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ESTONIA

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 centralized review of the 2004 greenhouse gas (GHG) inventory submission of Estonia, 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 18 to 22 October 2004 in Bonn, Germany, and was conducted by the following team of nominated experts from the roster of experts: Generalists – Mr. William Irving (United States) and Mr. Matthew Dudley (Australia), Energy – Mr. Pavel Fott (Czech Republic), Mr. Hongwei Yang (China) and Mr Takeshi Enoki (Japan), Industrial Processes – Mr. Jos Olivier (Netherlands) and Ms. Virginia Sena (Uruguay), Agriculture – Mr. Damdin Dagvadorj (Mongolia) and Ms. Anna Romanovskaya (Russian Federation), Land-use Change and Forestry (LUCF) – Mr. Rizaldi Boer (Indonesia) and Mr. Xiaoquan Zhang (China), Waste – Mr. Yunus Arikan (Turkey) and Ms. Elisabeth Scheele (United States). Mr. William Irving was the lead reviewer. Due to unforeseen circumstances, Mr. Rizaldi Boer, who was invited as the second lead reviewer, was not able to attend the review in Bonn, but contributed from Indonesia. The review was coordinated by Ms. Astrid Olsson (UNFCCC secretariat).

2. In accordance with the "UNFCCC guidelines for the technical review of greenhouse gas inventories from Annex I Parties", a draft version of this report was communicated to the Government of Estonia for comment prior to its publication.

B. Inventory submission and other sources of information

3. In its 2004 submission, Estonia has submitted common reporting format (CRF) tables for the year 2002 and a national inventory report (NIR). Where needed the expert review team (ERT) also used the previous year's submission, additional information provided during the review and other information. 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 Estonia was carbon dioxide (CO_2), contributing 88.7 per cent to total[2] national GHG emissions expressed in CO_2 equivalent, followed by methane (CH_4) – 9.7 per cent – and nitrous oxide (N_2O) – 1.6 per cent. Perfluorocarbons (PFCs) and hydrofluorocarbons (HFCs) have not been estimated, and emissions of sulphur hexafluoride (SF_6) do not occur. The Energy sector accounted for 90.9 per cent of total GHG emissions (excluding LUCF), followed by Waste (3.8 per cent), Agriculture (3.6 per cent) and Industrial Processes (1.6 per cent). Total GHG emissions

[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.

(excluding LUCF) decreased by 55.2 per cent from 1990 to 2002. The overall reduction in total GHG emissions is attributed to Estonia's status of an economy in transition, and Estonia is encouraged to provide more information on the sharp decline in the NIR.

D. Key sources

5. Estonia does not report a key source analysis as part of its 2004 submission, but the UNFCCC secretariat[3] identified 10 key sources. The main key sources identified by the secretariat are CO_2 emissions from stationary energy combustion (coal) and road vehicles, which contributed 63.6 and 9.4 per cent of total GHG emissions, respectively, on a level assessment basis.

E. Main findings

6. Estonia must be commended for submitting an NIR for the first time. This NIR provides detailed information on country-specific methods. However, improvements can be made to the NIR in relation to the handling of cross-cutting topics from the *1996 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), and by making the CRF tables more complete. The ERT has made recommendations to Estonia in the general and sector-specific sections below which, if implemented, will bring the inventory more closely into line with the UNFCCC reporting guidelines.

F. Cross-cutting topics

Completeness

7. The NIR covers all sectors and most IPCC source categories. A complete time series of estimates by gas and by sector (in CRF table 10) is provided for the years 1990–2002. However, a complete time series of CRF tables has not been submitted. Gaps in the coverage of source categories include Industrial Processes source categories emitting fluorinated gases (F-gases), activities in the Agriculture sector such as prescribed burning of savannas and field burning of agricultural residues, activities in the Solvent and Other Product Use sector, and Waste Incineration.

8. The ERT recommends that the Party improve the discussion of completeness, the methodological descriptions, sectoral trends and time-series consistency and explain the recalculations.

9. Estonia has submitted almost all CRF tables for 2002. Not submitted tables are: 2(II).F (Industrial Processes), 3 and 3.A-D (Solvent and Other Product Use), 4.E and 4.F (Agriculture), and 6.C (Waste). The ERT recommends that Estonia consider providing a complete time series of CRF tables in its next submission, giving priority to the tables for the base year and years for which the estimates have been recalculated. Estonia is encouraged to use the notation keys to improve the transparency of the CRF tables.

10. The ERT identified an inconsistency between the CRF and the NIR in the total emissions reported. This error is related to the LUCF totals and affects the estimates of overall emissions.

Transparency

11. The ERT noted that, in submitting its first NIR, Estonia has greatly improved the transparency of its submission to the UNFCCC. The structure of the report is not entirely consistent with the UNFCCC reporting guidelines, but it does provide a very good basis for future improvements.

[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.

12. The NIR is structured by sector, with each sector chapter providing information on the methodology used and a qualitative uncertainty assessment for the Energy, LUCF and Waste sectors. Information is provided on the sources of the methods used, on any assumptions used, and on expert judgement used for country-specific methods or emission factors (EFs). Estonia is encouraged to ensure that all expert judgement is documented (and referenced) in accordance with the IPCC good practice guidance.

Recalculations and time-series consistency

13. The NIR provides the rationale for two methodological changes that the Party has undertaken in the Energy and Industrial Processes sectors. Estonia has not provided a discussion of the impacts of the resulting recalculations on the emissions trend or of whether the time series is consistent. Nor has it provided the CRF recalculation tables (except for LUCF), and it is encouraged to do so in its next submission.

14. The NIR does not provide a rationale for the recalculation of the 2001 LUCF estimate. This information is not provided in CRF table 8(b). Estonia is encouraged to document the reason for, the extent and the impact of all recalculations in the NIR and the CRF, and to include CRF tables for all years for which recalculations have been carried out.

Uncertainties

15. Estonia has not provided quantified uncertainty estimates, but has provided qualitative assessments of uncertainty in the NIR and in CRF table 7. The ERT recommends that Estonia use the tier 1 uncertainty calculation approach outlined in the IPCC good practice guidance and the default uncertainty ranges as a first step in preparing a quantitative uncertainty analysis.

16. The ERT recommends that Estonia provide more detailed information in its NIR on the basis for expert judgements and a discussion on the factors contributing to the uncertainty of source categories.

Verification and quality assurance/quality control approaches

17. Estonia does not have a formal quality assurance/quality control (QA/QC) plan and has not provided information on QA/QC and verification procedures in the NIR.

18. The ERT encourages Estonia to develop a QA plan consistent with the IPCC good practice guidance, focusing on the tier 1 uncertainty checks as a first priority. A QA/QC plan will help Estonia manage time-series consistency, bearing in mind the problems experienced with the quality of data from the statistical agencies (which Estonia has documented), the revision of data sets from year to year in the Energy sector, and the changes to methods, EFs and activity data (AD).

G. Areas for further improvement

Identified by the Party

19. Estonia is taking steps towards developing a data collection system for the F-gases. The NIR does not outline other sector-specific or general future improvements to the inventory.

Identified by the ERT

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

(a) Undertake a key source analysis consistent with the IPCC good practice guidance tier 1 method;

(b) Complete the entire time series, starting with the CRF tables for the base year 1990 if it is not possible to complete all years by the next submission, and use the notation keys;

(c) Restructure and enhance the NIR to make it consistent with the structure outlined in the UNFCCC reporting guidelines, particularly with respect to choice of methods and data, explanations of trends, and uncertainty analysis for individual source categories;

(d) Improve the documentation of recalculations in both the NIR and the CRF so that future ERTs can clearly identify the magnitudes of the changes, and the justifications for and methodologies used for recalculating estimates;

(e) Improve the QA/QC of the inventory, particularly the checking of consistency between the emission totals in the CRF and the NIR.

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

II. ENERGY

A. Sector overview

22. In 2002 the Energy sector accounted for 90.9 per cent of total national emissions excluding LUCF. Emissions of CO_2 from stationary and mobile combustion were identified as key sources by the secretariat, contributing a combined 87.8 per cent of total national GHG emissions and 98.2 per cent of national CO_2 emissions, excluding LUCF. There was a drastic decrease of CO_2 emissions from fuel combustion – of 54.3 per cent – from 1990 to 2002, caused mainly by Estonia's transition from a planned economy to a market economy. Mobile combustion contributed 12.7 per cent to the total CO_2 emissions, which is a relatively small proportion compared to other Annex I Parties.

23. The Energy sector is not covered completely in terms of IPCC source categories (for example, GHG emissions from 1.A.1.b Petroleum Refining and 1.A.1.c Manufacture of Solid Fuels and Other Energy Industries, and CO_2 and N_2O fugitive emission from fuels are omitted), but the sectoral and sectoral background data tables are provided. The level of disaggregation for 1.A.2 Manufacturing Industries and Construction is not in line with the *IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC Guidelines). The notation keys have not been used for the Energy sector, as there are cells left blank or filled in with "0".

24. Section 2.1.1 of the NIR describes a recalculation resulting from an adjustment in the allocation of some gasoline and diesel fuels to the Residential sector that had previously been included in Road Transportation. However, there is no corresponding information on recalculations in CRF table 8 for the Energy sector, and it is not possible to check the rationale and time-series consistency as Estonia's 2004 submission includes CRF tables only for the year 2002 for this sector.

25. There are no changes in the uncertainty assessment of the Energy sector compared to the report in Estonia's Third National Communication. The uncertainty of the activity data could range from 10 per cent up to 25 per cent, on the basis of expert judgement. The uncertainties of the energy balances from the Statistical Office of Estonia (SOE) have been reduced as a result of improvements to the institutional arrangements during the period 1993–1999.

B. Reference and sectoral approaches

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

26. CO_2 emissions from fuel combustion have been calculated using the reference approach and the sectoral approach. For the year 2002, the sectoral approach estimate is 8.21 per cent higher than the reference approach estimate. The estimates under the sectoral approach are higher mainly in liquid fuels. This is mainly due to different sources of fuel import/export data being used for the two approaches. The ERT recommends that Estonia collect import/export data more consistently as all its gasoline and diesel are imported.

International bunker fuels

27. Estonia reports all aviation emissions as domestic, while the ERT believes that the reverse is probably true because most flights are likely to be international. Estonia reports emissions from marine use of fuel, but the relevant AD in the sectoral approach (table 1.C) are close to the AD for international bunkers in the reference approach (table 1.A(b)). This suggests that Estonia may not have included emissions from international aviation in both approaches. The ERT recommends that Estonia make efforts to estimate fuel consumption for international bunkers, as this will bring its inventory more closely into line with the IPCC Guidelines.

Feed stocks and non-energy use of fuels

28. Natural gas used for fertilizer production is reported in the NIR but there is no estimate of carbon storage for this in CRF table 1.A(d). The ERT recommends that Estonia estimate the carbon stored in natural gas-based fertilizer production using at least the IPCC tier 1 approach.

Country-specific issues

29. Thermal processing of oil shale using the Estonian internal combustion vertical retort produces oil shale semi-coke with significant calorific value. At present this is deposited in spent shale dumps. Estonia reports in the CRF 394.04 Gg CO_2 as stored carbon from oil shale.

30. In 2002 Estonia exported 6,526 TJ shale oil, a special liquid fuel produced from oil shale (solid fuel). As the production and export process is relatively complex, involving both energy conversion from solid fuel to liquid fuel, and the data on shale oil exports are closely related to the statistics for other liquid fuels (Estonia's gasoline and diesel supply is mostly based on import), the ERT suggests that Estonia set up a QA/QC procedure to ensure that the AD are of high quality.

C. Key sources

Stationary combustion: solid, liquid and gaseous fuels – CO_2

31. CO_2 emissions from stationary combustion (solid, liquid and gaseous fuels) represented 75.9 per cent of all reported emissions (without LUCF) in 2002 in Estonia. Specifically, CO_2 emissions from stationary combustion of solid fuels (mostly oil shale), liquids and gaseous fuels contributed 63.6 per cent, 5.0 per cent and 7.1 per cent, respectively, of total reported emissions in 2002 (without LUCF). Public Electricity and Heat Production is the most important subsector, contributing 97.3 per cent, 66.1 per cent and 85.3 per cent of the CO_2 emissions from stationary combustion of solid, liquid and gaseous fuels, respectively. CO_2 emissions from stationary combustion in Estonia showed a declining trend from 1990 to 2002. Emissions in 2002 had declined by 57.5 per cent since 1990.

32. The 2002 emissions estimates for the Energy sector are generally based on the tier 1 IPCC method and the IPCC default EFs with the exception that Estonia has developed a national EF for oil shale combustion –that is, for emissions from the burning of oil shale as fuel and the decomposition of the carbonates in oil shale.

Manufacturing industries: all fuels – all gases

33. Only aggregated emissions from manufacturing industries and construction are reported. In response to a question from the ERT, Estonia explained that it is possible to report these emissions by subcategories. The ERT encourages Estonia to make its reporting more consistent with the UNFCCC reporting guidelines and provide disaggregated estimates in its next submission.

Road transportation: liquid fuels – CO_2

34. The tier 1 method has been used for emissions from road transportation. CO_2 emissions from road transportation represented 9.4 per cent of all reported emissions (without LUCF) in 2002. In contrast to the declining trend of total emissions, CO_2 emissions from road transportation increased by 8.3 per cent between

2001 and 2002. In addition to gasoline and diesel, Estonia reports in the CRF that a small amount of kerosene is also used for road transportation, which contributed 2.4 per cent of emissions from this key source. The ERT suggests that Estonia provide the necessary information on the major driving forces behind the increase in emissions from road transportation and show how the kerosene is used for road transportation.

Fugitive emissions: oil and gas operations, liquid fuels – CH_4

35. Fugitive CH_4 emissions from oil and gas operations represented 2.0 per cent of all reported emissions (without LUCF) in 2002. These emissions were mostly from the transmission and utilization of natural gas at industrial plants and power stations. Fossil fuel production processes contributed only a small percentage as oil and natural gas are mainly imported. The tier 1 IPCC methods and the IPCC default EFs have generally been applied for this key source. As it is a key source, the ERT suggests that Estonia explore the possibility of applying higher-tier methods.

Fugitive emissions: oil shale mining and handling, solid fuels – CH_4

36. Fugitive CH_4 emissions from oil shale mining and handling contributed 1.1 per cent of all reported emissions (without LUCF) in 2002. These emissions come from both underground and surface mining of oil shale. The 2002 estimate for this key source was based on the tier 1 IPCC methods for coal mining and Estonia's national EFs provided by Estonian oil shale specialists. Estonia is unique among Annex I Parties in producing oil shale. The ERT encourages Estonia to continue to improve its application of the IPCC guidelines for this source category.

D. Non-key sources

Road transportation: gasoline and diesel – N_2O

37. Estonia's N_2O emissions from road transportation also show an increasing trend since 2001. Estonia states in the NIR that IPCC default EFs were used for estimating N_2O from road transportation. This being the case, the ERT suggests that Estonia check the numbers of vehicles equipped with three-way catalysts and of vehicles based on two-stroke engines in order to avoid possibly underestimating these emissions.

III. INDUSTRIAL PROCESSES AND SOLVENT USE

A. Sector overview

38. In 2002, emissions from the Industrial Processes sector accounted for 1.6 per cent of total national emissions (without LUCF). CO_2 emissions represented 100 per cent of the sector's emissions in 2002 (over 70 per cent being from cement production). From 1990 to 2002, emissions from the sector fell by 48.0 per cent due to a decrease of emissions from mineral products. No actual or potential emissions for F-gases have been estimated, no emissions from the Solvent and Other Product Use sector are reported, and the notation keys are not used (except for actual emissions of HFCs and PFCs, which are reported as "not estimated" ("NE") in table 2(II)).

39. For the Industrial Processes sector, CO_2 from cement production was the only key source identified by the secretariat.

40. The transparency of the reporting of this sector may be improved by providing an explanation in the NIR of the trends and major inter-annual changes, and by using the notation keys in the CRF.

41. The transparency and completeness of the information for this sector could also be improved by providing AD on production for GHG-emitting processes and by indicating when emissions are not estimated or are reported elsewhere (e.g., for ammonia production). The Party is recommended to fill in the overview table 7 in more detail. The ERT also recommends that Estonia discuss briefly in the NIR the reasons for not estimating some sources.

42. Regarding the completeness of the information for this sector and the identification of sources not yet estimated, the ERT recommends that Estonia focus in its next submission on recalculating the current inventory for the whole time series or, at minimum, for the years already provided, 1990 and 2000–2002. The ERT further recommends that Estonia give priority to providing documentation on the key sources rather than adding supposedly minor new sources to the inventory (unless they can be added without major effort).

B. Key sources

Cement production – CO_2

43. The ERT observed significant inter-annual changes in the figures for emissions from cement production between 2001 and 2002, and in the (mineral) emissions between 1997 and 1998. It recommends that Estonia investigate the causes of these large changes and either correct them or explain them in the NIR. It should follow the IPCC allocation guidelines for cement production.

44. The ERT observed that no definition of the AD in the CRF is provided. This has led to confusion, in particular on the 2002 data, and the ERT recommends that the Party provide this information in its future submissions and improve the description of methods in the NIR.

C. Non-key sources

Lime production – CO_2

45. The ERT observed that the EF used for 2000 (0.51 t CO_2/t lime) is not consistent with the value used in 2001 and 2002 (0.79 t CO_2/t lime), and recommends that Estonia correct this in its next submission. Estonia confirmed during the review that this was an error.

46. The ERT observed a significant inter-annual change in the figures for emissions from lime production between 2001 and 2002, and recommends that Estonia investigate the causes of this and either correct it or explain this large change in the NIR.

Ammonia production – CO_2

47. According to international statistics, Estonia produces ammonia, which is a source of CO_2. The ERT recommends that Estonia try to estimate and report these emissions separately as an industrial process rather than as part of the Energy sector. Also, if these emissions are to be included in a more aggregated calculation of non-energy use emissions, Estonia should report the ammonia production AD in order to enable the ERT to evaluate the existence and size of the source.

Consumption of halocarbons and SF_6 – HFCs, PFCs and SF_6

48. For HFCs, PFCs and SF_6 no consumption data are available since the SOE does not collect these data. The ERT encourages the efforts of Estonia in developing a data collection system for these gases, as mentioned in the NIR.

IV. AGRICULTURE

A. Sector overview

49. In 2002, emissions from the Agriculture sector accounted for 3.6 per cent of total GHG emissions in Estonia (without LUCF). These were largely CH_4 from enteric fermentation (1.9 per cent of the national total), N_2O from agricultural soils (1.3 per cent of the national total), and CH_4 and N_2O from manure management (0.4 per cent of the national total). The largest single contributing source in the sector was CH_4 from enteric fermentation, which accounted for 53.0 per cent of CO_2 equivalent emissions from the sector in 2002. The principal sources of emissions in the Agriculture sector and their relative contributions to the total remained similar over the period 1990–2002, even though total emissions from the sector decreased by 71.2 per cent, from 2,440 Gg in 1990.

50. The secretariat's key source analysis identified CH_4 emissions from enteric fermentation as the single key source in the Agriculture sector.

51. The CRF and the NIR include estimates of all gases and sources of emissions from the sector, as recommended by the IPCC Guidelines. The CRF tables report that 90 per cent of crop residues are burned on-field (**$Frac_{BURN}$**) in the country; however, GHG emissions from field burning are not reported. Tables 4.C, 4.E and 4.F are not filled in and the notation keys are not used. The ERT encourages Estonia to provide a complete inventory, to report all AD, EFs and references, to check the use of the notation keys ("NE", "not occurring" ("NO") and "not applicable" ("NA")), and to fill in the additional information boxes in its future inventories.

B. Key sources

Enteric fermentation – CH_4

52. Estonia has used the IPCC default EFs for developing countries and the tier 1 methodology. No information on, milk yields or average weight of dairy cattle is reported. According to a response provided by Estonia during the review, the average milk yield per cow was 5,138 kg in 2002, which corresponds to the yield for developed countries. The ERT encourages Estonia to apply the EFs for developed countries in its next submission and to consider the possibility of using the tier 2 method for cattle.

C. Non-key sources

Manure management – CH_4 and N_2O

53. Estonia reports significant inter-annual changes in CH_4 emissions from manure management, in particular between 1995 and 1996 (CRF table 10). The explanations provided by Estonia during the review – that the swine population decreased and the calculations for goats are separate – are not sufficient to explain the changes. Calculations made by the ERT only for 1995 showed that emissions in that year (3.9 Gg) should be roughly one-third of the amount reported by the Party. It is evident that Estonia has used incorrect units for population sizes (million head instead of thousand head) and for the nitrogen (N) excretion rates (t N/head/yr instead of kg N/head/yr) for dairy cattle, non-dairy cattle, swine, sheep and poultry in CRF table 4.B(b). The ERT recommends that Estonia correct these errors in its next submission.

Agricultural soils – N_2O

54. Estonia has not reported N_2O emissions from cultivation of histosols in the CRF because of a lack of AD. The ERT encourages Estonia to collect the data. The 2002 values of the $Frac_R$ and $Frac_{BURN}$ were identified as outliers in previous 2004 review stages. The AD for the amount of animal wastes applied to soil reported in table 4.D are not consistent with the sum of N excreted across all types of animal waste management system (AWMS) (except pasture, range and paddock) reported in the table 4.B(b). Estonia explained during the review that this inconsistency was the result of mistakes made during the conversion of data from the IPCC software to the CRF format. The ERT encourages Estonia to check these values and correct them for its next submission.

V. LAND-USE CHANGE AND FORESTRY

A. Sector overview

55. Net CO_2 removals from Estonian forests increased at an average rate of 2 per cent per year over the period 1990–2002, but fluctuated greatly. Net removals increased quickly from 6,317 Gg in 1990 to 9,693 Gg in 1993, then decreased sharply to around 7,700 Gg in the next two years, and increased again to about 9,600 Gg in 1996.

56. Estonia has provided CRF tables for the year 2002 only, and has included emissions and removals of CO_2 but not the other gases. According to the NIR and the CRF, CH_4 emissions from forest and grassland conversion occurred only in the period 1990–2000; thereafter they are considered to be zero (insignificant or negligible).

57. In the NIR, Estonia has provided background information as well as the sources of the AD used in developing the inventory. The methodology and EFs used are IPCC default, except for 5.B Forest and Grassland Conversion, where Estonia has used a country-specific EF. (This information is not provided in the CRF for 2002 as the GHG emissions have been considered to be negligible (reported as zero).

58. In the CRF, Estonia reports recalculations for this sector for 2001, but these recalculations are not described in CRF table 8(b) or in the NIR. Data in the CRF table 8(a) show that the differences between the previous submission and the latest submission for the 2001 estimates are huge. For category 5.A the difference is 368 per cent, for 5.C it is 0.2 per cent and for 5.D it is 97,778 per cent. The overall difference in net CO_2 removals from this sector for 2001 is 1,174 per cent, that is, net removals of 739 Gg CO_2 were reported in the 2003 submission and 9,417 Gg is reported in the 2004 submission.

59. The NIR explains that the rapid increase in the net CO_2 removals between 1990 and 1993 was primarily due to the rapid increase in forest area, mainly due to the abandonment of agricultural land. However, no explanation of the sudden change in net CO_2 removals that occurred after 1993 is provided. The NIR indicates that the variability of the estimates might be due to human activities (cutting, drainage and fires). Since the CRF is available for 2002 only, the ERT was unable to track the cause of the sudden changes.

60. In CRF table 7, Estonia assesses the quality of the estimates of CO_2 removals and emissions as high for both 5.A and 5.B; no assessment is provided for 5.C and 5.D. The text does not provide an explanation of how the level of certainty was defined as high. An explanation about the sources of error is given in the NIR. The approaches used in estimating the errors do not follow the IPCC good practice guidance.

61. Estonia has provided estimates of CO_2 removals and CO_2 emissions from 5.A, 5.B, 5.C and 5.D. The method used is tier 1 and the EFs are the IPCC defaults.

B. Sink and source categories

Changes in forest and other woody biomass stock

62. The growth rate of boreal forest has been estimated based on the works of Karoles et al. (1994) and Kellomäki et al. (1992), and data from the SOE (<http://www.stat.ee>). The growth rate used is 5.0 t/ha/yr, which is much higher than that used by other countries. For example, Canada and Sweden used values of 1.19 and 3.14 t/ha/yr, respectively.

63. Estonia has used three sources of data for volume of wood harvest: the *Year Book of Forest '94* for data for 1990–1994, the *Year Book of Forest '99* for data for 1995–1999, and the SOE for 2000–2002. These data are much lower than those estimated by the Estonian Forestry Survey Centre (EFSC) using the statistical method of the National Forest Inventory (SNFI). The SNFI's results were nearly twice as high as the statistical data. Thus, the exact values of forest harvest are not known for the period 1990–2002. The NIR does not explain whether this finding was used as a basis for the recalculation. In its next submission, the Party should explain the basis for the recalculation and how the recalculation was done, if through adjustment of activity data and/or emission factors.

Forest and grassland conversion

64. In the NIR, CO_2 emissions from 5.B are reported for the years 1990–2000, but CH_4 emissions are only reported for 1990–1998. After 2000, emissions from 5.B are considered to be negligible since there were no more conversions of forest to agricultural land and no more construction of road and drainage systems in forests. However, the Party notes that these data were based on the personal opinions of forestry experts. In its next submission, therefore, Estonia should provide official documentation to support for the assumptions.

Abandonment of managed land

65. In table 11 of the NIR, the area of abandoned land has been calculated as the difference between total forest area in year *t-20* and that in year *t* (where *t* is the inventory year). In table 9, however, the area of

forest stand in the inventory year (*t*) is similar to the area of forest land in year *t-20* shown in table 11. In the CRF, the area of forest stand in 2002 is the same as that in table 9 of the NIR, which means that the CO_2 removals from forest growth in 5.A reported in the CRF occurred in year *t-20*, not in the inventory year.

66. In the NIR, it is argued that the mean growth rate of trees on abandoned land should be much higher than the growth rate of mature forests, as the trees are younger and grow faster. Estonia considers that the area of mature forests in the inventory year (year *t*) was the same as total forest area in year *t-20*, while the area of abandoned land was the difference between total forest area in the inventory year (*t*) and total area of mature forest in year *t-20*. Following this argument, the ERT considered that the mature forests reported in the NIR might be the same as the area of managed forest stand used in 5.A (table 9 of the NIR), while the growth of forests on abandoned land might actually refer to plantation forests. Thus, in its next submission, the Party may need to move this into module 5.A instead of 5.C and redefine abandoned land.

CO_2 emissions and removals from soils

67. In the NIR, Estonia has not provided references to the sources of data used in estimating CO_2 emissions/removals from mineral soils and organic soils. Estonia notes that the distribution of soil types between different land categories is still uncertain. The total area of organic soils varies considerably over the period 1990–1998, and then remains constant (table 13 of the NIR). The total area of mineral soils is relatively constant in the period 1990–2000 and then increases considerably, to 2.84 million ha. Consequently the estimates of CO_2 emissions/removals from soils also vary considerably between years. However, there is no explanation of why the areas of mineral soils and organic soils change so much between years. Estonia should provide supporting documentation or references at least for the recent data and recalculate the old data, estimated from expert opinion, as necessary.

C. Areas for improvement

68. The ERT recommends that Estonia provide revised estimates for the CO_2 emissions/removals from categories 5.A, 5.C and 5.D in its future submissions. Estonia may need to revise its data on area of abandoned land and cross-check with area of managed forest. The definition of abandoned land used by Estonia should be provided. Similarly, the areas of mineral soils and organic soils may also need to be checked and Estonia should provide further information on why these areas change from year to year.

69. For its future NIRs, Estonia should also provide explanations on the recalculation of CO_2 emissions/removals for the LUCF sector.

70. The ERT encourages Estonia to provide CRF tables for the whole time series, to improve the AD and EFs, and to apply the IPCC good practice guidance for evaluating the uncertainty of the CO_2 emissions/removals estimates.

VI. WASTE

A. Sector overview

71. In 2002, the Waste sector accounted for 3.8 per cent of the total GHG emissions of Estonia. In 1999 the figure was 6.8 per cent. Emissions of CH_4 from the sector decreased by 53.5 per cent from 1990 to 2002. The two sources estimated (Solid Waste Disposal Sites and Waste-water Handling) are key sources and contributed 2.5 per cent and 1.3 per cent, respectively, to total national GHG emissions in 2002. The figures for emissions from both show large inter-annual variations.

72. The application of the IPCC default methodology is consistent with the IPCC Guidelines. According to the IPCC good practice guidance, however, because the two sources are both key sources, the use of a higher-tier method and/or country-specific EFs and parameters should be considered in future inventories.

73. Estonia has provided more information than in previous inventories, but transparency is still lacking in this sector as regards the choice of methodologies and EFs. Information is still lacking on AD; activity data should be provided for every year in order to evaluate trends and anomalies.

B. Key sources

Solid waste disposal sites – CH_4

74. CH_4 emissions from solid waste disposal sites decreased by 65.0 per cent from 1990 to 2002. It would help to explain this dramatic decrease if the Party could provide further clarification of the trends in waste generation, waste generation per capita and CH_4 emissions over the entire time period.

75. Solid waste disposal sites (SWDS) are a key source category, and the ERT suggests that Estonia consider using a higher-tier method for this category. As well as providing a more accurate method, the use of a higher tier would lessen the effects of large inter-annual variations in the waste generation statistics. Estonia could use default *k* values and calculate country-specific factors such as methane generation potential (L_o), based on waste composition, if available. A historical time series could be developed based on current waste generation and generation trends, and expert judgement on historical trends, or historical trends in similar countries.

76. The EFs and AD are not transparent and the information given in the CRF sometimes contradicts that given in the NIR. In some cases, additional data or clarification of the data would be useful. Examples are the methane correction factor (MCF) value (given as 1 in the NIR and 0.8 in the CRF); the composition of waste; the percentage of waste going to SWDS; the calculation of waste generation data in the early years of the time series; oxidation value (if any); and the methodology used for calculating methane recovered. The ERT also recommends that the Party provide justifications for the choice of parameters used if the factors used are not default factors or if a choice has been made among alternative default factors (e.g. MCF values). The justification for an MCF value could be based on a description of the solid waste situation in the country (types of solid waste sites, regulations, etc.) and/or situations and MCF values in similar countries. During the review, in response to a question, Estonia provided the correct values and a justification for the degradable organic carbon (DOC) value. The ERT recommends that Estonia include this type of information in its next NIR.

77. It is not clear how complete the SWDS inventory is, since the CRF states that it is only partially complete and the NIR does not provide enough information to make it possible for the ERT to determine whether emissions occur from other sources such as unmanaged sites. During the review, in response to a question, Estonia stated that it has only managed landfills. The statement in the CRF that the inventory is only partially complete should therefore be clarified.

Waste-water treatment – CH_4

78. The methodology used is tier 1 with default EFs and country-specific AD. Waste-water treatment is a key source category and the ERT suggests that the Party consider using country-specific parameters, especially the fraction treated by the system and the choice of MCF value(s).

79. The trend of the AD is described but is sometimes in conflict with the waste usage statistics. The problem is compounded by the fact that the time series is supplied only for waste water as a whole and not for domestic and industrial waste water separately. The ERT suggests that Estonia provide a more detailed discussion in its next submission where the information could potentially be contradictory, as well as presenting emissions from domestic and industrial waste water separately.

80. The implied emission factor (IEF) for waste-water treatment is high but the NIR is not sufficiently transparent to allow the ERT to evaluate this IEF. Examples of cases where additional data or clarification of the data would be useful are the MCF value used, the methane-producing capacity (Bo) value, and the AD for all industries over time. Documentation on the waste-water flows and the methodology used for industrial waste water, and an explanation of the choice of various EFs (e.g. the fraction treated by the handling system) would be useful.

81. For industrial waste water, the CRF provides information which is not in the NIR, and this information requires some clarification. In the CRF additional information table, the waste water AD listed for Pulp and Paper are identical to the AD listed for Organic Chemicals. As this is unusual, the ERT requests clarification on whether the flows are the same for both subsectors. The degradable organic compound (DC) values for organic chemicals and food and beverages appear low. Disaggregation of the Food and Beverage sector would allow a more thorough review. The ERT recommends that the Party discuss and justify these values in the NIR.

C. Non-key sources

Human sewage – N_2O

82. Emissions of N_2O from human sewage have not been included due to lack of data. However, the Food and Agriculture Organization of the United Nations (FAO) provides protein consumption data for many countries and its data may make it possible to calculate emissions from this source. The ERT suggests that the Party investigate potential sources of AD and that it introduce a tier 1 method for the calculation of emissions from human sewage.

Waste incineration – all gases

83. No emissions from waste incineration have been estimated. The Party's responses to 2001 review report noted that there is no incineration within the country, but this fact should be noted in the NIR and the CRF.

ANNEX 1: MATERIALS USED DURING THE REVIEW

A. Support materials used during the review

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

UNFCCC secretariat. "2004 Status report for Estonia" (available on the secretariat web site <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/inventory_review_reports/application/pdf/est04.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 <http://unfccc.int/resource/webdocs/sai/2004.pdf>) and Part II – the section on *Estonia* (unpublished).

Estonia'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://www.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/gpgaum.htm>).

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

Responses to questions raised during the review were received from Mr. Jaan-Matti Punning (Institute of Ecology), including additional material on the methodology and assumptions used.

Karoles, K., A. Leemet and O. Lugus (1994). Forest and Forest Products Country Profile. Estonia. UN, New York and Geneva. 35 pp.

Kellomäki, S., H. Väisänen, H. Hänninen, T. Kolström, R. Lauhanen, U. Mattila and B. Pajari (1992). "A simulation model for the succession of the boreal ecosystem." Silva Fennica 22(1).

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