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ICELAND

REPORT OF THE INDIVIDUAL REVIEW OF THE GREENHOUSE GAS INVENTORY SUBMITTED IN THE YEAR 2004[1]

EXECUTIVE SUMMARY

1. This report covers the in-country review of the 2004 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 of the Conference of the Parties. The review took place from 20 to 24 September 2004 in Reykjavik, Iceland, and was conducted by the following team of nominated experts from the roster of experts: Generalist and Industrial Processes – Mr. Klaus Radunsky (Austria), Energy – Mr. Francis Yamba (Zambia), Agriculture and Land-use Change and Forestry – Mr. Sergio González (Chile), Waste – Ms. Tatiana Tugui (Republic of Moldova). Mr. Klaus Radunsky and Mr. Francis Yamba were the lead reviewers. The review was coordinated by Ms. Sevdalina Todorova-Brankova (UNFCCC secretariat).

2. In accordance with the "UNFCCC guidelines for the technical review of greenhouse gas inventories from Annex I Parties" (hereinafter referred to as UNFCCC review guidelines), 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.

3. In the year 2002, the most important greenhouse gas in Iceland was carbon dioxide (CO_2), contributing 74 per cent to total[2] national GHG emissions expressed in CO_2 equivalent, followed by methane (CH_4) – 15 per cent – and nitrous oxide (N_2O) – 8 per cent. Perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF_6) taken together contributed 3 per cent of the overall GHG emissions in the country. The Energy sector accounted for 53 per cent of the total GHG emissions, followed by Industrial Processes (26 per cent), Agriculture (14 per cent) and Waste (7 per cent).

4. Total GHG emissions amounted to 3,622 Gg CO_2 equivalent in 2002 and increased by 9 per cent from 1990 to 2002. In the same period gross domestic product (GDP) (at current market prices) increased by almost 36 per cent. Whereas GDP increased by 9 per cent from 1998 to 2002, total GHG emissions increased by 3 per cent over the same period. Tables 1 and 2 provide data on emissions by gas and by sector from 1990 to 2002. Over that period CO_2 emissions increased by 28 per cent, mainly as a result of increased emissions from the Industrial Processes and Manufacturing Industries and Construction sectors. CH_4 emissions increased over the same period by 15 per cent, mainly because of increases in the Waste sector; and N_2O emissions decreased by 14 per cent over the same period because of the changes in Industrial Processes and Agriculture. Emissions from HFCs increased significantly (there were no

[1] In the symbol for this document, 2004 refers to the year in which the inventory was submitted, and not to the year of publication.

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

emissions in 1990), whereas emissions from PFCs saw an 83 per cent decrease between 1990 and 2002. No trend could be assessed for SF_6 due to lack of updated data on emissions. With this exception, the overall trends are considered to reflect the real fluctuations in emissions over the years.

Table 1. Greenhouse gas emissions by gas, 1990–2002

GHG emissions	Gg CO_2 equivalent													Change from 1990–2002 per cent
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	
CO_2 (with LUCF)[a,b]	2 079	1 989	2 101	2 195	2 149	2 157	2 236	2 325	2 301	2 457	2 448	2 445	2 517	21
CO_2 (without LUCF)[a,b]	2 085	2 003	2 126	2 232	2 196	2 213	2 302	2 405	2 395	2 570	2 579	2 590	2 679	28
CH_4	460	463	462	469	475	479	493	509	523	520	540	541	527	15
N_2O	351	343	322	329	335	331	349	348	346	366	342	335	303	–14
HFCs[c]	0	0	0	2	3	25	29	37	64	59	32	54	35	
PFCs	420	348	155	75	45	59	25	82	180	173	127	92	73	–83
SF_6[c]	5	5	5	5	5	5	5	5	5	5	5	5	5	0
Total (with CO_2 from LUCF)[b]	**3 316**	**3 148**	**3 045**	**3 075**	**3 012**	**3 057**	**3 138**	**3 307**	**3 419**	**3 582**	**3 494**	**3 472**	**3 460**	**4**
Total (without CO_2 from LUCF)[b]	**3 322**	**3 163**	**3 070**	**3 112**	**3 059**	**3 113**	**3 204**	**3 388**	**3 513**	**3 694**	**3 625**	**3 617**	**3 622**	**9**

[a] LUCF = Land-use Change and Forestry

[b] Note that the figures in table 1 are not consistent with the data submitted by Iceland in the CRF tables (see also paragraph 27)

[c] The HFC and SF_6 emissions are potential emissions as actual emissions have not been submitted by Iceland

Table 2. Greenhouse gas emissions by sector, 1990–2002

GHG source and sink categories	Gg CO_2 equivalent													Change from 1990–2002 per cent
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	
Energy	1 703	1 657	1 781	1 842	1 806	1 816	1 909	1 965	1 928	1 968	1 871	1 843	1 915	12
Industrial Processes[b,c]	865	759	565	535	507	557	533	650	797	932	934	932	934	8
Solvent Use	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Agriculture	568	557	532	534	541	521	535	534	541	546	527	524	503	–11
LUCF[a]	–6	–15	–25	–37	–47	–56	–66	–81	–94	–112	–131	–145	–163	2717
Waste	185	190	192	200	205	219	227	239	248	248	278	280	269	45
Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	

[a] LUCF = Land-use Change and Forestry. NE = not estimated. NO = not occurring

[b] Note that the figures in table 2 are not consistent with the data submitted by Iceland in the CRF tables (see also paragraph 27)

[c] The HFC and SF_6 emissions are potential emissions as actual emissions have not been submitted by Iceland

5. During the review the expert review team took note of the country-specific circumstances relevant for the understanding of the emissions data and the comprehensiveness of the inventory submission, inter alia, the population of 290,000 inhabitants living on an area of about 103,000 km^2 with two-thirds of the population concentrated in the Greater Reykjavik area, the high share of renewables (hydro-power and geothermal energy) in public electricity and heat production, the small share of forest land, and the high importance of the fishing industry and aluminium and ferroalloys production for the economy of Iceland.

6. The expert review team acknowledged that Iceland has provided for the first time a complete set of common reporting format tables for the whole period 1990–2002, as well as a national inventory report,

including a key source analysis based on emissions data for the years 1990 and 2002. The expert review team also noted the improvements based on recommendations from the 2001 desk review (see FCCC/WEB/IRI(I)2001/ISL) and the ongoing work to significantly improve the quality of the emissions inventory for the Land-use Change and Forestry (LUCF) sector, in particular with regard to activity data, with the goal of meeting the reporting requirements under the Kyoto Protocol.

7. However, the expert review team noted some departures from the UNFCCC guidelines in that not all CO_2 emissions/removals from the Industrial Processes and LUCF sectors are included (see also paragraphs 27 and 28).

8. Furthermore the expert review team noted the strong commitment of the very small number of staff who are responsible for preparing the submission. It encouraged Iceland to speed up the process of establishing a more robust network for compiling the annual inventory submission in order to make better use of synergies, for example, with regard to the work already undertaken by various agencies, and to provide the necessary resources to start full 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).

9. The issues of high importance for improving the inventory can be summarized as follows:

(a) The establishment of a more robust institutional and legal framework for fulfilling the reporting requirements under the UNFCCC, for example, as a basis for the preparation of the national energy balance;

(b) The reporting of all LUCF activities and Industrial Processes emissions in accordance with the UNFCCC reporting guidelines;

(c) Closing other estimation and reporting gaps in the inventory (e.g., emissions from waste-water handling, and actual emissions from HFCs and SF_6);

(d) Improving the quality of the activity data (e.g., in the LUCF and Waste sectors);

(e) Further implementation of the IPCC good practice guidance (e.g., the use of additional country-specific methodologies for key sources such as road transportation; quantitative estimation of uncertainties for total and sectoral emissions, as well as for the main key sources; and the introduction of a more advanced quality assurance/quality control system, including verification of information provided by industry, including the fishing industry);

(f) Improvement of the transparency of the inventory by providing more detailed information in the national inventory report (e.g., on recalculations, on the choice of methodologies, on details of country-specific methodologies and on activity data, and references to background material);

(g) Improvement of consistency with other national and international data sets (e.g., waste-related activity data, cement production data) and of explanations for inconsistencies, if any.

10. A more complete list of necessary improvements, split into those with higher and those with lower priority, is included in paragraphs 29 and 30.

11. In addition the expert review team noted the need to report offshore fuelling of fishing vessels and other ships in Icelandic waters, should it occur, and encouraged Iceland to continue efforts to develop a methodology to estimate GHG emissions from hydro-reservoirs and from the use of geothermal energy, as both sources might be significant ones under the specific circumstances of Iceland.

I. OVERVIEW

A. Inventory submission and other sources of information

12. Iceland submitted a complete set of common reporting format (CRF) tables for the years 1990–2002 on 25 June 2004. Iceland also submitted a national inventory report (NIR) for the first time in 2004. These are the main documents reviewed by the expert review team (ERT). Where needed the ERT also used previous years' submissions, including the CRF tables for the years 1999, 2000 and 2001.

13. During the in-country review Iceland provided the ERT with additional information. Most relevant were the revised CRF tables for the year 2002, reflecting GHG emissions not excluding emissions falling under decision 14/CP.7 of the Conference of the Parties (COP). In addition other documents that are not part of the inventory submission were provided, such as official publications (e.g., the *Statistical Yearbook*) and internal documents (e.g., "Eldsneytisnotkun Islendinga Eftir Notkunarflokkum, Innlend Notkun" [Fuel use in Iceland per type, domestic use] from the National Energy Forecast Committee). The full list of materials used during the review is provided in annex 1 to this report.

B. Key sources

14. Iceland has reported a tier 1 key source analysis, both level and trend assessment, as part of its 2004 submission, using data for the years 1990 and 2002. The key sources analyses performed by the Party and the secretariat[3] produced similar results with small deviations due to the different disaggregation of emissions in source categories. The deviations include N_2O emissions from animal production and CO_2 emissions from navigation, which are key sources according to the secretariat's assessment but are not assessed as key sources in the national analysis, whereas HFC emissions from ozone depleting substance (ODS) substitutes are identified as a key source only in the national key source assessment and not by the secretariat.

15. Iceland has used the key source analysis only to a limited extent to prioritize the further development of its inventory and has not yet established a more comprehensive road map to further improve its emissions inventory.

C. Cross-cutting topics

Completeness

16. The inventory is complete with regard to the time period covered (1990–2002), coverage of the whole territory of Iceland, and coverage of sectors. Most of the gaps are related to the lack of data for the LUCF sector as specified under the UNFCCC and to the lack of data on actual emissions of HFCs, PFCs and SF_6. The potential emissions of SF_6 have not been updated and the figures for potential emissions of HFCs include only imports of the gases in bulk, without information on gases imported in products such as air-conditioning equipment. There are other gaps in the data, for instance, with regard to emissions from waste-water handling, N_2O and CH_4 emissions from fuel combustion of various combustion sources, CO_2 and N_2O emissions from solvent and other product use, and CO_2 emissions and removals from soils.

[3] The secretariat had identified, for each individual Party, those source categories which are key sources in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC good practice guidance. Key sources according to the tier 1 trend assessment were also identified for those Parties providing a full CRF for the year 1990. Where the Party has performed a key source analysis, the key sources presented in this report follow the Party's analysis.

Transparency

17. There is a need to develop the NIR further in order to improve the transparency of reporting. Although the NIR follows the template agreed by the COP, important information is missing or insufficient in the NIR and should be included in the next submission, for instance, relating to the rationale for the choice of the methods, activity data (AD) and their linkage to national statistics, a more detailed description of the specific circumstances of Iceland (e.g., with regard to the Agriculture, LUCF and Energy sectors), and information on country-specific approaches and methodologies. Furthermore the ERT would welcome more complete information that helps to explain any changes in emission factors (EFs) or implied emission factors (IEFs) (e.g., for aluminium production) or AD (e.g., cement and fertilizer production). The ERT appreciated the fact that no data are treated as confidential even though industrial activities in Iceland are usually focused on a few plants.

Recalculations and time-series consistency

18. The ERT noted that the Party had undertaken recalculations for the time series 1990–2001 to take into account the recommendations of the 2001 desk review, for example, updates in the allocation of fuel consumption between Transport and Manufacturing Industries and Construction, the introduction of a more accurate tier 2 slope methodology for PFC emissions from the aluminium industry, the revision of numbers of animals, the replacement of a poorly documented country-specific methodology by IPCC tier 1 approaches, and updates in the figures for landfilled waste. Comparing the figures for emissions reported for inventory year 1990 shows: total GHG emissions of 2,939 Gg CO_2 equivalent reported in 2001; recalculations resulted in a figure of 2,799 Gg CO_2 equivalent (–5 per cent decrease compared to the figure reported in 2001) in the 2002 submission, 2,838 Gg CO_2 equivalent (–3 per cent) in the 2003 submission, and 3,322 Gg CO_2 equivalent (+13 per cent compared to the 2001 submission) in the 2004 submission. These changes are comparable to the changes resulting from recalculations for inventory year 1999: total GHG emissions of 3,441 Gg CO_2 equivalent were reported in 2001; recalculations resulted in a figure of 3,119 Gg CO_2 equivalent (–9 per cent) in the 2002 submission, 3,082 Gg CO_2 equivalent (–10 per cent) in the 2003 submission, and 3,694 Gg CO_2 equivalent (+7 per cent) in the 2004 submission. The increase in total GHG emissions between the years 1990 and 1999 changed from 17 per cent (reported in the 2001 submission) to 11 per cent (in the 2002 and 2004 submissions) and 9 per cent (in the 2003 submission). The rationale for most of the latest recalculations is provided in the NIR. Although no quantitative estimates of uncertainties have been made so far there are good reasons to say that the recalculations have considerably improved the accuracy of the emissions inventory. Additional recalculations are expected following the recommendations of this report (e.g., taking into account more recent figures on the amount of waste deposited, and adding emissions data for sources that are not yet included).

Uncertainties

19. Iceland has addressed uncertainties in a qualitative manner only. The NIR identifies a quantitative uncertainty evaluation as a priority for the next submission. The ERT encourages Iceland to do this in order to have a sound basis for identifying the priorities for further improvement of the inventory. Uncertainties are expected to be large, especially in LUCF (due to the lack of a national forest inventory), Waste (due to lack of historical data) and Agriculture sectors (due to a lack of country-specific methodologies that take into account the specific breeds in Iceland).

Verification and quality assurance/quality control approaches

20. Iceland has not yet established formal quality assurance/quality control (QA/QC) procedures. The NIR states that calculations and units have been checked internally within the Environment and Food Agency (EFA), which is in charge of preparing the inventory submission. For the time being no plans have been developed to introduce QA/QC in consistency with the IPCC good practice guidance because

of resource limitations. The ERT recommends regular verification of the information provided by the operators of plants or other installations and the introduction of peer review of the inventory estimates before they are submitted to the UNFCCC secretariat.

Institutional arrangements

21. During the in-country visit, Iceland explained the institutional arrangements for preparation of the inventory. The EFA, which is under the ultimate control of the Ministry of Environment, has overall responsibility for the national inventory. The National Energy Forecast Committee (NEFC) collects annual information on fuel sales from companies (which provide the information on an informal basis), and these data are the basis for the calculation of the emissions from the Energy sector. Data on geothermal energy are collected by the National Energy Authority (NEA). The Icelandic Association of Farmers, on behalf of the Ministry of Agriculture, is in charge of assessing the size of the animal population each year, the Agricultural Research Institute collects information relevant for LUCF and Agriculture, and the EFA collects information from industry, imports of different types of HFCs and estimates AD with regard to Waste. The NEA submits information on energy to the International Energy Agency (IEA) but does not publish an official national energy balance. Statistics Iceland (Hagstofa Islands) provides information to the Food and Agriculture Organization of the United Nations (FAO) and collects and provides data on import/export statistics (e.g., data relevant for HFCs, fertilizers and solvents).

22. The ERT noted the lack of statistical information on road transportation relevant for preparation of the emission inventory, as well as data on waste water and solid waste composition.

23. The ERT further notes that not enough resources have been available to employ more than one expert at the EFA for the preparation of the inventory, or to subcontract external institutions or experts. The ERT recommends the involvement of the Climate Change Council, an inter-ministerial committee of high-ranking civil servants, in the improvement of the institutional and legal arrangements for the preparation of the GHG inventory.

Record keeping and archiving

24. Iceland does not yet have a centralized archiving system; for example, LUCF data are not stored at the EFA, and many of the data used are based on expert judgement and not documented in line with good practice. The background information is collected and available at the institutions identified above. The ERT was only able to investigate record keeping and archiving at the EFA back to 1990 for data collected by the EFA. The ERT recommends that Iceland establish a centralized archiving system at the EFA.

Follow-up to previous reviews

25. For the first time Iceland has submitted a complete set of CRF tables since 1990 as well as an NIR with the 2004 submission. Furthermore a key sources analysis has been made for the first time, the AD for categories 4.A and 4.B have been updated, notation keys have been used more systematically, emissions have been reallocated under different categories following the recommendations of the 2001 desk review, additional sources in the Agriculture sector have been addressed and methodologies have been revised to correspond to IPCC tier 1 methods or higher-tier approaches (e.g., for Industry). Most of the inconsistencies and gaps in the CRF tables have been eliminated. Many additional explanations to improve the transparency of the estimates were also provided as comments on the 2004 synthesis and assessment (S&A) report.

D. Areas for further improvement

Identified by the Party

26. The NIR identifies several areas for improvement, for example, a quantitative uncertainty assessment is needed; there are gaps in the estimates of emissions for several sources; the fuel split between types of vehicle should be improved; actual emissions from HFCs should be estimated; country-specific nitrogen (N) excretion factors for sector 4.D, Forest Inventory, should be revised; the documentation of management activities in LUCF should be improved; better carbon stock data (including baseline) are needed; and the data on waste should be disaggregated into categories. In its response to the issues raised during the review, Iceland indicated that it is willing to provide emissions data for its total emissions, and in addition to provide data excluding emissions falling under decision 14/CP.7 (see para. 27 below), to report LUCF data according to the UNFCCC guidelines and to recalculate emissions from the Waste sector on the basis of updated and revised AD.

Identified by the ERT

27. Iceland has submitted CRF tables excluding emissions that fall under decision 14/CP.7 of the COP. 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. The Government of Iceland notified the COP in a letter dated 17 October 2002 of its intention to avail itself of the provisions of decision 14/CP.7. 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 recommends that Iceland should follow the 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 emissions. Tables 1 and 2 and all the figures used in this report reflect those emissions.

28. Iceland has submitted CRF tables for the Land-Use Change and Forestry sector, with information starting from 1990 and limited to the activities afforestation and revegetation, which are the most relevant for Iceland under the Kyoto Protocol. The ERT encouraged Iceland to follow the UNFCCC reporting requirements for this sector and explained that the reporting requirements under the Kyoto Protocol for Land Use, Land-use Change and Forestry (LULUCF) are based on those under the UNFCCC. The ERT did not consider whether the information reported was consistent with the IPCC good practice guidance relevant for activities under Articles 3.3 and 3.4 of the Kyoto Protocol.

29. The ERT identified the following additional cross-cutting issues that should be addressed with high priority. The Party should:

(a) Improve the consistency and completeness of its reporting, including all categories covered in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC Guidelines) and the UNFCCC reporting guidelines, in particular those related to the Industrial Processes and LUCF sectors;

(b) Prepare a national energy balance;

(c) Improve consistency with the IPCC good practice guidance, for example, by providing quantified uncertainty estimates;

(d) Improve transparency by providing more complete information on:

i. The rationale for the choice of approaches and methodologies;

ii. The details of country-specific methodologies; and

iii. Information on AD, including references to national statistical data sources;

(e) Improve completeness by providing emissions data for sources that are not yet addressed, given that methodologies are available.

30. The ERT also identified the following additional cross-cutting issues that should be addressed in the longer term. The Party should:

(a) Upgrade methodologies to higher tiers for the most relevant key sources;

(b) Introduce a QA/QC system and improve the quality of input data with a significant impact on uncertainty; and

(c) Develop a country-specific methodology for GHG emissions from hydro-reservoirs and geothermal energy.

31. Recommended improvements relating to specific categories are presented in the relevant sectoral sections of this report.

32. The ERT strongly recommends that the Party strengthen the personnel and financial resources, as well as the institutional framework for the preparation of the inventory submissions at the EFA, in order to implement the above recommendations, and encourages Iceland to nominate inventory experts to participate in the review process under the UNFCCC.

II. ENERGY

A. Sector overview

33. The Energy sector in Iceland has some peculiarities that are reflected in the emissions profile of the country. Although per capita energy consumption in Iceland is very high, the Energy sector is not carbon-intensive since the proportion of renewable energy is the highest by far of other Annex I Parties.

34. Geothermal energy plays a significant role in energy supply in Iceland. In addition, energy consumption in the country is based on hydropower and imported fossil fuels. The consumption of primary fuels in 2002 can be summarized as follows: geothermal energy (78.7 PJ) 54.7 per cent; hydro-energy (25.1 PJ) 17.4 per cent; petroleum products (35.8 PJ) 24.9 per cent; and coal (4.3 PJ) 3 per cent[4]. The major portion of the liquid fuels imported is used in the fishing industry and transportation (90 per cent). Space heating and some industrial activities account for the rest of consumption. Consumption of gas (LPG) is not significant but is increasing due to the development of energy-consuming industries.

35. For the year 2002, these peculiarities translate into the following figures in the inventory. The Energy sector contributed 53 per cent of total GHG emissions in Iceland (without LUCF). Since there are practically no fugitive emissions occurring in Iceland, fuel combustion is the only contributing source. 1.A.4 Other Sectors (dominated by Fisheries) and 1.A.3 Transport were the most important sources in the Energy sector, accounting for 39 per cent and 35 per cent, respectively, of the sectoral emissions, followed by 1.A.2 Manufacturing Industries and Construction with 25 per cent and 1.A.1 Energy Industries with 1 per cent. The Energy Industries were a minor source because of Iceland's reliance on renewable energy sources with comparatively steady emissions. In the year 2002, GHG emissions in the Energy sector were 12.5 per cent above the 1990 level. However, the trend varies for the different subsectors, the highest

[4] According to *Energy in Iceland.*

increases occurring in Manufacturing Industries and Construction (26.4 per cent) and Transport (10 per cent). Energy Industries saw a decrease of –5.4 per cent over the period 1990–2002, while for Other sectors the change was +4.3 per cent.

36. In the Energy sector, Iceland uses a tier 1 method for estimating CO_2 emissions and a tier 2 method for estimating CH_4 and N_2O emissions. The methodologies are described in the NIR, including the EFs, which are mainly IPCC defaults. The sources for the AD are also indicated. However, no detailed information on the AD and no national energy balance are provided in the NIR.

Sectoral institutional arrangements

37. The EFA is responsible for compiling and archiving the inventory for the Energy sector. Input data on fuels consumed are provided by the NEFC through the NEA and sometimes directly to the EFA. The NEFC compiles data on all fossil fuels from statistics provided by the oil, airline, shipping and fishing vessels companies, and performs some QA/QC when receiving data from the companies. Data are provided on an informal basis, not on the basis of a legal obligation. In 2003, liberalization of the market and competition led to the problem of companies being unwilling to submit data—the first time this problem has occurred. The data prepared from the NEFC are considered the official data for the country and are the basis for the data which the NEA forwards to Statistics Iceland and the IEA. While the data at the NEFC follow the national nomenclature, the NEA organizes them to fit the internationally accepted categorization. However, prepared information is not published by Iceland as a formalized and validated national energy balance but only used to be submitted to the IEA. This was found to be one of the energy-related peculiarities for the Party. The ERT encourages Iceland to develop the national energy balance in order to improve the transparency and robustness of the inventory.

Completeness

38. The CRF includes estimates of all major gases and sources of emissions from the Energy sector, as recommended by the IPCC and UNFCCC guidelines. There are omissions in the estimates for CH_4 and N_2O emissions from fuel combustion, which are recognized by the Party (see 1.8 General Assessment of the Completeness, NIR, page 16). For fugitive emissions, the notation keys "not occurring" ("NO") and "not estimated" ("NE") are used. The source that will need estimation in future is the distribution of oil products, which was indicated as "NE" due to time constraints.

39. In terms of completeness of the information submitted for the sector, Iceland has provided inventory data in the CRF for the years 1990–2002 for the first time. The use of notation keys has improved compared to the previous submissions. A problem was mentioned in the 2001 desk review related to the filling in of table 1.A(d) covering feedstocks and non-energy use of fuels. Since industrial process emissions are of major importance in the country, this table is needed to assist transparency for the allocation of coal and coke between the Energy and Industrial Processes sectors. In the 2004 submission, the table still does not cover all the fuels used as feedstocks and does not match the information provided in table 1.A(b).

40. Recognizing the lack of a standard IPCC methodology, the ERT encourages Iceland to consider in its future inventories the development of methodologies to estimate GHG emissions from hydro-reservoirs, geothermal energy drilling operations and steam production processes because of the importance of these sources in the power sector of the Party.

Transparency

41. The 2004 NIR has significantly improved the transparency of the Party's reporting. It lists the net calorific value (NCV) of each fuel and the EFs used in the estimation of GHG emissions, and also provides their sources. Although the NIR provides summary results of GHG emissions from the Energy

sector, it does not provide AD in the form of a national energy balance to assist in the replication of the inventory. Transparency can be further improved by the inclusion of references, energy balance figures, and explanations for the rationale behind omitting some sources and the selection of the methodology applied.

Recalculations and time-series consistency

42. Following the recommendations of the 2001 desk review two main changes have been made for the Energy sector: emissions from district heating have been moved from the Residential sector to Energy Industries, and diesel fuel consumption of machinery has been moved from the Transport sector to Construction. In addition emissions from the Waste sector with energy recovery are reported under the Energy sector. The changes did not have a significant effect on total CO_2 emissions from the sector. However, the ERT noted the significant impact of this reallocation for N_2O sectoral emissions – a 59.5 per cent increase. The inventory team explained the difference as being due to the large difference in default EFs for the subcategories involved. The changes are consistent over the entire time series.

Uncertainties

43. A quantitative estimate of uncertainties has not been undertaken, but a qualitative assessment of the reliability of AD and the uncertainty of EFs has been performed. The NIR assumes a comparatively low uncertainty for the sector (about 5 per cent). For the AD, the information is based on fuel sales and can be assumed to be accurate. For the EFs, only default values are used which are not assessed for their applicability to the national circumstances. The ERT encourages Iceland to perform a quantitative estimation of uncertainties for the subsectoral emissions reported under the Energy sector, particularly for the key sources.

Verification and quality assurance/quality control approaches

44. No formal QA/QC has been undertaken. The ERT encourages the introduction of a comprehensive QA/QC system, including verification of information provided for the Energy sector by oil companies, industries and fishing vessels. Cross-checking of the energy-related data sets within the country and their harmonization should be considered when developing the QA/QA plan.

B. Reference and sectoral approaches

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

45. CO_2 emissions from fuel combustion have been calculated using the reference approach and the sectoral approach. For the year 2002, the difference in CO_2 emissions between the two approaches is 0.1 per cent. Since the country relies on imports of fossil fuels, the two approaches give practically the same results. There is a difference in the solid fuel consumption between the sectoral and the reference approach, which is the highest of the reporting Parties, as indicated during the previous stage of this review. The review showed that this is due to the main use of solid fuel as feedstock for Industrial Processes; these fuel quantities are therefore not reported as fuel consumption under the sectoral approach.

46. Although the data used for preparing the CRF and for the energy balance presented by the IEA are the same (coming from the NEFC), and the overall match of the figures is good, the allocation of fuels differs in some cases and the ERT detected other inconsistencies (e.g., differences in stock changes). The ERT recommends internal coordination between the institutions using the energy data and an elaboration of an official national energy balance as a sound basis for energy-related estimates.

47. Currently Iceland uses the default NCVs and carbon EFs as included in the IPCC Guidelines, and it was indicated that there are no national data available for these values.

International CO_2 bunker fuels

48. GHG emissions from international bunkers (marine and aviation) have been estimated and reported separately from national estimates, in accordance with the IPCC good practice guidance. Separation of domestic fuel from international fuel use has been reported in the CRF and is based on the information from the NEFC. However, the ERT recommends providing more detailed information on disaggregation in the NIR.

Feedstocks and non-energy use of fuels

49. Although estimated in accordance with the UNFCCC guidelines, the feedstocks are still not transparently reported in the CRF table on Feedstocks and Non-Energy Use of Fuels; for example, not all the fuels falling under this category, in particular coke and coal, are reported (see the 2004 S&A report and the 2001 review report). The ERT encourages Iceland to include all relevant fuels in CRF table 1.A(d) in its next submission. It also recommends reassessing the values for carbon stored since some of the values applied, for example, for coke, can be considered high in the possible range.

C. Key sources (fuel combustion)

50. Iceland has performed a level and trend assessment. Under the Energy sector, the following key sources were identified: for CO_2 emissions – stationary combustion: oil, stationary combustion: coal, mobile combustion: construction, mobile combustion: fisheries, and for CO_2 and N_2O emissions - mobile combustion: road vehicles. For estimates of key sources, Iceland has mainly used a tier 1 method and IPCC default NCVs and EFs.

Stationary combustion: oil – CO_2

51. This is a key source on both level and trend assessment and refers to CO_2 emissions from combustion of liquid fuels in the energy industries, manufacturing industries and construction, and the commercial/institutional and residential areas. Emissions of CO_2 from this source increased by 16 per cent between 1990 and 2002. In 2002, the contributions of this source to the Energy sector and to total GHG emissions were 14.3 and 7.4 per cent, respectively.

52. The highest change (181.8 per cent) in liquid fuel consumption, as reported in the 2004 S&A report, is related to fuel consumption under Energy Industries between 1997 and 1998. This change was satisfactorily explained as being due to unfavourable water conditions in 1998, which resulted in reduced hydroelectricity supply and the need for increased oil imports to ensure the power supply.

53. Some AD used in the estimates are not readily subdivided into the subcategories requested by the CRF. For example, it was explained that the fuel allocation in Manufacturing Industry and Construction is a top–down procedure: starting from one value, the inventory team tries to allocate the estimates to the different categories based on the information requested from the different industries. Data on fuel consumption for the fishmeal industry are estimated on the bases of production data. The ERT recommends further work to improve the data on fuel consumption by subcategory.

54. The default IPCC EFs are used. Given the importance of the source, the ERT encourages Iceland to assess the appropriateness of the default values and to develop country-specific EFs for this key source.

55. In response to the 2001 review report, Iceland has reallocated fuels used for heating purposes (residual oil) from Energy Industries to the Residential subsector and performed recalculations, although this change did not affect the total amount of CO_2 emissions. The ERT noted that Iceland's residual oil for heating swimming pools was classified under Energy Industries and suggests that this source be included under the subcategory Commercial in the next submission.

1.A.2f Stationary combustion: coal – CO_2

56. This is a key source on trend assessment, involving combustion of coal in the cement industry. CO_2 emissions from this source decreased by 30 per cent between 1990 and 2002. Iceland explained the decrease as being due to a decline in the sales of local cement due to cheaper imports. Since the NCV and carbon content of coal can be measured, the ERT encourages Iceland to develop country-specific EFs. The CRF table is not transparent in terms of where exactly these emissions are included and the ERT encourages more transparent reporting and cross-referencing between the CRF and the NIR.

1.A.2f Mobile combustion: construction – CO_2

57. This is a key source according both level and trend assessment. Emissions from the source increased by 49 per cent between 1990 and 2002 and contributed 9 per cent to total GHG emissions in the year 2002. Recalculations have been undertaken to take account of diesel fuel consumption from construction machinery, which was reclassified from Transport to Construction. This change did not affect total CO_2 emissions from the Energy sector.

1.A.3b Mobile combustion: road vehicles – CO_2 and N_2O

58. CO_2 emissions from road transportation are a key source according both level and trend assessment. In 2002, the emissions contributed 90 per cent of emissions from the Transport subsector and 16.7 per cent of total national GHG emissions. Emissions increased by 19 per cent between 1990 and 2002 and the ERT noted that this increase was due to the increasing number of vehicles and annual mileage driven. The number of vehicles increased from 134,181 vehicles in 1990 to 183,698 in 2002 (an increase of 37 per cent). This resulted in a reduction of the persons: car ratio from 2.4 in 1990 to 1.8 in 2002.

59. N_2O emissions from road transportation are a key source according to trend assessment and accounted for 9 per cent of total N_2O emissions in 2002. The ERT noted that N_2O emissions have increased by 547 per cent since 1990. The Party explained this significant increase as being due to the introduction of catalytic converters since 1995.

60. Although the sources are key sources, Iceland applies a very simplified methodology using AD for fuel sales from the NEA, expert judgement to allocate fuels between different types of vehicle, and default EFs from the IPCC guidelines. The assessment done for gasoline and diesel cars is not well documented. The ERT encourages Iceland to gather more data to reduce the uncertainty with regard to the allocation of the fuels to different types of vehicles.

61. In view of the importance of these key sources (CO_2 and N_2O emissions from road transportation), the ERT also encourages Iceland to implement additional country-specific higher-tier methodologies as part of good practice aimed at improving the inventory and reducing uncertainties. Plans are under way to improve the quality of data on vehicle type classification.

1.A.4c Mobile combustion: fisheries – CO_2

62. This is a major key source based on both level and trend assessment. It accounted for 37 per cent of the Energy sector and 19.3 per cent of total GHG emissions. Emissions of CO_2 from fisheries grew by 8 per cent between 1990 and 2002. In one year the ERT noted offshore fuelling of fishing vessels that 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 if it occurs again.

D. Non-key sources (fuel combustion)

Stationary combustion: biomass

63. The CRF and the NIR do not explain what is included under Fuel Consumption of Biomass. During the in-country review it was clarified that it is wood products (waste timber) used in ferroalloys production. Further documentation of the estimates from biomass in the NIR is recommended.

Stationary combustion: other fuels

64. During the in-country visit Iceland explained that Other Fuels include landfill gas and that the estimates for these emissions are explained in the Waste sector but reported under the Energy sector in consistency with the IPCC Guidelines. The ERT considers that further explanation of the approach is needed in the NIR.

65. The ERT was informed that from 2003, part of CH_4 from landfills started to be used for electricity generation. This development will necessitate proper classification and reporting of the emissions.

Mobile combustion: construction – N_2O (1.A.2f)

66. As indicated, a part of the diesel consumption reported under the Transport sector in the previous submissions was allocated to Construction, reported under 1.A.2f Other in the 2004 submission. Along with this reallocation, N_2O emissions from the source increased significantly since the default EFs were changed from those for road transport to those for off-road machinery. The ERT encourages Iceland to assess closely the types and characteristics of construction equipment under the sector and reconsider the use of the EFs based on the actual split between road and off-road machinery used in the Construction sector.

Fugitive emissions

67. The Party reports that these emissions are not relevant due to lack of production of fuels in Iceland. The emissions from oil distribution are to be estimated in future.

Country-specific categories

68. As already indicated, hydro- and geothermal energy account for the greater part of the electricity and heat-generating resources in Iceland. Recognizing the lack of methodologies to estimate the emissions from these sources, the ERT encourages Iceland to further develop its research in the area of renewables with a view to possible inclusion of the emissions from these sources in future.

E. Areas for further improvement

Identified by the Party

69. In its NIR, Iceland indicates planned improvements to the estimating of the emissions from road transportation, namely a better split between vehicle types and corresponding fuel consumptions.

Identified by the ERT

70. In addition to the need for improving estimates from road transportation, the ERT recommends further work in the following areas:

(a) The development of a national energy balance;

(b) Consistency between energy-related data sets (improved fuel allocation between sectors);

(c) Moving to country-specific NCVs and EFs for the Energy sector;

(d) Improved reporting of feedstocks;

(e) Further research in the area of emissions from geothermal and hydro-energy;

(f) The implementation of higher-tier methodologies for estimating N_2O emissions from road traffic vehicles and other key sources;

(g) The need for accounting for offshore fuelling; and

(h) The improvement of transparency in reporting, better referencing and documentation of the estimates.

III. INDUSTRIAL PROCESSES AND SOLVENT USE

A. Sector overview

71. In the year 2002, the Industrial Processes sector contributed 26 per cent to the total GHG emissions of Iceland, corresponding to 934 Gg CO_2 equivalent, which is the same share as in 1990. The trend in emissions shows a significant decline from 1990 to 1994 and an increase from 1995 to 1999, with emissions being almost steady since then. Aluminium and ferroalloys production together contributed 92 per cent to Industrial Processes, and cement production and HFCs plus SF_6 contributed 4 per cent each. In the year 1990 there was also a contribution (6 per cent) from fertilizer production, which has since been closed down.

72. The trend for CO_2 emissions from Industrial Processes shows a decline in emissions from 1990 to 1991 and an increase from 1992 to 2002. Emissions of N_2O (originating from the chemical industry) declined significantly after 1999 due to the closing down of fertilizer production. Emissions from PFCs decreased from 1990 to 1996 due to improvements in the production process for aluminium, increased in 1997 and 1998 due to an increase in the production of aluminium, and have been decreasing since 1999, again due to improvements in the production process. Emissions from HFCs are reported to have increased from 1992 to 1998, with significant fluctuations since then (high emissions in 1999 and 2001 and low emissions in 2000 and 2002). No changes in SF_6 emissions have been reported due to lack of updating of the figures.

73. The Government of Iceland notified the COP in a letter dated 17 October 2002 of its intention to avail itself of the provisions of decision 14/CP.7. According to the view of Iceland expressed in its 2004 NIR, three projects have been identified that fall under the provisions of decision 14/CP.7, corresponding to emissions of 441.3 Gg CO_2 in the year 2002. However, during the in-country review Iceland submitted a set of CRF tables including all industrial emissions and the data reflected in this report are based on these revised 2002 CRF tables.

Sectoral institutional arrangements

74. The data on emissions from the Industrial Processes sector are based on information provided by the operators of industrial facilities to the EFA, which estimates and reports the emissions from the sector.

Completeness

75. The CRF includes estimates of most gases and sources of emissions from the Industrial Processes sector, as recommended by the IPCC Guidelines. The following gaps have been identified: no actual emissions for HFCs, PFCs and SF_6 have been submitted; emissions from road paving with asphalt and asphalt roofing, as well as from food and drink, are not estimated; emissions from projects which in the view of Iceland fall under decision 14/CP.7 of the COP have been excluded from the inventory (see also

paragraph 73); and no updating of SF_6 emissions has been done since they have been estimated for the first time. The ERT encourages Iceland to provide emissions data for the above sources, including an update of the potential emissions of SF_6, with its next submission, while recognizing that the lack of data is mainly due to lack of human and financial resources.

76. The CRF does not include emissions of greenhouse gases from solvent and other product use. The ERT encourages Iceland to provide these estimates with its next submission.

Transparency

77. The NIR does not include information on AD for activities in the Industrial Processes sector, or a detailed description of the country-specific methodology used to estimate PFC emissions in aluminium production, nor does it include a description of the fertilizer production that contributed to emissions in 1990 and the following years. The ERT would also welcome some more information on diatomee production, although emissions are mainly relevant for the Energy sector and few process emissions of CO_2 occur for this source; however, no IPCC methodology is available for that source category. Any changes due to recalculations should be reflected in the NIR in terms of changes in emissions data, with a clear linkage to changes in AD and/or EFs. The ERT encourages Iceland to provide a more comprehensive NIR in its next submission, for example, including AD linked to national statistical data, to facilitate the review process.

78. Iceland has used notation keys as recommended by the 2001 desk review, and the sources of EFs and AD have been provided in the NIR.

Recalculations and time-series consistency

79. Emissions data have been improved by recalculation of PFC emissions from the aluminium industry. The country-specific methodology used until now did not take into account the duration of the anode effect, the assumption being an anode effect duration (AED) of 5.5 min. Recalculations followed the tier 2 Slope Method and resulted in significant differences in emissions for the years 1990–1992 (due to AED values being longer than assumed) and from 1997 to 1999 (due to AED values being longer than assumed in the phase of extension of an existing plant and during start-up operation of another new one). Because data on AED and number of anode effects per cellday (AEF) are available, it was possible to establish a consistent time series. The ERT appreciated these recalculations. However, more details on the recalculation should be reported in the next submission. CO_2 emissions from cement production have also been recalculated, upgrading the method to tier 2. Recalculation resulted in a 2.6 per cent increase in the figures for emissions in 2001.

Uncertainties

80. Table 7 indicates that the estimates for CO_2 are considered to be of high quality, while the quality of the estimates for the other gases is considered to be medium or low. No progress has been made with providing quantitative estimates for uncertainties in this sector.

Verification and quality assurance/quality control approaches

81. The ERT noted the relevance of data provided by plant operators directly to the EFA. However, these data have not been verified, for example, by an independent party. The ERT encourages Iceland to introduce verification of information relevant for the calculation of emissions from industry as part of the implementation of the IPCC good practice guidance.

B. Key sources

82. All sources reported under Industrial Processes have been identified as key sources by level assessment and two of them, PFCs from aluminium production and HFCs from ODS substitutes, have also been identified as key sources according to trend assessment.

2.C.2 Ferroalloys production – CO_2

83. In 2002 CO_2 emissions from ferroalloys production accounted for 389 Gg CO_2 or 42 per cent of total GHG emissions from the Industrial Processes sector. The corresponding data for the year 1990 are 203 Gg CO_2 and 23 per cent.

84. The IPCC tier 1 method has been used in combination with the IPCC default EFs. The NCV values are provided by the NEA. The ERT would welcome some information in the NIR on the basis on which the NCV values are derived. Iceland is encouraged to introduce a tier 2 approach so as not to overestimate CO_2 emissions from ferroalloys production. Iceland indicated that some emissions of this category may fall under decision 14/CP.7 of the COP.

2.C.3 Aluminium production – CO_2

85. In 2002 CO_2 emissions from aluminium production accounted for 393 Gg CO_2 or 42 per cent of total GHG emissions from the Industrial Processes sector. The corresponding data for the year 1990 are 136 Gg CO_2 and 16 per cent.

86. The IPCC tier 1 method has been used in combination with the IPCC default EFs. The NCV values are provided by the NEA. The ERT would welcome some information in the NIR on the basis on which the NCV values are derived. Iceland indicated that some emissions of this category may fall under decision 14/CP.7 of the COP.

2.C.3 Aluminium production – PFCs

87. In 2002 PFC emissions from aluminium production accounted for 73 Gg CO_2 equivalent or 8 per cent of total GHG emissions from the Industrial Processes sector. The corresponding figures for the year 1990 are 420 Gg CO_2 equivalent and 49 per cent.

88. As described above, Iceland now uses the more accurate tier 2 Slope Method, and the ERT would welcome some background information on the associated values for AED and AEF as a better basis for comparison with other data, as well as some further specifications of the AD. The IPCC default Slope-EFs are those for the Centre Worked Prebaked Technology. During the in-country review the ERT was informed about verification of emissions estimates by monitoring of emissions at plant sites, and that there has been fair agreement between these independent sets of data.

2.A.1 Cement production – CO_2

89. In 2002 CO_2 emissions from cement production accounted for 39 Gg CO_2 or 4 per cent of total GHG emissions from the Industrial Processes sector. The corresponding figures for the year 1990 are 52 Gg CO_2 and 6 per cent. The decrease in emissions data is due to a decrease in AD in production and increased imports of cement.

90. Iceland now uses the more accurate tier 2 method with cement kiln dust (CKD) correction and an EF of 0.4402 t CO_2 per tonne of cement, which is consistent with the IPCC good practice guidance. The ERT encourages Iceland to verify the information provided by plant operators.

2.F Consumption of halocarbons and SF_6 – HFCs

91. In 2002 emissions from HFCs and SF_6 accounted for 40 Gg CO_2 equivalent or 4 per cent of total GHG emissions from the Industrial Processes sector. Consumption of halocarbons and SF_6 is reported to have increased from 1992 to 1998, with significant fluctuations since then (high emissions in 1999 and 2001 and low emissions in 2000 and 2002).

92. Iceland is strongly encouraged by the ERT to estimate actual emissions of HFCs, taking into account in particular emissions from refrigeration and air-conditioning equipment, aerosols/metered dose inhalers and electrical equipment. The potential emissions of HFCs reported only reflect HFCs imported to substitute ODS in already existing refrigeration, as well as in new refrigeration equipment. This might result in these emissions being underestimated.

C. Non-key sources

93. No non-key sources have been reported by Iceland under Industrial Processes sector.

D. Areas for further improvement

Identified by the Party

94. In the NIR, Iceland indicates plans to estimate actual HFC emissions but without providing a schedule for the planned improvements.

Identified by the ERT

95. In addition, the ERT recommends that Iceland should:

(a) Provide emissions data for the sources currently not estimated (see paragraph 75 above) within the 2005 submission;

(b) Establish verification procedures for any information relevant for the calculation of emissions data provided by plant operators;

(c) Estimate quantitative uncertainties for the key sources;

(d) Improve transparency by providing more detailed information in the NIR, including an explanation of the choice of methods for key source categories and more detailed information on trends, as well as explanations of the EFs used and information on the origin and data flow of AD;

(e) Further improve the use of notation keys; for example, in table 2(I)s1 "0.00" for source categories 2.A.4 and 2.C.1 as well as 2.C.5 should be replaced by "NO"; and in table 2(I) sheet 2 "0.00" for actual emissions of SF6 should be replaced by "NE"; and

(f) Estimate CO_2 and N_2O emissions from solvent use, including the corresponding information in the NIR.

IV. AGRICULTURE

A. Sector overview

96. Agriculture is a minor economic activity in Iceland compared with other countries. Only a very small part of its national territory is suitable for crop and animal production, and GHG emissions from the sector are proportionally smaller. In the year 2002, CH_4 emissions from the sector reached 12.3 Gg,

accounting for 48.9 per cent of total CH_4 emissions; and N_2O emissions reached 0.79 Gg or 80.6 per cent of total N_2O emissions. In 2002, emissions from the Agriculture sector accounted for 13.9 per cent of total national GHG emissions without LUCF. CH_4 emissions from the sector declined by 11.4 per cent in the period 1990–2002, mainly as a result of a steady reduction in the number of dairy cattle and sheep. N_2O emissions from agricultural soils also fell, by 9.9 per cent, in this period with a trend characterized by high inter-annual fluctuations, mainly due to changes in the use of nitrogen (N) fertilizers, as explained during the in-country review.

Sectoral institutional arrangements

97. Activity data are provided by the Icelandic Association of Farmers for livestock population and by Statistics Iceland for the use of synthetic fertilizers. Other AD (parameters, fractions) needed to estimate emissions from manure management and agricultural soils are provided by the Agricultural Research Institute. EFA prepares the CRF tables and produces the NIR for the Agriculture sector.

Completeness

98. The CRF is complete and includes all gases and sources of emissions which occur in the country, covering the national territory and the whole time series, as recommended by the IPCC good practice guidance. The CRF includes CH_4 and N_2O emissions from 4.A CH_4 Enteric Fermentation, 4.B(a) CH_4 and 4.B(b) N_2O – Manure Management, and 4.D N_2O – Agricultural Soils. Not occurring ("NO") are 4.C Rice Cultivation, 4.E Prescribed Burning of Savannas and 4.F Field Burning of Crop Residues. The CRF has a few omissions regarding some animal species of which the population is small (goats and others) and cultivation of histosols. The NIR is not complete as it only includes information on the key source categories (4.A and 4.D), and methods and assumptions are not documented. The ERT encourages Iceland to complete the NIR with regard to the missing information.

Transparency

99. The NIR contains information on the major methodological issues involved in the sources reported but fails to document (1) the estimation from the Agricultural Research Institute on the proportion of excreted N from different livestock types subject to different animal waste management systems (AWMS), and (2) the N excretion rates, which were explained as country-specific during the in-country review.

Recalculations and time-series consistency

100. Recalculations for the sector were performed during the 2004 submission, due to:

(a) Revision of the figures for the number of domestic animals;

(b) Inclusion of N_2O emissions from manure management;

(c) Completion of the sources of emissions from agricultural soils (grazing animals and indirect emissions);

(d) Correction of the EF for manure applied to soils; and

(e) Exclusion of CO_2 emissions from soils, although such data were included in the 2003 submission.

101. The recalculation process for 2001 resulted in a 100 per cent reduction in the estimates of CO_2 emissions, a 16.3 per cent increase in the figures for CH_4 emissions and a 316.9 per cent increase in the figures for N_2O emissions, with an overall increase of 79.3 per cent in total sectoral emissions expressed as CO_2 equivalents. Overall, the recalculation process has resulted in more accurate and complete

emissions estimates, although some emission sources are still not reported. The reasons for recalculations are not reported in the NIR, although they were well explained during the in-country review.

102. In its 2004 submission Iceland does not report CO_2 emissions from soils either in the Agriculture sector or under LUCF. The ERT encourages Iceland to include this category under the LULUCF sector in its next submission because enough information is available in the country to produce the estimates.

Uncertainties

103. Only qualitative assessments of uncertainties have been included in CRF table 7s2, ranging from "medium" to "low" quality of estimates. The low quality estimates are related to N_2O emissions, whereas medium quality estimates are related to CH_4 emissions. The ERT encourages Iceland to implement a quantitative uncertainty assessment and to improve the reliability of the estimates, especially for the key sources.

Verification and quality assurance/quality control approaches

104. The NIR states that no formal QA/QC has been performed in this sector, although calculations and units have been checked by the EFA, as well as the consistency of data between years. The ERT encourages Iceland to define and gradually establish a formal QA/QC procedure.

B. Key sources

105. The key sources in this sector are CH_4 emissions from Enteric Fermentation and N_2O emissions from Agricultural Soils. Although a tier 1 method is still applied to estimate the emissions from these sources, comparison of the estimates with previous submissions indicates the efforts made to improve the quality and completeness of the estimates from these sources.

Enteric fermentation – CH_4

106. In 2002, CH_4 emissions from this source category accounted for 91.8 per cent of CH_4 emissions from Agriculture and for 44.9 per cent of total national CH_4 emissions. Emissions declined in the period 1990–2002 by 12.2 per cent because of the reduction in the number of dairy cattle and sheep. Although it is a key source, a tier 1 method and default EFs were used to estimate CH_4 emissions. Iceland reports that these emissions may have been overestimated because Icelandic animals are smaller in size than animals in other reporting Parties, but no specific research has been done that would allow Iceland to use country-specific EFs. The ERT encourages Iceland to assess the contribution of the animal species more accurately, to apply a tier 2 method and to derive country-specific EFs for the significant animal species in accordance with the IPCC good practice guidance.

107. Population data have increased substantially from the figures reported in the 2003 submission and also from the figures published by Statistics Iceland due to the inclusion of young animals born during the winter period and not accounted for previously. Goats and other animal species (mink, rabbits, foxes) are not reported, although AD are available. The ERT acknowledges the effort undertaken by the national team in producing more accurate animal population data and notes the need for better documentation of the estimation of AD in the NIR. The ERT encourages Iceland to include all domestic animal species with available AD, making use, if needed, of specific EFs in other Parties' submissions.

Agricultural soils – direct N_2O emissions

108. In 2002, direct N_2O emissions from Agricultural Soils accounted for 39.4 of emissions from this source category, 35.2 per cent of N_2O emissions from the Agriculture sector and 28.4 per cent of total national N_2O emissions. Direct N_2O emissions from soils declined by 10.3 per cent in the period 1990–2002 and were estimated following a tier 1b method and applying country-specific AD and default

conversion fractions and EFs, which is in agreement with the IPCC good practice guidance. The NIR does not include information and supporting references for the country-specific conversion parameters needed to produce the estimates but an explanation was provided during the in-country review.

109. Figures for synthetic fertilizer consumption differ between Statistics Iceland and the FAO database. The ERT recommends that the Party check both data sets and provide some explanation of the differences in its next NIR.

110. Two sub-sources are omitted from Agricultural Soils category: histosols cultivation and N-fixing crops. With regard to histosols, a constant figure of 7.5 kha has been reported over the years but no EF has been identified and thus no emissions data have been provided. During the review, the ERT was informed that these AD are under verification and emissions estimates from this sub-source will be available for the next submission. With regard to N-fixing crops, the ERT was informed during the review that in Iceland conditions for growing N-fixing crops are poor, and that the proportion of legume plants in pasture is less than 1 per cent. However, legume plants are dominant in the revegetated areas and the inclusion of these under Grasslands seems to be appropriate. The ERT encourages Iceland to incorporate these revegetated areas as N-fixing crops for the next submission for the sake of completeness of the source category, provided it is not necessary to adapt the IPCC methodology.

111. Some minor inconsistencies were found in table 4.D, which do not lead to changes in the emissions estimates, but need to be corrected for the next submission:

(a) The total amount of nitrogen applied as synthetic fertilizers that remains in the soil after volatilization must be reported, instead of the total amount of N applied to soils as synthetic fertilizer; and

(b) The amount of crop residues left in the field for decomposition must be reported, instead of the total amount of crop residues produced.

112. The estimates for direct N_2O emissions from soils are more complete in the 2004 submission because all the sub-sources except histosols cultivation are included. In addition, a country-specific EF for manure applied to soils has been used but its reliability or accuracy cannot be assessed because no supporting references are provided in the NIR.

Agricultural soils – indirect N_2O emissions

113. In 2002, indirect N_2O emissions from agricultural soils accounted for 41.2 per cent of emissions from this source category, 36.8 per cent of the N_2O emissions from the Agriculture sector and 29.8 per cent of total national N_2O emissions. They declined by 9.9 per cent over the period 1990–2002. Indirect N_2O emissions were estimated following a tier 1b method and applying country-specific AD, default conversion fractions and EFs. The submission of the source category is complete as the two sub-sources are included for the entire time series and the total surface of the country.

114. The ERT acknowledges the improvement in completeness of the sectoral inventory by the inclusion for the first time of estimates of N_2O emissions for this source category.

C. Non-key sources

Manure management – CH_4 and N_2O

115. In 2002, CH_4 emissions from manure management accounted for 8.2 and 4.0 per cent of CH_4 emissions from the Agriculture sector and total national CH_4 emissions, respectively; in the same year, N_2O emissions from manure management accounted for 10.6 of emissions from the sector and 8.6 per cent total national N_2O emissions. No description of non-key source categories is available in the NIR; according to the information received during the in-country review, this was due to lack of time and descriptions will be provided for the next submission. CH_4 and N_2O emissions were estimated following a tier 1 method and applying default EFs. Country-specific N excretion rates that take into account the smaller size of the native breeds, as explained during the in-country review, and manure distribution between different AWMS have been applied, but the NIR fails to document them properly. The ERT encourages Iceland to provide this information to improve transparency further.

116. The ERT acknowledges the effort made by Iceland to include estimates for N_2O emissions from manure management for the first time, and the improvement in the accuracy of CH_4 emission estimates from manure management due to more precise animal population data.

Agricultural soils: animal production – N_2O emissions

117. N_2O emissions from animal production account for 19.4 per cent of N_2O emissions from Agricultural soils, 17.4 per cent of emissions from the Agriculture sector and 14.0 per cent of total national N_2O emissions. No description of this non-key source category is included in the NIR. The ERT encourages Iceland to include full information on this source category in its next submission.

118. The ERT acknowledges the effort made by Iceland to include estimates for N_2O emissions from pasture, range and paddock for the first time.

D. Areas for further improvement

Identified by the Party

119. Iceland has already addressed many of the findings from the 2001 desk review and the S&A reports. In addition, Iceland reports in the NIR that the development of country-specific EFs for CH_4 emissions from enteric fermentation and the revision of country-specific N excretion factors are planned as a further development.

Identified by the ERT

120. The ERT acknowledges the efforts of the staff involved in the sectoral inventory but considers that a stronger institutional arrangement is needed, namely the involvement of more experts along with financial support for the work that is needed, in particular to develop country-specific parameters and EFs.

121. The ERT encourages Iceland to provide a more complete and transparent NIR by including information on the non-key source categories and by providing documentation for the country-specific parameters. The ERT also encourages Iceland to upgrade the estimates of emissions from enteric fermentation using a methodological approach that is in agreement with the IPCC good practice guidance.

122. In addition, the ERT encourages Iceland to complete the source categories, including the missing domestic animal species, and the estimates for cultivation of histosols in its future submissions.

V. LAND-USE CHANGE AND FORESTRY

A. Sector overview

123. According to the information contained in the NIR and that provided during the in-country review, the natural woodland area of Iceland covers 1.2 per cent of the national territory, whereas forest tree plantations and revegetation activities cover less than 1 per cent of the national territory. These two activities are mainly driven by purposes other than carbon sequestration.

124. The LUCF sector is reported to be a net sink of CO_2 with total net removals of 162.5 Gg CO_2 in 2002. If these removals are accounted for in the inventory, total national CO_2 emissions and total GHG emissions decrease by 6.1 and 4.5 per cent, respectively. In the period 1990–2002, the net CO_2 removals of the sector showed a steady increase over the period 1990–2002. The estimate is considered to be incomplete as only afforestation and revegetation activities undertaken since 1990 have been included in the GHG inventory.

Sectoral institutional arrangements

125. The AD are provided to the Agricultural Research Institute by the Icelandic Forest Research Institute for afforestation and by the Soil Conservation Service for revegetation. Emission factors to be applied are decided by informal contacts among experts of these three agencies and the EFA. The Agricultural Research Institute elaborates the inventory, prepares the CRF tables and provides the information for the NIR for this sector. The EFA compiles the inventory as well as the NIR.

Completeness

126. Although the submission covers the main sources of carbon flux in the sector, it cannot be regarded as complete because:

(a) It only includes partial estimates of CO_2 removals from 5.A Changes in Forest and Other Woody Biomass Stock and 5.E Others (revegetation of eroded soils) because it does not include all the subcategories (Non-Forest Trees and Forest Biomass Removals for 5.A).

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

(c) Boreal forest plantations and revegetation activities undertaken only since 1990 have been reported (in line with the Kyoto Protocol reporting requirements).

127. The ERT encourages Iceland to improve the completeness of the estimates and the corresponding reporting in the CRF tables and in the NIR section on LUCF.

Transparency

128. The NIR contains information which is useful for a better understanding of the national circumstances of the LUCF sector in Iceland, although more information is needed for fully transparent reporting, especially on methodological issues, so as to enable the ERT to understand the underlying assumptions. The NIR does not provide sufficient environmental, background and methodological information, or information on AD and EFs for revegetation or background information on the growth rate applied for boreal forest plantations. Although references are reported, the ERT recommends that the NIR should include a brief overview of the information contained in the literature referenced, especially when it is not in one of the official UN languages.

Recalculations and time-series consistency

129. According to table 8(b) of the CRF for 2001, recalculations have been reported for CO_2 removals due to revision of the figures for area of forest/biomass stock. As the NIR states, the recalculation produced minor changes of the previously estimated CO_2 removals from boreal forest tree plantations. No recalculations have been performed for 5.E Other (revegetation) because the Party is aware of the high uncertainty of the AD and the growth rate values available. The national team is aware of the need to recalculate estimates once the quality of the AD is substantially improved, as is planned. The ERT was only able to assess the consistency of the time series of boreal tree forest plantation; the same EF was applied for the years 1990–2002. The ERT considers that the methodological approach applied by Iceland is acceptable and will lead to more accurate estimates in the future.

Uncertainties

130. Qualitative assessments of uncertainties of AD, based on expert judgement, have been performed. In CRF table 7 the value "medium" for both source categories is reported. Bearing in mind the approach applied to generate the AD and the background information for the EFs, the ERT considers that the uncertainties implied in the estimation are higher than stated. The ERT encourages Iceland to improve the uncertainty assessment by doing its best to produce quantitative estimates.

Verification and quality assurance/quality control approaches

131. No assessment or control of data quality has been performed although some improvements are ongoing, prioritizing the AD from 1990 onwards. The ERT encourages Iceland to define and establish QA/QC procedures for the AD in order to achieve a substantial improvement of the quality of the inventory and the reliability of the estimates in the sector.

B. Sink and source categories

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

132. Removals from boreal forest tree plantations established since 1990 are reported. This means that Iceland is reporting only young plantations where harvesting or other biomass removal practices have not occurred. The methodology used to estimate removals from these plantations has been reported to be country-specific in CRF table Summary 3s2 due to the use of a country-specific annual biomass growth rate (2.4 t dm/ha). The ERT suggests that the methodological approach of using a default method together with a country-specific EF should not be classified as a country-specific methodological approach. No information is provided in the NIR but during the in-country review the national team explained that this annual growth rate covered the total above-ground biomass. This growth rate is a conservative estimate coming from a large number of field measurements. The ERT encourages Iceland to reduce the uncertainty of the growth rate value by improving its quality. In addition, the ERT recognizes the improvements achieved by the measurement of biomass growth and encourages Iceland to continue those efforts.

133. Activity data on afforested area are derived indirectly, based on the number of seedlings produced by the plant breeding stations, seedling density ha^{-1} and a factor of 0.25 to account for seedling losses. Iceland is aware of the need to validate these AD and to improve land-use mapping for direct measurements of the afforested area.

134. Removals of CO_2 from non-forest trees have not been reported in this source category. No notation keys are used in CRF table 5.A.

135. For improvement, Iceland is developing a national forest inventory where all natural woodlands and forest plantations will be included. Improved estimates of carbon stock and carbon stock changes in both managed and unmanaged woodlands in Iceland can be expected in the future.

5.B Forest and grassland conversion – CO_2 and non-CO_2 emissions; 5.C Land abandonment – CO_2 removals

136. Emissions/removals from these categories are reported as "NE" in CRF table 5, no notation keys are included in CRF tables 5.B and 5.C, and no information is provided in the documentation boxes. The ERT encourages Iceland to report these categories, although the changes to the national emissions/removals may be only minor, as stated by the national team during the in-country review. This issue is relevant not only for the completeness of the submission but also for Iceland being better prepared for the new sectoral CRF tables which will be in use from the 2005 submission onwards.

5.D Cultivation of soils – CO_2 emissions/removals

137. Emissions from this category are reported as "NE" in CRF table 5, no notation keys are included in CRF table 5.D and no information is provided in the documentation box. The ERT believes that Iceland has the information needed to estimate the AD for reporting CO_2 emissions from cultivated organic soils.

5.E Other (revegetation) – CO_2 emissions and removals

138. Data on carbon sequestration from revegetated areas since 1990 are reported. No methodological information is provided in the NIR. During the in-country review, the ERT was informed that the CO_2 removals were estimated using a country-specific annual carbon sequestration rate (0.75 t C/ha) which includes not only the above- and below-ground biomass and dead organic matter but also the carbon (C) stored in the soil profile. The national team states that removal estimates are net removals as no carbon losses from the soil are assumed to occur before revegetation. However, this is not based on field measurements and the baseline of carbon content in the eroded areas should be defined.

139. The ERT encourages Iceland to:

(a) Improve the transparency of the NIR by including more information on the methodology applied, with emphasis on how carbon uptake per hectare was derived;

(b) Improve the quality of the carbon sequestration rate, reducing its uncertainty; and

(c) Fill in the gaps in the source category, producing a carbon balance of the revegetated areas.

140. Activity data on the annual area revegetated are derived indirectly from the number of seeds and the amount of fertilizers used along with some basic spell out (GIS) mapping of the revegetation areas. Iceland is aware of the high uncertainty of the AD produced, the risk of double counting or not counting some areas, and the need to validate these AD and to improve land-use mapping for direct measurement of the revegetated area.

C. Areas for further improvement

Identified by the Party

141. Iceland has described some ongoing research that may help to improve the GHG inventory for this sector. The research includes:

(a) A national forest inventory (with updates every five years) that consists of an area-based (GIS) database and measurements of carbon stock and carbon stock changes on 3,000 systematically distributed plots, to include all natural woodlands and forest plantations;

(b) Improvement in the recording of revegetation activities with regard to both location and description of activities and management, including the establishment of a baseline underpinned by field data on carbon stock estimated before the start of the activity; and

(c) Work to establish a land-use database relevant to the GHG inventory and to provide funding for research and monitoring of the most relevant parameters for converting land-use and land-use changes to emissions and removals of GHGs in order to meet the requirements of the new good practice guidance for LULUCF.

Identified by the ERT

142. In addition to the improvements identified by Iceland, the ERT identified some other issues that should be taken into consideration for further development:

(a) An updated institutional arrangement for the LUCF inventory elaboration, within the scope of the inventory system, is needed; this institutional arrangement must provide the financial support for developing all the activities needed to obtain an accurate inventory of the sector, and especially to improve the quality of the AD and of the country-specific growth rates.

(b) The NIR should include an explanation of the environmental features that determine forestry activities and land-use changes, along with the type of anthropogenic intervention in sensitive ecosystems, as background information to help understand the rationale of the GHG estimates.

(c) The completeness of the sectoral inventory should be improved by including emissions/removals from all source and sub-source categories which are appropriate in Iceland and for which AD and EFs can be derived with reasonable accuracy.

(d) The transparency of reporting in the CRF and the NIR should be improved.

VI. WASTE

A. Sector overview

143. In the year 2002, emissions from the Waste sector accounted for 7.4 per cent of total national emissions (excluding CO_2 from LUCF) compared with 5.6 per cent in 1990. This share is high compared to the share of this sector for other Parties. The percentage of waste going to managed waste disposal sites increased from 55 per cent in 1990 to 99 per cent in 2002. CH_4 emissions, the major GHG in this sector, increased by about 51 per cent from 1990 to 2001, and then decreased by 4 per cent in 2002 due to an increased amount of CH_4 being recovered. CH_4 from 6.A Solid Waste Disposal on Land is the major source in this sector and accounted for 7.3 per cent of total national GHG emissions in 2002. Emissions from waste-water handling (table 6.B) have not been estimated due to lack of time and are considered to be minor. Emissions from incineration of municipal, hospital and hazardous waste accounted for 0.1 per cent of total national GHG emissions (table 6.C).

Sectoral institutional arrangement

144. The AD on waste in Iceland are collected by the EFA. These data are incomplete as there is little information on the actual amount of waste generated, its composition and its characteristics. However, since 1990 estimates of the weight of all incoming waste have been available from the largest

disposal site in operation and surveys of its composition have been carried out. On the basis of this information the EFA has estimated the amounts and the composition of waste for the whole country. Statistics for 2002 have been used as a basis to estimate historical data, assuming an increase in the amount of waste of 1.5 per cent per capita per year.

Completeness

145. The CRF includes estimates of most gases and sources of emissions from the Waste sector, excluding emissions of CH_4 and N_2O from waste-water handling, which are considered to be minor (estimated to be 0.02 Gg CH_4 in 2002), and emissions of N_2O from waste incineration, which have not been estimated due to lack of information with regard to the type of incinerators. The notation key "NE" has been used to report the emissions for which no estimates are available.

Transparency

146. The inventory is more transparent than the previous one, mainly because a description of the methodology used, including assumptions and background data and studies, has been included. Some improvements for estimating emissions from the Waste sector are summarized in a relatively accessible format and described in the NIR. More detailed references on the AD used should be included in the next submission. Notation keys are used and the CRF is filled in according to the recommendations of the 2001 desk review.

Recalculations and time-series consistency

147. In its 2004 submission Iceland has provided recalculated estimates for CH_4 emissions from landfilled waste. For the year 2001, the recalculations resulted in an increase in the estimates of emissions from Waste, from 47 Gg CO_2 equivalent in the 2003 submission to 174 Gg CO_2 equivalent in the 2003 submission. This change is due to the revision of data on landfilled waste. The data in the CRF are higher than previously indicated in the *Statistical Yearbook of Iceland 2003* due to the revised definitions of waste streams and the inclusion of more waste types, for example, agricultural waste, industrial waste, and construction and demolition waste. The methods and EFs used for estimating CH_4 emissions from solid waste disposal on land have been taken from the IPCC Guidelines and are consistently applied over the entire time series.

Uncertainties

148. Quantitative uncertainty has not been evaluated. However, it has been indicated that this source category shows the greatest uncertainty within the inventory due to the poor statistics in this field. This is reflected both in table 7 of the CRF, where the estimates for Waste sector are considered to be of low quality, and in the NIR. The Party is planning to submit a quantitative assessment of the uncertainty in its next submission.

Verification and quality assurance/quality control approaches

149. No formal QA/QC plan exists as yet for this sector.

B. Key sources

150. There are two key sources from the sector: CH_4 emissions from solid waste disposal are one of the important sources on both level and trend assessment, while CO_2 emissions from incineration are considered a key source only with regard to trend assessment.

Solid waste disposal on land – CH_4

151. CH_4 emissions from solid waste disposal sites (SDWS) accounted for 7.3 per cent of total national GHG emissions in 2002. Since the 1970s Iceland has made considerable progress regarding waste management. Waste management has become a business activity subject to licensing laws and a collection system and sites have been established. The number of disposal sites has been reduced. However, their size has increased. About 70 per cent of municipal waste is still going to landfills and 24 per cent is recycled or recovered by other means such as incineration with energy recovery. Industrial non-hazardous waste is disposed at SWDS.

152. In its 2004 submission, Iceland has used the tier 1 method for estimating CH_4 from SWDS, thus following a recommendation of the 2001 desk review and substituting the methodology previously used. Because of the significant changes in the amount of waste generated over the time series, the ERT recommends further studies of the historical data on municipal solid waste (MSW) at SWDS in the interests of more accurate estimation of CH_4 emissions from SWDS. The ERT also recommends further investigations with the aim of changing the method from tier 1 (default methodology) to tier 2 (first order decay (FOD)).

153. The figures for landfilled waste have been revised in the 2004 submission. Nevertheless the AD on waste in Iceland are still incomplete. There is little information on the actual amount of waste generated or on its composition and characteristics. Waste statistics in Iceland were introduced in 2002 following the lines of European Union legislation and are reported to Eurostat. Statistics for 2002 have been used to estimate historical data, assuming that the waste generated has increased by 1.5 per cent per capita per year. According to the NIR, the AD on annual MSW at SWDS should correspond to those included in the Icelandic Waste Management Plan (IWMP) but the CRF does not contain the same figures as provided in the IWMP. The ERT recommends a new recalculation for CH_4 emissions from SWDS based on the documented data in the IWMP.

154. The composition of landfilled waste is assumed to be constant over the time series (the value for DOC is 0.14 Gg C/ Gg MSW). The ERT recommends further studies on the composition of landfilled waste based on the experience of Nordic and other European countries (e.g., in Austria, the DOC value changed during the period 1980–2002 from 0.15 to 0.12).

155. The IPCC default EFs have been used to estimate CH_4 emissions from solid waste disposal (fraction DOC dissimilated (DOC_F) = 0.55, oxidation fraction (OX) = 0.1 for managed sites and OX=0 for unmanaged sites, methane correction factor (MCF) = 1 for managed and MCF = 0.4 for unmanaged and shallow sites), and the 2002 value of the CH_4 IEF for solid waste disposal on land (0.04 t/t waste) is comparable to the values reported by other Parties (0.00–0.21 kg/t waste).

156. Even though the available data are insufficient for using a tier 2 method, much of the additional information needed as a background to understanding table 6.A is available in the literature referenced. Only some of these AD are reported as additional information in the CRF additional information box to table 6.A and no references to the background information are included in the NIR.

Waste incineration – CO_2

157. This is a key source in the trend assessment. Emissions from waste incineration have been estimated using the IPCC good practice guidance. The NIR contains a detailed description of the default data used for estimating CO_2 from incineration from MSW. Only 3–4 per cent of the waste generated is incinerated, almost all of it with energy recovery. Emissions from waste incineration in Iceland decreased by 82 per cent from 1990 to 2002 because the total amount of waste being incinerated has decreased and a higher percentage has been incinerated with energy recovery, and is thus reported under Energy (table 1.A(a)). According to the CRF tables, half of the waste (7 tonnes) was incinerated with energy recovery and according to the NIR half (7 tonnes) was incinerated without energy recovery. In 1995 one incinerator was closed down and a new one with a capacity of 11,000 tonnes per year was put into

operation in 2004. Further explanations of waste management practices and the allocation of the emissions should be provided in the NIR.

158. As indicated in the documentation box, CRF table 6.C includes total CO_2 emissions from incineration of biogenic waste, with and without energy recovery. At the same time the AD reported in this table are those that relate to incinerated waste without energy recovery. This results in a value for the CO_2 IEF for biogenic wastes (1990.48 kg CO_2/t waste) that has been identified as an outlier and is the highest of all values of the reporting Parties (they range from 381.6 to 1990.48 kg CO_2/t waste). If the correct value for CO_2 emissions were included, the IEF would be 995.2 kg CO_2/t of waste. The table should be revised in the next submission.

C. Non-key sources

159. All emissions from the Waste sector that have been estimated originate from key sources. Other emission sources are indicated as "NE". This refers to CH_4 and N_2O emissions from incineration and waste-water handling. Emissions from human sewage were included in previous submissions but have been omitted in the 2004 submission because of lack of time. The ERT was informed that they will be considered in the next inventory submission.

D. Areas for further improvement

Identified by the Party

160. In its NIR, Iceland has indicated the following planned improvements in the sector:

(a) Surveys to obtain better data on the Waste sector related to the amount of carbon deposit at SWDS; and

(b) Disaggregating the AD into different types (municipal waste, clinical waste and hazardous waste).

Identified by the ERT

161. The ERT reaffirms the need for improvement in the areas as planned by the Party and further recommends:

(a) Collecting data and providing estimates for CH_4 and N_2O emissions from waste-water handling and waste incineration;

(b) Improving the transparency of reporting in the CRF by providing additional information, for example, as required in table 6.A Solid Waste Disposal on Land;

(c) Further investigating the possibilities of changing the method from the tier 1 default methodology to tier 2 FOD for estimating CH_4 emissions from SWDS; and

(d) Better documentation in the NIR of the background data and of the assumptions used for the estimates.

ANNEX 1: MATERIALS USED DURING THE REVIEW

A. Support materials used during the review

2003 and 2004 Inventory submissions of Iceland. 2004 submission including a set of CRF tables for 1990–2002 and an NIR.

CRF tables for the year 2002 reflecting the GHG emissions not excluding emissions falling under decision 14/CP.7.

UNFCCC secretariat (2004). "Report of the individual review of the greenhouse gas inventory of Iceland submitted in the year 2001 (desk review)". FCCC/WEB/IRI(1)/2001/ISL (available on the secretariat web site http://unfccc.int/files/national_reports/annex_i_ghg_inventories/inventory_review_reports/application/pdf/icedeskrev.pdf).

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UNFCCC secretariat. "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories", "Part II: UNFCCC reporting guidelines on national communications" and "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention." FCCC/CP/1999/7 (on the secretariat web site http://unfccc.int/resource/docs/cop5/07.pdf).

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B. Additional materials

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National Energy Forecast Committee (2002). Eldsneytisnotkun Islendinga Eftir Notkunarflokkum, Innlend Notkun". Fuel use in Iceland per type, domestic use (unpublished).

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Icelandic Agricultural Statistics 2002. Icelandic Agriculture

Icelandic Association of Farmers, Agricultural Genetic Resources Committee, and Nordic Gene Bank for Domestic Animals (2004). *Icelandic Livestock Breeds*. ISBN 9979-885-02

Arnalds, O., G. Gudbergsson and J. Gudmundsson (2000). "Carbon sequestration and reclamation of severely degraded soils in Iceland." *Icelandic Agricultural Science* 13: 87–97.

Arnalds, Ó., Á.L. Aradóttir, A. Snorrason, G. Gudbergsson, P.H. Jónsson and A.M. Agústsdóttir (1999). "Organic carbon sequestration by restoration of severely degraded areas in Iceland. Preliminary results." *Fjôlrit Rala* 197. April.

Christensen, T. R. *Carbon cycling and methane emissions from wet tundra ecosystems: feedback effects on climate change*. Climate Impacts Group, Centre for Geobiosphere Studies, Lund University, Sweden

Icelandic Association of Farmers, Agricultural Genetic Resources Committee, and Nordic Gene Bank for Domestic Animals (2004). *Icelandic Livestock Breeds*. ISBN 9979-885-02

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