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Report of the individual review of the greenhouse gas inventory of Iceland 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 Iceland, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with decision 19/CP.8. The review took place from 10 to 15 October 2005 in Bonn, Germany, and was conducted by the following team of nominated experts from the roster of experts: Generalists – Mr. Riccardo de Lauretis (Italy) and Mr. Tinus Pulles (the Netherlands); Energy – Mr. Simon Eggleston (United Kingdom of Great Britain and Northern Ireland), Mr. Tomas Gustafsson (Sweden) and Mr. Francis Yamba (Zambia); Industrial Processes – Ms. Maria Jose Lopez (Belgium) and Ms. Virginia Sena (Uruguay); Agriculture – Mr. Jorge Alvarez (Peru) and Ms. Britta Hoem (Norway); Land Use, Land-use Change and Forestry (LULUCF) – Mr. Sandro Federici (European Community) and Walter Oyhantçabal (Uruguay); Waste – Mr. Faouzi Ahmed Senhaj (Morocco) and Mr. Jose Villarin (Philippines). Mr. Tinus Pulles and Mr. Jose Villarin were the lead reviewers. The review was coordinated by Mr. Harald Diaz-Bone and Mr. Javier Hanna (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 Iceland, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

B. Inventory submission and other sources of information

3. In its 2005 submission, Iceland submitted a complete set of common reporting format (CRF) tables for the years 1990–2003 and a national inventory report (NIR). Iceland has not reported on LULUCF using the CRF reporting tables for LULUCF as required by decision 13/CP.9. Where needed the expert review team (ERT) also used previous years' submissions, additional information provided during the review and other information. The full list of materials used during the review is provided in the annex to this report.

C. Emission profiles and trends

4. In 2003, the most important GHG in Iceland was carbon dioxide (CO_2) contributing 75.9 per cent to total[1] national GHG emissions expressed in CO_2 equivalent, followed by methane (CH_4), 13.6 per cent, and nitrous oxide (N_2O), 8.7 per cent. Perfluorocarbons (PFCs) contributed 1.7 per cent.[2] The Energy sector accounted for 53.8 per cent of total GHG emissions, followed by Industrial Processes (25.6 per cent), Agriculture (14.1 per cent), Waste (6.3 per cent) and Solvent and Other Product Use (0.1 per cent).

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[1] In this report, the term total emissions refers to the aggregated national GHG emissions expressed in terms of CO_2 equivalent excluding LULUCF, unless otherwise specified. Iceland has not provided the tables of the common reporting format for LULUCF as required by decision 13/CP.9 using the land-use categories of the Intergovernmental Panel on Climate Change *Good Practice Guidance for Land Use, Land-use Change and Forestry*. Instead it has used the common reporting format tables for Land-use Change and Forestry (LUCF) as contained in the CRF adopted by decision 18/CP.8, which are based on the categories of the Intergovernmental Panel on Climate Change *Revised 1996 Guidelines for National Greenhouse Gas Inventories*. Analysis of the inventory year 2003 and the total national emissions shown in this report, are based on data covering all Industrial Processes emissions, as contained in annex II of the NIR.

[2] Iceland reported potential emissions of hydrofluorocarbons (HFCs, 69.35 Gg CO_2 equivalent) and sulphur hexafluoride (SF_6, 5.38 Gg CO_2 equivalent). Actual emissions of HFCs and SF_6 are reported as "not estimated" and "not occurring". Analysis of the inventory year 2003 and the total national emissions shown in this report, are based on reported actual emissions.

Total GHG emissions amounted to 3,459.3 Gg CO_2 equivalent and had increased by 5.6 per cent from 1990 to 2003.

D. Key categories

5. Iceland has reported a key category tier 1 analysis, both level and trend assessment, as part of its 2005 submission. The key category analyses performed by the Party and the secretariat[3] produced similar results. Iceland has not included LULUCF and certain CO_2 emissions from Industrial Processes (see paragraph 7) in its key category assessment. Iceland is recommended to include those emissions in the key category analysis in its next submission.

E. Main findings

6. Iceland has submitted a GHG inventory which is largely complete and consistent with the 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" (hereinafter referred to as the revised UNFCCC reporting guidelines). However, several areas of improvements have been identified. The NIR reports that time constraints did not allow the Party to improve the inventory as needed. The main further improvements include the establishment of a robust national inventory system, including a quality assurance/quality control (QA/QC) plan, the estimation of activities which are not yet estimated, especially in the LULUCF and Waste sectors, the implementation of the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) with the use of more advanced tier methods to estimate the key categories, and the provision of quantitative uncertainty estimates. Iceland is encouraged to set up the necessary institutional arrangements to fully implement the IPCC good practice guidance. Iceland is also recommended to provide CRF tables including all GHG emissions in order to fulfil the reporting requirements under the UNFCCC.

7. As in previous inventory submissions, Iceland has submitted CRF tables excluding certain CO_2 emissions in the Industrial Processes sector from three single projects, which in the view of the Party fall under decision 14/CP.7. This was because the NIR aimed at the dual purpose of providing estimates of Iceland's GHG emissions for the UNFCCC and of tracking Iceland's internationally agreed targets under the Kyoto Protocol. As in previous inventory reviews, the ERT recognized the Party's intention, but noted that its current reporting is inconsistent with the reporting requirements under the UNFCCC. In order to fulfil them, the ERT repeats the recommendation of the 2004 inventory review that Iceland should follow the revised UNFCCC reporting guidelines and not exclude emissions that fall under decision 14/CP.7. However, Iceland may wish to consider the inclusion of an additional annex in the NIR that reflects its GHG emissions (including their trend) excluding emissions that fall under decision 14/CP.7. The ERT only assessed those GHG emissions from Iceland that include all Industrial Processes emissions as contained in annex II to the 2005 NIR, in which Iceland has provided seven additional CRF tables (i.e. CRF table 2(I)s1, table 2(I).A-Gs2, table Summary 1.As1, table Summary 1.B, table Summary 2, table 10s1 and table 10s5) for the inventory year 2003. All the figures used in this report reflect those emissions, unless otherwise stated.

[3] 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.

F. Cross-cutting topics

1. Completeness

8. Iceland has provided a complete set of CRF tables for the period 1990–2003. The inventory covers the full national territory and all sectors. The notation keys are used throughout the tables. The main categories not reported are: Distribution of Oil Products – CO_2 and CH_4, actual HFC and SF_6 emissions under Consumption of Halocarbons and SF_6 (potential emissions are used in the trend tables), Wastewater Handling – N_2O and CH_4, and emissions and removals from a number of subcategories in the Land-use Change and Forestry (LUCF) sector. Iceland is encouraged to estimate these emissions. CO_2 emissions from plants in the ferroalloy and aluminium industry that in the view of the Party fall under decision 14/CP.7 are reported only in the documentation box of the CRF tables for all the years, and in the annex II to the NIR, but not in the cells of the CRF tables. Iceland is strongly recommended to include these emissions in the CRF tables in its next submission, bearing in mind that the inventory is reported under the Convention. Iceland is also recommended to provide the LULUCF CRF reporting tables in its 2006 submission.

2. Transparency

9. The ERT noted that the quality of the information reported in the CRF tables and in the NIR has improved since the Party's previous submission. However, there is a need to improve the transparency of the reporting, especially in the Energy, Agriculture and LULUCF sectors. The ERT encourages Iceland to improve transparency in its reporting by supplying more detailed information on methodologies.

3. Recalculations and time-series consistency

10. Iceland has provided recalculated estimates (tables 8(a)) and explanatory information for the period 1990–2002. The rationale for these recalculations is provided in the NIR in the sector chapters. The Party's reported recalculations match those identified by the secretariat.[4] The recalculations result in decreases in the estimates of total emissions of 7.2 per cent and 3.1 per cent for 1990 and 2002, respectively. The major changes include the updating of the estimates of CH_4 emissions from Solid Waste Disposal on Land and CO_2 emission from Waste Incineration, and the estimation of N_2O emissions from Solvent and Other Product Use that were previously not estimated.

4. Uncertainties

11. Iceland has addressed uncertainties in a qualitative manner only. However, information on activity data (AD) and emission factor (EF) uncertainties are provided in the NIR in the sectoral chapters. The NIR states that Iceland plans to provide quantitative uncertainty estimates for the 2006 submission. The ERT encourages Iceland to implement these plans, in order to create a sound basis for identifying the priorities for further improvement of the inventory.

5. Verification and quality assurance/quality control approaches

12. Iceland has not yet established a formal verification and QA/QC plan, although the calculations, the units used and data consistency are checked during the preparation of the inventory within the Environment and Food Agency of Iceland (EFA), which is the agency in charge of preparing the inventory. Iceland reports in the NIR that the development of a QA/QC system is under consideration.

[4] This assessment is based on the inventory data as shown in the 2005 CRF table files, and hence does not cover all industrial emissions (see paragraph 6).

13. The ERT noted some inconsistencies in the information presented in the CRF tables and in annex II to the NIR (CRF table Summary 2 and table 10s5 in the NIR show different numbers for both sectoral Industrial Processes emissions and overall GHG emissions).

6. Follow-up to previous reviews

14. The ERT acknowledged that, in response to previous reviews, N_2O emissions from Solvent and Other Product Use, and N_2O and CH_4 emissions from fuel combustion of various combustion sources have been estimated. However, the recommendation that Iceland include all emissions from the Industrial Processes sector in the national totals has not been followed.

G. Areas for further improvement

1. Identified by the Party

15. The NIR identifies several areas for improvement. In the list of planned improvements, Iceland includes the preparation of a national energy balance on an annual basis to be used in estimations. The implementation of a national inventory system has also already started. The estimation of quantitative uncertainties, the development of a QA/QC system, the estimation of HFC and SF_6 emissions, and some methodological improvements in Road Transportation, Agriculture and Waste are under consideration.

2. Identified by the ERT

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

(a) Provide quantified uncertainty estimates;

(b) Improve the consistency and completeness of its reporting, in particular in the Industrial Processes and LULUCF sectors;

(c) Prepare a national energy balance;

(d) Introduce a QA/QC management system;

(e) Implement fully the national inventory system that has been started.

17. The ERT recommends that the Party strengthen the personnel and financial resources available for the implementation of its reporting requirements under the Convention.

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

II. Energy

A. Sector overview

19. In 2003, the Energy sector contributed 53.8 per cent of the total GHG emissions of Iceland. There are virtually no fugitive emissions, so the sectoral emissions are entirely due to fuel combustion. The Transport and Other Sectors (dominated by Agriculture/Forestry/Fisheries) were the most important sources in the Energy sector, accounting for 37.5 per cent and 36.7 per cent, respectively, of sectoral emissions, followed by Manufacturing Industries and Construction, with 24.2 per cent, while Other and Energy Industries contributed only 0.8 per cent each. Energy Industries were a minor source because of Iceland's high share of renewable energy sources. In 2003, GHG emissions from the Energy sector were 9.2 per cent above the 1990 level. The trend varies for different subsectors, the highest increases occurring in Other (12,767.7 per cent), Manufacturing Industries and Construction (19.5 per cent) and

Transport (14.8 per cent). Energy Industries saw a decrease of 31.0 per cent over the period 1990–2003, while emissions from the Other Sectors decreased by 2.1 per cent.

20. In CRF table Summary 3 Iceland indicates that it uses an IPCC tier 1 approach with IPCC default values for all CO_2 emissions, including the key categories. For CH_4 and N_2O it indicates that it has used both tier 1 and tier 2 with IPCC default values. As no further details are provided in the NIR, the ERT was not able to verify this or to determine whether the use of IPCC default values in tier 2 methods for non-key categories is reasonable or worthwhile, when default values are used for CO_2 for key categories. The ERT recommends that Iceland use higher-tier methods for key categories, as requested by the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines). The ERT noted that fuel suppliers are likely to have additional information on the carbon content of the fuels supplied in Iceland. During the review Iceland informed that it will make every effort to obtain the carbon content and net calorific values of the fuels from the fuel suppliers and include this in its 2006 submission. The ERT further noted that, while the sources of AD are indicated, detailed information on AD and the national energy balance are not provided in the NIR.

21. The CRF includes estimates of all gases and major sources of emissions from the Energy sector, as recommended by the Revised 1996 IPCC Guidelines and the revised UNFCCC reporting guidelines. Estimates of N_2O and CH_4 emissions from fuel combustion of various subsectors have been reported for the first time in the 2005 submission. The notation keys are applied appropriately. The ERT acknowledged this improvement since the 2004 submission.

22. Iceland has taken note of the comments of the 2004 review report on the need to provide AD in the form of a national energy balance in future submissions, as well as the need to estimate quantitative uncertainties and develop a QA/QC plan. However, the ERT noted that methodological details are only provided for key categories in the NIR and recommends that the NIR should be complete.

B. Reference and sectoral approaches

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

23. CO_2 emissions from fuel combustion have been calculated using the reference and sectoral approaches. For the year 2003, there is a difference of 0.44 per cent in the CO_2 emissions estimates between the reference approach and the sectoral approach.

2. International bunker fuels

24. Consumption in international aviation and marine bunkers, as reported in CRF table 1.C, corresponds closely to the International Energy Agency (IEA) data for most years. Iceland relies on the national energy data for the amounts of bunker fuels. The ERT noted that in many countries these energy data are split between national and international bunkers but this split may not reflect the definitions of national and international bunkers given in the Revised 1996 IPCC Guidelines. The ERT recommends that the Party review its fuel consumption data and the split between national and international consumption, ensuring that it is compiled using the definitions given in the Revised 1996 IPCC Guidelines, and, if this is not possible, reallocate the fuel according to these guidelines. The ERT further recommends that Iceland describe the results of this investigation in its NIR.

3. Feedstocks and non-energy use of fuels

25. The ERT commends Iceland for the efforts made to include all feedstocks in CRF table 1A(d). However, the ERT noted that the methods used for estimating the feedstocks are still not transparently reported in the NIR. Iceland is encouraged to include descriptions of the methods used in its 2006 submission.

4. Country-specific issues

26. Geothermal energy and hydroelectric power provide 70 per cent of Iceland's primary energy sources. However, the ERT noted that both geothermal energy and hydroelectric power are potential sources of greenhouse gases. While the Revised 1996 IPCC Guidelines do not provide default methods, they do state that it is good practice to estimate emissions from all sources in a country. Given the importance of geothermal energy and hydroelectric power in Iceland, the ERT reiterates the recommendation of the 2004 review report that it should examine these sources and estimate the related emissions.

27. The ERT noted that the NIR only addresses emissions from key categories. The Party states that it will provide information on non-key categories in its future submissions. The Party is encouraged to supply a complete NIR in future, including information on non-key categories.

C. Key categories

1. Manufacturing industries and construction – Other: Solid – CO_2

28. The 1990–2003 implied emission factor (IEF) for CO_2 from solid fuels in the subcategory Other (92.71 t/TJ) is at the lower end of the range of reporting Parties (38.99–135.48 t/TJ) and lower than the IPCC default range (94.60–106.70 t/TJ). The NIR does not specify the origin of this IEF. The NIR also reports that all coal used in the country is used in a single cement plant. Iceland is encouraged to obtain the actual carbon content of the fuel used either from the plant or based on the source of the coal, and use it in its estimation of emissions for its next submission.

2. Manufacturing industries and construction – Other: Liquid – CO_2, N_2O

29. Manufacturing industries and construction – Other contains two key categories: Mobile Combustion: Construction – CO_2 and Cement Manufacture – CO_2. The ERT considered that it would aid clarity if more information on the contributions of these two sources were provided in the documentation box.

30. The ERT encourages Iceland to assess the types and characteristics of construction equipment under this category and to reconsider the EFs used, based on the actual split between road and off-road machinery in the Construction sector. The ERT encourages Iceland to make this assessment and document it in the NIR.

3. Road transportation: Liquid – CO_2, N_2O

31. The IEF for gasoline is 68.61 t/TJ for all years. However, Iceland indicates in the NIR that it uses the IPCC default value (73 t/TJ). Iceland is encouraged to clarify this in its 2006 submission.

32. As indicated during the previous 2005 review stages, the trend in the N_2O IEF for gasoline shows unusual and abrupt increases. The same value is reported for the years 1991–1994 (1.73 kg/TJ), for 1995–1996 (5.27 kg/TJ), for 1997–1998 (8.82 kg/TJ) and for 1999–2003 (13.24 kg/TJ). Iceland has addressed this issue in its response to previous 2005 review stages. The ERT, however, concluded that the increases in the IEF for N_2O from gasoline reported in Road Transportation cannot be feasible, as it considers an inter-annual increase of 189 per cent (between 1994 and 1995) implausible; similar step changes between 1996 and 1997, and between 1998 and 1999 (66 per cent and 50 per cent, respectively) are also seen as unrealistic. As the turnover of the vehicle fleet is slow and from one year to the next the emission patterns of the great majority of vehicles remain unchanged, the IEFs for the total vehicle fleet can only change slowly. The ERT recommends that the Party verify these data and revise them as appropriate for the next submission.

D. Non-key categories

1. Energy industries: Liquid, other fuels – CO_2, CH_4 and N_2O

33. During the 2004 in-country review, Iceland explained that other fuels as it reports them include landfill gas. The estimates for these emissions are explained in the NIR under the Waste sector but reported under the Energy sector in accordance with the Revised 1996 IPCC Guidelines. The ERT reiterates the recommendation of the 2004 review that Iceland should provide further explanation of the approach it uses in the NIR.

34. The ERT recommends that the Party estimate CH_4 emissions from other fuels in Public Electricity and Heat Production.

35. The 2004 in-country review noted that use of residual oil for heating swimming pools was reported under Energy Industries, and suggested that this source be included under the category Commercial/Institutional in Iceland's next submission. Considering no recalculations have been performed in Other Sectors, the ERT also recommends that this be carried out for Iceland's 2006 submission.

2. Manufacturing industries and construction: Gas, liquid, solid, other fuels, biomass – CO_2, CH_4 and N_2O

36. As indicated during previous 2005 review stages, liquid fuel consumption is reported for the years 1992–2003 for the subcategory Iron and Steel. Activity data are reported as "0" for 1990 and 1991. It was not clear to the ERT whether the AD for 1990 and 1991 should be reported as "not occurring" ("NO") or as "not estimated" ("NE"). Furthermore, the CRF reports significant use of biomass. The ERT recommends that the Party explain this activity and the related EF in the NIR. The Party is encouraged to revise the CRF by using the correct notation keys and to provide further details in its 2006 submission. In addition, the ERT recommends that Iceland estimate CH_4 and N_2O emissions from biomass consumption.

37. The AD values of fuel consumption for Food Processing, Beverages and Tobacco, and the CO_2 emissions from liquid fuels for Other, fluctuate considerably, with inter-annual changes of up to 112 per cent. No reasons for the variability are given in the NIR. The Party is encouraged to explain the fluctuations observed in this sector in the NIR.

3. Navigation: Liquid – CO_2, CH_4 and N_2O

38. The IEA reports fuel consumption for residual oil (80 TJ in 2003), while the CRF reports "0.00". The AD for gas/diesel oil in 2003 are 26.9 per cent lower in the CRF than the data reported to the IEA (the amounts are 237 TJ and 173 TJ, respectively). The ERT recommends that the Party investigate the reasons for the differences and provide an explanation in its 2006 NIR.

39. The 2004 review report noted that offshore fuelling of fishing vessels was included in the national totals, although the fuel was not sold on the national territory. Such offshore fuelling of vessels in Icelandic waters should be reported under 1.A.4.c Other – Agriculture/Forestry/Fisheries for any year in which it occurs. The ERT encourages Iceland to include this item when developing a QA/QC plan and to explain what has been done in the NIR.

4. Fugitive emissions from oil, natural gas and other sources: Oil – CO_2 and CH_4

40. AD, IEFs and CO_2 and CH_4 emissions from the distribution of oil products are reported as "NE". While this is not likely to be a significant source, the Party is recommended to estimate these emissions.

III. Industrial Processes and Solvent and Other Product Use

A. Sector overview

41. In 2003, the Industrial Processes sector accounted for 25.6 per cent of total national GHG emissions in Iceland, and Solvent and Other Product Use for 0.1 per cent. In 2003, CO_2 accounted for 93.1 per cent of emissions from the Industrial Processes sector, and PFCs from Aluminium Production for 6.8 per cent. In the period 1990–2003, GHG emissions from Industrial Processes increased by 2.8 per cent, mainly because of an increase of 12.0 per cent in emissions from Metal Production (as a result of an increase in aluminium and ferroalloys production), compensated by a decrease of 36.8 per cent in emissions from Mineral Products (due to a fall in cement production) and a decrease of 99.0 per cent in emissions from the Chemical Industry (due to the closing down of fertilizer production).

42. The ERT welcomes the methodological improvements made by the Party such as the introduction of a higher-tier method (tier 2) for Cement Production.

43. The ERT encourages Iceland to establish verification and quality control procedures for data provided by industrial plants.

44. To improve the completeness of the inventory, the ERT encourages Iceland to provide estimates of emissions from food and drink production.

45. Concerning the Solvent and Other Product Use sector, the Party explains in the NIR that the conversion of non-methane volatile organic compound (NMVOC) emissions to CO_2 has not been reported. The ERT encourages the Party to estimate CO_2 emissions from Solvent and Other Product Use. The ERT noted that descriptions, explanations and assumptions are not documented in the NIR, and encourages Iceland to provide more detailed information about the AD and assumptions used to estimate emissions from the Solvent and Other Product Use sector.

46. According to the CRF tables, NMVOC emissions from chemical products, manufacture and processing are reported as "included elsewhere" ("IE"), but no explanation is provided. The ERT invites Iceland to indicate where the NMVOC emissions from chemical products, manufacture and processing have been reported.

B. Key categories

1. Ferroalloys production – CO_2

47. The ERT noted that the same value is reported for CO_2 emissions for the years 1990 and 2000–2003 (203.5 Gg). For 2003, an additional 185.72 Gg CO_2 are reported separately and not included in the total emissions. Iceland has reported these emissions separately following decision 14/CP.7 on the impacts of single projects on emissions in the commitment period (see paragraph 7). The ERT noted that this is not consistent with the revised UNFCCC reporting guidelines and encourages Iceland to report all Industrial Processes emissions in its future inventories.

2. Aluminium production – CO_2

48. The ERT noted that the same value is reported for CO_2 emissions for the years 1990–1991 and 2001–2003 (136.5 Gg). For 2003, an additional 265.10 Gg CO_2 are separately reported and not included in the total emissions. Iceland has reported these emissions separately following decision 14/CP.7 on the impacts of single projects on emissions in the commitment period (see paragraph 7). The ERT noted that this is not consistent with the revised UNFCCC reporting guidelines and encourages Iceland to report all Industrial Processes emissions in its future inventories.

3. Aluminium production – PFCs

49. The ERT noted large decreases in the perfluoromethane (CF_4) and perfluoroethane (C_2F_6) IEFs between 1990 and 2003 (from 0.62 kg/t for CF_4 and 0.08 kg/t for C_2F_6 in 1990, to 0.03 kg/t for CF_4 and 0.004 kg/t for C_2F_6 in 2003); all the 1992–2003 values are below the IPCC default ranges (0.31–1.7 kg/t for CF_4 and 0.04–0.17 kg/t for C_2F_6). The inter-annual changes for 1991–1992, 1992–1993, 1993–1994, 1994–1995, 1995–1996, 1996–1997, 1997–1998 and 2000–2001 have also been identified as outliers. Iceland explained that the IEFs do vary from year to year and from plant to plant depending on the number of anode effects and their intensity and duration. The ERT recommends that Iceland provide more detailed information in its next NIR on the AD and anode effect data (anode effect duration in minutes (AED) and number of anode effects per cellday (AEF)), in order to enable the ERT to interpret and verify these fluctuations.

4. Consumption of halocarbons and SF_6 – HFCs

50. Consumption of Halocarbons and SF_6 was identified as a key category by the Party, but not by the secretariat. Concerning the fluorinated gases (F-gases), only imports in bulk of HFC-125, HFC-134a and HFC-143a are reported. The Party explains in the NIR that data are not available to allow it to estimate actual emissions. The ERT encourages Iceland to collect relevant data in order to be able to estimate actual emissions of halocarbons and SF_6 for its next submission.

C. Non-key categories

Consumption of halocarbons and SF_6 – SF_6

51. According to the information provided in the CRF tables, SF_6 emissions from Electrical Equipment are constant over the whole time series. The ERT invites Iceland to justify and document this trend, and encourages it to estimate SF_6 emissions from all sources of Consumption of Halocarbons and SF_6.

52. Iceland estimates emissions from “Mineral Wool” and “Diatomee Production” in the CRF tables, but no methodological information is provided in the NIR. To enhance the transparency of the inventory, the ERT recommends that Iceland include in the NIR methodological information on the emissions estimates from “Mineral Wool” and “Diatomee Production” even if they are not key categories.

IV. Agriculture

A. Sector overview

53. In 2003, the Agriculture sector accounted for 14.1 per cent of the total national GHG emissions of Iceland, reaching 489.4 Gg CO_2 equivalent. Over the period 1990–2003, emissions from the sector decreased by 14.3 per cent. In 2003, CH_4 emissions contributed 51.7 per cent of sectoral emissions, and N_2O accounted for the remaining 48.3 per cent. Enteric Fermentation, Agricultural Soils and Manure Management are the only categories reported, contributing 47.5 per cent, 43.0 per cent and 9.4 per cent, respectively, to the sectoral total.

54. Iceland has carried out a key category analysis using the IPCC tier 1 method, and identified the following key categories: Enteric Fermentation in domestic livestock – CH_4, and Direct and Indirect N_2O Emissions from Agricultural Soils. The secretariat’s analysis also includes Animal Production – N_2O in the key categories. It is not clear from the NIR whether Iceland has included this category under Direct Soil Emissions in its analysis or not.

55. The NIR provides a general description of the methodologies and data sources used. As with the 2004 submission, the NIR is not complete because it does not include information about emissions from

Manure Management. The ERT encourages the Party to include a description of the methodology used for calculating emissions from Manure Management in its next submission.

B. Key categories

1. Enteric fermentation – CH_4

56. Since Enteric Fermentation is a key category for Iceland, the ERT encourages the Party to update the methodology used to tier 2.

57. The ERT noted that the populations of sheep and swine used in the calculations differ from the populations reported to the Food and Agriculture Organization of the United Nations (FAO). The AD reported in the 2005 submission for Sheep (647,000 head) are 27.4 per cent higher than the data provided by FAO, while the AD reported for Swine (32,000 head) are 36.7 per cent lower than the data provided by FAO. The ERT encourages the Party to explain these differences in its 2006 submission, and to work on the harmonization of the data submitted to different international organizations.

2. Direct emissions from agricultural soils – N_2O

58. Emissions from the Cultivation of Histosols are reported in the CRF and described in the NIR as "NE", but there is no information about the reason for this. During the 2004 in-country review, the ERT was informed that the constant figure of 7.5 kha histosols used previously was under verification and that emissions estimates would be available for the 2005 submission. The ERT encourages the Party to include emissions from this source in its 2006 submission.

59. As indicated during previous 2005 review stages, $Frac_R$ is reported since 1992 and it shows fluctuations within the range of 0.05–0.40 in the period 1992–2003, remaining below the IPCC default value (0.45). The Party stated in its response to the 2004 previous review stages that $Frac_R$ increases with an increase in the amount of barley produced. It was not clear to the ERT whether Iceland had any crop harvest before 1992. The ERT encourages the Party to explain this matter in its 2006 NIR, and to provide the background information for the estimation of $Frac_R$.

60. During the previous 2005 review stages it was indicated that the change in the value of $Frac_{NCRBF}$ between 1990 (0.011 kg nitrogen (N)/kg of dry biomass) and 2003 (0.008 kg N/kg of dry biomass) has been identified as an outlier. The 2003 value is 30.8 per cent lower than the 1990 value, and both values are lower than the IPCC default value (0.03 kg N/kg of dry biomass). There is no description in the NIR of the methodology used for calculating the emissions reported from Crop Residue. The ERT encourages the Party to include this information in its 2006 submission.

C. Non-key categories

Manure management – CH_4 and N_2O

61. Emissions are reported in the CRF tables but there is no information in the NIR about the methodology and data sources used for this category.

62. It was not clear to the ERT whether the $Frac_{GRAZ}$ reported in CRF table 4.D and the fractions used for Pasture Range and Paddock for the different types of animals by calculating N_2O from manure are consistent. The ERT encourages the Party to explain this in its 2006 submission.

V. Land Use, Land-use Change and Forestry

A. Sector overview

63. The ERT noted that Iceland has not submitted the LULUCF CRF reporting tables as required by decision 13/CP.9. Instead it has used the CRF tables for LUCF, which is based on the categories of the Revised 1996 IPCC Guidelines.

64. According to the NIR, the natural woodland area of Iceland covers 1.2 per cent of the national territory, whereas forest tree plantations and re-vegetation activities cover less than 1 per cent of the national territory. The planting of forest trees and re-vegetation activities are mainly driven by purposes other than carbon sequestration.

65. The LUCF sector is reported to be a net sink of CO_2, with total net removals of 207.64 Gg CO_2 in 2003. This is equal to 7.9 per cent of total CO_2 emissions, or 6.0 per cent of total GHG emissions. Over the period 1990–2003, net CO_2 removals by the sector showed an important increase, by 2,508.5 per cent.

66. When reviewing the information on the LUCF sector, the ERT considered the estimates to be largely incomplete, for the following reasons:

(a) The estimates only include partial estimates of CO_2 removals from 5.A Changes in Forest and Other Woody Biomass Stock (forest plantations since 1990) and 5.E Other (re-vegetation of eroded soils since 1990);

(b) CO_2 and non-CO_2 emissions from 5.B Forest and Grassland Conversion, CO_2 removals from 5.C Abandonment of Managed Lands and CO_2 emissions/removals from 5.D CO_2 Emissions and Removals from Soil are reported as "NE", due to lack of data;

(c) Area of forest plantations has been derived using, as a proxy, the production of seedlings in nurseries and subdividing this total production by the average value of seedlings planted per hectare. Moreover, two different numbers for that average value are provided: 4,000 in the CRF and 2,350 in the NIR. The method therefore results in such high uncertainties that it should be considered not applicable;

(d) No AD or EFs are reported for re-vegetation.

67. The ERT encourages Iceland to continue improving the completeness of its reporting on the LULUCF sector, with regard to both the CRF tables for LULUCF and the NIR.

68. The ERT encourages Iceland to improve the consistency of its reporting on the LULUCF sector, applying the methodologies outlined in the IPCC *Good Practice Guidance for Land Use, Land-use Change and Forestry*.

69. The ERT noted that the NIR contains information which is useful for a better understanding of the national circumstances of the LUCF sector in Iceland. However, more information is needed for fully transparent reporting, especially on methodological issues. The ERT further noted that the NIR does not provide sufficient background and methodological information, or information on the AD and EFs used for re-vegetation, or background information on the growth rate applied for forest plantations. The ERT recommends that Iceland include in the NIR a brief overview of the information contained in the literature referenced, especially when it is not in one of the official UN languages.

70. Qualitative assessments of the uncertainties of the estimates, based on expert judgement, have been performed, and in CRF table 7 the value "medium" is reported. Bearing in mind the approach applied to generate the AD and background information for the EF, the ERT considers that the

uncertainties implied in the estimation are likely to be higher than reported. The ERT encourages Iceland to improve the uncertainty assessment and to provide quantitative estimates of uncertainties in its next inventory submission.

VI. Waste

A. Sector overview

71. In 2003, the Waste sector accounted for 6.3 per cent of Iceland's total GHG emissions. Between 1990 and 2003 sectoral emissions increased by 63.4 per cent. Most of this change can be attributed to increases in CH_4 emissions from Solid Waste Disposal on Land, which increased by 87.0 per cent between 1990 and 2003. Solid Waste Disposal on Land is a key category, accounting for 97.5 per cent of total Waste emissions in 2003.

72. Revisions to Iceland's solid waste AD have resulted in recalculations which decreased the estimates of total base year (1990) emissions by 27.4 per cent, and the estimates of 2002 emissions by 19.3 per cent. Since the NIR already acknowledges that the solid waste AD are not complete, the ERT can only encourage Iceland to continue its efforts in studying and determining this important component of its Waste inventory.

73. The ERT recommends Iceland, in the interest of completeness, to estimate emissions from Waste-water Handling. According to CRF table 9, this omission is due to lack of AD. The ERT noted that it is important to quantify emissions from this category in order to determine the choice of priorities for improvements to the inventory for future submissions.

B. Key categories

1. Solid waste disposal on land – CH_4

74. Iceland is encouraged to apply a tier 2 method (e.g. the first-order decay (FOD) model) in estimating emissions from Solid Waste Disposal on Land, which is a key category. Inputs to the FOD model, namely the decay rate constant (k) and the methane generation potential (Lo), can be obtained from the IPCC literature or from countries with similar conditions. The historical AD used in tier 1 can be used in this higher-tier method.

75. The ERT noted that the CRF sectoral background data table, table 6.A, is not completely filled in. Some of the information required in these cells can be obtained from the NIR and/or from references cited there (e.g. Environment and Food Agency). The ERT recommends that Iceland complete this table to provide greater transparency and to increase the comparability off the inventory with those of other Parties.

76. The NIR states that historical AD have been reconstructed from 2002, based on an annual increase rate of waste generation of 1.5 per cent per capita per year. The ERT recommends that the Party explain or justify the magnitude of this value. A good way to assess the quality of solid waste AD is to calculate per capita waste generation rates and to compare these with other countries and over time.

77. The time series trend of Iceland's Waste emissions follows closely the pattern of CH_4 emissions from landfills over the years. This pattern shows two distinct annual rates, one of about 7–8 per cent from 1990 to 1994, and the other of about 1–2 per cent from 1995 to 2003. Iceland is encouraged to explain the apparent reduction of CH_4 emissions from landfills, particularly between 1994 and 1995.

78. The degradable organic carbon (DOC) value (0.14 Gg C/Gg municipal solid waste) used in Iceland's solid waste emissions inventory may be underestimated because a DOC fraction of only 57 per

cent of the waste stream has been determined. Iceland is encouraged to complete this calculation and report the results in its next inventory submission.

2. Waste incineration – CO_2

79. Since Waste Incineration is a key category by the trend assessment (due to a rapid decrease since 1990), Iceland has improved its collection of AD, particularly at major incineration plants, since 2000. The ERT encourages Iceland to start determining its own EFs rather than using the IPCC default values in its estimation of incineration-related emissions.

80. In its calculation of historical emissions associated with waste incineration, Iceland has used a value of 500 kg of incinerated waste per capita for certain years (e.g. 1990, 1995, and 2000), and interpolated for intervening years. This implies that roughly 1.4 kg/person/day of waste is incinerated (assuming that 500 kg is an annual value). The ERT noted that this value may be unreasonably high, and Iceland is encouraged to validate this figure.

C. Non-key categories

Waste-water handling – CH_4 and N_2O

81. Since emissions from Waste-water Handling have not been estimated for the 2005 inventory submission, the ERT recommends the use of the notation key "NE" rather than "0.00" as the appropriate entry under Wastewater Handling in CRF table 6.

82. Iceland is encouraged to estimate N_2O Emissions from Human Sewage. Population data and other parameters from FAO data sets can be readily accessed to provide initial yet reasonable estimates. The ERT recommends that Iceland report these emissions estimates in its next submission.

Annex

Documents and information used during the review

A. Reference documents

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

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

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

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

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

UNFCCC secretariat. "2005 Status report for Iceland". Available at <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/inventory_review_reports/application/pdf/iceland_final_report_to_web.pdf>).

UNFCCC secretariat. Synthesis and assessment report of the greenhouse gas inventories submitted in 2005. Part I: 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 (2005). "Report of the individual review of the greenhouse gas inventory of Iceland submitted in the year 2004". FCCC/WEB/IRI/2004/ISL. Available at <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/inventory_review_reports/application/pdf/iceland_final_report_to_web.pdf>>).

B. Additional materials

Responses to questions during the review were received from Mr. Ottar Gíslason (Ministry for the Environment) including additional material on the methodology and assumptions used.

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