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# REPORT OF THE INDIVIDUAL REVIEW OF GREENHOUSE GAS INVENTORIES OF SLOVAKIA SUBMITTED IN THE YEAR 2001[1]

**(Desk review)**

## I. OVERVIEW

### A. Introduction

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

2. The review of Slovakia's 2001 inventory submission took place from 8 October to 27 October 2001. The desk review was carried out by a team of nominated experts from the roster of experts, working in their own countries. Experts participating in the review were Mr. Klaus Radunsky (Generalist, Austria), Mr. Michael McGettigan (Energy, Ireland), Mr. John Sarafidis (Energy, Greece), Mr. Mauro Meirelles de Oliveira Santos (Industrial processes, Brazil), Mr. Alexander Nakhutin (Industrial processes, Russian Federation), Mr. Ayite-Lo Ajavon (Agriculture, Togo), Mr. Pascal Boeckx (Agriculture, Belgium), Mr. Tomás Hernández-Tejeda (Land-use change and forestry (LUCF), Mexico), Mr. James Barton (LUCF, New Zealand), Ms. Sirintornthep Towprayoon (Waste, Thailand) and Mr. Heinrich Widmer (Waste, Switzerland). The review was coordinated by Ms. Rocio Lichte (UNFCCC secretariat). Mr. Klaus Radunsky and Mr. Ayite-Lo Ajavon were lead authors of this report.

3. In accordance with the UNFCCC review guidelines, a draft version of this report was communicated to the Government of Slovakia, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

### B. Inventory submission and other sources of information

4. The expert review team (ERT) reviewed the 2001 inventory submission of Slovakia, which consists of common reporting format (CRF) tables for the year 1999 submitted on

[1] In the symbol for this document, 2001 refers to the year the inventory was submitted and not to the year of publication. The number (1) indicates that for Slovakia this is a desk review report.

[2] For the UNFCCC review guidelines and decision 6/CP.5, see document FCCC/CP/1999/7, pages 109 to 114 and 121 to 122, respectively.

23 April 2001. In addition, Slovakia submitted a brief national inventory report (NIR) during the time of the review. The ERT also made some reference to the CRF for the inventory year 1998 submitted in 2000 and to the Second National Communication (NC2) for more information on inventory methods.

5. For the review the ERT also used the 2001 status report, the draft synthesis and assessment (S&A) report 2001, the final S&A report of the 2000 inventory submissions (FCCC/WEB/SAI/2000), as well as the preliminary key source analysis prepared by the UNFCCC secretariat.[3] During the review, Slovakia responded to the preliminary findings raised in the draft S&A report for the land-use change and forestry (LUCF) sector and provided a revised CRF for 1999 that included some of the tables that had not been filled in in the CRF submitted on 23 April 2001.[4]

6. Other sources of information used during the review include: the preliminary guidance for experts participating in the individual review of GHG inventories, the UNFCCC reporting guidelines[5] and the review guidelines (FCCC/CP/1999/7).

7. During the review the Party was not contacted to request additional information.

## C. Emission profile, trends, key sources

8. Slovakia has an emission profile broadly typical of an Annex I country. The most important GHG is carbon dioxide ($CO_2$) which, in 1999, accounted for 86% of total emissions,[6] followed by methane ($CH_4$), 9%, and nitrous oxide ($N_2O$), 5%. By source category, energy accounted for 82% of total emissions; agriculture, 7%, industrial processes, 7%, and waste, 3.5%.

9. Tables 1 and 2 provide data on emission trends by gas and by sector. Emissions of $CO_2$, excluding LUCF, decreased by 25% between 1990 and 1999 due mainly to a decline in emissions in the energy industry between 1990 and 1994, which is typical of a country with an economy in transition (EIT). $N_2O$ emissions also decreased (by 53%) between 1990 and 1999. Agriculture, industrial processes, LUCF and waste all contributed to the decline in $N_2O$ emissions, whereas emissions in energy increased, with a significant increase in transport. $CH_4$ emissions also showed a decline of 31% between 1990 and 1999, with $CH_4$ emissions from agriculture, waste, energy and LUCF all decreasing and those from transport increasing. Hydrofluorocarbons (HFCs) experienced significant growth from 1994, with emissions in 1999 being 22 times those of 1994, whereas perfluorocarbon (PFC) emissions decreased by 95% from 1990. $SF_6$ emissions also increased significantly from 1994. Total GHG emissions (without $CO_2$ from LUCF) decreased by 28% between 1990 and 1999.

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[3] The UNFCCC secretariat had identified, for each individual Party, those source categories that 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 that provided a full CRF for the year 1990. The key sources presented in this report are based on the secretariat's preliminary key source assessment. These might differ from the key sources identified by the Party itself.

[4] For technical reasons, it was not possible to take into account the revised CRF in this review.

[5] The guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories (FCCC/CP/1999/7), are referred to in this report as the UNFCCC reporting guidelines.

[6] In this report, the term total emissions refers to the aggregate national GHG emissions expressed in terms of $CO_2$ equivalents excluding LUCF, unless otherwise specified.

**Table 1. GHG emissions by gas, 1990-1999 (Gg $CO_2$ equivalent)**

| GHGs | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|---|---|---|---|---|
| | $CO_2$ equivalent (Gg) | | | | | | | | | |
| Net $CO_2$ emissions/removals | 57,180 | 50,006 | 46,466 | 43,574 | 39,816 | 41,235 | 40,644 | 41,072 | 41,911 | 42,248 |
| $CO_2$ emissions (without LUCF)[(a)] | 59,606 | 52,432 | 48,892 | 46,000 | 43,051 | 44,470 | 44,877 | 45,157 | 43,594 | 44,875 |
| $CH_4$ | 6,767 | 6,182 | 5,635 | 5,253 | 5,114 | 5,212 | 5,336 | 5,056 | 4,688 | 4,658 |
| $N_2O$ | 5,885 | 4,976 | 4,378 | 3,643 | 3,694 | 3,867 | 3,201 | 3,181 | 3,026 | 2,745 |
| HFCs | 0 | 0 | 0 | 0 | 3 | 25 | 45 | 70 | 44 | 66 |
| PFCs | 272 | 267 | 249 | 156 | 132 | 114 | 35 | 33 | 24 | 14 |
| $SF_6$ | 0 | 0 | 0 | 0 | 9 | 10 | 11 | 11 | 12 | 13 |
| Total (with net $CO_2$ emissions/removals) | 70,104 | 61,431 | 56,728 | 52,627 | 48,768 | 50,462 | 49,272 | 49,423 | 49,706 | 49,743 |
| Total (without $CO_2$ from LUCF)[(a)] | 72,530 | 63,857 | 59,154 | 55,053 | 52,003 | 53,697 | 53,505 | 53,509 | 51,389 | 52,370 |

[(a)] In the CRF, the information in these rows is requested to facilitate comparison of data since Parties differ in the way they report $CO_2$ emissions and removals from LUCF.

**Table 2. GHG emissions by sector, 1990-1999 (Gg $CO_2$ equivalent)**

| SOURCE AND SINK CATEGORIES | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|---|---|---|---|---|
| | $CO_2$ equivalent (Gg) | | | | | | | | | |
| 1. Energy | 57,771 | 51,327 | 47,373 | 44,522 | 41,439 | 42,756 | 43,383 | 43,594 | 41,852 | 43,099 |
| 2. Industrial processes | 4,731 | 3,755 | 3,901 | 3,662 | 4,045 | 4,271 | 3,415 | 3,546 | 3,658 | 3,704 |
| 3. Solvent and other product use | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4. Agriculture | 7,860 | 6,662 | 5,810 | 4,878 | 4,541 | 4,679 | 4,579 | 4,392 | 4,070 | 3,731 |
| 5. LUCF (net emissions) | -2,345 | -2,345 | -2,345 | -2,345 | -3,173 | -3,173 | -4,211 | -4,038 | -1,670 | -2,612 |
| 6. Waste | 2,088 | 2,032 | 1,989 | 1,909 | 1,916 | 1,929 | 2,106 | 1,930 | 1,796 | 1,821 |
| 7. Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

10. Slovakia did not provide an identification of its key sources. According to the preliminary assessment by the secretariat, the key sources shown in table 3 below have been identified for Slovakia.

**Table 3. Key sources Slovakia, 1999: Level assessment (UNFCCC secretariat)[(a)]**

| Key source | Gas | Level assessment % | Cumulative total % |
|---|---|---|---|
| Stationary combustion – coal | $CO_2$ | 33.4 | 33 |
| Stationary combustion – gas | $CO_2$ | 25.8 | 59 |
| Mobile combustion – road vehicles | $CO_2$ | 8.7 | 68 |
| Stationary combustion – oil | $CO_2$ | 5.9 | 74 |
| Stationary combustion – other fuels | $CO_2$ | 4.3 | 78 |
| Limestone and dolomite use | $CO_2$ | 3.4 | 82 |
| Direct emissions from agricultural soils | $N_2O$ | 3.1 | 85 |
| Cement production | $CO_2$ | 2.4 | 87 |
| Enteric fermentation in domestic livestock | $CH_4$ | 2.2 | 89 |
| Solid waste disposal sites | $CH_4$ | 1.9 | 91 |
| Waste water handling | $CH_4$ | 1.6 | 93 |
| Fugitive emissions: oil & gas operations | $CH_4$ | 1.4 | 94 |
| Fugitive emissions: coal mining & handling | $CH_4$ | 1.1 | 95 |

[(a)] See footnote 3 of this report.

## D. General assessment of the inventory

### 1. Completeness and transparency of reporting

Completeness

11. Slovakia submitted inventory data for the year 1999 using the CRF of the UNFCCC reporting guidelines. The ERT identified some areas where the reporting relating to emissions of HFCs, PFCs and $SF_6$ in the national inventory could be improved (details of the emissions remain unclear). Emissions from international bunkers are included under transport and have not been reported separately. With these exceptions, the inventory covered all major sources and sinks, as well as all direct and indirect gases included in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, hereinafter referred to as the IPCC Guidelines.

12. The ERT noted that for the years 1990 to 1998 a full CRF has not been provided in the 2001 inventory submission. However, CRF tables for the year 1998 were submitted in 2000, and inventories were submitted in IPCC tables for the years 1990 to 1997.

Transparency

13. Transparency of the inventory, as defined by the UNFCCC reporting guidelines, cannot be fully assessed in this review because the complete information as required by the UNFCCC reporting guidelines, which is essential for conducting a review, has not been provided as part of the 2001 submission. This missing information includes the background data needed for a comprehensive NIR according to the UNFCCC reporting guidelines, completed CRF tables covering recalculations (table 8(a) and table 8(b)),[7] sectoral background data for industrial

[7] The revised CRF provided by Slovakia during the review included recalculation tables; however, these could not be considered during this review (see also paragraph 5 and footnote 4).

processes (table 2(II).F) and waste (table 6.C), completeness (table 9) and a complete CRF time series of inventories from 1990. Good use is made of notation keys in the various tables[8].

14. The NC2 provides some background information about the compilation of GHG inventories in Slovakia. However, revised time series of emissions in both the 2000 and 2001 submissions suggest that there are substantial ongoing efforts to further develop and improve GHG inventories. The causes and assumptions underlying the revisions are not entirely clear from the available reports.

15. The ERT strongly recommends that Slovakia provide more comprehensive submissions in the future by including the information mentioned above and a more detailed breakdown of emissions from the various subsectors of energy source category 1.A.2. More information is also needed on the format of the national energy statistics,[9] the differences between bottom-up and top-down data, and a precise description of the manner in which they are applied in GHG inventories. See also footnote 8 for information provided by Slovakia in its response to the draft of this report.

## 2. Cross-cutting issues

Institutional arrangements

16. Institutional arrangements were not addressed by the desk review.

Record keeping

17. No assessment of record keeping was made during this desk review.

Verification and quality assurance/quality control (QA/QC) approaches

18. No information was provided in the 2001 inventory submission regarding QA/QC or whether the inventory data was subject to any self-verification or independent review procedures.

Recalculations

19. Recalculations have been conducted for Slovakia's inventories. The draft S&A report 2001 states that differences are evident between GHG trend tables in 2001 and those of the 2000 submission. The NIR states that the most recent revisions were undertaken in the preparation of the Third National Communication (NC3) and that the trend tables in the 2001 submission are consistent with those published in the NC3. Tables 8(a) and 8(b) of the CRF relating to recalculations have not been filled in in the 1998 and 1999 inventories (see also paragraph 5 and footnotes 4 and 7). Total GHG emissions in the base year submitted in 2001 were 5% lower than the corresponding value reported in the 2000 submission.

Uncertainties

20. The ERT noted that no specific information on estimates of uncertainty has been provided. The NIR states that uncertainty associated with emissions of $CO_2$ from fuel

[8] Slovakia informed the ERT that background information including descriptions of the methods used is currently available in the Slovak language only, in the form of sectoral reports, but that Slovakia is planning to provide these reports in English by 2008.

[9] In its response Slovakia indicated that the statistical system in Slovakia is standardized according to the EU/Eurostat.

combustion in Slovakia is less than 5% and that the accuracy of the $CO_2$ balance (carbon cycle) in forests and soils was estimated at 30%. The uncertainty of estimation for $CH_4$ emissions for individual categories in general is about 30%. A qualitative uncertainty assessment based on the use of indicators is provided in CRF table 7.

## 3. Areas for further improvement

Planned or ongoing work by the Party

21. Further development of inventories is constrained by limited resources, but Slovakia plans further work to improve the accuracy of emissions estimates and to prepare a NIR with all required information (such as emission factors, activity data).

22. The ERT encourages Slovakia to continue its efforts to further improve the accuracy of its emissions estimates and to submit a NIR which is fully in line with the UNFCCC reporting guidelines.

Issues identified by the ERT

23. The ERT found that Slovakia's inventory needed some further improvement in addition to the improvements related to transparency already indicated in paragraphs 13 to 15 above. A NIR and a complete CRF time series, complying with the specifications set down in the UNFCCC reporting guidelines, is needed to fully assess transparency and consistency as defined in those guidelines.

24. The ERT encourages Slovakia to implement the good practice guidance as far as possible, noting the special consideration given to countries with economies in transition.[10]

25. *Verification*: the ERT encourages Slovakia to consider implementing and reporting a formal system of verification for the whole national inventory, consistent with the IPCC Guidelines and good practice guidance. This will help overcome some existing inconsistencies and gaps in the current inventory.

26. *Methodologies*: Slovakia is encouraged to supply, as part of its NIR, information about the methodologies chosen and the rationale underlying the choice (see also footnote 8). It should also consider developing, where appropriate, tier 2 approaches for key source categories.

27. *Calculation sheets*: Slovakia may wish to provide calculation sheets in order to provide information, in a transparent manner, about the actual calculations and how those calculations are linked to the data reported in the CRF.

28. *Emission factors*: Slovakia may wish to consider a review of some emission factors, particularly those obtained from the *Joint EMEP/CORINAIR Atmospheric Emission Inventory Guidebook* and the Revised 1996 IPCC Guidelines, to reflect recent research and technological developments, as well as national circumstances.

29. *Reporting*: Slovakia is strongly encouraged to submit a NIR consistent with the UNFCCC reporting guidelines, as well as the full time series of emissions data using the CRF

[10] According to the conclusions of the Subsidiary Body for Scientific and Technological Advice (SBSTA) at its twelfth session, the IPCC good practice guidance should be applied by Annex I Parties as far as possible for inventories due in 2001 and 2002, and should be used for inventories due in 2003 and beyond. Annex I Parties with economies in transition may phase in the good practice guidance two years later than other Annex I Parties.

from 1990 onwards, and to further improve the explanation given of trends (for example with respect to year-to-year variation for changes in forest and other woody biomass).

30. *Completeness:* In its future inventories, Slovakia may wish to consider reporting emissions from international bunkers separately from domestic transport emissions.

31. *Uncertainty*: Slovakia may wish to quantify uncertainties according to the IPCC good practice guidance for key source categories.

32. *Notation keys*: Slovakia is encouraged to make further use of the notation keys in accordance with the UNFCCC reporting guidelines.

### 4. Consistency with the UNFCCC reporting guidelines and the IPCC Guidelines

33. The NIR describes the 1990 to 1999 GHG time series as consistent with respect to methods and principal data inputs. The 1999 CRF tables are broadly consistent with the IPCC and UNFCCC reporting guidelines although some key tables have not been filled in. A more comprehensive NIR and a complete CRF time series are needed to fully comply with the UNFCCC reporting guidelines. Apparently good practice guidance has not yet been fully implemented, although some elements of good practice guidance may already apply according to information provided in the NIR.

### 5. Conclusion

34. The ERT considers that, in its 2001 inventory submission, Slovakia provided only partly adequate information to the COP on its GHG inventory and GHG emission trends.

## II. ENERGY

## A. Sector overview

35. Total GHG emissions in Slovakia decreased by approximately 28% from 72,530 Gg in 1990 to 52,370 Gg in 1999. The energy sector remains the major source of emissions. This sector accounted for 92% of all $CO_2$ emissions in the country in 1999 and for 82% of total GHG emissions. Five key source categories in the energy sector contributed approximately 90% of all $CO_2$ emissions and 78% of total GHGs in Slovakia in 1999. The combustion of coal accounted for almost 40% of $CO_2$ emissions and for one-third of all GHGs.

### 1. Completeness

36. The energy sector of the Slovak inventory is substantially covered with respect to IPCC source categories and all gases relevant to the sector are reported in the CRF. However, the ERT notes that emissions from international bunkers do not appear to have been estimated (reported as NE), although marine bunkers are probably not applicable. This was confirmed by Slovakia in its response to the draft of this report. The NIR states ambiguously that aviation emissions are included under 1.A.3 Transport but are assumed to be negligible. According to Slovakia's response to the draft of this report the entirety of aviation emissions is included in the national total; data on fuel consumption for international flights could not be obtained separately. Slovakia uses the IPCC reference approach to derive total $CO_2$ emissions from combustion sources and this methodology has been given the most detailed treatment in the 1999 CRF. Fugitive emissions are adequately covered in tables 1.B.1 and 1.B.2. Generally there has been a thorough use of notation keys throughout the CRF tables.

## 2. Methodologies, activity data and emission factors

37. Slovakia relies on the application of the IPCC reference approach to calculate $CO_2$ emissions from stationary combustion sources because, according to the NC2, it was not possible to obtain a full sectoral breakdown of energy consumption from national statistics. The emission factors used in this approach appear to be country-specific values.

38. The sectoral approach has also been completed in the 1998 CRF (2000 submission) and 1999 CRF (2001 submission) for $CO_2$ emissions from combustion sources. However, there is significant aggregation of activity data and emissions between categories 1.A.1 and 1.A.2 due to the full sectoral breakdown of energy consumption not being available and, consequently, use of the notation key included elsewhere ("IE") for all subsectors under 1.A.2. This limits the number of useful comparisons of implied emission factors (IEFs) that can be made with other Parties' tier 1 methods; default emission factors have also been used for $CH_4$ and $N_2O$ emissions from stationary combustion sources.

39. Table Summary 3 of the CRF indicates that a model approach has been used to derive emission estimates from all transport sources. According to the NIR, this model refers to the COPERT II model developed for use in the CORINAIR methodology. Tier 1 methods and a combination of country-specific and default emission factors are used to quantify fugitive emissions of $CH_4$.

40. Annual energy consumption data are available on a top-down basis in the statistical yearbook. A national register of emissions and air pollution sources provides energy data compiled on a bottom-up basis, but annual updates cover only stationary sources >= 5 MW and mobile sources.

## 3. Recalculations

41. The draft S&A report 2001 states that differences are evident between GHG trend tables in the 2001 and 2000 submissions. Furthermore, some differences are also apparent in the energy sector totals for $CO_2$ and $CH_4$ published in the NC2 for the years 1990 through 1995 compared with the corresponding values in the 1998 CRF trend tables. The NIR states that the most recent revisions were undertaken in the preparation of the NC3 and that the trend tables in the 2001 submission are consistent with those published in the NC3. Tables 8(a) and 8(b) of the CRF relating to recalculations, have not been filled in in the 1998 and 1999 CRFs (2000 and 2001 submissions, respectively) (see also paragraph 5 and footnotes 4 and 7). The revised estimates for $CH_4$ in the energy sector are approximately 40% lower in the 1999 CRF than in the 1998 CRF due to downward revision of the fugitive emissions from subsector 1.B.2 Oil and natural gas.

## 4. Uncertainties

42. No specific information is provided about estimates of uncertainty. A high quality rating is assigned to $CO_2$ emissions from the energy sector in CRF overview table 7. The NC2 states that uncertainty associated with emissions of $CO_2$ from fuel combustion in Slovakia (four fifths of total GHGs) is less than 10%, based on a comparison of the emissions estimated using national and IPCC default emission factors.

### 5. Consistency with the UNFCCC reporting guidelines and the IPCC Guidelines

43. The Slovak GHG inventory for the energy sector has been compiled in broad conformity with the IPCC Guidelines. The $CO_2$ emissions from combustion sources, which account for the bulk of GHGs in Slovakia, are determined through an in-depth application of the reference approach, with full accounting using the IPCC methodology for carbon storage in feedstocks and other non-energy uses of fuels.

44. The sectoral approach for $CO_2$ estimation lacks sectoral detail due to the manner in which national energy data are published but, overall, it is adequate for comparison purposes. The 1999 CRF tables generally exhibit consistency with the UNFCCC reporting guidelines with relatively few tables left uncompleted and widespread use of notation keys. The ERT notes that emissions from international bunkers are not reported in accordance with the guidelines. The indicator not estimated ("NE") is used in relation to marine bunkers, although not occurring ("NO") would probably be more appropriate for Slovakia. In its response to the draft of this report Slovakia noted that NE was erroneously reported, but that this would be corrected in the next inventory submission.

## B. Reference and sectoral approach

### 1. Comparison between reference and sectoral approach

45. It appears that national top-down energy statistics in Slovakia are well suited to the application of the reference approach. Emissions of $CO_2$ according to the reference approach are therefore the basis of the total in Slovakia for all years from 1990. The emissions calculated under the sectoral approach are based on bottom-up energy data and are included mainly for verification purposes. Although the NC2 states that IPCC default emission factors are used to calculate $CO_2$ emissions under the reference approach, the values for 1998 and 1999 clearly deviate from the defaults in virtually every case. A full analysis of carbon storage through the non-energy use of fuels, as required by this method, is presented in the 1998 and 1999 CRFs.

46. There is a difference of just over 1% between the results of these two methods in 1999 (table 1.A(c) of the CRF) for both total energy and total emissions. However, in the case of solid fuels, energy consumption and emissions under the reference approach are 21% and 16% higher, respectively, than those under the sectoral approach.

### 2. Treatment of feedstocks and non-energy use of fuels

47. Table 1.A(d) relating to feedstocks and non-energy use of fuels has been completed fully for 1998 and 1999 (2000 and 2001 submission, respectively). For all fuel types in table 1.A(d) relating to feedstocks and non-energy use of fuels in Slovakia, the default proportions for carbon storage given in the IPCC Guidelines are used in the calculations for both years.

### 3. International bunker fuels

48. The emissions from international bunker fuels are not estimated. See also paragraphs 36 and 44 above.

## C. Key sources

### 1. Stationary combustion – $CO_2$ emissions from oil, gas and coal

49. Key source sector analysis shows that the four stationary combustion source categories relating to coal, gas, oil and other fuels accounted for 80% of total $CO_2$ emissions in 1999 and for 69% of total GHG emissions. The $CO_2$ emissions from coal combustion alone contributed one-third of all GHG emissions in 1999. The combined emissions from these key source categories determined the overall decreasing trend in $CO_2$ emissions in Slovakia from 1990 to 1994 followed by stabilization in more recent years.

50. In the sectoral approach, all emissions in 1.A.1 Energy industries and 1.A.2 Manufacturing industries and construction are combined in sub-category 1.A.1(a) Public electricity and heat production. The resultant IEFs are therefore highly aggregated values.

51. The IEF of 50 t/TJ for $CO_2$ in respect of the combined emissions from liquid fuels in 1999 under 1.A.1 and 1.A.2 was identified as being among the lowest for all reporting Parties. This value is approximately one-third less than the typical value for such fuels. The corresponding value of 32.36 t/TJ for 1998, highlighted in the draft S&A report, deviates even further from typical or default $CO_2$ emission factors.

52. The similarly anomalous $CO_2$ IEF of 32.36 t/TJ for liquid fuels under subsector 1.A.4 Other sectors in both 1998 and 1999 is determined by the same consumption and emission values for both years in the underlying 1.A.4(a) Commercial and institutional source category. Such a result is probably due to a combination of mismatched emissions and activity data and incorrect aggregation of data for sub-categories 1.A.4(a) through 1.A.4(c).

### 2. Fuel consumption by road traffic

53. Fuel combustion in road transport was another key source category in the energy sector in 1999, generating $CO_2$ emissions which accounted for 8.7% of all GHGs. Unlike many other reporting Parties, the emissions in Slovakia from this key source category show a marginal decrease between 1990 and 1999.

54. The CORINAIR methodology as applied to 1.A.3(b) Road transportation under the sectoral approach, is essentially a tier 3 methodology for all gases. The 1999 $CO_2$ emissions factors for gasoline and diesel used in this subsector are similar to IPCC default values and the values of other Parties. However, the $CO_2$ IEF in the case of liquefied petroleum gas (LPG) in 1999 is approximately 25% higher than the IPCC default for this fuel, although the amount of fuel concerned is small. The 1998 CRF submitted in 2000 is incomplete in respect of 1.A.3(b) Road transportation, and IEFs are not available.

### 3. Fugitive emissions

55. The 1999 IEF of 7 kg/tonne for total fugitive $CH_4$ emissions from Coal mining (underground mines) in Slovakia shows a marked deviation from the IPCC recommended range of 0.6-2.7 kg/tonne for this source. In its response to the draft of this report, Slovakia informed the ERT that this emission factor is based on measurements undertaken in the former Czechoslovakia and could be reconsidered in the future.

56. The IEF for fugitive $CH_4$ in subsector 1.B.2(b) Natural gas transmission decreased from 5,000 kg/PJ in 1998 to 2,000 kg/PJ in 1999. The IEF for fugitive $CH_4$ from Other leakage in this

subsector decreased from 340,000 kg/PJ in 1998 to 120,000 kg/PJ in 1999. The NIR indicates that these changes followed reconsideration of gas balance differences by the national gas company. The NIR states that the reduced emission factors are applied in the recalculated inventories from 1990.

### D. Non-key sources

57. Activity data are reported for domestic navigation in the CRF, but there is no such entry in the energy balances of the International Energy Agency (IEA).

58. The IEA energy balances show jet kerosene consumption of 892 GJ under 1.A.3(a) Civil aviation (domestic) in 1999, but no activity data are reported for this item in the CRF.

### E. Areas for further improvement

Issues identified by the ERT

59. This review and the draft S&A report 2001 identify a small number of apparently anomalous IEFs relating to $CO_2$ emissions from key source categories. The reason may be the high degree of aggregation of the activity data and emission data concerned. The Party is therefore encouraged to provide separate breakdowns of emissions in 1.A.1 Energy industries and in the various sub-categories under 1.A.2 Manufacturing industries and construction in future submissions.

60. The Party is encouraged to provide more information on the format of national energy statistics, the differences between top-down and bottom-up data, and the precise manner in which they are applied in GHG inventories.

## III. INDUSTRIAL PROCESSES

### A. Sector overview

61. As stated in the NIR, $CO_2$ emissions occurring in coke and aluminium production, crude oil processing and metallurgy are included in the balance of $CO_2$ emissions from fossil fuel combustion (reference approach). Because of that the share of the industrial sector in GHG generation appears to be low. The emissions in industrial processes accounted for 6.5% of total emissions in Slovakia in 1990, increasing to 7.1% in 1999. Industrial processes accounted for 7.9% of $CO_2$ emissions, which accounted for 6.8% of all GHGs in 1999. Limestone and dolomite use accounted for 50% of total industrial processes emissions, followed by emissions due to cement production (35%) and lime production (15%).

62. HFC, PFC and $SF_6$ emissions accounted for 0.4% of the country's total emissions in 1990 and 0.2% in 1999. The share of HFCs in the total emission of fluorinated GHGs in 1999 was 71%; PFCs contributed 15%, and $SF_6$ 14%.

63. Total emissions of fluorinated GHGs decreased by 66% in the 1990 to 1999 period. HFCs experienced significant growth from 1994 with emissions in 1999 being 22 times those of 1994, whereas PFC emissions decreased by 95% from 1990. $SF_6$ emissions also increased significantly, growing from 0.03 Gg of $CO_2$ equivalent in 1990 to 12.7 Gg in 1999.

64. According to Slovakia's NIR, emissions of PFCs decreased as a result of introducing modern technologies in aluminium production. Rapid growth of HFC emissions is caused by replacement of freons in the refrigerating systems.

### 1. Completeness

65. All sources indicated in the IPCC Guidelines which occur in Slovakia are included in the national inventory.

66. Estimation of consumption of halocarbons and $SF_6$ is described by the Party as "partial" in CRF table 7. In the absence of any comments on the subject, the ERT was not able to decide whether incomplete activity data were collected by the Slovakia's inventory team, resulting in incomplete estimates, or whether some subcategories (e.g., foam blowing, semiconductors manufacture) were not estimated in this source category.

67. No estimates of HFC emissions are included in the CRF for the 1990 to 1993 period. In its response to the draft of this report, Slovakia explained that, according to the results of surveys, emissions from these categories did not occur at that time. The ERT notes, however, that small-scale emissions from refrigeration and air conditioning may possibly have existed in that period. See also paragraph 94.

68. CRF table 9 (completeness) was not filled in in the 2001 inventory submission.

### 2. Consistency

69. The ERT came to the conclusion that the time series of emissions in the industrial processes sector are consistent from a methodological viewpoint and may be consistent in respect of activity data.

### 3. Recalculations

70. According to the NIR, all emissions were recalculated using the methodologies from the Revised 1996 IPCC Guidelines, however CRF table 8 provides no information on recalculations in the industrial processes sector.

### 4. Transparency

71. Transparency of the industrial processes sector cannot be fully assessed by the ERT because essential support material is not available. This missing information includes the background data in the NIR and completed CRF tables covering recalculations (tables 8(a) and 8(b)), sectoral background data for industrial processes (table 2(II)F), completeness (table 9), and a complete HFC time series from 1990.

72. Use of notation keys in the CRF tables for methodologies and emission factors have increased the degree of transparency in the industrial processes sector.

73. The ERT concluded that, for purposes of checking, more information besides the CRF was needed. For example, in limestone and dolomite use the emission factor used was 0.44 t/t. This could mean pure calcium limestone use (IPCC default) or some type of mix with dolomite, which has an emission factor that is lower than 0.477 t/t depending on its composition.

### 5. Comparability

74. Owing to the reporting of some industrial emissions in the energy sector, as mentioned in the *overview* above, comparability in this sector is difficult to assess.

75. Comparability of HFC, PFC and $SF_6$ emission estimates is relatively high. However, it is limited by a lack of information on activities, methodology and other background information.

## 6. Methodology and emission factors

76. The NIR states that methodologies from the Revised 1996 IPCC Guidelines were used, as noted also in table Summary 3 of the CRF. IPCC tier 1 and tier 2 methods were used to estimate emissions of fluorinated gases.

77. Only information on emission factors is provided in the CRF, in table Summary 3, which indicates default emission factors for mineral products. These were the only ones mentioned in the sector.

78. Both IPCC default and country-specific emission factors were used by Slovakia's inventory team to estimate emissions of fluorinated gases.

## 7. Activity data

79. Activity data on production are taken from The Statistical Yearbook of the Slovak Republic (1990, 1995 and 1999). According to the NIR, activity data on consumption of HFCs, PFCs and $SF_6$, which are not included in national statistics, are obtained using questionnaires.

80. Some numerical activity data were not included in Slovakia's 1999 inventory submission (NIR and CRF). For example, in table 2(I).A-G sheet 1 of the CRF, some activity data are described as not estimated. The CRF sectoral background data table 2(II).F has not been filled in. However, the country's NIR includes some discussion of emission-related activities and trends.

## 8. Good practices

81. According to information provided in the NIR, the IPCC good practice guidance has not yet been fully implemented.

82. According to Slovakia's NIR, limited financial resources made it impossible to apply the national emission factors in all source categories of the industrial processes sector and to estimate uncertainty according to IPCC good practice guidance. In spite of this, the CRF and the NIR demonstrate some examples of implementing good practice, for example, obtaining information through questionnaires.

## 9. Uncertainty

83. Quantification of uncertainty according to the IPCC 1996 methodology was not implemented due to lack of input data and resources. Only the qualitative assessment of uncertainty in the industrial processes sector is presented in CRF table 7.

## 10. Cross-cutting issues with the energy sector

84. According to Slovakia's NIR, $CO_2$ emissions occurring in coke and aluminium production, crude oil processing and metallurgy are reported in the energy sector (reference approach).

## B. Key sources

85. 2.A.3. Limestone and dolomite use – $CO_2$ (3.4% level assessment): the S&A report points to a rather sharp increase in emissions from 1997 to 1998 of about 14.2%, and a decrease of 7.1% from 1994 to 1995.

86. 2.A.1 Cement production – $CO_2$ (2.4% level assessment): no indication is given of whether emission estimates are based on cement or clinker production; the IEF (0.411t/t) is one of the lowest among reporting countries, lower than the IPCC defaults for cement 0.499t/t or clinker 0.507-0.526t/t.

87. No source categories of HFCs, PFCs and/or $SF_6$ were identified as key sources on the basis of the level assessment. However, due to the rapid growth of these emissions, sources of fluorinated gases are likely to be identified as key sources on the basis of a trend assessment.

88. The ERT took special note of some reporting issues related to fluorinated gases, in particular, that potential emissions of HFCs are reported in CRF table 2(II) but not in the sectoral reports and summary tables.

89. $SF_6$ emissions reported in the CRF table 2(II) are not mentioned in the sectoral and summary report tables.

90. The $SF_6$ subcategory "Other" (CRF table 2(II)) needs further explanation and background information.

## C. Areas for further improvement

91. According to the NIR, Slovakia plans in future to further improve the accuracy of the results.

Issues identified by the ERT

92. The ERT encourages Slovakia to estimate the 12 items reported as not estimated under industrial processes in the CRF tables.

93. Slovakia may wish to improve completeness by reporting in the CRF the methodologies applied for estimating emissions of PFCs from aluminium production. Slovakia explained in its response to the draft of this report that PFC emissions are estimated on the basis of the frequency of anode effects, and provided as a reference the source in which the method is described.[11]

94. Emission trends of HFCs may be expanded to cover the 1990 to 1993 period (possibly by using notation keys).

95. The ERT encourages Slovakia to include information on recalculations in the industrial processes sector in future inventory submissions (see also paragraph 5, and footnotes 4 and 7 to this report).

96. Further comments are invited on the completeness of estimates in the 2.F Consumption of halocarbons source category, and on $SF_6$ emissions included as "Other" in CRF table 2(II) but not reflected in the sectoral report and summary tables.

[11] The description of the method can be found at: Mareckova,K.@all, Emissions of Greenhouse Gases in the Slovak Republic 1990-1994, Country Study Slovakia, final report, Bratislava, May 1997.

97. Slovakia may wish to improve the transparency of its reporting and comparability by providing more information on the methodologies used for emission estimation, and by more intensive use of notation keys.

# IV. AGRICULTURE

## A. Sector overview

98. Slovakia's inventory submission is in broad conformity with the UNFCCC reporting guidelines and IPCC Guidelines. Slovakia has provided the following information required by the COP:

(a) A brief NIR and a set of CRF tables;

(b) References for sources of information relating to emission factors and activity data;

(c) A check-list of reported inventory information;

(d) Estimates for the major sources and years 1998 and 1999;

(e) A description of the methodologies used to calculate emissions and removals;

(f) Recalculated estimates, with additional information in the NIR;

(g) Estimates of uncertainties for source categories.

99. Slovakia submitted inventory data for 1999 using the CRF. Emissions from agricultural residue burning were reported as not occurring (NO). The inventory covered all major sources and sinks, as well as all direct and indirect gases, included in the IPCC Guidelines.

100. Emissions from the agricultural sector were estimated using the IPCC Guidelines with either country-specific emission factors or parameters, where available, or default emission factors and other parameters.

Trends

101. Over the 1990 to1999 period, $CH_4$ emissions from agriculture (mainly from enteric fermentation) decreased from 101.3 Gg to 109.9 Gg, while $N_2O$ has decreased from 8.6 Gg to 8.3 Gg.

Draft S&A report

102. Slovakia did not provide any response to the different issues raised pertaining to the agriculture sector in the draft S&A report 2001.

## B. Key sources

### 1. 4.A Enteric fermentation - $CH_4$

103. The reporting of emissions estimates for this source category largely conforms to the UNFCCC reporting guidelines.

104. $CH_4$ from enteric fermentation: for cattle, sheep and swine the activity data were reported with lower values.

Methodology

105. Methane emissions from ruminants were estimated using the IPCC Guidelines and country-specific emission factors for cattle, sheep, goats and deer.

Recalculations

106. Recalculations have been made for Slovakia's inventories, but little information was provided.

Activity data and emission factors

107. The calculation of emissions from agriculture for the Slovak Republic are based on data in the Green Report of the Slovak Republic for agriculture and The Statistical Yearbooks. The IPCC default emission factors for livestock were modified according to specific national circumstances.

Completeness

108. Most $CH_4$ emissions from enteric fermentation from livestock classes were estimated. Slovakia's emission factors were not available for other livestock classes. The livestock classes recorded cover the most significant emissions.

Uncertainty

109. No specific information was available on uncertainties related to $CH_4$ emission estimates from enteric fermentation.

### 2. 4.D.1 Agricultural soils - $N_2O$

110. The reporting of $N_2O$ emission estimates for agricultural soils largely conforms to the UNFCCC reporting guidelines.

111. Direct $N_2O$ emissions from agricultural soils: for N-fixing crops and crop residue, the unit of the $N_2O$ IEF refers to kg $N_2O$ -N/kg instead of to kg $N_2O$-N/kg dry biomass, and for N input to soils that is lost through leaching and runoff.

112. Direct $N_2O$ emissions from utilization of agricultural land and from utilization of animal waste, as well as indirect $N_2O$ emissions from agriculture, were determined taking into account different types of soil, vegetation canopy and the application of mineral and organic fertilizers. $N_2O$ emissions are mainly caused by excessive deposits of mineral nitrogen in soil (the result of intensive fertilization) and an unfavourable air regime in soil (use of heavy machinery for cultivation).

113. No data on Histosols is provided and no reason is given. $FRAC_{GASM}$ is 0.3. This is higher than the IPCC default. $FRAC_{GRAZ}$ was calculated. However, transparency is again lacking. $FRAC_{LEACH}$ is very low (0.07).

Methodology

114. In the agriculture sector, the nitrogen balance was elaborated using the methodology in the Revised 1996 IPCC Guidelines. For crop residues, the methodology used was slightly different from the IPPC default method.

Recalculation

115. Slovakia provided recalculations for the inventories.

Activity data and emission factors

116. The calculation of emissions from agriculture for the Slovak Republic are based on data in the Green Report of the Slovak Republic and The Statistical Yearbooks. The IPCC default emission factors were modified according to specific national circumstances.

Completeness

117. Emission estimates for burning of agricultural residues were reported as not occurring. Slovakia informed the ERT in its response to the draft of this report that this agricultural practice is prohibited in Slovakia.

Uncertainty

118. No specific information was available on uncertainties related to $N_2O$ emission estimates for agricultural soils.

### C. Non-key sources

119. Indirect $N_2O$ emissions from agricultural soils: the $N_2O$ IEF for atmospheric deposition is low and no explanation was provided.

## V. LAND-USE CHANGE AND FORESTRY

### A. Sector overview

120. The LUCF sector constitutes a reported net sink (as in Summary 1.A of the CRF) of 2,627 Gg of $CO_2$ which, in absolute terms, is equivalent to 5.9% of Slovakia's total 1999 $CO_2$ emissions. According to table Summary 1.A of the CRF, for the year 1999, changes in forest and other woody biomass stocks constitute a net sink, reported as 809 Gg $CO_2$. Abandonment of managed lands constitutes a reported sink of 1,415 Gg $CO_2$, and $CO_2$ emissions and removals from soil constitute a reported sink of 669 Gg $CO_2$. Forest and grassland conversion constitute a reported source of 265 Gg $CO_2$.

121. Slovakia used a combination of default and country-specific methods for estimating $CO_2$ emissions and removals for the LUCF sector.

#### 1. Verification and QA/QC approaches

122. Slovakia did not submit information regarding QA/QC activities in the LUCF sector in a NIR or any other accompanying documentation. Hence, it was not possible to determine whether national self-verification or QA and QC procedures had been applied to the LUCF tables of the 1999 CRF.

123. Different values are reported for 1999 for table 5.A and table 5 for net $CO_2$ removals (-2,098.22 Gg $CO_2$ in table 5.A *versus* -808.65 Gg $CO_2$ in table 5); for gross $CO_2$ emissions (9,295.99 Gg $CO_2$ in table 5.A *versus* 9,171.00 Gg $CO_2$ in table 5); and for gross $CO_2$ removals (-11,394.21 Gg $CO_2$ in table 5.A *versus* -9,979.65 Gg $CO_2$ in table 5). Slovakia may explain these differences.

124. With regard to the above findings, Slovakia provided the following response: The differences between data for carbon uptake/removal reported in tables 5 and 5.A are connected with carbon uptake calculations. In table 5.A the carbon uptake is calculated for the whole area of Slovak forests including the areas which have been afforested during the past 80 years, as it is impossible to split these areas. Due to the fact that carbon uptake for afforested lands is calculated separately in table 5.C, it is necessary to correct for double carbon counting; in table 5, therefore, the value for gross carbon uptake is reported as the difference between the values from tables 5.A and 5.C. In the 2002 submission, a correction was made in the reported values and carbon uptake calculations were made only in table 5.A. For the year 2003, a NIR which includes all explanations will be prepared. All input data are based on the official statistical data from forestry statistics.

**2. Completeness**

125. Table 5, Sectoral report for LUCF, was used in the CRF, and the sectoral background tables (5.A-D) were used to report activity data and other information.

126. Table 5.A, Sectoral background data for changes in forest and other woody biomass stocks, was used for reporting activity data for a list of 20 temperate forest species. This table reported the area of forest/biomass stocks, average annual growth rate, carbon uptake increment and the implied carbon uptake factor for the 20 temperate forest species. Estimates of the amount of biomass removed in commercial harvest, traditional fuel wood consumed and total other wood used were reported.

127. Table 5.B, Forest and grassland conversion, was used for reporting activity data for the annual net loss of biomass for coniferous and broadleaf temperate vegetation and the on-site quantity of biomass burned. Estimates of on-site burning were given for emissions of $CO_2$, $CH_4$ and $N_2O$ for coniferous and broadleaf temperate vegetation. Estimates of biomass burned through forest fires were given, as was an estimate of the average quantity of biomass left to decay in forests.

128. Table 5.C, Abandonment of managed lands, was used for reporting activity data for temperate coniferous and broadleaf ecosystems for the total area abandoned and re-growing (by the age ranges specified), and the annual rate of aboveground biomass growth (by the age ranges specified). Estimates of annual carbon uptake in aboveground biomass (by the age ranges specified) were reported.

129. Table 5.D, $CO_2$ emissions and removals from soil, was used for reporting activity data. Estimates of the net change in soil carbon in mineral soils from the cultivation of mineral soils were reported but for a non-IPCC soil type category. Carbon emissions from the liming of agricultural soils were reported.

130. Slovakia's CRF reporting for the LUCF sector for 1999 can thus be viewed as substantially complete.

### 3. Transparency

131. Slovakia has used the documentation boxes in tables 5.A-D to explain some of the reasons underlying the data reported. This was useful in assessing the transparency of the estimates provided. Slovakia also made use of notation keys in the LUCF sector. [12]

### 4. Recalculations

132. Recalculations of emissions and removals for the LUCF sector were not reported in the 1999 CRF.

### 5. Uncertainties

133. As Slovakia did not submit information regarding uncertainties in the LUCF sector in a NIR or any other accompanying documentation it was not possible to determine the level of uncertainties in the estimates reported in the LUCF tables for the 1999 CRF.

### 6. Consistency with the UNFCCC reporting guidelines and the IPCC Guidelines

134. The LUCF sector for Slovakia can be regarded as mainly consistent with the IPCC Guidelines and UNFCCC reporting guidelines in that most estimates have been given for the various activities within this sector. Consistency with the guidelines would be enhanced by supplying a NIR with the CRF.

## B. Specific source and sink categories

### 1. 5.A Changes in forests and other woody biomass stocks

135. Changes in forests and other woody biomass of 2,098 Gg reported in table 5.A, constitute net removals of $CO_2$ equivalent to 5.0% of Slovakia's total 1999 $CO_2$ emissions. If a value of 808.6 Gg is used (as in table 5), changes in forests and other woody biomass constitute net removals of $CO_2$ emissions equivalent to 1.9% of Slovakia's total 1999 $CO_2$ emissions.

136. Trends in the estimates of changes in forest and other woody biomass emissions were significant between 1994 and 1995; 1997 and 1998 (where emissions of 185 Gg $CO_2$ in 1998 were reported compared with removals of 2,245 Gg $CO_2$ in 1997); and 1998 and 1999 (where emissions of 185 Gg $CO_2$ in 1998 were reported compared with removals of 684 Gg $CO_2$ in 1999).

Methodology

137. No supporting documentation was available to assess the methodology used in reporting the estimates.

Conversion factors and IEFs

138. Implied carbon uptake factors were reported in table 5.A for the 20 temperate species. These ranged from 0.50 t C/ha for *Betulus* sp. to 2.16 t C/ha for *Fagus sylvatica*.

[12] The notation keys "NO" and "NE" were used in table 5; "NO" in table 5.A; "NO", "NA" and "IE" in table 5.B; "NO" in table 5.C; "NO" in table 5.D. In table 5.B the documentation box was used to explain the situation.

139. Carbon emission factors (t C/t dm) of 0.49 were used for the estimates of carbon released for total biomass removed in commercial harvest, traditional fuelwood consumed, and total other wood use.

## 2. 5.B Forest and grassland conversion

140. Forest and grassland conversion was a source for a reported 265 Gg of $CO_2$ emissions in 1999. If included in the national total, this was 0.6% of Slovakia's reported 1999 $CO_2$ emissions.

Methodology

141. No supporting documentation was available to assist in assessing the methodology used in reporting the estimate.

Activity data

142. Activity data were not reported for the areas converted annually by on and off-site burning, but estimates were given for the annual net loss of biomass and the quantity of biomass burned on-site.

143. Estimates were given in table 5.B for emissions from on-site burning of $CH_4$ (0.18 Gg for temperate coniferous; 0.42 Gg for temperate broadleaf) and $N_2O$ (1.61 Gg for temperate coniferous; 3.72 for temperate broadleaf). These estimates were not carried forward into table 5.

Conversion and IEFs

144. IEFs were not calculated in table 5.B.

## 3. 5.C Abandonment of managed lands

145. Abandonment of managed lands was a sink for a reported 1,415 Gg of $CO_2$ removals in 1999. This was 3.2% of Slovakia's reported 1999 $CO_2$ emissions.

Methodology

146. No supporting documentation was available to assist in assessing the methodology used in reporting the estimate.

Activity data

147. Estimates were provided for the total area abandoned and regrowing for coniferous temperate ecosystems (31.09 kha for the first 20 years; 159.60 kha for >20 years) and broadleaf temperate ecosystems (29.87 kha for the first 20 years; 153.40 kha for >20 years) and the annual rate of aboveground biomass growth for temperate ecosystems (1.00 t dm/ha for the first 20 years; 1.50 t dm/ha for >20 years).

Conversion and emission factors

148. IEFs were estimated in table 5.C. These were 0.49 t C/ha/year for the first 20 years and 0.98 t C/ha/year for >20 years for coniferous original ecosystems; 0.75 t C/ha/year for the first 20 years and 1.25 t C/ha/year for >20 years for broadleaf original ecosystems.

### 4. 5.C $CO_2$ Emissions and removals from soil

149. $CO_2$ emissions and removals from soil was reported as a sink for 669 Gg of $CO_2$ removals in 1999. This was 1.5% of Slovakia's reported 1999 $CO_2$ emissions. Note, however, that this estimate may be reported with the wrong sign in table 5.D and in table 5.

Methodology

150. No supporting documentation was available to assist in assessing the methodology used in reporting the estimate. It is not clear how the total net carbon emissions from agriculturally impacted soils have been estimated. The details given in the documentation box attempt to explain the estimate but further comments are required.

Conversion and emission factors

151. Carbon conversion factors of 0.12 were used in estimating the carbon emissions from liming.

## C. Areas for further improvement

152. Slovakia is encouraged to provide a NIR describing fully how the estimates in the LUCF sector have been prepared. This should include details of the country-specific methods used.

153. Slovakia is encouraged to explain fully when large year-to-year variations occur (as in the estimates for emissions/removals for changes in forest and other woody biomass).

154. Slovakia is encouraged to check its CRF submission for consistency between tables (see the differences noted between tables 5.A and 5).

# VI. WASTE

## A. Sector overview

155. The review is based on the CRF. A NIR was provided during the desk review. Agreement with the draft S&A report was found.

### 1. Completeness

156. Activity data on waste disposal are incomplete and inconsistent as there are no specific explanations concerning municipal solid waste (MSW) disposal. The existence of special studies providing specific data on the production of waste per capita, as well as on degradable organic carbon in the waste, is reported in the NIR, but no corresponding data are provided in the CRF.

### 2. Trends

157. A slight decrease (about 8%) in waste disposal activity was reported for 1990 to1999.

## B. Key sources

### 1. 6.A Solid waste disposal and 6.B wastewater handling – $CH_4$

Methodology

158. Data on solid waste category "Other" are not explained in the CRF. Wastewater handling includes sewage sludge and non-treated sources (40%) and has been estimated using the IPCC methodology.

Emission factor

159. IEFs are not calculated separately for managed and non-managed solid waste disposal sites (SWDS) which therefore use the same methane correction factor (MCF).

160. Emissions from wastewater handling and sludge are high compared with most other countries.

## C. Areas for further improvement

161. Activity data on waste disposal should be completed and comments on technical aspects (e.g., management) provided, as well as additional information concerning waste generation and disposal.

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