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REPORT OF THE INDIVIDUAL REVIEW OF THE GREENHOUSE GAS INVENTORY OF IRELAND SUBMITTED IN THE YEAR 2001[1]

(Desk review)

EXECUTIVE SUMMARY

1. This report contains the findings of the desk review of the greenhouse gas (GHG) inventory submitted by Ireland for the year 2001. For this review, the expert review team (ERT) examined Ireland's common reporting format (CRF) tables for 1999, as well as the synthesis and assessment report, status report and the preliminary key source analysis prepared by the UNFCCC secretariat.

2. The review was limited by the absence of a national inventory report (NIR) and CRF data tables for the period 1990–1998. One of the principle findings of the ERT is that it is very important for Ireland to supply these data and an NIR in its future submissions. The ERT also notes that Ireland needs to estimate several important sources of emissions and removals in the future, including fluorinated gases (HFCs, PFC and SF_6) in the industrial processes sector, several source categories in the land-use change and forestry (LUCF) sector, and wastewater handling in the waste sector.

I. OVERVIEW

A. Introduction

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

4. The review of Ireland took place from 14 November 2001 to 8 March 2002. The desk review was carried out by a team of nominated experts from the roster of experts, working in their own countries. Experts participating in the review were Ms. Dina Kruger (Generalist, USA), Mr. Javier Hanna Figueroa (Energy, Bolivia), Dr. Hugh Saddler (Energy, Australia), Ms. Irina B. Yesserkepova (Industrial Processes, Kazakhstan), Mr. William Kojo Ageymang

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

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

Bonsu (Industrial Processes, Ghana), Mr. Luis Gerardo Ruiz Suarez (Agriculture, Mexico), Ms. Pascale Collas Land-Use Change and Forestr, Canada), Mr. Francois Wencelius (Land-use Change and Forestry , France), Ms. Maria Paz Cigaran (Waste, Peru), and Mr. Charles Russell (Waste, New Zealand). The review was coordinated by Ms. Astrid Olsson (UNFCCC secretariat). Ms. Dina Kruger and Ms. Irina B. Yesserkepova were lead-authors of this report.

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

B. Inventory submission and other sources of information

1. National inventory report

6. Ireland did not submit an NIR in 2001.

2. Common reporting format (CRF)

7. In its 2001 submission, Ireland submitted CRF tables only for the year 1999. Summary data for the years 1990–1998 were submitted using the IPCC summary tables.

3. Other sources of information

8. Ireland did not submit any other inventory sources for review purposes. The ERT used the draft synthesis and assessment (S&A) report 2001, the preliminary key source analysis[3] and the status report prepared by the secretariat. The ERT also referred to Ireland's response to the draft S&A report.

9. Other sources of information used during the review include: the preliminary guidance for experts participating in the individual review of GHG inventories, the UNFCCC reporting guidelines[4] and the review guidelines (FCCC/CP/1999/7).

C. Emission profile, trends and key sources

1. Emission profile

10. Ireland has a fairly typical emission profile for an Annex I Party. The most important GHG is CO_2 (carbon dioxide), which in 1999 accounted for 64.1% of total emissions,[5] followed by CH_4 (methane) at 20.4%, and N_2O (nitrous oxide) at 15.5%. By sector, energy accounted for 63.2% of total emissions, agriculture 29.7%, industrial processes 4.6% and waste 2.3%. The agriculture sector is responsible for a comparatively larger share of Ireland's emissions than is the case for most other Annex I Parties.

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[3] The UNFCCC secretariat had identified, for each individual Party, those source categories which are *key sources* in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as 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. The key sources presented in this report are based on the secretariat's preliminary key sources assessment. They might differ from the key sources identified in by the Party itself.

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

[5] In this report, the term "total emissions" refers to the aggregate national emissions based on CO_2 equivalents excluding LUCF, unless otherwise specified.

2. Emission trends

11. Ireland's emission trends are summarized by sector and GHG in tables 1 and 2. Ireland's emissions increased by approximately 11,840 Gg CO_2 equivalents (22%) between 1990 and 1999. The emission increase over this period was fairly steady, except for a slight drop between 1992 and 1993. By gas, CO_2 emissions increased by 33% over the period, CH_4 emissions increased by 4% and N_2O emissions increased by 12%. By sector, energy emissions increased by 34% and agricultural emissions increased by 9% over the period. Industrial emissions fell initially and have been gradually increasing in recent years. Waste sector emissions increased by 8% between 1990 and 1996, and then declined by 21% between 1996 and 1999.

TABLE 1. GHG EMISSIONS BY GAS, 1990–1999 (Gg CO_2 equivalent)

GHGs	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	CO_2 equivalent (Gg)									
Net CO_2 emissions/ removals	26,555	27,081	27,517	26,835	28,263	28,588	29,635	31,800	33,526	35,153
CO_2 emissions (without LUCF)	31,575	32,256	32,893	32,421	33,987	34,501	35,700	38,071	40,019	41,887
CH_4	12,836	12,992	13,030	13,099	13,159	13,311	13,559	13,747	13,631	13,307
N_2O	9,086	8,919	8,860	9,021	9,291	9,505	9,660	9,548	10,066	10,143
HFCs	0	0	0	0	0	0	0	0	0	0
PFCs	0	0	0	0	0	0	0	0	0	0
SF_6	0	0	0	0	0	0	0	0	0	0
Total (with net CO_2 emissions/removals)	48,477	48,991	49,407	48,955	50,713	51,403	52,854	55,095	57,223	58,603
Total (without CO_2 from LUCF)	53,497	54,117	54,783	54,542	56,437	57,317	58,919	61,366	63,716	65,337

Table 2. GHG emissions by sector, 1990–1999 (Gg CO_2 equivalent)

GHG SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	CO_2 equivalent (Gg)									
1. Energy	30,795	31,493	32,134	31,738	33,098	33,707	34,990	37,212	39,229	41,311
2. Industrial processes	2,966	2,766	2,777	2,690	2,953	2,853	2,815	3,076	3,062	3,035
3. Solvent and other product use	67	71	71	71	71	71	71	71	62	62
4. Agriculture	17,889	18,020	17,957	18,175	18,424	18,777	19.118	19,166	19,698	19,411
5. Land-use change and forestry	-5,020	-5,176	-5,376	-5,586	-5,724	-5,913	-6,065	-6.271	-6,493	-6,734
6. Waste	1,780	1,816	1,844	1,868	1,890	1,908	1,925	1,841	1,594	1,518
7. Other	0	0	0	0	0	0	0	0	0	0

3. Key sources

12. Ireland did not conduct a key source analysis as part of its 2001 submission. The secretariat conducted a tier 1 analysis which identified 13 key source categories; these are listed in table 3.

Table 3. Key sources Ireland, 1999: Level assessment

(UNFCCC secretariat)[a]

Key source	Gas	Level Assessment %	Cumulative total %
Stationary combustion – oil	CO_4	19.9	20
Stationary combustion – coal	CO_2	16.6	36
Enteric fermentation in domestic livestock	CH_4	15.5	52
Mobile combustion – road vehicles	CO_2	14.0	66
Stationary combustion – gas	CO_2	9.2	75
Animal production	N_2O	4.7	80
Direct N_2O emissions from agricultural soils	N_2O	4.7	84
Solid waste disposal sites	CH_4	2.3	87
Manure management	CH_4	2.2	89
Cement production	CO_2	1.7	91
Indirect N_2O from nitrogen used in agriculture	N_2O	1.5	92
Ammonia production	CO_2	1.4	94
Nitric acid production	N_2O	1.2	95

[a] See footnote 3 of this report

D. General assessment of the inventory

1. Completeness of reporting

CRF

13. Ireland submitted inventory data for the year 1999 using the CRF of the UNFCCC reporting guidelines. The ERT identified some omissions in the 1999 CRF tables, including:

(a) Table 8(a) and (b): recalculations;

(b) Estimates for HFCs, PFCs, and SF_6 (which were reported as "NE" (not estimated) in the industrial processes sector);

(c) Estimates for forest and grassland conversion, abandonment of managed lands, and soils (except for liming) (which were reported as "NE" in the LUCF sector;

(d) Estimates for CH_4 emissions from wastewater handling and N_2O emissions from human sewage (which were reported as "NE" in the waste sector).

14. The ERT noted that data for the years 1990 to 1998 were not submitted in the CRF.

NIR

15. Ireland did not submit an NIR as part of its 2001 submission.

2. Cross-cutting issues

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

16. No information was provided as to whether the inventory data were subject to any external verification or independent review procedures. In addition, no information was

provided as to whether any QA/QC procedures were performed. As part of its self-verification of estimates, Ireland compared the results of the reference approach with that of the sectoral approach for the energy sector.

Recalculations

17. No information on recalculations was provided in the CRF. Tables 8(a) and (b) were not completed.

Uncertainties

18. Ireland provided a qualitative uncertainty assessment.

3. Conformity with the UNFCCC reporting guidelines and the IPCC Guidelines

19. The national inventory submitted by Ireland is not in conformity with the UNFCCC reporting guidelines because it is not complete. The missing information includes an NIR, completed 1999 CRF tables, and all CRF tables for the years 1990–1998.

20. The 1999 CRF tables were broadly consistent with the IPCC Guidelines, although there were several important gaps. Emissions from several source categories were not provided. In addition, it is not possible to evaluate all emission methods and data to determine whether they are consistent with the IPCC Guidelines and good practice guidance, because the necessary documentation was not provided in an NIR.

E. Areas for further improvement

1. Issues identified by the Party

21. In its response to the draft S&A report 2001, Ireland indicated that it is working to improve its estimates for several important sources. For enteric fermentation, Ireland explained that a major research project is under way to improve data. Once these data are available, Ireland intends to use a tier 3 method for its estimates. Ireland is also collecting additional farm-level data to improve its estimate of CH_4 emissions from waste management. Ireland is also conducting detailed studies of N_2O emissions from soil to improve emission factors. Finally, Ireland reported that it is conducting research into land-use change activities in order to achieve more comprehensive coverage of potential emission and removal sources and to acquire sufficient detail for a full application of the IPCC Guidelines.

22. In its response to the draft desk review report, Ireland described its plan to improve its inventory submission in the following ways:

- Provision of a CRF time series for the years 1990 – 2000;
- Preparation of a first NIR; and
- Assessment of sources currently identified as “not estimated” (NE) that should be estimated;

In addition, Ireland noted five other areas of emphasis for improvements: estimates of emissions of HFCs, PFCs and SF_6, reevaluation and refinement of estimates for carbon sequestration in forests; revised estimates for solvents and other product use; recalculations for all years, as appropriate; and more complete CRF tables, including Tables 8(a), 8(b) and 9.

2. Issues identified by the ERT

23. The ERT found that the actions proposed by Ireland will be very helpful in improving the quality of the inventory. Efforts to improve the transparency of the inventory by providing an NIR are particularly important, as mentioned above. The ERT also identified some specific areas for improvement at the sectoral level, as discussed below:

Energy

24. The 1999 emissions estimates presented for the energy sector are on the whole complete and appear to be of good quality. The ERT recommends that in its next submission Ireland provide estimates for the entire time series. The ERT also notes that some of the emission factors used for N_2O and CH_4 appear anomalous and should be explained.

Industrial processes

25. The ERT found several serious gaps in Ireland's emission estimates for this sector. Ireland did not estimate emissions of fluorinated gases (HFCs, PFCs and SF_6), and the ERT urges Ireland to prepare such estimates in the future. The ERT also notes that Ireland is using default methods for the source categories of the industrial processes sector. The ERT recommends that Ireland implement higher tier methods, particularly for key source categories such as cement production.

Agriculture

26. The ERT noted that Ireland's inventory submission appeared to include all necessary sources, and that Ireland has several research projects under way to improve its estimates in the agriculture sector. A detailed evaluation of the quality of Ireland's submission was not possible, however, given the lack of documentation for the data provided in the CRF. The ERT emphasizes that an NIR is required for effective assessment of Ireland's emission estimates.

LUCF

27. The ERT identified several gaps in estimates of emissions and removals of CO_2. No estimates were prepared for the categories forest and grassland conversion, abandonment of managed lands, and soil (except for liming). Within the forest and woody biomass category, emissions were not estimated for commercial harvest, fuel wood or other wood uses. The ERT notes that Ireland is undertaking a research effort to improve its LUCF inventory and suggests that this is an important priority for future submissions.

Waste

28. The waste sector requires improvement, because waste water handling has not been estimated by Ireland. Solid waste disposal on land is a key source category in the Irish inventory, and the ERT recommends that the tier 2 method be used to estimate emissions and that the IPCC good practice guidance be implemented in this sector of the inventory.

Good practice

29. Ireland is encouraged to implement the IPCC good practice guidance, and to describe its progress in an NIR.

Verification and QA/QC

30. Ireland is encouraged to implement QA/QC procedures, as outlined in the IPCC good practice guidance and to document its activities in an NIR.

Uncertainty

31. The ERT encourages Ireland to undertake quantitative uncertainty analysis, following the IPCC good practice guidance.

Key source analysis

32. The ERT recommends that Ireland perform a key source analysis and use the results to improve its inventory. The ERT notes that Ireland has prioritized certain sources in its response to the report. The ERT suggests that Ireland should fully implement the key source analysis described in the IPCC good practice guidance and report the results in its NIR.

II. ENERGY

A. Sector overview

33. The energy sector accounted for 63.2% of total gross emissions in 1999 and 70.5% of total net emissions. Ireland has relatively large emissions of CH_4 and N_2O from its agricultural sector, and also relatively large CO_2 removals from its LUCF sector. As a result, emissions of CO_2 from the energy sector, which totaled 29,603 Gg in 1999, representing 94.5% of total gross CO_2 emissions.

34. The energy sector includes four key source categories with a combined contribution of 59.7% to total gross emissions: CO_2 emissions from the stationary combustion of oil, coal and gas and CO_2 emissions from mobile combustion from road vehicles.

35. During the period 1990–1999 the total CO_2 equivalent emissions from energy increased by 34%. By greenhouse gas, CO_2 emissions increased by 34%, CH_4 decreased by 25% and N_2O increased by 58%. The very rapid emission growth was attributable to 42% emission growth in energy industries (1.A.1) and 96% emission growth in transport (1.A.3). Emissions from manufacturing industries and construction (1.A.2) grew more slowly over the period, and were up by only 11% between 1990 and 1999. Other sectors (1.A.4) grew by only 2%. Fugitive emissions from fuels are low, and declined during the period.

1. Completeness

36. With few exceptions, the CRF included estimates of most gases and sources of emissions from the energy sector, as recommended by the IPCC Guidelines. The exceptions were:

(a) Emissions of NO_X, CO, NMVOCs and SO_2 were estimated for the manufacturing industries and construction subsector (1.A.2) as a whole, but not for individual subsectors within this sector; that is, an aggregated tier 1 approach was used for this sector;

(b) Emissions of all gases, including CO_2, from the civil aviation subsector of transport (1.A.3) were not estimated. However international aviation bunkers consumption of 22.78 PJ of aviation gasoline and jet fuel, with CO_2 emissions of 1.624 Gg, was reported in table 1.C. It is assumed that emissions from domestic civil aviation are very small in Ireland;

(c) All activity cells for other (1.A.5) were set to not occurring ("NO") in table 1. This sector is normally used to report emissions from military fuel use and from the combustion and other oxidation of engine oil and other lubricants. This sector should not be reported as "NO", but some (presumably small) emissions should be recorded. In table 7s1, emissions from this sector were reported as not estimated ("NE"). This would seem to be a more correct representation of the situation (but is inconsistent with table 1). In its response to the draft desk review report Ireland noted that the national energy balance does not provide any activity data from military use of fuel.

(d) In the fugitive emissions sector, emissions of CO_2 and CH_4 from natural gas distribution were estimated, but emissions from natural gas exploration, production, processing, transmission, venting and flaring were not estimated. Ireland noted in its response to the draft desk review report that it will include emissions from gas production in future submissions. The related activity data were also not estimated, and so it is not possible to say how large this sector is in Ireland. Other sources of fugitive emissions do not occur in Ireland.

2. Methodologies

37. Both the reference approach and the sectoral approach were used. The IPCC tier 1 method was used for all major gases. For CO_2 emissions from electricity generation (1.A.1.a), which accounts for 39% of total energy sector CO_2 emissions, plant-specific emission factors reported by the electricity company were used. A plant-specific emission factor was also used for CO_2 emitted from ammonia manufacture (the major chemical industry activity in Ireland).

3. Emission factors

38. IEFs (implied emission factors) for CO_2 for the various fuels in the various sectors appear to be consistent and were close to, though not always identical with, IPCC default values. CORINAIR emission factors were used for CH_4 and N_2O in all sectors. However, IEFs for these gases revealed a number of apparent anomalies, as follows:

(a) IEFs for CH_4 were zero in the following subsectors: electricity generation (1.A.1.a) - all fuels - and 1.A.1.b (gaseous fuels). In the latter case, Ireland indicated in its response to the draft S&A report that this was in fact refinery gas;

(b) IEFs for both CH_4 and N_2O from biomass were zero in all subsectors of other sectors (1.A.4). This would not seem to conform to physical reality;

(c) For all other fuels in all other sectors, IEFs for CH_4 were somewhat lower than IPCC tier 1 default values, but this may be consistent with a widespread use of emission control equipment, and is presumably consistent with CORINAIR;

(d) On the other hand, for all other fuels in all other sectors, IEFs for N_2O were significantly higher than IPCC tier 1 default values (on average, by a factor greater than 10). If the CORINAIR values have been used correctly, this implies a major inconsistency between CORINAIR and the IPCC. If, for the sake of illustration, emission factors for N_2O in the energy sector were lower by a factor of 10, emissions from the energy sector as a whole would be lower by 1,364 Gg, equivalent to 3.3% of total energy sector emissions.

39. In its response to the draft desk review report Ireland noted that it will investigate the IEFs.

4. Activity data

40. It is understood that all activity data were obtained from official national energy statistics.

5. Comparison between reference and sectoral approaches

41. Both reference and sectoral (national) approaches were used. The reference approach inventory was compiled, and it appears to follow the IPCC Guidelines. However, the following features are noted:

(a) All carbon contained in apparent consumption of naphtha (5.1 PJ) was stated as being stored;

(b) Apparent consumption of bitumen and lubricants was reported as zero; this would be consistent with national autarchy with respect to these products; that is, all national consumption is sourced from national refineries and there are no exports. Ireland explained in its response to the draft desk review report that the national energy balance does not contain any information on bitumen or lubricants and that these products are not produced in Ireland's one small refinery;

(c) Compared with the national approach, the reference approach estimates of CO_2 emissions were:

(i) higher by 2.5% for liquid fuels;

(ii) lower by 0.4% for solid fuels;

(iii) higher by 13.1% for natural gas.

42. For liquid fuels, no explanation was provided for the difference most of which is attributable to a difference in activity (energy consumption) estimates. As with other countries, it is likely that some of the difference is attributable to uncertainties in estimating the energy content and average CO_2 emissions for crude oil. (Crude oil refined in Ireland represents about 38% of Ireland's total consumption of liquid products, with net imports of refined products accounting for virtually all the remainder.)

43. For natural gas, the wide difference was attributed in the documentation box of table 1.A(c) to the exclusion from the national approach of 17.2 PJ of natural gas used as industry feedstocks. It is understood from other information that most of this gas is used in the manufacture of ammonia, which means that the fossil carbon is emitted within a short period and is correctly included in reference approach emissions; that is, there is no adjustment for stored carbon, as would be the case if the feedstock were being used to produce long-lived plastic products. It is not clear why this natural gas is not included in the activity data used to compile the national approach. It is noted that the national approach does include 5.1 PJ of natural gas used in the chemicals subsector (together with 5.5 PJ of liquid fuels).

B. Key sources

1. Stationary combustion: oil – CO_2

Completeness

44. All sub-sources were estimated.

Methodologies

45. The tier 1 method (for both sectoral and reference approaches) was used for almost all sub-sources, with country-specific emission factors. The only exception was electricity generation (1.A.1.a) for which a tier 3 methodology (power plant-specific emission factors) was used.

Emission factors

46. The IEFs for liquid fuels were consistent with the mix of petroleum products which would be expected to be used in the various subsectors. As reported in table 1.A(b), the emission factors for diesel and liquefied petroleum gas (LPG) were slightly lower than the respective IPCC default values. The IEF for liquid fuels used in 1.A.1.a was particularly high, implying use of a very heavy and/or high sulphur fuel oil in this sector.

Activity data

47. It is understood that all activity data were obtained from official national energy statistics.

2. Stationary combustion: coal – CO_2

Completeness

48. All sub-sources were estimated.

Methodologies

49. The tier 1 method (for both sectoral and reference approaches) was used for almost all sub-sources, with country-specific emission factors. The only exception was electricity generation (1.A.1.a) for which a tier 3 method with power plant-specific emission factors is used. Note that this sub-source accounted for 69% of total emissions.

Emission factors

50. The IEFs for the various sub-sources reflected the use of a mix of bituminous coal and coke/smokeless fuel and were close to IPCC default values.

Activity data

51. It is understood that all activity data were obtained from official national energy statistics.

3. Mobile combustion: road vehicles – CO_2

Completeness

52. All sub-sources were estimated.

Methodologies

53. The tier 1 method (for both sectoral and reference approaches) was used, with country-specific emission factors.

Emission factors

1. The IEFs for gasoline and LPG were slightly higher than the IPCC default value and the IEF for diesel was slightly lower.

Activity data

54. It is understood that all activity data were obtained from official national energy statistics.

4. Stationary combustion: gas – CO_2

Completeness

55. All sub-sources were estimated.

Methodologies

56. The tier 1 method (for both sectoral and reference approaches) was used for almost all sub-sources with country-specific emission factors. The only exception was an ammonia plant (part of 1.A.2.c) for which a tier 3 method with a plant-specific emission factor was used. The IEF for gaseous fuels in this sector was very slightly lower than the IEF for gaseous fuels in other sectors.

Emission factors

57. The IEFs for gaseous fuels were internally consistent, and slightly lower than the IPCC default value for natural gas.

Activity data

58. It is understood that all activity data were obtained from official national energy statistics.

5. Issues identified in the draft S&A report 2001

59. The draft S&A report 2001 noted many of the same issues as are identified here. The following matters raised by the draft S&A report merit further comment:

(a) First, the draft S&A report stated that no information was provided on some fuel types which (it is implied) were included in the IEA energy consumption data for Ireland, that is, bitumen, lubricants, refinery feedstocks. However, it should be noted that, unless there is net trade or stock change in these products, in which case they will appear in the reference approach, they will not appear separately anywhere in the CRF, because the CRF reports only total liquid fuels (with the exception of petrol, diesel and aviation fuels used in transport). Hence it cannot be concluded that these products have in fact been excluded from the Irish inventory. Ireland noted in its response to the draft desk review report that these products are not included in its national energy balance and are not produced in Ireland.

(b) Secondly, the draft S&A report 2001 noted apparently anomalous values for CO_2 IEFs in some sectors. In its response, Ireland explained some of these (gaseous fuels in

1.A.1b, petrol in 1.A.3.b). The third noted (liquid fuels in 1.A.1.a) was higher than the IPCC default CO_2 emission factor for residual fuel oil and higher than the value used in the reference approach in this CRF. It implies that in Ireland a very heavy and/or high sulphur fuel oil is used in this subsector;

(c) Thirdly, the draft S&A report 2001 noted the apparently anomalously high IEF values for N_2O in most sectors, as also noted above. Ireland should explain these values;

(d) Finally, the CO_2 IEF for residual oil used in 1.A.3.d was identical with the CO_2 emission factor for residual fuel oil used in the reference approach.

III. INDUSTRIAL PROCESSES

A. Sector overview

1. Completeness

60. Ireland provided sectoral tables for only 1999, and table 9s1 was not completed. There were several unexplained data gaps in the inventory. Emissions of HFCs, PFCs and SF_6 were reported as "NE". Table 10s1 reported aggregated emissions from 1990 to 1999. The aggregated emissions in industrial processes showed some inconsistencies, and the trend in total CO_2 equivalent emissions for 1990 to 1997 was very erratic. The ERT recommends that Ireland should provide an NIR in future submissions and fully explain these trends.

2. Transparency

61. Ireland's inventory was not transparent, due to the incomplete nature of the reporting and the aggregated nature of the reported emissions for the entire time series.

3. Methodologies

62. Ireland used principally IPCC default methods for estimating emissions. For the chemical industry (2.B), a tier 1a method was employed. CO_2 from cement production was a key source category and use of the IPCC default method affects the reliability of the reported emissions. In its response to the draft desk review report Ireland noted that better information is beginning to be made available and that this will allow for country-specific higher tier methods in the future.

4. Emission factors

63. IPCC default emission factors were used in the emission estimates, even for some key source categories, such as CO_2 emissions from ammonia production. Ireland did not appear to be implementing the IPCC good practice guidance in its emission estimates.

5. Activity data

64. Ireland did not describe how activity data were collected. Activity data for potential key source categories such as emissions of fluorinated gases from the consumption of halocarbons and SF_6 were reported as "NE" in the CRF tables.

B. Key sources

65. Ireland did not perform a key source analysis. The secretariat's preliminary key source analysis identified three key sources: CO_2 from cement production, CO_2 from ammonia production and N_2O from nitric acid production. Ireland did not estimate emissions of HFCs,

PFCs and SF_6. In many countries, this is a key source category due to its rapid growth. The ERT strongly encourages Ireland to report emissions of these gases in its future submissions.

1. 2.A.1 Cement production – CO_2

66. Cement production was a key source category, contributing 1.7% of total absolute emission levels. Ireland used the default method to obtain both activity data and emission factors, which makes the reported emission estimate less reliable. The ERT recommends that Ireland use a higher tier method for this source in future.

2. 2.B.1 Ammonia production – CO_2

67. The IEF for CO_2 (2.3 t/t) was the highest among reporting Parties and higher than the IPCC default range of 1.5–1.6 t/t. Ireland explained, in its response to the draft S&A report, that the emission factor is based on plant-specific data. Ireland further explained, in its response to the draft desk review report, that this EF refers to tonnes CO_2 per tonne of natural gas feedstock, rather than per tonne of ammonia produced.

3. 2.B.2 Nitric acid production – N_2O

68. The IEF for N_2O (0.0101 t/t) was high compared to other reporting Parties and higher than the IPCC default range of 0.002-0.009 t/t. In its response to the draft S&A report 2001, Ireland reported that this emission factor was based on data from one plant. The ERT notes that this response does not explain why the factor is so high, and suggests that Ireland provide further details.

IV. AGRICULTURE

A. Sector overview

69. Emissions from the agriculture sector were 17,889.4 Gg CO_2 equivalent in 1990, without considering the CO_2 emissions from agricultural soils, which represented 36.9% of national emissions. In 1999, emissions were 19,441.1 Gg, representing 33.1% of total emissions. This difference represents an 8.5% increase in emissions over the period. The sector is responsible for five out of 13 key sources in the key source categories, according to the assessment carried out by the secretariat.

1. Completeness and transparency

70. Rice cultivation, savanna burning and the field burning of agricultural soils were reported as not occurring ("NO"). Some subcategories within the direct soil emissions were not estimated. Methane emissions from manure management from sheep were not estimated. The inventory was not complete because an NIR was not submitted.

2. Methodologies, emission factors and activity data

71. The livestock population characterization was consistent among different source categories: CH_4 from enteric fermentation, CH_4 from manure management and N_2O from manure management. Default IPCC emission factors were used for all non-cattle livestock. For cattle, country-specific research was used to obtain national average emission factors for dairy and non-dairy cattle. No further details were provided in the submission. In its response to the draft S&A report 2001, however, Ireland reported that major research projects were under way to substantially improve the inventory with regard to several key sources in the sector.

B. Key sources

72. Five out of 13 key sources identified by the secretariat belong to this sector. However, without an NIR and with CRF tables for only one year, very little can be done in addition to the draft S&A report 2001 carried out by the secretariat.

73. In relation to Ireland's answers to the draft S&A report 2001, it seems that the country has carried out a thoughtful characterization of livestock populations (that is, three year averages of cattle and sheep populations, considering seasonal fluctuations, as suggested by the IPCC good practice guidance). The secretariat noticed that methane emissions from manure management were only reported for cattle and swine. Ireland's answer seemed to indicate that there was no management of sheep-related manure. However, given the population in this category, a default emission factor for cool climates and tier 1 calculations should have been used. In its response to the draft desk review report, Ireland explained that sheep are generally not housed in Ireland and consequently there is no manure management related to sheep.

74. Ireland also recognizes in its inventory the key role of N_2O emissions from soils and reports that detailed studies are under way.

C. Non-key sources

75. Without an NIR and with CRF tables for only one year very little can be done in addition to the draft S&A report 2001 carried out by the secretariat.

V. LAND-USE CHANGE AND FORESTRY

A. Sector overview

1. Completeness

76. Ireland indicated in table 9 that no attempt had been made to estimate emissions and removals from the categories forests and grasslands conversion, abandonment of managed lands and soils, except for liming. Ireland was not confident that robust estimates can be made for these activities. As a result, only tables 5 and 5.A and an incomplete table 5.D were reported. Estimates of C uptake from trees other than managed forests (such as agricultural wood lots and urban forestry) were not reported, nor were C losses from managed forests. Moreover, there were no estimates of CH_4 and N_2O emissions and no explanation regarding their omission. If forest fires occur in managed forests, non-CO_2 emissions could be reported. Ireland noted in its response to the draft desk review report that significant improvements have been made in subcategory 5.A and that the findings of ongoing research are awaited before estimates back to 1990 can be prepared for 5.B, 5.C, and 5.D.

77. Analysis of time series consistency is not possible, since 1999 was the only year reported in Ireland's 2001 submission.

2. Transparency

78. Transparency suffered significantly from the absence of an NIR and the fact that documentation boxes in tables 5.A to 5.D were not filled in. At a minimum, explanations should be provided for the exclusion of some categories from reporting, as well as references and sources for activity data and annual growth rates.

3. Methodology, emission factors and activity data

79. The default IPCC method and country-specific factors were used for estimating changes in forest biomass stocks. Activity data and average annual growth rates were reported in table 5.A. The default method and emission factors were used for estimating emissions from liming.

B. Sources and sinks categories

1. Changes in forest and other woody biomass stocks

80. Managed forests in Ireland are an increasing sink for CO_2. Removals amounted to 7,096.6 Gg CO_2 in 1990, or a nearly 32% increase on the 5,381.4 Gg estimate for 1990. Annual increases range between 1.9% (1991/90) and 3.8% (1995/94).

81. The estimates of CO_2 emissions and removals from this category were reported in table 7 to be complete. However, emissions from commercial harvest, fuel wood or other wood use were not reported. It seems that these losses were not taken into account, which constitutes a significant weakness in Ireland's LUCF inventory. As a result, the estimate of 7,096.6 Gg CO_2 reported under this category for 1999 was actually a "gross" figure. The documentation box could be used to provide explanations for these issues.

82. The average annual growth rate for above-ground biomass in temperate commercial coniferous forests (3.3 C/ha/yr implied C uptake) was among the highest values for that forest type from reporting Parties, according to the draft S&A report 2001. In its response, Ireland indicated that this was based on data for the Sitka spruce. It also indicated that there is incomplete coverage of the various tree species and that the method is considered to be "oversimplified".

2. Liming – CO_2

83. All emissions were reported under the limestone category. CO_2 emissions from liming were estimated at 362 Gg CO_2 in 1999, a similar level to that of 1990. Over the decade, the level of emissions fluctuated between 294 Gg CO_2 in 1993 (18% below 1990 levels) and 467 Gg CO_2 in 1996 (29% above 1990 levels).

VI. WASTE

A. Sector overview

84. In 1999, emissions from the waste sector represented 2.3% of Ireland's GHG emissions. The only category reported in this sector was solid waste disposal on land. Table 6 was complete with the use of notation keys. In the absence of detailed documentation in an NIR, it is not possible to review the estimates thoroughly.

1. Completeness and transparency

85. An NIR was not submitted and although there are some notes embedded in the CRF document, these do not provide enough information or clarity. CH_4 emissions from wastewater treatment and N_2O emissions from human sewage were both reported as "NE". In its response to the draft desk review report, Ireland reported that methane emissions from wastewater are considered negligible because virtually all wastewater treatment in Ireland is aerobic. Estimates of N_2O emissions from sewage will be included in future submissions.

2. Methodology, emission factors and activity data

86. The method used to estimate emissions from solid waste disposal sites (SWDS) is not clear. Ireland reported using the default IPCC method, but included a confusing note in the documentation box referring to a country-specific method. Without an NIR, it is difficult to determine what method was used or how emission factors and activity data were obtained. There was no evidence that the IPCC good practice guidance had been incorporated in the reporting framework.

B. Key sources

1. 6.A Solid waste disposal on land

Trends

87. Emissions from this source increased by 8% between 1990 and 1996, and then fell sharply by 21% between 1996 and 1999. In 1999, emission levels were 14% below 1990 levels. There is no documentation supporting this decrease in emissions; no discussion was included in the documentation boxes. In its response to the draft desk review report, Ireland explained that the decline in emissions is attributable to the increase in CH_4 recovery.

Methodology, emission factors and activity data

88. The default IPCC tier 1 method was apparently used to estimate emissions. However, there was reference to the potential CH_4 from municipal solid waste (MSW) released over a 20-year period at different rates per year. The explanation in the documentation box would thus appear to indicate that an alternative, country-specific method was used. In reviewing the estimate, the ERT concluded that the default method was used, and the ERT suggests that Ireland should clarify its note in the documentation box.

89. The additional information table (table 6.A) appeared to be missing some values; that is, the fraction of MSW disposed of at SWDS and also the composition of landfill waste did not add up to 100%. It seems that there could be a numerical mistake in this section.

C. Non-key sources

90. There were no estimates provided for non-key source categories in this sector. CH_4 from wastewater treatment and N_2O from human sewage were reported as “NE” but no information was provided in the completeness table or in the documentation box. The ERT notes that this was also noted in the S&A report on Ireland’s 2000 CRF submission.

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