from soil

61. CO_2 emissions from soils show a very substantial increase in 2002 compared with 2001 (from 296 Gg CO_2 in 2001 to 2,580 Gg CO_2 in 2002), but the reliability of these figures is very low due to the methodology used, which is described in the NIR. According to the Party the inconsistencies in the estimates for 2001 – and previous years – are attributable to the implementation of a new statistics system. Hungary also recognizes the need to review and recalculate the CO_2 emissions from soils in order to eliminate these inconsistencies. This is considered relevant because of the significant impact on effective net removals of CO_2. The Party should clarify whether those emissions are overestimated or have been underestimated in the earlier years, and reasonable estimates of uncertainty should be included.

62. The NIR (chapter 7.3.5) mentions that recalculations for this source category have already been done in 2003 for the years constituting the base year and 1990, and that recalculations for the following years are currently being undertaken. It mentions that, due to the lack of data for lime consumption, it is assumed that lime effectively used coincides with the lime requirements of the soils. Adopting this assumption could introduce a great deal of uncertainty in the estimates unless reasonable proof can be provided that farmers consistently manage the pH of their soils according to this criterion. For the sake of accuracy, consistency and transparency, full attention should be paid to improving the quality of the data in this particular category.

VI. WASTE

A. Sector overview

63. In the year 2002 the share of the Waste sector in the total GHG emissions of Hungary was 6.2 per cent. Estimates are provided for CH_4, CO_2 and N_2O. The main gas emitted was CH_4, contributing 97.8 per cent to the total emissions from the sector in 2002.

64. Hungary's estimates in this sector are not complete. As previous reviews noted, CH_4 emissions from sludge and N_2O emissions from human sewage are not estimated. Emissions from industrial incinerators are not completely covered, as noted in the NIR (page 97).

65. Some explanation and documentation need to be provided in the NIR in order to increase transparency in the use of some country-specific parameters. The ERT also noted some inconsistencies between the NIR and the CRF.

66. Recalculations for the base year and 1990 for CH_4 emissions from solid waste disposal sites (SWDS) have been performed (NIR page 92). However, they are not adequately explained in the NIR. Hungary plans to recalculate the time series for 1991–1997 for CH_4 emissions from SWDS and waste-water handling, and the ERT recommends the Party to make this time series consistent. The ERT appreciates Hungary's planning to make the time series consistent and recommends, as previous reviews have done, that Hungary use the IPCC good practice guidance methodology.

B. Key sources

6.A Solid waste disposal on land – CH_4

67. Hungary has used the IPCC default method for the years 2000–2002. As a means for comparison, Hungary has also estimated emissions for these years using a methodology called tier 1 country-specific methodology, and the results were very similar. The country-specific methodology was used for the years before 2000. Since the Party has identified this source category as a key source, the ERT supports the recommendation of the previous review that Hungary use a higher-tier method.

68. Hungary should increase the transparency of its reporting by providing explanations of and documenting the following country-specific parameters used: the methane correction factor (MCF) (0.98 instead of 1 recommended by the IPCC for managed SWDS); the gas generation rate (250 m^3/t decomposing waste); the degradable organic carbon (DOC) fraction; the oxidation factor; and the CH_4 conversion rate constant. CH_4 recovery should be subtracted from the emissions only if well documented data are available. This seems to be the case only for the year 2000, but not for 2001 and 2002, where the 2000 value has been used.

69. The ERT found inconsistencies between the NIR and the CRF, which should be addressed in the Party's next submission:

(a) Emissions from unmanaged disposal sites have been reported as "NO", while data for annual municipal solid waste (MSW) disposed in such sites and an MCF have been provided in the CRF. Furthermore, the NIR mentions that anaerobic decomposition takes place in unmanaged SWDS.

(b) CO_2 emissions from 6.A Managed Solid Waste Disposal on Land are reported for 1991–1999, while for the base year, 1990, and 2000–2002 this source is reported as "NO" (table 10 of the CRF).

(c) Hungary should also harmonize its data on the composition of landfilled wastes in the CRF and the NIR (e.g., for textiles, the NIR indicates 3 per cent (page 90), while in the CRF

2.5 per cent is reported, leading to a sum less than 100 per cent). The information on the distribution of solid wastes to different disposal systems is not complete.

6.B Waste-water handling – CH_4

70. The IPCC methodology has been used. As the NIR states, appropriate data are not available on industrial waste water or domestic and commercial waste water in Hungary.

71. Hungary states in the NIR that IPCC default values are used for the calculation of emissions from industrial waste water. The values and their units (NIR page 94) are not consistent with those indicated in the IPCC Guidelines. The ERT recommends that Hungary specify clearly the default factors used in the recommended IPCC units. It is praiseworthy, however, that Hungary reports in its CRF different chemical oxygen demand (COD) values for some industrial waste-water streams.

72. Emissions from sludge produced during waste-water treatment and the distribution of decomposing matter between water and sludge are not estimated due to lack of information. The ERT recommends that Hungary use expert judgement to calculate the data, as stated in the IPCC good practice guidance.

73. Hungary should also include estimates of N_2O emissions from human sewage using the IPCC default methodology and AD from FAO if country-specific data are not available, as recommended by the previous review.

C. Non-key sources

6.C Waste incineration – CO_2, N_2O

74. Hungary should specify whether emissions are reallocated and reported under Energy, since incineration is used for energy purposes, and show that reallocation is done properly. AD on amounts of incinerated municipal waste are provided in the NIR from 1985 to 2002 and the methodology used is acceptable since this is not a key source.

75. Hungary should provide documentation on the estimation of industrial wastes incinerated as recommended in the previous review report. Industrial waste incinerators are currently being surveyed, and this will enable Hungary to make its emissions estimates more complete.

ANNEX 1: MATERIALS USED DURING THE REVIEW

A. Support materials used during the review

2003 and 2004 Inventory submissions of Hungary. 2004 submission including a set of CRF tables for 2002 and an NIR. 2003 submissions including CRF tables for 1985, 1986, 1987, average 1985–1987 (base year), 1990, 2000 and 2001.

UNFCCC secretariat (2004). "Report of the individual review of the greenhouse gas inventory of Hungary submitted in the year 2003 (Desk review)." FCCC/WEB/IRI(1)/2003/HUN (available on the secretariat web site <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/pdf/hundeskrev03.pdf>).

UNFCCC secretariat. "2004 Status report for Hungary" (available on the secretariat web site <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/inventory_review_reports/application/pdf/hun04.pdf>).

UNFCCC secretariat. "Synthesis and assessment report of the greenhouse gas inventories submitted in 2004. Part I." FCCC/WEB/SAI/2004 (available on the secretariat web site <http://unfccc.int/resource/webdocs/sai/2004.pdf>) and Part II – the section on *Hungary* (unpublished).

UNFCCC secretariat. Review findings for Hungary (unpublished).

Hungary's comments on the draft "Synthesis and assessment report of the greenhouse gas inventories submitted in 2004" (unpublished).

UNFCCC secretariat. "Handbook for review of national GHG inventories". Draft 2004 (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", "Part II: UNFCCC reporting guidelines on national communications" and "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention." FCCC/CP/1999/7 (available on the secretariat web site <http://unfccc.int/resource/docs/cop5/07.pdf>).

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" and "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention." FCCC/CP/2002/8 (available on the secretariat web site <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 on the following web site: <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

IPCC/OECD/IEA. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, volumes 1–3, 1997* (available on the following web site: <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>).

B. Additional materials

Responses to questions during the review were received from Mr. László Gáspár (National Directorate for Environment, Nature and Water – Directorate for Environmental Protection) including additional material on the methodology and assumptions used.

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