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

* In the symbol for this document, 2005 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Overview

A. Introduction

1. This report covers the centralized review of the 2005 greenhouse gas (GHG) inventory submission of Slovakia, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with decision 19/CP.8. The review took place from 17 to 22 October 2005 in Bonn, Germany, and was conducted by the following team of nominated experts from the roster of experts: Generalists – Mr. Art Jaques (Canada) and Ms. Inga Konstantinaviciute (Lithuania); Energy – Mr. Matej Gasperic (Slovenia), Ms. Sophia Mylona (Norway) and Ms. Roberta Quadrelli (International Energy Agency (IEA)); Industrial Processes – Ms. Marisol Bacong (Philippines), Mr. Domenico Gaudioso (Italy) and Ms. Birna Hallsdottir (Iceland); Agriculture – Mr. Steen Gyldenkaerne (Denmark) and Mr. Vlad Trusca (Romania); Land Use, Land-use Change and Forestry (LULUCF) – Mr. Aquiles Neuenschwander Alvarado (Chile) and Mr. Nijavalli H. Ravindranath (India); Waste – Mr. Eduardo Calvo (Peru) and Ms. Sirintornthep Towprayoon (Thailand). Ms. Sirintornthep Towprayoon and Mr. Art Jaques were the lead reviewers. The review was coordinated by Mr. Matthew Dudley (UNFCCC secretariat).

2. In accordance with the “Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention”, a draft version of this report was communicated to the Government of Slovakia for comment prior to its publication.

B. Inventory submission and other sources of information

3. In its 2005 submission, Slovakia submitted an almost complete set of common reporting format (CRF) tables for the year 2003 and a national inventory report (NIR) providing general information on methodologies, activity data (AD), emission factors (EFs), recalculations, and key categories. A brief description of uncertainties, verification, and quality assurance/quality control (QA/QC) procedures is provided in the NIR. Where needed, the expert review team (ERT) also used previous years’ submissions, additional information provided during the review, and other information. The full list of materials used during the review is provided in the annex to this report.

4. In 2003, the most important GHG in Slovakia was carbon dioxide (CO₂), contributing 82.9 per cent to total¹ national GHG emissions expressed in CO₂ equivalent, followed by methane (CH₄), 9.1 per cent, and nitrous oxide (N₂O), 7.6 per cent. Perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF₆) taken together contributed 0.3 per cent to the overall GHG emissions in the country. The Energy sector accounted for 80.3 per cent of total GHG emissions, followed by Agriculture (7.8 per cent), Industrial Processes (7.6 per cent) and Waste (4.3 per cent). Total GHG emissions amounted to 51,641.44 Gg CO₂ equivalent and decreased by 28.4 per cent from 1990 to 2003. Total GHG emissions, with LULUCF included, amounted to 46,758.80 Gg CO₂ equivalent and decreased by 32.9 per cent over the same period.

¹ In this report, the term total emissions refers to the aggregated national GHG emissions expressed in terms of CO₂ equivalent excluding LULUCF, unless otherwise specified.

C. Key categories

5. Slovakia has provided a key category analysis based on the tier 1 method, using level and trend assessment, in its 2005 submission. The key category analyses performed by the Party and the secretariat² produced similar results, except that Stationary Combustion under Other Fuels was identified by the secretariat. These minor differences are due to the fact that Slovakia uses the reference approach for Stationary Combustion sources.

D. Main findings

6. Slovakia's inventory submission does not adequately adhere to the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the revised UNFCCC reporting guidelines). In general, the NIR does not follow the structure contained in the guidelines, it does not include detailed sectoral trends analysis, and it does not provide sufficient transparency to allow the ERT to understand how the emissions were calculated and replicate them. There are inconsistencies between what is reported in the NIR and the CRF tables, in particular for LULUCF. While a full set of CRF tables (with the exception of table 2(II)) for the year 2003 is provided, and a full set of LULUCF reporting tables as required by decision 13/CP.9 for the years 1990–2003 have been reported, no other CRF tables have been provided for the years 1990–2002, as required.

E. Cross-cutting topics

1. Completeness

7. The Slovakian inventory is not complete. Slovakia has not provided the CRF tables for the period 1990–2002, only for the year 2003. Trend data for the period 1990–2003 are available; however, there is little analysis to accompany them. All major source/sink categories and direct and indirect GHGs are reported, but data are missing from some CRF tables and the notation keys are not always used correctly. The ERT noted that a complete submission is required in order to conform to the revised UNFCCC reporting guidelines and strongly recommends that Slovakia include all the CRF tables for the period 1990–2002 in its next submission.

2. Transparency

8. In general, the inventory is not sufficiently transparent. The NIR provides brief descriptions of the institutional arrangements, QA/QC procedures, uncertainty assessments and estimation methods, a key category analysis, a summary of trends in emissions by gas, and recalculations. The ERT found it difficult to assess a number of sources of emissions in all sectors owing to a lack of information, in particular on choices of methods, AD and EFs, in the NIR. Specific examples include: there is no information on what is contained in the LULUCF CRF tables for 1990–2003; the descriptions of the factors underlying the trends in several sectors are inadequate; and no details are provided on a number of calculations undertaken in the Energy sector.

² The secretariat identified, for each individual Party, those source categories which are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the Intergovernmental Panel on Climate Change *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Key categories according to the tier 1 trend assessment were also identified for those Parties providing a full CRF for the year 1990. Where the Party has performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

3. Recalculations and time-series consistency

9. Slovakia has provided recalculations only for the year 2002 in CRF table 8(a). The recalculations were undertaken mainly as a result of improved AD and some methodological and EF changes. The recalculations result in a 0.51 per cent decrease in the estimates of total emissions (without LULUCF) in 2002. The rationales and explanatory information for these recalculation provided in CRF table 8(b) do not correspond to the information provided in the NIR for the relevant sectors. The NIR states that recalculations have been performed for the whole time series, which involve revision of methodologies and data. However, these recalculations are not reflected because CRF tables for the years 1990–2002 are not provided.

4. Uncertainties

10. Slovakia has used a tier 1 method, as outlined in the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) to assess the uncertainty in the emissions inventory. The analysis has been performed across all sectors and gases for the year 2003. The NIR states the uncertainties to be 10 per cent by level assessment and 3 per cent by trend assessment, identical with the estimates provided in the previous (2004) NIR. Qualitative estimates are provided in CRF table 7. The uncertainty estimates appeared to the ERT to contain some inconsistencies.

5. Verification and quality assurance/quality control approaches

11. Slovakia does not report a long-term QA/QC plan in accordance with the IPCC good practice guidance. General information on QA/QC procedures is provided in the NIR, including the checking of emissions estimates by external consultants within Slovakia and reviewers in the Czech Republic. The NIR states that Slovakia will be harmonizing all its inventories of pollutants and following ISO 9001 as part of the implementation of a European Union Directive. The ERT strongly encourages Slovakia to develop, implement and report on its QA/QC plan.

6. Follow-up to previous reviews

12. Compared with the findings of previous reviews, the transparency of the inventory has been improved only slightly. A complete set of CRF tables and a more transparent, detailed and structured NIR are still the major issues.

F. Areas for further improvement

1. Identified by the Party

13. The NIR states that Slovakia will improve time-series consistency and the transparency of the choice of methodologies and AD.

2. Identified by the ERT

14. The ERT identifies the following cross-cutting issues for improvement and noted that many of these suggestions were made in the previous two centralized reviews of Slovakia. The Party should:

- (a) Provide a complete set of CRF tables for all years and ensure consistency between the information in the tables and in the NIR;
- (b) Provide additional documentation on the methods, data and assumptions used in the NIR, and follow the UNFCCC required structure for the NIR;
- (c) Provide more precise descriptions of QA/QC procedures and how they are implemented;

- (d) Improve transparency in all sectors in the NIR, in particular relating to decisions on choice of methodologies and data.

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

II. Energy

A. Sector overview

16. In 2003, the Energy sector in Slovakia accounted for 80.3 per cent of total national GHG emissions. Estimated CO₂ emissions for the Energy sector, based on the reference approach, decreased by 29.1 per cent from 1990 to 2003, while total emissions for the sector decreased by 28.1 per cent over the same period. Between 2002 and 2003 emissions increased by 2.0 per cent. These changes appear to reflect changes in the emissions from stationary combustion. Within the sector, the largest sources are Manufacturing Industries and Construction, and Energy Industries, contributing 28.4 and 25.9 per cent, respectively, to total national GHG emissions. Transport accounts for 10.4 per cent of the national total.

17. In its 2005 submission, Slovakia has completed the CRF tables for all sources and gases only for the year 2003. To assess trends, the Party has used the reference approach estimates of CO₂ emissions because of the lack of sector-specific data prior to 2000. The Party has started a major revision in order to build a national energy balance and to present sectoral approach estimates for the full period 1990–2003 in its next submission. The ERT recommends that Slovakia finalize this work, as it is fundamental in improving the completeness and transparency of the inventory.

18. The Energy sector in the NIR is not as transparent as the revised UNFCCC reporting guidelines require and the current descriptions of the various subsectors raise a number of questions. The ERT recommends that the Party include more complete documentation on the sources of the country-specific net calorific values (NCVs) and EFs, in particular for CO₂, presented in the NIR, as well as information on the mix of fuels used in each sector. A discussion on the reasons for the trends observed, and the inclusion of a complete national energy balance for both the base year (1990) and the most recent year, are also important elements to be incorporated in Slovakia's next submission. To improve transparency in the CRF, the Party should use the appropriate notation keys instead of zero values and provide explanations both in the relevant documentation boxes and in table 9 Completeness.

19. For 2003 the Party has provided a key category analysis, based on a level assessment only, that finds five key categories in the Energy sector. However, this analysis combines categories derived from the reference approach (e.g. Gaseous Fuels) and categories derived from the sectoral approach (e.g. Transport: Road), with the result that the allocation of emissions is inconsistent (e.g. natural gas from transportation pertains to two categories). The ERT recommends that the Party use data disaggregated by sector for its key category analysis, as such data are available for the most recent year.

20. In response to suggestions of the previous (2004) review, recalculations have been performed for the whole time series for fugitive emissions from oil and gas and from coal. Complete documentation on the new methodologies is presented in the NIR, but recalculated data are provided in the CRF only for the year 2002.

21. Uncertainties are estimated for some aggregated categories. As in the key category analysis, the categories are aggregated in an inconsistent way. In addition, the Party should explain why uncertainties on the AD for the same category are different for different gases. For example, for the category Reference Approach: Solid Fuels, uncertainties on the AD are estimated as 5 per cent for CO₂ and 3 per cent for CH₄.

B. Reference and sectoral approaches

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

22. Both the reference and the sectoral approach estimates of CO₂ from fuel combustion are provided for 2003. The difference is less than 1 per cent. However, the differences in energy consumption are larger for all categories of fuel (31.9 per cent for liquid fuels, 63.9 per cent for solid fuels, and 10.5 per cent for gaseous fuels). These discrepancies are at due least in part to a different classification of fuels being used in the two approaches – an issue that the Party is recommended to document further. For example, the ERT recommends that the Party describe which fuels are included under Other Fuels, a category that appears only in the sectoral approach.

2. International bunker fuels

23. In response to the previous (2004) review, the Party no longer reports consumption of international marine bunkers. For aviation, the fuel consumption is allocated between national and international use according to expert judgement, whereas landing/take-off (LTO) cycles are used to compute CO₂ emissions. The ERT recommends that the Party provide complete documentation of the methodology chosen and to assess whether the allocation of fuel consumption to national and international transportation follows the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines).

3. Feedstocks and non-energy use of fuels

24. The ERT recommends that the Party provide documentation on the allocation of fuel between energy and non-energy use. Currently, the CRF table is filled in, but no information is provided in the NIR. In CRF table 1.A(d), “plastics” is reported among Other Fuels. The ERT recommends that the Party explain the reason for this allocation and verify that this quantity is accounted for in the proper way and is not excluded twice from the total carbon.

C. Key categories

1. Stationary combustion: Gas – CO₂

25. The country-specific EF for natural gas is higher than the IPCC default values and those of neighbouring countries which share the same gas pipeline, such as Austria, the Czech Republic and Hungary. The ERT recommends that the Party justify the choice of this EF in the light of national circumstances.

2. Stationary combustion: Solid – CO₂

26. The lack of information on the mix of fuels used in the different sectors prevented the ERT from assessing the validity of several fairly unusual implied emission factors (IEFs). For example, the CO₂ IEF for Public Electricity and Heat Production: Solid Fuels is 93.3 t CO₂/TJ, while the IPCC default range is 94.6–106.7 t CO₂/TJ.

3. Stationary combustion: Other fuels – CO₂

27. The IEFs for CO₂ are highly variable between the different subcategories. The ERT recommends that more transparent documentation be provided on which fuels are included within the category Other Fuels.

4. Mobile combustion: Road transportation – CO₂

28. For Road Transportation, the NIR states that a tier 2 methodology is used (COPERT III model). The ERT recommends that in its next submission the Party include more explicit documentation on all AD and on all key parameters used as input for the model.

5. Fugitive emissions: Coal, oil and gas – CH₄

29. The ERT acknowledges that the documentation provided on fugitive emissions from oil and gas operations has improved significantly compared to Slovakia's 2004 submission. However, justifications for some of the assumptions used are needed. For example, the EFs chosen for CH₄ emissions from mining activities are at the lower level of the IPCC range, without any explanation being given. In addition, the ERT recommends that further explanations be given on the methodology used to recalculate the CH₄ emissions from oil and natural gas back to the base year (1990).

D. Non-key categories

Stationary combustion: Solid fuels – CH₄ and N₂O

30. For non-CO₂ gases, not all the IEFs used compare well with the IPCC default values for Manufacturing Industries and Construction (e.g. Iron and Steel). The ERT recommends that the Party improve transparency by documenting all the calculations involved in these estimations. In addition, the Party should document how the non-CO₂ emissions have been estimated for those years where only the reference approach (that is, a method to estimate CO₂ emissions only) was available.

III. Industrial Processes and Solvent and Other Product Use

A. Sector overview

31. In 2003, the Industrial Processes sector in Slovakia accounted for 7.6 per cent of total national emissions and sectoral emissions had decreased by 7.6 per cent since 1990. Mineral production contributed 58 per cent of sectoral emissions. Among the GHGs, CO₂ had the highest share of emissions of the Industrial Processes sector – at 76 per cent – and accounted for 6.3 per cent of total national emissions. The key categories include Cement Production – CO₂, Lime Production – CO₂, Magnesite Use – CO₂, Iron and Steel Production – CO₂, and Nitric Acid Production – N₂O. The methods used in Cement Production, Nitric Acid Production, and Iron and Steel Production do not follow the IPCC good practice guidance. Also, the AD and EFs used in the categories Lime Production, Magnesite Use, and Iron and Steel Production are not clearly presented.

32. The Party has covered all gases in the report. However, the sectoral background data for Consumption of Halocarbons and SF₆ are not provided (table 2(II).F). The Industrial Processes sections of the 2005 NIR are not organized in such a way as to categorize the source categories and subcategories properly. For example, sections 4.2 to 4.4 could be lumped together under the Mineral Production section and with Cement Production. The Party is encouraged in the NIR to follow the categorization of sources given in the Revised 1996 IPCC Guidelines. Moreover some sources, such as Asphalt Roofing and Road Paving, are not described in the NIR.

33. GHG emissions in the Industrial Processes sector in Slovakia have fluctuated over the whole time series (1990–2003), with emissions in 2003 estimated at 8 per cent less than the 1990 level. The decrease was greatly influenced by the 15 per cent decrease in CO₂ emissions from the sector between 1990 and 2003. This has been partly offset by the increasing trend in reported emissions of fluorinated gases (F-gases), which has more or less kept the total emissions from the Industrial Processes sector on a low declining trend.

34. Recalculations in the Mineral Products subsector have been performed for CO₂ emissions due to a change in the method used and in the AD for limestone consumption. The ERT was not able to assess the recalculations (for 1990–2002) because only the CRF table for 2003 has been submitted. Uncertainty estimates have been determined for the subsectors presented in the NIR. The Party is undertaking QA/QC review and audits by comparing the data with national statistics and by inviting external reviewers to review the inventory. However, specific QA/QC reviews and audit, such as collection and measurement of emissions in the Industrial Processes sector (e.g., calcium oxide (CaO) content of clinker), are not presented.

B. Key categories

1. Cement production

35. Cement production contributed 23 per cent of the total emissions of the Industrial Processes sector in 2003. The Party uses total cement production data taken from the national statistical yearbook, but these do not account for the types of cement produced. The reported value of clinker production in 2003 (1,754.7 kt) is not in line with the volume of cement production reported in the NIR (2,930.2 kt) using the given clinker content in cement of 74.9 per cent. Furthermore, it is only half of what was reported for 2002 (3,141 kt) in the 2005 synthesis and assessment report. Uncertainty estimates are, however, reported to be low. The ERT recommends that the Party review the clinker production data reported for 2003.

36. As this is a key category, the ERT recommends that the Party use the tier 2 method, collect data on clinker production and CaO content of clinker from companies in the cement industry, and apply the cement kiln dust (CKD) losses factor. The uncertainty estimates reported are low even with the use of total production data in Slovakia and the use of weighted averages for percentage of clinker in cement and CaO content.

2. Lime production

37. Lime production accounted for 14 per cent of the total emissions of the Industrial Processes sector in 2003. In order to improve the transparency of its estimates the Party should make an effort to obtain production data broken down by type of lime and apply the respective EFs.

38. The Party has carried out a recalculation due to a change in the purity of lime from 97 per cent to 91.2 per cent. The Party is encouraged to examine whether the 91.2 per cent, as well as the recalculation, applies to the whole time series. Purity can be affected by other factors (e.g., geographical/geological factors) and may vary over a 13 year-period. The basis of the 97 per cent purity assumption used previously is not described. Recalculations of the 2002 estimates indicated that CO₂ emissions decreased by 29 per cent compared to the 1990 level.

3. Magnesite use

39. CO₂ emissions from the use of magnesite accounted for 11 per cent of the total emissions of the Industrial Processes sector in 2003. Lower emissions (almost half of the 1990 level) were reported from 1991 to 1994, but the estimates of 2003 emissions are fairly close (the difference is 5 per cent) to the estimates of base year (1990) emissions. The NIR does not provide clear information about the uses of magnesite clinker in Slovakia, and the ERT recommends that the Party provide information on the uses of magnesite in the country. If magnesite clinker is used to produce cement, CO₂ emissions should be reported under 2.A.1 Cement Production. The approach used in the calculation is correct, since it is based on magnesite clinker production data, as in the tier 2 methodology for cement production. Information about CKD should be collected and used in the calculation; default correction factors should be used when this information is not available.

4. Nitric acid production

40. Emissions from nitric acid production accounted for 20 per cent (784.2 CO₂ equivalent) of the total Industrial Processes emissions in 2003, mainly composed of N₂O emissions. The N₂O and nitrogen oxide (NO_x) EFs are based on actual measurements in one plant, taken in 1996, and on IPCC default values for the other plant. The ERT encourages the Party to conduct measurements at both plants and update the entire time series. To improve the transparency of the reporting, the ERT recommends that the Party provide information on the production process (AD including abatement technologies) and include appropriate QA/QC procedures to justify the emissions and uncertainty estimates.

5. Iron and steel production

41. Iron and Steel Production contributed 14 per cent of the total Industrial Processes emissions in 2003. CO₂ emissions were 22 per cent higher than the 1990 level. The NIR indicates that CO₂ emissions from pig iron production are included under the Energy sector, yet only emissions from steel production are included. The Party has not used the tier 2 methodology, which is based on tracking carbon flows related to steel production, although the NIR states that it has. Emissions have been estimated using the amount of steel produced as AD and an EF for which no reference has been given. The ERT recalculated the CO₂ emissions using equation 3.6B of the IPCC good practice guidance, and the data provided by the Party for iron input, steel production, and carbon content of iron and steel. The value obtained was 607.15 kt, instead of the 535.15 kt reported in the CRF and in the NIR. The ERT encourages the Party to use the tier 2 methodology consistently and report the figures in a transparent manner.

IV. Agriculture

A. Sector overview

42. In 2003, emissions in the Agriculture sector in Slovakia amounted to 4,016.6 Gg CO₂ equivalent, or 7.8 per cent of the total national GHG emissions (excluding LULUCF). From 1990 to 2003, emissions from the sector decreased by 50.2 per cent, mainly due to a decrease of all CH₄ and N₂O emissions in the sector; this was caused by important decreases in the animal populations. The 2005 submission only covers the CRF tables for 2003, and the 2004 submission covered only the CRF tables for 2001 and 2002, due to the fact that it was impossible to assess the AD and EFs used. However, the reporting of the Agriculture sector is complete in terms of gases and sources covered. Some additional information tables in the CRF are empty or are only partially complete (additional information linked with tables 4.A and 4.B(a)) and the notation key “not occurring” (“NO”) is presented in table 4.C Rice Cultivation and table 4.E Prescribed Burning of Savannas without any explanations being given in the NIR. Table 4.F Field Burning of Agricultural Residues is also filled in with “NO” and an explanation is provided in the CRF documentation box to the effect that the activity is prohibited in Slovakia.

43. The NIR structure is not in line with the revised UNFCCC reporting guidelines and there is no information in the sector overview on the sources of AD, the EFs, uncertainty estimates, time-series consistency, QA/QC, verification, or recalculations and planned improvements. Some information on uncertainty evaluation and QA/QC are presented in the introductory chapter of the NIR but the QA/QC activities actually undertaken are not specified. The NIR does not include a list of references but some documents are quoted as footnotes in the Agriculture sector. A brief reference for the sectoral institutional arrangements is included in the NIR, and no information on sectoral archiving and documentation procedures is presented. The NIR presents only a brief description of the sector. The Party is encouraged to improve the transparency of its reporting by using the required structure of the NIR and by providing detailed information on descriptions of specific sources, institutional arrangements, documentation, AD, methodology, including EFs, uncertainty estimates, time-series

consistency, QA/QC, verification, recalculations and planned improvements along with the national circumstances that explain the trends.

44. The Party has performed a key category assessment which was almost entirely consistent for the Agriculture sector with the one performed by the secretariat. The key categories identified are: Direct Emissions from Agricultural Soils – N_2O , Enteric Fermentation – CH_4 , and Manure Management – N_2O . The methodologies used are generally consistent with the Revised 1996 IPCC Guidelines, although they are not documented, but they are not consistent with the IPCC good practice guidance, where the use of higher-tier methods is requested for key categories, and more detailed information is needed to facilitate the understanding of some methodological approaches. The CRF tables and the NIR show various inconsistencies in the information presented: for example, in CRF Summary table 3 the Party mentions that tier 1 and tier 2 methods were used for all sources, but only the tier 1 method was really used in the calculations. The CRF tables also show some inconsistencies in the emission time series, as some different EFs were used for different years, for example, the EF for Enteric Fermentation – CH_4 for goats.

45. The AD used are mainly taken from the national statistics office and are based on the census of sowing areas, the census of domestic livestock, and the statistical yearbook. The ERT was unable to identify whether the data for livestock are one-year data or three-year averages, as requested by the Revised 1996 IPCC Guidelines. Not enough information is provided in the NIR to explain the fluctuations in AD over the period 1990–2003 for all sources. Recalculations of the 2002 inventory have been performed for all the sources in the Agriculture sector, as presented in CRF table 8(a). However, no explanatory information is included in the NIR regarding the recalculations, and only some information on recalculations of CH_4 emissions from manure management is included in CRF table 8(b). The Party is encouraged to incorporate detailed information on both the recalculations and the AD in its next NIR. The ERT identified an inconsistency in the AD used, which was also identified in the previous (2004) review, regarding the use of different livestock population characterization for two source categories (e.g. the swine population reported in table 4.B(a) is higher than the sum of disaggregated swine in table 4.B(b)), and this is not in line with the IPCC good practice guidance. Some notation keys are missing in tables 4.A and 4.B(a). The Party is recommended to use a single livestock characterization and to recalculate the entire time series, while also providing sufficient information in the NIR to support the disaggregation of the swine population. The Party is also encouraged to improve the estimates for the key categories and to complete the data provided in the CRF using the appropriate notation keys.

46. Slovakia has not implemented all the recommendations for the Agriculture sector from the previous reviews and has not provided a more comprehensive NIR.

B. Key categories

1. Enteric fermentation – CH_4

47. The AD used are taken from the national statistical office and are based on the census of domestic livestock, but no information is provided in the NIR to explain the reported decrease in livestock populations (mainly cattle) over the period 1990–2002. The Party has estimated CH_4 emissions from enteric fermentation using the IPCC tier 1 method for all the animal species, which is not in line with the IPCC good practice guidance, taking into account that cattle account for about 90 per cent of the total CH_4 emissions in Enteric Fermentation. The Party is recommended to use the IPCC tier 2 method for cattle and to provide additional information in the NIR.

48. Country-specific EFs together with default EFs have been used in this category. For dairy cattle, the Party has used a country-specific EF which is the same as the IPCC default EF for Western Europe, and for non-dairy cattle it has used the IPCC default value for Eastern Europe. This issue was identified in previous reviews and the Party is recommended to provide more information in the NIR to clarify it

and to explain the assumptions underlying the choice of the Eastern Europe EF for non-dairy cattle. The default EFs for developed countries have been applied for all other the animal species. The milk yield is presented in the additional information table and shows an increased value from 2001 to 2003, but at the same time the IEF for dairy cattle remains constant (100 kg/head/year).

2. Manure management – N₂O

49. The AD used are taken from the national statistical office, but no information is provided in the NIR to explain the reported decrease of emissions over the period 1990–2003. An inconsistency was identified: the swine population disaggregated in table 4.B(b) is lower than the swine population presented in table 4.B(a). The same issue was identified by the previous (2004) review and not enough information is presented in NIR to explain it. The Party has applied the IPCC tier 1 methodology and country-specific EFs for non-dairy cattle, swine, and poultry, and used IPCC default EFs for Western Europe for dairy cattle, and IPCC default for Eastern Europe for sheep, goats and horses, which is not in line with the IPCC good practice guidance. Slovakia is encouraged to provide more information in the NIR on the selection of EFs for different animal species and to apply a higher-tier method for this key category.

50. The data on animal waste management systems (AWMS) are country-specific and the NIR does not provide sufficient information to support them, as requested by the previous (2004) review. The assumption that only 20 per cent of manure production from dairy cattle and 10 per cent of manure from non-dairy cattle is deposited on grassland does not appear to be appropriate, as non-dairy cattle normally graze 50 per cent of the time. The only AWMS for turkeys and ducks and the most important AWMS for broilers, as presented in the CRF and the NIR, is the liquid system, but this type of animal is normally raised in solid systems and should be treated in the calculation as “other AWMS”. The Party is recommended to provide additional information in the NIR to support the selection of different AWMS for each animal species, as requested in the 2004 review report.

3. Agricultural soils – N₂O

51. The Party has used the tier 1a method together with IPCC default and country-specific EFs to estimate N₂O emissions from agricultural soils, as recommended by the IPCC good practice guidance. The AD on the amount of synthetic fertilizers applied to soils decrease substantially over the period 1990–2003 and there is no explanation provided in the NIR to explain this decrease. AD on crops are provided by the national statistical office and the nitrogen (N) content is country-specific.

52. The calculation of the amount of crop residues returned to soil does not appear to be appropriate as Slovakia has estimated the N content in the whole crop and assumed that all of it is then returned to the soil. The ERT considered that some of the data used in the calculations are too high, for example: for potatoes the value is 2.79 per cent N in biomass. Furthermore, all N in fodder crops is reported as being returned to soil, although it must be assumed that the crops are removed from the land area. Slovakia is recommended to provide a detailed description in the NIR of the methodology used, and a thorough description of the data on N content, and to estimate Frac_R for all types of crops. For N-fixing crops the same problem occurs and the emissions are overestimated. Slovakia is recommended to include a full description of the methodology underlying the data on N content in N-fixing crops and to recalculate the emissions estimates.

C. Non-key categories

Manure management – CH₄ no number needed

53. The Party has applied a IPCC tier 1 methodology along with country-specific and IPCC default EFs, which is in line with the IPCC good practice guidance. The table with additional information on

AWMS is not filled in. Notation keys are not provided for the AD in CRF table 4.B(a). The AD used are taken from the national statistical office, but no information is provided in the NIR to explain the reported decrease of emissions over the period 1990–2003.

54. The IEF for dairy and non-dairy cattle provided in the CRF is lower than the IPCC default EF for Eastern Europe (the EF used for swine is that for Eastern Europe), and no explanation is provided in the NIR to support the selection of these country-specific EFs. The ERT recommends that Slovakia provide more information in the NIR regarding the selection of the climate region and to explain the methodology used for calculating the EFs.

V. Land Use, Land-use Change and Forestry

A. Sector overview

55. Slovakia has prepared the CRF tables using the Revised 1996 IPCC Guidelines as well as the new CRF tables based on the IPCC *Good Practice Guidance for Land Use, Land-use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). However, the information provided in the NIR on inventory categories and the CRF tables refers to the Revised 1996 IPCC Guidelines. This review is largely based on the CRF tables, which were prepared using the approach of the new IPCC good practice guidance for LULUCF according to decision 13/CP.9. The LULUCF sector was a net sink for the year 2003 and has remained a sink for all the years 1990–2003. The sink size has fluctuated from year to year and is high for the recent years (2001–2003), in the range of 4,800 to 5,200 Gg CO₂ equivalent, compared to 1,600 Gg for the year 1999 or 2,400 Gg for 1990. An explanation is required for the reported fluctuation. It is interesting to note that, for the year 2003, the estimates of net CO₂ equivalent emissions/removals shown in the CRF tables which are based on the Revised 1996 IPCC Guidelines and in those which are based on the IPCC good practice guidance for LULUCF are nearly the same, at 4,860 Gg CO₂ equivalent and 4,830 Gg CO₂ equivalent, respectively. This result makes sense, given that the same AD and emission/removal factors have been used. The ERT noted, however, that the IPCC good practice guidance for LULUCF includes new land-use categories and carbon pools, and requires additional AD and EFs which will probably change the results. The ERT recommends that the Party fully implement the IPCC good practice guidance for LULUCF.

56. No key category analysis has been carried out and table 7 has not been reported. Background table 5.B for Cropland and table 5.C for Grassland are incomplete (particularly for biomass) even though 0.8 and 1.4 million hectares, respectively, are under these land uses. The NIR should provide an explanation for the GHG inventory estimated using the new CRF tables. If fertilizer-related emissions are reported in the Agriculture sector, the notation key “included elsewhere” (“IE”) should be entered in CRF table 5(I). CRF Summary table 3 is incomplete, for example, for CH₄ and N₂O. Similarly, CRF table 9 is not filled in with reasons for not including some land-use categories or carbon pools.

57. It was difficult for the ERT to assess the transparency of the reporting in the LULUCF sector since the NIR does not reflect the land-use categories for the CRF based on the IPCC good practice guidance for LULUCF; moreover, only very limited explanation is provided, although some of the AD and EFs used are given in the NIR.

58. QA/QC procedures are very briefly described in the NIR, but it is not clear if they have been adopted for the LULUCF sector. Further, details of uncertainty estimation are not given. It is not clear if uncertainty is estimated for the LULUCF sector.

59. Slovakia has recalculated emission trends for all the years 1990–2003 using the new CRF tables based on the IPCC good practice guidance for LULUCF. The trends or fluctuations in CO₂ equivalent emissions are not explained. In CRF table 10 prepared according to the Revised 1996 IPCC Guidelines,

the values are nearly identical to those prepared according to the IPCC good practice guidance for LULUCF. The sharp increase in the sink size from 2001 requires explanation. N₂O emissions have remained constant at 0.01 Gg for all the years 1990–2003, which needs to be explained.

B. Sink and source categories

1. Land-use representation

60. Table 22 in the NIR gives the area under different land-use categories over the period 1982–2003. A land-use change matrix as suggested in the IPCC good practice guidance for LULUCF would be very useful. It is unclear what Other Land in NIR table 22 includes; “Other Land” as used by the Party has different meanings at different points.

2. Forest land

61. Activity data on cropland and grassland converted to forest land, if such conversions occur, need to be reported (table 5.A), along with emission or removal factors. The NIR mentions annual harvesting residues and this may be reflected in CRF table 5.A. It is not clear whether biomass increment includes belowground biomass. Nor is it not clear from the NIR or from the CRF tables whether belowground biomass and dead organic matter carbon pools have been considered. The reason for reporting soil organic carbon only for Coniferous Forest and not for Deciduous Forest is not explained.

3. Cropland and grassland

62. If conversion of other land-use categories to cropland or grassland is occurring, then this needs to be reported. No living biomass or dead organic matter carbon pools are reported. If CO₂ emissions or removals occur, this should be reported and explained, since the area under these land uses is large.

4. Other land

63. A large area, of 662 kha, is reported under the category Other Land in CRF table 5.F and in the NIR. Further, net emissions of 269 Gg are reported from Other Land in CRF table 10, but clarification is needed as to what is included under this category. The IPCC good practice guidance for LULUCF states that it includes bare soil, rock, ice, and all other unmanaged land, from which CO₂ emissions and removals need not be reported in Other Land Remaining Other Land. However, if conversion occurs – for example, if forest land or grassland is converted to other land – then emissions and removals need to be reported.

64. It is recommended that Slovakia adopt the new CRF tables based on decision 13/CP.9 for the LULUCF sector and expand its reporting to cover all the relevant land-use categories, gases and carbon pools. Further, a key category analysis needs to be conducted, including the LULUCF sector, using the approach of the IPCC good practice guidance for LULUCF. The NIR should provide as much explanation as possible for the methods adopted in estimating the values entered in the CRF tables. The ERT strongly recommends that the Party include a table giving a land-use change matrix in the next NIR, together with an explanation of land-use conversions or changes and the land-use category definitions used, particularly for Other Land. Activity data on land conversion from one category to other (e.g. cropland and grassland conversion to forest land and so on) should be estimated and reported in the NIR and the CRF tables. The NIR is too brief and needs to be expanded to provide additional information on the land-use change matrix and AD used. An uncertainty estimation for the LULUCF sector is needed, using the methods of the IPCC good practice guidance for LULUCF, since uncertainty is supposed to be high for this sector. Slovakia is advised to double check all the entries in the CRF, namely “not estimated” (“NE”), “NO”, “0.00” and “IE”, in order to correct the inconsistencies.

VI. Waste

A. Sector overview

65. In 2003, the Waste sector in Slovakia contributed 4.3 per cent to total national GHG emissions. In 1990 the figure was 2.9 per cent. The increase of 6.5 per cent in total emissions from the sector from 1990 to 2003 is mainly due to a 50 per cent increase in N₂O emissions, and a 30 per cent increase in CH₄ emissions from solid waste disposal sites (SWDS), partly offset by a 33 per cent reduction in CH₄ emissions from waste-water handling. The trends for SWDS CH₄ and for waste-water handling are not fully consistent and need further explanation and documentation in the NIR. Slovakia has provided all the CRF sectoral tables for the year 2003, covering all source categories and gases. Slovakia has performed recalculations for CH₄ emissions from SWDS as a result of new AD becoming available for industrial waste, resulting in an increase in the estimates of emissions of 0.41 per cent for 2002.

B. Key categories

1. Solid waste disposal on land – CH₄

66. The IPCC default methodology has been used to estimate emissions from this source. Municipal solid waste, industrial waste and agricultural wastes are included. The transparency of the NIR and the CRF should be improved by including information on all the parameters needed to estimate emissions.

67. Slovakia should review the following parameters and inconsistencies, and provide an explanation for them in the NIR:

- (a) The value of degradable organic carbon (DOC) applied to agricultural wastes, and the sources for this value;
- (b) A CH₄ generation rate constant (as reported in the CRF =0.04, 0.08) is not used for the default method;
- (c) The CH₄ fraction should have used the IPCC default fraction (0.5) if a default methodology has been applied, and not “NE” as is reported;
- (d) The value of DOC degraded (0.77) seems to be wrong and the number should be revised.

2. Waste-water handling – CH₄

68. The methodologies used are reported to be default and country-specific. A proper explanation should be included in the NIR (no explanation of the methodologies is provided for domestic and commercial waste water, and the explanation provided for industrial waste water is not clear enough).

69. References to the parameters used and reported in the CRF and their sources should also be included to ensure transparency. The check method should be used in calculating emissions for domestic waste water, and the default method for industrial waste water should be reported to allow comparison with other Parties' inventories.

C. Non-key categories

1. Waste-water handling – N₂O

70. On the basis of the information available, the ERT considers this subsector to be a key category by trend analysis. N₂O emissions have been calculated using two methods: IPCC, and that of the Institut für Systemtechnik und Innovationsforschung (ISI). Slovakia should explain the ISI methodology, and document and reference the parameters used.

2. Waste incineration – CO₂ and N₂O

71. Even though it appears in the section on recalculations, there is no information on this subsector in the NIR. A description of the methods and data used for this subsector should be included in the NIR. Information on the sources of the AD used should be provided, indicating the quantities and composition of wastes and the EFs included in the Energy sector, so as to allow cross-checking through the years.

72. CRF table 6.C should differentiate between biogenic wastes (which should not be added to the total CO₂ emissions, but should be reported) and non-biogenic wastes.

Annex**Documents and information used during the review****A. Reference documents**

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

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

IPCC/OECD/IEA. Revised 1996 IPCC Guidelines for national greenhouse gas inventories, volumes 1–3, 1997. Available at <<http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>>.

UNFCCC. Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories. FCCC/SBSTA/2004/8. Available at <<http://unfccc.int/resource/docs/2004/sbsta/08.pdf>>.

UNFCCC. Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention. FCCC/CP/2002/8. Available at <<http://unfccc.int/resource/docs/cop8/08.pdf>>.

UNFCCC secretariat. Status report for Slovakia. 2005. Available at <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/inventory_review_reports/application/pdf/2005_status_report_slovakia.pdf>.

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

UNFCCC secretariat. Slovakia: Report of the individual review of the greenhouse gas inventory submitted in the year 2004. FCCC/WEB/IRI/2004/SVK. Available at <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/inventory_review_reports/application/pdf/2004_irr_centralized_review_slovakia.pdf>.

B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Ziak Lubomir (LIFEENV) including additional material on the methodology and assumptions used.
