UNITED
NATIONS

UNFCCC Framework Convention on Climate Change

Distr.
GENERAL

FCCC/ARR/2006/CZE
1 August 2007

ENGLISH ONLY

Report of the individual review of the greenhouse gas inventory of the Czech Republic submitted in 2006*

* In the symbol for this document, 2006 refers to the year in which the inventory was submitted, and not to the year of publication.

CONTENTS

I. Overview

A. Introduction

1. This report covers the in-country review of the 2006 greenhouse gas (GHG) 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. The review took place from 26 February to 3 March 2007 in Prague, the Czech Republic, and was conducted by the following team of nominated experts from the roster of experts: generalist – Mr. Klaus Radunsky (Austria); energy – Ms. Sumana Bhattacharya (India); industrial processes – Ms. Amaia Uriarte (Spain); agriculture – Mr. Chang Liang (Canada); land use, land-use change and forestry (LULUCF) – Mr. Nagmeldin Elhassan (Sudan); waste – Ms. Maria Paz Cigaran (Peru). Mr. Elhassan and Mr. Radunsky were the lead reviewers. The review was coordinated by Mr. Sergey Kononov and Mr. Matthew Dudley (UNFCCC secretariat).

2. In accordance with the "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention" (the UNFCCC review guidelines), 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.

B. Inventory submission and other sources of information

3. In 2006, the Czech Republic submitted a complete set of common reporting format (CRF) tables for the years 1990–2004 and a national inventory report (NIR). Where needed, the expert review team (ERT) also used the previous year's submission, additional information provided during the review and other information. The full list of materials used during the review is provided in the annex to this report.

C. Emission profiles and trends

4. In 2004, the most important GHG in the Czech Republic was carbon dioxide (CO_2), which contributed 86.3 per cent to total[1] national GHG emissions expressed in CO_2 equivalent, followed by methane (CH_4), 7.9 per cent, and nitrous oxide (N_2O), 5.3 per cent. Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6) taken together contributed 0.5 per cent of overall GHG emissions in the country. The energy sector accounted for 83.0 per cent of total GHG emissions, followed by industrial processes (8.8 per cent), agriculture (5.5 per cent), waste (2.3 per cent) and solvent and other product use (0.4 per cent): see figure 1.

5. Total national GHG emissions decreased by about 24.6 per cent between 1990 and 2004; in 2004 these emissions amounted to 146,432.4 Gg CO_2 equivalent. Tables 1 and 2 show GHG emissions by gas and by sector, respectively.

[1] In this report, the term total emissions refers to the aggregated national GHG emissions expressed in terms of CO_2 equivalent excluding LULUCF, unless otherwise specified.

Table 1. Greenhouse gas emissions by gas, 1990–2004

Greenhouse gases	Gg CO_2 equivalent								Change from base year (Convention) to 2004 (%)
	Base year (Convention)	1990	1995	2000	2001	2002	2003	2004	
CO_2 (with LULUCF)	162 085.3	162 085.3	123 346.1	121 255.7	121 059.0	117 016.4	121 449.6	121 573.5	–25.0
CO_2 (without LULUCF)	163 864.2	163 864.2	131 157.0	128 136.5	128 132.0	123 181.5	127 199.3	126 444.2	–22.8
CH_4	18 506.3	18 506.3	13 686.9	12 195.1	12 290.7	12 142.8	11 755.8	11 595.1	–37.3
N_2O	11 850.5	11 850.5	8 098.0	7 702.3	7 920.5	7 663.0	7 200.4	7 792.2	–34.2
HFCs	–	–	0.7	262.5	393.4	391.3	590.1	600.3	–
PFCs	–	–	0.1	8.8	12.3	13.7	24.5	17.3	–
SF_6	–	–	75.2	141.4	167.8	66.8	99.8	49.6	–

LULUCF = Land use, land-use change and forestry.

Table 2. Greenhouse gas emissions by sector, 1990–2004

Sectors	Gg CO_2 equivalent								Change from base year (Convention) to 2004 (%)
	Base (Convention)	1990	1995	2000	2001	2002	2003	2004	
Energy	156 233.5	156 233.5	125 573.0	122 875.7	123 876.3	118 899.5	121 710.1	121 585.5	–22.2
Industrial processes	19 050.2	19 050.2	14 027.8	13 305.4	12 563.2	12 257.5	13 467.2	12 946.2	–32.0
Solvent and other product use	764.8	764.8	596.3	568.6	550.0	539.6	525.2	519.3	–32.1
Agriculture	15 474.0	15 474.0	9 586.3	8 393.7	8 593.7	8 358.6	7 778.4	8 044.1	–48.0
LULUCF	–1 730.1	–1 730.1	–7 769.0	–6 828.0	–7 014.7	–6 105.6	–5 688.8	–4 804.4	177.7
Waste	2 649.6	2 649.6	3 192.5	3 250.3	3 275.3	3 344.3	3 328.3	3 337.3	26.0
Total (with LULUCF)	192 442.1	192 442.1	145 207.0	141 565.7	141 843.8	137 294.0	141 120.3	141 628.0	–26.4
Total (without LULUCF)	194 172.2	194 172.2	152 976.0	148 393.7	148 858.4	143 399.6	146 809.1	146 432.4	–24.6

LULUCF = Land use, land-use change and forestry.

Note: Tables 1 and 2 reflect the revised estimates submitted by the Czech Republic in the course of the 2006 review on 13 April 2007. These estimates differ from the Czech Republic's GHG inventory submitted in 2006. More information is provided in this report.

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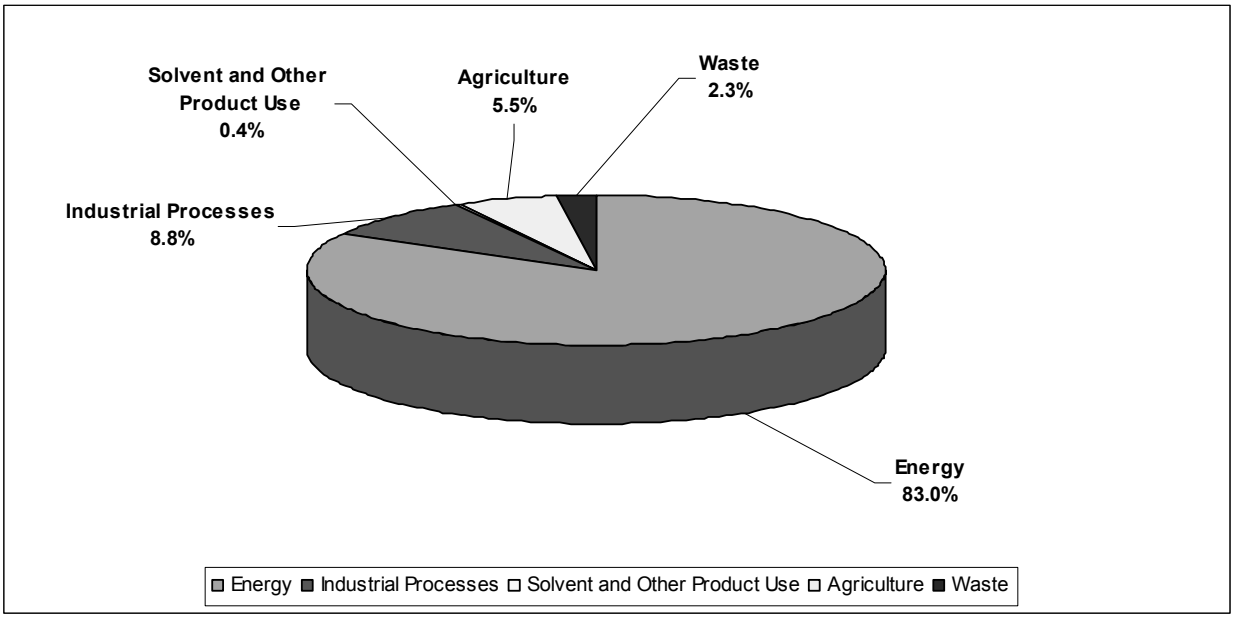
Figure 1. Shares of sectors in total GHG emissions, 2004



D. Key categories

6. The Czech Republic has reported a tier 1 key category analysis, both level and trend assessment, as part of its 2006 submission. The key category analyses performed by the Party and the secretariat[2] produced somewhat different results. The Czech Republic has not included the LULUCF sector in its key category analysis and has identified 15 key categories for 2004, whereas the secretariat has identified 24 key categories in 1990 and 25 in 2004. The key reasons for the differences are the non-inclusion of the LULUCF sector and a different level of aggregation in the key category analysis of the Czech Republic. The ERT encourages the Czech Republic to follow more closely 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), to use a more detailed aggregation level of categories, and to include the LULUCF sector in the analysis of key categories. The ERT acknowledges that the Czech Republic has used key category analysis as a tool to support and guide the improvement of its inventory.

E. Main findings

7. Total GHG emissions in 2004 without LULUCF amounted to 146,432.4 Gg CO_2 equivalent and they decreased by about 24.6 per cent between 1990 and 2004. The energy sector is the dominant sector in terms of GHG emissions; it accounted for 83.0 per cent of total GHG emissions in 2004. Carbon dioxide (CO_2) is the most important GHG, contributing 86.3 per cent of total national GHG emissions in 2004.

8. The ERT acknowledges the significant improvements that have been made in the inventory based on the recommendations of previous reviews. An almost complete set of CRF tables and an NIR were submitted in 2006; the revised LULUCF tables in accordance with decision 13/CP.9 and a full time

[2] The secretariat identified, for each Party, those source categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance for LULUCF. Key categories according to the tier 1 trend assessment were also identified for those Parties that provided a full set of CRF tables for the base year or period. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

series covering the whole period since 1990 were submitted for the first time. However, there are several categories for which GHG emissions still have not been estimated.

9. The ERT noted the need to further improve the transparency of the reporting by including adequate documentation, and descriptions and justification of the assumptions, methods and data used in preparing the inventory estimates, in the Party's future NIRs. The ERT advised the Czech Republic to follow closely the IPCC good practice guidance, which recommends the use of country-specific data and emission factors (EFs), if available, particularly for key categories.

F. Cross-cutting topics

1. Completeness

10. The inventory submitted covers all years from 1990 to 2004, and all sectors and gases including actual emissions of HFCs, PFCs and SF_6 (the fluorinated gases (F-gases)). The ERT noted several categories for which GHG emissions occur in the Czech Republic but for which no emissions have been estimated. The Party explained that in such cases either not enough information was available to calculate emissions or the emissions were only minor. Moreover, the Czech Republic has not submitted CRF tables 7 (key categories) and 9(b) (completeness), nor explanations for the large (over 2 per cent) differences between the reference and the sectoral approach. There are reporting gaps in some sectoral tables (e.g., in the energy sector) and in table 8(b) (recalculations). The ERT encourages the Party to provide estimates for all categories where emissions occur in the country, even if they are minor, by using simple but reasonable approaches, utilizing expert judgement as necessary.

11. The ERT noted that the inventory may underestimate emissions because of the gaps in some categories, such as CO_2 and CH_4 emissions from 1.B.2(c) (venting and flaring for oil and natural gas); CH_4 and N_2O emissions from 1.A.3(a) (transport, civil aviation, aviation gasoline); N_2O emissions from 1.A.3(b) (transport, road transportation, liquefied petroleum gas (LPG)); CO_2 emissions from 1.B.1(a) (fugitive emissions from coal mining and handling); N_2O emissions from several industrial processes (e.g., glass production, bricks and ceramics, ammonia production, ethylene production); CO_2 emissions from road paving with asphalt and asphalt roofing; GHG emissions from ferro-alloys production; several categories in the LULUCF sector (e.g., cropland remaining cropland, grassland remaining grassland); and N_2O emissions from industrial waste water and sludge. The ERT encourages the Party to prepare and report estimates for all the missing categories.

2. Transparency

12. The ERT encourages the Czech Republic to improve the transparency of the inventory by including additional information in the NIR with regard to the annexes on key category analysis and the assessment of completeness, the identification of emission factors used, improved descriptions of individual sectors,[3] explanations as to the selection of methodologies, and information on the sources of activity data (AD). The most relevant background material that is only available in the Czech language should be included in the NIR in English. The methodologies used for estimating emissions should be appropriately referenced, any country-specific data should be identified and referenced in the NIR, and rationales should be provided for the selection of specific default EFs. The methodological descriptions in the NIR should be more detailed and consistent with the actual data used.

13. The ERT found that in table 9(a) only limited information is provided to explain the use of the notation keys. Furthermore, the use of the notation keys is not consistent across all the CRF tables. The ERT encourages the Party to provide some explanation of the use of all the notation keys and to use them

[3] For example, a description of expert judgement on insignificant land-use changes and a description of the linking of land-use categories under CORINE and COSMC, including definitions of land-use categories, are needed for the LULUCF sector.

in a manner that is consistent with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines).

3. Recalculations and time-series consistency

14. The ERT noted that the time series is not completely consistent, because the Party has not recalculated those emissions data for the years 1998–2004 that are still based on preliminary energy data, although the Czech Statistical Office (CSO) usually makes the final national energy balance available about 12 months after 31 December of a given year.

15. The ERT expects that in the future the Party will report recalculations in a more transparent manner in its NIR and the CRF tables, and will regularly update the figures for the latest year on the basis of the final national energy balance. The ERT suggests that the Party establish a transparent and well-documented process to manage recalculations when they become necessary due to a change in methodology or emission factors.

4. Uncertainties

16. The Czech Republic has provided a tier 1 uncertainty analysis for 25 source categories and for the inventory in total, following the IPCC good practice guidance. However, the analysis is based to a great extent on the default uncertainties included in the IPCC good practice guidance and on expert judgement. The Party recognized that more reliable results could be obtained by gathering data on uncertainties of AD and EFs, but did not indicate by when this could be achieved. The ERT encourages the Party to use more country-specific information and to request the institutions providing activity data or those institutions in charge of estimating emissions to estimate the relevant uncertainty data as well. Such estimates should cover not only key categories but all categories in order to provide an appropriate basis for the management of inventory improvements.

5. Verification and quality assurance/quality control approaches

17. The Czech Republic is still elaborating a quality assurance/quality control (QA/QC) plan that would be in accordance with the IPCC good practice guidance. This will include general QC procedures (tier 1) as well as source/sink category-specific procedures (tier 2) for key categories and for those individual categories in which significant methodological and/or data revisions have occurred. The ERT believes that the introduction of a QA/QC system at the Czech Hydrometeorological Institute (CHMI) under International Organization for Standardization (ISO) standard 9001 will also be very helpful for meeting all the requirements for the national inventory system, and the ERT welcomes the fact that ISO 9001 certification was received by the CHMI in April 2007. The ERT recommends the Party to define and document all the responsibilities of the institutions/experts involved in the preparation of the inventory in formal agreements with those institutions/experts, and believes that such agreements should also address QA/QC. The CHMI in part uses the emissions data produced for the European Union emissions trading scheme (EU ETS) for verification purposes. The ERT suggests that the Party verify the emissions data for all sectors following the IPCC good practice guidance and check that the best available input data have been used.

18. The draft inventory data are usually checked by responsible experts from the CHMI before being forwarded to the UNFCCC, and an additional review is made by the Ministry of Environment, but these reviews are poorly documented. The ERT suggests that the Party introduce better documentation of quality control at all stages of inventory preparation, within the CHMI as well as for other institutions/experts contributing to inventory preparation.

6. Follow-up to previous reviews

19. The ERT acknowledges the significant improvements that have been made in the inventory of the Czech Republic based on the recommendations of previous reviews. In 2006, a full time series of CRF tables covering the period since 1990 was submitted for the first time and other improvements have also been made (e.g., the reporting of actual emissions for the F-gases, recalculations in the industrial processes sector, and improvements in the LULUCF sector). The ERT suggests that the Party introduce better documentation of the process of further improving the inventory, within the CHMI as well as for other institutions/experts contributing to the preparation of the inventory, for example, by setting up a table that identifies the areas of concern, the institution/person that is responsible for the improvement, a date by which the improvement is expected to be finalized, a column to register the date by which the improvement has been finalized, and a column that shows that the improvement has been verified.

G. Areas for further improvement

1. Identified by the Party

20. The NIR identifies several areas for improvement. These relate in particular to:

(a) Use of higher-tier methods in some sectors following recommendations of former ERTs (e.g., for CO_2 emissions from waste incineration);

(b) Improvement of the completeness of the CRF tables;

(c) Update of country-specific parameters used in the inventory;

(d) Improvement of the uncertainty estimates.

2. Identified by the ERT

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

(a) Improve transparency by

(i) Providing a complete explanation of the use of the notation keys and using them in a more consistent manner;

(ii) Providing better information on all data sources used;

(iii) Integrating relevant information requested by the ERT during the in-country visit into its future NIRs;

(b) Provide more precise descriptions of those methodologies that differ from the IPCC's, including information in English related to background material that is only available in Czech;

(c) Improve the key category analysis by using the sector split recommended by the IPCC and by addressing the LULUCF categories as well;

(d) Improve the QA/QC system in line with the requirements of ISO 9001;

(e) Improve the documentation of quality control at all stages of inventory preparation as well as with regard to the improvement of the inventory;

(f) Improve record keeping by archiving the underlying calculation sheets and background material at the CHMI;

(g) Recalculate the time series since 1998 using the final energy data, including proper documentation in the NIR;

(h) Provide the necessary resources in order to speed up further improvements to the national GHG inventory.

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

II. Energy

A. Sector overview

23. In 2004, GHG emissions from the energy sector in the Czech Republic had decreased by 22.2 per cent compared to 1990, from 156,233.5 to 121,585.5 Gg CO_2 equivalent. A sharp decline in GHG emissions (of 24.8 per cent) occurred between 1990 and 1994, but thereafter until 2004 the emissions fluctuate without any distinctive trend. The share of the energy sector in total national GHG emissions increased from 80.5 per cent in 1990 to 83.0 per cent in 2004. GHG emissions from fossil fuel combustion constitute a major share of GHG emissions from the energy sector (94.6 per cent in 1990 and 95.7 per cent in 2004), the rest being fugitive CH_4 emissions, mainly from the extraction of solid fuels.

24. CO_2 emissions from the energy sector decreased from 145,612.4 Gg in 1990 to 114,763.6 Gg in 2004. However, the share of CO_2 emissions in total emissions from the energy sector increased from 93.2 per cent in 1990 to 94.4 per cent in 2004. Energy industries contribute the major part to CO_2 emissions from the sector: in 1990, their share was 39.6 per cent, and this increased to 49.9 per cent in 2004. CO_2 emissions from transport more than doubled between 1990 and 2004 – from 7,341.9 Gg in 1990 to 15,228.7 Gg in 2004 – and their share in total CO_2 emissions from the energy sector increased from 5.0 per cent in 1990 to 13.3 per cent in 2004. This is mainly due to the doubling of CO_2 emissions from road transport over this period. A decline in CO_2 emissions from all the other categories, such as manufacturing industries and construction, the commercial and residential sectors, and other categories, is observed over the period 1990–2004.

25. N_2O emissions from the sector increased from 664.5 Gg CO_2 equivalent in 1990 to 1,074.9 Gg CO_2 equivalent in 2004, and their share in total emissions from the energy sector increased from 0.4 to 0.9 per cent over the same period. The increase is mainly attributed to N_2O emissions from road transport, which increased about eight times between 1990 and 2004. On the other hand, CH_4 emissions from the energy sector decreased, from 9,956.6 Gg CO_2 equivalent in 1990 to 5,747.0 Gg CO_2 equivalent in 2004, mainly due to the closing of coal mines in the Czech Republic, and consequently their share in the emissions of the energy sector fell from 6.4 per cent in 1990 to 4.7 per cent in 2004.

26. The ERT noted that emissions were not estimated for a few categories, such as fugitive CH_4 emissions from venting and flaring of oil and natural gas (category 1.B.2(c)), CH_4 and N_2O emissions from gasoline combustion in aviation (1.A.3(a)), and N_2O emissions from LPG consumption in road transport (1A.3(b)). The sectoral background data for the energy sector (tables 1.Aa(s1) to 1.Aa(s4)) are not provided for the years 1996 and 1997.

27. A key category analysis has been made using both level and trend assessment. This is in line with the IPCC good practice guidance. Both approaches identify as key categories CO_2 emissions from solid, liquid and gaseous fuel combustion in stationary sources, and fugitive CH_4 emissions from solid fuel extraction. The trend assessment identifies CH_4 emissions from stationary combustion and N_2O emissions from road transport as key categories.

28. The ERT noted a number of cases where the NIR could be made more transparent. These include the need for an explanation of the quantification of petrochemical products and lubricants

incinerated, as this also has implications in the waste sector in terms of the energy recovered from waste. Furthermore, although surface transport vehicles have been extensively subcategorized to estimate the emissions from this category, this fact is not reflected in the NIR. The methodology used for estimating the country-specific emission factors developed for road transport for CO_2, CH_4 and N_2O also needs to be described in more detail.

29. The recalculations presented by the Party in its 2006 submission include the reallocation of emissions from non-energy use of fuels (production of iron and steel, production of ammonia) from category 1.A.2 (manufacturing industries and construction) to category 2 (industrial processes, specifically 2.C.1. and 2.B.1). Furthermore, CO_2 emissions from sulphur removal from coal combustion from category 1.B.1(c) (other) have been reallocated to category 2.A.3 (limestone and dolomite use). Also, the CH_4 data for fugitive emissions – natural gas (1.B.2(b)) for 1990–2004 have been revised and recalculated because new data were obtained on the technical discharge of natural gas at compressor stations in the transit system for the transport of natural gas across the territory of the country. In addition, minor changes have been made in category 1.B.2.(a) (oil) for the period 1998–2000. In this case, recalculation was not involved, but an adjustment of the proportions between the individual subcategories was made.

30. The activity data used for estimating emissions from the energy sector mostly come from the CSO. QA/QC procedures are applied to the AD by means of checks with the data providers. For example, fuel extraction data were checked with the Czech Mining Authority, the Employers Federation of the Mining and Petroleum Industry, and the Miner's Association, and liquid fuel consumption data were verified using data produced by the Czech Association of the Petroleum Industry and Trade. Random checks are carried out by the CHMI to verify the correctness and completeness of the data entered in the CRF tables.

31. The planned improvements indicated by the Party include the recalculation of N_2O emissions from road traffic using the IPCC good practice guidance, as the emission estimates are currently not comparable with those of other European countries.

32. The ERT noted that for completeness of reporting it is essential to estimate GHG emissions from all sources that exist in the country, even if they are small. Furthermore, it was noted during the in-country visit that for the period from 1998 onwards GHG emissions for the energy sector have been estimated using the preliminary activity data reported by the CSO. The ERT suggests that the Party use the final AD received/published at the end of each data assessment cycle for reporting the GHG emissions for the years from 1998 onwards, because there are differences – ranging from –0.81 per cent to +0.73 per cent – between the preliminary and final energy balance data for the years 2002, 2003 and 2004.

B. Reference and sectoral approaches

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

33. The NIR table 3.1 reports the differences in CO_2 emission estimates between the reference approach and the sectoral approach. For most years the estimates of emissions under the reference approach are higher than the estimates of emissions under the sectoral approach. However, inconsistent differences are observed in the years 1994, 1999, 2000 and 2001, in that in these years the emissions under the sectoral approach are higher than those reported under the reference approach. The data for these years need to be re-examined to explain and resolve these inconsistencies.

34. CRF table 1.A(c) reports a difference of 10.9 per cent between the reference and sectoral approaches in 1990. However, in the NIR the same difference is given as about 1.7 per cent (table 3.1). A similar situation is observed for other years. The NIR explains (table 3.1) that the principal reason for the different values in the CRF and the NIR is that the values in the CRF table include the energy content

of fuel used as feedstock for non-energy purposes; when this factor is taken into account, the difference decreases considerably. The ERT recommends that the Czech Republic, in its next submission, report apparent consumption excluding non-energy use and feedstock in CRF table 1.A(c). This approach is likely to make the difference in CO_2 emissions between the two approaches, reported in CRF table 1.A(c), much lower.

2. International bunker fuels

35. The Czech Republic estimates emissions from domestic and international aviation separately. The allocation is based on fuel deliveries for international aviation as recorded in a 2004 report of the CSO entitled "Supply of basic final refinery products". The methodology used for estimating emissions is not described in the NIR and no description was provided to the ERT during the review. The ERT recommends that the Party include further methodological information in its future inventory submissions and encourages it to consider applying higher-tier methods based on landing and take-off data.

3. Feedstocks and non-energy use of fuels

36. CO_2 emissions from masout (heavy fuel oil) used for ammonia production have been included in category 2.B.1 (ammonia production) and CO_2 emissions from the whole amount of coke used in metallurgy have been reported under 2.C.1 (iron and steel production). An explanation is needed as to whether all fossil fuel products used for non-energy purposes are included in the estimates (e.g., the petrochemical feedstock which stores about 80 per cent of carbon).

C. Key categories

1. Stationary combustion: solid fuels – CO_2

37. CO_2 emissions from the combustion of solid fuels are the most important key category, identified as key by both level and trend assessments. In 1990, emissions from this category accounted for 55.0 per cent of total national GHG emissions. According to the IPCC good practice guidance, country-specific emission factors, if available, should be used for a key category. However, the Czech Republic has consistently used the default IPCC CO_2 EFs for estimating CO_2 emissions from combustion of coal for the period 1990–2004. This approach has been retained in the 2006 submission, despite the fact that net and gross calorific values (NCVs/GCVs) for different types of Czech coals are available (as shown in a study by Fott (1999)) and could be used to develop country-specific CO_2 EFs. The reason given in the NIR for using the IPCC values is that the differences between the IPCC CO_2 default EFs for different types of coal and the country-specific EFs for the same coals were not significant in the context of the overall uncertainty. The ERT did not agree with this judgment and stated that, to be in line with the IPCC good practice guidance, the estimates should be the best estimates possible, neither underestimating nor overestimating the emissions, regardless of how wide the uncertainty range is. The ERT also emphasized that non-utilization of country-specific CO_2 EFs gives rise to an overestimation of CO_2 emissions from this category. During the 2006 in-country review, therefore, the ERT advised the Party to recalculate the entire time series using country-specific EFs.

38. The Czech Republic agreed with the ERT's judgment and revised CO_2 emissions from stationary combustion of solid fuels during the 2006 review process. The revised estimates were provided to the ERT and they are reflected in this report. The ERT appreciated very much that the Czech Republic submitted the revised estimates for CO_2 emissions from combustion of coal in due time and that the recalculations followed the recommendations of the ERT. The ERT recommends that the Czech Republic provide recalculation tables for the years 1990–2004 applying the country-specific EFs

in its next submission, using the same values as those submitted to the ERT during the 2006 review.[4] It also recommends the Party to provide in the NIR a description of the method used and the assumptions made, a table of the most important parameters, and references to the sources of the data.

2. Road transportation: CO_2 emissions

39. CO_2 emissions from road transportation amounted to 5,995.4 Gg in 1990, and had increased by more than 140 per cent by 2004, to 14,538.6 Gg. The ERT recommends that the Party provide a detailed description in the next NIR of the methodology used to estimate CO_2 emissions from road transport, including the values for the EF, their source and an explanation for that choice.

40. In the key category analysis, the Czech Republic combined CO_2 emissions from off-road transport with those from water transport, and this combined source was identified as a key category by the level assessment (but not by the trend assessment). This merging of the two categories and its identification as a key category are not justified, and the ERT recommends that the Czech Republic reconsider this approach and follow the recommendations of the IPCC good practice guidance with regard to the sector split in the identification of key categories.

3. Stationary combustion: solid fuels – CH_4

41. Over the period 1990–2001, CH_4 emissions from stationary sources were calculated as a fraction of hydrocarbon (C_xH_y) emissions, determined within the framework of REZZO (the national emissions register for traditional pollutants). These emissions represent the sum of CH_4 and non-methane volatile organic compounds (NMVOCs). The fraction of CH_4 was assumed to equal 35–50 per cent. However, this assumption could not be verified for individual fuels. Since 2003, all CH_4 emissions have been determined on the basis of default emission factors taken from the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines). The Party has not checked whether these two methodologies are consistent. In the ERT's opinion, the EF used in the REZZO method is too high when compared to the IPCC default values, which results in an overestimate of emissions in the earlier years, including 1990. During the review process, therefore, the ERT recommended, in accordance with the IPCC good practice guidance, that the Czech Republic follow the same methodology across the whole time period.

42. The Czech Republic agreed with the ERT's judgement and revised its estimates of CH_4 emissions from stationary combustion of solid fuels during the 2006 review process; the ERT appreciated this very much. The revised estimates were provided to the ERT in timely fashion and are reflected in this report. The ERT recommends that the Czech Republic provide recalculation tables for the years 1990–2004 applying the revised EFs in its next submission, using the same values as those submitted to the ERT during the 2006 review.[5] It also recommends that the Party provide in the NIR a description of the method used and the assumptions made, a table of the most important parameters, and references to the sources of data.

4. Stationary combustion: solid fuels – N_2O

43. The Party explained during the in-country visit that the implied emission factors used for estimating N_2O emissions from: energy industries – solid fuels (1.A.1); manufacturing industries and construction – solid fuels (1.A.2); and other sectors – solid fuels (1.A.4) are country-specific and are within the range of the IPCC default EFs. However, comparison of the two showed major discrepancies:

[4] As formulated by the Czech Republic in "Response of the Czech Republic to questions from the expert review Team (ERT) formulated in the course of the in-country review of Czech Republic's initial report under the Kyoto Protocol and Czech Republic's GHG inventory submitted in 2006" (see part B of the annex).

[5] As formulated by the Czech Republic in "Response of the Czech Republic to questions from the expert review Team (ERT) formulated in the course of the in-country review of Czech Republic's initial report under the Kyoto Protocol and Czech Republic's GHG inventory submitted in 2006" (see part B of the annex).

the default factors used are in fact about three times higher than the IPCC default factor of 1.4 kg N_2O/TJ. The ERT also noted that the Party has used different EFs for the different sectors for the same fuel, which is not consistent with the approach suggested by the IPCC. The ERT recommended during the review process that the Party revise the estimate of N_2O emissions from combustion of solid fuels in stationary sources for the period 1990–2004 using the IPCC default EF.

44. The ERT appreciated very much that the Czech Republic agreed to this recommendation and submitted revised estimates for N_2O emissions from combustion of solid fuels in stationary sources in good time; these revisions followed the ERT's recommendation and they are reflected in this report. The ERT recommends that the Czech Republic provide recalculation tables for the years 1990–2004, applying the revised EFs, in its next submission.[6] It also recommends the Party to provide in the NIR a description of the method used and the assumptions made, a table of the most important parameters, and references to the sources of data.

5. Road transportation – N_2O emissions

45. N_2O emissions from the road transportation sector have become a key category for 2004 in the 2006 submission, whereas they were not in the year 2003 as reported in the 2005 submission. The CDV[7] approach is used to estimate these emissions, which is based on a combination of measurements performed for certain cars typically used in the Czech Republic and EF values taken from literature (see Dufek (2005)). The Party is encouraged to provide more details (e.g., identify the EFs taken from the literature and the estimated values of the EFs, identify the cars for which measurements have been made, and identify the share such cars make up of the total fleet) of this approach in the next NIR.

6. Coal mining and handling – CH_4

46. Currently, the IPCC default EFs are used to estimate CH_4 emissions from surface mining and post-mining activities. The Party considers it useful to carry out a study that would determine the ratio of methane released to brown coal produced by surface mining, in order to choose an EF that would correspond to the country-specific characteristics. The ERT supports this intention because emissions from this source in the base year amounted to 18.3 per cent of fugitive emissions from solid fuels.

III. Industrial processes and solvent and other product use

A. Sector overview

47. In 2004, the industrial processes and solvent and other product use sectors contributed 8.8 per cent and 0.4 per cent, respectively, to total GHG emissions in the Czech Republic. Emissions from industrial processes decreased by 32.0 per cent between 1990 and 2004, and by 3.9 per cent between 2003 and 2004. The main reasons for the decrease since 2003 are a reduction in coke consumption in the iron and steel industry and a reduction in emissions from ammonia production. The main driving forces for the 1990–2004 change are reductions in CO_2 emissions from iron and steel production (by 5,807.1 Gg) and from cement production (by 828.0 Gg). On the other hand, HFC emissions from ozone-depleting substance (ODS) substitutes and CO_2 emissions from limestone and dolomite use increased, by 600.3 Gg CO_2 equivalent and 367.3 Gg CO_2, respectively.

48. The ERT acknowledges the improvements to the inventory made by the Czech Republic in comparison with previous submissions, for example, in reviewing and updating the AD for cement production; reallocating the emissions from coke used as a reducing agent to metal production for the

[6] The recalculations should use the same values as those in "Response of the Czech Republic to questions from the expert review Team (ERT) formulated in the course of the in-country review of Czech Republic's initial report under the Kyoto Protocol and Czech Republic's GHG inventory submitted in 2006" (see part B of the annex).

[7] CDV = Transport Research Centre, Brno.

whole time series; reporting the emissions from lime production; and estimating both actual and potential emissions of HFCs, PFCs and SF_6.

49. The CRF includes estimates for most gases and emission categories as recommended by the Revised 1996 IPCC Guidelines. For CO_2, CH_4 and N_2O, detailed data are provided for the whole period 1990–2004, but for HFCs, PFCs and SF_6 data are only provided for the years 1995–2004.

50. The Czech Republic is encouraged to estimate and report data for the F-gases for the years 1990–1994; to provide estimates for the sources that are currently missing (asphalt roofing, road paving with asphalt, calcium carbide, carbon black, dichloroethylene, styrene, methanol, and ferroalloys production); to complete CRF table 9 (completeness) in a manner consistent with the data in CRF tables; and to use the notation keys correctly and appropriately.

B. Key categories

1. Cement production – CO_2

51. Since its previous (2005) inventory submission the Czech Republic has changed from a method of calculation based on cement production to a method based on clinker production. Data on individual plants were taken from the Party's reporting under the EU ETS and national allocation plans, and country-specific EFs were developed. Clinker production data taken from Czech Cement Association were used as activity data. The NIR provides data on the recalculations made since the previous submission and describes the QA/QC procedures in place.

2. Limestone and dolomite use – CO_2

52. Emissions from this category are estimated based on limestone and dolomite use in the sulphur removal units of power stations and in sintering plants. Emissions have increased sharply since 1996 because new air quality regulations required the installation of sulphur removal equipment at power plants. For the sake of the completeness of the inventory, the ERT recommends that the Czech Republic consider other uses of limestone and dolomite.

3. Ammonia production – CO_2

53. Emissions have been estimated based on ammonia production data and an EF that relates the residual fuel oil flow, the carbon content of the oil and the ammonia flow. Emissions from ammonia production are subtracted from overall CO_2 emissions relating to the consumption of residual fuel oil. The ERT suggests that the Czech Republic clarify, in its next NIR, whether the 2.41 Gg CO_2/Gg ammonia (NH_3) ratio comes from *Ullmans Encyclopedia* or from a study by Markvart and Bernauer (2005) (see the NIR, sections 4.1 and 4.2.3).

4. Nitric acid production – N_2O

54. Based on a technical study by Markvart and Bernauer (2005), the NIR explains the origin of the AD and gives an analysis of the EFs used; they are representative of the current and past situation at Czech nitric acid plants. To enhance transparency, the Czech Republic is encouraged to provide in the next NIR important information on the development of EFs from that study.

5. Iron and steel production – CO_2

55. As recommended by the previous review (FCCC/ARR/2005/CZE), a portion of emissions from the energy sector has been reallocated, for the whole time series, to this category in the 2006 submission; the ERT appreciates the fact that the Party has undertaken the reallocation process recommended by previous reviews. Emissions have been calculated based on the coke consumption in blast furnaces (a tier 1 method) and reported under the category steel instead of coke. In the NIR, it is explained that actual emissions of coke occur not in the blast furnace but in the subsequent combustion of blast furnace

gas in energy production. There are some inconsistencies between the AD given in the NIR and those given in the CRF regarding coke consumption in the 1990–2003 time series. For 1990, the CRF shows 7,285 kt while the NIR shows 4,222 kt; for 1991 the corresponding figures are 6,435 kt and 2,959 kt; and so on. Because this is a key category, the ERT encourages the Czech Republic to estimate these emissions using a higher-tier method according to the IPCC good practice guidance and to improve transparency by reporting the number of plants and describing the prevailing technologies.

6. Ozone-depleting substance substitutes – HFCs

56. In its 2006 submission, the Czech Republic has estimated both actual and potential emissions, which is a notable improvement compared to previous submissions, where only potential emissions were estimated. All emissions from stationary refrigeration are reported under "domestic refrigeration", and these emissions increased from 0.72 Gg CO_2 equivalent in 1995 to 76.41 Gg CO_2 in 1996, and up to 525.2 Gg CO_2 in 2004. The reason given for the sharp increase of emissions between 1995 and 1996 is the increase in imports of ODS substitutes for servicing purposes. No uncertainty analysis has been made: QC for this category is reported to be under development. The ERT encourages the Czech Republic to further disaggregate emissions from stationary refrigeration into subcategories; to consider the emissions from ODS substitutes contained in products; and to provide better documentation of the method of estimation in order to improve transparency.

C. Non-key categories

1. Lime production – CO_2

57. The NIR describes AD collection and QA/QC. In the Party's 2005 submission, emissions were equal to removals, and therefore no emissions were reported under this category. For the 2006 submission, the Czech Republic has developed an EF that is based on raw material consumption at plants and on the assumption that the hydrated lime, which accounted for 35 per cent of the production, recarbonates; this process removes CO_2 from the atmosphere. This is an important assumption, and the Czech Republic is recommended to provide in its next NIR the underpinning study that supports it, and to consider the emissions and removals separately.

2. Glass production – CO_2

58. Emissions have been estimated based on total glass production and an EF taken from the CORINAIR 1999 guidebook. Emissions have been recalculated for the 2006 submission because the activity data have been corrected. The ERT encourages the Czech Republic to apply a higher-tier method in order to take into account the existence of different types of glass.

3. Solvent and other product use – CO_2

59. This sector includes emissions of NMVOCs from the use of solvents, calculated using the CORINAIR methodology. Solvents are also considered to be a source of CO_2 emissions. The NIR describes the structure for the basic processing of emissions data, but no further details are provided of the products considered under this category (e.g., solvent-based coatings, water-borne coatings, powder coatings and dilution solvents). The ERT encourages the Czech Republic to take this observation into consideration for its future submissions.

IV. Agriculture

A. Sector overview

60. In 1990, emissions from the agriculture sector in the Czech Republic amounted to 15,474.1 Gg CO_2 equivalent, compared to 8,044.1 Gg CO_2 equivalent in 2004 – a decrease of 48.0 per cent. The sector's contribution to total national emissions (excluding LULUCF) decreased from 8.0 per cent in

1990 to 5.5 per cent in 2004. The main drivers for this decrease were reductions in the cattle population (by about 60 per cent) and reductions in the use of synthetic fertilizers (by about 48 per cent). Emissions from the sector include CH_4 from enteric fermentation and manure management, and N_2O from manure management and agricultural soils.

61. The inventory for the agriculture sector is complete and includes all source categories and gases. However, the ERT identified some problems relating to documentation and transparency. For example, the Czech Republic has not followed the required structure of the NIR, according to which all sources and gases for the agriculture sector should be reported, and a brief description provided for each source category, methodological issues, uncertainty and time-series consistency, QA/QC and verification, recalculations and planned improvements. This should be rectified in the Party's next submission.

62. This part of the Czech Republic's GHG inventory has improved since the 2005 submission. In the 2006 NIR, revised tier 2 emission factors for dairy and non-dairy cattle have been reported, which has produced more accurate estimates of CH_4 emissions from enteric fermentation. These new EFs for cattle are in line with values for other European countries.

63. There are numerous places in the CRF tables where the notation keys are either used incorrectly or inconsistently from year to year, or not used at all. For example, in table 4 (sectoral report for agriculture, sheet 1 of 2) for 1990, NE ("not estimated") should be used for buffaloes instead of NO ("not occurring"). In the same table, for other livestock, the notation key IE ("included elsewhere") should be deleted. In sheet 2 of the same table, for categories F. (field burning of agricultural residues) and G. (other), all cells should be filled in with NO, rather than NA ("not applicable"). Similar inconsistencies can be observed in table 4.A, table 4.B(a) sheets 1 and 2, table 4.B(b), table 4.D and table 4.F. The ERT recommends that the Czech Republic review the use of the notation keys in the agriculture sector and correct the inconsistencies identified above.

B. Key categories

1. Enteric fermentation – CH_4

64. In 1990, CH_4 emissions from enteric fermentation were 231.9 Gg CH_4, or 82.8 per cent of total CH_4 emissions (280.0 Gg) from agriculture. Cattle accounts for 95.1 per cent of CH_4 emissions from enteric fermentation. In the 2006 NIR, the Czech Republic has reported tier 2 country-specific emission factors for dairy and non-dairy cattle, and used the *Statistical Environmental Yearbook of the Czech Republic* as a source for animal population data. These new emission factors for cattle are in line with those used by other European countries. However, the methods used for deriving the tier 2 emission factors come from studies by Hons and Mudrik (2003) and by Kolar et al. (2004), which have not been published in peer-reviewed scientific journals, and are available only in Czech. The ERT recommends that the Czech Republic present more information in the NIR on its major assumptions, data collection, expert consultations and parameters in order to improve transparency for this key category.

2. Direct emissions from agricultural soils – N_2O

65. In 1990, direct N_2O emissions from agricultural soils amounted to 14.8 Gg N_2O and accounted for 51.4 per cent of total N_2O emissions from agricultural soils; in 2004, these emissions amounted to 8.7 Gg N_2O (56.4 per cent). Emissions from this source decreased by 41.2 per cent from 1990 to 2004, mainly because of reductions in animal populations, the consumption of synthetic nitrogen (N) fertilizers and crop production. N_2O emissions from animal manure on pasture, range and paddock (category 4.D.2) are included in direct emissions from soils (category 4.D.1) in the key category analysis conducted by the Czech Republic. For comparability with other Parties' inventories and the secretariat's analysis, the Czech Republic should consider separating the two categories.

66. Three sources – synthetic N fertilizers, animal manure applied as fertilizers and crop residue decomposition – collectively accounted for 98.8 per cent of total direct N_2O emissions from agricultural soils in 1990 (98.7 per cent in 2004). The Czech Republic uses the IPCC default EFs of 0.0125 kg N_2O-N/kg N for synthetic N fertilizers, animal manure applied to soils, biological N fixation and crop residue decomposition, and the factor of 8 kg N_2O-N/ha/yr for cultivation of histosols.

67. Like previous reviews the ERT notes that the Czech Republic has not reported the fractional parameters (CRF table 4.Ds2) for all years and recommends that the Party complete the relevant additional tables.

68. The sum of animal waste management systems (AWMS) (excluding pasture, range and paddock) multiplied by the IPCC default for $Frac_{GASM}$ of 0.2 does not produce the same value as the one reported in CRF table 4.D. The difference arises from the fact that the Czech Republic has not included manure from daily spread as part of manure applied to soils. This is not consistent with the Revised 1996 IPCC Guidelines. The ERT recommends that for its next submission the Czech Republic correct this problem and ensure consistency in the CRF tables across all years.

3. Indirect emissions from agricultural soils – N_2O

69. In 1990, indirect N_2O emissions from agricultural soils amounted to 11.7 Gg N_2O and accounted for 40.6 per cent of total emissions from agricultural soils; in 2004, these emissions amounted to 5.8 Gg N_2O (38.0 per cent). Indirect N_2O emissions decreased by 50.0 per cent from 1990 to 2004. Emissions from leaching and run-off accounted for 83.4 per cent of indirect N_2O emissions from agricultural soils in 1990, and atmospheric deposition for the remaining 16.6 per cent; these shares remained almost the same in 2004. The Czech Republic uses the IPCC default EF of 0.025 kg N_2O–N/kg N and an N leaching factor of 30 per cent, and IPCC default EFs and volatilization factors of 10 per cent for synthetic N fertilizers and 20 per cent for manure N. The fractional parameters are not reported in the CRF tables and the ERT recommends that the Czech Republic rectify this for its next submission.

4. Pasture, range and paddock manure – N_2O

70. Emissions from this source decreased from 2.3 Gg N_2O in 1990 to 0.9 Gg N_2O in 2004, a reduction of 62.1 per cent, because of the decrease in animal populations since 1990. The IPCC tier 1 method has been used. The secretariat identified N_2O emissions from animal manure on pasture, range and paddock as a key category by trend assessment in 2004, but the Czech Republic did not; the Czech Republic should review this during the preparation of the key category analysis for its next submission.

5. Manure management – CH_4

71. The Czech Republic uses the IPCC tier 1 method for estimating emissions from this category, which amounted to 48.1 Gg CH_4 in 1990 and 24.6 Gg CH_4 in 2004. Between 1990 and 2004, these emissions decreased by 48.9 per cent, due mainly to the reduction in the cattle population since 1990. The secretariat identified CH_4 emissions from manure management as a key category by trend assessment in 2004, but the Czech Republic did not; the Czech Republic should review this during the preparation of the key category analysis for its next submission.

72. The ERT considers it desirable to develop tier 2 emission factors for dairy and beef cattle since data on daily feed intakes are available. Tier 2 emission factors could be derived from data on enteric fermentation in the studies by Hons and Mudrik (2003) and Kolar et al. (2004). Other parameters such as methane producing potential (Bo) and the methane conversion factor (MCF) are also available from the IPCC good practice guidance. The ERT encourages the Czech Republic to derive tier 2 country-specific CH_4 EFs for dairy and beef cattle. In line with the improvement plan mentioned in the 2006 NIR, the

ERT also encourages the Czech Republic to determine a country-specific allocation of the distribution of livestock between different AWMS.

V. Land use, land-use change and forestry

A. Sector overview

73. Forest land covers 33.6 per cent of the total land area of the Czech Republic. In 2004, the LULUCF sector was a net sink of 4,804.4 Gg CO_2 equivalent, which offset about 3.3 per cent of total GHG emissions from other sectors. In 1990 net removals from the LULUCF sector amounted to about 1,730.1 Gg CO_2 equivalent, offsetting only 0.9 per cent of net emissions from other sectors. According to the data reported, therefore, net GHG removals by LULUCF increased by about 177.7 per cent in 2004 compared to their level in the base year.

74. The ERT noted major improvements in the 2006 submission: for the first time the Czech Republic has reported the LULUCF sector using the revised CRF tables as agreed in decision 13/CP.9, provided recalculations of all years (1990–2004), and reported categories such as grassland, wetland and other land. Nevertheless, the Czech Republic still considers the 2006 inventory to be a transitional one and has indicated that it still needs to fully apply the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF) in its future submissions.

75. The completeness of the inventory has improved compared to previous submissions. However, for several land-use categories, such as cropland remaining cropland (5.B.1), land converted to cropland (5.B.2), grassland remaining grassland (5.C.1) and land converted to settlements (5.E.2), emissions and removals have been considered as negligible and are therefore reported as "not estimated" (NE) or "not occurring" (NO). The NIR states that this assumption is based on the application of tier 1 methods of the IPCC good practice guidance for LULUCF; however, the work on which this assumption is based and the basis for excluding these categories have not been reported, and the assumption has not been justified. There is no provision in the UNFCCC reporting guidelines to exclude the reporting of any category or source other than the optional ones. The ERT recommends that the Czech Republic complete its reporting by estimating the categories which are currently reported as NE or NO, in accordance with the UNFCCC reporting guidelines and the IPCC good practice guidance for LULUCF, using national data or, if national data are not available, default IPCC data. Uncertainty estimates and QA/QC procedures have not been reported for LULUCF.

76. Lack of transparency and inadequate documentation represent a major deficiency in the CRF and the NIR submitted by the Czech Republic in 2006. The sampling system used to collect measurements and provide updates for the Forest Management Plans (FMP) database is not described in the NIR. Information on key category analysis has not been provided in CRF table 7. The methods used for deriving activity data, references for some of the factors used, and definitions of land uses have not been provided. The ERT encourages the Czech Republic to include in its next NIR a complete description of the sampling system used to collect AD for GHG inventory purposes; to provide estimates of uncertainty, as required by the UNFCCC reporting guidelines, in a quantitative and/or qualitative manner; to provide transparent documentation supporting the key category analysis; to establish QA/QC procedures for the LULUCF sector; and to provide tabulated data for the different land-use categories in the general section of the NIR on QA/QC.

77. The information received during the in-country visit clarified the approaches and methods used by the Czech Republic for land use categorization and indicated an approach based on good practice. However, these efforts are not transparently documented in the NIR. The ERT encourages the Czech Republic to document clearly in the NIR all the steps taken and the approaches and methods used for land-use categorization.

B. Key categories

1. Forest land remaining forest land – CO_2

78. A tier 2 method was used to estimate both CO_2 and non-CO_2 emissions for this category. Although the Czech Republic has detailed data on land areas, forest types, species and other inventory-related parameters, all the estimates for four distinct forest types have been reported together at an aggregate level. Such aggregated reporting does not provide sufficient transparency and may lead to incorrect estimates of GHG emissions. Estimates should be prepared using available national data and methods at the most disaggregated level; results can then be aggregated at the national level. The ERT recommends that the Czech Republic make more effort to use the data that are available, at their disaggregated level, in order to provide more detailed and better documented estimates in its future GHG inventories.

79. Equations 1 and 2 in section 7.2.2 of the NIR are modifications of the original equations 3.2.5 and 3.2.7 of the IPCC good practice guidance for LULUCF. In equation 1 the Party has included factor F_B to expand volume under bark to volume over bark. In equation 2 factor R (the root ratio) has been introduced with the argument that this was omitted from the IPCC good practice guidance for LULUCF but corrected in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Another factor, F_{HL}, has been introduced to include the unaccounted loss associated with harvest, and in the same equation factor F_{BL} of the fraction of biomass left to decay has been removed from the equation. The ERT was informed that, in the opinion of the Czech experts, these modifications to the IPCC equations do not change the nature of the equations; rather they add clarity and enable the Czech Republic to input its available data directly. However, some of the factors used are not well referenced, for example, F_B and F_{HL}. In addition, the way in which other inputs (e.g., wood density (D) and biomass expansion factor applicable to the increment (BEF1)) have been weighted or averaged is not described. It was therefore not possible for the ERT to assess the implications of these modifications for the IPCC equations. The ERT suggests that the Czech Republic change its national data to fit the IPCC equations and document them in a tabular format, or use its national equations and provide adequate documentation as required.

80. For soil carbon, only emissions from mineral soils have been estimated. Changes in carbon stock in organic soil are considered negligible. However, the wrong notation key (NO) is used instead of NE in CRF table 5.A; this should be corrected in the Party's next submission.

2. Cropland remaining cropland – CO_2

81. The Czech Republic reports category 5.B.1 as NE and notes in CRF table 5.B that "Under the conditions of the country, carbon stock change of this category can safely be considered negligible". During the in-country visit the Party also indicated the lack of data needed to estimate GHG emissions in this category. The ERT noted that the Party has used default methods and data for other categories in this submission and suggests that the Party can similarly use default methods and data to report estimates for this category until the required data are developed. The ERT also noticed that the notation keys are not used correctly, for example, the notation key NO is used for soil carbon. Despite the fact that emissions for 5.B.1 are reported as NE, category "Cropland remaining cropland - CO_2" was identified by the secretariat as a key category for both 1990 (by level assessment) and 2004 (by trend assessment), because it also includes carbon emissions from lime application in agriculture, which have been reported by the Czech Republic.

82. Only carbon emissions from lime application in agriculture have been estimated and reported as an aggregated value because the NIR states that it is impossible to separate the data for limestone and dolomite applications. The ERT encourages the Czech Republic to find an approach to separate these data and to provide disaggregated estimates in its future submissions.

3. Other land – CO_2

83. The reporting of emissions from other land remaining other land is not mandatory. All emissions from land conversion to other land have been reported as NE except for forest land and cropland converted to other land, which have been reported using IPCC tier 1 default methods.

84. The land-use classification used by the Czech Republic for other land allows areas such as infrastructure, airports and roads to be part of the other land category. This classification is not consistent with the IPCC good practice guidance for LULUCF, in which such land-use areas are defined as coming under the settlements category. The IPCC good practice guidance for LULUCF defines other land as bare soil, rocks, ice and unmanaged land areas that do not fall into any of the other five land-use categories. The rationale for having such a category is to allow the area of identified land uses to match the national land area. The ERT encourages the Czech Republic to harmonize its land-use definitions with the definitions used by the IPCC good practice guidance for LULUCF, particularly for other land and settlements.

C. Non-key categories

1. Land converted to grassland – CO_2

85. For this category, the IPCC tier 1 default method has been used. The ERT observed some large inter-annual differences in the estimates for some years because of changes in the area data used in the years 1991 and 1996. These changes are mainly attributed to conversion from cropland to grassland. During the in-country review the Party explained that the data used are from official sources, such as the CSO, and that for the transitional period in the early 1990s it is difficult to identify the underlying reasons for the differences. The ERT was informed that the cropland area is, in general, decreasing, being affected by a number of EU-related regulations and policies. The ERT recommends that the Czech Republic carefully check such variations and provide explanatory information in the NIR and the relevant CRF tables, especially when the values of AD and emissions fluctuate considerably.

2. Settlements remaining settlements – CO_2

86. The NIR states that land used for infrastructure such as industrial zones and city parks is included under other land. The ERT advises the Czech Republic to harmonize its land-use definitions for this category with the IPCC good practice guidance for LULUCF.

VI. Waste

A. Sector overview

87. In 2004, the waste sector contributed 2.3 per cent of total national GHG emissions in the Czech Republic and 24.3 per cent of total CH_4 emissions, whereas in 1990 it contributed 1.4 per cent of total GHG emissions and 13.5 per cent of total CH_4 emissions. From 1990 to 2004, emissions from the sector increased by 26.0 per cent (or by 687.7 Gg CO_2 equivalent), despite a reduction in emissions from managed waste disposal sites as a result of the introduction of CH_4 recovery systems and a decrease in population.

88. A major improvement since the 2005 submission is that the Czech Republic has provided all the CRF tables for the entire time series, including the base year. The estimates for the waste sector are complete with the following exceptions:

(a) N_2O emissions from waste incineration are provided only for the years 2003 and 2004;

(b) CH_4 emissions from waste incineration are reported as not estimated, since they are considered negligible;

(c) CO_2 emissions from waste incineration are not reported for 1990, being considered as not occurring.

89. The methodologies, data sources and formulae used for calculations are described in the NIR for all reported categories, with some minor exceptions which are detailed below. Greater clarity, however, is still needed in the description of the sources, the parameters used and the years in which they have been applied, and of how certain parameters (e.g., the degradable organic content, DOC) are calculated.

90. In the course of the 2006 in-country review the Czech Republic revised its estimates for CH_4 emissions from solid waste disposal on land (a key category) using a tier 2 methodology, as suggested by the ERT and recommended by the IPCC good practice guidance. The corresponding explanation is provided below in section VI.B.1. The ERT appreciated very much that the Czech Republic accepted the ERT's recommendation to recalculate these emissions and submitted these recalculations in a timely fashion.

B. Key categories

1. Solid waste disposal on land – CH_4

91. Emissions from this category, identified as a key category by both level and trend assessment, amounted to 79.2 Gg CH_4 and represented 62.7 per cent of total GHG emissions from the waste sector in 1990; in 2004, they amounted to 109.3 Gg CH_4 or 68.7 per cent of total emissions from waste.

92. Although this is a key category, in its 2006 submission the Czech Republic estimates CH_4 emissions from managed solid waste disposal sites[8] using the default IPCC methodology (tier 1) because of the lack of pre-1990 activity data needed to apply the first order decay (FOD) method, which is the tier 2 method suggested by the IPCC good practice guidance for key categories (and which the ERTs in 2004 and 2005 recommended that the Czech Republic use). During the in-country visit, therefore, the ERT encouraged the Czech Republic to estimate these CH_4 emissions using the FOD method, applying the national data available or the default parameters most appropriate for the national circumstances where no national data are available. In doing so, the Czech Republic had to ensure that the information provided was in accordance with the UNFCCC reporting guidelines and included the following:

(a) a description of the methodology and formulae used to estimate historical data (AD, EFs, other parameters, as appropriate);

(b) the assumptions made and the rationale for each of the formulae, parameters and values;

(c) a recalculation of the entire time series, including the data sets used in the calculation.

93. In response, the Czech Republic provided to the ERT during the review a comprehensive document presenting the application of the FOD method and all the information defined in the paragraph above (Havránek, 2007). The revised 1990 value for CH_4 emissions from solid waste disposal sites was accepted by the ERT. It amounts to 79.2 Gg CH_4 (the previous estimate was 93.2 Gg) emissions or 1,662.6 Gg CO_2 equivalent (the previous estimate was 1,957.2 Gg).

94. The ERT recommends that the Czech Republic implement this method for its next inventory submission and provide the relevant recalculation tables for the years 1990–2004. The same values for the parameters (i.e., OX = 0.1, DOC_f = 0.5, F = 0.55) and the same assumptions should be used as in the CUEC Working Paper 2007/2 (Havránek, 2007). The ERT also recommends that the Czech Republic

[8] Managed waste disposal on land is the only subcategory under solid waste disposal on land for which CH_4 emissions are reported; emissions from unmanaged waste disposal sites are reported as "not occurring" (NO) for all years between 1990 and 2004.

provide in its next NIR a description of the FOD method used, the assumptions made, a table of the most important parameters, and references to the sources of data.

95. Sources for the data on CH_4 recovery are not referenced clearly in the NIR, but they were clarified during the in-country visit. Data for the years 1990–2001 are taken from a study that includes information about particular landfills with their corresponding amount of landfill gas incinerated, based on information provided by the companies operating those landfills. From 2002 onwards, the data have been provided by the Ministry of Trade and Industry in an aggregated format (showing the total quantity recovered) but not broken down by operating facility. The ERT recommends that in the Party's next submission the source of these data be clearly referenced in the NIR, and that efforts be made to provide the information in a disaggregated manner. The ERT also noted that the IPCC good practice guidance suggests that an inventory of known recovery facilities should be available.

2. Waste incineration – CO_2

96. Emissions from waste incineration are not reported in the CRF for 1990. The Czech Republic clarified during the review that there was no incineration in 1990. The ERT recommends that the Czech Republic report these emissions using the notation key NO ("not occurring") in the corresponding CRF tables for 1990 and provide the corresponding explanation in the NIR.

97. The trend in emissions from waste incineration seems to be inconsistent (a constant value is used for the years 1991–2002, but not after 2002) and it is not explained in the NIR. During the review, the Party clarified that the years 1991–2002 (reported as constant) needed to be recalculated because they are based on aggregated data. Data for 2003 and 2004 are based on the Statistical Yearbook and include the amount for municipal, sludge, hazardous and clinical wastes separately. The ERT recommends that the Czech Republic recalculate the emissions using estimated disaggregated data, as stated in its NIR, in order to ensure consistency in the time series.

98. The ERT identified a reporting error, which does not affect the emission estimates, in CRF table 6.A for 2004, where the amount reported (404.7 Gg) corresponds to the total of municipal solid waste and not to the total amount of waste incinerated as provided in the NIR (467.7 Gg). The ERT recommends that the Party address this inconsistency in its next submission, since the same problem was also noted in the previous (2005) submission for the 2003 data.

99. The NIR includes information about the amount of waste (192 Gg in 2004) that is incinerated as a fuel. The corresponding emissions are reported in the waste sector. To improve transparency and comparability, and be consistent with the IPCC good practice guidance, the ERT recommends that these emissions be allocated to other fuel in the energy sector, and that the corresponding recalculation be performed for the entire time series.

C. Non-key categories

Waste-water handling – CH_4

100. The Czech Republic uses a tier 1 method as recommended by the IPCC good practice guidance for estimating emissions from domestic and industrial waste water. A description of the methodology, an example of the calculation and the sources of data used are provided in the NIR and the corresponding CRF tables. In the case of domestic waste water, the sources for total population, the percentage of the people connected to the sewer and the percentage of the water treated are not clearly referenced. During the in-country visit, it was clarified that the information is taken from the Statistical Yearbook; this reference should be included in the Party's next NIR.

101. In the case of industrial waste-water handling, a typing error was identified on page 106 of the 2006 NIR. In the formula presented, Bo is expressed in kg CH_4/kg biochemical oxygen demand (BOD),

whereas it should be kg CH_4/kg chemical oxygen demand (COD). The value used, however, is based on COD, so the emissions are nevertheless estimated correctly.

VII. Conclusions and recommendations

102. The GHG inventory including a full set of CRF tables for the years 1990–2004 and an NIR have been submitted by the Czech Republic. The ERT considers the inventory submission to be broadly consistent with the UNFCCC reporting guidelines, the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. Areas for further improvement relate to: the identification of key categories; the reporting of emissions for some missing categories; greater transparency in the reporting on methodologies and data sources, and of the approach used to estimate uncertainties; the inclusion of uncertainties for non-key categories; the need for regular recalculations in order to base the inventory on the final energy data; and further improvement in consistency between the NIR and the CRF.

103. In the course of the review, the ERT formulated a number of recommendations relating to the completeness and transparency of the Czech Republic's GHG inventory. The key recommendations[9] are that the Czech Republic:

- Prepare for the 2008 submission updated information on QA/QC, archiving, the completeness of the inventory, recalculations and transparency;
- Include in the 2008 submission emissions data for the source categories for which emissions have not so far been estimated.

104. In order to close gaps in the emissions data within the limits of available resources, the ERT suggests that the Czech Republic make use of approaches that use only country-specific data that are already available. However, such estimates should also include an assessment of the associated uncertainties. This assessment might be based on expert judgement.

105. The ERT appreciated the efforts that the Czech Republic has made to revise emission estimates for the categories CO_2 emissions from the combustion of solid fossil fuels; CH_4 emissions from fuel combustion; N_2O emissions from fuel combustion; and CH_4 emissions from solid waste disposal sites. The ERT believes that this effort has notably improved the robustness of the estimates of emissions for 1990.

106. The ERT suggests that the Party consider carefully any implications for the consistency of the time series when introducing further improvements to the inventory related to the use of higher-tier methods.

[9] For a complete list of recommendations, the relevant sections of this report should be consulted.

Annex

Documents and information used during the review

A. Reference documents

IPCC. Good practice guidance and uncertainty management in national greenhouse gas inventories, 2000. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

IPCC. Good practice guidance for land use, land-use change and forestry, 2003. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.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>.

UNFCCC. 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/SBSTA/2004/8. Available at <http://unfccc.int/resource/docs/2004/sbsta/08.pdf>.

UNFCCC. 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. Status report for the Czech Republic. 2006. Available at <http://unfccc.int/resource/docs/2006/asr/cze.pdf>.

UNFCCC secretariat. Synthesis and assessment report on the greenhouse gas inventories submitted in 2006. FCCC/WEB/SAI/2006. Available at <http://unfccc.int/resource/docs/webdocs/sai/sa_2006.pdf>.

UNFCCC secretariat. The Czech Republic: Report of the individual review of the greenhouse gas inventory submitted in the year 2005. FCCC/WEB/IRI/2005/CZE. Available at <http://unfccc.int/resource/docs/2006/arr/cze.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Pavel Zamyslicky (National UNFCCC Focal Point, Department of Climate Change / Emissions Trading Unit, Ministry of the Environment of the Czech Republic) including additional material on the methodology and assumptions used. The following additional information was provided by the Czech Republic during the review.[10]

CSO (2005): Statistical Yearbook of the Czech Republic 2005, Czech Statistical Office (CSO), Praha

CSO (2006): Statistical Yearbook of the Czech Republic 2006, Czech Statistical Office (CSO), Praha

Dufek, J. (2005): "Verification and evaluation of weight criteria of available data sources for N_2O from transportation", Report of the Transport Research Centre (CDV)for the Czech Hydrometeorological Institute, Brno.

Fott, P. (1999): "Carbon emission factors of coal and lignite: analysis of Czech coal data and comparison to European values", *Environmental Science and Policy*, 2/3 (June), pp. 347–354(8).

[10] This list does not include the presentations made by Czech experts during the in-country visit.

Havránek, M. (2007): "Emissions of methane from solid waste disposal sites in the Czech Republic during 1990–2005: Application of a first order decay model", CUEC Working Paper 2007/2, Environment Centre, Charles University, March.

Hons, P., and Mudrik, Z. (2003): "Czech country-specific data for estimation of methane emissions from enteric fermentation of cattle", AGROBIO Report for the Czech Hydrometeorological Institute (in Czech), Prague.

Informal communication: Calculation of CH_4 emissions from municipal solid wastes.

Informal communication: Comments from the Czech Statistical Office on energy, agricultural and LULUCF data.

Informal communication: Comparison of GHG emissions estimates between the second national communication and the 2006 inventory submission.

Informal communication: Estimates of CH_4 emissions from municipal solid wastes under several scenarios.

Informal communication: Sources of information – Agriculture in NIR 2006.

Informal communication: Sources of information – Energy.

Informal communication: Sources of information – LULUCF in NIR 2006.

Kolar, F., Havlikova, M. and Fott, P. (2004): "Recalculation of emission series of methane from enteric fermentation of cattle", Report of the Czech Hydrometeorological Institute (in Czech), Prague.

KONEKO Marketing Co, Ltd, *Energy Economy: Czech Republic*, 1995–1999, 1996–2000, 1997–2001, 1999–20003, 2000–2004 and 2001–2005 editions.

Markvart, M., and Bernauer, B. (2005): "Emissions of nitrous from chemical industry", Report for the Czech Hydrometeorological Institute (in Czech), Prague.

Rehacek, V. and Michalek, L. (2005): "Antropogenni emise fluoride siroveho, castecne fluorovanych uhlovodiku a zcela fluorovanych uhlovodiku v r. 2004 v Ceske republice'. Listopad.

"Response of the Czech Republic to questions from the expert review Team (ERT) formulated in the course of the in-country review of Czech Republic's initial report under the Kyoto Protocol and Czech Republic's GHG inventory submitted in 2006". Submitted to the ERT through the UNFCCC secretariat on 13 April 2007).

Svoboda, K. (1996): "Emisni factory N_2O pro spalovacich procesy ve stacionarnich zdrojich a navrhy opatreni pro snizeni emisi", Report for the Czech Hydrometeorological Institute.

Takla, G. (2002): "Uvolnovani metanu pri hlubinne tezbe uhli", in *Cesky Plynarensky Svaz*, Praha.

Takla, G. and Novacek, P. (1997): "Emise dulnich plynu v ostravsko-karvinskem uhelnem reviru a moznosti jejich minimalizace", in *Cesky Plynarensky a Naftovy Svaz: Technicky vybor "Plyn a zivotni prostredi",* Praha.

Vyzkumny Ustav Maltovin Praha spol. s.r.o. Problematika emisi sklenikovych plynu pri vyrobe cementu. Prosinec, 2003.

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