UNITED NATIONS
NATIONS UNIES

FRAMEWORK CONVENTION ON CLIMATE CHANGE - Secretariat
CONVENTION - CADRE SUR LES CHANGEMENTS CLIMATIQUES - Secrétariat

FCCC/WEB/IRI(1)/2003/HUN 7 April 2004

HUNGARY

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

(Desk review)

I. OVERVIEW

A. Introduction

1. In accordance with decision 19/CP.8 of the Conference of the Parties, the United Nations Framework Convention on Climate Change (UNFCCC) secretariat coordinated a desk review of the 2003 greenhouse gas (GHG) inventory submission of Hungary. The review took place from 13 to 31 October 2003, and was conducted by the following team of nominated experts from the roster of experts: Generalist – Mr. Samir Amous (Tunisia) and Mr. Bernd Gugele (European Community); Energy – Mr. Lambert Schneider (Germany) and Mr. Francis Yamba (Zambia); Industrial Processes – Mr. Luis Conde Alvarez (Mexico) and Mr. Tinus Pulles (the Netherlands); Agriculture – Mr. Vitor Góis (Portugal) and Mr. Haruo Tsuruta (Japan); Land-use Change and Forestry (LUCF) – Mr. Mikhail Gytarsky (Russia) and Mr. Tomás Hernández-Tejeda (Mexico); Waste – Ms. Elizabeth Scheehle (United States) and Mr. Charles Jubb (Australia). Mr. Samir Amous and Mr. Mikhaill Gytarsky were the lead reviewers of this review. The review was coordinated by Ms. Sevdalina Todorova-Brankova (UNFCCC secretariat).

2. In accordance with the UNFCCC "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention" (hereafter referred to as the UNFCCC reporting guidelines), a draft version of this report was communicated to the Government of Hungary, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

3. The expert review team (ERT) commends Hungary for the substantial progress in the improvement of the overall quality of its inventory submission in comparison with the previous review. It acknowledges the efforts undertaken by Hungary to improve quality of national reporting through the national inventory report (NIR) and common reporting format (CRF), as well as to introduce the *Intergovernmental Panel on Climate Change (IPCC) Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) in the inventory preparation, although as an economy in transition (EIT) Party, Hungary has two additional years to implement this guidance (FCCC/SBSTA/2000/5, paragraph 48 (c)). The ERT also acknowledges the Party's supportive attitude to the review and its efficient cooperation with the review team.

[1] In the symbol for this document, 2003 refers to the year in which the inventory was submitted, and not to the year of publication. The number (1) indicates that this is a desk review report.

B. Inventory submission and other sources of information

4. In its 2003 submission, Hungary submitted a complete set of CRF tables for the years 1985–1987 (average (base year[2]) and each of the years in the period), 1990, 2000 and 2001, and an NIR. Where needed the ERT also used previous years' submissions, additional information provided during the review and other information. The full list of materials used during the review is provided in annex 1 to this report.

C. Emission profiles and trends

5. In the year 2001, the most important GHG in Hungary was carbon dioxide (CO_2), contributing 74.8 per cent to total[3] national GHG emissions expressed in CO_2 equivalent, followed by methane (CH_4) – 13.1 per cent and nitrous oxide (N_2O) – 11.4 per cent. Perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF_6) taken together contributed 0.7 per cent of the overall GHG emissions in the country. The Energy sector accounted for 78.1 per cent of total GHG emissions followed by Agriculture – 9.5 per cent, Waste – 6.8 per cent, and Industrial Processes – 5.2 per cent. Total GHG emissions (excluding LUCF) amounted to 78,923 Gg CO_2 equivalent and decreased by 29.9 per cent from the base year (average of the years 1985–1987) to 2001. Between 1990 and 2001 GHG emissions decreased by 17.4 per cent. Emissions of all gases decreased considerably in Hungary between the base year and 2001 – CO_2 by 29.8 per cent, CH_4 by 23.5 per cent and N_2O by 38.1 per cent. The main decreases were in CO_2 emissions from manufacturing industries and other sectors, CH_4 from agriculture (enteric fermentation and manure management) and from solid fuels, and N_2O from agricultural soils. The trends are described in the NIR but not explained in detail for all relevant sources.

D. Key sources

6. Hungary reports a tier 1 key source analysis as part of its 2003 submission. In addition to a level assessment for 2001, a trend assessment for 2000–2001 was performed and included in the NIR. The key source analysis (level assessment) performed by the Party and the UNFCCC secretariat[4] produced similar results. The differences were due to different aggregation of N_2O emissions in the two analyses, namely: the category N_2O Emissions from fuel combustion should be reported as N_2O Emissions from stationary combustion, because it does not include N_2O from mobile combustion; and the category 1.A.5 CO_2 Emissions from Other (bottom of page 94, appendix 1 of the NIR) should also be a key source according to the trend assessment. The ERT encourages Hungary to provide in the NIR a more clear linkage between the determination of areas for inventory improvement and the national key source analysis.

E. Main findings

7. The ERT noted that Hungary has implemented some of the improvements recommended by the previous in-country review. The main improvements are the recalculations made for the base year and 1990, improvement of the key source analysis, and the provision of more detailed information for process types, methodologies, activity data (AD) and emission factors (EFs) in the NIR. However, more detail is needed for a fully transparent inventory, and the inventory submitted by Hungary is still not fully in conformity with the UNFCCC reporting guidelines, mainly because of the lack of complete CRF tables for entire time series and the lack of transparency of the NIR. Hungary needs to make further efforts to

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[2] According to the provisions of Article 4.6 of the Convention and decisions 9/CP.2 and 11/CP.4, Hungary, as an Annex I Party undergoing the process of transition to a market economy, is allowed to use the average of the years 1985–1987 as its base year.

[3] 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.

[4] The UNFCCC 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. 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.

achieve full implementation of the IPCC good practice guidance. A number of recommendations from the 2002 in-country review have been only partially implemented or not implemented at all; the cross-sectoral issues not yet fully implemented are listed in paragraphs 14 and 15 below.

F. Cross-cutting topics

Completeness

8. Hungary has provided CRF data for 1985–1987, 1990, 2000 and 2001 that are fairly complete, with a few exceptions, such as emissions from glass production and N_2O from waste-water handling. In CRF table 10, data on emissions of CO_2 from chemical industries, biomass and soil; on CH_4 from fuel combustion (by source category) and chemical industries; on N_2O from fuel combustion (by source category), manure management and prescribed burning of agricultural residues; and on fluorinated gases are not provided for the period 1991–1997, nor are data on N_2O emissions from the chemical industry for 1991–2000. CH_4 and N_2O emissions from international aviation are not provided for 1998–1999. Notation keys are only occasionally used. Emissions data for 1988–1989 have not been provided.

Transparency

9. The transparency of the Hungarian submission has improved thanks to the provision of base year estimates and more detailed information in the NIR. According to the NIR, data on activated carbon production are confidential, and emissions from it were not estimated in 2001. Information about other technologies was declared confidential in 2000, but their aggregate emissions were published. It is unclear how this affects the rest of time series. Further improvements may be achieved by providing a complete CRF time series and more explanation in the NIR on the methodologies used, the main reasons for recalculations and responses to previous reviews.

Recalculations and time-series consistency

10. Since inventory year 1998, Hungary has been preparing inventories using the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC Guidelines). The base year, 1990 and 2000 have been recalculated according to the IPCC Guidelines. However, information on recalculations is only available for the year 2000 and is very limited (CRF tables 8(a) and 8(b)). The time series for 1991–1997 has not been recalculated because of lack of resources. Some sectors of the 1998 and 1999 inventories also need to be recalculated. According to CRF table 8(a), the recalculations for 2000 resulted in a decrease in the figures for GHG emissions by 7.9 per cent excluding LUCF (and 8.7 per cent including LUCF). The gases most affected, by sector, are: CO_2 from transport (–8.7 per cent); CH_4 fugitive emissions from fuels (–61 per cent), N_2O from agricultural soils (–62.9 per cent); and N_2O from all source categories of Energy sector (+1,703 per cent). The recalculation of the base year increases the figures for total emissions by 10.7 per cent, mainly as a result of an increase in N_2O emissions from Agriculture (+500.2 per cent or 7,070 Gg CO_2 equivalent). The recalculations are partly due to the recommendations of the previous review and were undertaken to make the base year estimates more consistent with recent years. However, they are insufficiently documented in both the CRF and the NIR. The ERT recommends that Hungary provide recalculations for all years in the CRF and the NIR, with more transparent explanations of the reasons for them and their quantitative effects on each of the most important source categories.

Uncertainties

11. The NIR states that the uncertainty estimates are calculated according to the IPCC good practice guidance mainly for key source categories. Qualitative descriptions of the level of uncertainty are given where calculation according to the IPCC good practice guidance was not possible. However, it is not clear which tier was used or for which source categories uncertainty estimates were made. In the NIR, the following uncertainty ranges are provided: CO_2 +/–2 – 4 per cent, CH_4 +/–15 – 25 per cent, and N_2O +/–80 – 90 per cent. Qualitative uncertainty estimates are also given in CRF table 7. The table

indicates a reduction of uncertainties for several source categories but no clear indication is provided as to how and why they have been reduced. The ERT encourages Hungary to provide a description of the approaches and underlying assumptions used for the quantitative and qualitative uncertainty estimates it reports. It also recommends that the Party provide a clear linkage between the uncertainty analysis and the prioritization of further improvements in the inventory.

Verification and quality assurance/quality control approaches

12. Quality checks are made by the experts involved in compiling the GHG inventory, but there is no regular quality assurance/quality control (QA/QC) system in place. The NIR mentions that AD are provided by several accredited sources, but information on their reliability is provided only in a few cases. The NIR does not include concrete plans to implement QA/QC procedures in line with the IPCC good practice guidance.

G. Areas for further improvement

Identified by the Party

13. The NIR identifies some areas for improvement, namely: time-series consistency, in particular the recalculation of the time series for 1991–1997; the development of country-specific EFs, in particular for Agriculture; and the allocation of more resources to calculating uncertainty estimates.

Identified by the ERT

14. The major areas for improvement related to cross-cutting issues include: (a) the provision of complete time series for fluorinated gases and enhancement of the consistency of the estimates for 1998 and 1999 with regard to specific sectors; (b) the provision of complete CRF data for each year and a schedule for recalculations; (c) expanded use of notation keys; (d) the need for more detailed explanation of the sources of AD, their documentation and archiving methods used, and the reasons for recalculations in the CRF; (e) the use of the base year for trend assessment in the key source analysis; (f) the development of QA/QC and long-term improvement plans in accordance with the IPCC good practice guidance; and (g) the provision of more information on methods used and source categories considered in the uncertainty analysis.

15. To improve the transparency of the inventory estimates, Hungary is encouraged to include its national energy balance data in the NIR. The ERT also recommends that Hungary apply higher tier methods for key sources and to provide information on changes undertaken in response to the issues identified by the previous reviews. Recommended improvements relating to specific source/sink categories are presented in the relevant sector-specific sections of this report.

II. ENERGY

A. Sector overview

16. In the year 2001, the Energy sector contributed 78.1 per cent of total GHG emissions in Hungary (without LUCF). Fuel combustion is the main source, accounting for 96.4 per cent of GHG emissions in the Energy sector, while fugitive emissions make a relatively small contribution (3.6 per cent). Emissions from energy industries are the largest source within the Energy sector (35.7 per cent), followed by others (26.8 per cent), manufacturing industries and construction (17.6 per cent) and transport (15.2 per cent). In 2001, GHG emissions in the Energy sector were 16.1 per cent below the 1990 level and 28.7 per cent below the base year level.

17. For the years provided in the CRF, the reporting of emissions in the Energy sector is fairly complete. In response to the previous reviews, the CH_4 and N_2O EFs for fuel combustion have been revised and included in the NIR. However, precise references and explanations for their choice are not always provided. Some of the revised EFs are outside the usual range reported by other Parties. In line

with the previous reviews, the ERT recommends that Hungary provide in the NIR a clear and transparent description of AD collection, the methodologies and EFs used, and underlying key assumptions. More precise information on lower heating values and assumed oxidation factors should also be provided. Hungary is also encouraged to explain the choice of EFs and to reassess the adequacy of those EFs which are identified as outliers.

18. In the recalculation of fuel combustion, similar or the same CH_4 and N_2O EFs have been used for all years. For some source categories, however, emission intensity may have changed significantly, for example, for N_2O emissions from road transportation. The ERT recommends that Hungary use the IPCC good practice guidance tier 2 approach for key sources and to reflect technology changes over time in the EFs used.

B. Reference and sectoral approaches

Comparison of the reference approach with the sectoral approach

19. CO_2 emissions from fuel combustion have been calculated using the reference and the sectoral approaches. For all reported years the difference in CO_2 emissions between the two approaches is relatively small and reasonable (1.29 per cent in 2001).

International bunker fuels

20. In response to the previous review, Hungary has provided estimates for emissions from domestic aviation, which were previously reported as "not occurring" ("NO"). However, no information is provided to explain how domestic aviation is separated from international aviation. The ERT encourages Hungary to provide this information.

21. Hungary does not report on emissions from international navigation. In its response to the draft review report, Hungary explained that the international navigation has practically disappeared after 1990. The ERT encourages Hungary to separate emissions from international navigation in accordance with the IPCC good practice guidance for those years where such emissions occurred.

Feedstocks and non-energy use of fuels

22. In line with the previous review, Hungary is encouraged to provide in the NIR and the CRF documentation box background information on the assumptions made with regard to feedstocks.

Country-specific issues

23. CH_4 emissions from the use of thermal water in Hungary are reported under 1.A.5 Other Fuel Combustion. Since these emissions are not related to fuel combustion, the ERT that recommends Hungary consider to allocate them under category 1.B.2d Fugitive Emissions, consistent with the latest updates of table 1.B.2 of the CRF (FCCC/CP/2002/8).

C. Key sources

Stationary fuel combustion: gas, coal and oil – CO_2

24. The CO_2 implied emission factors (IEFs) for solid fuels in the category 1.A.2 seem to be inconsistent within the time series. Values vary significantly between single years across all industries. The CO_2 IEFs for solid fuels in category 1.A.2c Chemicals are higher than the average reported by other Parties. In category 1.A.4, the CO_2 IEF for liquid fuels is rather low compared with those reported by other Parties and varies significantly across subcategories and inventory years. To improve transparency of reporting, the ERT encourages Hungary to include the data on fuel combustion in the next inventory submission.

25. As indicated in the previous review, coal-derived (refinery) gases are included under gaseous fuels instead of solid fuels, leading to a relatively high IEF for gaseous fuels. This seems to have been partly adjusted; however, there are still some inconsistencies with the category iron and steel production. The CO_2 IEF for gaseous fuels is appropriate for 2001, 1990 and the base year (56 kg/GJ), but it is significantly higher for 2000 (88 kg/GJ). In 2000, the CO_2 IEF for gaseous fuels in energy industries is also higher (66 kg/GJ) than that for all other years reported (56 kg/GJ).

26. As with the previous review, the ERT encourages Hungary to specify clearly which sectors are reported under 1.A.2f Other Sectors. In addition, the CO_2 IEF for liquid fuels in this category varies considerably over time, being significantly lower in 2000 and 2001 than in other years. Hungary is encouraged to specify what the other fuels with comparatively low CO_2 IEF values are.

27. Hungary reports CO_2 emissions from gaseous fuels in category 1.A.5 Other. It is not clear what the physical source of these emissions is (the documentation box refers to "loss of measuring"). If this emission source reflects losses in the natural gas pipeline network (as indicated in the NIR), these emissions should be reported as fugitive emissions (in 1.B.2b), as they are not related to fuel combustion activities. Moreover, such fugitive emissions are usually mainly CH_4 rather than CO_2. If this emission source is in fact the combustion of CH_4 in compressor stations for pipelines, the relevant emissions should be reported under 1.A.3e Other Transportation.

Road transportation: gasoline, natural gas – CO_2

28. As identified in the 2002 review, the CO_2 EF used for 1.A.3b Road Transportation is not the most appropriate. Furthermore, the CO_2 IEF for natural gas is lower in 2001 (56 kg/GJ) than in 2000 and 1990 (63 kg/GJ). The ERT encourages Hungary to use country-specific EFs or apply a more appropriate default EF for gasoline (73 kg/GJ), as in table I-36 of the IPCC Guidelines.

Stationary fuel combustion – N_2O

29. N_2O emissions from fuel combustion are identified by Hungary as a key source. In the analysis performed by the secretariat, the stationary combustion of coal and gas was also identified as a key source of N_2O emissions. As with the previous review, the ERT encourages Hungary to develop a tier 2 approach for estimating emissions from this source, as recommended by the IPCC good practice guidance.

30. In 1998 and 1999, N_2O emissions in CRF table 10 are significantly lower than in other years. Some of the revised EFs are at the upper end of the range compared with those of other Parties, for example, coal combustion, liquid and gaseous fuels in 1.A.1 Energy Industries and 1.A.3b diesel use for Road Transportation. In addition, the time series are not always consistent, in particular for categories 1.A.3 Manufacturing Industries and Construction and 1.A.4 Other. The ERT recommends that Hungary provide more explanation on the choice of EFs, improve the consistency of its time series and reassess the outliers.

Fugitive emissions: coal mining and handling – CH_4

31. For the years 2000 and 2001, Hungary has recalculated fugitive CH_4 emissions from coal mining and handling using national EFs instead of the default ones. For the base year and 1990, the EFs applied differ significantly from those used for 2000 and 2001. The CH_4 EF for underground coal mining applied (2 kg/t) is lower than the IPCC defaults. The rationale for the choice and use of these EFs is not explained in the NIR. Hungary is encouraged to explain the use of all EFs, to make consistent time-series estimates and to check the adequacy of the CH_4 EF for underground coal mining. As stated in the previous review, emissions from the transformation of solid fuel should be reported or it should be specified where they are included.

Fugitive emissions: oil and natural gas operation – CH_4

32. Hungary has also recalculated fugitive CH_4 emissions from oil and gas production. The revised estimates are based on a methodology used in the Canadian GHG inventory. Since recalculations have

only been carried out for some years, the time series of CH_4 emissions from oil and gas operations is not consistent: the emissions amount to approximately 55 Gg in the base year 1985–1987 and in 1990, to approximately 300 Gg from 1991 to 1999, and to approximately 70 Gg in 2000 and 2001. The IEFs used also vary considerably across the time series. In all the years reported the CH_4 IEF for oil production is significantly higher than the values reported by other Parties and the IPCC default range. As stated in the previous review, Hungary currently does not estimate fugitive emissions from natural gas which crosses the country but is not consumed within the country. The ERT encourages Hungary to apply consistent recalculations to all years, to provide more thorough background information on the appropriateness of the Canadian EFs for the whole time series from 1985 to the present, and to provide estimates of emissions from the transport of natural gas through the country.

D. Non-key sources

Stationary and mobile fuel combustion: coal, oil, gas – CH_4

33. The CH_4 EFs have been recalculated for all fuel combustion sectors. However, the revised EFs in the NIR are not always consistent with the IEFs reported in the CRFs: for example, the CH_4 EF for diesel (3.5 kg/TJ) and aviation gasoline (19 kg/TJ) in the NIR have been applied in 2000 and 2001 in the CRF, but not in the other years reported, where the IEFs used are different (3 kg/TJ and 5 kg/TJ). Some of the revised EFs are outliers: this is the case, for example, with liquid fuels in 1.A.1 Energy Industries (the IEF is rather low compared with those of other Parties and the IPCC default value), solid fuels in 1A.2 Manufacturing Industries and Construction (the IEF is the highest value among all Parties) and gaseous fuels for 1.A.3b Road Transportation (Hungary's IEF is one-tenth the IPCC default value). The ERT recommends that Hungary provide clear references and rationales for the choice of EFs and to improve the time-series consistency, since some IEFs differ significantly from year to year.

Mobile combustion: all fuels – CO_2, CH_4, N_2O

34. Fuel consumption in 1.A.3d Navigation has decreased from approximately 1900 TJ in 1985 to approximately 30 TJ in 2000 and 2001. The CO_2 EF for gas/diesel oil is lower than it is in all other countries that report on a net calorific value **(**NCV) basis. The use of lubricants has only been reported for 1985. The ERT encourages Hungary to reassess the appropriateness of its estimates for navigation.

35. In response to the 2002 review, Hungary has estimated fuel combustion in 1.A.3a Civil Aviation, which was previously reported as "NO". However, the data provided show quite large fluctuations. The consumption of gasoline amounts to 1 TJ in 1990 and to 108 TJ in 2000. No consumption is reported for 1986. The ERT recommends that Hungary provide more explanation of the basis for estimation in the NIR and to revise its estimates if appropriate.

36. In response to the 2002 review, CO_2, CH_4 and N_2O emissions from agricultural machinery previously reported under 1.A.3e Other Transportation have been reallocated to 1.A.4c Agriculture in accordance with the IPCC Guidelines.

III. INDUSTRIAL PROCESSES AND SOLVENT USE

A. Sector overview

37. In the year 2001, total GHG emissions from the Industrial Processes sector amounted to 4,079 Gg CO_2 equivalent. They decreased by 27.5 per cent from the base year and increased by 14.4 per cent from 2000. The overall decrease is mainly due to a decrease of emissions from chemical industry. However, consumption of halocarbons and SF_6 has increased 4.4 times since the base year, mainly as a result of the inclusion of HFC and PFC emission estimates in the most recent years. As mentioned in the NIR, the amount of F-gases used in fire extinguishers and in foam blowing has not been determined. In terms of gases, CO_2 shows the greatest decrease – of 37.2 per cent compared with the base year – followed by PFCs with a 25.8 per cent decrease and N_2O with a 16 per cent decrease. Emissions of the other gases

(CH_4, HFCs and SF_6) have increased; in terms of weight, they represent 1.6 per cent of the emissions in this sector for the base year and 8.7 per cent for 2001.

38. In the year 2001, total GHG emissions from solvent use amounted to 248 Gg CO_2 equivalent, a reduction of 35.4 per cent compared with the base year. The major emissions in 2001 were N_2O from anaesthesia and whipped cream, with 65 per cent, followed by CO_2 emissions from paint application with 35 per cent.

39. Hungary has improved its AD for cement and aluminium production by using a bottom–up approach that follows tier 2 method of the IPCC good practice guidance.

B. Key sources

Cement production – CO_2

40. Hungary has applied a new method for the estimation of emissions from cement by the country's four cement plants. It is a tier 2 method, where national EFs are used. The data for the full time series are not yet available, but they are planned to be completed in the next submission. The EFs applied are based on measured data and data provided by the companies. Hungary explains the difference between its national EFs and the default EFs from the IPCC Guidelines as being due to the use of additives. The ERT invites Hungary to elaborate on this explanation in its next inventory submission.

Ammonia production – CO_2

41. 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 calculation method that is based on gas consumption.

Nitric acid production – N_2O

42. Hungary has used the national statistics data and the default EF to calculate emissions from nitric acid production. As it is a key source, Hungary is encouraged to apply plant-specific emission estimates and QA/QC procedures in accordance with the IPCC good practice guidance for this source category.

Substitutes for ozone depleting substances – HFCs and electric equipment – SF_6

43. These are identified in the NIR as key sources (trend assessment). Emission estimates are available for some years, but not for the full time series. Completion of the time series is indicated as further work to be done by the Party. The ERT invites Hungary to provide a better explanation of the methods applied when these sources are included in the next submission.

C. Non-key sources

Limestone and dolomite use – CO_2

44. The NIR does not provide information on AD and EFs used for calculating emissions from limestone and dolomite use. Besides, it is unclear from the NIR how the actual estimates were made. In its responses to the ERT's questions, Hungary clarified that 303,248 t of limestone and 131,957 t of dolomite were used in 2001 for iron and steel production with default CO_2 EFs: 440 kg/t (limestone) and 477 kg/t (dolomite). To enhance transparency of reporting, the ERT encourages Hungary to include AD and EFs used in the next submission and provide the description of inventory estimates.

Iron and steel production – CO_2

45. This subsector is included under the Energy sector, as table 9 of the CRF indicates. The ERT recommends that Hungary try to report these emissions under Industrial Processes, as recommended in the IPCC Guidelines and the good practice guidance, or, alternatively, to further explain the methodology applied and the rationale for including it under the Energy sector.

Ferroalloys production – CO_2

46. According to the NIR, Hungary has used the IPCC default EF (1.3 t CO_2/t product) for ferro-manganese. However, the EF value proposed in the IPCC Guidelines is 1.6 t CO_2/t product. The ERT encourages Hungary to check the correct use of the default EFs for this source category.

Solvents – CO_2

47. A CO_2 IEF of 0.125 (t/t) is reported for degreasing and dry cleaning. However, the NIR does not provide adequate explanation of the method used to estimate the emissions. The ERT encourages Hungary to provide more explanation on the emission trends for this source category.

IV. AGRICULTURE

A. Sector overview

48. In the year 2001, emissions from the Agriculture sector were 7,504 Gg CO_2 equivalent and accounted for 9.5 per cent of total national GHG emissions. Recalculations have increased the emissions figures for the base year and for 1990 by 252 and 244 per cent, respectively. The 2001 emissions are 51.3 per cent of the base year level. AD were taken from the Yearbook for Agricultural Statistics of the Central Statistical Office (KSH) and the Animal Breeding and Feed Institute. Hungary has used a tier 1 method to calculate GHG emissions from the Agriculture sector. As further work to be carried out, Hungary identifies the development of country-specific EFs and AD for animal waste management systems (AWMS), the calculation of the nitrogen (N) excretion rate, and completion of the estimates for missing years from 1991 to 1997.

B. Key sources

Enteric fermentation – CH_4

49. According to the NIR, Hungary has used the West European default EF for cattle because national livestock farming and milk yield per unit are closer to West European parameters. The rationale for this selection is not clearly explained in the NIR. As part of the additional information provided during this review, Hungary demonstrated that milk production of dairy cattle was 5,860 kg/head/yr (i.e., between the West European and North American levels). Hungary also stated that the national meat production of non-dairy cattle also corresponds to the West European level, but no supporting data were provided. The ERT recommends that Hungary include more explanation on the selection of EFs in the NIR.

50. Livestock population numbers were taken from the Yearbook of Agricultural Statistics for all years except 1990, when Food and Agriculture Organization of the United Nations (FAO) data are used. However, for 2001, there are differences between the livestock numbers reported and the FAO statistics, and the discrepancy is not explained in the NIR. During the 2002 in-country review, the discrepancy was explained by the use of different reference dates (spring for the FAO and autumn for the Institute for Environmental Management (IEM)). However, in the documentation box to CRF table 4.B(a), the reference date for livestock numbers is given as 1 December. The ERT encourages Hungary to provide more explanation on its livestock population data in the NIR.

Manure management – CH_4

51. The East European default EF (4 kg/animal/yr) is used for swine, while the West European EF is used for cattle. In CRF table 4.B(a), 78 and 22 per cent of animal waste for swine are allocated, respectively, to liquid system, and to solid storage and dry lot. These data suggest that Hungary should

use the West European EF for swine.[5] However, for cattle, judging by the additional information in the CRF that solid storage and dry lot are the principal management systems used, the EF for Eastern Europe is more appropriate. Hungary replied that these EFs would be corrected accordingly. The ERT further recommends that the rationale for the EFs used be documented in the NIR. Hungary should apply the tier 2 method using the reported percentage of manure treated under each manure management system in CRF table 4.B(a) in order to establish a country-specific methane correction factor (MCF) and EF.

52. Hungary has used the IPCC default EF value for a cool climate (0.078 kg/animal/yr) for estimating CH_4 emissions from poultry in 2001. However, for 1985–1987, 1990 and 2000, an EF of 0.14 kg/animal/yr was used, and no explanation for the discrepancy in the time series is provided. In response to this comment Hungary replied that the EFs will be revised.

Manure management – N_2O

53. Although the NIR indicates that information from the Animal Breeding and Feed Research Centre was used for the determination of N excretion for each AWMS, the ERT noticed that the values in CRF table 4.B(b) corresponded to the IPCC default values. The Party later confirmed this and clarified that country-specific data were only used for allocating N excretion to the different AWMS. The ERT recommends that Hungary clarify the description of the methodology of allocation in the NIR.

54. The default value of N excretion for Eastern Europe was used for dairy and non-dairy cattle. This is not consistent with the choice of the default value for Western Europe for CH_4 emissions from enteric fermentation and manure management. Hungary responded that it would change the values of N excretion to the West European, as recommended by the ERT. Nevertheless the Party is encouraged to determine what N excretion rate is adequate for Hungarian conditions, preferably by measuring the N content in cattle manure.

Direct emissions from agricultural soils – N_2O

55. According to the NIR, the amount of animal waste applied to soils is 58,010,355 kg N/yr. This value is too low when it is compared with the sum of nitrogen produced in all manure management systems except pasture range and paddock, as in CRF table 4.B(b) (166,006,000 kgN/yr). Apparently this value was obtained by summing total N over all AWMS (including pasture range and paddock) from CRF table 4.B(b) and subtracting the fractions given by $Frac_{FUEL}$, $Frac_{GRAZ}$ and $Frac_{GASM}$. However, the values for $FracG_{RAZ}$ (0.23) and $Frac_{FUEL}$ (0.25) are not adequately referenced. Hungary replied that the estimates for this source would be changed and the default value 0 for $Frac_{FUEL}$ used. The ERT encourages Hungary to check the estimates and provide references to all fractions and methodologies used, as well as ensuring that the AD in CRF tables 4.B(b) and 4.D are consistent.

56. The ERT identified a notable difference in the AD on N-fixing crops and crop residues between 2000 and 2001. In its response to the ERT questions, Hungary clarified that the difference was driven by a 50-per cent increase in national production. To improve transparency of reporting, the ERT encourages Hungary to verify the changes in the AD and provide the rationale for their increase in NIR.

57. For N excretion on pasture range and paddock, the AD are equal to the actual excretion values reported in CRF table 4.B(b), which is not consistent with $Frac_{GRAZ}$. To avoid overestimation, Hungary is encouraged to check that the use of $Frac_{GRAZ}$ in the calculation of N in animal waste applied to soil is correct.

58. In response to the previous review, the NIR explains the exclusion of emissions from the cultivation of histosols from the national inventory as the result of the correction of the interpretation error identified in previous submissions.

[5] The IPCC Guidelines specify: "Eastern Europe: solid based systems are used for the majority of manure. About one-third of livestock manure is managed in liquid based systems. Western Europe: Liquid/slurry and pit storage systems are commonly used for cattle and swine manure."

Indirect emissions from nitrogen used in agriculture – N_2O

59. In CRF table 4.D, the AD for the input of deposition of volatized nitrogen cannot be traced back to $Frac_{GASF}$, $Frac_{GASM}$ and the data for synthetic fertilizer and animal manure N input within the same table. Hungary responded that the AD were filled in electronically and corrected. The ERT encourages Hungary to provide more explanation in the NIR as to how the value for N input was obtained from the total amount of animal waste produced and synthetic fertilizer used. It also recommends that Hungary should maintain a consistent presentation of the AD on manure management and animal waste applied to soils for the calculation of direct and indirect emissions from soils as in CRF tables 4.B(a), 4.B(b) and 4.D.

C. Non-key sources

Rice cultivation – CH_4

60. No explanation of scaling factors for organic amendment is provided in the NIR or the CRF. The ERT was therefore not able to judge whether the CH_4 EFs and emission estimates are adequate. Hungary is encouraged to provide in CRF table 4.C more information on the type and amount of organic amendments added to justify the scaling factor used, although the Party responded that the scaling factor used was 2.

Field burning of agricultural residues – CH_4, N_2O

61. The 2001 submission reports CH_4 EFs for wheat and barley that differ from those reported for 2000 (they are 2.91 and 2.74 kg/t dm, respectively, instead of the 3.24 and 3.04 kg/t dm reported for 2000). The value of $Frac_{BURN}$ in CRF table 4.D (0.25) differs from that in table 4.F (0.09). Hungary is encouraged to check that the representation of $Frac_{BURN}$ within the CRF is consistent.

V. LAND-USE CHANGE AND FORESTRY

A. Sector overview

62. In the year 2001, the LUCF sector was a net sink of 5.7 per cent of the GHG emissions of Hungary. Owing to increased removals in forests, the overall sink is 236.7 per cent higher than in the base year. Forest and grassland conversion and abandonment of managed lands are reported as "NO". In response to the previous review, Hungary has carried out recalculations that are explained in the NIR and the CRF. For 2000, they result in a net difference of 9.1 per cent above the previous estimates. As with the previous review, the ERT noticed that the available data are insufficient to allow it to reconstruct inventory and emission trends. The ERT encourages Hungary to include in NIR more information in order to allow a reconstruction of inventory and emission trends for the sector.

63. Hungary has used the IPCC default methodology and conversion factors along with country-specific growth and expansion rates. The accuracy of the AD and uncertainty assessment applied are described in the NIR. No QA/QC has been performed within the sector, but AD are verified and double-checked consistently. The IPCC Worksheets are referred to in the NIR but are not provided, making it impossible to track the actual estimates. To improve the consistency and transparency of reporting, the ERT encourages Hungary to include the IPCC Worksheets used for calculations in the NIR.

B. Sink and source categories

Changes in forest and other woody biomass stocks – CO_2

64. In the year 2001, this category represented a net sink for 8.1 per cent of the total GHG emissions of Hungary. According to the NIR, net removals have increased by 60.4 per cent since the base year as a result of intensive increment and reduced harvests. The methods for calculation of annual growth rate and biomass removed are described in the NIR. However, in line with the previous review, the ERT noted that no numerical data on increment and harvest are provided, nor are the growth and expansion

rates applied provided, making it impossible to assess the correctness of the estimates. Hungary is encouraged to provide the data on increment and harvest in specific forest types as well as the annual growth and expansion rates used in the calculations.

Forest and grassland conversion – CO_2, CH_4, N_2O

65. In response to the previous review, Hungary clarified that CO_2 and non-CO_2 emissions from on-site burning and decay of harvesting residues are reported under this category. In 2001, the emissions from this source were 1.9 per cent of the national total and 18 per cent lower than in the base year. A combination of default and country-specific conversion rates has been used, but no values of country-specific rates are provided in the NIR. Hungary is encouraged to include numerical data for the country-specific rates used in the calculations in the NIR.

Emissions and removals from soils – CO_2

66. In the year 2001, Hungary reports CO_2 emissions from mineral and organic soils and liming that are 0.4 per cent of total national emissions and 62.5 per cent lower than in the base year.

VI. WASTE

A. Sector overview

67. In the year 2001, the Waste sector contributed 6.8 per cent of the total CO_2 equivalent emissions of Hungary. The CRF includes estimates of most gases and sources of emissions, although not all cells in the CRF include data or a notation key, and this affects both the completeness and the transparency of the submission. Not included are N_2O from waste water and human sewage, as was also noted in previous reviews. The CRF and the NIR are not detailed or transparent enough to allow independent verification of all sources and parameters. Formal QA/QC measures have not been applied throughout the sectors, although the largest waste source has undergone a comparative check. For solid waste, the results were checked against the default methodology. For other sectors, the results have not been checked with the results from other methods or countries.

B. Key sources

Solid waste disposal on land – CH_4

68. Improvements have been made in the inventory following the last (2002) ERT review, notably the incorporation of QA/QC procedures for landfills and the removal of biogenic CO_2 emissions. The NIR provides an additional level of detail but further improvements are recommended in this area.

69. Emissions of CH_4 from unmanaged solid waste disposal sites are not estimated although AD are available and are reported in the CRF. The NIR states that all waste disposed in unmanaged sites is under completely aerobic conditions and no CH_4 is generated. This is inconsistent with the IPCC Guidelines, which recommend a default MCF value of 0.4. Estimates of CH_4 from unmanaged sites should be further evaluated and, if it is deemed that the unmanaged sites are fully aerobic and no CH_4 is generated, the NIR should provide further documentation for this assumption.

70. As noted in the previous review, the data for the tier 1 country-specific methodology (NIR, p. 76) include only major landfill sites operated by communities and no landfill sites operated by industry. However, industrial landfill sites are usually a small source.

71. In response to the comments made during the last review on insufficient documentation of the EF used, the current NIR provides an additional level of detail, especially in clarifying that the EF is a lifetime factor. However, the EF is based on a literature search that is not well documented, and it is recommended that the literature and values from the literature be referenced and documented.

72. Since the methodology is based only on annual waste generation and lifetime biogas EFs, the trend would be adequate if the Waste sector were in a steady state (i.e. had not changed its characteristics for several years). However, the NIR suggests that this is not the case given the changing characteristics of the sector (NIR, p. 78). Additionally, this methodology would need to be revised in order to capture changes in the Hungarian regulations regarding waste management and organic disposal. The ERT recommends the use of a higher-tier method. If the present method is retained, the estimate of biogas per unit of waste and the applicability of the steady state assumption should be researched and documented.

Waste-water handling – CH_4

73. As noted in the previous review, the methodologies are in accordance with the IPCC Guidelines, but data are not available on sludge. The ERT recommends using the IPCC good practice guidance, which simplifies the methodology and the sludge data are no longer needed.

74. The methodology for domestic waste water uses biochemical oxygen demand (BOD) data, but applies the chemical oxygen demand (COD) maximum methane producing capacity (Bo) value. In the IPCC good practice guidance, Bo of 0.25 kg CH_4/kg COD is noted as appropriate, but the recommended value for BOD is 0.6 kg CH_4/kg BOD. The BOD values for domestic waste water are country-specific for 2000 and 2001 but are default values for other years. The country-specific values are more consistent and accurate than the default values, even if the BOD value is suspected to have changed slightly over time.

75. The methodologies use country-specific BOD and COD values and output amounts, but use the default MCF values. The ERT recommends more research into this sector, as recent publications imply that for most EIT countries the value would be closer to 0.15 than to 1.

76. For industrial waste water, country-specific AD have been used for calculating the COD value, and default EFs have been used. Industrial waste-water data for 1985–1987 have been estimated using 2000/2001 data. The Party may be able to back-cast output on the basis of industry production statistics. The ERT recommends that Hungary include the human sewage N_2O component in the emissions from waste water. The IPCC default methodology can be applied with AD sourced from FAO if AD are not available in the country.

C. Non-key sources

Waste incineration – CO_2

77. A significant improvement of the inventory for waste incineration is that the methodology and EFs are currently derived from a background paper for the IPCC good practice guidance, which is not included in the IPCC good practice guidance but can be considered consistent with it. The IPCC good practice guidance default methodology could be completed and compared to the current results as a QA/QC procedure. Since CO_2 from waste incineration is not a key source, the default values are sufficient. The AD on municipal waste incineration are plant-specific, with only one incinerator in the country. The AD on industrial waste incinerated are based on expert judgement. Further documentation of the basis for the judgement is recommended.

78. The NIR is contradictory on the CO_2 emissions. It states that the estimates are fossil CO_2 emissions for the entire period (NIR, p. 82). The NIR goes on to state that, following comments by an earlier review, the CO_2 emissions for fossil CO_2 for 2001 were calculated using a revised methodology, and emissions for the base years and for 1990 and 2000 were recalculated (p. 82). An explanation is required as to whether emissions for 1991–1999 have been recalculated. The N_2O EF is taken from the IPCC good practice guidance for MSW waste for hearth or grate. It is the mid-point of the average given in table 5.7. It is recommended that the applicability of this value be justified.

ANNEX 1: MATERIALS USED DURING THE REVIEW

A. Support materials used during the review

2002 and 2003 Inventory submissions of Hungary. 2003 submissions including CRF for years 1985–1987, 1985, 1986, 1987, 1990, 2000 and 2001, and an NIR.

UNFCCC secretariat (2003). "Report of the individual review of the greenhouse gas inventory of Hungary submitted in the year 2002 (In-country review)." FCCC/WEB/IRI(2)/2002/HUN (available at http://unfccc.int/program/mis/ghg/countrep/hunincountrep.pdf).

UNFCCC secretariat. "2003 Status report for Hungary" (available at http://unfccc.int/program/mis/ghg/statrep03/hun03.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 Hungary) (unpublished).

Hungary's comments on the Draft synthesis and assessment report of the greenhouse gas inventories submitted in 2003 (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

Responses to questions during the review were received from Mr. Gáspár László (Institute for Environment Management) including additional material on the methodology and assumptions used.

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