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REPORT OF THE INDIVIDUAL REVIEW OF THE GREENHOUSE GAS INVENTORY OF HUNGARY SUBMITTED IN THE YEAR 2000[1]

(Centralized review)

A. GENERAL OVERVIEW

1. Introduction

1. The Conference of the Parties (COP), at its fifth session, by its decision 6/CP.5, requested the secretariat to conduct, during the trial period, individual reviews of greenhouse gas (GHG) inventories for a limited number of Parties included in Annex I to the Convention (Annex I Parties) on a voluntary basis, according to the UNFCCC guidelines for the technical review of GHG inventories from Parties included in Annex I to the Convention.[2] In doing so, the secretariat was requested to coordinate the technical reviews and to use different approaches for individual reviews, including desk reviews, centralized reviews and in-country reviews.

2. In response to the mandate by the COP, the secretariat coordinated a centralized review of six national GHG inventories (Australia, Canada, Hungary, Japan, the Netherlands and New Zealand) submitted in 2000, which took place from 7 to 11 May 2001. The review was carried out by a team of nominated experts from the roster of experts working at the headquarters of the UNFCCC secretariat in Bonn. The members of the team were: Mr. Ayite-Lo Ajavon (Togo), Mr. Wiley Barbour (United States of America), Mr. Pascal Boeckx (Belgium), Mr. Jose Gonzalez Migues (Brazil), Mr. Tomas Hernandez-Tejeda (Mexico), Mr. Klaus Radunsky (Austria), Mr. Yiannis Sarafidis (Greece), Ms. Sirintornthep Towprayoon (Thailand) and Mr. Hristo Vassilev (Bulgaria). The review was coordinated by Mr. Stylianos Pesmajoglou (UNFCCC secretariat). Mr. Wiley Barbour and Mr. Jose Gonzalez Migues were lead-authors of this report and also served as sector experts.

3. The main overall objective of the centralized review of GHG inventories was to ensure that the COP had adequate information on the GHG inventories. The review should further assess the progress of the Parties toward fulfilling the requirement outlined in the UNFCCC reporting guidelines on annual inventories (FCCC/CP/1999/7). In this context, the review team checked the responses of the Parties to questions raised in previous stages of the review process and the consistency of the inventory submission with the UNFCCC reporting guidelines and the

[1] In the symbol of this document, 2000 refers to the year the inventory was submitted, and not to the year of publication. The number (3) indicates that for Hungary this is a centralized review report.

[2] Document FCCC/CP/1999/7, in particular the UNFCCC review guidelines (pages 109 to 114), and decision 6/CP.5 (page 121 to 122).

Revised 1996 Intergovernmental Panel on Climate Change Guidelines for National Greenhouse Gas Inventories (hereinafter referred to as the IPCC guidelines), and identified possible areas for improvement in the inventories of the six Annex I Parties. Each inventory expert reviewed the information submitted for specific IPCC sectors and each IPCC sector was covered by two experts.

4. The review team has also assessed, to a certain degree, whether the reporting fulfils the requirements included in the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance), although the IPCC good practice guidance had not been published at the time the inventory was submitted and could not, therefore, have been used in the compilation of the inventory.

5. The UNFCCC secretariat provided the review team with all necessary technical guidance, information and data, such as national inventory data reported according to the common reporting format (CRF) submitted in the year 2000, national inventory reports (NIRs) for the year 2000, the synthesis and assessment report (S&A report) of GHG inventories prepared by the secretariat, and comments from the Parties on the S&A report.

2. Overall findings

6. The inventory submitted by Hungary did not meet all the standards for inventory preparation and submittal as defined by the UNFCCC reporting guidelines and the IPCC guidelines, due to the unavailability of a written report. However, data tables were provided with emission estimates prepared in the CRF, as well as IPCC tables. The absence of a written NIR rendered detailed analysis difficult, but Hungary's submission of detailed data tables provided some information on methods and emission factors (EFs) used, as well as information on trends, completeness and coverage of other gases. A written evaluation report was also provided as part of the submittal and reviewed.

3. Completeness

7. It was difficult to assess source category completeness owing to the absence of an NIR, but based on the estimates reported in the CRF tables and IPCC tables, the report appears to be largely complete. The CRF tables provide some guidance, but the tables for the industrial sector make frequent use of included elsewhere (IE) and not estimated (NE).

4. Transparency

8. The absence of an NIR resulted in a substantial loss of transparency. The CRF tables were incomplete in some cases; indicators such as IE or not occurring (NO) were not used and documentation boxes were used sparingly. However, submittal of IPCC tables and worksheets provided many details on methods used and trends in emissions, and allowed a general understanding of the methods and assumptions used.

5. Data sources used for centralized review

5.1 National greenhouse gas emission inventory report

9. The review team did not have access to a written NIR. Hungary did submit a "Written evaluation/report" (only hardcopy). IPCC tables, some trend tables and sectoral descriptions were provided. Some general information on methodologies, sources of activity data and emission factors (EFs) for the agriculture sector were also provided. Differences compared with previous inventories and problematic elements in the inventory preparation have been discussed. No specific information is provided on how and what self-verification procedures are undertaken.

5.2 Common reporting format

10. Hungary submitted inventory data using the CRF for the year 1998. The CRF includes many of the requested tables but not all. Indicators have not been used; many cells have been left blank and there are therefore many unexplained gaps in the CRF.

11. Hungary provided worksheets, which were sometimes adapted to national circumstances, on livestock, soils and field burning of agricultural residues. No extra information is given in the documentation boxes.

5.3 Synthesis and assessment report (S&A report)

12. Hungary provided a response to the S&A report on 10 May 2001 and the review team was able to take these comments into account.

13. Time-series consistency for industrial processes was assessed in the S&A report. There are two findings for industrial processes: a large decrease in CO_2 emissions from metal production between 1991 and 1992 (in line with a decline for most sectors) and a 52 per cent increase for N_2O emissions between 1995 and 1996.

14. The written evaluation/report estimates emissions of NMVOC from industrial processes at 37.95 Mg, while in the CRF the corresponding value is "0".

15. CO_2 from metal production showed a large decrease from 1991 to 1992 (although this was in line with the general decline for most sectors for those years).

16. N_2O from the chemical industry showed a 52 per cent increase between 1995 and 1996.

17. Some inconsistencies were noted for CH_4 emissions from enteric fermentation and manure management in the two reports submitted to the UNFCCC.

18. Significant year-on-year variations have also been reported in CH_4 emissions from rice cultivation and in N_2O from agricultural soils.

B. ENERGY

1. General overview

1.1 Completeness

19. The energy sector appears to be complete for 1998, but data is missing for other years except at the summary level presented in the trends tables.

1.2 Transparency

20. Despite the absence of an NIR, the energy data is reported in a detailed manner in the CRF tables. Written documentation with references to the source of the activity data should be provided to improve transparency.

1.3 National self-verification

21. No information was provided on self-verification activities.

2. Reference approach

22. There is a difference of 3.7 per cent between CO_2 emissions calculated using reference and sectoral approaches. Liquid fuel emissions are 7.6 per cent higher and gaseous fuels are 3.4 per cent lower. In the CRF documentation box, it was noted that the difference in the energy figure between the two approaches was due to "non-energy and leak". However, there is no explanation of the difference in the total CO_2 emissions figure in the CRF.

23. The reference approach energy data for 1998 corresponds very closely to International Energy Agency (IEA) data (only 0.4 per cent lower). Apparent consumption of liquid fuels is 3.5 percent higher in the CRF, solid fuels is 9.2 per cent lower and natural gas is the same. Specific differences include:

(a) Production of NGL is 5,002 TJ higher in the CRF;

(b) CRF data for imports of naphtha, lubricants, petroleum coke and paraffin waxes appear to have been reported under "Other oil";

(c) It is possible that the primary coal rows have been misreported in one of the data sets. The CRF figures in "Other bituminous coal" correspond to sub-bituminous coal in IEA data. The CRF figures for sub-bituminous coal and in lignite have been reported under lignite in the IEA data;

(d) IEA data shows 42,006 TJ of coking coal imports that have not been reported in the CRF;

(e) The CRF shows 21,660 TJ of coke oven coke/gas coke imports, whereas IEA data shows 238 TJ;

(f) No exports of coke oven gas/gas coke have been reported in the CRF;

(g) Exports of residual fuel oil is reported as bitumen in the CRF.

3. Feedstocks

24. Feedstocks are reported in the CRF, but no additional information is provided.

25. The fraction of carbon stored and the implied emission factors (IEFs) calculated, are in accordance with the proposed values in IPCC guidelines, with the exception of naphtha (carbon stored 0.8 instead of the 0.75 proposed by the IPCC).

4. Key sources

4.1 Fugitive emissions

26. In general, this section of the report seems to be well developed. Data is provided at a disaggregated level and some additional information is included in the CRF.

27. *Emission trends*: Fugitive emissions from coal mining have decreased from a high of 223 Gg CH_4 in the base year (1988) to 94.3 Gg in 1998. Emissions of methane from oil and gas rose from 225 to 305 Gg.

28. *Methodology*: Emissions from fugitive oil and gas have been reported in a transparent manner, but no estimates are provided from flaring and venting. IPCC tier 1 methods and default EFs were used to estimate CH_4 from oil and natural gas, and IPCC default methods and EFs were used to estimate CH_4 from solid fuels.

29. *Emission factors*: EFs generally correspond to IPCC default values. The CH_4 IEF for underground mines, post-mining activities, is 1.68 kg/t, within the IPCC range of 0.6 - 2.68.

30. *Activity data*: The CRF reports 12 active underground mines, and coal production data is reported for surface and underground mines. Detailed activity data were provided for oil and gas systems, including a breakout between large sources (industrial and power plants) and commercial/residential throughput.

31. *Completeness*: This category appears to be addressed comprehensively and completely. Total mining activity in 1998 (15.1 Mt coal produced) compares closely with IEA estimates (the IEA estimate is 2.8 per cent lower).

4.2 Stationary combustion – CO_2 emissions

32. *Methodology*: The IPCC default method has been used to estimate CO_2 emissions from "Energy industries", "Manufacturing industries and construction" and "Other sectors". The calculation steps are presented in the IPCC tables provided.

33. Variations in the time-series provided:

(a) CO_2 emissions in "Manufacturing industries and construction" increased by 75.9 per cent from 1997 to 1998;

(b) CO_2 emissions in "Other" present a 268 per cent increase from 1994 to 1995 and a 100 per cent decrease from 1997 to 1998 (nothing reported for 1998). This decrease may be related to the increase in manufacturing industries' emissions for 1998.

34. *Emission factors*: The IPCC default EFs were used to estimate CO_2 emissions from "Energy industries", "Manufacturing industries and construction" and "Other sectors".

35. *Activity data*: There are no references for the fuel consumption data used.

36. *Recalculations*: No recalculation tables are provided in the CRF.

37. *Completeness*: All subsectors are covered but there are no estimates on NOx, CO, NMVOC and SO_2 emissions in the CRF. With the exception of NMVOC emissions, these estimates exist in the IPCC tables provided (see the sectoral energy report table).

38. *Uncertainty*: Aside from the summary information provided in Table 7 of CRF, no specific information is provided on this issue

4.3 Mobile combustion

39. *Methodology*: The IPCC default method has been used to estimate CO_2 emissions from "Transport". The calculation steps are presented in the IPCC tables provided.

40. *Emission factors*: The IPCC default EFs have been used to estimate CO_2 emissions from "Transport".

41. *Activity data*: There are no references for the fuel consumption data used.

42. *Recalculations*: The CRF recalculation tables were not filled out.

43. *Completeness*: All subsectors are covered but there are no estimates on NOx, CO, NMVOC and SO_2 emissions in the CRF. With the exception of NMVOC emissions, these estimates exist in the IPCC tables provided. However, the EFs used need to be justified since they are different from the ones proposed in the IPCC guidelines (e.g., the CO EF of gasoline for road transport used is 6,000 kg/TJ and the value proposed by the IPCC is 8,000 kg/TJ).

44. *Uncertainty*: Aside from the summary information provided in Table 7 of CRF, no specific information is provided on this issue.

4.4 Non-key sources

45. Estimates of CH_4 and N_2O emissions are based on the IPCC default method.

46. The change in CH_4 emissions in "Other" from 1990 to1991, although representing a small contribution to emissions, was substantial (557 per cent).

47. The EFs selected in road transport, are different from the ones proposed in the IPCC guidelines (e.g., the N_2O EF of gasoline for road transport used is 1.5 kg/TJ and the value proposed by IPCC is 0.6 kg/TJ), but at the same time they are lower than the upper limit defined in the IPCC guidelines, where it is mentioned that for 2-stroke engines, the EFs could be up to 3 times higher than those for 4-stroke engines. Hungary also noted that according to the IPCC good practise guidance the uncertainty of the default N_2O estimates may be more than ± 50 per cent.

48. The N_2O IEF from road transportation for gasoline is among the lower values calculated among reporting Parties.

49. The N_2O IEF from road transportation for diesel oil is almost the lowest compared with other countries.

5. Bunker fuels

50. International and domestic fuel consumption for navigation and aviation are reported in the 1998 CRF tables. Explanation is provided in the documentation box. According to the explanation provided ("domestic aviation lines are not relevant") all emissions have been reported as bunkers.

51. CH_4 and N_2O emissions from aviation bunkers are not provided in the CRF and, as a result, the IEFs cannot be estimated. However, in the IPCC tables submitted there are estimations for both CH_4 (module1.xls, worksheet "1-3s2-3CH_4 ") and N_2O (module1.xls, worksheet "1-3s2-3N_2O"), but the EFs used for these estimations (10 kg/TJ for CH_4 and 0.6 kg/TJ for N_2O) are different from the ones proposed by the IPCC for aviation (0.5 kg/TJ for CH_4 and 2 kg/TJ for N_2O).

6. Weather-related adjustments

52. It is presumed that there are no weather-related adjustments since they are not mentioned in the NIR.

7. Questions and issues from previous review stages

53. In an introductory remark, it is stated that the institute responsible for the GHG inventory - IEM (Institute for Environmental Protection) - did not participate in the preparation of the previous inventory estimates. Estimates in the database for former years may not have been prepared according to the IPCC guidelines and, as a result, time series are not always consistent. It is also stated that a revision of the former inventories is planned.

54. Responses were provided on the deviation between national and sectoral approaches in the energy figures. It was commented that the IPCC guidelines do not provide information on the counting and measuring of losses. However, the deviation in the CO_2 emissions figure is not addressed.

55. Hungary provided comments on the difference between the energy data reported in the reference approach and those presented by IEA in the energy balances. The different classification of solid fuels is noted. However, there are significant differences in the apparent consumption estimated with the different data sets that are not addressed.

56. The use of higher CH_4 and N_2O EFs in road transport is due to the fleet composition in Hungary (2-stroke engine vehicles). However, the low values of the IEFs for gasoline and diesel in road transport are not discussed. Moreover, the selection of the specific EF values, which are within the range proposed by the IPCC, is not explained.

57. According to the response provided for the aviation bunker fuel allocation, there is no regular domestic air travel in Hungary and there are no data about the fuel allocation. Therefore, all fuel use is allocated to international aviation. However, it is reasonable to assume that domestic aviation exists and therefore there is a need for the development of statistical procedures to estimate the fuel consumption in this category.

58. With the exception of the deviation in CO_2 aviation bunker emissions, which is attributed to an error in the filling in of the respective data corrected in the 2001 submissions, in all other cases reference is made to the introductory remark. Therefore, all previous submissions need revising.

8. Questions and issues from Parties' response to draft centralized review report

59. Hungary provided detailed technical comments on the draft report which the review team was able to take into account.

C. INDUSTRIAL PROCESSES

1. General overview

1.1 Completeness

60. Emissions were not reported for several non-key source subsectors, in particular, the iron and steel industries.

1.2 Transparency

61. As indicators have not been used it is difficult to analyse the CRF.

1.3 Recalculations

62. The CRF recalculation tables were not completed. Comparisons of emissions at the summary level with previously submitted data, identified areas where estimates have changed. The industrial processes category lists CO_2 from mineral products in 1996 at 11.2 per cent lower than the previously reported inventory value.

1.4 Methodology

63. Default/default for mineral products and chemical industry and IPCC tier 1b/default for metal production. IPCC tier 1a, default/country-specific for HFCs; IPCC tier 1b/default and IPCC tier 1a/country-specific for PFCs, and IPCC default/default and IPCC default/ country-specific for SF_6.

1.5 Uncertainty

64. Only qualitative assessment of the uncertainty of the estimates is provided (high for N_2O and $SF_{6;}$ high for mineral and medium for chemical and metal production for CO_2, and low for CH_4, HFCs and PFCs).

2. Mineral sector

65. Cement production (2.A.1) is a key source for Hungary.

66. There is no information on lime production, limestone and dolomite use or soda ash production and consumption.

3. Chemical sector

67. Emissions from ammonia production and nitric acid production were estimated for Hungary.

68. Emissions from silicon and calcium carbide and ethylene and coke production were not calculated.

4. Metal sector

69. Emissions from iron and steel production were not reported for Hungary, despite United Nations' information that 1,940 kt of steel production and 1,259 kt of pig iron production occur annually.

70. CF_4, C_2F_6, and CO_2 emissions from aluminium production and emissions from SF_6 were estimated for Hungary. The IEF is high for CO_2 emissions from aluminium production.

71. Emissions from ferroalloys production and SF_6 used in magnesium foundries were not reported.

5. Production and consumption of HFCs and SF_6

72. Emissions from production of HFCs and SF_6 were not reported.

73. Potential and actual emissions from consumption of HFCs and SF_6 were estimated.

6. Key sources

74. CO_2 from cement production (level assessment of 2 per cent) was identified as a key source.

7. Questions and issues from previous stages

75. Hungary provided a response to the S&A report on 10 May 2001 and the review team was able to take these comments into account. Highlights from the response to the S&A report relating to industrial processes are as follows:

Key sources

76. 2.A.6 "Road paving with asphalt": activity data were reported but no CO_2 emissions. Hungary provided the following answer: "There is no factor value".

77. 2.B.2 "Nitric acid production": production data reported in the CRF (510 t in 1998 – apparently similar to previous years) are lower than data from international statistics (310,000 t in 1993). Hungary provided the following answer: "It is possibly incorrect data but there is only one producer so it is confidential. The NH_3 producing data is incorrect. The correct data should be 362,000 t - instead of 640 t".

78. The S&A report stated for solvent and other product use: For N_2O estimates, insufficient activity data/IEF information were provided. Hungary provided the following answer: "The activity data - except the other - we do have but we have no EF information about this.

D. AGRICULTURE

1. General overview

1.1 Completeness

79. The analysis of activity data, EFs and tables in the agriculture sector reported in the different categories seem not to be complete owing to a lack of data on some activities. This is in contradiction to the IPCC tables provided.

1.2 Transparency

80. The IPCC tables submitted by Hungary did not provide a clear discussion on methodological issues, references and the source of the activity data.

1.3 National self-verification

81. There was no indication as to whether a national self-verification process had taken place.

1.4 Emission trends

82. N_2O and CH_4 emissions decreased significantly between 1990 and 1997. The value given for agricultural N_2O in table 10s5 for 1998 in CO_2-eq appears erroneous, since the abrupt emission increase (600 per cent) does not fit with the data in tables 10s2 and 10s3.

2. Key sources

2.1 Methodology

83. The national GHG inventory submitted to the secretariat by Hungary was based on UNFCCC guidelines and IPCC methodology according to decision 3/CP5. Emissions from the agricultural sector were estimated using the IPCC guidelines. The estimates of GHG emissions have been reported according to the UNFCCC guidelines using the CRF adopted by the COP.

2.2 Activity data (AD) and emission factor (EF)

84. The IPCC default methodology and activity data were used to estimate enteric fermentation and manure management CH_4 emissions and N_2O emissions from agricultural soils.

2.3 Good practices

85. The data reported in the agriculture sector relating to key sources show a level of detail that accords with the level of disaggregation recommended by the IPCC good practice guidance, in particular:

(a) CH_4 from manure management;

(b) Direct N_2O emissions from agricultural soils;

(c) Indirect N_2O emissions from nitrogen used in agriculture.

2.4 Completeness

86. In the agriculture sector there was no report on activity data or the EF for CH_4 emissions from enteric fermentation and manure management.

2.5 Uncertainty

87. Uncertainties have been addressed for the agriculture sector but no real calculations were performed.

2.6 Recalculations

88. UNFCCC table 10 seems to indicate that recalculations have been made for some gases, e.g., CH_4 from enteric fermentation.

2.7 Emissions estimates

89. Methane emissions from enteric fermentation and manure management were not estimated for poultry and swine because of a lack of appropriate EF and other parameters, which are not specified.

2.8 Assumptions

90. There is insufficient information on assumptions.

2.9 National self-verification

91. No information was provided in the submission on whether the inventory data and estimates had been subjected to a national self-verification process. The fact that significant variations from year to year remained in the document confirmed this observation.

3. Specific assessment

Enteric fermentation (table 4.A)

92. Not reported in the CRF although calculated in the IPCC tables.

Methane emissions from manure management (table 4.B(a))

93. Not reported in the CRF although calculated in the IPCC tables.

Nitrous oxide emissions from manure management (table 4.B(b))

94. There is an error in the totals. The IEF for "aerobic lagoons" is 0.0. The reason is probably that no emission was reported in the IPCC tables, although N input data are provided and the default EF is used. The IEF for "Others" is high. The reason is that not all the N input data provided in the IPCC tables are reported in the CRF.

Rice cultivation (table 4.C)

95. The EF is taken as the reported arrhythmic mean from the IPCC guidelines.

Agricultural soils (table 4.D)

96. The CRF for this section is incomplete. The IPCC tables provided, however, are satisfactory. No additional parameters are mentioned in the CRF.

103. *Direct soils emissions*: For FSN, FBN and FCR no data are reported in CRF. For FAW, the wrong data are reported in the CRF. For histosols an IEF of 2 was used in the IPCC tables. The IPCC guidelines suggest using 5 and the IPCC good practice guidance suggests 8.

104. *Animal production*: No data are provided in the CRF. $FRAC_{graz}$ is not reported in CRF, but is used in the IPCC tables. The factor used for $FRAC_{graz}$, to calculate manure N used (sheet 4-5A suppl.) is 0.2. The correct calculated value is 0.225. So, it is questionable whether 0.2 is a round number for 0.225 or whether it was entered by accident.

105. *Indirect emissions*: No data are given in the CRF. Nevertheless good data are provided in the IPCC tables.

Agricultural residue burning (table 4.F)

106. Burning of cereals is reported. In this case $FRAC_{burn}$ (used in sheet 4-5B suppl. of the IPCC tables) should be adapted. This has not been done and the default value is used.

4. Quality assessment/quality control (QA/QC)

107. No information on QA/QC was provided.

5. Uncertainty

108. No information on uncertainties was provided.

E. LAND-USE CHANGE AND FORESTRY (LUCF)

1. General overview

109. No NIR was provided for the LUCF sector, however, IPCC tables were included as companion materials. CO_2 and CH_4 trends were provided in the CRF, from the base year to 1998.

110. According to summary table 2 in 1998 net emissions from sector 5 were estimated as 4,410.52 Gg carbon dioxide equivalent (Gg CO_2-e). This corresponds to 5.6 per cent of total GHG emissions in 1998.

2. Findings

2.1 Changes in forest and other woody biomass stocks (table 5.A)

111. *Completeness*: Data have been provided on CO_2 emissions and removals for subsector 5.A.2 "Temperate forests" for 1998. For the period from the base year until 1997, net CO_2 emissions/removals have been provided in table 10 (sheet 1) for sector 5.A. The net CO_2 emissions/removals doubled between the base year (1985 to1987) and 1993. Tropical and boreal forests are not applicable which is perfectly reasonable due to geographic location.

112. *Consistency*: The information provided was not consistent throughout all CRF tables. Inconsistencies have been noted between sectoral background tables 5.B and 5.C and table 5 and

table 10, sheets 1 and 2. Apart from the above inconsistencies, data for the LUCF sector seem to be internally consistent. Assessment of consistency across the time series was limited because the data in the CRF were only available for 1998.

113. *Recalculations*: No recalculations have been indicated in table 11 of the CRF.

114. *Transparency*: Information has been provided relating to methodological issues as well as indicators (emission and conversion factors and activity data). In summary table 3, it is indicated that IPCC default methods and EFs have been applied for this category.

115. *Comparability*: Owing to a lack of background information, it is difficult to compare Hungary's data with those of other countries. It is difficult to assess comparability beyond the data for 1998 owing to the limited information provided. By increasing completeness and transparency, comparability on data and methodologies could be improved.

116. *Methodology*: IPCC default methods and EFs were used wherever possible. Gaps in data are mainly due to a lack of activity data and capacity (resources) and not to methodological problems.

117. *Emissions and conversion factors*: The following information has been taken from worksheets included in the submission:

Category	Average annual growth rate (t dm/ha)	Biomass Conversion/expansion ratio (t dm/m^3)	Implied carbon uptake factor (t C/ha)
Temperate commercial			
-evergreen	3.80		1.71
-deciduous	4.20		1.89
Oak		0.67	
Turkey oak		0.77	
European beach		0.68	
Hornbeam		0.79	
Black locust		0.74	
Other hardwood		0.59	
Poplar		0.38	
Other dec. softwood.		0.48	
Conifers		0.50	

Carbon emission factor (t C/t dm): 0.45

118. Although detailed data have only been provided for 1998, it can be assumed that the same factors have been used throughout the period from the base year.

119. *Activity data*: Activity data on area of forest/biomass stocks and commercial harvest have been provided for 1998 in the worksheets included in the submission.

Category	Area of forest/biomass stocks (kha)	Commercial harvest (1000 m^3 roundwood)
Temperate/commercial/evergreen	249,179	
Temperate/commercial/deciduous	1442,934	
Oak		413.2
Turkey oak		340.8
European beach		230.8
Hornbeam		126
Black locust		506.4
Other hardwood		61.6
Poplar		878.22
Other dec. softwood		162
Conifers		453.84

120. However, data for other years are missing and a reference to the origins of the data and a short description of the methodology used to estimate them would be welcome.

2.2 Forest and grassland conversion (table 5.B)

121. *Completeness*: Data have been provided on CO_2 and CH_4 emissions for subsectors 5.B.2 "Temperate forests" and 5.B.4 "Grasslands/tundra" for the years 1991 to 1998 (table 10, sheets 1 and 2). CO_2 emissions range from 1,402.52 Gg in 1995 to 1,513.93 in 1992, and CH_4 emissions from 0.22 in 1993 to 0.28 Gg CH_4 in 1991. It is noted that data related to CH_4 emissions from on-site burning have also been included in sectoral background table 5.B, whereas summary table 2 shows a value of 0.00 Gg CO_2 equivalent and table 10 (sheet 2) includes CH_4 emissions under sector 5.C "Abandonment of managed land" for the years 1991 to 1997. N_2O emissions from on-site burning have not been calculated. It is proposed to estimate the missing figures and to make tables consistent.

122. *Consistency*: Information has been presented and used in a consistent manner.

123. *Recalculations*: No recalculations have been indicated in table 11 of the CRF.

124. *Transparency*: Information has been provided on methodological issues as well as indicators (emission and conversion factors and activity data). In summary table 3, it is indicated that IPCC default methods and EFs have been applied for this category.

125. *Comparability*: Owing to a lack of background information, it is difficult to compare Hungary's data with those of other countries. It is difficult to assess comparability beyond the data related to 1998 owing to the limited information provided. By increasing completeness and transparency, comparability on data and methodologies could be improved.

126. *Methodology*: IPCC default methods and EFs were used.

127. *Emissions and conversion factors*: The following information has been taken from worksheets included in the submission:

Category	Biomass before conversion (t dm/ha)	Biomass after conversion (t dm/ha)	Net change in biomass density (t dm/ha)	Fraction of biomass burned on site	Fraction of biomass oxidised on site
Temperate coniferous	1	0	1	0.05	0.9
Temperate broadleaf	1	0	1	0.05	0.9
Grasslands	1.5	2.5	-1		

Carbon fraction of above-ground biomass (burned on site): 0.45

128. On-site burning of forests:

Category	CH_4	CO_2
Implied emission factors (t/ha)		
Coniferous	1.32	0.07
Broadleaf	1.87	0.07

129. Worksheet 5-3 shows that emissions of N_2O may have been calculated. However, due to the low figure (0.00112 kt N or 0.00174 kt N_2O), the figure included in sectoral background table 5.B is 0.00 Gg N_2O.

130. *Activity data*: For 1998, activity data on area converted annually have been provided for forest and grassland conversion in table 5.B.

Category	Area converted annually (kha)
Temperate coniferous	135.70
Temperate broadleaf	673.60
Grasslands	8.20

131. It would help verification if larger areas (e.g., larger than 100 ha) of land use and land-use change were identified with the help of a map.

2.3 Abandonment of managed lands (table 5.C)

132. *Completeness*: No data have been provided for this sector (except in table 10, sheet 2 on CH_4 trends, but the data may be related to sector 5.B). According to table 9 (completeness), no data have been provided because of a lack of adequate information on activity data and/or EF.

133. *Transparency*: Information on section 5.C "Abandonment of managed lands" was not provided.

134. *Emissions and conversion factors*: Owing to a lack of information relating to section 5.C, emission and conversion factors and activity data for this sector could not be reviewed.

2.4 CO_2 emissions and removals from soil (table 5.D)

135. *Completeness*: Data have been provided for subsectors specified as: "Cultivation of organic soils" and "Liming of agricultural soils" for 1998 (203,5 Gg CO_2 emissions).

136. *Consistency*: Information has been presented and used in a consistent manner.

137. *Recalculations*: No recalculations have been indicated in table 11 of the CRF.

138. *Transparency*: Information has been provided on methodological issues as well as indicators (emission and conversion factors and activity data). Summary table 3 indicates that IPCC default methods and EFs have been applied for this category.

139. *Comparability*: Owing to a lack of background information, it is difficult to assess comparability.

140. *Emission and conversion factors*: The following information has been taken from worksheets included in the submission:

Category	Annual loss rate (Mg C/ha/yr)
Cultivation of organic soils	
a.) Upland crops	10.00
b.) Pasture/forests	2.50

Carbon conversion factor (liming): 0.12

141. *Activity data*: For 1998, activity data on land area were reported in sectoral background table 5.D.

Category	Land area (ha)
Upland crops	4709.50
Pasture/forests	1769.30

Total annual amount of lime (Mg): 33,165.0

142. Activity data were also reported for cultivation of mineral soils, but corresponding estimates in net change in soil carbon were zero, according to IPCC table 5-5s1.

2.5 Other (table 5.E)

143. No additional categories were reported.

3. Uncertainty

144. According to table 8.A (overview table for national GHG inventories), the quality of the estimate is low throughout sector 5. No additional information, e.g., on the method used to assess quality of data or on internal verification, was provided.

4. Reporting

145. Reporting was based on the CRF for 1998, as well as worksheets, in accordance with the IPCC guidelines. No additional national inventory report was submitted due to a lack of resources.

5. Feed back on in-depth review (IDR)

146. Compared to the status of emissions data during the first IDR in 1997, the inventory has improved considerably.

6. Areas for improvement

147. The gaps identified above should be filled.

F. WASTE

1. General overview

148. No NIR was submitted, so this review is based only on the CRF tables and IPCC reporting spreadsheets.

1.1 Completeness

Key source: solid waste disposal on land

149. Country-specific methods were introduced for CO_2 and CH_4 emission estimates for this category. Table 6A in the CRF provides some activity data and limited reporting in the additional information table. An explanation of the CO_2 emissions included in the inventory of solid waste disposal systems (SWDS) is recommended. The data on methane recovery in worksheet 6-1 were not taken into account in the CRF.

Non-key source: wastewater handling

150. The CRF describes N_2O emissions from this category as NE due to inadequate information on the EF. Activity data are provided in table 6.B for domestic and industrial wastewater and additional information is also provided in the appropriate box.

Non-key source: waste incineration

151. Emission estimates for CH_4 and N_2O are not reported owing to inadequate information on activity data and EFs as described in table 9s1 in the CRF. However, CO_2 estimates are provided.

1.2 Methodology

Key source: solid waste disposal on land

152. The estimates result from a country-specific methodology. Table 6 in the CRF distinguishes between managed and unmanaged waste disposal sites, but no explanation is provided. The review team suggests an explanation of the CO_2 emission estimate.

Non-key source: wastewater handling

153. Country-specific methodologies are used in conjunction with the default value from the IPCC guidelines. Degradable organic carbon in the additional information box in table 6.B in the CRF was found to be very high (10 times higher than that recommended by the IPCC). Therefore, this figure leads to high CH_4 emissions per capita from wastewater handling and should be re-evaluated or explained.

Non-key source: waste incineration

154. Although CO_2 emissions were reported in CRF table 6.C and were developed using country-specific methodology, no details of the methodology are available. The quantity of incinerated MSW (350,000 Gg) is too high due to a transcription error (the actual value is 350 Gg), as confirmed by Hungary in their comments on the draft review report.

1.3 Emission factor

Key source: solid waste disposal on land

155. The IEF for CH_4 is within applicable limits. However, the actual EFs for CO_2 should be documented.

Non-key source: wastewater handling

156. A default EF was used. However, methane emissions per capita from wastewater handling are very high due to high degradable organic carbon assumption (see comment under "Methodology" above).

Non-key source: waste incineration

157. According to table 6.C of the CRF, the IEF is quite low. The EF for N_2O has been omitted.

1.4 Activity data

Key source: solid waste disposal on land

158. The CRF and the worksheet were found to contain incomplete activity data. Only the 1998 data are reported. The IPCC tables report that 27 per cent of MSW goes to unmanaged waste disposal sites.

Non-key source: wastewater handling

159. IPCC worksheet 6-3 contains detailed activity data on IWW flows. Some missing fields were noted in table 6-3s1, apparently due to use of country-specific data. Additional details should be provided to improve transparency.

Non-key source: waste incineration

160. As noted before, there appears to be a transcription error in the activity data for waste incineration. The total waste generation figure in the IPCC tables (2,700 Gg of MSW) accounts for total waste disposed of in managed and unmanaged SWDS, so an explanation of the activity data for incineration should be provided.

1.5 Recalculation

161. No recalculated data.

1.6 Uncertainty

164. A review of uncertainty has been omitted due to the absence of an NIR.

1.7 Trends

165. Emission trends for CO_2 from SWDS remained relatively constant from 1990 to1997; only 1998 showed an increase. In addition, CO_2 from incineration was constant from 1990 to1998. Methane emissions from SWDS tracked well against CO_2 emissions in that only 1998 emissions increased. Emissions of CH_4 from WWH decreased slightly from 1990 to 1997 and decreased more rapidly in 1998. Trends of CO_2 equivalent emissions likewise decreased significantly in 1998.

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