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BULGARIA

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

(In-country review)

EXECUTIVE SUMMARY

1. This report describes the findings of the technical review of the 2003 inventory submission of Bulgaria, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat in accordance with decision 19/CP.8 of the Conference of the Parties. Bulgaria submitted its annual inventory on 23 May 2003. It consisted of complete common reporting format tables for the years 2000 and 2001, the national inventory report and a series of summary tables showing revised emission estimates for the years 1988 and 1990–1999.

2. The review took place from 1 to 5 September 2003 in Sofia, Bulgaria, at the Executive Environment Agency, and was conducted by the following team of nominated experts from the roster of experts: Generalist – Mr. Michael McGettigan, Ireland; Energy – Ms. Sophia Mylona, Norway; Industrial Processes – Mr. Alexander Nakhutin, Russian Federation; Agriculture – Ms. Hongmin Dong, China; Land-use Change and Forestry – Mr. Tomas Hernandez, Mexico; Waste – Mr. Davor Vesligaj, Croatia.
Mr. Michael McGettigan and Ms. Hongmin Dong were the lead reviewers of this review. The review was coordinated by Ms. Rocio Lichte (UNFCCC secretariat).

3. In accordance with the UNFCCC "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.

4. In the year 2001, total[2] national greenhouse gas emissions in Bulgaria amounted to 65,791 kt carbon dioxide (CO_2) equivalent, corresponding to 8.25 kg/capita. The most important greenhouse gas was CO_2, contributing 74.6 per cent of the total, while methane (CH_4) and nitrous oxide (N_2O) accounted for 14.3 per cent and 11.1 per cent, respectively. Emissions of industrial gases (hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6)) contributed less than 0.03 per cent of the total. This small contribution reflects SF_6 emissions and PFCs from metal production only, as actual emissions of HFCs and PFCs from the consumption of halocarbons were not included in the inventory.[3] The Energy sector accounted for 76.7 per cent of total greenhouse gas emissions in 2001, Industrial Processes contributed 8.4 per cent, and Agriculture and Waste produced 7.6 per cent and 7.3 per cent, respectively.

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[1] In the symbol for this document, 2003 refers to the year in which the inventory was submitted, and not to the year of publication of the review report. The number (2) indicates that this is an in-country review report.

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

[3] Bulgaria did, however, provide potential emission estimates for that emission source.

5. As a Party undergoing transition to a market economy, Bulgaria chose the year 1988 as its base year.[4] Tables 1 and 2 provide the latest reported data on emissions by gas and by sector in Bulgaria for 1988 and the period 1990–2001. The estimates indicate that, in common with other Parties with economies in transition, large reductions in emissions of greenhouse gases have taken place in all sectors of the economy. Total emissions were lowest in 2000 and a slight upturn is evident in 2001. Total emissions decreased by 54.4 per cent from 1988 and by 47.2 per cent from 1990. Most of the decrease was due to reductions in CO_2 emissions, which decreased by 52.3 per cent from 1988 and by 41 per cent from 1990. Emissions of CH_4 and N_2O decreased by 61.7 per cent and 56.8 per cent, respectively, between 1988 and 2001. Emissions from the Agriculture and Waste sectors decreased by approximately two-thirds in each case, while reductions of approximately 50 per cent occurred in emissions from both the Energy and the Industrial Processes sectors. Reported net CO_2 removals in the Land-use Change and Forestry sector doubled between 1988 and 2001.

6. Bulgaria's Energy Institute produces the national greenhouse gas inventories on behalf of the Executive Environment Agency, which comes under the Ministry of Environment and Water. Inventory capacity is limited as experts in the Energy Institute are engaged only on a part-time basis and there is little direct involvement of external experts. Nevertheless, substantial progress is being made towards better compliance with the UNFCCC reporting guidelines and the Party has begun to implement some important elements of 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). The lack of resources clearly means that progress on this is slow and the expert review team is aware that as a Party with economy in transition, Bulgaria has two more years than Annex II Parties to fully implement the IPCC good practice guidance.[5] The Energy Institute is reorganizing its activities in order to establish more efficient data handling methods with particular emphasis on the systematic application and recording of inventory recalculations. This is a positive development, as recalculations will continue to be an important element of greenhouse gas inventory development and reporting in Bulgaria for some time. Virtually all activity data used in the inventory process are acquired through efficient and elaborate statistical data collection systems. It is expected that they will be a key element of any future national inventory system in Bulgaria.

7. Annual inventories are available for the years 1988 and 1990–2001 but common reporting format data files have been compiled only for the years 1998–2001. The emission estimates for other years have been reported in summary format only. The inventories reported in the common reporting format data files indicate good source and gas coverage in Bulgaria. The Party has difficulty in obtaining the information necessary to complete the coverage of emissions of fluorinated gases and to estimate CO_2 emissions and removals in some Land-use Change and Forestry categories, as well as some smaller sources within the Energy and Industrial Processes sectors. The inventory agency is continuing to improve the quality of the national inventory report. Notable inclusions in the 2003 national inventory report were the list of key sources, the complete uncertainty analysis of the emission estimates and a description of recent recalculations that improve the quality and consistency of the emissions time series.

8. The estimation of greenhouse gas emissions in Bulgaria makes considerable use of tier 2 methods and country-specific emission factors, particularly in relation to CO_2 emissions from stationary combustion sources, which include the largest key sources. It follows that an essential requirement of good practice is being implemented with respect to a major part of total emissions in Bulgaria. The methods applied in general for the Industrial Processes, Agriculture and Waste sectors are largely IPCC tier 1 default methods that rely on IPCC emission factors. However, considerable efforts are being made to account for country-specific circumstances in these sectors also, by adapting emission factors or other methodological parameters wherever it is considered appropriate.

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[4] According to the provisions of Article 4.6 of the Convention and decisions 9/CP.2 and 11/CP.4, Bulgaria, as an Annex I Party undergoing the process of transition to a market economy is allowed to use the year 1988 as its base year.

[5] According to the relevant conclusions of the Subsidiary Body for Scientific and Technological Advice (SBSTA), Annex I Parties with economies in transition may phase in the good practice guidance two years later than other Annex I Parties (see FCCC/SBSTA/2000/5, para. 48 (c)).

9. The in-country review of Bulgaria's 2003 submission and supporting materials has identified the need for improvements mainly in relation to transparency, completeness and a number of methodological issues.

10. Transparency needs to be increased by constructing the national inventory report more in accordance with the specifications laid down in the UNFCCC reporting guidelines. This is particularly the case for the information required on disaggregated national emission factors and the activity data underlying the estimates, as well as the descriptions of methodologies and assumptions used. In the Agriculture sector, it is not clear why the IPCC default values of emission factors and other variables are used in some cases while country-specific values that differ substantially from the defaults are applied in other cases. The expert review team found it difficult to understand the inter-annual variations in the emissions that have been reported for some sector/gas combinations and the apparent inconsistencies between trends for gases from the same source. It should be possible to provide more explanation on these issues in the national inventory report so that they are fully resolved in subsequent reviews.

11. The review team was unable adequately to assess the methodology used to estimate CO_2 emissions and removals reported under Land-use Change and Forestry category 5.A as the tree species are not identified for the chosen forest classes and the values of the basic input parameters (yield class, carbon content, wood density, biomass expansion factors) that determine biomass growth and CO_2 uptake are not specified. Similarly, the conversion of harvested wood to CO_2 emissions is not transparent. Bulgaria is encouraged to provide this information so that a more complete analysis may be performed for this category.

12. The expert review team has made it clear to Bulgaria that a complete time series of emissions and related inventory data is vital for the proper assessment and review of annual inventories. Although the difficulties in acquiring all the necessary historical data are recognized, Bulgaria is nevertheless encouraged to produce a greenhouse gas inventory for 1989 and to aim to compile a full common reporting format time series. In continuing to develop a complete and consistent emissions time series, there is a particular need to take full account of the very large changes that have occurred in the main drivers of emissions and their effect on the values of particular inputs or methodological parameters. In some cases, the values used for later years may not be appropriate for the base year or other years at the beginning of the time series.

13. This review has raised questions about some aspects of the methodological approach for CH_4 emissions from solid waste disposal and indirect N_2O emissions from agricultural soils. The Party has taken the approach that landfills to which certain control criteria apply under Bulgaria's waste management legislation are equivalent to fully managed landfills for the purposes of estimating CH_4 emissions using the IPCC default method and a methane correction factor of 1.0. Almost three-quarters of solid wastes are allocated to managed landfills on this basis. This proportion is high compared to those reported by other Parties and the expert review team is of the view that it may not be fully supported by the available information on the physical status and management regime for solid waste disposal sites in general. Regarding Agriculture, the adoption of the IPCC default nitrogen leaching fraction of 0.3, which largely determines the amount of indirect N_2O emissions from agricultural soils, does not seem justified in Bulgaria, given the very low rate of nitrogen application in the country. The inventory agency is advised to reconsider its approach to these particular key emission sources with a view to selecting values of the input parameters that are substantiated by the available data and thereby obtain more robust estimates.

Table 1. GHG emissions by gas 1988, 1990–2001

GHG emissions	Gg CO_2 equivalent													
	1988	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**Change from 1988–2001 %**
CO_2 (with LUCF)[a]	98 354	77 455	57 657	51 312	54 323	51 615	54 181	52 952	52 390	45 635	41 424	37 866	39 622	–59.7
CO_2 (without LUCF)	103 011	83 255	65 537	58 948	61 345	58 590	61 701	60 142	58 242	51 868	48 032	46 842	49 089	–52.3
CH_4	24 482	25 623	25 029	23 646	21 271	15 420	16 168	15 064	12 830	11 769	10 112	10 182	9 388	–61.7
N_2O	16 904	15 789	13 006	10 373	8 987	8 576	9 228	8 991	8 485	7 294	6 904	7 440	7 298	–56.8
HFCs	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	
PFCs	0.0	0.0	0.0	0.0	0.0	0.0	46.9	0.0	0.0	69.4	43.5	29.4	14.5	
SF_6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.1	
Total (with CO_2 from LUCF)	139 741	118 868	95 692	85 331	84 581	75 611	79 627	77 006	73 706	64 768	58 483	55 519	56 324	–59.7
Total (without CO_2 from LUCF)	144 398	124 667	103 572	92 967	91 603	82 586	87 146	84 196	79 558	71 001	65 091	64 495	65 791	–54.4

[a] LUCF = Land-use Change and Forestry

Table 2. GHG emissions by sector 1988, 1990–2001

GHG source and sink categories	Gg CO_2 equivalent													
	1988	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**Change from 1988–2001 %**
Energy	104 301	84 246	67 836	61 671	63 877	60 217	63 128	61 625	59 540	54 044	49 361	48 070	50 453	–51.6
Industrial Processes	10 803	9 627	6 532	5 474	5 353	6 333	7 755	7 628	6 859	4 852	4 747	5 612	5 533	–48.8
Solvent Use	0	0	0	0	0	0	0	0	0	0	0	0	0	
Agriculture	15 245	15 070	12 936	9 843	7 820	6 800	6 656	6 315	6 013	5 884	5 959	5 835	4 977	–67.4
LUCF[a]	-4 657	-5 800	-7 880	-7 636	-7 022	-6 975	-7 519	-7 190	-5 852	-6 233	-6 608	-8 976	-9 467	103.3
Waste	14 048	15 726	16 268	15 978	14 553	9 236	9 607	8 628	7 146	6 220	5 011	4 978	4 827	–65.6
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total (including LUCF)	139 741	118 868	95 692	85 331	84 581	75 611	79 627	77 006	73 706	64 768	58 483	55 519	56 324	–59.7

[a] LUCF = Land-use Change and Forestry

I. OVERVIEW

A. Inventory submission and other sources of information

14. Bulgaria submitted the national inventory report (NIR) on 23 May 2003 along with common reporting format (CRF) tables for the years 2000 and 2001. Summary data tables on recalculations for the base year 1988 and for the years 1990–1999 were also part of the 2003 submission.

15. During the review the host country provided further information, including copies of legislative instruments governing national statistics and waste disposal, additional time-series activity data (AD), lists of emission factors (EFs), details of emission trends and other documentation requested by the expert review team (ERT). This information is not referenced in the NIR and is not part of the official inventory submission for which this review was conducted. Nevertheless, it is useful for assessing certain aspects of the methodological approach adopted in some sectors and it facilitates more complete analysis of the data presented in the CRFs. A full list of materials used during the review is provided in annex 1 to this report.

B. Key sources

16. Bulgaria reported a tier 1 key source analysis as part of the NIR submitted in 2003, based on a formulation of key sources that has been revised since the previous submission. The key source level assessments performed by the Party and the secretariat[6] produced the same results with respect to the individual key sources identified in the 2001 inventory, except that the Party considered the stationary combustion of coal in three source categories (giving a total of 18 key sources) while the secretariat treated the combustion of coal as a single source (total of 16 key sources). Bulgaria did not list key sources according to trend assessment but described them in the NIR. Any qualitative criteria that might have been considered in the determination of key sources are not mentioned in the NIR, and Bulgaria confirmed that it did not consider qualitative criteria in its identification of key sources.

17. The largest key sources are combustion sources of carbon dioxide (CO_2). Five key sources of CO_2 emissions in the Energy sector accounted for 68 per cent of total emissions and three further key sources of CO_2 in Industrial Processes produced 5 per cent of emissions. There were four key sources each of methane (CH_4) and nitrous oxide (N_2O) emissions, which contributed 12.6 per cent and 9.3 per cent of total emissions, respectively. Given the very large contribution of stationary combustion to total emissions in Bulgaria, the Party quantifies the emissions of CO_2 at a low level of disaggregation (tier 2 and tier 3) using detailed country-specific data. Apart from this focus on combustion sources, there is no indication that the list of key sources has had a role in setting priorities for the work to date on greenhouse gas (GHG) inventories.

C. Cross-cutting topics

Completeness

18. Annual inventories are available for the years 1988 and 1990–2001 but CRF data files have been compiled only for the years 1998–2001. The 2003 submission included CRF data files for 2000 and 2001 only, although recalculations for the previous years of the time series have been undertaken. The inventories for other years have been reported in summary format only. The estimates for the 1996 inventory are approximations, but the way in which they have been produced is not described. No inventory has been compiled for 1989.

[6] The UNFCCC secretariat had identified, for each individual Party, those source categories which are key sources in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance. Key sources according to the tier 1 trend assessment were also identified for those Parties providing a full CRF for the year 1990 and/or the base year, if different from 1990 in the case of Parties with economies in transition. Where the Party has performed a key source analysis, the key sources presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key source assessment conducted by the secretariat.

19. The inventory reported in the CRF for 2001 includes emission estimates for the majority of source/gas combinations likely to be relevant in the country. The principal data gaps (indicated by the notation key "NE" (not estimated)) relate to actual emissions of hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) in source category 2.F Consumption of halocarbons and sulphur hexafluoride (SF_6), and to some extent also potential emissions from that source, and to CO_2 emissions/removals as well as non-CO_2 gases in the Land-use Change and Forestry (LUCF) categories 5.B Forest and Grassland Conversion, 5.C Abandonment of Managed Lands and 5.D CO_2 Emissions and Removals from Soil. Some lack of coverage was also noted with regard to a number of minor sources within the Energy and Industrial Processes sectors.

Transparency

20. The CRF tables have been completed in adequate detail and the lack of transparency is primarily the result of insufficient detail being provided in the NIR about methods and data. Transparency could be increased considerably by including the lists of EFs and other information provided during the review, along with better descriptions of methods and data. The ERT found it particularly difficult to assess the quality of the emissions/removals estimates reported under category 5.A Changes in Forest and Other Woody Biomass Stocks, and encourages the Party to provide further information so that a more complete analysis can be performed for this category. Justifications for the methods chosen and the assumptions made in all sectors need to be more fully documented. In general, the use of notation keys in the CRF tables is good but a more appropriate notation has been suggested by the ERT in some instances. The information sources used in the inventory need to be fully documented and the data and emission estimates for individual source categories in the CRF tables need to be adequately cross-referenced with the corresponding descriptions given in the NIR, using calculation sheets wherever practicable.

21. The issue of confidentiality impacts on transparency in relation to the Industrial Processes sector, where emissions are reported only in aggregate form. The emissions are estimated by applying adapted CORINAIR EFs to aggregated production data for the relevant sources, but individual company data are not made available to the inventory agency. An emissions permit system such as is often used to obtain emissions data for industrial processes in other countries does not exist in Bulgaria.

Recalculations and time-series consistency

22. The 2003 submission includes recalculations for Bulgaria's base year 1988 and all years 1990–1999, and the reasons for this are outlined in the NIR. The revision with the greatest effect on reported emissions relates to N_2O emissions from the cultivation of organic soils. It is explained that, as a result of earlier misinterpretation of the term "histosols", the contributing area used was grossly overestimated and a much lower and more realistic value has now been applied, based on soil maps and information on the areas accessible for cultivation. The resultant reduction in N_2O emissions in agriculture varies from 46 per cent in 1988 to 77 per cent in 1999 compared to the estimates provided in the previous submission. Changes have also been made with respect to CH_4 emissions reported for source categories 1.B.2 Oil and natural gas and 6.B Waste-water Handling. They largely reflect more precise application of the Intergovernmental Panel on Climate Change (IPCC) default data for the relevant emission sources.

23. The ERT believes that the latest recalculations are justified and they contribute to more robust estimates of GHGs in Bulgaria. As far as can be determined from table 8 of the CRF, the changes appear to be applied consistently for all years. The overall effect of recalculations is to reduce the figures for total national emissions in all years and the trend is unaffected. The decrease varies from 8 per cent in 1988 to 16 per cent in 1999 (the most recent year to be recalculated).

24. The reported GHG estimates for 1996 have been determined using a simplified approach which is not elaborated by the Party but explained as being due to funding problems for work on 1996. Without further explanation, the ERT could not assess how far this simplified approach is consistent with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC Guidelines), or the methods of the IPCC good practice guidance.

Uncertainties

25. The calculation and documentation of complete tier 1 estimates of uncertainty in the NIR represent good progress on this issue in 2003. The analysis indicates an uncertainty of 8.7 per cent in total emissions in 2000 and 2001. The underlying estimates of uncertainty in the AD and EFs are described as being a combination of country-specific and United Kingdom values and those available in the IPCC good practice guidance. There is no information on the rationale for the choices made between these sources and the manner in which the country-specific uncertainties are arrived at was not fully explained during the review. The ERT is of the view that the estimates of uncertainty listed for AD relating to CH_4 emissions from solid waste disposal and the various N_2O emission sources in the Agriculture sector are low and probably do not account for all the component uncertainties associated with these data. In table 7 of the 2001 CRF, Bulgaria indicated that the estimates for emissions of CO_2 from Energy and Industrial Processes, and CH_4 emissions from Agriculture were of high quality while virtually all other emission estimates were considered to be of medium quality.

Verification and quality assurance/quality control

26. No formal quality assurance/quality control (QA/QC) procedures, as defined by the IPCC good practice guidance, are currently applied in the inventory process in Bulgaria for any sector. Also, the NIR does not include any discussion on the national emission inventory system (processes) in place nor on the existence or plans of a national QA/QC plan and verification processes. However, verification procedures are an inherent part of all statistical data collection by the National Statistical Institute (NSI), and the Institute believes that the adoption of Eurostat standards has improved data quality. Further checking is performed by the inventory agency in the pre-processing of data received from the NSI before they are used for estimating emissions. The comparisons of the results for energy consumption and CO_2 emissions obtained from the sectoral approach and the reference approach are reported in the CRF. The liquid fuel energy consumption in the reference approach exceeded that in the sectoral approach by 41 per cent in 2000 and by 26 per cent in 2001. For gaseous fuels, the excess was 28 per cent in 2000 and 34 per cent in 2001. The reasons given by the Party do not fully explain differences of this magnitude for liquid and gaseous fuels, and the ERT believes that some degree of double counting may still be associated with liquid fuels in the reference approach.

Institutional arrangements

27. During the visit, Bulgaria described the institutional arrangements for preparation of the inventory. Bulgaria's Energy Institute (EI) performs the role of inventory agency. It undertakes the work by way of a separate contract for each annual inventory negotiated with the Executive Environment Agency (EEA), which works under the aegis of the Ministry of Environment and Waters. Six inventory experts are involved on a part-time basis, which usually equates to about two person-years' work on the annual inventory. The statistical data inputs for energy, industrial processes and waste are acquired from the NSI while those for agriculture and LUCF are supplied mainly by the Ministry of Agriculture and Forestry (MAF). The EEA has overall control of and responsibility for reporting and archiving the national inventory, but is currently not directly involved in the calculation and preparation of emission estimates. An internal review of the inventory is performed by the senior statistical expert from the NSI before the EEA adopts the final inventory and submits it to the UNFCCC secretariat. No other institutes have a direct role in the preparation of the inventory and external sectoral experts are involved mainly in an advisory capacity.

28. The ERT was impressed by the comprehensiveness of the statistical data collection systems in Bulgaria and their capacity to deliver annual statistics in a timely manner. They are being successfully implemented under the provisions of Bulgaria's Law on Statistics, a copy of which was provided to the ERT. The established methods of data collection would form a key element of the national inventory system now envisaged by the Party. The ERT was informed that initial plans for such a system are taking shape where, in the first instance, the roles and responsibilities of all agencies, contributors and stakeholders will be clearly defined.

Record keeping and archiving

29. Bulgaria does not yet have a centralized archiving system for all materials and information related to its GHG inventories and no formal system is foreseen in the short term. The data used for the annual inventory compilation are stored mainly in electronic spreadsheet format and in hard copy at the EI. The ERT did not access these files nor any other inventory information kept electronically or as hardcopy archives. This was due to the location of the review, which took place at the EEA, where reference materials or background documentation were not available. A visit to the EI was not offered to the review team. The CRF data files are maintained at the EEA and posted on the EEA web site. The EI recently initiated steps to reorganize the activities of inventory experts and establish more efficient data handling methods with particular emphasis on the systematic application and recording of recalculations. This is a positive development as recalculations are likely to be an important element of GHG inventory development and reporting in Bulgaria for some time to come.

Areas related to previous reviews

30. Bulgaria has acted on the previous recommendation that it should carry out and report recalculations in a consistent way that shows the effect across all years where revisions in a particular source category are justified. Other issues identified in earlier reviews, such as the provision of a complete set of CRF tables for the entire time series, have not yet been addressed. The large differences between the results of the reference approach and the sectoral approach have not been resolved and it has not been possible to make any progress on compiling CRF data files for the years prior to 1998.

D. Areas for further improvement

Identified by the Party

31. Although steps are being taken to develop better inventory work practices at the EI, specific areas for improvement are not being targeted in any systematic fashion on a year-to-year basis. Clearly, the lack of resources for inventory purposes is the main problem. The EI believes that the situation is unlikely to change unless more funding is provided to ensure that the inventory experts have full-time and long-term involvement in the annual cycle of inventory preparation and reporting. During the review Bulgaria also acknowledged the need to improve the quality of the data in the 1988 base-year inventory. The ERT strongly encourages national efforts to achieve the above targets.

Identified by the ERT

32. Further improvements in Bulgaria's submissions require a more complete application of most aspects of the UNFCCC reporting guidelines. The Party needs to give particular attention to the NIR requirements set down in these guidelines. Some of the methodological issues that have been identified in this review may be quite readily resolved but others will require in-depth analysis by national experts if the most appropriate methods are to be used. The ERT finds it difficult to understand the inter-annual variations in the emissions that have been reported for some sector/gas combinations but recognizes the problems in obtaining reliable historical data for this Party, which is undergoing transition to a market economy. Detailed documentation of the inventory process in these circumstances, according to the specifications laid down in the UNFCCC reporting guidelines, is vital for further assessment and review of the inventories.

33. The ERT considers the following improvements as regards cross-cutting issues in the Bulgarian inventory important. In many cases, their achievement will depend on further implementation of the IPCC good practice guidance, which is fundamental to producing inventories of high quality and adequate transparency. The ERT recognizes that not all these improvements can be carried out in the short term. Bulgaria should:

(a) Pursue all possibilities of greater funding in order to increase GHG inventory capacity by promoting awareness of the importance of reliable emissions data and complete reporting in order to meet the needs of the Convention. The permanent designation of an agency/institute as the competent body for

compiling and reporting annual inventories on a continuous basis without the need for the current practice of separate annual contracts would increase efficiency and improve the inventory;

(b) Develop institutional arrangements to initiate QA/QC procedures and encourage a more active role in inventory compilation by sectoral experts in Industrial Processes, Agriculture, LUCF and Waste;

(c) Exploit the mandate of the NSI to enhance statistical surveys related to the national car fleet and waste disposal and other areas where data more specific to the emissions inventory process can be obtained;

(d) Include more detail in the NIR. The inventory agency is evidently following the recommendation of the UNFCCC reporting guidelines in using country-specific methods and data as much as possible but the Party should be aware that this approach increases the need for a comprehensive NIR compiled in accordance with those guidelines. A considerable increase in transparency can be achieved simply by providing more of the basic data, such as the annual energy balance and disaggregated EFs, underlying the emissions estimates and adequate descriptions of how they are used;[7]

(e) Devise a work programme to produce CRF data files for all years; Bulgaria should make an effort to submit data in the CRF not only for the latest year but for the base year and all years in the period for which recalculations are performed, that is, all years in the period 1988–1999;

(f) Attempt to compile GHG estimates for 1989 as required by the UNFCCC reporting guidelines and provide them in the CRF, since information for 1989 has not been submitted so far, and elaborate on the simplified approach used to report emissions for 1996;

(g) Provide more explanation of emission trends in general in order to make it possible to fully assess the apparent inconsistencies between trends for gases from the same source and to understand the reasons for some large inter-annual variations across the time series;

(h) Consider seriously the recommendations in the sections below regarding the need for re-evaluation of certain aspects of the methodological approach for some important emission sources (see for example paragraphs 130 and 159 in the Agriculture and Waste sectors, respectively).

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

II. ENERGY

A. Sector overview

35. Bulgaria's Energy sector accounted for 77 per cent of national total GHG emissions in 2001. Subsector 1.A.1 Energy Industries is clearly the major source category in the Energy sector, comprising 62.6 per cent of total energy emissions and 48 per cent of total GHG emissions in Bulgaria. Subsectors 1.A.2 Manufacturing Industries and Construction and 1.A.3 Transport contributed 13 per cent and 9 per cent, respectively, to the national GHG emissions total in 2001. During the period 1990–2001 GHG emissions from the Energy sector decreased by 40 per cent, primarily because of reductions in emissions in 1.A.2 Manufacturing Industries and Construction. Compared to the base year 1988, energy-related emissions had decreased by 51.6 per cent in 2001. Total emissions from Energy increased by 5 per cent in 2001 compared with 2000. Bulgaria attributes this to the increase in electricity production for export to neighbouring countries.

[7] The new UNFCCC reporting guidelines adopted by decision 18/CP.8 facilitate the provision of such information given that Parties are no longer required to provide the NIR in hardcopy form.

Completeness

36. The CRF tables for 2000 and 2001 are largely complete. They include estimates for most gases and sources of emissions from the Energy sector, as recommended by the IPCC Guidelines. Emissions not included concern primarily fugitive emissions of CO_2 and N_2O from solid and liquid fuels as well as those in the Solid Fuel Transformation subsector and in Navigation. These emissions are likely to be very small.

37. Notation keys are used extensively in the CRF tables. However, some notation keys seem to be applied in an incorrect manner. The meaning of the notation key "0.0"[8] is often unclear as there is no specification as to whether this indicates negligible amounts, no available data, no estimation or not occurring. The use of the notation keys "IE" (included elsewhere) and "NE" should be supported by explanations in table 9 (Completeness), as required.

38. The NIR includes discussion of some methodological issues pertinent to energy data reporting, such as emission trends, recalculations, key and non-key sources, the reference and sectoral approaches, and confidentiality. The depth to which these issues are addressed is variable. However, the absence of documentation on data sources is a general feature of all the issues addressed in the NIR. Some specific sources such as international bunker fuels as well as feedstocks and non-energy fuel use, are not addressed.

39. The key sources found in the Energy sector by Bulgaria agree with those identified in the secretariat's tier 1 analysis (level assessment).

Transparency

40. Bulgaria has improved its national GHG emission inventory considerably since its last submission. However, a major deficiency in the reporting of the Energy sector still exists, namely the lack of documentation on the actual data sources used and EFs applied in the inventory preparation. Another important missing element is information on the national circumstances and procedures followed from the collection of energy data and EFs from the sources to data processing and their eventual incorporation into the GHG emission database. During the review national experts explained that there are 28 regional statistical offices in Bulgaria which collect data on all emission sources (irrespective of size) from all municipalities under their jurisdiction. These data are subjected to initial checks to detect obvious errors and inconsistencies, and expert judgement is also involved here. National energy balance tables and lists of the EFs used in the compilation of the emission inventories were provided to the ERT during the visit. It is strongly recommended that Bulgaria include all the above information in future submissions in order to substantially improve transparency.

41. Not all notable features detected in the emission trends of the Energy subsectors are described fully in the NIR. The national experts made available to the ERT a description of the reasons for some fluctuations in the trends observed in Bulgaria. It is suggested that this kind of information be included in future NIRs.

Recalculations and time-series consistency

42. Recalculations performed in the Energy sector are given in the respective CRF tables for the years 1988 and 1990–1999. These were carried out in order to achieve time-series consistency by eliminating the double counting of non-energy emissions from the energy industries subsector and in order to correct the EFs for CH_4 and N_2O emissions from coke combustion in subsector 1.A.2 Manufacturing industries and construction, for which previously zero values were assumed. This assumed no emissions from electric and thermal energy generation, which is an incorrect consumption. A new CH_4 EF was adopted for biomass combustion in subsector 1.A.5 Other and fugitive emissions of CH_4 in end-use leakage of natural gas were revised using IPCC default EFs. The recalculations have led to an overall downward revision of figures for

[8] According to the new UNFCCC reporting guidelines adopted by decision 18/CP.8, a "0" does no longer constitute a notation key.

the Energy sector as a whole for all years. The effect of recalculations on the Energy sector as a whole or the subsectors specifically is not addressed in the NIR. Bulgaria should address this in future submissions.

Uncertainties

43. The NIR provides quantitative uncertainty estimates for all emission sources and EFs in the Energy sector, disaggregated by fuel. These data are based on the figures proposed in the IPCC good practice guidance, adapted to the national circumstances where possible. Bulgaria should include a discussion on the choice of uncertainty estimates and how they are adapted to the national inventory, in future submissions.

Verification and quality assurance/quality control

44. During the visit national experts specified that upon receipt (energy) data are routinely double-checked by experts to detect any obvious errors or inconsistencies (see also paragraph 40 under Transparency). The NIR states that a large project has been initiated, aiming primarily at more efficient data management in accordance with the IPCC good practice guidance methodology. However, during the visit national experts specified that work is hampered until resources are available. This is expected to be rectified by the end of 2003. As no formal national QA/QC plan with transparent routines for documentation and archiving or related concrete plans seems to be in place at the moment, it is recommended that action be taken in this direction in the immediate future.

B. Reference and sectoral approaches

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

45. Energy consumption and CO_2 emissions for 2001 are 11.4 per cent and 3.1 per cent higher, respectively, in the reference approach than in the sectoral approach. The differences in the consumption of liquid and gaseous fuels are surprisingly high (+26 per cent and +34 per cent, respectively). Bulgaria lists some reasons for the discrepancy in the NIR and during the review elaborated further on the observed discrepancies, as follows:

(a) The CRF tables for the sectoral approach do not add data for liquefied petroleum gas (LPG) to consumption and corresponding emissions to the group of liquid fuels. When this is accounted for, the discrepancy in fuel combustion drops to approximately 11 per cent;

(b) The statistical difference of the energy balance for liquid fuels is high (e.g., 2.9 per cent for gasoline). When this is accounted for the discrepancy in energy consumption drops to approximately 8 per cent;

(c) Consumption of fuels for non-energy use is not excluded from the apparent consumption of the reference approach. This leads to an overestimate of the energy AD in the reference approach compared to the sectoral approach. The ERT however notes that the inclusion of fuels for non-energy use in the apparent consumption corresponds to the common calculation procedure of the reference approach. As regards CO_2 emissions, this fact does not explain the difference between the two approaches.

46. In reconciling the energy balance provided during the review with CRF table 1.A(b), the ERT finds that item (c) accounts for most of the discrepancy in energy consumption in the case of gaseous fuels and may also account for approximately two-thirds of the discrepancy for liquid fuels. The reasons for the remainder of the discrepancy for liquid fuels are not clear and some double counting of secondary liquid fuels may be involved in the representation of the energy balance in table 1.A(b). In addition, the convention followed as to whether stock changes are positive or negative in table 1.A(b) is the opposite to that followed for Bulgaria's energy balance.

47. The NIR presents the way in which the difference in CO_2 emissions between the reference and sectoral approaches has evolved over time (1988, 1990–2001). The emissions obtained using the reference approach are lower than those obtained using the sectoral approach in the early years (minimum 5.5 per cent in 1990) and higher from 1992 onwards (maximum 5.6 per cent in 1998). National experts attribute the

deviations to the application of country-specific EFs in the sectoral approach, which differ significantly from the IPCC default values used in the reference approach for imported coal and domestic brown and black coals. The differences in the early years are said to be due to the substantial decrease in the quantity of high-emitting brown and hard coals, both imported and locally produced, in the period 1991 onwards.

48. Energy data from the International Energy Agency (IEA) were not available for Bulgaria at the time of the review.

International bunker fuels

49. International bunker fuels and associated emissions are reported in the CRF tables, but this emission source is not addressed in the NIR. This sector should be properly described and documented in future in accordance with the requirements of the UNFCCC reporting guidelines.

50. The values of the CO_2 implied emission factor (IEF) for residual oil and gas/diesel oil in international marine bunkers in 2001 (81.52 t/TJ and 76.08 t/TJ, respectively) are found to be the highest of all the reporting Parties. Bulgaria indicated that the EF used for residual oil is country-specific, but did not address the case of gas/diesel oil. A clear explanation is recommended here in order to improve transparency.

51. Emissions of CO_2 from international aviation increased by 47 per cent in 2001 compared with 2000. Bulgaria attributed this to increased activity.

Feedstocks and non-energy use of fuels

52. No description is provided in the NIR on the feedstocks and non-energy use of fuels reported in the CRF tables. National experts specified that the amounts are taken from the national energy balance, but the ERT has difficulty in identifying the various fuel quantities listed in table 1.A(d) from the energy balance. A clear description should be provided in future submissions on the way feedstocks and non-energy use of fuels are treated in the inventory.

53. The maximum possible factor (1.0) is used to estimate carbon stored for natural gas used as feedstocks. This value is not consistent with the IPCC Guidelines. The greater part of natural gas consumed as feedstocks in the country is used for the chemical production of ammonia which on subsequent use in fertilizer production leads to the release of carbon to the atmosphere. Bulgaria explained that the factor was recommended by national experts. The explanation provided by the Party may be a result of misinterpretation of the IPCC Guidelines.

C. Key sources

54. Emission estimates are based primarily on tier 2 IPCC methods, with the exception of energy industries, where tier 3 was used. The respective AD are included in the national energy balance. Both country-specific and default EF values have been used.

Stationary Combustion – all fuels – CO_2

1.A.2. Manufacturing Industries and Construction

55. Emissions of CO_2 in this subsector decreased by 77 per cent between 1988 and 2001. For the sake of transparency, it is recommended that Bulgaria describe the reasons for such a large decrease in the NIR. Elaboration on the contribution of the different fuel types to the total trend would also improve clarity as sharp changes are detected over the years.

1.A.4. Other sectors

56. Emissions of CO_2 in this subsector decreased by 78 per cent between 1988 and 2001. Furthermore, in 2001 emissions from the Commercial/institutional subsector increased by 74 per cent compared with 2000, while the Residential subsector saw a decrease of 35 per cent during the same period. These features need to be discussed and explained clearly in the NIR.

Stationary combustion – Coal – CO_2

1.A.1. Energy industries

57. The value of the CO_2 IEF for solid fuels in 2001 (106.81 t/TJ) is one of the highest across the reporting Parties. Bulgaria explained that this is due to the combustion of local lignite coal with a very high EF. Appropriate documentation needs to be provided to support the figures reported. This factor is also 37 per cent higher than the value reported in 2001 for the year 1999. Bulgaria explained that this discrepancy was due to wrong accounting of emissions from solid fuels manufacturing (1A1c) as combustion emission in the earlier submission.

58. The NIR states that the country-specific EFs used in the tier 3 approach were based on measurements and analytic calculations in power plants from the Maritza East complex. They were further aggregated to the level of fuel type and power plant types to estimate CO_2 emissions in this subsector. An elaboration of the methodology followed and references to any existing documentation should be provided to improve transparency on the matter.

1.A.2. Manufacturing industries and construction

59. In the case of the Pulp, Paper and Print subsector, the 2000 and 2001 values of the CO_2 IEF for solid fuels are the highest of reporting Parties (107.5 t/TJ and 101.8 t/TJ for 2000 and 2001, respectively). In addition, the IEF decreased by 5.3 per cent in 2001 as compared with 2000. Bulgaria explained that the high IEFs result from the use of high-emitting domestic lignite coal, and that the decrease in the IEF is due to the use of larger amounts of imported coal in 2001 with a lower EF.

1.A.4. Other sectors

60. The value of the CO_2 IEF for solid fuels in 2001 (99.88 t/TJ) is one of the highest across the reporting Parties. Bulgaria explained that this is due to the combustion of domestic lignite coal with a high EF.

61. In the subsector Agriculture/Forestry/Fisheries, the 2000 and 2001 values of the CO_2 IEF for solid fuels are found to be the highest of reporting Parties (100.8 t/TJ). This could be explained by the use of high-emitting domestic coal. However, during the review Bulgaria explained that in 2001 imported coal of better quality was used in this subsector. This would imply a lower IEF in 2001 than in 2000, which is not the case. A clearer explanation is needed on this matter.

Stationary combustion – Oil – CO_2

1.A.1. Energy industries

62. Emissions from liquid fuels used in the refining of petroleum are indicated as not occurring ("NO"). However, in earlier inventories emissions from this source were reported. Bulgaria should explain the reason for this discrepancy and, if necessary, adjust the corresponding notation key accordingly.

63. The value of the CO_2 IEF for liquid fuels in 2001 (68.17 t/TJ) is 12 times higher than the one reported in 2001 for the year 1999. Bulgaria explained that the anomaly in the 1999 value was due to wrong accounting of emissions from liquid fuels production (1A1b) as combustion emissions in the earlier submission.

Mobile combustion – Oil – CO_2

64. Emissions are estimated by means of an IPCC tier 2 method. It is not clear from the NIR in which cases the EFs used are only country-specific or a combination of country-specific, default and CORINAIR factors. A clearer description is needed.

1.A.3.b Road transportation – CO_2

65. Total gasoline consumption and corresponding CO_2 emissions from transport decreased by 14 per cent in 2001 compared with 2000. The reasons for this change could be provided in the NIR to improve transparency given that CO_2 emissions are generally on an increasing trend since 2000.

66. The values of the CO_2 IEF for diesel oil (76.14 t/TJ) in 2000 and 2001 are the highest across the reporting Parties. During the review Bulgaria explained that EFs used in this case are based on national studies. It is recommended that documentation on this matter be provided in future submissions.

1.A.3. Other transportation

67. Bulgaria indicates in the NIR that this source comprises emissions from off-road vehicles used in agriculture and construction. This specification should be provided in the relevant documentation box of the CRF. The description of this key source needs to be made clearer and should be backed up by the appropriate documentation in the NIR.

Fugitive emissions – Solid fuels – CH_4

1.B.1.a Coal mining and handling

68. Emissions are estimated using the IPCC tier 1 method, employing default EFs. The description of this key source in the NIR needs to be backed up by the appropriate documentation. Coal mining is an important industry in Bulgaria and it should be possible to obtain sufficient country-specific data in order to apply a tier 2 method for this particular key source.

Fugitive emissions – Oil and natural gas – CH_4

1.B.2.b Natural gas

69. Emissions are estimated using the IPCC tier 1 method, employing IPCC default EFs relating to the former USSR and Eastern Europe. The description of this key source in the NIR needs to be backed up by the appropriate documentation. Emissions from natural gas transmission are the major component of fugitive emissions in this source category. Bulgaria should investigate whether a tier 2 method can be adopted for this activity.

1.B.2.a Oil

70. The AD and emissions from 1.B.2(a).v Distribution of Oil Products and 1.B.2(a).vi Other are reported as "NE". Bulgaria attributes this to the lack of data and appropriate infrastructure for acquiring them. The Party is encouraged to develop procedures for the collection and further processing of such data using the IPCC good practice guidance.

1.B.2.c Venting and flaring

71. The AD and emissions from Flaring are reported as "NE". Furthermore, the AD and emissions for oil and gas combined from Venting are reported as "NE". Bulgaria could attempt to estimate flared and vented volumes and calculate subsequent emissions using the tier 1 approach, as recommended in the decision trees of the IPCC good practice guidance.

D. Non-key sources

Stationary combustion – Biomass – CH_4

72. The CH_4 IEF for biomass for 2000 and 2001 is remarkably higher in the subsector Agriculture/Forestry/Fisheries (74 kg/TJ) than in the subsectors Commercial/institutional and Residential (15 kg/TJ). Bulgaria explained that the higher IEF could be the result of the combustion of newer biomass and the use of open fires in the corresponding subsector.

Mobile combustion

1.A.3.b Road transportation – Liquid fuels – N_2O

73. Emissions of N_2O from Road transportation decreased between 1998 and 1999 while emissions of CO_2 increased by 20 per cent during the same period. A clear explanation on this issue should be given in the NIR as emissions of N_2O from this source are increasing in most countries. The national inventory experts expressed the view that the overall effect of catalyst controls on cars is probably still negligible in Bulgaria, given the high proportion of very old cars in the fleet, the small number of new cars bought annually and a significant shift to LPG use.

74. The 2000 and 2001 values of the N_2O IEF for gasoline (1.1 t/TJ) are the lowest across the reporting Parties. Moreover, the value of the N_2O IEF for diesel oil in 2001 (1.91 t/TJ) is one of the lowest across the reporting Parties. Bulgaria explained that the EFs used in the calculations are based on national studies. Given the possible importance of this source, which is a key source for many other Annex I Parties and might be a potential key source for Bulgaria according to the trend assessment, it is recommended that corresponding documentation be provided by the Party in future submissions to enable assessment of those factors by future review teams.

1.A.3.c Railways – Liquid fuels – CO_2

75. The 2000 and 2001 values of the CO_2 IEF for liquid fuels (76.1 t/TJ) are among the highest across the reporting Parties. Bulgaria explained that the EFs used in this case are based on national studies. It is recommended that documentation on this be provided in future submissions.

1.A.3.d Navigation – All fuels – all gases

76. Data on navigation (1.A.3.d) are reported as "NO" in the CRF tables. During the visit, national experts explained that domestic water transport is insignificant and not reported in the national energy balance. However, Bulgaria did report AD for this subsector for 1999 in the 2001 submission. Data on navigation should be reported in the CRF no matter how low their values are. Furthermore, emissions from gas/diesel oil are indicated as "IE" in the CRF for 2000. This notation key should be supported by an explanation in the corresponding documentation box and table 9 (Completeness), as required.

E. Areas for further improvement

Identified by the Party

77. In its NIR Bulgaria recognizes the need to improve the quality of data in the national Gross Energy Balance, parts of the stock balances in the case of the largest GHG sources and statistical data on vehicles such as type, makes and fuel combustion characteristics. There exists a concrete plan to improve different aspects of the inventory system, but action is anticipated to start in 2004 after finance is arranged. During the review Bulgaria also acknowledged the need to improve the quality of the data in the 1988 base-year inventory. The ERT strongly encourages national efforts to achieve the above targets.

Identified by the ERT

78. The data reported in the CRF tables for the Energy sector are largely complete. Reporting can be further improved by correcting some notation keys and providing explanations in the documentation boxes and in table 9 (Completeness) where appropriate.

79. The NIR is notably better than that in the previous submission. However, substantial improvements are still required to make it fully informative and to comply with the UNFCCC reporting guidelines. As national energy balance tables are the ultimate source of AD in the Energy sector, it is recommended that Bulgaria include them in future NIRs. This would enable review experts to reconcile the energy balance data with those which appear in the reference approach tables 1.A(b) and 1.A(d) and would allow for a better understanding of subsector fuel allocations in the sectoral approach.

80. Full documentation relevant to the country-specific factors used in the preparation of the emission inventory for the Energy sector (such as disaggregated EFs for combustion sources along with adequate description of how they are used) is another element that would greatly enhance the quality of the NIR. The Party should also discuss the quality (reliability, consistency, deficiencies) of the raw energy-related data collected through its impressive network, as well as the modes of action followed in the case of unreliable, inconsistent or missing data. Notable features in trends should be explained more clearly, and specific sectors such as bunker fuels and feedstocks should be included and properly addressed in the NIR.

81. Efforts need to be made to improve the national inventory for the base year since the data quality for 1988 is by Bulgaria's own admission lower that that of more recent years.

82. Inventory experts should investigate whether the information necessary to apply tier 2 methods for fugitive CH_4 emissions from coal mining and natural gas transmission can be obtained.

83. National QA/QC procedures need to be developed to further improve the quality and accuracy of emission estimates for the Energy sector and the GHG emission inventory as a whole.

III. INDUSTRIAL PROCESSES AND SOLVENT USE

A. Sector overview

84. The Industrial Processes sector contributed 7.5 per cent to total national emissions in the base year 1988, 8.7 per cent in 2000, and 8.4 per cent in 2001. Four key sources were identified by Bulgaria using the IPCC tier 1 level assessment and confirmed by the secretariat's analyses: CO_2 from Iron and steel production, N_2O from nitric acid production; CO_2 from Cement production, and CO_2 from Lime production.

85. Emissions of fluorinated gases from the consumption of halocarbons and SF_6 may become a key source in the future because of the potentially high emission trend. No estimates of actual emissions from this source category were provided in Bulgaria's inventory submission, apart from SF_6 emissions from one activity (Electrical equipment).

86. Emissions in some source categories, e.g. nitric acid and lime production, show substantial inter-annual variations, including variations between 2000 and 2001, as a result of rapid changes in production.

87. Estimates of emissions were carried out by the EI on the basis of the AD collected by the NSI and by the Ministry of Environment and Waters. Where the AD were considered confidential under national legislation, emission estimates were made by the NSI with methodological support from the EI as the EI is not given access to the underlying activity data.

88. Bulgaria used the IPCC Guidelines methodology and the generally similar CORINAIR methodology to estimate emissions. The IPCC good practice guidance was followed to estimate CO_2 emissions from cement production. The EFs used are a combination of IPCC and adapted CORINAIR values.

Completeness

89. The CRF includes estimates of most gases and sources of emissions in the Industrial Processes sector, as recommended by the IPCC Guidelines. Activities not included are limestone and dolomite use, asphalt roofing, and CO_2 and N_2O emissions in sector 3 Solvent and Other Product Use. Only production-related emissions were estimated in source category 2.A.4 Soda ash production and use. In source category 2.F Consumption of halocarbons and SF_6, only the potential emissions of HFCs were estimated. Actual SF_6 emissions were partially estimated (for some activities under Electrical equipment). No estimates of PFC emissions were provided in this source category.

90. The NIR covers all source categories and all the CRF tables have been completed.

Transparency

91. Though the information in the CRF and NIR provides for a basic understanding of the sector, the ERT recommends that Bulgaria include in the NIR more detailed information about methodologies and a justification of the EFs used, especially if the national EFs are based on special studies. A clearer distinction between the IPCC default methods, CORINAIR and national methodologies and EFs in the NIR is also recommended. During the visit the ERT was given access to the national methodological guidance referred to in the NIR which is only available in Bulgarian language. A list of national EFs for Industrial Processes was also provided to the ERT.

92. Notation keys are widely used. However, in some cases the notation key used is not appropriate (for instance, "NO" is used instead of "NE" and "IE"). Some cells in the CRF tables were not filled in.

Recalculations and time-series consistency

93. Bulgaria provided recalculated estimates for its base year (1988) and 1990–1999. The recalculations affected process-related CH_4 emissions (a decrease of up to 26 per cent before 1999 and an increase of 7.8 per cent in 1999), and process CO_2 emissions (a decrease of less than 1 per cent). Justification is provided in the CRF table 8(b). It is noted that the information in table 8(b) partly contradicts table 8(a).[9] The ERT encourages Bulgaria to clarify this in order to improve consistency and transparency of reporting.

B. Key sources

Iron and steel production – CO_2

94. The methodology used by Bulgaria assumes a weighted average production-based EF applied at the national level. As the NIR mentions, this EF differs significantly from the process-by-process EFs included in the IPCC Guidelines. Taking into account the fact that the contribution of the two key steel production processes used in the country to total production may vary significantly over time, using a constant weighted average EF may increase the uncertainty of the emission estimates. The ERT recommends that Bulgaria improve quality of estimates by implementing the IPCC good practice guidance methodology and EFs.

95. The ERT recommends clearer descriptions on issues of confidentiality and disaggregation in the NIR and CRF for this source category, including the use of the "C" (confidential) and "IE" notation keys in the reporting tables as required by the UNFCCC reporting guidelines.

96. Emissions of CO_2 decreased by 4.6 per cent in year 2001 as compared with 2000 as a result of decreasing production.

Nitric acid production – N_2O

97. Bulgaria used the IPCC Guidelines methodology and an EF adapted to national technologies. The EF of 6 kg N_2O/t is within the range of EFs presented in the IPCC Guidelines. The appropriate AD were taken from national statistics. Emissions of N_2O show large inter-annual fluctuations between the years 1998–1999 (a 24 per cent decrease) and 1999–2000 (a 79 per cent increase).

Cement production – CO_2

98. Bulgaria has used the tier 2 methodology recommended by the IPCC good practice guidance for estimating CO_2 emissions. The EF of 0.52 t CO_2/t clinker applied is appropriate. The correction for cement

[9] According to table 8(b) of the CRF, an increase of AD for ethylene production was the only reason for recalculating CH_4 emissions in the Industrial Processes sector. However, the values reported in table 8(a) indicate a total decrease of CH_4 emissions resulting from the recalculations. During the visit, the ERT was informed that other reasons for the recalculations include removal of double counting and reallocation of emissions within the sector. Though recalculations were aimed to increase accuracy of emission estimates, the ERT came to the conclusion that further clarification on the recalculations undertaken is necessary.

kiln dust recommended by the IPCC good practice guidance was applied. However, the procedure of reconstructing the AD (production of clinker) using export/import statistics is country-specific and the description of the procedure provided in the NIR is not sufficiently detailed to ensure transparency. The ERT recommends that a complete description be provided in the NIR. Emissions of CO_2 from cement production decreased by 5.5 per cent from 2000 to 2001.

Lime production – CO_2

99. Bulgaria has used the IPCC Guidelines methodology and EF for quicklime production. AD were reported from national statistics. The ERT noted that no studies were carried out to clarify whether dolomitic quicklime or hydraulic lime is produced in the country. Bulgaria may wish to conduct such studies and, as it recommended by the IPCC good practice guidance, to apply individual EFs to estimate CO_2 emissions separately from the production of each type of lime. Emissions of CO_2 increased by 14.9 per cent from 2000 to 2001 as a result of growing demand for lime.

C. Non-key sources

Glass production – CO_2

100. The methodology and EF used by Bulgaria are based on the CORINAIR approach. In this case, the emission factor of 800 kg CO_2/t would appear to account for emissions from fuel combustion as well as process emissions and it is not clear whether the appropriate deduction has been made to fuel consumption under subsector 1.A.2 Manufacturing industry and construction.

Soda ash production and use – CO_2

101. Bulgaria has used the IPCC Guidelines methodology and the default EF to estimate emissions in this source category. No estimates of emissions are provided for soda ash use because of lack of AD. The ERT encourages Bulgaria to improve data collection and provide the necessary estimates.

Carbide production – CO_2

102. The IEF for calcium carbide production, which is the same as the national EF included in the list made available during the review, is the highest among reporting Parties. The ERT assumes that emissions from calcium production and use were both estimated by Bulgaria by using this EF.

Iron and steel production – CH_4

103. According to Bulgaria's NIR, the national EFs based on experimental and analytical studies are used to estimate emissions related to the production of pig iron, sinter and coke. These factors are included in the list made available during the review. The ERT encourages Bulgaria to provide or reference more information on these studies.

104. It is not clear why the NIR states that the AD used for estimating CH_4 emissions are partially confidential, whereas such information is not given with regard to the CO_2 emission estimates. This contradicts the information given in CRF table 2(I).A–G and comments received by the ERT in the course of the review. The ERT recommends that Bulgaria reconsider this issue.

Ammonia production – CO_2

105. The emission factor of 0.86 t CO_2/t ammonia is approximately half the IPCC default value, as previously recorded in the desk review report. It is noted also that the reporting of emissions for this activity, which arise from the use of natural gas feedstocks, appears inconsistent with Bulgaria's adoption of zero emissions for the non-energy use of natural gas as part of the reference approach estimation of CO_2 emissions (see paragraph 53). The inventory experts need to examine this inconsistency and the relatively low emission factor above in order to ensure that emissions from ammonia production are being estimated fully in accordance with the IPCC Guidelines.

Aluminium production – PFCs

106. The ERT concluded that the IPCC default EF of 1.4 kg/t has been used to calculate emissions of perfluoromethane (CF_4), but the emission factor of 0.01 kg/t used by Bulgaria to estimate perfluoroethane (C_2F_6) emissions from CF_4 is lower than the IPCC default recommendation by an order of magnitude.

Consumption of halocarbons and SF_6

107. The IPCC Guidelines methodology and the default EF are used by Bulgaria to estimate actual emissions of sulphur hexafluoride (SF_6) from electrical equipment. The AD are incomplete as electrical distribution network activities are not included. Coverage of SF_6 emissions from electrical equipment is thus incomplete.

108. Potential emissions of HFCs have been estimated using the appropriate IPCC methodology. Actual emissions of HFCs and PFCs, as well as potential emissions of PFCs, are not estimated because of problems with AD collection. Bulgaria noted that the completeness of the AD used to estimate potential emissions varies from year to year. Noting that consumption of halocarbons and SF_6 may be a key source in the country because of the expected high upward trend, the ERT encourages Bulgaria to improve data collection and provide necessary estimates.

Solvent and Other Products Use

109. Emissions of non-methane volatile organic compounds (NMVOCs) were estimated in this sector on the basis of the CORINAIR methodology. A rapid change in the emissions reported from 1998–1999 and in the following years was caused by a change in the methodology used. No emission estimates for gases other than NMVOC are provided.

D. Areas for further improvement

Identified by the Party

110. No information on planned further improvements in the Industrial Processes and Solvent Use sectors is included in the inventory submission. In the course of the visit the ERT was informed about the following improvements planned by Bulgaria:

(a) Implementation of the IPCC good practice guidance in order to improve estimates in some source categories, for example, Lime production (pending the availability of resources);

(b) Recalculation of emissions from solvent and other product use based on retrospective modelling of related activities.

Identified by the ERT

111. The ERT would recommend the following improvements to the Industrial Processes and Solvent Use sectors. The Party should:

(a) Provide emission estimates for sources occurring in the country but not covered by the present inventory submission (limestone and dolomite use, asphalt roofing, use of N_2O for anaesthesia). Bulgaria may also wish to consider estimating CO_2 and N_2O emissions from Solvent and Other Product Use applying methodologies developed by other Parties;

(b) Develop and report emission estimates based on complete activity data for source categories where some AD are lacking at present (soda ash production, potential emissions of HFCs/PFCs, and SF_6 emissions from electrical equipment);

(c) Develop and report estimates of actual emissions of HFCs and PFCs from category 2.F Consumption of Halocarbons and SF_6 based on the IPCC Guidelines and the IPCC good practice guidance;

(d) Provide the complete time series from 1990 for emissions of HFCs, PFCs and SF_6, as required by the UNFCCC reporting guidelines;

(e) Be consistent and precise in the use of notation keys according to the UNFCCC reporting requirements;

(f) Conduct periodic studies to update nationally developed EFs, such as for ammonia production, CO_2 from iron and steel production, and CH_4 from industrial processes categories.

112. Bulgaria may wish to consider implementing the bottom–up approach for the estimation of emissions from key sources instead of the approach based on weighted average EFs which is currently used.

113. A number of problems to be solved in the Industrial Processes and Solvent Use sectors are of an institutional character, such as lack of resources, difficulties in AD collection, QA/QC and verification procedures.

IV. AGRICULTURE

A. Sector overview

114. In the base year 1988, Bulgaria's GHG emissions from the Agriculture sector were estimated to be 15,245 Gg CO_2 equivalent. By 2001, emissions from Agriculture had decreased by about 67 per cent to 4,977 Gg CO_2 equivalent, mainly as a result of a reduction in animal populations. Emissions from the Agriculture sector represented about 7.6 per cent of total GHG emissions in year 2001. N_2O emissions constituted 64.5 per cent of total agricultural CO_2 equivalent emissions in 2001. Over the period 1988–2001, CH_4 and N_2O emissions from agriculture decreased by approximately 69.1 per cent and 66.3 per cent, respectively.

115. CH_4 emissions from enteric fermentation and direct and indirect emissions of N_2O from agricultural soils were identified by Bulgaria as key sources in 2001. These three key sources accounted for 6 per cent of total emissions in the country.

Completeness

116. The CRF includes estimates of almost all gases and sources of emissions from the Agriculture sector, as recommended by the IPCC Guidelines, except for field burning of agricultural residues from some minor crops for which the MAF does not obtain AD.

Transparency

117. The NIR contains a broad description of methodologies and trend analysis. The basic changes made during the elaboration of the inventories for years 2000 and 2001, including sources of some data, census methodology for animal populations and revision of the area of cultivated histosols, are documented in the NIR. However, the information provided does not sufficiently support the data in the CRF and the methodologies employed. The NIR could benefit from a more detailed discussion of data availability, assumptions, and data collection and processing procedures.

Methodologies, emission factors and activity data

118. Bulgaria uses the IPCC tier 1 methodology except for CH_4 emissions from manure management, where the tier 2 methodology is used for cattle and swine. The ERT recommends that Bulgaria use tier 2 methods for key sources when the data are available.

119. The parameters and EFs for estimating emissions from the Agriculture sector are mainly IPCC default values. However, country-specific data are used for CH_4 emissions from manure management, and for CH_4 and N_2O emissions from field burning of agricultural residues. These parameters and EFs are not presented in the NIR.

120. Most of the AD in year 2001 were provided by the agricultural statistics department within the MAF, whereas the related information in year 2000 is taken from the NSI. The methodology for estimating the average number of animals has been changed since the year 2000. Data for nitrogen fertilizers applied to soils are provided by the National Service for Plant Protection, not by the NSI. The area of cultivated histosols was substantially reduced and recalculations made for previous years. The ERT recommends that Bulgaria provide more information on data collection in future submissions.

121. Consistent tier 1 characterizations of animal populations have been used across the relevant subsectors in individual years. Bulgaria uses the default values for nitrogen excretion for the East European region for the applicable livestock categories in the country. In allocating nitrogen excretion to the various animal waste management systems, the default values for Eastern Europe are used only for dairy cattle and the livestock category "Other", while country-specific allocations are used for other animal categories. The rationale for this approach is not clear.

Recalculations and time-series consistency

122. The recalculations of N_2O emissions from agricultural soils for the period 1988–1999 are reported in the CRF because the area of cultivated histosols was revised downwards according to the MAF data. It is explained that, owing to an earlier misinterpretation of the definition of histosols, the contributing area was grossly overestimated, and a much lower and more realistic value is now being applied, based on soil maps and information on the areas accessible for cultivation. The effect of recalculation on N_2O emissions from agricultural soils is a decrease of 49.5 per cent for the base year 1988 and of 79.8 per cent for year 1999.

123. The change of data sources and methodology for counting the animal population introduces notable inconsistencies for the time series.

Uncertainties

124. Explanations are needed for the choice of values for the uncertainties in the AD and EFs used for agriculture in the tier 1 uncertainty analysis. In the opinion of the ERT, the uncertainty values are very low.

B. Key sources

Enteric fermentation in domestic livestock – CH_4

125. Bulgaria uses the tier 1 methodology for estimating CH_4 emissions from enteric fermentation for all livestock categories, together with default EFs.

126. The methodology for estimating the average number of animals has been changed since year 2000. Up to the year 2000, an annual animal population census was undertaken in January of each year. Since 2001, the census is carried out twice a year, in May where preliminary data are obtained, and in November, where final data are obtained.

127. Emissions from enteric fermentation decreased by nearly 21 per cent in year 2001 compared to year 2000 as a result of numbers of livestock being reduced.

128. The disaggregated livestock population data given for the major animal categories (cattle, sheep, goats and pigs) in year 2001 are much lower than the corresponding values published by the Food and Agriculture Organization of the United Nations (FAO). For example, the cattle population is 574,750 in the CRF, compared to 639,778 according to FAO, and the sheep population is 1,511,935 in the CRF, compared to 2,286,400 according to FAO. However, the number reported for buffaloes is about 10 times higher than the corresponding FAO figure. The national information source that supplies data to the FAO could not be identified during the review. It is recommended that Bulgaria explain in the NIR the differences between the CRF data and the FAO data, and show why the data used for inventory reporting in the CRF are considered more appropriate than those supplied to the FAO.

Indirect emissions from nitrogen used in agricultural soils – N_2O

129. The NIR states that the IPCC default methodology and default EF have been used.

130. Indirect emissions of N_2O in 2001 amounted to 3.87 Gg, which is marginally greater than the estimate of 3.82 Gg reported for direct emissions. Furthermore, emissions from nitrogen leaching and run-off contributed 84 per cent of the indirect N_2O emissions from soils in year 2001. The CRF indicates that the IPCC default value of 0.3 has been used for $Frac_{LEACH}$, the fraction of nitrogen input to soils that is lost though leaching and run-off. Considering the very low rate of nitrogen application to Bulgaria's agricultural land (approximately 38 kg/ha based on table 4.D of the CRF and agricultural land area of 6.25 million ha from FAO), the ERT believes that the default leaching fraction is not justified in this case. The ERT recommends that the suitability of this value of leaching fraction be re-evaluated in order to reflect the low nitrogen input in the country. A more realistic value of $Frac_{LEACH}$ would result in indirect emissions being considerably smaller than direct emissions, which is typical of most Parties.

Direct emissions from agricultural soils – N_2O

131. The IPCC default tier 1a methodology has been applied to estimate direct N_2O emissions from agricultural soils.

132. The area of cultivated histosols used for the years 2000 and 2001 is 205 ha, which is much smaller than the figure of 4,805 ha used in previous inventories. This revision of the area of histosols led to a drastic decrease in N_2O emissions from agricultural soils, ranging from 49.5 per cent in 1988 to 79.8 per cent in 1999 after recalculation. The NIR indicates that the new data are from the soil resources executive agency within the MAF, and the change seems justified (see paragraph 122). The ERT notes that the default EF of 5 kg N/ha/year for mid-latitude organic soil is still being used by Bulgaria rather than the updated value of 8 kg N/ha/year given in the IPCC good practice guidance.

133. Although the NIR states that default EFs in general are used for direct N_2O emissions in agriculture, all the IEFs in CRF table 4.D are actually lower than the IPCC default values. The differences are not large in the case of fertilizer and animal waste nitrogen applied to soil (default 0.0125 compared to country-reported 0.01). However, very large differences are apparent in the case of N-fixing crops (default 0.0125 compared to country-reported 0.0003) and crop residues (default 0.0125 compared to country-reported 0.00012).

C. Non-key sources

Agricultural soils: Animal production – N_2O

134. Country-specific values were used for $Frac_{GRAZ}$, the fraction of livestock nitrogen excreted and deposited onto soil during grazing. The disaggregated values for $Frac_{GRAZ}$ according to animal type should be provided in the NIR.

Manure management – CH_4

135. The tier 2 method is applied for estimating EFs for cattle (dairy and non-dairy) and swine, based on country-specific values of manure management systems usage from expert judgement.

136. The additional information required in CRF table 4.B(a), does not include the related values for sheep. Bulgaria should describe the choice of values of manure management systems usage in the NIR.

137. CH_4 emission from this sources have decreased by 29 per cent in the year 2001 compared to the year 2000 because average annual numbers decreased after the data source and the methodology for estimating animal numbers were changed.

Manure management – N_2O

138. A combination of default and county-specific proportions of excreted nitrogen among the various animal waste management systems is applied. Goat emissions are reported in Other livestock but there is no indication of this in CRF table 4.B(b) and there is no description in the NIR.

Rice cultivation – CH_4

139. Bulgaria reports CH_4 emissions from rice production by using the IPCC default methodology and EFs. The IEF of 40g $CH_4/m^2/yr$ is at the high end of the range and no explanations are provided in either the NIR or the CRF tables. The national inventory experts stated that the EF chosen accounts for the longer period of irrigation employed in Bulgaria. The ERT encourages Bulgaria to provide more information on the choice of EF even if the value is within the range of the IPCC default values.

Field burning of agricultural residues, CH_4 and N_2O

140. The value for dry matter in wheat (0.55) is the lowest among all reporting Parties. Bulgaria informed the ERT that this values is based on expert judgement.

D. Areas for further improvement

Identified by the ERT

141. The ERT encourages Bulgaria to:

(a) Adopt a value of $Frac_{LEACH}$ that is compatible with the level of nitrogen input to soils. The amount of nitrogen applied to soils has decreased considerably since the base year and the value of $Frac_{LEACH}$ to be used in any further recalculations related to indirect N_2O emissions needs to reflect this trend;

(b) Assess the impact on the emissions trend after changing the data sources and the methodology used for counting the animal population;

(c) Check the AD for cattle, sheep and swine because there is a big difference between the FAO data and those reported in the CRF, and explain why and in what way the CRF data are more suitable than the FAO data;

(d) The NIR should provide more information on the choice of AD, parameters and EFs, especially where country-specific values are applied. Review experts need more information in order to understand why EFs for direct N_2O emissions are different from the default values and why IPCC default values of several variables are used in some cases and not in others;

(e) Consider using tier 2 methods for key sources where the data are available.

V. LAND-USE CHANGE AND FORESTRY

A. Sector overview

142. Net CO_2 removals from the LUCF sector were equivalent to 13.9 and 14.4 per cent of total national emissions in 2000 and 2001, respectively. The estimate of CO_2 removals in 2001 was double that of the base year, 1988.

Completeness

143. Under this sector, Bulgaria provides estimates of CO_2 emissions and removals only for category 5.A Changes in forest and other woody biomass stocks. The CRFs for 2000 and 2001 include separate estimates for CO_2 emissions and CO_2 removals, as recommended by the UNFCCC reporting guidelines. CO_2 removals are reported in respect of two forest classes under 5.A.2 Temperate forests and CO_2 emissions are reported for two harvested wood categories under 5.A.5 Other. For the categories 5.B Forest and grassland

conversion, including non-CO_2 gases, and for 5.C Abandonment of managed lands, no estimates have been provided (the notation key "NE" is used for temperate forests). No estimates have been provided for category 5.D CO_2 emissions and removals from soils ("NE" reported). The notation key "NO" is used for all forest/land types other than temperate forests.

Transparency

144. The information provided in this sector is not transparent. The underlying methodology cannot be fully assessed for category 5.A on the basis of the available information as the forest species, the forest land area managed and the factors that determine carbon uptake (yield, wood density, carbon content, biomass expansion factors) are not included. Time-series data on forest areas and harvest volumes were provided during the review but it was not possible to reconcile this information completely with that presented in the CRF tables. Also, the NIR does not provide information on the categories for which emissions are not estimated.

Recalculations and time-series consistency

145. No recalculations have been done in this particular sector. The non-coverage of temperate forest plantations would suggest that some revision is justified but the full extent of potential recalculations cannot be determined at present without the detailed information necessary for in-depth assessment of the emissions and removals reported. The methodological approach is based on the assumption of a constant rate of biomass growth over five-year periods and it seems that the highly fluctuating net CO_2 removals are largely determined by the annual harvest. It is difficult to evaluate the consistency of the time series in these circumstances.

Verification and quality assurance/quality control

146. The NIR does not describe how the data were obtained to estimate annual CO_2 emissions and removals. The ERT encourages Bulgaria to provide more detailed information on data collection in future submissions.

B. Sink and source categories

5.A Changes in forest and other woody biomass stocks – CO_2

147. The contributing area and associated CO_2 removals are reported for commercial evergreen and deciduous forests in Bulgaria. No corresponding estimates are provided for plantation forests. The estimates of CO_2 uptake for commercial evergreen and deciduous forests are the same for years 2000 and 2001 even though the contributing areas are larger in 2001. This result reflects the adoption of a constant rate of forest growth for the period between forest inventories, which is usually five years. The average annual growth rate associated with the reported CO_2 removals was not specified and instead the term "different" appears in the CRF.

148. The carbon uptake factors of 1.2 and 1.03 t C/ha for evergreen and deciduous forests, respectively, are country-specific values and they are lower than those of most other European countries with similar forest ecosystems. No information on the component inputs that determine forest growth and CO_2 removals is provided.

149. The carbon EF of 0.45 t C/t dm is the same for years 2000 and 2001 for both classes of forest (commercial harvest and other wood use) for which emissions are quantified. As in the case of CO_2 removals, no information is provided on the component inputs that are used to convert harvested wood to CO_2 emissions.

C. Areas for further improvement

Identified by the Party

150. Bulgaria is planning to improve the national forest inventory and the national soil inventory.

Identified by the ERT

151. The Party needs to provide more data in the NIR (mainly related to forestry area, species type, yield coefficients, biomass expansion factors) in order to improve transparency. References to all the data sources used should be provided. Emissions of CO_2 and non-CO_2 gases from category 5.B.2 (Forest and grassland conversion, temperate forests) should be included in the LUCF inventory. The ERT also recommends that information on plantation forests be included because these cover a considerable area of land. Furthermore, the CO_2 emissions and removals from soils and changes in land management should be studied in an attempt to estimate CO_2 emissions and removals from 5.C Abandonment of managed lands, and 5.D CO_2 emissions and removals from soil.

VI. WASTE

A. Sector overview

152. Emissions from the Waste sector represented approximately 7.3 per cent of total GHG emissions in year 2001, and there has been a reduction of 65.6 per cent in emissions since 1988, mostly as a result of changes in data collection systems as well as a steady decrease in population and the overall downsizing of economic activities. Solid waste disposal and Waste-water handling were the source categories for which emissions were estimated in this sector. Land disposal of solid waste was identified as a key source, which represented 6.4 per cent of total GHG emissions in 2001. There are no waste incineration installations in Bulgaria.

Completeness

153. All CRF tables specific to the Waste sector (6.A, 6.B and 6.C) were completed for years 2000 and 2001. For 1988 and the period 1990–1999, only trend and recalculation tables were provided. The CRF tables contain most of the required data and notation keys where relevant. The NIR contains general information about methodology but without sufficient elaboration of the EFs and AD used.

Transparency

154. The NIR provides a general description of the methodologies used for estimating emissions from the Waste sector, but without adequate information on the underlying criteria, methodological input parameters and AD used. Most of this information, however, can be found in the tables and additional information boxes of the CRF. The matter of transparency is particularly important because of the steep reduction in emissions from the Waste sector in 1994, indicated in the previous review report, as a result of changes in data collection systems which are not fully explained in the NIR.

Recalculations and time-series consistency

155. The Party has provided information on recalculations done for years 1988 and 1990–1999. The CRF tables 8(a) and 8(b) show that recalculation has been performed in the Waste sector but it is still not fully clear what parameters were changed. This information is not provided in the NIR. The issue of large per capita emissions from waste-water handling was indicated in previous reviews. The recalculations of emissions from waste-water handling reported in the CRF tables show significant decreases in emissions of CH_4 from this source in comparison to previous submission. The decrease varied from 70 per cent in 1988 to 56 per cent in 1998. The ERT recommends that Bulgaria provide more information on the recalculations in the next NIR.

156. Regarding time-series consistency, there was a significant change in emission trend from solid waste disposal in 1994 (see transparency above). In that respect the time series prior to 1994 is not fully consistent with that for the period 1994–2001.

Uncertainties

157. Quantitative uncertainty assessment was performed in the Waste sector as part of the overall tier 1 uncertainty estimates reported for 2001. The uncertainty of AD for solid waste disposal was estimated to be 20 per cent, and for waste-water handling 30 per cent.

Verification and quality assurance/quality control

158. The NIR does not contain any information to the effect that QA/QC procedures have been established or followed in the waste sector. The data on annual amounts of disposed municipal solid waste (MSW) provided by the NSI and the EEA were cross-checked and verified by the Ministry of Environment and Waters.

B. Key sources

Solid waste disposal on land – CH_4

Methodology

159. The IPCC default methodology was used to estimate emissions from solid waste disposal on land. There are no historical data on amounts and composition of MSW so that it is not possible to apply the first-order decay (FOD) methodology. According to the NSI, landfills are classified as controlled or uncontrolled. All controlled landfills are included in the category Managed in table 6.A of the CRF, while uncontrolled landfills are included in the category Other in table 6.A. The NIR does not provide a full explanation of the criteria for classifying landfills between these two categories, although that could be useful, particularly as 73 per cent of Bulgaria's MSW is disposed to managed solid waste disposal sites (SWDSs). This appears to be relatively high percentage in comparison to some other countries with similar circumstances. Bulgaria's inventory experts explained that all controlled landfills are considered to be managed because they are issued with operating permits that prescribe the waste covering and/or compacting to be carried out. The previous review report has identified the same issues, but no further explanation was provided in the NIR submitted in 2003. The ERT recommends that the Party clarify this issue in its next inventory submission as the split between managed and unmanaged landfills is crucial to the estimation of CH_4.

Activity Data

160. Data on the annual amounts of MSW were provided by the NSI but have not been presented in the NIR. In the period 1988–1993 the primary sources of data were waste management companies, which apparently greatly overestimated the amounts of MSW which they collected and transported to SWDSs. After 1994 the NSI started to collect data from the local municipality administrations responsible for the waste management, which gives more accurate data. This change resulted in a steep decrease in the amounts of waste reported and a consequent reduction of CH_4 emissions from SWDSs. Previous reviews and synthesis and assessment reports have identified this issue. The ERT recommends that Bulgaria provide more details on changes in data collection system, present historical data on MSW in the NIR, and if possible revises its historical data on MSW for the period 1988–1993 on the basis of trend data for the period 1994–2001.

161. Table 6.A of the CRF shows that the total amount of disposed waste in 2001 was 3,198 kt (same number is in the 2001 NSI report), while on the basis of data from the additional information box the amount equals 3,994 kt for the total population and 2,776 kt for the urban population. The ERT recommends that Bulgaria review and clarify this issue.

Emission Factors

162. The parameters used for determining EFs are default values from the IPCC Guidelines, except for MSW_f, the fraction of MSW that goes to landfills, which equals 1.0, and the methane correction factor for so-called uncontrolled SWDSs, which equals 0.6. The NIR provides data on waste composition for the

years 2000 and 2001, but these data were not used for estimating country-specific degradable organic carbon (DOC). The ERT encourages Bulgaria to use its country-specific data to estimate DOC.

163. In the CRF additional information box, the CH_4 generation rate constant was reported to be 0.0 and the time lag considered was notified as NE. Since these parameters are used only for the FOD model it is recommended that the NA notation key be used instead. The same issue was identified in the previous review.

C. Non-key sources

Waste-water handling – CH_4 and N_2O

Methodology

164. The IPCC default methodology was used to estimate CH_4 emissions from domestic and industrial waste-water/sludge handling and N_2O emissions from human sewage.

Activity Data

165. Data on amounts of domestic and industrial waste water and sludge generation and type of treatment are provided by the NSI. Since this information is not provided in the NIR, the ERT recommends that Bulgaria provide it in future NIRs.

166. Data on protein consumption are country-specific value and are provided in the CRF.

Emission Factors

167. The parameters used for determining EFs are default values from IPCC Guidelines and the IPCC good practice guidance. These items of information are not provided in the NIR.

D. Areas for further improvement

Identified by the Party

168. There has been a significant improvement in the data collection system managed by the NSI and the EEA for solid waste disposed to landfills and in the enforcement of national waste legislation in recent period. This has resulted in an overall improvement of the accuracy, completeness and transparency of data in the Waste sector.

169. It is expected that, as a result of improvements in the waste management systems, there will be more separation and recycling of waste materials before landfilling.

Identified by the ERT

170. In the opinion of the ERT, the allocation of almost three-quarters of solid wastes to managed landfills, which ultimately determines the amount of CH4 emissions from this source, is not fully supported by the existing information and criteria related to Bulgaria's controlled landfills. The inventory compilers are advised to reconsider the approach to this particular key emission source with a view to selecting values of the input parameters that are substantiated by the available data and thereby obtain more robust estimates.

171. Beside the specific issues addressed above, further improvement in the Waste sector could be achieved in overall transparency of AD and EFs used for estimating emissions.

ANNEX 1: MATERIALS USED DURING THE REVIEW

A. Support materials on the CD-ROM and the web page for the review

2003 Inventory submission of Bulgaria, including CRF for 2000 and 2001 and an NIR.
2002 Inventory submission of Bulgaria (Summary and trend tables for 1999 (CRF)).
UNFCCC secretariat. "Report of the individual review of the greenhouse gas inventory of Bulgaria submitted in the year 2001 (Desk review)." FCCC/WEB/IRI(1)2001/BGR (available at http://unfccc.int/program/mis/ghg/countrep/buldeskrev.pdf).
UNFCCC secretariat. "2003 Status report for Bulgaria" (available at http://unfccc.int/program/mis/ghg/statrep03/bgr03.pdf).
UNFCCC secretariat. "Synthesis and assessment report of the greenhouse gas inventories submitted in 2003 Part I", FCCC/WEB/SAI/2003 (available at http://unfccc.int/program/mis/ghg/s_a2003.html); and Part II – the section on Bulgaria) (unpublished).
UNFCCC secretariat. Review findings for Bulgaria (unpublished).
UNFCCC secretariat. "Handbook for review of national GHG inventories". Draft 2003, (unpublished).
UNFCCC secretariat. "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories." FCCC/CP/1999/7 (available at http://www.unfccc.int/resource/docs/cop5/07.pdf).
UNFCCC secretariat. "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention." FCCC/CP/2002/8 (available at http://unfccc.int/resource/docs/cop8/08.pdf).
UNFCCC secretariat. Database search tool – *Locator* (unpublished).
IPCC. *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, 2000* (available at http://www.ipcc-nggip.iges.or.jp/public/gp/gpgaum.htm).
IPCC/OECD/IEA. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, volumes 1–3, 1997* (available at http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm).
Third national communication of Bulgaria.

B. Additional materials received during the in-country visit

Bulgaria, Law on Statistics, *Official Gazette* no. 57, 25 June1999, as amended in *Official Gazette* no. 74, 30 July 2002).
Bulgarian National Statistical Institute. Energy Balance 2001.
Bulgarian National Statistical Institute. Questionnaires sent to enterprises, municipalities, etc. for data collection (air emissions, water use, water supply, waste-water streams, amounts of waste, expenditures, environmental protection, etc.).
Bulgarian National Statistical Institute. National Statistical Yearbook 2002, p. 304, "Livestock products 1997–2001".
Bulgarian Ministry of Environment and Water. "Bulgarian waste management legislation".
Bulgarian National Statistical Institute. Environment Statistics 2001.
Bulgarian Ministry of Agriculture and Forestry, National Forestry Board. "The forests in Bulgaria" (brochure).
Bulgarian Ministry of Agriculture and Forestry, Agro Statistics Department. "Bancik 2001. Final results. Land cover and land use of the territory of Bulgaria in 2001: Results and analysis".
Unpublished, internal materials:
List of emission factors used (energy industries, manufacturing industries and construction, transport, other sectors, fugitive emissions, enteric fermentation, manure management, rice cultivation, agricultural soils, agricultural residues, solid waste, domestic waste water, industrial waste water).
List of emission factors used (Industrial Processes) (in Bulgarian).
Fuel uses (in tonnes) according to vehicle types in 2000 (in Bulgarian).
Mineral fertilizers used (in Bulgarian).
Average livestock population 1988, 1990–2001.
Changes in parameters related to areas, 1955–2000 (in five-year periods) (in Bulgarian).

Data on forest cuts (in million m^3, 1988–2001) (handwritten; source: Bulgarian Ministry of Agriculture and Forestry, National Forestry Board).

Analysis of recent energy demand and GHG emission trends: Effect of applied policies and measures.

C. Materials given access to during the visit

Bulgarian National Statistical Institute. National Statistical Yearbook 2002.

"Guidelines for balance method estimation of the pollutants emissions released in the atmosphere", Sofia, 2000 (internal document, in Bulgarian).

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