UNITED
NATIONS

UNFCCC Framework Convention on Climate Change

Distr.
GENERAL

FCCC/ARR/2005/BGR
3 May 2006

ENGLISH ONLY

Report of the individual review of the greenhouse gas inventory of Bulgaria submitted in 2005*

* In the symbol for this document, 2005 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 centralized review of the 2005 greenhouse gas (GHG) inventory submission of Bulgaria, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with decision 19/CP.8. The review took place from 3 to 8 October 2005 in Bonn, Germany, and was conducted by the following team of nominated experts from the roster of experts: Generalists – Ms. Anke Herold (European Community) and Ms. Ruta Bubniene (Lithuania); Energy – Mr. Leif Hockstad (USA), Mr. Michael Strogies (Germany) and Mr. Steven Oliver (Australia); Industrial Processes – Ms. Sonia Petrie (New Zealand), Ms. Ionela Draghici (Romania) and Mr. Kiyoto Tanabe (Japan); Agriculture – Mr. Marcelo Rocha (Brazil) and Mr. Erda Lin (China); Land Use, Land-use Change and Forestry (LULUCF) – Mr. Justin Ford-Robertson (New Zealand) and Mr. Jozef Mindas (Slovakia); Waste – Mr. Ayite-Lo Ajavon (Togo) and Ms. Anke Herold. Ms. Anke Herold and Mr. Ayite-Lo Ajavon were the lead reviewers. The review was coordinated by Ms. Rocio Lichte (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", a draft version of this report was communicated to the Government of Bulgaria, 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 its 2005 submission, Bulgaria submitted an almost complete set of common reporting format (CRF) tables for the years 1988 (base year for Bulgaria) and 1990–2003, and a national inventory report (NIR). Bulgaria has not provided the CRF tables for LULUCF as required by decision 13/CP.9. Where needed, the expert review team (ERT) also used previous years' submissions, additional information provided during the review, and other information. The full list of materials used during the review is provided in the annex to this report.

C. Emission profiles and trends

4. In 2003, the most important greenhouse gas in Bulgaria was carbon dioxide (CO_2), contributing 77.1 per cent to total[1] national GHG emissions expressed in CO_2 equivalent, followed by methane (CH_4), 13.5 per cent, and nitrous oxide (N_2O), 9.3 per cent. Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) taken together contributed 0.03 per cent[2] of the overall GHG emissions in the country. The Energy sector accounted for 77.3 per cent of total GHG emissions, followed by Waste (8.1 per cent), Industrial Processes (8.0 per cent) and Agriculture (6.6 per cent). Total national GHG emissions amounted to 69,167 Gg CO_2 equivalent and decreased by 50 per cent from 1988 (base year) to 2005.

D. Key categories

5. Bulgaria has made improvements in its key category analysis by reporting a key category tier 1 and tier 2 analysis, both level and trend assessment, as part of its 2005 submission. The key category

[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. Because Bulgaria has not provided estimates for LULUCF using the tables of the CRF for LULUCF, but has reported estimates for the "old" Land-use Change and Forestry according to the tables as contained in the CRF adopted by decision 18/CP.8, this report refers to Land-use Change and Forestry instead of LULUCF, as appropriate.

[2] For HFCs only potential emissions have been reported. These are not reflected in the percentage contribution presented in this paragraph. For more information see paragraphs 47 and 48 of this report.

analyses performed by the Party and the secretariat[3] produced similar results. The differences that occur are due to a higher level of disaggregation in the Party's analysis.

E. Main findings

6. Improvements have been made in the 2005 submission compared to the previous (2004) submission, in particular with the provision of CRF tables for the years 1990–2002 and for the base year, 1988, which has been recalculated. However, CRF tables for 1989 remain to be submitted for the time series to be complete. The inventory is still significantly lacking in transparency, in particular for base year emissions, for which the estimates could not be substantiated by providing adequate data and information during the review. Although Bulgaria frequently responded to queries from ERT during the review by indicating that the reported estimates are considered to be correct, it did not provide additional background data and parameters. As a result, a number of the issues raised by the ERT could not be clarified during the review. For a number of important source categories, Bulgaria is not yet using the appropriate tier methods, and some source categories are not yet estimated. Improved methods, the estimation of missing categories and gases, and a substantial increase in the transparency of the reporting should be priorities in Bulgaria's inventory improvement plan. Data for the LULUCF sector have not been estimated and reported according to the land-use categories of the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance for Land Use, Land-use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). Bulgaria explained to the review team that the most important problem is the lack of funds to conduct the improvements suggested above.

F. Cross-cutting topics

1. Completeness

7. The CRF tables submitted show full geographical coverage and good coverage of sources; however, the year 1989 of the time series is missing. The reporting of the Land-use Change and Forestry (LUCF) sector is incomplete: estimates have only been reported for category 5.A Changes in Forest and Other Woody Biomass Stocks, and some source categories have not been estimated, such as Limestone and Dolomite Use, Asphalt Roofing, and Solvent and Other Product Use – CO_2 and N_2O. Actual emissions of HFCs are only reported for 1995, and no estimates of actual or potential emissions from consumption of PFCs are provided. The Party explains that emissions from categories 5.B–5.E in LUCF, CO_2 emissions from Solid Waste Combustion, fluorinated gas (F-gas) emissions and N_2O emissions from Solvent and Other Product Use are not included due to the lack of methodologies and resources. The Party is encouraged to complete the time series, to report the LULUCF sector as required by decision 13/CP.9, and to estimate the missing gases and source categories.

2. Recalculations and time-series consistency

8. The ERT noted that recalculations reported by the Party of the time series 1988–2002 had been undertaken to take into account improved activity data (AD), revised emission factors (EFs), improved methods and the inclusion of additional sources. A considerable number of recalculations have been performed only for the base year inventory. The major changes include: many corrections of AD and

[3] The secretariat identified, for each Party, those source categories which are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the Intergovernmental Panel on Climate Change *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. 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 year 1990. Where the Party has 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.

EFs for the base year; the recalculation of emissions in the Waste sector; accounting of stored carbon in the Energy sector; corrections to EFs in the Energy sector; and the addition of emissions from petroleum refining and aluminium production for earlier years. The explanations for these recalculations are provided in a general way in the NIR. However, in many cases sources of new data are not clearly referenced and the explanations given are not sufficiently detailed. Comparison with previous inventory submissions is difficult as in 2004 only the CRF tables for 2002 were submitted. CRF tables 8(a) for earlier inventory years (i.e. 1988, 1990–2001) present emissions estimates that were not submitted to UNFCCC in 2004. The ERT recommends that Bulgaria provide explanations for each source category and gas separately, include references to data sources and explain more clearly the corrections that have been included (e.g. provide more details on changes made due to data structuring). Bulgaria has not used CRF table 8(b) to explain the reasons for recalculations, and the ERT recommends that the Party provide this table with its next inventory submission.

9. The general trend in total GHG emissions is not greatly affected by the recalculations, but for individual source categories the trend has changed considerably as a result of the recalculations. In a number of cases recalculations of base year emissions are not sufficiently explained: the recalculations for Agricultural Soils – N_2O resulted in an increase of emissions in the base year, but decreases or only very minor changes for all other years. The recalculated amounts of synthetic fertilizer applied in the base year seem to be very high compared to the rest of the time series, as this value is 3.6 times the average for the period 1991–2003. In its response to questions raised during the review Bulgaria explained that the big decrease after 1988 is due to the change of ownership of arable land after it was returned to the documented owners. However, this does not fully explain why the new owners use considerably smaller amounts of fertilizer. The Party should provide more detailed explanations, including references to the data sources used for the 1988 estimate. In the Industrial Processes sector emissions from aluminium production have been recalculated based on data for the period 1988–1994. The time series shows high aluminium production in 1988 compared to the following years; further details are needed to show how estimates for the base year and the following years have been calculated, and the data sources used should be provided. Bulgaria should provide further information in its next NIR on the issues summarized in this paragraph.

10. The NIR explains that it was not possible to achieve consistent time series for the number of animals in the Agriculture sector and that these categories were not recalculated. The ERT recommends that Bulgaria address this as soon as possible.

11. The explanations for the recalculations for Solid Waste Disposal – CH_4 are lacking in detail with regard to the data sources used, errors corrected, and how exactly time-series consistency for the amounts of waste landfilled has been achieved. Further information should be provided in Bulgaria's next inventory submission.

3. Uncertainties

12. A tier 1 level uncertainty assessment was performed, which is generally in line with the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance). Bulgaria reports many problems with data availability for the base year, in particular in the Energy sector. In the uncertainty estimation, it seems that the methodological approach assumes the same uncertainties for the base year and recent years; at least no separate uncertainty estimates for the base year are provided. The ERT recommends that Bulgaria develop separate uncertainty estimates for the base year and the latest inventory year.

4. Verification and quality assurance/quality control approaches

13. The ERT welcomes the ongoing development of the National System for estimation of anthropogenic emissions together with the monitoring and reporting system for air pollution.

14. Bulgaria states that quality assurance/quality control (QA/QC) procedures have been applied for the preparation of the GHG inventory; however, there is no formal QA/QC system and quality management plan in place. Although the Party indicates that there is a certified quality management system for stationary point sources, this does not extend to the GHG estimates submitted. The NIR states that the QC procedures at the organization responsible for the statistics are harmonized with international standards, but it is not clear whether this is sufficient to achieve the necessary data quality. The ERT recommends that the Party prepare a formal QA/QC plan and establish a QA/QC system for GHG emissions.

5. Follow-up to previous reviews

15. Bulgaria has made a number of improvements to cross-cutting areas suggested by the previous (2004) review – the provision of CRF tables for the entire time series (except for 1989), the inclusion of a number of additional sources in the inventory, such as CO_2 emissions from non-energy use of fuel, an improved structure of the NIR, and the recalculation of its base year emissions estimates. In its response to this review, Bulgaria stated that currently no resources have been allocated for the estimation of an inventory for the year 1989.

16. A number of recommendations from previous reviews are still outstanding, such as the provision of an inventory improvement plan, greater transparency in the reporting on methodologies, the inclusion of tables with AD in the NIR, and the implementation of detailed QC checks and source-specific QA/QC activities as part of a QA/QC management system.

G. Areas for further improvement

1. Identified by the Party

17. The NIR identifies the national system for GHG emissions estimation as the key area for improvement. In 2005 several projects to investigate and determine the parameters and data necessary for the estimation of emissions in the Agriculture and LUCF sectors will be started, and the method used to estimate fugitive emissions from coal mining will be improved.

2. Identified by the ERT

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

(a) Improve the transparency of its reporting by providing in the NIR more detailed descriptions of methods used, as well as AD and EFs, as indicated in the sectoral sections of this report; in particular, for methodologies that differ from those of the IPCC, the descriptions need a greater level of detail;

(b) Use higher-tier methods for key categories;

(c) Provide more detailed information about the data sources and methods used for calculating base year emissions;

(d) Implement tier 1 QC checks, develop source-specific QA/QC procedures, and describe QA/QC objectives and their actual implementation.

19. Recommended improvements relating to specific source/sink categories are presented in the relevant sector sections of this report. Bulgaria noted in responding to this review that, while it agrees

with the ERT's recommendations for future work, their implementation would be difficult for reasons of funding.

II. Energy

A. Sector overview

20. In 2003, emissions from the Energy sector in Bulgaria totalled 53,466 Gg CO_2 equivalent and showed a decrease of 44,815 Gg CO_2 equivalent, or 46 per cent, since the base year (1988). The Energy sector is the largest source of GHG emissions in Bulgaria, accounting for 77.3 per cent of total national emissions in 2003. Within the Energy sector, the largest contributions in 2003 arose from Energy Industries (58 per cent), with Manufacturing Industries (22 per cent) and Transport (13 per cent) accounting for the bulk of the remainder. Major sources include combustion for electricity generation, road transportation, and residential fuel combustion. Fugitive emissions, considered to be minor in Bulgaria (3 per cent of the Energy total in 2003), are also accounted for in this sector, and include emissions arising from coal mining and the production of oil and natural gas.

21. Bulgaria's NIRs continues to show improvements with regard to transparency, although the ERT encourages the Party to provide more specific data and more discussion of the methodologies used for most Energy sources. For example, Bulgaria lists the oxidation factors used in the emissions calculations in the CRF, but not in the NIR. The ERT encourages Bulgaria to improve the transparency of the calculations by referencing the source of the oxidation factors in the NIR (e.g. whether IPCC default factors or country-specific factors are used).

22. The NIR states that a "tier 2/3" methodology was used for the Energy calculations. However, this is difficult to confirm because no AD have been provided in the NIR. Judging from the information provided in the relevant chapter of the NIR, the method used calculates emissions using country-specific EFs and AD from the national energy balance. If this is the case, and the method does not measure plant-specific fuel consumption, the ERT recommends that it would be more appropriate to call the methodology tier 2.

B. Reference and sectoral approaches

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

23. Bulgaria has calculated CO_2 emissions from fuel combustion using the reference and the sectoral approaches. For the year 2003, there is a difference of 1.6 per cent in the CO_2 emissions estimates and a difference of 11 per cent in the fuel consumption estimates between the reference and the sectoral approaches. Explanations are not provided in the documentation box of CRF table 1.A(c). Bulgaria has improved the differences between the two approaches by reporting emissions from the non-energy use of fuels for the first time in its 2005 inventory submission.

2. International bunker fuels

24. The NIR states that AD for international bunker fuels are provided from Bulgaria's national energy statistics, which only provide information on total aviation and marine consumption. The NIR further states that the split between domestic and international bunker fuel consumption is determined by expert judgement, but no further explanation is provided. Bulgaria does not provide data for consumption of aviation gasoline in 1988. For jet kerosene, there is an unexplained peak for fuel use in 1993 (almost to the level of 1988). No explanation is provided in the NIR as to why AD for jet gasoline use are missing from 1999 onwards. The ERT recommends that Bulgaria improve the calculation and explain how it considers international bunker fuels.

3. Feedstocks and non-energy use of fuels

25. The NIR contains some details on the accounting for the non-energy uses of fossil fuels in Bulgaria, and the corresponding CRF tables have been filled in. Bulgaria has used IPCC default carbon storage factors. However, no AD are provided in the NIR, and it was impossible for the ERT to determine whether fuel amounts considered as "non-energy use" are cross-referenced with feedstocks (e.g. iron and steel) in the Industrial Processes chapter. The ERT encourages Bulgaria to investigate the links between these feedstock fuels.

4. Country-specific issues

26. The NIR explains that for the recalculations of fuel combustion activities the structures of the 1990 national energy balance were used. However, it does not explain exactly how the 1988 data were derived, that is, what assumptions were made in the absence of data for 1988, and what methods were used to apply 1990 data trends back to 1988. The NIR only states that additional clarifications from the National Statistical Office (NSI) experts were taken into account, but it remains unclear which data were used and what clarifications were provided. Additional data or explanations are needed to justify the recalculation. In addition, Bulgaria should provide time-series data on fuel consumption and the EFs used. The ERT also recommends that, if there are problems due to changes in the statistical agencies over the time series, given the country's particular circumstances, then greater detail should be provided on how gaps are filled in by interpolation or extrapolation.

C. Key categories

1. Stationary combustion: Solid and liquid fuels – N_2O

27. As previous reviews have noted, the IEFs for N_2O from stationary combustion are very high compared to those of other Parties and compared to the IPCC default (in some cases, they are greater than the IPCC defaults by ~30 per cent). Furthermore, a distinct lack of transparency concerning this high IEF has been noted since several reviews. The Party has not provided the actual EF used in this calculation in the NIR, and, in response to questions on this and previous reviews, has only stated that a country-specific EF was used. The ERT considers this information essential to enable a review team to assess the appropriateness of this EF, which otherwise appears to result in an overestimation of emissions from this source. The ERT strongly recommends that the Party provide in the NIR the precise EF used in the N_2O emissions calculations and the data to support the N_2O EF used.

2. Energy industries, manufacture of solid fuels and other: Solid and liquid fuels – CO_2

28. The AD for this source drop rapidly in 1998 and that year shows a large deviation from the trend (which does fluctuate, but nowhere else in the time series to the low level seen in 1998). Additionally, the implied emission factor (IEF) for solid fuels is very low throughout the time series (the solid fuel CO_2 IEF is equivalent to a gas fuel CO_2 EF). In response to questions from the ERT, Bulgaria stated that this anomaly is due to Bulgaria's accounting for coke oven gas (with an EF of 47 kg/GJ in Bulgaria) under Solid Fuels for this source. The ERT encourages Bulgaria to follow the guidance given in table 1.A(a) of the CRF tables, which states that if some derived gases (e.g. gas works, gas, coke oven gas, blast furnace gas) are considered, Parties should provide information on the allocation of these derived gases under the above fuel categories in the documentation boxes of the CRF tables.

29. Additionally, the CRF tables report consumption of 2.55 TJ for Solid Fuels and 0.24 Gg CO_2 emissions in 2003 for the source category 1.A.2.b Manufacturing Industries and Construction – Non-Ferrous Metals. This is a large difference from 2002, for which the CRF tables report consumption of 1,148.02 TJ for Solid Fuels and 121.67 Gg CO_2 emissions. This not only represents a large decrease in consumption and emissions, but the IEF for Solid Fuels also decreases from a nearly constant value

throughout the time series to a lower value in 2003. The ERT recommends that Bulgaria examine the AD and emissions reported for 2003 to ensure their accuracy.

3. Transport

30. The origin of the AD and EFs presented in the NIR for the Transport categories is not sufficiently transparent. The ERT believes that, given the importance of Transport to Bulgaria's inventory, the sources should be discussed in greater depth, and recommends that Bulgaria provide further explanations of the Transport emissions calculations. Furthermore, the NIR states for several Transport sources that country-specific EFs have been used (based on national studies or expert judgement). However, these studies are not referenced in the report. It is therefore almost impossible to check the data and results submitted. Considering that a national tier 2 model is used for Road Transportation, and given that the IEF for CO_2 from gasoline and diesel varies widely, and the IEF for N_2O is nearly constant across the time series (without explanations being given in the NIR), the ERT recommends that Bulgaria provide more detail about these data in the NIR.

4. Fugitive emissions: Coal mining and handling – CH_4

31. Emissions have been estimated using only a tier 1 approach and IPCC default EFs. Bulgaria should try to develop country-specific EFs and, given that the types of coal mined differ substantially, it would be preferable to develop region-specific EFs, or acquire measured data from mines. Bulgaria acknowledges in the NIR that this source is an area for future improvement. The ERT encourages Bulgaria to proceed with these improvements.

32. The EFs chosen from the IPCC default range seem appropriate. It would assist transparency to include the EFs used in the NIR. The source of the coal mining AD is not discussed or referenced in the NIR. A greater level of background detail should be provided in the NIR on the coal production data.

D. Non-key categories

Other

33. Emissions from the use of biomass in this source category are reported in the CRF tables, but corresponding information about the methods and data sources used is not provided in the NIR. The related IEF for CH_4 fluctuates, while very high EFs for CO_2 are applied (the IEF is constant). N_2O emissions are only reported for the years 1990–1997 (the remaining years are given the notation key "not occurring" ("NO")). The ERT recommends that Bulgaria clarify these estimation parameters and their trends in its next submission.

III. Industrial Processes and Solvent and Other Product Use

A. Sector overview

34. In 2003, the Industrial Processes sector in Bulgaria accounted for 8.0 per cent of total national GHG emissions. Since the base year (1988) emissions from this sector had decreased by 47.0 per cent. In 2003, CO_2 made up 77.5 per cent of the emissions from this sector (mainly from Iron and Steel Production and Cement Production). N_2O from nitric acid production accounted for 21.0 per cent, CH_4 for 1.1 per cent, and the remaining 0.4 per cent was F-gases (PFCs from aluminium production and SF_6 from electrical equipment). Most gases and source categories are covered in the inventory, except for Limestone and Dolomite Use, Asphalt Roofing, and Consumption of Halocarbons and SF_6. As to Consumption of Halocarbons and SF_6, actual emissions for HFCs are only reported for 1995 and neither actual nor potential emissions of PFCs have been provided. No estimates of emissions of CO_2 or N_2O are reported in the Solvent and Other Product Use sector.

35. There have been improvements in the NIR since the last submission with the inclusion of source-specific uncertainty analysis and time-series information. However, the NIR is still not transparent enough to enable the ERT to fully understand and assess the appropriateness of the methodologies and EFs used. The ERT encourages Bulgaria to provide more detailed descriptions of the methodologies used for the source categories (especially key categories) and to explore the possibility of obtaining non-confidential AD, particularly for the base year.

36. For several processes Bulgaria states in the NIR that EFs and methodologies have been adapted to national conditions from CORINAIR. It would increase transparency if these EFs were provided and explained in the NIR. If they cannot be adequately justified, the ERT recommends the use of the IPCC default methodologies together with default EFs (specific examples are discussed in the section on key categories below).

37. Recalculations have been carried out as a result of the inclusion of additional AD for SF_6 emissions from electrical equipment and the inclusion of a new source category, CH_4 from plastics, synthetic resins and glues. The ERT commends Bulgaria for these improvements to the inventory.

B. Key categories

1. Cement production – CO_2

38. The NIR states that the tier 2 methodology has been used to estimate CO_2 emissions, and the cement data available in the country have been converted into clinker. The method used to convert cement data into data on clinker is not clearly described in the NIR. However, if clinker production data are estimated from cement production, the method used corresponds to tier 1 rather than tier 2. As this is a key category, the IPCC good practice guidance requires the use of a tier 2 method, and indicates that national clinker production data should be reported. The ERT recommends that Bulgaria include information on the types of cement produced in the country and the composition of cement and clinker, and describe clearly the method used to convert cement production into clinker production in the next NIR. The ERT also recommends that the Party investigate whether confidential clinker production data can be obtained from cement plants and reported in an aggregated manner.

2. Lime production – CO_2

39. The methodology used to estimate emissions is not clearly described in the NIR. Hydrated lime is mentioned in the CRF tables, but there is no reference in the NIR indicating whether any other types of lime are produced in the country. Following the recommendations of previous review reports, the ERT encourages Bulgaria to provide more information on the type(s) of lime produced in the country and to consider the composition of the lime in estimating the EF, in line with the IPCC good practice guidance.

3. Nitric acid production – N_2O

40. For most years AD are confidential; however, data are available for 1990–1991, 1993 and 2001. The ERT encourages Bulgaria to obtain AD for the base year if possible and to consider using the extrapolation and interpolation techniques from the IPCC good practice guidance to complete the time series if AD continue to be confidential.

41. The NIR states that the method used to estimate N_2O emissions from this source is a special methodology taking into consideration the technologies in use in Bulgaria. The ERT encourages the Party to provide more detailed explanations of the methodology in order to increase transparency in its next NIR.

4. Iron and steel production – CO_2

42. The country-specific method used to estimate emissions from this category is not transparently reported in the NIR. Following the recommendations of previous review reports, the ERT encourages Bulgaria to explain why it considers this method to be more appropriate than the IPCC methodology. As this a key category and the largest single contributor of emissions to the Industrial Processes sector, the ERT recommends that Bulgaria implement the IPCC good practice guidance tier 2 methodology and EFs in order to improve the quality of these estimates.

C. Non-key categories

1. Ammonia production – CO_2

43. The IEF for ammonia production (0.86 tonne CO_2/t ammonia) is much lower than the IPCC default of 1.5–1.6 t CO_2/t ammonia. Bulgaria explains in the NIR that this is due to the EF being adapted from CORINAIR, but the method used to derive this EF is not described in the NIR. The ERT recommends that Bulgaria provide an explanation of how this EF was derived and the justification for using it in its next NIR.

2. Limestone and dolomite use – CO_2

44. Bulgaria states that at present there is no collection of AD for consumption of carbonates. Iron and Steel Production is a key category for the Party and normally this process involves the consumption of limestone. Emissions from this consumption are usually reported under this source category. There is no mention of this source in the NIR or the CRF. The ERT requests clarification from Bulgaria on whether limestone is used during steel production and, if it is, encourages the Party to report the emissions in this source category.

45. Dolomite production is reported in the CRF for 1998 and 1999 under this source category, but there are no data for other years in the time series and in the NIR there is no explanation of the method used. The ERT requests clarification from Bulgaria on whether dolomite production has occurred for years other than 1998 and 1999, and requests Bulgaria to provide an explanation of the method used in its next NIR.

3. Aluminium production – CO_2 and PFCs

46. The EFs used to estimate CO_2, hexafluoroethane (C_2F_6) and tetrafluoromethane (CF_4) emissions from aluminium production seem to be reasonable, but the methodology is not described in the NIR. The ERT recommends that Bulgaria include this in its next NIR.

4. Consumption of halocarbons and SF_6 – HFCs

47. Potential emissions for HFCs have been reported for years 1995 and 1998–2003. Actual emissions for HFCs (HFC-134a) have been reported for the year 1995 only. The ERT encourages Bulgaria to report potential HFC emissions for 1996 and 1997 and to develop efforts to estimate actual emissions for all years of the time series, as this source is likely to become a key category in future.

48. Actual HFCs have been added to the national emissions total in 1995 but potential emissions have not been added: the Party states in the NIR that this is to avoid double counting. However, the IPCC good practice guidance (page 3.79) states that if actual emissions for all subcategories and all years are unavailable, only the potential emissions should be added to the national emissions total.

IV. Agriculture

A. Sector overview

49. In 2003, emissions from the Agriculture sector in Bulgaria amounted to 4,578 Gg CO_2 equivalent, or 6.6 per cent of total national GHG emissions. Agriculture was responsible for 22.2 per cent of total CH_4 emissions and 38.7 per cent of total N_2O emissions. Since the base year (1988), emissions had decreased by 66.4 per cent. Enteric Fermentation is the most important source category, with 33 per cent of sectoral emissions, followed by Direct N_2O Emissions from Soils (22.6 per cent), Animal Production – N_2O (11.9 per cent) and Indirect N_2O Emissions from Soils (11.3 per cent). There are some significant inter-annual decreases over the 1990–2003 period which can be explained by decreases in AD, in particular in animal populations.

50. In the light of these significant inter-annual variations, Bulgaria should reconsider the consistency of the time series and provide more information on the methods for collecting data and possible explanations of the variations. During the review Bulgaria explained that "data is consistent because it is in line with results from independent experts evaluations and they follow verification procedures of Ministry of Agriculture and Forestry". Bulgaria should give more information in its next submission about these expert evaluation and verification procedures.

51. In the Agriculture sector the following categories were identified as key: Enteric Fermentation – CH_4; Manure Management – CH_4; Direct N_2O Emissions from Soils; Indirect N_2O Emissions from Soils; Animal Production – N_2O; and Manure Management – N_2O. In the Agriculture chapter of the NIR, however, only Enteric Fermentation, Direct Emissions from Soils and Animal Production are reported as key categories. The ERT recommends that Bulgaria include corresponding descriptions for all key categories in the Agriculture sector.

52. The uncertainties presented for the source categories in the Agriculture sector are high, but no information on the expert judgements performed by local and foreign experts is given. During the review, Bulgaria explained "these are a sum from scientific and practical studies of our experts and consultations with experts from the Netherlands, Spain, Germany, United Kingdom and IPCC/Organisation for Economic Co-operation and Development (OECD)". Bulgaria should explain in more detail the "scientific and practical studies" in the NIR of its next submission.

1. Enteric fermentation – CH_4

53. A tier 1 method and IPCC default EFs have been applied to this category. Bulgaria recognizes that, given that this is a key category, the application of the tier 1 method does not correspond to the requirements of the IPCC good practice guidance. During the review Bulgaria explained that it plans to apply tier 2 in the near future once financial support "from abroad" becomes available. Bulgaria is encouraged to develop the necessary arrangements in order to apply a tier 2 method.

2. Direct soil emissions – N_2O

54. Bulgaria uses the IPCC methodology and IPCC default values to estimate direct N_2O emissions from agricultural soils. For $Frac_{LEACH}$ the value used (0.1) is lower than the IPCC default (0.3), and the value used for $Frac_R$ (0.1) is also lower than the IPCC default (0.45). Bulgaria insists that these country-specific values are appropriate for the country's situation, but does not provide sufficient information on their source and background. Bulgaria is encouraged to provide additional information in its next inventory submission to justify these fractions.

3. Animal production – N_2O

55. The AD show large inter-annual fluctuations. Bulgaria explains these as being due to the typical situation for economies in transition. For $Frac_{GRAZ}$ Bulgaria has used a value of 0.456, which is relatively high compared to those of other reporting Parties (no IPCC default is available). The previous (2004) review recommended Bulgaria to explain the underlying assumptions that have led to its choosing this value. This explanation has not yet been provided in the NIR, and the ERT recommends that Bulgaria include it in its next inventory submission.

B. Non-key categories

Manure management – CH_4, N_2O

56. Bulgaria uses a tier 1 method for cattle and swine and tier 2 for other animal categories. Bulgaria should add more information to the NIR regarding the application of the tier 2 method. During the review Bulgaria explained that the tier 2 method is in fact implemented only for non-dairy cattle, dairy cattle and swine, and that only for these animals additional parameters are available. Bulgaria should give more information about the parameters used for the calculation.

57. No information at all is given in the NIR regarding estimation of N_2O emissions from manure management. Bulgaria should improve the NIR with more information regarding this source.

V. Land Use, Land-use Change and Forestry

A. Sector overview

58. Bulgaria has not provided the LULUCF reporting tables as required by decision 13/CP.9 and following the land-use categories of the IPCC good practice guidance for LULUCF. Instead, it has continued to report according to the tables for LUCF as contained in the CRF adopted by 18/CP.8, which are based on the categories of the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines). Bulgaria has indicated that it will adopt the new reporting format for LULUCF for its 2006 submission. The ERT welcomes this transition and encourages Bulgaria to increase the transparency and completeness of its reporting.

59. Bulgaria has reported fluctuating removals over the time series with an overall increase in removals of 37 per cent from the 1988 base year (5,133 Gg CO_2 equivalent) to 2003 (7,056 Gg CO_2 equivalent). Net removals of 6,157 Gg CO_2 equivalent are reported for 1990. Net removals in 2003 represented 10.2 per cent of total emissions. The 2003 net removals estimate is 15.2 per cent lower than that for 2002 due to increased harvesting.

60. Bulgaria has provided estimates for category 5.A Changes in Forest and Other Woody Biomass Stocks. No estimates are provided for any other categories either because the data are not available or because the activities do not occur. The ERT encourages Bulgaria to provide estimates in its next submission and to review the notation keys used for the categories in which estimates are not provided in order to ensure consistency.

61. Recalculations are not mentioned in the LUCF chapter of the NIR or noted in CRF table 8, but they are detailed in chapter 10 (Recalculations and Improvements) of the NIR. For most recalculated years recalculations of the LUCF sector have resulted in an increase in net CO_2 removals of approximately 10 per cent compared with the previous (2004) inventory. The net removals estimated for the base year have increased by 10.2 per cent compared to the estimate provided in the 2004 submission.

62. LUCF was not included in the key category analysis. No uncertainty analysis has been conducted due to lack of methodology. The ERT recommends that the Party address these issues in its next submission when the IPCC good practice guidance for LULUCF is implemented.

63. The ERT appreciates that there has been some progress and some improvements have been made since the previous submission, and that plans have been developed to include additional categories (Abandonment of Managed Lands 5.C and CO_2 Emissions and Removals from Soil 5.D) in the inventory. The ERT stresses that Bulgaria should strive to report all subcategories relevant to the country in the new LULUCF reporting tables.

B. Sink and source categories

Changes in forest and other woody biomass stocks – CO_2

64. It seems that the conversion factor used (0.6) is high, and that no biomass expansion factor has been applied. There is little information on the area of different forest species or on forest management. The carbon EF used is lower than the IPCC default, but no explanation of this is provided. The ERT recommends that Bulgaria provide more data and information on the conversion and expansion factors and AD used, with appropriate explanations.

65. Bulgaria reports emissions from temperate forests in table 5 as "NO", with all emissions reported under Harvested Wood. The ERT notes that in the new CRF for LULUCF harvested wood should be reported as a loss in carbon stocks.

VI. Waste

A. Sector overview

66. In 2003, the Waste sector in Bulgaria contributed approximately 8.1 per cent of total national GHG emissions. CH_4 from landfills was the most important GHG emitted in the sector, contributing 75.4 per cent to total sectoral emissions. From 1990 to 2003 emissions in the sector decreased by 65.1 per cent.

B. Key categories

1. Solid waste disposal on land – CH_4

67. Bulgaria has used a tier 1 method for solid waste disposal. Given that this is a key category, the use of a higher-tier would be required to be consistent with the IPCC good practice guidance. Bulgaria explained that historical data are not available for the long time series required for a first-order decay (FOD) approach. The ERT, however, noted that amounts of waste landfilled can be extrapolated on the basis of population data, and that waste composition can be extrapolated from recent years or could be taken from similar countries. Due to the characteristics of the tier 1 method, its use can result in a time series that generally overestimates base year emissions and underestimates emissions in the later years of the time series. The ERT strongly recommends that Bulgaria use a tier 2 method in future.

68. It remains unclear how managed and unmanaged waste is treated in estimating emissions. In its response to questions raised during the review Bulgaria stated that unmanaged waste disposal sites do not exist, but that "activity in this field is in progress". The NIR explains that category 6.A.3 Other includes emissions from uncontrolled landfills. The ERT recommends that Bulgaria report such emissions from uncontrolled sites under "unmanaged" landfills.

69. A fraction of 5 per cent of waste is not included under waste landfilled, but these small waste amounts are neither incinerated nor landfilled. In its response to questions raised during the review,

Bulgaria replied that it assumes that gipsies and wanderers immediately utilize 5 per cent of the total waste amounts. Bulgaria should provide more detailed explanations as to how this assumption was derived and why this fraction is assumed to be 5 per cent.

2. Waste-water handling – CH_4

70. Bulgaria uses a tier 1 approach for this source. Given that this is a key category, the use of a higher-tier method would be required to be consistent with the IPCC good practice guidance. Detailed methodological information and parameters are not provided. Some detailed parameters for industrial waste water were provided upon request of the ERT. This information should be added to Bulgaria's next inventory submission, and detailed parameters should also be provided for domestic and commercial waste water.

C. Non-key categories

1. Waste-water handling – N_2O

71. No clear methodological description is available in the NIR for this source category. In response to questions raised during the review, Bulgaria specified that the method used is a default method from the Revised 1996 IPCC Guidelines for human sewage and that data for protein consumption by humans are country-specific. The ERT recommends that Bulgaria include a description of the methodology and the exact source of the data used in the NIR of its next submission.

2. Waste incineration

72. Bulgaria reports that solid waste is not incinerated for energy production, but there are examples of hazardous waste incineration which does not emit GHG emissions. The latter statement is highly unlikely as all combustion processes include an oxidation of carbon to CO_2. Those CO_2 emissions should be included in the inventory. In its response to the review, Bulgaria explained that this waste refers to hazardous waste from hospitals which is regarded as being of biogenic nature. The ERT recommends Bulgaria to include an improved explanation in its next NIR.

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>.

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UNFCCC secretariat. Synthesis and assessment report on the greenhouse gas inventories submitted in 2005. FCCC/WEB/SAI/2005. Available at <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/inventory_review_reports/application/pdf/sa_2005_part_i_final.pdf>.

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B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Hristo Vassilev and Mr. Christo Christov (Energy Institute JS Co.) including additional material on the methodology and assumptions used.

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