UNITED NATIONS
NATIONS UNIES

FRAMEWORK CONVENTION ON CLIMATE CHANGE - Secretariat
CONVENTION - CADRE SUR LES CHANGEMENTS CLIMATIQUES - Secrétariat

FCCC/WEB/IRI/2004/IRL 15 April 2005

IRELAND

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

I. OVERVIEW

A. Introduction

1. This report covers the desk review of the 2004 greenhouse gas (GHG) inventory submission of Ireland, 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 8 to 26 November 2004 and was conducted by the following team of nominated experts from the roster of experts: Generalists – Mr. Paul Filliger (Switzerland) and Ms. Kristina Saarinen (Finland), Energy – Mr. Mario Contaldi (Italy) and Mr. Hugh Saddler (Australia), Industrial Processes – Ms. Karin Kindbom (Sweden) and Ms. Kristine Zommere (Latvia), Agriculture – Mr. Ayite-Lo Ajavon (Togo) and Ms. Hongmin Dong (China), Land-use Change and Forestry (LUCF) – Ms. Dominique Blain (Canada) and Mr. Richard Volz (Switzerland), Waste – Mr. Philip Acquah (Ghana) and Ms. Katarina Mareckova (Slovakia). Ms. Hongmin Dong and Mr. Mario Contaldi were the lead reviewers of this review. The review was coordinated by Ms. Rocio Lichte (UNFCCC secretariat).

2. In accordance with the UNFCCC "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention" a draft version of this report was communicated to the Government of 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

3. In its 2004 submission, Ireland has submitted a complete set of common reporting format (CRF) tables for the years 1990–2002 and a national inventory report (NIR). Where needed the expert review team (ERT) also used the previous year's submission and additional information provided during the review. The full list of materials used during the review is provided in annex 1 to this report.

C. Emission profiles and trends

4. In the year 2002, the most important GHG in Ireland was carbon dioxide (CO_2), contributing 66.5 per cent to total[2] national GHG emissions expressed in CO_2 equivalent, followed by methane (CH_4) – 18.6 per cent – and nitrous oxide (N_2O) – 14 per cent. Perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF_6) taken together contributed less than 1 per cent of the overall GHG emissions of the country. The Energy sector accounted for 64.5 per cent of total GHG emissions, followed by Agriculture (27.2 per cent), Industrial Processes (5.6 per cent) and Waste (2.6 per cent). Total GHG emissions (excluding LUCF) amounted to 68,875 Gg CO_2 equivalent and increased by

[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 LUCF, unless otherwise specified.

29 per cent from 1990 to 2002. The trends of the different gases appear reasonable except for the exceptional increase of CO_2 removals in LUCF for the years 2001 and 2002 (10 times greater than the mean from 1990 to 2000).

D. Key sources

5. Ireland has reported a tier 1 key source analysis, both level and trend assessment, as part of its 2004 submission. The key source analyses performed by the Party and the secretariat[3] produced slightly different results as they used different levels of aggregation. Ireland provides the analysis at both a general level (11 key sources) and a detailed level (40 key sources), which seems to be very appropriate to the country's needs and provides a good basis for prioritizing the work of developing the inventory in the future. The ERT recommends that Ireland work towards a tier 2 key source analysis. The secretariat's analysis resulted in 16 key sources.

E. Main findings

6. The inventory methods applied by Ireland as well as the CRF tables and the NIR are generally on a high level of development. No inconsistencies were found between the CRF tables and the NIR except for the information related to recalculations (see paragraph 14).

7. The Party states that it has not yet been able to implement the recommendations of the 2003 in-country review but that the in-country review report will guide future improvements to the inventory. The ERT supports the Party in this and is of the opinion that it should be given high priority.

F. Cross-cutting topics

Completeness

8. The inventory is generally complete in terms of coverage of sources and gases, and inventories have been provided in the form of the CRF for all years required, from 1990 to 2002. The CRF tables have been completed for all sectors. Gaps in the inventory were, however, noted in the LUCF sector, for which no estimates are provided for categories 5.B and 5.C, as well as for fluorinated gases (F-gases) (no data are provided for 1990–1994), asphalt roofing and road paving with asphalt, and N_2O in the Solvent Use sector. The NIR (chapter 1.6 and table 1.1 as well as the sectoral methodology chapters) gives comprehensive information on the completeness of the present inventory submission. The Party recognizes that there are sources to be completed in the Industrial Processes, Agriculture, LUCF and Waste sectors. Data on the F-gases are available only from 1995 onwards.

Transparency

9. The institutional framework for preparation of the inventory is well described in the NIR, as are inventory preparation in general, emission levels and trends, key sources, methods used, data sources, uncertainty estimates, quality control and verification activities.

10. The present organization of the NIR does not entirely follow the structure outlined in the revised UNFCCC reporting guidelines. The ERT encourages Ireland to develop the NIR to follow the outline described in the reporting guidelines in order to facilitate more efficient use and review of the information in the NIR.

11. The NIR (table 1.2) compiles information on the methods applied in compiling the inventory. It provides fairly comprehensive information on the methods used, but the descriptions of the underlying

[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. However, they are presented at the level of aggregation corresponding to a tier 1 key source assessment conducted by the secretariat.

assumptions and the calculation procedures could be more detailed. This would further enhance the transparency of the NIR.

12. There is no information on confidentiality issues in the NIR except that data on waste incineration are often confidential. However, given the scale and type of these processes, the emissions can be estimated to be negligible.

13. The ERT encourages Ireland to pay attention to and further improve the use of the notation keys in the CRF. They are used in only a limited way in some of the tables.

Recalculations and time-series consistency

14. No recalculations have been carried out for the 2004 submission. Even though CRF tables 8 have been completed for 1990–2000, the information in those tables is the same as that provided in the 2003 submission, and the recalculation tables provided in the 2004 submission therefore reflect the recalculations made in 2003. According to the Party recalculations will be carried out for the next submission to take into account new research and data.

Uncertainties

15. Ireland has provided quantitative uncertainty estimates using the tier 1 uncertainty assessment, as required by the UNFCCC reporting guidelines, for all relevant sources of the inventory. The overall uncertainty was 11.5 per cent for the 2002 inventory (it was 11 per cent for 2001 inventory) and the trend uncertainty was 7.5 per cent for the period 1990–2002 (5 per cent for 1990–2001). No explanation is given for this increase of uncertainty, but it may be due to the fact that some uncertainty estimates have been modified according to the recommendations of the 2003 in-country review. Ireland states that the uncertainty is driven by the high uncertainties of the estimates of N_2O from agricultural soils and notes that this highlights the need for more reliable data for this particular source (see also the 2003 in-country review report). The Party states that a study on the national energy balance will give additional information on uncertainties in the Energy sector.

Verification and quality assurance/quality control approaches

16. A formal quality management system is not yet in place, nor is there a system for the review of annual inventories. However, several quality assurance/quality control (QA/QC) procedures that are currently carried out are well described in the NIR. No information about record keeping is provided in the NIR.

17. For some source categories the NIR provides a table on "Sector-specific good practice guidance" indicating which elements 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) are already being implemented and which are not. These tables provide good information to aid follow-up of the development of the inventory.

G. Areas for further improvement

Identified by the Party

18. Several areas for improvement identified in the NIR (chapter 6 and the source-specific chapters) are based on current research and are related to the LUCF sector (biomass carbon stocks, peat soils) and Agriculture (enteric fermentation and nitrogen inputs to soil). Other improvements concern better data acquisition and uncertainty estimates. There are also plans for a national review to be conducted each year.

Identified by the ERT

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

(a) Implement the recommendations of the 2003 in-country review, as already planned;

(b) Further develop the key source analysis and the uncertainty analysis towards a tier 2 approach;

(c) Provide more precise descriptions of methodologies that differ from the IPCC methodologies;

(d) Improve transparency by restructuring the NIR according to the UNFCCC reporting guidelines;

(e) Develop a formal quality management system and describe record keeping and archiving.

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

II. ENERGY

A. Sector overview

21. In 2002, the Energy sector accounted for 64.5 per cent of Ireland's total GHG emissions. During the period 1990–2002 GHG emissions from the sector increased by 43.2 per cent, while total emissions increased by 29 per cent. Within the Energy sector Ireland identified four key sources under the level assessment (covering about 61 per cent of total emissions) and five key sources under the trend assessment.

Completeness

22. All significant emission sources and gases are included in the inventory. Emissions from the consumption of aviation gasoline in domestic civil aviation (1.A.3a) are not estimated ("NE" is reported), nor are fugitive CH_4 and CO_2 emissions from natural gas transmission systems (1.B.2b(ii)). Ireland responded to the draft of this report that with regard to fugitive emissions, only CH_4 emissions from natural gas distribution are a relevant source.

Transparency

23. The methodology used to estimate emissions is country-specific, and the activity data (AD), emission factors (EFs) and detailed methodologies are generally well described in the NIR. The main source of AD is the national energy and oil balance sheets published by Sustainable Energy Ireland. This source is supplemented by direct reporting of energy consumption (pursuant to the conditions for the award of environmental licences) by the alumina refining, ammonia, cement and oil refining industries. Energy consumption at individual privately owned power stations is reported similarly. Emissions from the major power stations of the Electricity Supply Board are estimated by the Board for each power station and reported to the inventory agency.

24. Fugitive emissions from oil and natural gas are also reported directly by Ireland's sole natural gas producer and its sole gas distribution business.

Areas for further improvements identified by ERT

25. The ERT noted that a few findings of the 2004 synthesis and assessment (S&A) report, if addressed by the Party, have the potential to improve the emission estimates significantly with regard to the transparency and consistency of the inventory. In particular the ERT encourages Ireland to address in its future submissions the issues related to: the rather high implied emission factors (IEFs) of liquid, solid and gas fuels of energy industries; the large inter-annual fluctuations of CO_2 emissions for chemicals; and the 1997 IEFs for liquid and solid fuels in the Manufacturing Industries and Construction sector, which appear to be unusual.

26. There are some further minor issues where the Party's response to the 2004 S&A report provides a full explanation of the issue identified but where, in the interests of greater clarity in future submissions, it would be advantageous if more information could be provided. This is particularly the case for some non-key sources such as: biomass from public electricity and heat production (the low IEF and the completeness of the time series); CH_4 and N_2O emissions from transport (lack of data for 1991–1992); the difference between the data in the Party's GHG inventory and the International Energy Agency (IEA) consumption data for jet kerosene; the sharp inter-annual decreases in reported fuel consumption and emissions data between 2001 and 2002 in some Transport categories (Railways and Navigation); the time series of biomass and emissions from other fuels under the Commercial/Institutional/Residential sectors; the inter-annual fluctuations in and the completeness of the time series for CO_2 emissions from oil and natural gas; and the large inter-annual variations in, and the difference between the data reported in the GHG inventory and the IEA data for, marine bunker fuels.

B. Reference and sectoral approaches

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

27. For both solid and liquid fuels, the difference between the estimates of CO_2 emission using the two approaches is very small. It is slightly larger for gaseous fuels, but less than 1 per cent overall. The NIR explains that the larger difference for CO_2 emissions from gaseous fuels is caused by the use of a higher EF for natural gas used in electricity generation in the sectoral approach. This EF is identified as being exceptionally high compared to those reported by other Parties, and the ERT recommends further consideration of this issue.

International bunker fuels

28. Emissions of CH_4 and N_2O from consumption of international marine bunkers are not estimated (they are in fact reported as zero in the CRF, but as "NE" in the NIR, which should also be used in the CRF), although corresponding emissions from domestic water transport are estimated and reported. This was noted in the 2003 in-country review report, but has not yet been addressed by the Party.

Feedstocks and non-energy use of fuels

29. The consumption of lubricants, bitumen and solvents, none of which are produced in Ireland, is not reported in either the sectoral or the reference approach. In the case of lubricants, this means that CO_2 emissions arising from the fraction of lubricants assumed to be oxidized (default 0.50) are omitted from Ireland's inventory. The omission of these petroleum products was noted in the 2003 in-country review report, although the implication for the emissions estimates was not explicitly identified. It is recommended that the Party take steps to include these products in its national oil balance sheet, and then include emissions from lubricants in its inventory.

C. Key sources

30. The key source analysis reports CO_2 from stationary combustion – liquid fuels, CO_2 from stationary combustion – solid fuels, CO_2 from mobile combustion – road transportation and CO_2 from stationary combustion – gaseous fuels as key sources according to the level analysis. All these plus N_2O from mobile combustion – road transportation are key sources according to the trend analysis.

Stationary combustion: liquid fuels – CO_2

31. The IEF for liquid fuels used in the energy industries (mainly public electricity generation) was noted as being particularly high. While the ERT surmises that this may be attributable to the use of petroleum coke, the Party has not provided any explanation, which it should do. In the Chemical Industry sector of Manufacturing, the inter-annual variations in emissions from liquid fuels are large. The Party advised the ERT that this is mainly attributed to large uncertainties in energy consumption data for Ireland's sole ammonia plant. There is an exceptionally high CO_2 IEF for liquid fuels in 1.A.2f Other Manufacturing Industries and Construction in 1997. This is attributed by the Party to the large quantity

of petroleum coke used mainly in cement manufacture, which had not been included in previous inventory submissions, combined with a mistaken allocation of the energy derived from petroleum coke to solid, rather than liquid, fuels. It is recommended that efforts be made to improve the quality of all these data and to correct the identified errors in future submissions.

Stationary combustion: solid fuels – CO_2

32. The three issues identified in the previous paragraph in relation to liquid fuels also apply to solid fuels in the two sectors referred to.

Stationary combustion: gaseous fuels – CO_2

33. The ERT noted that the CO_2 IEF for gaseous fuels in public electricity generation is particularly high compared to those reported by other Parties; this has not been fully explained by the Party.

D. Non-key sources

Civil aviation: liquid fuels – all gases

34. Consumption of aviation gasoline in domestic civil aviation is reported in the NIR as being included with consumption of jet kerosene. The reason for this is not adequately explained and emissions from this source are reported as "NE" when they should be noted as "included elsewhere" ("IE") if the NIR is correct. This matter should be addressed in Ireland's next submission.

Rail transportation: liquid fuels – all gases

35. Reported consumption and associated emissions dropped very sharply between 2001 and 2002. The Party reports this as being caused by a change in the way data are reported by the railway company and states that the inventory agency is investigating the issue. It is recommended that this investigation be completed and fully reported in the 2005 submission.

Domestic navigation: liquid fuels – all gases

36. A similar drop in reported consumption and associated emissions as for rail transportation is reported for this sector. It is recommended that the Party undertake a similar investigation.

Fugitive emissions oil and natural gas – CO_2

37. Large inter-annual variations are reported. There is also considerable inconsistency in reported CO_2 emissions from venting and flaring, which in some years are zero. While large variations are not unexpected from this emission source, some explanation in the NIR would be valuable and should be included in future submissions.

38. It is not clear from either the CRF or the NIR whether or where emissions resulting from flaring at Ireland's only oil refinery are reported. The ERT considers it most probable that they are included in stationary combustion emissions, but there is no explicit information to support this assumption. A clear explanation should be included in the next submission.

III. INDUSTRIAL PROCESSES AND SOLVENT USE

A. Sector overview

39. The Industrial Processes sector accounted for 5.6 per cent of total national GHG emissions in the year 1990 and for 5.6 per cent in 2002. Emissions from the sector increased by 29 per cent between 1990 and 2002.

40. Emissions are reported for most sources and gases, except for asphalt roofing and road paving with asphalt for which no emissions have been estimated ("NE" is reported), and for N_2O from solvent and other product use. Actual emissions from consumption of HFCs, PFCs and SF_6 have not been

provided for the years 1990–1994. Metal production occurred in Ireland only prior to 2001. The only ammonia and nitric acid production plants closed down in June 2002.

41. The 2004 submission is generally transparent in the CRFs, except for the lack of use of notation keys in some cases, especially for the earlier years. The NIR provides sufficient explanations to make it possible to understand the methodology and the basis for the calculations in most cases, but emission trends and inter-annual variations are not explained or commented on at source level. A table in the NIR lists the elements of the IPCC good practice guidance that are already implemented in individual sectors and those which remain to be addressed. The table covers methodological choices, recalculations, uncertainty assessment, verification, documentation and planned improvements for the Industrial Processes sector in general as well as for some specific sources. QC and review activities still remain to be introduced for the sector.

B. Key sources

Cement production – CO_2

42. Production of cement has increased in recent years as new plants have opened. The methodology used to estimate emissions is not consistent over time. The process emissions of CO_2 reported in the CRFs for 2001 and 2002 are estimated indirectly as the difference between reported total emissions of CO_2 from plants and emissions from combustion that can be derived from fuel use data. Earlier data are estimated by using the tier 1 methodology. In annex D to the NIR Ireland presents a comparison between the reported emissions in the CRFs and estimates for 1990–2003 based on information recently acquired in connection with implementation of the European Union Emissions Trading Directive. Differences for individual years are within 18 per cent. Ireland states that the new information will enable it to revise the estimates for all years in its 2005 submission. The ERT encourages Ireland to revise the emissions estimates in a consistent manner according to a higher-tier methodology.

Ammonia production – CO_2

43. The NIR states that the EF used (54.94 kg/TJ) is country-specific and the same as the EF for natural gas combustion in the Energy sector. The IPCC default EF including the oxidation factor is 55.8 kt/PJ. No further information is provided in the NIR regarding the country-specific EF. The only ammonia production plant closed in 2002.

Consumption of halocarbons and SF_6 – HFCs

44. Assumptions made are generally well covered in the NIR and its appendix D but they are not always transparently justified. In the CRFs, data for actual and potential emissions are reported for 1995–2002, while 1990–1993 are reported as "NE" and in the tables for 1994 the cells are left blank. The ERT encourages Ireland to explain and justify the assumptions in more detail in the NIR.

45. Potential emissions by source are reported in table 2(I)s2 only for 2002.

Semiconductor manufacture – PFCs

46. The NIR explains that two companies manufacture semiconductors. One of them calculates emissions as 72 per cent of the amount of F-gases used, while no explanation is provided about the methodology used at the other company. The methodology seems not to be in accordance with the IPCC good practice guidance (e.g., as given in table 3.15 in the IPCC good practice guidance). During the 2003 in-country review, Ireland explained that confidentiality is a problem. Data are available to the Irish Environmental Protection Agency (EPA) inspectors, but not to the Irish GHG inventory team. The 2003 in-country review recommended that Ireland make arrangements with the companies in order to make information available for future review purposes in accordance with the IPCC good practice guidance. Since the methodology does not seem to be in accordance with the IPCC good practice guidance, the ERT recommends that calculation methodologies be explained and justified in the NIR, or changed to follow the IPCC good practice guidance.

Lime production – CO_2

47. In response to the 2003 in-country review, Ireland has submitted AD for all years, as well as providing explanations of the choice of EF in the NIR. A high-calcium lime EF according to the IPCC good practice guidance (0.75 t CO_2/t lime) is used consistently in the tier 1 estimates. This is considered appropriate for Ireland, according to the NIR, since high-grade limestone is the standard raw material. The NIR also states that data from the Emissions Trading Scheme will shortly be available, enabling Ireland to review and revise the estimates. The ERT encourages it to carry through this review and revision.

C. Non-key sources

Steel production – CO_2

48. The notation keys are used inconsistently over the years (e.g., "not occurring" ("NO") and "NE" are used interchangeably). Apparently steel was produced prior to 2001, but emissions from that steel production have not been estimated. Even though the steel plant closed down in 2001, estimates should be made for the earlier years and the notation keys should be properly used.

Electrical equipment – SF_6

49. Data are presented in the NIR (annex D), but are not commented on in the appropriate chapter. No explanations of the inter-annual fluctuations are provided in the NIR.

IV. AGRICULTURE

A. Sector overview

50. In 2002, emissions from the Agriculture sector amounted to 18,724 Gg CO_2 equivalent, or 27.2 per cent of total national emissions, whereas in 1990 they represented 33.7 per cent of the total. The main reason why share of the sector has fallen is the rapid increase in CO_2 emissions in the other sectors of the inventory and a slight downturn in both CH_4 and N_2O emissions from agriculture after 1998.

51. The CRF includes estimates of CH_4 and N_2O emissions from most agricultural sources, all gases and all years. CH_4 emissions from manure management from non-cattle livestock species and N_2O emissions from organic soils and the burning of agricultural residues are not estimated because they are not considered significant source categories. Rice cultivation and prescribed burning of savannas do not occur in Ireland.

52. For the 2002 inventory Ireland identified key sources at the level of a disaggregated calculation of emissions. According to the tier 1 level assessment, it identified eight key sub-sources, and according to the tier 1 trend assessment it identified seven key sub-sources, which belong to CH_4 from enteric fermentation, N_2O from agricultural soils and CH_4 from manure management. The eight key sub-sources accounted for 23.2 per cent of total national emissions in 2002. The key source analysis conducted by the secretariat identified in addition CH_4 and N_2O from manure management as key sources.

53. Consistent seasonal and three-year average livestock populations within the different emission categories have been used, which is in line with the IPCC good practice guidance. However, the population data for sheep published by the Food and Agriculture Organization of the United Nations (FAO) for 2002 are 22.5 per cent lower than the data reported in the CRF (6,792,000 head are reported in the CRF, compared with 4,807,000 head by FAO). The Party has addressed this issue in response to earlier S&A and review reports. In the 2003 in-country review the ERT identified the same issues, and the 2004 ERT found that the FAO figures for a given year are identical to the figures for December of the previous year from the statistical publications on agriculture from the Irish Central Statistics Office (CSO). Both the data reported to FAO and the AD used for the GHG inventory come from the CSO; however, the AD used for the GHG inventory are taken from census surveys taken twice a year (June and December) and averaged over three years, whereas the FAO data are the figures for one survey in

December. As explained by Ireland in responding to the draft of this report, the differences between the June and December survey data are primarily due to animal slaughter.

54. The methodologies used by Ireland are IPCC default tier 1 with country-specific EFs for some sources. The ERT recommends that Ireland document the assumptions made in developing country-specific EFs, the methodology used and any relevant related information to further improve the transparency of its inventory. Ireland is encouraged to make an effort to develop a tier 2 approach based on its research programme.

B. Key sources

Enteric fermentation – CH_4

55. Emissions of CH_4 from enteric fermentation amounted to 9,524 Gg CO_2 equivalent in 2002, accounting for almost 14 per cent of total national GHG emissions.

56. Ireland has used the IPCC tier 1 method and for non-dairy cattle an EF of 50 kg CH_4/head/year. The NIR states that this value has been developed by Irish agricultural experts largely in accordance with the tier 2 method, but it is not documented by the inventory agency. The additional information to table 4.A which is to be completed by Parties that use a tier 2 method is not provided, so that it was difficult for the ERT to track the EFs for this source. Given the importance of the non-dairy cattle sub-source, the ERT recommends that Ireland improve the transparency of its reporting by providing the methodology used, the assumptions made, and related parameters.

Manure management – CH_4

57. Ireland has only estimated CH_4 emissions from cattle, swine and poultry manure. The NIR states that the values of methane-producing capacity (Bo), volatile solids (VS) and methane correction factor (MCF) are taken from the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC Guidelines); however, the ERT noted that the value of MCF (10) for the anaerobic lagoon of swine manure reported in the additional information to CRF table 4.B differed from the recommended value of 90 in the IPCC Guidelines. The ERT recommends that Ireland re-check these data.

58. CH_4 emissions have been reported as "0.00" for sheep, goat and horse manure. The IPCC default EF for sheep is 0.19 CH_4/head/year but, given the cool climate of Ireland, the assumption mentioned in the NIR of no emissions of CH_4 is reasonable. The ERT recommends that Ireland re-examine the IPCC Guidelines and apply them where appropriate.

Direct emissions from soils and manure management – N_2O

59. Country-specific excretion rates of 92.5 kg N/head/year for dairy cattle and 50 kg N/head/year for non-dairy cattle have been applied; according to the NIR these were taken from survey data. The value of animal waste applied to soil reported in CRF table 4.D (70,424,472 kg N/year) differs from that provided in table F.6 in the NIR (93,799.180 kg N/year). It seems that there is a calculation error in the NIR, and the ERT recommends Ireland to recalculate this. According to the Irish response during this review, this calculation error has been corrected for the all inventory years in the 2005 submission.

Agricultural soils: animal production – N_2O

60. For the fraction of livestock nitrogen (N) excreted and deposited onto soil during grazing ($Frac_{GRAZ}$), Ireland uses a value of 0.63, which is the highest among reporting Parties, and according to the Irish response to the draft of this report reflects the fact that cattle are held outdoors for much of the year and the significant contribution from sheep.

Agricultural soils: indirect emissions – N_2O

61. A country-specific $Frac_{GASM}$ of 0.17 and a $Frac_{GASF}$ of 0.04 have been used to estimate indirect N_2O emissions from agricultural soils. The IPCC recommended values are 0.2 for $Frac_{GASM}$ and 0.1 for

$Frac_{GASF}$. The sources and basis for the country-specific values, which are based on the NH_3 emission inventory in agriculture according to the CORINAIR methodology, are provided in the NIR.

V. LAND-USE CHANGE AND FORESTRY

A. Sector overview

62. In 2002, Ireland's LUCF sector accounted for net removals of 978 Gg CO_2 equivalent, corresponding to 1.4 per cent of total national GHG emissions without LUCF.

63. A major discontinuity can be observed in the sectoral time series. Net annual removals for the period 1990–2000 averaged 67 Gg CO_2 equivalent, with a standard deviation of 48 Gg CO_2; however, for the years 2001–2002 net annual removals averaged 803 Gg CO_2 equivalent (standard deviation of 247). The NIR indicates that changes in parameter values were implemented for the 2002 inventory year, notably a 26 per cent increase in the biomass expansion factor (from 1.3 to 1.64) and an adjustment of the biomass carbon content to 0.5, as opposed to the previous values (0.4–0.45). Because of time constraints, recalculations were not performed for the entire time series; hence the discontinuity between 2001 and 2002. Complete recalculations will be included in the next inventory submission and the description of the method used will be updated accordingly. This explanation does not, however, account for the order-of-magnitude difference between the net sectoral removals (629 Gg CO_2 equivalent) in 2001 and the average annual removals of previous years. This discrepancy also appeared in the 2003 submission.

64. CO_2 emissions/removals are reported for category 5.A Changes in Forest and Other Woody Biomass Stocks. Emissions or removals from land-use change (categories 5.B Forest and Grassland Conversion and 5.C Abandonment of Managed Lands) are not estimated, nor is category 5.D CO_2 Emissions and Removals from Soil, except for emissions from lime application.

B. Sink and source categories

5.A Changes in forest and other woody biomass stocks

65. Ireland uses a country-specific method to determine forest areas and stocks; it is based on extrapolation of forest areas inventoried in 1995, growth and yield models, and management statistics for public forests only, except for data on planting which is available for both public and private forests. On the basis of these data sources and assumptions, Ireland estimates carbon (C) stocks for each inventory year and determines changes by the difference from the previous year's stocks.

66. Ireland has modified table 5.A to provide stock data; it also reports an "implied C uptake factor", but it is not clear how these figures relate to others in the table, which merely report standing C stocks as opposed to increment. Removals are reported from plantations only. Data have not been provided and the notation keys have not been used for managed forests.

67. The NIR clearly identifies conversion or expansion factors, and explains their use in the estimation procedures. The ERT believes that what is termed "conversion factor biomass volume to dry matter, t dm/m^3" in CRF table 5.A is actually a dry density, while the column "Expansion factor stemwood volume to total tree biomass", for which no units are specified, may be the expansion factor from merchantable to total tree biomass. Still in table 5.A, the "conversion factor from biomass volume to dry matter" of biomass removed (harvested) is lower than a weighted mean of that used for calculating standing biomass. The relatively high expansion factor is the same for all species; it could be further refined by age-class and species type.

68. Fuelwood estimation is included in commercial harvest. An explanation is needed as to why fuelwood consumed is not reported separately.

5.B, 5.C and 5 D

69. No estimates are reported for 5.B.2 Forest and Grassland Conversion – Temperate Forests, 5.C Abandonment of Managed Lands or 5.D CO_2 Emissions and Removals from Soil except for liming. The NIR indicates that major research is under way to develop the missing estimates.

70. The notation keys are not used consistently. Of all the subcategories under 5.B, only Mixed Broadleaf/Coniferous are indicated as "NE"; for all others Ireland reports "0" instead of using the notation keys. In table 5.D, land area of mineral soils under cultivation is indicated as "0", and for organic soils no indication is provided; however, table 5 reports zero removals, whereas for emissions "NE" is reported.

71. Appendix G to the NIR mentions "afforested and reforested areas" but data are not reported in table 5.C. The Party should clarify whether this expression is to be interpreted as a land-use change or replanting after harvest; the ERT recommends that the UNFCCC definitions be used.

Recommendations

72. The ERT commends Ireland for its transparent descriptions of approaches used. It recommends that transparency be enhanced further by the appropriate use of the notation keys and the documentation box in the CRF. Recalculations should be carried out for the years 1990–2001 in category 5.A.

VI. WASTE

A. Sector overview

73. Emissions from the Waste sector represented 2.3 per cent in 1990 and 2.6 per cent in 2002 of total national GHG emissions in Ireland. The sector has one key source – solid waste disposal on land. CH_4 and N_2O emissions from waste-water handling are not estimated except for N_2O from human sewage. Emissions from waste incineration are reported as "NO" in the CRF but as "NE" in table 5.9 of the NIR.

74. The Waste chapter of the NIR contains descriptions of methods used, parameters and AD. The data in the CRF tables for category 6.A are not consistent with the results presented in the NIR, and it is not clear which of the numbers are the correct ones.

75. Total emissions from the Waste sector increased by 45 per cent between 1990 and 2002, or approximately 3–4 per cent a year. CH_4 emissions increased during this period by 36.6 per cent, but showed large inter-annual fluctuations: emissions dropped by 15 per cent between 1997 and 1998, and increased by 12 per cent between 1999 and 2000 and again by 33.3 per cent between 2001 and 2002 (according to the data reported in table 10s2 in the 2004 CRF). The ERT recommends that Ireland explain these changes.

B. Key sources

Solid waste disposal on land – CH_4

76. Methane emissions have been estimated for managed and unmanaged disposal sites separately. According to the NIR, Ireland has applied a modified IPCC tier 2 method and IPCC default values. From 1970 to 2002 potential emissions are estimated according to the IPCC tier 1 method and these emissions are then distributed over the time frame of 20 years. Historical municipal solid waste (MSW) deposited since 1970 has been calculated and used in the estimates. Detailed calculation sheets are attached to the NIR. The numbers in the column "CH_4 Emitted – All SWDS" provided in table H.5 of the NIR differ significantly from the values reported in the CRF trend table except for the year 2002. Ireland should harmonize and improve the consistency of the information reported. According to the response by Ireland to this review this matter would be improved for the 2005 submission.

C. Non-key sources

Waste-water handling – CH_4

77. CH_4 emissions from waste-water handling are not estimated. According to CRF table 9 and the NIR, these emissions are negligible since most waste water is treated aerobically.

Waste-water handling – N_2O

78. N_2O emissions are estimated only for human sewage, using the IPCC default method. The ERT encourages Ireland to make an effort to obtain AD to estimate N_2O emissions from industrial and commercial and domestic waste-water handling.

ANNEX 1: MATERIALS USED DURING THE REVIEW

A. Support materials used during the review

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

UNFCCC secretariat (2004). "Report of the individual review of the greenhouse gas inventory of Ireland submitted in the year 2003 (In-country review)". FCCC/WEB/IRI(2)/2003/IRL (available on the secretariat web site <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/inventory_review_reports/application/pdf/irlrep03.pdf>).

UNFCCC secretariat. "2004 Status report for Ireland" (available on the secretariat web site <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/inventory_review_reports/application/pdf/ire04.pdf>).

UNFCCC secretariat. "Synthesis and assessment report of the greenhouse gas inventories submitted in 2004. Part I": FCCC/WEB/SAI/2004 (available on the secretariat web site at http://unfccc.int/resource/webdocs/sai/2004.pdf) and Part II – the section on *Ireland* (unpublished).

UNFCCC secretariat. Review findings for Ireland (unpublished).

Ireland's comments on the draft "Synthesis and assessment report of the greenhouse gas inventories submitted in 2004" (unpublished).

UNFCCC secretariat. "Handbook for review of national GHG inventories." Draft 2004 (unpublished).

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 (available on the secretariat web site <http://unfccc.int/resource/docs/cop5/07.pdf>).

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" and "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention." FCCC/CP/2002/8 (available on the secretariat web site <http://unfccc.int/resource/docs/cop8/08.pdf>).

UNFCCC secretariat. Database search tool – *Locator* (unpublished).

IPCC. *IPCC Good practice guidance and Uncertainty Management in National Greenhouse Gas Inventories, 2000* (available on the following web site: <http://www.ipcc-nggip.iges.or.jp/public/gp/english>).

IPCC/OECD/IEA. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, volumes 1–3, 1997* (available on the following web site: <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>).

B. Additional materials

No additional information or materials were requested by the ERT during this review.

- - - - -