UNITED NATIONS
NATIONS UNIES

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

FCCC/WEB/IRI(2)/2003/CZE 19 December 2003

CZECH REPUBLIC

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

(In-country review)

EXECUTIVE SUMMARY

1. This report covers the review of the 2003 inventory submission of the Czech Republic, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat in accordance with decision 19/CP.8 of the Conference of Parties. The review took place from 29 September to 3 October 2003 in Prague, Czech Republic, and was conducted by the following team of nominated experts from the roster of experts: Generalist – Ms. Maria Paz Cigaran (Peru), Energy – Mr. Yannis Sarafidis (Greece), Industrial Processes – Ms. Nataliya Parasyuk (Ukraine), Agriculture – Mr. Damdin Dagvadorj (Mongolia), Land-use Change and Forestry – Ms. Kathryn Bickel (USA), Waste – Ms. Katarina Mareckova (Slovakia). Ms. Nataliya Parasyuk and Ms. Maria Paz Cigaran were the lead reviewers. The review was coordinated by Ms. Astrid Olsson (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 the Czech Republic, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

3. The Czech Republic submitted its annual inventory on 15 April 2003, consisting of common reporting format tables for the years 1994 and 2001 and the national inventory report. In the year 2001, the most important greenhouse gas in the Czech Republic was carbon dioxide (CO_2), contributing 86 per cent to total[2] national greenhouse gas emissions expressed in CO_2 equivalent, followed by methane (CH_4) – 7 per cent, and nitrous oxide (N_2O) – 6 per cent. Perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF_6) together contributed less than 1 per cent of the overall greenhouse gas emissions in the country. The Energy sector accounted for 88 per cent of total greenhouse gas emissions, followed by the Agriculture sector (5.1 per cent), the Industrial Processes sector (4.7 per cent) and the Waste sector (1.8 per cent).

4. Total greenhouse gas emissions (excluding Land-use Change and Forestry) amounted to 148,056 Gg CO_2 equivalent in 2001 and decreased by 23 per cent from 1990 to 2001. Tables 1 and 2 provide data on emissions by gas and sector from 1990 to 2001. Over the period 1990–2001, CO_2 emissions decreased by 22 per cent, mainly from decreases in emissions from manufacturing industries and construction. CH_4 emissions decreased by 37 per cent during the same period, mainly from reductions in fugitive emissions from solid fuels and emissions from enteric fermentation. N_2O emissions decreased by 26 per cent over the same period from reductions in emissions from agricultural soils. Over the period 1995–2001,

[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 (2) indicates that this is an in-country review report.

[2] In this report, the term total emissions refers to the aggregated national GHG emissions expressed in terms of CO_2 equivalent excluding Land-use Change and Forestry, unless otherwise specified.

emissions from HFCs, PFCs and SF_6 increased by 47,193 per cent, 4,039 per cent and 34 per cent, respectively.

Table 1. Greenhouse gas emissions by gas, 1990–2001

GHG emissions	CO_2 equivalent (Tg)												Change from 1990–2001 %
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	
Net CO_2 emissions/removals	161.9	NE	NE	NE	125.9	NE	128.3	132.7	124.5	117.7	123.9	123.6	–24
CO_2 emissions (without LUCF)[(a)]	164.0	NE	NE	NE	130.6	NE	132.8	137.4	128.3	121.1	127.9	128.0	–22
CH_4	16.8	NE	NE	NE	13.0	NE	12.6	12.1	11.4	10.7	10.7	10.5	–37
N_2O	11.3	NE	NE	NE	8.3	NE	9.2	8.8	8.4	8.1	8.2	8.3	–26
HFCs	NE	NE	NE	NE	NE	0.002	0.14	0.30	0.38	0.41	0.67	1.0	+47,193
PFCs	NE	NE	NE	NE	NE	0	0.004	0.007	0.009	0.003	0.009	0.014	+4,039
SF_6	NE	NE	NE	NE	NE	0.17	0.18	0.32	0.132	0.11	0.21	0.22	+34
Total (with net CO_2 emissions/removals)	**189.9**	NE	**NE**	**NE**	**147.2**	**NE**	**150.4**	**154.2**	**144.8**	**137.0**	**143.7**	**143.7**	**–24**
Total (without CO_2 from LUCF)	**192.0**	NE	**NE**	**NE**	**151.9**	**NE**	**154.9**	**158.9**	**148.6**	**140.4**	**147.7**	**148.1**	**–23**

[a] LUCF = Land-use Change and Forestry

Table 2. Greenhouse gas emissions by sector, 1990–2001

GHG source and sink categories	CO_2 equivalent (Tg)												Change from 1990–2001 %
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	
Energy	171.0	NE	NE	NE	135.8	NE	137.9	142.4	132.7	125.2	132.5	130.3	–24
Industrial Processes	4.7	NE	NE	NE	3.8	0.17	3.9	4.3	4.5	3.97	4.3	6.99	+48%
Solvent Use	0.7	NE	NE	NE	0.60	NE	0.66	0.52	0.57	0.55	0.55	0.53	–28
Agriculture	12.5	NE	NE	NE	8.5	NE	9.2	8.7	7.93	7.8	7.5	7.6	–39
LUCF[a]	–2.1	NE	NE	NE	–4.6	NE	–4.4	–4.6	–3.7	–3.4	–4.0	–4.3	+108
Waste	2.9	NE	NE	NE	3.2	NE	3.2	2.8	2.9	2.7	2.7	2.6	–12
Other	0	NE	NE	NE	0	NE	0	0	0	0	0	0	0

[a] LUCF = Land-use Change and Forestry

5. The Czech Republic provided a national inventory report containing inventory data for the years 1990, 1994 and 1996–2001. In addition, the Czech Republic provided a nearly complete set of common reporting format tables for the years 1994 and 2001. Notation keys were not used consistently across the common reporting format tables. Trend tables were provided for the years 1990, 1994 and 1996–2001 for all gases, and for 1995 for fluorinated gases. Common reporting format tables were not provided for years 1991–1993 and 1995 for any sectors. In the national inventory report, trend tables for the complete time series from 1990–2001 are presented for solid waste disposal sites (CH_4), and for cement production (CO_2) and nitric acid production (N_2O). Common reporting format tables for recalculations were provided for the year 1994. Common reporting format tables for this year have not been submitted previously; reference figures are included in the Third National Communication of the Czech Republic.

6. The national inventory report contains information on methodologies, activity data, emission factors, key source analysis[3] and brief explanations of quality assurance/quality control approaches for most sectors. This information is, in some cases, not sufficient to make it possible to clearly understand the underlying assumptions and methodological choices, making it practically impossible to reproduce some of the estimates reported in the inventory. The Czech Republic presented comprehensive and useful information to the expert review team during the review. The inclusion of this information or of references to it in the next submission would greatly increase the transparency of the Czech inventory. Specific examples of what information should be included are provided in the discussion on individual sectors below. In some cases, the Czech Republic applies country-specific methodologies and emission factors to estimate some categories; this effort is welcomed. Further research and documentation on the decisions to use such approaches, focusing on how country-specific approaches to reducing uncertainties in the emissions estimates have been elaborated, are strongly encouraged.

7. The Czech Republic is building a more complete and transparent inventory, showing progress every year. A number of areas for further improvement were identified by the Czech inventory team for each sector in the national inventory report. A step-by-step implementation plan would provide the Czech Republic with a clear path for improving the inventory. The ongoing climate change project awarded to the Czech Hydrometeorological Institute by the Climate Change Unit of the Environment Ministry of the Czech Republic is the perfect framework for developing and implementing such a plan.

8. The main problems identified in the Czech inventory are the following:

(a) Insufficient documentation in the national inventory report and common reporting format tables of methodologies, emission factors, activity data, underlying assumptions and recalculations, which limits the transparency of the submission. Regarding country-specific methodologies and emission factors, more information is needed in order to assess their contribution to the accuracy and completeness of the inventory;

(b) Inconsistencies between international data (from the International Energy Agency and the Food and Agriculture Organization) and national activity data for the Energy and Agriculture sectors;

(c) An incomplete time series;

(d) Lack of formal quality assurance/quality control procedures and of an archiving system.

9. Details on these cross-cutting issues are explained in each sector, as well as the recommendations for improvements.

10. The Czech Republic has made important improvements since the last submission. It has reported full common reporting format tables for 1994 and 2001, reallocated process emissions from iron and steel production from the Energy sector to the Industrial Processes sector, and described some sectoral quality assurance/quality control procedures in the national inventory report. A major pending issue is the completion of the full times series, which the Party has already identified as a priority for improvement of the inventory.

I. OVERVIEW

A. Inventory submission and other sources of information

11. The Czech Republic submitted a national inventory report (NIR) on 15 April 2003. It also submitted common reporting format (CRF) tables for the years 1994 and 2001. The CRF data sets for 2001 contain data for 1990, 1994 and 1996–2001 in the trend and summary tables. Where needed the

[3] The national inventory report contains a key source analysis, both level and trend, for the year 2000. During the review, the Party presented a key source analysis, both level and trend, based on the 2001 data. The expert review team used updated data for the review.

expert review team (ERT) also used submissions from previous years, including the CRF tables for the years 1990 and 2000.

12. During the review the Czech Republic provided the ERT with additional information sources. These documents are not part of the inventory submission but are in many cases referenced in the NIR. The full list of materials used during the review is provided in annex 1 to this report.

B. Key sources

13. The Czech Republic in its 2003 NIR reports a key source tier 1 analysis; including both level and trend assessments based on the data for the year 2000 rather than 2001. Nevertheless, during the review it provided a new key source analysis for the year 2001, including both level and trend, which was considered by the ERT for the review. The level assessment for this key source analysis included the reallocation of emissions from iron and steel production from fuel combustion to the Industrial Processes sector. The trend assessment, however, did not include the reallocation because data for 1990 were not available. The key source analysis performed by the Party and the preliminary key source assessment by the secretariat[4] produced similar results. The differences encountered were the following:

(a) The Party identifies carbon dioxide (CO_2) emissions from Mineral products as a key source (1.4 per cent), while the secretariat identified Cement Production (1.2 per cent) as a key source. This caused a change in the position in the key source table of Agriculture: Indirect emissions of nitrous oxide (N_2O) from agriculture (1.3 per cent in both the secretariat and the Party's assessment);

(b) The Party aggregated two sources – mobile sources off road, including navigation (1 per cent), and usage of new gases (0.9 per cent) – leaving out the following key sources identified by the secretariat: nitric acid production (N_2O) and non-CO_2 stationary combustion (N_2O);

(c) N_2O from nitric acid production was included as a key source in the trend assessment performed by the Party.

14. Key source analysis is considered by the Party to be a critical factor for the preparation of its submission. It is used to prioritize the methodological development of the inventory. The Party expressed its interest in developing a tier 2 key source analysis, pending completion of an uncertainty analysis following 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).

C. Cross-cutting topics

Completeness

15. The Czech inventory includes some information about methodologies, activity data (AD), emission factors (EFs) and emission trends, quality assurance/quality control (QA/QC) approaches, and uncertainties, and a key source analysis for the year 2000. Nevertheless, in many cases this information is limited in detail and completeness, thus reducing the transparency of the inventory.

16. The Czech Republic has provided CRF tables for the years 1994 and 2001, and trend tables with information for the years 1990 and 1996–2001. For hydrofluorocarbons (HCFs), perfluorocarbons (PCFs) and sulphur hexafluoride (SF_6), data are provided for the years 1995–2001. In the case of halocarbons and SF_6, only potential emissions are estimated. Emissions estimates for the years 1991–1993 and 1995 are available at the Czech Hydrometeorological Institute (CHMI) office but not in

[4] 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.

the CRF format; they were estimated using the 1995 IPCC Guidelines. Table 8(a) has been completed for the recalculation of year 1994, but table 8(b) has not (reasons for recalculation).

17. For all the sectors except Energy and Waste, some CRF tables are left blank (these are: for 1994 and 2001: table 2(II).F; for 1994: tables 4.C, 4.E, 4.F, 5.B, 5.C, and 5.D, 8(b)) or have been filled in using notation keys as not estimated ("NE") and not occurring ("NO") (for 2001: tables 4.C, 4.E, 4.F, 5.B, 5.C and 5.D). The specific cases and the correct or incorrect usage of notation keys are described in the sector-by-sector analysis below.

Transparency

18. The NIR and the CRF are not sufficiently transparent to ensure evaluation and comparability across Parties. There is a lack of detailed information on methodologies, underlying assumptions and national choices for AD and EFs. It is not clear that the use of national models or country-specific EFs improves the accuracy or the completeness of the inventory because the reasons for choosing them are not clearly explained in the NIR. In addition, information based on expert judgement is not documented.

19. For each sector, the Czech Republic provided to the ERT, upon request, important information that was not included in the NIR. Since this information is available to the Party, the ERT strongly recommends that it be included in the NIR and CRF documentation boxes, where relevant, in future submissions. This would greatly improve the transparency of the inventory.

20. External sources are well referenced in the NIR but not complete. There is a lack of references regarding the assumptions used in determining country-specific EFs and models. The ERT recommends that a list of all studies, national choices of EFs, methodologies, AD, self verification and surveys, and all relevant information be included as references in the NIR and that they be archived in one place.

Recalculations and time-series consistency

21. Time series are not complete. A time series is provided including the years 1990, 1994 and 1996–2001, with small inter-annual variations that have not been explained in the NIR or during the review. The ERT encourages the Party to include some explanations for these inter-annual fluctuations. Emissions data for the years 1991–1993 and 1995[5] are missing for all sectors in the CRF. Some additional trend tables for the whole time series are included in the NIR only for the Industrial Processes and Waste sectors.

22. The ERT notes that recalculations were undertaken for the year 1994 for the different gases. Emissions reported as "previous emissions" in CRF table 8(a) have been taken from the Third National Communication. Some information is reported in the documentation box of table 8(b) but not in the actual table, and the rationale and proper explanation for these recalculations are not provided in the NIR.

23. Additional information about the reasons for recalculation was provided during the review. The ERT strongly recommends that table 8(b) be used for every recalculation and that the reasons for changes in every sectoral chapter of the NIR be clearly addressed.

24. The recalculation for 1994 increased the figures for total emissions by 2.7 per cent. The major changes include: an increase of 920 per cent in N_2O emissions from agricultural soils which is due to the application of the *Revised 1996 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC Guidelines) methodology (from 553 Gg CO_2eq to 5,645 Gg CO_2eq); and an increase of 2.8 per cent in CO_2 emissions from the Energy sector due to an adjustment in the sectoral approach. In addition, recalculations for 1994 increased net removals from Land-use Change and Forestry (LUCF) by 18 per cent. The impact on the trend of these recalculations cannot be assessed because of lack of data for the full time series.

[5] Emissions of fluorinated gases (F-gases) are provided in the time series for 1995 onwards.

25. As a general assessment, these recalculations contributed to the completeness of the inventory, since new sources were added as a result of the application of the IPCC Guidelines. Nevertheless, the impact on the Industrial Processes and Agriculture sectors needs to be further assessed when more specific data are provided (by further research on the use of lime in other activities than construction, and the adjustment of the country-specific EFs for enteric fermentation). Recalculations in the LUCF sector were explained to the ERT during the review and are the result of initial data entry errors.

Uncertainties

26. The Czech Republic has provided qualitative uncertainty estimates using CRF table 7. The majority of emissions estimates are assessed as being of medium or high quality, but there is no further explanation of this assessment in the NIR. The NIR also provides figures for the accuracy of the inventory by gas (CO_2: 7–10 per cent, methane (CH_4): 35–40 per cent and N_2O: 70–100 per cent) and for total emissions (15 per cent), based on expert judgement. No documentation was available to support these figures. However, the report does state that this method was not fully in conformity with the IPCC good practice guidance.

27. During the review the Party presented a preliminary uncertainty analysis using the tier 1 methodology in the IPCC good practice guidance and based on 2000 data. The uncertainties used for the EFs and AD for each key source are taken from the IPCC good practice guidance or established from expert judgement, but the Party expressed the opinion that they are not reliable. The Party is planning to provide an updated preliminary uncertainty analysis for the 2004 inventory submission, and along these lines the CHMI is planning to ask for uncertainty figures for AD and EFs during the compilation of the inventory. The Party plans to use the tier 1 uncertainty assessment for the tier 2 key source analysis with the aim of having better tools available for prioritizing further improvements to the inventory.

Verification and quality assurance/quality control approaches

28. The Party has provided some information about procedures for almost every sector of the inventory in the NIR. These procedures are not well documented, and are applied as regular internal checks but not necessarily in a systematic way. Nor are they entirely in line with the IPCC good practice guidance. As part of the QA for the inventory, two experts review it before the Ministry of the Environment approves it. A lack of QA/QC procedures for the establishment of national country-specific EFs, based on expert judgement or plant-specific studies, has been identified.

29. The Party does not have a written QA/QC plan in place. The Party expressed its will to implement QA/QC procedures in accordance with the IPCC good practice guidance.

Institutional arrangements

30. During the in-country visit, the Czech Republic explained the institutional arrangements for the preparation of the inventory. The CHMI has overall responsibility for the national inventory through implementation of the project called the National Program to Mitigate Climate, Scientific and Technical Aspects Needed for Joining the EU (2002–2005), assigned to it through a tender by the Ministry of the Environment. This project comprises two sub-projects:

(a) GHG National Inventory for 2001–2004 Assurance of Time series Consistency; Preparation of the National Inventory System in Harmony with International Obligations;

(b) Support for the Preparation of the National Climate Change Program and its Evaluation;

(c) The main tasks of sub-project (a) are to prepare the national inventory for 2001–2004 and to recalculate the time series from 1990 onwards in a consistent manner.

31. The inventory is developed by the CHMI's Climate Change Division, with the support of ad hoc consultants or institutions. Contributions to the 2001 inventory were made by the following: Management, general issues and reporting – CHMI; Energy (1.A, 1.B) – KONEKO and CHMI; Industrial

Processes and Solvent Use (including fluorinated gases) – KONEKO and CHMI; Agriculture – CHMI; LUCF – CHMI with data provided by the Forest Research Institute; Waste – Centre for the Environment, Charles University. The CHMI compiles the final submission with inputs from the groups listed above. It has a special arrangement with the Czech Statistical Office under which it can obtain preliminary data before they are published. The inventory is then reviewed by two independent consultants, contracted by the Ministry of the Environment through the above-mentioned project, and approved by the newly implemented Climate Change Unit of the Ministry.

32. This arrangement allows the Czech Republic to compile a good inventory on time, but it presents challenges for tracking all the information needed for the evaluation of the inventory and ensuring timely access to all data.

Record keeping and archiving

33. The Party has a partly centralized but non-systematic archiving system for all documents and information needed for the reconstruction of all years of the inventory. The CHMI keeps electronic and hard copies of all NIRs and CRFs. Some of the calculation sheets and reference studies are also kept at the CHMI, but some of them are kept by the experts or institutes contracted for the different sectors (i.e., KONEKO for Energy, fugitive emissions, Industrial Processes and solvent use, the Institute of Forest Research for LUCF, etc.). The material needed for the inventory is not codified so that it can be difficult to track the documentation and some background information is not readily available.

Follow-up to previous reviews

34. The major improvements in the 2003 submission are the submission of CRF tables for 1994 and their inclusion in the trend tables, and the reallocation of process emissions from iron and steel production from the Energy to the Industrial Processes sector. Some QA/QC procedures are also briefly described in the NIR for some sectors of the inventory. The major issue pending is the completion of the full time series, which has already been identified for the Party as a priority for improvement of the inventory.

D. Areas for further improvement

Identified by the Party

35. The NIR identifies several areas for improvement, including:

(a) The inclusion of CRF tables for the years 1992 and 1996 in the Party's next submission;

(b) The development of uncertainty analysis.

36. The Czech Republic indicated during the review that its plan for the future includes:

(a) The application of QA/QC procedures;

(b) The implementation of a national system under the Kyoto Protocol.

Identified by the ERT

37. The ERT identifies the following cross-cutting issues for improvement. The Party should:

(a) Develop a plan for implementing all the improvements identified as needed, setting annual priorities, time frames and resource allocation, within the framework of the sub-project entitled GHG National Inventory for 2001–2004 Assurance of Time Series Consistency; Preparation of the National Inventory System in Harmony with International Obligations;

(b) Organize all the information related to the inventory – calculation sheets, background documents and studies – in a more systematic way to ensure that they are available for the replication of the inventory;

(c) Improve transparency by:

(i) Completing time series;

(ii) Including all background information and references in the NIR, for which the ERT encourages the Party to develop a system using the structure presented in the United Nations Framework Convention on Climate Change (UNFCCC) reporting guidelines (FCCC/CP/2002/8);

(iii) Documenting emission factors, AD and underlying assumptions. The Party should be especially careful with the use of national methodologies and EFs and ensure that they accurately reflect the national circumstances and improve the accuracy of the inventory;

(iv) Providing reasons and background data on the recalculations in tables 8(a) and 8(b) and in the NIR in each sector chapter;

(v) Using notation keys properly and consistently;

(vi) Making more extensive use of the documentation boxes in the CRF.

(d) Provide quantified uncertainty estimates, ensuring that uncertainties established for AD and emission factors are well referenced;

(e) Create a QA/QC management system, in accordance with the IPCC good practice guidance, that focuses primarily on key sources, taking into account the availability of resources;

(f) If possible, submit country-specific parameters and EFs to the IPCC database of EFs.

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

II. ENERGY

A. Sector overview

39. The Energy sector contributed 88 per cent of total greenhouse gas (GHG) emissions (without LUCF) in the Czech Republic in 2001, with 46.2 per cent deriving from the energy industries, which are the largest source in this sector. CO_2 emissions from the Energy sector amount to 96.5 per cent of total CO_2 emissions without LUCF. The five key sources in the Energy sector accounted for 85.3 per cent of total GHG emissions (without LUCF) in 2001.

40. CO_2 emissions from fuel combustion decreased by 24 per cent in the period 1990–2001 as a result of a reduction in the consumption of coal and its partial replacement by natural gas. Fugitive emissions of CH_4 dropped by 32 per cent as a result of technology modernization, a reduction in the amount of coal mined and lower coal consumption.

Completeness

41. The CRF includes estimates of most gases and sources of emissions from the Energy sector, as recommended by the IPCC Guidelines. The few exceptions are CH_4 emissions from venting/flaring and oil exploration, and emissions from manufacturing industries and construction, which are not disaggregated into subsectors but reported under Other. The ERT recommends that the Party make the necessary efforts to estimate the relevant emissions, especially for manufacturing industries and construction. The Party informed the ERT that it plans to make such a disaggregation, on the basis of secondary data available, in the next submission if possible. The ERT welcomes this effort and encourages the Party to continue this work. The ERT further encourages the Party to include in its next NIR a detailed description of the method used to disaggregate the data for manufacturing industries and construction.

Transparency

42. For key source categories, tier methods as recommended in the IPCC good practice guidance are used. For non-key source categories, higher-tier methods are usually used together with country-specific/ plant-specific EFs. The methods used are described in a general way that makes it possible to assess the Party's implementation of the IPCC good practice guidance. Sources and references for methods, AD and EFs are documented. However, detailed assumptions and input data for different estimation steps, which would allow reconstruction of the inventory from the underlying data, are not usually provided. The ERT recommends that the Czech Republic add this information, which is available, to its NIR.

Recalculations and time-series consistency

43. In the Energy sector, recalculations for the year 1994 have been done for all subcategories under 1.A (Fuel combustion activities) and 1.B (Fugitive emissions from fuels). The recalculations led to a reduction of emissions of 0.4 per cent for the year 1994. Table 8(b) is not filled in and only the documentation box states briefly the need for the recalculation, while no relevant information is provided in the NIR. The Party explained that the main reason for the recalculation was the implementation of the sectoral approach described in the IPCC Guidelines instead of the reference approach for estimating total CO_2 emissions that were disaggregated in the defined subcategories. Moreover, the final official energy balance for 1994 was used. Changes in the emissions of each gas are therefore attributed to the reallocation of AD and the use of more reliable data. The ERT recommends that detailed information about the recalculations should be reported in the relevant chapters of the NIR as well as in table 8(b) of the CRF.

44. There are no time series consistency problems for the years for which a complete CRF has been submitted. Emissions trends are explained on a qualitative basis in the NIR. However, it would be more helpful if relevant background data were provided in the NIR in order to explain the observed trends better.

Verification and quality assurance/quality control approaches

45. QA/QC activities for the Energy sector are reported in the NIR in a brief and general way in the form of planned activities for improving the inventory. However, a formal QA/QC plan has not been adopted.

B. Reference and sectoral approaches

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

46. CO_2 emissions from fuel combustion have been calculated using the reference and the sectoral approaches. For the year 2001, there was a difference of 2.03 per cent between the CO_2 emissions estimates for the two approaches. This difference is well explained by the Party in the relevant documentation box in the CRF and is attributed to coke consumption in the iron and steel industry.

47. The ERT notes that there are significant differences between the reference and the sectoral approaches by fuel type for both energy consumption and CO_2 emissions, although "stock changes" include losses and statistical differences. During the review, the Party explained that these deviations could be attributed to transfers in transformation processes, namely by coking and gasification of coal, accompanied by generation of fuel oils and gases. The ERT noted that such explanations could be included in the NIR.

48. Several areas of difference between the inventory data and data from the International Energy Agency (IEA) are identified, especially for liquid fuels. The data for natural gas and solid fuels correspond very closely. The Czech Republic is aware of the problem and attributes it to institutional problems regarding the development of the national energy balance. The Party considers that the official development of the national system could provide the basis for resolving this problem. On the basis of the explanations given, the ERT recommends that differences between the national data and the IEA data

should be either corrected or analyzed and explained by the Party. Moreover, the ERT states that it would be helpful if relevant information from the national energy balance used for the compilation of the inventory were reported in the NIR.

49. The NIR identifies several inefficiencies in the official energy balance compiled by the Czech Statistical Office, especially on the final energy consumption sector. These inefficiencies are mostly related to the disaggregation of fuel consumption by sector. For that reason, specialized procedures (use of detailed bottom–up models) are applied by the CHMI. However, the NIR does not contain any background information on the application of these procedures but only a short description of them. The ERT therefore recommends the Party to include in its next submission relevant information that would allow the inventory to be reconstructed from the underlying data.

International bunker fuels

50. The Czech Republic estimates emissions from domestic and international aviation separately. The NIR does not, however, provide a description of the rationale for the split between domestic and international emissions. During the review, the Party explained that calculations are based on fuel deliveries for international aviation and that this value is compared with the total fuel consumption of jet kerosene and with transport performance of domestic aviation according to the *Statistical Yearbook*. The ERT recommends the inclusion in future inventory submissions of information on the methodology used for the estimation of emissions from international aviation.

Feedstocks and non-energy use of fuels

51. The methodology used for the estimation of feedstocks and non-energy use of fuels is explained in the NIR and is consistent with the IPCC Guidelines, but no additional information is provided in the relevant box of the CRF.

C. Key sources

Stationary combustion: Solid fuels – CO_2

52. This key source accounts for 54.9 per cent of total GHG emissions (without LUCF) according to the key source analysis presented by the Party during the review. The emission factors and fuel parameters used are the default values proposed by the IPCC Guidelines.

Stationary combustion: Gas – CO_2

53. This key source accounts for 12.9 per cent of total GHG emissions (without LUCF) according to the key source analysis presented by the Party during the review. The emission factors and fuel parameters used are the default values proposed by the IPCC Guidelines.

Stationary combustion: Liquid fuels – CO_2

54. This key source accounts for 6.3 per cent of total GHG emissions (without LUCF) according to the key source analysis presented by the Party during the review. According to the information provided in the NIR, the emission factors and fuel parameters used are the default values proposed by the IPCC Guidelines. However, several cases where the CO_2 implied emission factor (IEF) for liquid fuels is among the lowest of reporting Parties are identified. The CO_2 IEF for total liquid fuel consumption (table 1.A(a)s1 of the CRF) and for other sectors (table 1.A(a)s4 of the CRF) is similar to the EF for gasoline, while the CO_2 IEF in manufacturing industries and construction (table 1.A(a)s2 of the CRF) is similar to the EF for liquefied petroleum gas (LPG). The ERT recommends the Party to analyse this issue further.

Mobile combustion: Road vehicles – CO_2 and N_2O[6]

55. CO_2 emissions from this key source, according to the key source analysis presented by the Party during the review, account for 7.6 per cent of total GHG emissions (without LUCF).

56. Estimation of GHG emissions from the sector is based on a disaggregation of total consumption by mode of transport and fuel. Additionally, in road transport, consumption is disaggregated by vehicle type (catalytic converters, non-catalytic converters, etc.). The MAED model, which is a detailed simulation model for energy demand analysis, is applied for this disaggregation taking into consideration data from an annual study of the Ministry of Transport. However, no background information on the implementation of the model (input data, assumptions etc.) is provided in the NIR. The ERT recommends the Party to provide more relevant background information in its next submission.

57. The way in which the N_2O EF for catalytic vehicles (tier 2 methodology) has been estimated is unclear. Expert judgement is used for considering the higher usage of new catalytic vehicles. An arithmetic mean is used for estimating the EF, although the necessary AD are estimated. The ERT recommends the Party to reconsider the estimation of N_2O emissions from road transport, taking into consideration the relevant EFs provided in the IPCC good practice guidance.

Coal mining and handling: Gas – CH_4

58. This key source accounts for 3.5 per cent of total GHG emissions (without LUCF) according to the key source analysis presented by the Party during the review. CH_4 emissions from deep mining are estimated using tier 2 methodology for the main coal-producing basin (Ostrava–Karvina) and a tier 1 approach for other deep mining areas (Kladno). CH_4 emissions from surface mining as well as for post-mining activities are estimated using tier 1 methodology. The NIR contains adequate justification for this use of different tiers.

59. The Party explained that the measurements on which the estimation of national emissions is based could not be directly reported, as measurement data may not be available because of the privatization of the sector since 1996. The ERT noted that an annual check of the validity of the estimated country-specific EF might be necessary in the new circumstances.

D. Non-key sources

Non-CO_2 stationary combustion: All fuels – CH_4

60. According to the NIR, CH_4 emissions from stationary combustion of all fuels are estimated by applying a tier 2 approach with IPCC EFs. The ERT notes that, given the aggregated presentation of Manufacturing Industries and Construction, it is not possible to apply a tier 2 method in this subcategory. Moreover, the ERT recommends the Party to include in its next submission information related to the technological structure of energy consumption.

Non-CO_2 stationary combustion: All fuels – N_2O

61. According to the NIR, N_2O emissions from stationary combustion of all fuels are estimated by applying a tier 2 approach with country-specific EFs. The ERT notes that, given the aggregated presentation of Manufacturing Industries and Construction, it is not possible to apply a tier 2 method in this subcategory.

62. The NIR explains the rationale for estimating country-specific EFs for solid fuels consumption in electricity generation,[7] but there is only a general description of the methodology applied for estimating these EFs. The Party provided the EFs used during the review.

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[6] Identified as a key source by the trend assessment undertaken by the Party.

[7] In the NIR (in which calculations presented are based on the 2000 data), Non-CO_2 stationary combustion: Solid fuels – N_2O is identified as a key source.

63. The ERT recommends the Party to include in its next submission information related to the technological structure of energy consumption as well as the country-specific EFs.

Fugitive emissions from oil and gas operations: CH_4

64. CH_4 emissions from oil and gas operations are estimated using higher-tier methodologies and country-specific EFs. However, there is only a short description of the methodologies applied and no background information was provided, especially for EFs. The CH_4 IEF for Oil production (5,287 kg/PJ) is slightly higher than the IPCC default value (300–5,000 kg/PJ) and the CH_4 IEF for Transmission – natural gas (3,188 kg/PJ) is lower than the IPCC default value (57,000–628,000 kg/PJ). It is not possible to assess whether these issues have been addressed. The ERT recommends the Party to provide more information. During the review, the Party noted that detailed background information is available but that it was not considered necessary to present it because the share of this source is low. Additionally, the issues identified in the previous 2003 review activities were well explained. The Party agreed to provide more information in its next submission.

E. Areas for further improvement

Identified by the Party

65. The Party plans to implement the sectoral approach, described in the 1996 IPCC Guidelines, for the remaining years (1991–1993 and 1995). Moreover, the improvement of the AD for road transport is also foreseen in cooperation with the Transport Research Centre.

Identified by the ERT

66. During the review, the Party provided more detailed information regarding the implementation of the selected tiers, country-specific EFs and methods, AD used and so on. The ERT encourages the Party to include such information in its next submission in order to further improve the completeness and transparency of the inventory.

III. INDUSTRIAL PROCESSES AND SOLVENT USE

A. Sector overview

67. Industrial Processes emissions were 6,991 Gg CO_2 equivalent in 2001 and contributed 4.7 per cent to total national emissions, excluding LUCF. The Party provided a revised key source analysis based on the 2001 inventory year. According to this analysis three key sources were identified in this category: cement production, nitric acid production, and iron and steel production. Together they represent 80 per cent of the total emissions of the Industrial Processes sector. Metal production accounts for 37 per cent of industrial processes emissions. CO_2 is the main gas emitted by industrial processes, contributing close to 65 per cent of the sector's emissions.

68. It was not possible to observe the general trend of this sector during the period 1990–2001 as the GHG emissions are reported only for the years 1990, 1994 and 1996–2001 in the trend table of the CRF (table 10). For HFCs, PFCs and SF_6, the years 1995–2001 are reported. However, emission trends (1990–2001) for two key sources, namely cement and nitric acid production, are presented in the NIR. CO_2 emissions from cement production in 2001 declined by 45 per cent relative to 1990 because of a decrease in cement production. N_2O emissions from nitric acid production fluctuated around a value of 3.5 Gg.

Completeness

69. The CRF includes estimates of most gases and sources of emissions from the Industrial Processes sector, as recommended by the IPCC Guidelines. Not included are: limestone and dolomite use, soda ash production and use, asphalt roofing, road paving with asphalt, carbide production and ferroalloys production. CRF tables 2(II).F and 9 are not filled in at all, with the exception of ammonia production in table 9. The ERT encourages the Party to include the missing sources in the Industrial Processes sector or

provide a clear explanation as to why they are not included in the inventory. Aluminium production, adipic acid production and production of halocarbons and SF_6 are reported as "NO" in the CRF.

Transparency

70. The ERT notes that not all explanations on methods used in the industrial processes inventory are transparent (e.g., those on AD, methods used, and implied emission factors for lime production and ammonia production). The ERT recommends that the Party include such information in the NIR, including detailed steps used in the estimation, a clear indication of which EFs are country-specific and which are IPCC defaults, and the data sources used to derive country-specific factors.

B. Key sources

Cement production – CO_2

71. Cement production is a key source in the Czech Republic. It accounts for 40 per cent of emissions from the whole Industrial Processes sector (1,789.96 Gg), and 1.2 per cent of total national emissions. Emissions are calculated in accordance with the IPCC Guidelines, using the IPCC default EF (0.4985 t CO_2/t cement). Activity data for cement production are available in the national statistics. However, using data on cement production for the calculation of emissions is not in line with the IPCC good practice guidance. The ERT recommends that CO_2 emissions be estimated using data for clinker production (tier 2). If it is not possible to obtain clinker production data directly, clinker production should be inferred from cement production and a correction for clinker import and export statistics should be applied (tier 1).

Nitric acid production – N_2O

72. Nitric acid production contributes 0.8 per cent of total emissions and 14.7 per cent of emissions from industrial processes. N_2O emissions for 2001 equalled 3.32 Gg. The tier 1 method and plant-specific EFs are used. The country-specific EF for nitric acid production is 6.57 kg N_2O/t HNO_3, based on the study by Markvart and Bernauer (2000). Activity data are obtained from the individual plants. Details of nitric acid production from different plants were presented to the ERT during the review. The methodology used is explained in the NIR. Two types of process are used in the Czech Republic, at pressures of 0.1 MPa and 0.4 MPa. The abatement technique with a selective catalytic reduction is mostly used, which slightly increases the amount of N_2O emissions. The methodology and EF used to estimate N_2O emissions from this source are consistent with the IPCC Guidelines.

Iron and steel production – CO_2, CH_4

73. Iron and steel production contributes 1.8 per cent to total emissions and 37 per cent to emissions from the Industrial Processes sector. In accordance with the IPCC good practice guidance, starting with the 2001 inventory, emissions from the process part of iron and steel production are reported under Industrial Processes (category 2.C.1). (For all previous years emissions were included in the Energy sector under Manufacturing Industries and Construction (category 1.A.2).) The methodology used for estimating emissions from iron and steel production is consistent with the tier 1 IPCC method. Calculations are based on the amount of coke burned in blast furnaces. The IPCC default emission factor (29.5 t C/TJ) and the oxidation factor (0.98) are used. Plant data for the period 1989–2001 were provided to the ERT. The ERT was informed that the national inventory team is planning to reallocate the process part of CO_2 emissions from iron and steel to the Industrial Processes sector from the Energy sector, based on these plant data, for the period 1990–2000. The ERT welcomes the Party's work on reallocating the process part of the emissions to the industrial sector and encourages it to report the results in its next submission.

C. Non-key sources

Lime Production – CO_2

74. Emissions from lime production are subsequently absorbed during application by chemical bonding in the hardening of mortar (a sink). Consequently net emissions are zero. The ERT encourages the Czech Republic to study this process and develop an appropriate sequestration factor. The national inventory team assumes that 100 per cent of lime is used in the construction sector, but the ERT notes that some lime may be used in iron and steel production and in the pulp and paper industry. Additional applications of lime should be identified and documented because not all the applications of the lime produced (e.g., in pulp and paper production, the treatment of effluents, and water softening and pH control) lead to CO_2 sequestration. The ERT recommends the Party to investigate this matter further and include the results in its next inventory.

Other mineral products

75. Emissions from limestone and dolomite use and asphalt roofing are reported as "NE". The ERT notes that there is no explanation as to why they are not estimated and requests further clarification. Emissions from soda ash production and use and from road paving with asphalt are reported as "0". The ERT reached a consensus with national experts to change "0.00" in the CRF for these sources to "NE" and to provide additional clarification for the sources reported as "NE" in the NIR and in CRF table 9.

Ammonia production – CO_2

76. CO_2 emissions from ammonia production are reported as included elsewhere ("IE"). They are included in the Energy sector under manufacturing industries and construction because of difficulties in identifying the amount of gasified fuel (black oil). The IEF is not reported in the CRF, while production data are provided. The ERT was informed during the review that emissions are roughly estimated to be about 375 Gg CO_2. The ERT encourages the national inventory team to consider reallocating CO_2 emissions from ammonia production to the Industrial Processes sector.

Other chemical industry

77. CH_4 (0.39 Gg) and N_2O (0.27 Gg) emissions are reported in the sectoral tables, but there is no explanation about emission sources. The ERT supposes that CH_4 emissions are from the carbon black, ethylene and styrene industries and that N_2O emissions are from the caprolactam industry. The ERT encourages the Party to provide information on what is included in Other in the CRF. The ERT suggests that emissions from carbide production be reported as "NO" in table 2(I) instead of "0".

Other metal production

78. Emissions from ferroalloys production are reported as "NE". However, AD are reported in the CRF table. The ERT notes that there is no explanation as to why these emissions are not estimated and requests further clarification. CH_4 emissions are reported in the line Other. The ERT notes that there is no information as to the source of these emissions, the AD or the IEF. The ERT encourages the inventory team to include a brief explanation for each emission source that is not estimated in the NIR and also provide a description of methods, EFs and AD for the category Other in both the NIR and the CRF.

Consumption of halocarbons and SF_6

79. There is no production of HFCs, PFCs or SF_6 in the Czech Republic. Only potential emissions are estimated, supplemented by information on the usage of fluorinated gases (F-gases) in individual sectors. The total potential emissions equalled 1,282.9 Gg CO_2 equivalent in 2001. HFCs, PFCs and SF_6 contribute 0.9 per cent of total national emissions and 18.3 per cent of industrial processes emissions. Import and export AD come from the Customs authorities. Emissions estimates for F-gases have been improved in the inventory as a result of improvement in data collection for 2001: for example, the submission of a questionnaire to all importers of F-gases made it possible to collect additional

information on the quantity, composition and usage of gases. Activity data are available for 1995, 1996 and 1999–2002 based on Customs Office information and questionnaires sent to importers and exporters, while consumption data for 1997 and 1998 were estimated on the basis of analogy with the year 1996 only, based on Customs data. The ERT was briefed on a recent study which studied opportunities for estimating actual emissions of HFCs, PFCs and SF_6. The ERT welcomes the initiative of the recent study and encourages the Czech Republic to continue its work and try to estimate actual emissions.

80. The ERT noted that HFC, PFC and SF_6 emissions are not reported in the CRF table Summary 2 under Industrial Processes. Total industrial processes emissions for 2001 are 5,708.44 Gg according to this table, while in table 10s5 total industrial processes emissions equal 6,991 Gg. The values should be the same in both tables.

Solvent and other product use

81. This category includes in particular emissions of non-methane volatile organic compounds (NMVOC) from the use of solvents, which are simultaneously considered to be a source of CO_2 emissions. CO_2 emissions amounted to 316.88 Gg in 2001. The category also includes N_2O emissions from solvent use in the food industry and in health care. The CORINAIR methodology is employed. NMVOC emissions amounted to 106.73 Gg. The data are prepared on the basis of a balance approach, which corresponds to the methodology in the Energy category, that is, production plus imports minus exports of VOCs.

D. Areas for further improvement

Identified by the Party

82. Planned improvements presented to the ERT mainly focused on actual data collection on the consumption of HFCs and PFCs, and on SF_6 use. Other areas for improvements identified include the collection of data on clinker production and the development of a new methodology for calculating the production of lime (research on the proportion of lime used in the building industry). The national experts also acknowledged the need to reallocate emissions for iron and steel production from the Energy to the Industrial Processes sector for the years 1990–2000.

Identified by the ERT

83. The method of reporting potential emissions from the use of F-gases leads to overestimation of total emissions from the Industrial Processes sector. The ERT recommends the Party to calculate actual emissions using the tier 2 approach and provide emissions estimates for 1990–1994. The ERT advises the Party to contact other Parties to learn from their experiences in estimating actual emissions from halocarbons and SF_6.

84. Further research on CO_2 sequestration for lime production and the investigation of other sources of lime use are needed.

85. To improve transparency, it would be helpful to report emissions from the main industrial processes in separate sub-chapters of the NIR, instead of by gas.

IV. AGRICULTURE

A. Sector overview

86. Emissions from agriculture in 2001 accounted for 5.2 per cent of total greenhouse gas emissions in the Czech Republic. This contribution was largely due to direct emissions of N_2O from agricultural soils (1.9 per cent), indirect emissions of N_2O from agricultural activities (1.3 per cent) and CH_4 emissions from enteric fermentation (1.2 per cent). The single largest contributing source in the Agriculture sector is direct emissions from cultivation of organic soils, which accounted for 63.2 per cent of CO_2 equivalent emissions from the sector in 2001. The principal emission sources in agriculture and

their respective contributions to the total remained similar during the period 1990–2001, even though total emissions from the sector decreased by approximately 39.8 per cent from 12,521 Gg in 1990.

87. During the in-country review the Party provided an updated version of its key source analysis. The Party identified three key sources – direct N_2O emissions from agricultural soils, indirect N_2O emissions from nitrogen used in agriculture, and CH_4 emissions from enteric fermentation – in the Agriculture sector. These key sources were also identified by the preliminary key source analysis performed by the secretariat and they account for 4.2 per cent of total emissions.

Completeness

88. The CRF and the NIR include estimates of all gases and sources of emissions from the Agriculture sector, as recommended by the IPCC Guidelines. However, not all data are appropriately presented in the CRF or the NIR. Emissions data for 1991–1993 and 1995 are not reported in table 7.6 (CH_4 and N_2O emission trends in agriculture) in the NIR. CH_4 emissions from rice cultivation are reported as zero in Summary 1.A in the NIR, but notation key "NE" is used in table 4. The use of notation keys ("NE", "NO", and not applicable ("NA")) should be checked and clarified.

Transparency

89. Information on methods, AD, EFs and other parameters used and appropriate references are not clearly reported in either the CFR or the NIR. Additional documentation was provided during the in-country review. In the CRF the additional information boxes for CH_4 from enteric fermentation and CH_4 emissions from manure management are not filled in. The ERT recommends the Czech Republic to fill in the additional information boxes in future inventories, if possible. The ERT further recommends the Party to include more detailed information on methods, assumptions, data sources and estimation steps in both the CRF and the NIR.

Recalculations and time-series consistency

90. Emissions from the Agriculture sector for enteric fermentation (CH_4), manure management (CH_4 and N_2O) and agricultural soils (N_2O) were recalculated for the year 1994 and reported in CRF table 8(a), but no explanations were provided in table 8(b). During the review, the Czech Republic explained that the recalculation was due to a change in the EFs for enteric fermentation and manure management and the application of the IPCC Guidelines for N_2O from agricultural soils. Emissions estimates have improved the accuracy of the emissions inventory.

B. Key sources

Direct N_2O emissions from agricultural soils

91. As mentioned above, agricultural soils are the main source of direct emissions of N_2O in the Agriculture sector. They contribute 1.9 per cent of total national emissions and 63 per cent of total emissions from the Agriculture sector. The ERT points out that the Party's accounting and allocation of nitrogen inputs from agricultural soils and its cross-checking of AD with other sources of information (from the Food and Agriculture Organization (FAO) and other international organizations) are incomplete. The ERT recommends that the Party improve the accuracy of both the AD and the EFs, recalculate emissions from the subcategory for all time series, and establish data cross-checking procedures. All data and parameters used should be clearly reported in both the CRF and the NIR.

Indirect N_2O emissions from nitrogen used in agriculture

92. Indirect N_2O from nitrogen used in agriculture is estimated as one of the key sources. Its contribution to total national GHG emissions is 1.3 per cent. There was an error in the units used for

nitrogen excretion per animal waste system (t N/yr was used instead of kg N/yr). The ERT recommends that this inconsistency be checked and amended in the next inventory.

Enteric fermentation – CH_4

93. CH_4 emissions from enteric fermentation are identified as a key source using the level and trend assessment. Their contribution to total national GHG emissions is 1.2 per cent. Emissions estimates covered all animal classes. A significant decrease in the population of animals since 1990, especially cattle, because of economic problems in the transition period of the country, has resulted in decreases in emissions. CH_4 emissions for dairy cattle and non-dairy cattle have decreased by 48.1 per cent and 56.7 per cent, respectively, from the 1990 level. The Czech Republic reports that conditions in agriculture have stabilized since 1994.

94. In the 2001 inventory, country-specific CH_4 EFs for enteric fermentation are used. The CH_4 EFs for cattle are lower than the IPCC default values for Eastern and Western Europe. The CH_4 EFs for sheep and goats are lower, and CH_4 EFs for horses and swine are higher than the IPCC default values.

95. The Czech Republic has compared its EFs to estimates in Western Europe and believes that the EFs used better reflect the practices in the country. Czech experts have started to update the existing EFs, especially CH_4 EFs from enteric fermentation, using the IPCC tier 2 approach based on the latest results of studies carried out in the Czech Republic. Preliminary results of the re-estimation of country-specific EFs presented to the ERT during the in-country review show that CH_4 EFs for enteric fermentation in the country-specific conditions can be improved, although calculation procedures are still under development. The ERT welcomes the work being done to revise the CH_4 emissions inventory for enteric fermentation and encourages the Party to report the revised estimates in future inventories. Another recommendation is that the full table 4.A and the additional information box should be filled in. If that is not possible the Party is recommended to include notation keys.

C. Non-key sources

Manure management – CH_4

96. The 2001 value of CH_4 emissions from manure management is 32.04 Gg. This is 0.5 per cent of total national GHG emissions. The CH_4 IEFs for dairy and non-dairy cattle as well as poultry are lower than the IPCC default values for cool Eastern and Western Europe. Also, the 2001 values of the CH_4 IEFs for sheep, goats, horses and swine are higher than the IPCC recommended default values. The ERT therefore recommends the Party to re-estimate the CH_4 EFs for the manure management for all animal classes in the country-specific conditions and to recalculate its emission inventories for all years since 1990.

Manure management – N_2O

97. The 2001 value of N_2O emission from manure management is 422 Gg, accounting for 0.3 per cent of total national GHG emissions. The reported N_2O IEF is 1000 higher than the IPCC default value because the Party used the nitrogen excretion per animal waste system in t N/yr instead of kg N/yr. The ERT recommends the Party to use the correct unit in its emissions inventory and re-estimate N_2O emissions from manure management in future inventories.

D. Areas for further improvement

Identified by the Party

98. The Party has identified the following areas for further improvement:

(a) Re-estimation of country-specific CH_4 and N_2O EFs for the relevant source categories, recalculation of all data series since 1990, and corrections in both the CRF and the NIR. The revision of the CH_4 emissions inventory for enteric fermentation has already started;

(b) Implementation of the IPCC good practice guidance for tier 2 calculations to re-estimate emissions from agriculture.

Identified by the ERT

99. In addition to the areas identified by the Party the ERT recommends the following actions for further improvement of the Agriculture sector inventory of the Czech Republic. The Party should:

(a) Improve its documentation of the methodologies and assumptions used to estimate CH_4 and N_2O emissions;

(b) Report emissions from the sector by source categories rather than by gas in the NIR to facilitate the review;

(c) Recalculate emissions from the Agriculture sector when EFs are available and produce a consistent time series for all gases and source categories;

(d) Expand its literature and farm surveys in order to collect more complete and reliable information on animal waste management systems (AWMS).

V. LAND-USE CHANGE AND FORESTRY

A. Sector overview

100. Net CO_2 removals of 4,363 Gg CO_2 from LUCF were reported in 2001. The removals are a result of the balance of emissions and removals in changes in forest and other woody biomass stocks, comprising forest management for timber, afforestation of agricultural land, and other non-forest trees along rivers and on small tracts of land. The net removals in the LUCF sector offset total national GHG emissions by 3 per cent. Trace gas emissions from burning in LUCF contributed less than 1 per cent to total national CH_4 emissions and negligible N_2O emissions in 2001 were reported. Net CO_2 removals from LUCF increased by 105 per cent from 1990 to 2001. An increase of 116 per cent occurred between 1990 and 1994, followed by annual fluctuations ranging from –4 per cent to +20 per cent. LUCF removals are small relative to total emissions and, when they are included in the time series, there is no detectable impact on overall trends.

Completeness

101. The CRF includes estimates of some gases, sources and sinks from the LUCF sector, as recommended by the IPCC Guidelines. Included are CO_2 from forest and other woody biomass stocks, as well as trace emissions of CH_4, N_2O, NO_X and carbon monoxide (CO) from on-site biomass burning in managed forests. CO_2 and trace gas emissions from forest and grassland conversion and CO_2 emissions from abandonment of managed lands are reported as "NO". CO_2 emissions and removals from soils are reported as "NE".

Transparency

102. The NIR provides limited information on methods, AD and emission factors used. The level of detail varies in different categories and is generally not sufficient to enable a thorough review of the methods. During the in-country review, additional documentation was provided which enhanced the transparency of the methodology. Information from the documentation should be included in future NIRs and appropriate references made to research and expert opinion in order to provide the rationale for using country-specific methods and EFs, and for the choice of AD.

Recalculations and time-series consistency

103. Recalculations in the CRF for 1994, provided in the 2003 submission, increased net removals from LUCF by 18 per cent. The documentation box states generally that recalculations for some sectors were performed to correct errors. Discussions revealed that the recalculations in the data for 1994 were carried out to correct for data entry errors, and the Party believes that this is probably the reason for recalculations in other years as well. The Party should explain the recalculations in detail in the documentation box in table 8(b) of the CRF, providing specific information on what changes were made and why. Information should also be provided on how the recalculations affect the accuracy of estimates and the consistency of the time series. Previous reviews also indicate that recalculations were done for 1990 and 1996–1999, which are not explained. In addition, the 2003 NIR states that the LUCF estimates for 1990–1995 were based on a tier 1 approach and were recalculated to be consistent with later estimates based on a tier 2 approach. This appears to be inconsistent with information provided during the review. The Party confirmed that this statement in the NIR is confusing and inaccurate, and this may be due to a problem with translation.

Uncertainties

104. Uncertainties are not documented in the NIR. The Party should include an assessment of the uncertainty of its LUCF estimates based on expert opinion and identifying the aspects of the methodology which contribute to uncertainty.

Verification and quality assurance/quality control approaches

105. There was no indication of formal QA/QC procedures being followed for the LUCF sector either in the NIR or during discussions with the ERT.

B. Sink and source categories

Forest and other woody biomass stocks – CO_2

106. A country-specific method is used to estimate the subcategory Forest management and timber harvest. Activity data and EFs are provided in the NIR. Limited details are provided on the country-specific approach, the source of AD, and the development of the country-specific factors.

107. Documentation was provided during the in-country review that elaborates the country-specific method, and parts of it were translated verbally. Information on the method of estimation, the development of models, expert consultations and rationale is contained in the documentation. The country-specific approach is based on the IPCC default approach, applying a combination of country-specific and default factors. The methodology was developed in 1994 and updated in 1996–1997. The inventory team uses a spreadsheet model of the updated approach with AD provided by the Forestry Management Institute to produce annual estimates. The Party should include information from this document in the NIR. In particular, details should be included on the estimation steps, including general equations and examples of calculations where necessary.

108. Sources for the country-specific EFs are provided in the documentation, including a list of research references and summaries of expert consultations. The NIR reports that a national forest inventory run by forestry experts is used in the methodology. It is unclear exactly how these data are used; they may be the basis for country-specific growth rates. The Party should provide in the NIR the sources used to develop country-specific factors and evidence that country-specific factors provide more accurate estimates than the IPCC defaults, drawing on the information in the documentation. The NIR should be explicit about which factors are country-specific and which are IPCC defaults.

109. Discussion with the Party revealed that AD come from national data published annually in December by the Czech Statistical Office. Official national statistics are released too late for inclusion in the submission, and the Party has a special arrangement which enables the inventory team to receive these data before release. Occasionally final numbers differ slightly from the pre-release numbers.

Recalculations are not carried out to account for these differences; future revisions to the method of preparing the data for LUCF will attempt to address this. Documentation on the statistics published by the Czech Statistical Office shows that data are collected by means of a questionnaire distributed to the forestry industry. The Party should include in the NIR information on the source of its AD, a description of how the data are collected and, if possible, information on the reliability of the AD.

110. Limited rationale is provided in the NIR for including non-forest trees in Forest and Other Woody Biomass Stocks. Documentation provided by the Party describes the approach and shows why this was included. Non-forest trees were added to the country-specific methodology when it was updated in 1996–1997, based on expert opinion: many experts believed that timber harvesting was decreasing and growth increasing on forest land along rivers and watersheds and in other small areas of land with tree cover, such as windbreaks. However, it remains unclear whether these lands should be included in the inventory. The same estimate is used each year and is based on a study from 1976. Data are adjusted by expert opinion to reflect conditions in the late 1990s. The Party should provide in the NIR the rationale for including this subcategory.

111. Figures on the afforestation of agricultural land are based on the default IPCC approach and EFs. Sufficient information is provided in the NIR to explain how this subcategory was estimated. One error was noted. Table 8.1 of the NIR shows that 0 ha of agricultural land were afforested in 1990, while table 8.3 of the NIR reports that 6 Gg CO_2 were removed from afforestation of agricultural land in the same year.

112. Carbon stock estimates for forest and other woody biomass stocks are reported in CRF table 5.A in aggregate for deciduous and coniferous forests, resulting in a single implied emission factor. However, separate AD and EFs are reported in the NIR for deciduous and coniferous trees under Forest Management and Afforestation of Agricultural Land. If possible, the Party should disaggregate the carbon stock change estimates by forest type and report estimates separately in the rows provided for Commercial Forests in table 5.A. Disaggregated estimates should also be reported in the NIR. This will facilitate transparent reporting.

Forest and other woody biomass stocks – CH_4, N_2O, CO, NO_X

113. Trace gas emissions from on-site burning in forest management are estimated using the IPCC default approach and an assumption that 7 per cent of harvested biomass is burned on-site. The assumption of 7 per cent is not described sufficiently in the NIR. The NIR reports that losses are estimated at 15 per cent and of that 50 per cent is assumed to be burned, which gives roughly 7 per cent. The Party should include in the NIR information supporting the assumption of 7 per cent. In addition, the Party should report the amount of biomass, in tonnes dry matter, that is burned on-site each year.

114. The documentation provided by the Party indicates that it is unknown whether CO_2 emissions from on-site burning are double-counted in the country-specific approach. This should be evaluated and clarified in the NIR.

115. CO_2 emissions from biomass fuels are included as CO_2 emissions from biomass harvesting in managed forests. Non-CO_2 emissions from biomass fuels are reported under the Energy sector. There is no apparent over- or under-counting for this source.

Forest and grassland conversion – CO_2, CH_4, N_2O, CO, NO_X

116. CO_2 emissions/removals and trace gas emissions from forest and grassland conversion are not estimated because of limited resources. This category will be considered in the methodological revisions planned for the LUCF sector. The notation "NO" is used in the CRF table. However, consultation during the in-country review suggested that this activity may be occurring. The country should use the notation key "NE" unless there is evidence that this source is not occurring, in which case a brief explanation should be provided in the NIR and the CRF to support this conclusion.

Abandonment of managed lands – CO_2

117. CO_2 emissions and removals from abandonment of managed lands are not estimated because of limited resources. The Party reports "NO" in the CRF table; information should be provided in the NIR and CRF to support this conclusion. It is unclear if afforestation of agricultural lands, which is reported in forest and other woody biomass stocks, is a result of forest regrowth after land is abandoned. If this is so, abandonment of managed land is occurring and the Party should either report the estimate under category 5.C or use the notation key "IE" in 5.C. This category will be considered as part of the methodological revisions planned for the LUCF sector.

CO_2 emissions and removals from soils – CO_2

118. The Party reports in the CRF table that CO_2 emissions and removals from soils are not estimated because of limited resources. This source will be considered in the methodological revisions planned for the LUCF sector. Estimates for CO_2 emissions from liming (a subcategory of soils) are provided in the NIR but are not reported in the CRF. The inclusion of this subcategory in the NIR is an improvement compared with previous submissions. The country has data that can be used, along with IPCC defaults, to estimate emissions of CO_2 from organic soils. The area of cultivated organic soils (histosols) is reported in the CRF table 4.D and an IPCC default factor for emissions per unit area is available for temperate climates. The country is encouraged to report CO_2 emissions from liming and organic soils. Mineral soils could be added to complete the estimates for this category, if possible.

C. Areas for further improvement

Identified by the Party

119. The Party has a formal plan to develop and implement a revised methodology for the LUCF sector following the publication of the IPCC good practice guidance for land use, land-use change and forestry (LULUCF). The revision is an explicit element of the CHMI contract with the Ministry of the Environment and is planned for completion in 2004. The Party hopes to begin using this revised methodology for its reporting by the 2005 or 2006 submission. A forestry expert at the Institute for Forest Ecological Research has been identified and tasked with the revision and contacts have been made with an agricultural soil expert and the University of Southern Bohemia. The revised method will consider all categories within the LUCF sector, including those currently not reported by the Party. If the same AD are used as in the present methodology, the Party intends to develop a formal process for incorporating final versions of the AD in its submissions, using recalculations if necessary.

Identified by the ERT

120. The NIR could be improved by following the recommended structure of NIRs in the UNFCCC reporting guidelines (FCCC/CP/2002/8). Specifically, an introductory discussion about the LUCF sector in the Czech Republic, including information on general trends in land use and land use change, and a conclusion that elaborates on trends in the time series and noteworthy changes from previous submissions, would also greatly improve the NIR. These elements would provide important context for evaluating the estimates reported for the LUCF sector.

VI. WASTE

A. Sector overview

121. Emissions from the Waste sector contributed 1.8 per cent to national total GHG emissions in 2001 (0.22 per cent of CO_2, 16.6 per cent of CH_4, and 1.8 per cent of total N_2O emissions). The share of total waste emissions has increased slightly compared to 1990 (1.5 per cent). The only key source in this category is solid waste disposal on land.

122. Emissions from the Waste sector have been estimated annually since 1995. They are estimated by using IPCC default methods, but the Party uses some country-specific parameters instead of IPCC

default parameters. These values are based on key studies and measurements, which are referenced in the NIR. All the reports referenced were provided to the ERT.

Completeness

123. The CRF includes estimates of all gases and sources of emissions from the Waste sector, as recommended by the IPCC Guidelines, except N_2O emissions from industrial waste-water handling. According to the Party's explanation, CH_4 and N_2O from waste incineration are included in the Energy section, but this was not possible to verify with the information contained in the CRF and the NIR or from the additional information provided by the Party during the visit. In table 6.C, AD and CO_2 emissions only are provided.

124. The NIR provides the complete trends of CH_4 emissions from municipal solid waste (MSW). CH_4 emissions from waste water are not provided for the years 1991–1993 and 1995, but are estimated (see para. 134). Emissions from waste incineration are not presented in the Waste section at all. The emissions reported in the Waste chapter of the NIR differ from those provided in the CRF trend tables. The ERT recommends the Party to include all estimated emissions in the trend tables in the CRF and the NIR as well.

Transparency

125. Methodologies for estimating emissions were summarized in the NIR, but more clarification may be needed since the country-specific parameters and data used are based on many different studies. The NIR provides just examples of parameters used for calculation in one year, and complete information is available only in the supporting materials. The materials referenced were provided during the review. The ERT recommends the Party to provide the parameters used for calculations in a transparent table form in the NIR for the entire period and for all subsectors.

126. Notation keys in CRF tables 6.C and 7 are not used in a consistent manner (e.g., in CRF table 7s3 waste incineration is reported as "IE" and in table 6.C it is reported as "NE").

Recalculations and time-series consistency

127. The Party states that emissions from solid waste disposal and waste-water treatment were recalculated for the entire time series in 2001. The reason for the recalculation is implementation of the IPCC good practice guidance. However, the information on recalculation is not documented in the 2003 NIR and CRF submissions. The ERT welcomes the efforts made by the Party to implement the IPCC good practice guidance, and encourages the Party to continue this effort and to document all recalculations in its future submissions.

B. Key sources

Solid waste disposal on land – CH_4

128. Managed solid waste disposal sites (SWDS) are a key source in the Czech Republic. Legislation does not allow unmanaged SWDS. During the visit the Party informed the ERT that there have been no active unmanaged sites in the country since 1990.

129. The Party states in its NIR that 4,294,000 tonnes of MSW are produced and that 2,575,000 tonnes of these are landfilled ($MSW_F = 0.6$). No explanation is provided in the NIR or the CRF about what happens with less than 2 million tonnes of MSW per year. Additional information on other types of MSW treatment was provided by the Party during the visit and can be found in the *Environmental Statistical Yearbook of the Czech Republic, 2002* (in Czech). The ERT recommends the Party to include a full explanation of the different types of waste treatment in its future submissions, both in the CRF additional information box and in the NIR.

130. The IPCC good practice guidance recommends Parties to use the first-order decay (FOD) model if disposal of MSW is a key source. The Czech Republic applies the default method (with some country-

specific parameters) as the information required for application of the FOD is not obtainable. The ERT encourages the Party to investigate whether it will be possible to use the FOD model in the future. According to the IPCC good practice guidance, the default method gives reasonable results if the amount and composition of waste have varied slowly over a period of several decades. The Czech Republic does not provide in its NIR any information on the composition of waste, but amounts of degradable organic carbon (DOC) (have been decreasing[8] since 1990 (from 0.19 to 0.08).[9] During the visit the Party explained that it is now investigating the composition of its waste. The ERT welcomes the efforts of the Party to investigate the waste composition and encourages the Party to continue this effort and to report the results in future submissions.

131. The Czech Republic uses in its calculations the value 0.6[10] for the parameter DOC_F (fraction of DOC dissimilated). The IPCC good practice guidance[11] states that this value should be used only if lignin C is not excluded from DOC. There is no information provided in the NIR as to whether lignin is included or not in the Czech Republic. The country-specific value is based on measurements and key studies which are referenced in the NIR. However, it was not possible for the ERT to assess whether the measurements are representative for all SWDS and for the entire period.

132. The oxidation factor applied (0.16) is higher than that recommended by the IPCC good practice guidance. Although references are provided, no explanation is given in the NIR. The Czech Republic plans to reconsider the oxidation factor currently used in its next submission. The ERT welcomes this work and encourages the Party to report the results in its next submission.

133. Flaring, utilization and targeted bio-oxidation (using bio-filters and microbes) of biogas are accounted for under CH_4 recovery. Some explanations of the technologies used were provided to the ERT during the Party's presentation. The ERT recommends the Party to document these methods and show in the NIR how methane recovered has been quantified.

C. Non-key sources

Waste-water handling – CH_4

134. During its presentation the Party explained to the ERT that emissions from this sector are estimated for the entire period, but in the CRF and the NIR figures are only reported for the years 1990, 1994 and 1996–2001. Emissions are estimated separately for municipal and industrial waste waters and sludge. The ERT encourages the Party to include all estimated emissions in the next submission.

135. Emissions are estimated in line with the IPCC Guidelines. The calculation is carried out using standard working sheets from the IPCC Guidelines. The parameters used are a mixture of default values and country-specific. Country-specific values are based on measurements and key studies referenced in the NIR. The relevant reports were provided to the ERT during the visit. The country-specific parameters and data are based on many different studies. The ERT recommends that the Party include further clarification in its future NIRs.

136. The Czech Republic reports the recovery of an increasing amount of methane. This is due to the wider use of anaerobic treatment technology, as described in background reports referenced in the NIR. The ERT recommends that more detailed information be included in future NIRs. It is recommended that a list of the most well-known methane recovery facilities be made available.

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[8] According to the IPCC good practice guidance (5.1.1.1), "by reduction in amount of carbon deposited at SWDS, the default method underestimates emissions and overestimates reductions".

[9] The DOC reported by the Czech Republic is at the lower end of the IPCC range. The DOC value has been estimated based on a national study, but the NIR does not provide sufficient information on this. The ERT was therefore not able to assess whether the measurements are representative.

[10] The IPCC default value for DOC_F is 0.77 (if lignin C is excluded from DOC).

[11] The default values provided by the IPCC good practice guidance for such a situation DOCF is 0.5–0.6.

Waste-water handling – N_2O

137. N_2O emissions from industrial waste water are not estimated but are assumed to be negligible in the Czech Republic.[12] The ERT recommends the Party to collect data directly from sources and to include these emissions in its future submissions.

138. Emissions from municipal waste water are estimated on the base of per capita protein consumption.[13] This IPCC default method is not very accurate, but its application is in line with the IPCC good practice guidance. The Party might consider using a more sophisticated method in the future.

Waste incineration – CO_2, CH_4, N_2O

139. There are three MSW incinerators in the country. It was not possible to check how much MSW is incinerated: the fraction of incinerated waste reported in the CRF is 3 per cent, which would correspond to 128,800 tonnes, but the amount reported in table 6.C is approximately 103,000 tonnes. The Czech Republic stated that the AD in table 6.C refer to the fraction of non-biogenic municipal waste and are based on expert estimates. Data are not updated annually. Incineration plants work at full capacity for the whole time, therefore constant emissions may be acceptable.

140. Waste incinerated is used for energy production. CO_2 emissions and AD are reported in category 6.C. According to the IPCC good practice guidance, all emissions from waste combustion for energy should be included in the Energy sector. The ERT recommends the Party to reallocate these emissions to the correct sector.

141. The Czech Republic explained that N_2O and CH_4 emissions are not reported in the Waste section but in the Energy sector. The ERT was not able to check this statement, and the Party was not able to show the ERT the row in the CRF tables where these emissions are allocated, so these emissions may be missing. In CRF table 6.C the notation key "NE" is used, but in CRF table 7 "IE" is used. The ERT recommends that the Party be transparent and present the emissions occurring during municipal waste combustion in a consistent way.

D. Areas for further improvement

Identified by the Party

142. The Party has identified the following areas for improvements. It plans:

(a) Studies to improve knowledge about the composition of MSW;

(b) Use of the national REZZO database to improve the accuracy of estimates of emissions occurring by biogas combustion;

(c) To modify the structure of the Waste chapter in the NIR;

(d) To reconsider the appropriateness of the oxidation factor used for calculation of emissions of CH_4 from solid waste.

Identified by the ERT

143. In addition to the areas identified by the Party, the ERT encourages the Czech Republic to:

(a) Provide relevant information about the treatment of solid waste in the country, since only 60 per cent is reported to be landfilled;

[12] The IPCC Guidelines do not provide methods or default parameters for this subcategory, and the Party has not developed a country-specific method.

[13] The country-specific value and protein consumption per capita are based on a national standard "capita equivalent".

(b) Include information concerning the rationale behind the choice of parameters, as well as all available emission estimates in the NIR and the CRF. If the parameters used for calculation change over time, all values should be included in the NIR in a transparent table, not only the range of parameter.

(c) Provide information in the NIR on validation/verification procedures[14] which are performed in the Waste sector.

[14] E.g., revisions by external experts or comparisons of data with those of neighbouring countries.

ANNEX 1: MATERIALS USED DURING THE REVIEW

A. Support materials used during the review

2002 and 2003 Inventory submissions of the Czech Republic. 2003 submissions including CRF for years 1994 and 2001 and an NIR.

UNFCCC secretariat (2003). "Report of the individual review of the greenhouse gas inventory of the Czech Republic submitted in the year 2002 (Desk review)." FCCC/WEB/IRI(1)/2002/ (available at http://unfccc.int/program/mis/ghg/countrep/czedeskrev02.pdf).

UNFCCC secretariat. "2003 Status report for the Czech Republic" (available at http://unfccc.int/program/mis/ghg/statrep03/cze03.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 the Czech Republic (unpublished).

Czech Republic's comments on the draft "Synthesis and assessment report of the greenhouse gas inventories submitted in 2003" (unpublished).

UNFCCC secretariat. "Review findings for the Czech Republic" (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

The following materials were used during the review:

Second National Communication of the Czech Republic.

Third National Communication of the Czech Republic.

"Outline of the Project: "National Program to Mitigate Climate, Scientific and Technical Aspects Needed for Joining the EU (2002–005)" (in Czech).

Czech Ministry of the Environment. *Environmental Statistical Yearbook of the Czech Republic, 2002* (Prague: Ministry of the Environment of the Czech Republic, 2002) (in Czech).

Responses to oral questions during the review were received from Mr. Jan Pretel and Mr. Pavel Fott (CHMI), as well as from consultants from KONEKO and Charles University.

Responses to written questions for the Energy sector were provided by Mr Pavel Fott (CHMI) and Mr. Jan Blaha (Koneko Ltd). Regarding cross-cutting issues and the Agriculture sector, reponses to written questions were provided by Mr. Pavel Fott.

Responses to questions on land use land-use change and forestry were received from Mr. Jan Pretel (CHMI). In addition, Mr Pretel provided information on activity data from the *Czech Statistical Yearbook*, an electronic copy of the spreadsheet model used to make estimates, and documentation on the model in a paper written by a former employee of the CHMI. Both the model and the model documentation were written in Czech. Mr. Pretel verbally translated portions of the written document at the reviewers' request.

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