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# Report of the review of the initial report of the Netherlands

*According to decision 13/CMP.1, each Annex I Party with a commitment inscribed in Annex B to the Kyoto Protocol shall submit to the secretariat, prior to 1 January 2007 or one year after the entry into force of the Kyoto Protocol for that Party, whichever is later, a report (the 'initial report') to facilitate the calculation of the Party's assigned amount pursuant to Article 3, paragraphs 7 and 8, of the Kyoto Protocol, and to demonstrate its capacity to account for emissions and the assigned amount. This report reflects the results of the review of the initial report of the Netherlands conducted by an expert review team in accordance with Article 8 of the Kyoto Protocol.*

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# I. Introduction and summary

## A. Introduction

1. This report covers the in-country review of the initial report of the Netherlands, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with the guidelines for review under Article 8 of the Kyoto Protocol (decision 22/CMP.1). The review took place from 16 to 21 April 2007 in Utrecht, the Netherlands, and was conducted by the following team of nominated experts from the roster of experts: generalist – Mr. Newton Paciornik (Brazil); energy – Mr. Ralph Harthan (Germany); industrial processes – Mr. Menouer Boughedaoui (Algeria); agriculture – Ms. Tajda Mekinda-Majaron (Slovenia); land use, land-use change and forestry (LULUCF) – Mr. Sandro Federici (Italy); waste – Mr. Amr Osama Abdel-Aziz (Egypt). Mr. Amr Osama Abdel-Aziz and Mr. Sandro Federici were the lead reviewers. In addition the expert review team (ERT) reviewed the national system, the national registry, and the calculations of the Party's assigned amount and commitment period reserve (CPR), and took note of the LULUCF parameters and the elected Article 3, paragraph 4 activities. The review was coordinated by Mr. Sergey Kononov (UNFCCC secretariat).

2. In accordance with the guidelines for review under Article 8 of the Kyoto Protocol (decision 22/CMP.1), a draft version of this report was communicated to the Government of the Netherlands.

## B. Summary

### 1. Timeliness

3. Decision 13/CMP.1 requests Parties to submit their initial report prior to 1 January 2007 or one year after the entry into force of the Kyoto Protocol for that Party, whichever is later. The initial report was submitted on 21 December 2006, which is in compliance with decision 13/CMP.1. In its initial report the Netherlands refers to its 2006 national inventory report (NIR) and common reporting format (CRF) table submissions of 3 October 2006 and 19 September 2006, respectively.

4. On 1 June 2007, after the ERT's in-country visit, the Netherlands submitted a complete set of revised CRF tables and, based on the revised tables, a document on recalculation of its assigned amount and commitment period reserve. This report is generally based on the revised tables and the document on recalculations. However, the ERT decided to calculate and implement one adjustment which has an impact on the value of the assigned amount and commitment period reserve. The adjusted values of these and other relevant parameters are also given in this report as appropriate.

### 2. Completeness

5. Table 1 below provides information on the mandatory elements that have been included in the initial report and also reflects any revised estimates provided by the Party resulting from the review process. Since the ERT decided to apply one adjustment, the table also reflects the adjusted values as appropriate. These revised values are based on revisions of emissions from the energy sector (category 1.A.1(a), public electricity and heat production; see paragraph 75), industrial processes (categories 2.A.7.1 – glass production (see paragraph 100)); 2.B.5 – caprolactam production (see paragraph 84); 2.G – indirect $N_2O$ emissions from deposition of nitrogen oxide ($NO_x$) from combustion and industrial processes (see paragraphs 91, 93), agriculture (all reported categories; see paragraphs 105, 113) and LULUCF (all reported categories; see paragraphs 126, 147–158). As a result of this revision, the value of the base year emissions changed from 214,588,451 tonnes carbon dioxide ($CO_2$) equivalent as reported originally by the Party to 213,483,384 tonnes $CO_2$ equivalent. The adjusted value of the base year emissions, as calculated by the ERT, is 213,034,498 tonnes $CO_2$ equivalent.

**Table 1. Summary of the reporting on mandatory elements in the initial report**

| Item | Provided | Value/year/comment |
|---|---|---|
| Complete GHG inventory from the base year (1990) to the most recent year available (2004) | Yes | Base year: 1990 |
| Base year for HFCs, PFCs and $SF_6$ | Yes | 1995 |
| Agreement under Article 4 | Yes | 94% of the base year |
| LULUCF parameters | Yes | Minimum tree crown cover: 20%<br>Minimum land area: 0.5 ha<br>Minimum tree height: 5 m |
| Election of and accounting period for Article 3, paragraphs 3 and 4, activities | Yes | The Netherlands has not elected activities under Article 3, paragraph 4 and will account for each activity under Article 3, paragraph 3 for the entire commitment period. |
| Calculation of the assigned amount in accordance with Article 3, paragraphs 7 and 8, as originally submitted by Party | Yes | 1,008,565,720 tonnes $CO_2$ eq. |
| Calculation of the assigned amount in accordance with Article 3, paragraphs 7 and 8, revised estimate | Yes | 1,003,371,907 tonnes $CO_2$ eq. |
| Calculation of the assigned amount in accordance with Article 3, paragraphs 7 and 8, adjusted estimate | – | 1,001,262,141 tonnes $CO_2$ eq. |
| Calculation of the commitment period reserve, as originally submitted by Party | Yes | 907,709,148 tonnes $CO_2$ eq. |
| Calculation of the commitment period reserve, revised estimate | Yes | 903,034,718 tonnes $CO_2$ eq. |
| Calculation of the commitment period reserve, adjusted estimate | – | 901,135,927 tonnes $CO_2$ eq. |
| Description of national system in accordance with the guidelines for national systems under Article 5, paragraph 1 | Yes | Mandatory requirements fulfilled. See section II.A |
| Description of national registry in accordance with the requirements contained in the annex to decision 13/CMP.1, the annex to decision 5/CMP.1 and the technical standards for data exchange between registry systems adopted by the CMP | Yes | See section F |

6. During the review process the Netherlands provided all the information on the national registry system required by decision 13/CMP.1, section I of decision 15/CMP.1, and relevant decisions of the Conference of the Parties serving as the Meeting of the Parties (CMP).

7. The information in the initial report covers all the elements required by decision 13/CMP.1, section I of decision 15/CMP.1, and relevant decisions of the CMP.

## 3. Transparency

8. The initial report is transparent. During the review the ERT identified only one problem related to the calculation of the contribution of net emissions from deforestation to the assigned amount.

## 4. Emission profile in the base year, trends and emission reduction target

9. In the base year – 1990 for $CO_2$, $CH_4$ and $N_2O$, and 1995 for HFCs, PFCs and $SF_6$ – the most important greenhouse gas (GHG) in the Netherlands was $CO_2$, contributing 74.9 per cent to total[1] national GHG emissions expressed in $CO_2$ equivalent, followed by methane ($CH_4$), 11.9 per cent, and

[1] In this report, the term total emissions refers to the aggregated national GHG emissions expressed in terms of $CO_2$ equivalent excluding LULUCF, unless otherwise specified. However, for the base year total emissions of the Netherlands include net GHG emissions from conversion of forests (deforestation).

nitrous oxide ($N_2O$), 9.3 per cent (see figure 1). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride ($SF_6$) taken together contributed 3.9 per cent of the overall GHG emissions in the base year. The energy sector accounted for 72.1 per cent of total GHG emissions in the base year, followed by industrial processes (11.0 per cent), agriculture (10.4 per cent) and waste (6.0 per cent) (see figure 2). Total GHG emissions (excluding LULUCF) amounted to 213,483.384 Gg $CO_2$ equivalent and increased by 1.8 per cent between the base year and 2004.

**Figure 1. Shares of gases in total GHG emissions, base year**

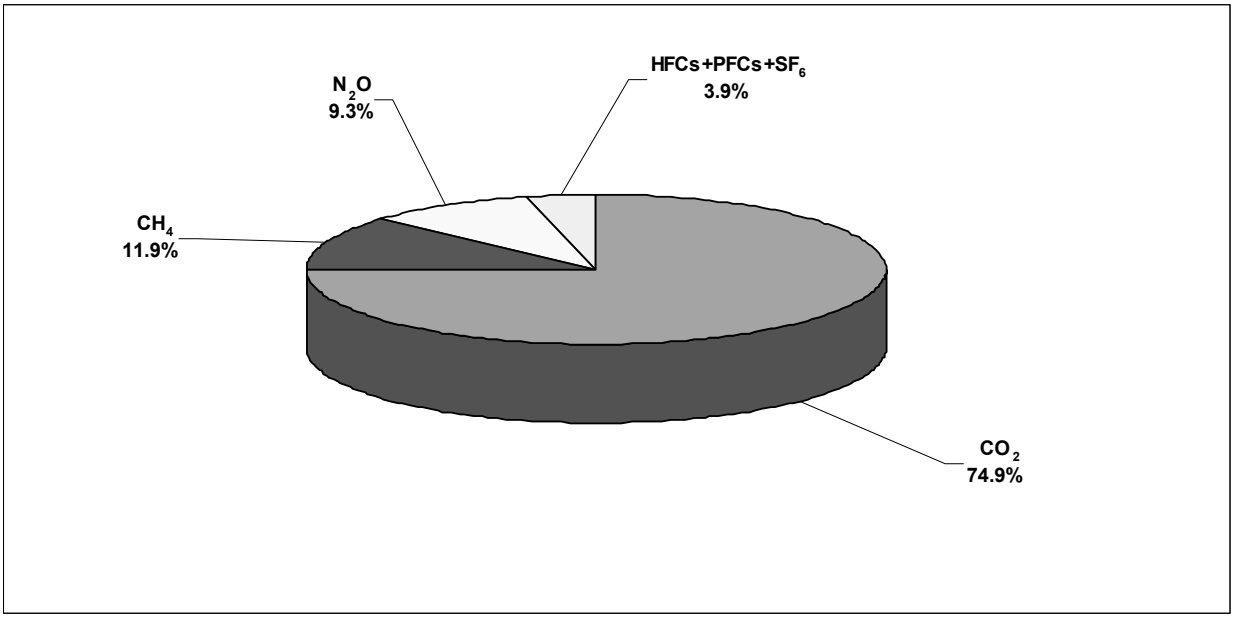
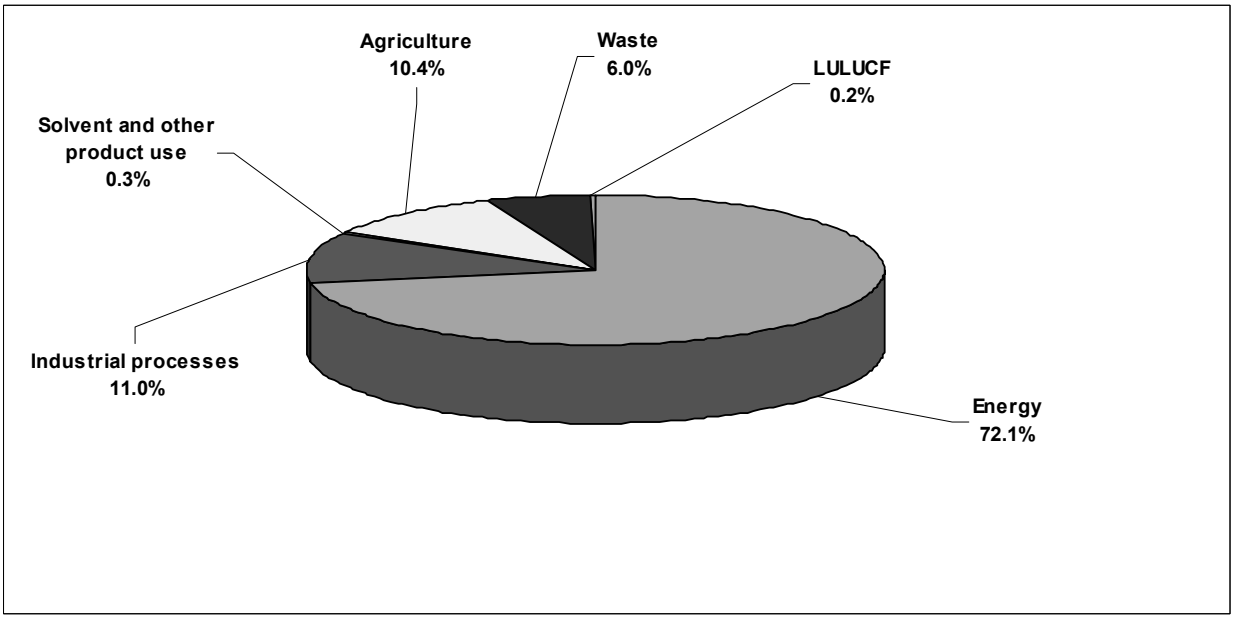



**Figure 2. Shares of sectors in total GHG emissions, base year**




*Note*: The share of LULUCF (0.2%) represents net GHG emissions from deforestation. The value for GHG emissions from deforestation is as reported by the Netherlands in its revised emission estimates submitted to the ERT on 1 June 2007 and does not reflect the adjustment made by the ERT (see section II.C of this report below).

10. Tables 2 and 3 show the greenhouse gas emissions by gas and by sector, respectively.

11. The Netherlands' quantified emission limitation is 92 per cent as included in Annex B to the Kyoto Protocol. As the Netherlands is part of the European Community, whose member States will meet their reduction commitment jointly in accordance with Article 4 of the Kyoto Protocol, the Netherlands' quantified emission limitation is 94 per cent. The Netherlands' assigned amount is calculated based on the Party's Article 4 commitment.

**Table 2. Greenhouse gas emissions by gas, 1990–2004**

| GHG emissions (without LULUCF) | Gg $CO_2$ equivalent | | | | | | | Change |
|---|---|---|---|---|---|---|---|---|
| | Base year (Kyoto Protocol) | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | from BY (Kyoto Protocol) to 2004 (%) |
| $CO_2$ | 159 389.5 | 159 355.8 | 170 610.6 | 169 605.6 | 175 191.9 | 175 728.4 | 179 648.2 | 181 319.0 | 13.8 |
| $CH_4$ | 25 440.9 | 25 437.8 | 23 793.6 | 19 248.7 | 18 859.1 | 17 990.6 | 17 544.9 | 17 298.8 | –32.0 |
| $N_2O$ | 21 219.3 | 19 943.6 | 21 308.3 | 19 038.1 | 17 954.0 | 17 104.1 | 16 830.2 | 17 352.3 | –18.2 |
| HFCs | 6 019.5 | 4 432.0 | 6 019.5 | 3 823.6 | 1 469.3 | 1 541.4 | 1 379.6 | 1 514.6 | –74.8 |
| PFCs | 1 937.8 | 2 264.5 | 1 937.8 | 1 580.6 | 1 488.6 | 2 185.5 | 619.5 | 284.7 | –85.3 |
| $SF_6$ | 301.3 | 217.3 | 301.3 | 335.1 | 356.3 | 332.3 | 309.2 | 328.4 | 9.0 |

LULUCF = Land use, land-use change and forestry; BY = Base year.

**Table 3. Greenhouse gas emissions by sector, 1990–2004**

| Sectors | Gg $CO_2$ equivalent | | | | | | | Change |
|---|---|---|---|---|---|---|---|---|
| | Base year (Kyoto Protocol) | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | from BY (Kyoto Protocol) to 2004 (%) |
| Energy | 153 993.6 | 154 005.2 | 165 512.7 | 164 269.2 | 170 397.3 | 170 983.7 | 174 789.5 | 176 317.8 | 14.5 |
| Industrial processes | 24 978.5 | 22 191.4 | 23 560.2 | 20 261.6 | 16 683.9 | 17 072.3 | 15 529.7 | 15 963.6 | –36.1 |
| Solvent and other product use | 541.2 | 541.2 | 439.9 | 306.9 | 268.5 | 248.6 | 230.2 | 231.2 | –57.3 |
| Agriculture | 22 097.8 | 22 097.8 | 23 138.7 | 19 923.2 | 19 589.3 | 18 560.9 | 18 290.9 | 18 326.0 | –17.1 |
| LULUCF[a] | NA | 2 667.3 | 2 465.2 | 2 668.6 | 2 638.0 | 2 629.7 | 2 618.5 | 2 598.1 | NA |
| Waste | 12 815.4 | 12 815.4 | 11 319.7 | 8 870.8 | 8 380.1 | 8 016.9 | 7 491.3 | 7 259.2 | –43.4 |
| **Total (with LULUCF)** | NA | 214 318.3 | 226 436.3 | 216 300.3 | 217 957.2 | 217 512.0 | 218 950.2 | 220 695.9 | NA |
| **Total (without LULUCF)** | 214 308.2 | 211 651.0 | 223 971.2 | 213 631.7 | 215 319.2 | 214 882.3 | 216 331.7 | 218 097.8 | 1.8 |

LULUCF = Land use, land-use change and forestry; BY = base year; NA = Not applicable.

[a] The LULUCF sector was a net source of GHG emissions for the Netherlands in the base year. In accordance with decision 13/CMP.1, total base year emissions for the purpose of the calculation of the assigned amount under the Kyoto Protocol shall include net GHG emissions from conversion of forests (deforestation). In 1990, net $CO_2$ emissions from deforestation for the Netherlands amounted to 487.562 Gg $CO_2$ equivalent according to the estimate made by the Party, or to 38.676 Gg $CO_2$ equivalent according to the adjusted estimate made by the ERT (see section II.C of this report). Net emissions from deforestation are neither shown separately nor included as a separate element of the net emissions from the LULUCF sector in the rows for total emissions in this table. However, they are added to total base year emissions for the purpose of the calculation of the assigned amount (see section II.D of this report).

*Note*: Tables 2 and 3 reflect the revised estimates submitted by the Netherlands in the course of the initial review on 1 June 2007. These estimates differ from the Netherlands' GHG inventory submitted in 2006. The adjusted estimate prepared by the ERT is not reflected in these tables. More information is provided in this report.

# II. Technical assessment of the elements reviewed

## A. National system for the estimation of anthropogenic GHG emissions by sources and sinks

12. The Netherlands' national system has been established in accordance with the guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol (decision 19/CMP.1). It meets the requirements for implementation of the general functions of the national system as well the specific functions of inventory planning, inventory preparation and inventory management.

13. Table 4 shows which of the elements of the national system are included and described in the initial report.

**Table 4. Summary of reporting on the elements of the national system**

| Reporting element | Provided | Comments |
|---|---|---|
| **Inventory planning** | | |
| Designated single national entity* | Yes | See section II.A.1 |
| Defined/allocated specific responsibilities for inventory development process* | Yes | See section II.A.1 |
| Established process for approving the inventory* | Yes | See section II.A.1 |
| Quality assurance/quality control plan* | Yes | See section II.A.2 |
| Ways to improve inventory quality | Yes | See section II.B.3 |
| **Inventory preparation** | | |
| Key category analysis* | Yes | See section II.B.1 |
| Estimates prepared in line with IPCC guidelines and IPCC good practice guidance* | Yes | See section II.B.2 |
| Sufficient activity data and emission factor collected to support methodology* | Yes | See section II.B |
| Quantitative uncertainty analysis* | Yes | See section II.B.2 |
| Recalculations* | Yes | See section II.B.2 |
| General QC (tier 1) procedures implemented* | Yes | See section II.A.2 |
| Source/sink category-specific QC (tier 2) procedures implemented | Yes | See section II.A.2 |
| Basic review by experts not involved in inventory | Yes | See section II.A.2 |
| Extensive review for key categories | Yes (periodically) | See section II.A.2 |
| Periodic internal review of inventory preparation | Yes | See section II.A.2 |
| **Inventory management** | | |
| Archive inventory information* | Yes | See section II.A.3 |
| Archive at single location | No | See section II.A.3 |
| Provide ERT with access to archived information* | Yes | See section II.A.3 |
| Respond to requests for clarifying inventory information during review process* | Yes | See section II.A.1 |

* Mandatory elements of the national system.

### 1. Institutional, legal and procedural arrangements

14. During the in-country visit, the Netherlands explained the institutional arrangements, as part of the national system, for preparation of the inventory. SenterNovem is the designated single national entity. Other organizations are also involved in the preparation of the inventory and have defined and allocated specific responsibilities for the inventory development process. SenterNovem is responsible for the overall coordination of the quality assessment/quality control (QA/QC) process. The actual calculation of anthropogenic GHG emissions and removals for each category is the responsibility of the Emissions Registration project which is being carried out by the Netherlands Environmental Assessment Agency (MNP). Various institutes are involved in the Emissions Registration project and are responsible

for the collection, processing, management and reporting of emissions and removals data. This work is organized in task groups as defined by an annual inventory plan.

15. In the Netherlands there is an established process for the official consideration and approval of the inventory, including recalculations, prior to its submission and for responding to any issues raised by the inventory review. The Ministry of Housing, Spatial Planning and the Environment has the legal responsibility for the formal approval of the inventory (the CRF and the NIR) before submission to the UNFCCC secretariat. SenterNovem is responsible for the QC/QA procedures and the final check before approval, as well as for responding to any issues raised by the inventory review.

### 2. Quality assurance/quality control

16. The Netherlands has developed a QA/QC plan which is in accordance with 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). This QA/QC plan is updated annually as part of its inventory improvement and inventory planning functions. This includes general QC procedures (tier 1) as well as source/sink category-specific procedures (tier 2) for key categories and for those individual categories in which significant methodological and/or data revisions have occurred, to be applied periodically. However, no information on the QC sectoral procedures is reported in the NIR for each sector or in the monitoring protocols. The ERT recommends that this information be included in the Party's future submissions as well as information on the tier 2 QC procedures recently applied.

17. The coordination of QA/QC is the responsibility of SenterNovem. QC procedures are applied by the Emissions Registration project and by the institutions responsible for the inventory preparation. Before submission of the inventory, a review procedure is performed that includes an internal check and peer review of the NIR by experts who have not been involved in the preparation process. Periodic audits are performed as part of the inventory management and improvement functions. Inconsistencies between the CRF tables and the NIR have been identified (see the sectoral sections of this report below), and the CRF table for key categories has not been updated with the results of the key category analysis presented in the NIR. The ERT suggested that the QC/QA procedures could be improved to ensure consistency between the CRF and the NIR.

### 3. Inventory management

18. The Netherlands has established an archiving system, but it is not yet fully centralized. A database system has been developed for the archiving of all inventory results as well as all the references to all documentation used in inventory preparation. The Emissions Registration project is responsible for maintaining the database. Uploading of the data is the responsibility of the institutions involved in inventory preparation. SenterNovem is responsible for the archiving of all documents that are not confidential referred to in the inventory as well as for making them available to the review teams. However, the basic data used in inventory preparation, as well as the intermediate calculations, are kept at the institutions responsible for the calculations. The ERT recommends that the database be improved to provide for these data to be archived centrally.

## B. Greenhouse gas inventory

19. In conjunction with its initial report, the Netherlands has submitted a complete set of CRF tables for the years 1990–2004 and an NIR. On 1 June 2007, after the ERT's in-country visit, the Netherlands submitted a complete set of revised CRF tables.

20. During the review the Netherlands provided the ERT with additional information sources. These documents are not all part of the initial report submission but are in many cases referenced in the NIR. The full list of materials used during the review is provided in annex I to this report.

## 1. Key categories

21. The Netherlands has reported a key category tier 1 and tier 2 analysis, both level and trend assessment, as part of its GHG inventory submitted with the initial report. The results of that key category analysis are used for choosing methodologies (on the application of tier 2 and higher-tier methods for key categories) and for prioritizing improvements, revisions of the methodologies, recalculations, and more focused uncertainty assessment. For the key categories, more detailed descriptions are provided in the NIR.

22. The tier 1 level key category analyses performed by the Party and the secretariat[2] produced similar results. The main reason for the differences, which are minor, is that the Party used a more disaggregated list of categories. In consequence, more key categories are included in the Party's key category analysis, such as $N_2O$ emissions from caprolactam production, manure management and animal production on agricultural soils. All the key categories identified by the secretariat are, at least partially, included in the Party's analysis. The Netherlands has not reported a key category analysis for the base year. In the secretariat's level key category analysis for the base year, fugitive emissions of $CH_4$ in oil and gas operations are identified as key. This category is not, however, identified as key in 2004, either by the Party or by the secretariat. The tier 1 trend analyses performed by the Party and the secretariat also produced similar results. All the key categories identified by the trend analysis that were not already identified as key categories on the level assessment are small categories for which emissions have been much reduced since 1990.

23. The Netherlands also reports a tier 2 key category analysis, for both level and trend assessments. As it is designed to do, the tier 2 analysis identified further key categories which have a low level of emissions but a high uncertainty, such as emissions of $N_2O$ in the agriculture sector. For these categories priority should be given to better estimation and reduction of the uncertainty.

24. The Netherlands has performed a key category analysis with and without the LULUCF sector. However, the key category tables presented in section A1.2 of the NIR do not include LULUCF. The ERT recommends that the tables including the LULUCF sector should also be included in the NIR. The ERT also recommends that the Party should additionally evaluate whether overall deforestation is a key category, as recommended in the IPCC good practice guidance.

## 2. Cross-cutting topics

25. The inventory is generally in line with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines), the IPCC good practice guidance and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF).

### Completeness

26. The inventory submitted is in general complete in terms of geographical coverage,[3] years, sectors, source and sink categories, and gases. Some small categories or gases within a category are still

[2] The secretariat identified, for each Party, those source categories that are key categories in terms of their absolute level of emissions, applying the tier 1 level assessment as described in the IPCC *Good Practice Guidance for Land Use, Land-use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF) for the base year or base year period as well as the latest inventory year. Key categories according to the tier 1 trend assessment were also identified. Where the Party performed a key category analysis, the key categories presented in this report follow the Party's analysis. However, they are presented at the level of aggregation corresponding to a tier 1 key category assessment conducted by the secretariat.

[3] In ratifying the Kyoto Protocol, the Netherlands declared that the ratification relates to its territory in Europe. Accordingly, the GHG inventory of the Netherlands does not covers Dutch territories outside Europe.

missing due to lack of activity data (AD) or assumed size. The Netherlands explains in the NIR that the justification for missing sources will be improved in the future.

27. The CRF tables are generally complete. However, some gaps have been identified, such as incomplete background tables in the agriculture sector and missing data for some years in the energy sector. Some of the notation keys are wrongly or inconsistently applied.

Transparency

28. The NIR is in general well prepared but it does not provide all the information needed to enable the ERT fully to assess the inventory. The Netherlands makes the protocols, as it calls them – the protocols for developing the emission estimates for each category of the inventory – available in the form of annexes to the NIR. However, the ERT came to the conclusion that the protocols do not provide enough information on the background data and intermediate parameters, and that the data presented are often inconsistent with the data in the NIR. The ERT recommends the Netherlands to revise the structure of the report, either by increasing the amount of information in the NIR or by redesigning the annexes. Moreover, the existence of confidential data (mainly in the industrial processes sector) made it difficult for the ERT to assess fully, during the in-country visit, how far the emission estimates for such categories conform to the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. The necessary information was partially supplied during and after the in-country visit.

Consistency

29. The Netherlands inventory was assessed as overall consistent. However, some important inconsistencies were identified in the LULUCF sector. These include the fact that the time series for the past 20 years has not been reconstructed and the inconsistency of the methodologies of the land classification applied to the two maps that were used to calculate the land-use change matrix which the Party reports.

Recalculations

30. The national system of the Netherlands can ensure that recalculations of previously submitted estimates of GHG emissions by sources and removals by sinks are prepared in accordance with the IPCC good practice guidance. Procedures for the carrying out and approval of recalculations have been established in the national system as part of its inventory planning, preparation and improvement functions, in line with its procedures for assessment and approval of methodological improvements and updating of protocols.

31. The ERT noted that recalculations for the whole time series from the base year to 2004 had been undertaken to take into account error correction, improvements in data, methodological changes and reallocation of categories. The major changes relate to: (a) $CO_2$ emissions from fuel combustion, due to a revised emission factor (EF) for natural gas and revised data for manufacturing industries and construction; (b) fugitive emissions from the oil and gas sector, due to the use of a new methodology; and (c) $CH_4$ emissions from enteric fermentation due to a new country-specific methodology. The rationale for these recalculations is provided in the NIR. The effect of the recalculations for the base year is an increase of 0.6 per cent in total estimated emissions excluding LULUCF and an increase of 0.4 per cent for total estimated emissions including LULUCF. For the year 2003 the effect was an increase of 0.4 per cent for total emissions excluding LULUCF and of 0.7 per cent for total emissions including LULUCF. As a result of recalculations the change in total national emissions from 1990 to 2003 has decreased from 1.5 per cent to 1.3 per cent.

Comparability

32. The inventory is overall comparable with those of other Parties. The allocation of the source/sink categories follows the Revised 1996 IPCC Guidelines and the IPCC good practice guidance.

The Netherlands reports indirect $N_2O$ emissions from $NO_X$ and ammonia ($NH_3$) deposition from non-agricultural sources in its 2006 submission, which most other Parties do not report. After the in-country review, the Party decided not to include indirect $N_2O$ emissions from $NO_X$ deposition.

Accuracy

33. The inventory is in general accurate in the sense that emissions are not systematically overestimated or underestimated. Tier 2 methodologies have been consistently applied for the key categories, targeting uncertainty reduction. The ERT identified a few problems of accuracy, for example, relating to $CO_2$ emissions from cement production, the $N_2O$ emissions of caprolactam, indirect $N_2O$ emissions from the deposition of $NO_X$ from industrial source categories, stationary combustion and transport, $N_2O$ emissions from manure management, net $CO_2$ emissions from deforestation, and $CH_4$ emissions from solid waste disposal. Many of these problems have been already addressed by the Netherlands during the 2006 review process; however, for net $CO_2$ emissions from deforestation the ERT considered it necessary to calculate and apply an adjustment.

Uncertainties

34. The Party has provided a tier 1 uncertainty analysis for each source category and for the inventory in total, following the IPCC good practice guidance.

35. The Netherlands has provided a tier 1 uncertainty analysis in the NIR. A tier 2 analysis was implemented during 2006 and a report on the relevant study was provided to the ERT. The complete results will be included in the 2007 submission. The periodic review of uncertainty data and uncertainty analysis and evaluation of results is provided for in the national system as part of its inventory planning and preparation functions, particularly in its improvement programme. The ERT found, however, that some of the basic uncertainty data could be overestimated and inconsistent with the methodology applied to estimate the emissions of some sectors (expert judgement was used for measured emissions in the industrial processes sector), and could be updated. This is particularly recommended for the categories identified as key in the tier 2 key category analysis.

### 3. Areas for further improvement identified by the Party

36. The NIR describes the improvements that have been made in response to the centralized review of the 2005 submission. It also identifies planned improvements such as a new tier 2 uncertainty analysis and updating of methodology protocols for the categories identified as key as a consequence of the tier 2 key category analysis. This includes examining the possibility of including anaerobic treatment in the methodology for calculating $N_2O$ emissions from manure management and of conducting further research on $N_2O$ emissions from soils.

### 4. Areas for further improvement identified by the ERT

37. The ERT identified the following cross-cutting issues for improvement. The Party should:

(a) Improve the transparency of the inventory by revising the NIR, either by increasing the information given in the NIR or by redesigning the annexes;

(b) Improve the archiving procedures of the inventory to allow for fully centralized access to the inventory data and related information.

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

## 5. Energy

Sector overview

39. In the base year (1990 for $CO_2$, $CH_4$ and $N_2O$, and 1995 for HFCs, PFCs and $SF_6$), the energy sector accounted for 72.1 per cent of total GHG emissions in the Netherlands. The subsector energy industries is the major source category in the sector, contributing 34.2 per cent to sectoral emissions and 24.6 per cent to total national emissions. The subsectors manufacturing industries and construction, transport, and other sectors accounted for 21.5 per cent, 17.2 per cent and 24.9 per cent, respectively, of energy sector emissions in the base year. Between 1990 and 2004, emissions from the energy sector increased by 14.5 per cent, mainly due to increased emissions from energy industries and transport.

40. The CRF tables for 1990 are largely complete. Some cells have been left blank in tables 1.A(b), 1.A(c) and 1.A(d). The Party is encouraged to fill these gaps with values or notation keys, as applicable.

41. The Netherlands has improved its inventory since the most recent (2005) submission. Major improvements involve the revision of the $CO_2$ emission factor of natural gas and the revision of the determination of emissions in the gas sector (related to transmission, distribution, venting and flaring).

42. The ERT noted that the emission estimates for the energy sector are lacking in transparency where methodologies and data sources are concerned. This is due to the fact that the information given in the NIR is often limited and has to be complemented by the monitoring protocols, which are referred to in annex 6 of the NIR as information that should be considered as part of the NIR submission, and background documents for individual source categories. Some of the information provided in these additional documents appears not to be up to date, which leads to inconsistencies between different documents. During the review, the Party provided all the information needed to explain the actual methodologies and data sources used. The Netherlands is encouraged to improve the transparency of its inventory for future submissions by compiling one stand-alone NIR with relevant extracts of those background documents which are needed in order to explain the methodologies and data sources used. Additional information may still be made available in protocols and other background documents.

43. Recalculations have been performed since the 2005 inventory submission. They relate in particular to fugitive emissions in the gas sector (the use of newly developed country-specific emission factors and updated data for transmission, distribution, venting and flaring) as well as to a revised $CO_2$ EF for natural gas combustion. In the NIR and during the review, the Party provided all relevant information for these recalculations. The ERT acknowledges that the recalculations have improved the quality of the inventory.

44. QA/QC procedures are in place and are to some extent described in the NIR. The Party is encouraged to include more information in the NIR with respect to QA/QC measures in place for data handling and for validation using different sources (e.g. cross-checks of the AD and EFs in energy industries and manufacturing industries and construction, as described during the review visit).

45. The ERT acknowledges the significant efforts made by the Party to provide an inventory using the best information available. In particular, the Netherlands uses many company- and country-specific activity data and emission factors to improve accuracy and to reduce uncertainties. Major efforts have been made to streamline the national energy statistics and preparation of the GHG inventory.
A good-quality data handling system, using a detailed database with company-specific data, is in place. The staff involved are highly qualified and motivated.

Reference and sectoral approaches

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

46. Energy consumption and $CO_2$ emissions in the base year are 17.1 per cent and 3.8 per cent higher, respectively, for the reference approach than for the sectoral approach. In 2004, the difference between the two approaches for energy consumption increased in comparison to the base year (to 19.4 per cent), while it decreased for $CO_2$ emissions (to 0.3 per cent). The difference in fuel consumption is the largest for liquid and solid fuels (31.4 per cent and 22.5 per cent, respectively, in the base year, and 42.9 per cent and 26.9 per cent, respectively, in 2004). The NIR gives four main reasons for the differences between the two approaches:

(a) $CO_2$ from the incineration of waste that contains fossil carbon is not included in the reference approach;

(b) The fossil-fuel related emissions reported as process emissions and fugitive emissions are not included in the sectoral approach;

(c) The country-specific carbon storage factors used in the reference approach are multi-annual averages, while the carbon storage factors in the sectoral approach are calculated for the specific mix of feedstock and non-energy use in each year;

(d) Plant-specific emission factors were used in the sectoral approach, whereas country-specific EFs were used in the reference approach.

47. In the NIR a correction to the inherent differences identified has been made by adding relevant fugitive emissions in the energy sector and process emissions from the industrial sector to the sectoral approach, and by including emissions from the incineration of fossil waste in the reference approach. As a result the overall difference of $CO_2$ emissions between the reference and the sectoral approach decreases in the base year (the difference between the two approaches becomes 0.6 per cent) and increases in 2004 (to 1.6 per cent).

48. The ERT noted that $CO_2$ emissions from liquid fuels are lower in the reference approach than in the sectoral approach for many years, which is not plausible. In addition, the difference between the reference approach and the sectoral approach for liquid fuels increased over time, while it decreased for solid and gaseous fuels. During the review, the Party provided the following explanations for this effect:

(a) Due to a confusion in the questionnaires for energy statistics, some chemical products were reported by companies as fuels, for example, as liquefied petroleum gas (LPG) instead of naphtha, which leads to *increasing* $CO_2$ emissions in the reference approach;

(b) LPG is included in the energy statistics, and companies partly export it. As a result of the export of LPG, apparent consumption of LPG decreases, which leads to *decreasing* emissions in the reference approach;

(c) The export-related effect under (b) is larger than the reporting-related effect under (a), so that the overall emissions are smaller in the reference approach than in the sectoral approach;

(d) These discrepancies increase over time, since companies' reporting is increasingly incorrect.

49. The Party believes that these problems only affect the reference approach (apparent consumption) and not the sectoral approach, since process emissions in the sectoral approach are calculated using a carbon balance and company-specific storage factors. The errors in reporting in the energy surveys have already been identified and corrected by the Party. In 2005 an improvement project

started in the national energy statistics. Correct reporting can be expected for the 2007 data. The Party is encouraged to describe these discrepancies in its NIR.

*International bunker fuels*

50. Emissions of $CO_2$ from international aviation increased by 131.3 per cent between 1990 and 2004, and those from international navigation increased by 36.3 per cent over the same period. As a result, the share of aviation bunkers in international bunker emissions increased from 11.7 per cent in 1990 to 18.3 per cent in 2004.

51. Default IPCC emission factors have been used for estimating $CH_4$, $N_2O$ and $CO_2$ emissions from residual fuel oil (heavy fuel oil), lubricants and jet kerosene. The $CO_2$ EF for gas/diesel oil is based on measured carbon content for fuel distributed for road transport.

52. International bunker fuel use is defined in the national energy statistics according to the Netherlands' tax definition (as the fuels for which a tax exemption for international transport applies). Since some international bunker sales are also partly used for national aviation and navigation, the Party calculates the following fuel consumption data from other sources and corrects the estimates for international bunkers accordingly:

(a) Fuel use by fisheries according to the IPCC definition has been calculated using information on shipping movements;

(b) Fuel use for military aviation and navigation according to the IPCC definition has been calculated using data provided by the Ministry of Defence;

(c) Fuel consumption from domestic navigation has been based on ship movements for national cargo transport and on a survey for national passenger transport;

(d) Fuel consumption for domestic aviation has been estimated based on figures from the Civil Aviation Authority Netherlands.

53. The ERT considers that emissions from international bunker fuels are appropriately dealt with by the Netherlands inventory. The Party is encouraged to update the data that are based on surveys or studies on a regular basis.

*Feedstocks and non-energy use of fuels*

54. The share of total feedstock-related emissions, including the combustion of residual chemical gas and waste combustion, in total national $CO_2$ emissions was about 12 per cent in 2004. The largest part of these emissions (64 per cent in 1990 and 80 per cent in 2004) is reported in the energy sector. This relates especially to emissions from blast furnace gas and residual chemical gas.

55. Because of erroneous reporting (see also paragraph 48) some chemicals were allocated to fuels used as feedstock, which has led to incorrect values for non-energy use of some fuels. However, the Party considers that this misallocation does not affect the emissions reported under energy or process emissions reported under industrial processes, since only the reference approach is affected. This issue has already been recognized by the Party and is being addressed.

56. In refineries not all the refinery gas or all the products are completely reported by the companies. For that reason, a fuel called "unaccounted for liquid fuel", calculated from a mass balance, is included in the inventory. According to information provided during the review visit, most of this fuel will be accounted for as pure $CO_2$ emissions from a hydrogen plant in future submissions. The remaining emissions will be included under refinery gas (and the corresponding emission factor will be adapted accordingly). Correspondingly, in future submissions there will be a shift from 1.A (fuel combustion) to 1.B (fugitive emissions) due to the reallocation of the pure $CO_2$ emissions.

57. During the review the Party provided sufficient evidence to substantiate the validity of the accounting of feedstocks and non-energy use of fuels. However, the Party is encouraged to improve the relevant documentation in the NIR.

Key categories

*Stationary combustion (1.A.1, 1.A.2, 1.A.4): all fuels – $CO_2$, $CH_4$ and $N_2O$*[4]

58. GHG emissions from stationary combustion accounted for 57.8 per cent of total national emissions in the base year and 63.6 per cent in 2004. These emissions increased by 11.8 per cent between 1990 and 2004. More than 99 per cent of overall emissions in stationary combustion are of $CO_2$.

59. The activity data in the national energy statistics for stationary combustion are determined as follows:

(a) Energy consumption for stationary combustion in energy industries (1.A.1) and manufacturing industries (1.A.2) is calculated using a bottom-up approach using detailed plant-specific data;

(b) Energy consumption in the residential sector (1.A.4(b)) is estimated based on a survey on energy consumption in households;

(c) Energy consumption in agriculture, forestry and fisheries (1.A.4(c)) is estimated based on a survey on energy consumption and on other data sources;

(d) Energy consumption in the subsector commercial and institutional services (1.A.4(a)) is determined by subtracting the energy consumption under other categories (1.A.1, 1.A.2, 1.A.3, 1.A.4(b) and 1.A.4(c)) from total energy consumption.

60. Emissions from stationary combustion in energy industries and manufacturing industries are calculated using a bottom-up approach and company-specific, sector-specific, country-specific and default data. Company-specific data from energy statistics and default sector-specific emission factors are compared with the data in environmental reports to yield best estimates of activity data, notably for "derived" fuels, and $CO_2$ EFs. The ERT acknowledges the significant effort the Netherlands has invested in putting this high-quality system in place and in reconciling data from the energy statistics and inventory preparation.

61. Due to the appearance of joint ventures in the 1990s, many industrial plants reporting under 1.A.2 have shifted to energy industries (1.A.1). Consequently, a reallocation between the two sectors has taken place.

62. The calculation of emissions in the residential sector includes a differentiation with respect to cooking, space heating and hot water.

63. The ERT encourages the Party to investigate the possibility of introducing technology-specific information for stationary combustion in order to increase accuracy with respect to $CH_4$ and $N_2O$ emissions, where pertinent, since emission factors may differ between boiler types, turbine types and so on.

64. Planned improvements by the Party include checking whether data obtained from the monitoring of the European Union (EU) emissions trading scheme (ETS) can be used to further improve data quality.

[4] It should be noted that not all emissions related to all fuels and gases under this category are key categories. However, since the calculation procedure for stationary combustion is common for many sources, individual source categories are difficult to separate.

*Road transportation: liquid fuels – $CO_2$, $CH_4$ and $N_2O$*[5]

65. $CO_2$ emissions from road transportation accounted for 15.7 per cent of total national $CO_2$ emissions in the base year and 18.5 per cent in 2004. These emissions increased by 32.9 per cent between 1990 and 2004.

66. The ERT acknowledges that the estimates of $CO_2$, $CH_4$ and $N_2O$ emissions from transport are in line with the IPCC good practice guidance and the Revised 1996 IPCC Guidelines. The overall basis for the calculation of emissions is fuel consumption. For $CH_4$ and $N_2O$ a bottom-up model is used additionally to incorporate differences of emission factors depending on vehicles, abatement measures and so on. The ERT appreciated the availability of many country-specific data (EFs of fuels and vehicles).

67. $NO_X$ emissions from road transportation are reported. (In the industrial processes sector (2.G) these emissions are used to calculate indirect $N_2O$ emissions from $NO_X$ deposition; see also paragraphs 90–91.) During the review the ERT concluded that the calculation of $NO_X$ emissions from road transportation is not in line with the IPCC good practice guidance, since these guidelines require a fuel-based calculation, while $NO_X$ emissions in the transport sector are calculated on the basis of a bottom-up approach using vehicle kilometres. The Party agreed to recalculate these $NO_X$ emissions in accordance with the IPCC good practice guidance. During the review process, the Party provided to the ERT revised $NO_X$ emission estimates for the transport sector calculated in accordance with the IPCC good practice guidance. Furthermore, the Party decided no longer to report $N_2O$ emissions from $NO_X$ deposition. The ERT reviewed these revised values and concluded that they are correct and appropriate. In addition, the ERT accepts the Party's decision to stop reporting $N_2O$ emissions from $NO_X$ deposition (see also paragraphs 90–91).

68. Emissions from the use of biofuels in transport are not yet included in the inventory. The Party plans to include them in its future submissions.

*Oil and gas – $CH_4$ and $CO_2$*[6]

69. $CH_4$ and $CO_2$ emissions in the oil and gas sector (1.B.2) have been calculated based on a tier 3 approach. This is in compliance with the Revised 1996 IPCC Guidelines.

70. The Netherlands has improved its estimates of activity data and emission factors significantly compared to previous submissions, in particular by using results from studies on $CH_4$ EFs for gas networks and by setting up a system to obtain emissions data on a very detailed level. The ERT acknowledges the efforts the Party has made to improve the methodology and the data used in this sector.

Non-key categories

*Public electricity and heat production: biomass, other fuels – $CO_2$, $CH_4$, $N_2O$*

71. According to the NIR, emissions from waste incineration are reported under energy industries (1.A.1) since all waste incinerators in the Netherlands also produce heat or electricity for energy purposes.

[5] It should be noted that not all emissions related to all fuels and gases under this category are key categories. However, since the calculation procedure for road transportation is common for many sources, individual source categories are difficult to separate.

[6] Please note that $CO_2$ emissions related to oil and gas are not a key category. However, since the calculation procedure for oil and gas relates to $CO_2$ and $CH_4$ alike, $CO_2$ is not separated out here.

72. Emissions have been estimated by determining the amount of fossil carbon in the waste (for $CO_2$ emissions) and by multiplying the waste incinerated with an emission factor (for $CH_4$ and $N_2O$ emissions).

73. During the review the ERT concluded that several of the data items provided do not match the actual values used for the calculation of emissions (the amount of waste incinerated, waste composition, fraction of fossil carbon). The ERT requested the Party to update the NIR with correct values in its future submissions. During the review process, the Party provided to the ERT a table including the revised values. The ERT reviewed these revised values and concluded that they are correct and appropriate.

74. The description of the methodology and the data sources used for the calculation of emissions is not fully transparent in the NIR. During the review, the Party was able to clarify the methodology and data sources used and to show that these emissions have been calculated correctly. Nevertheless, the Party is requested to improve the transparency of the NIR by documenting the methodology and data sources in sufficient detail.

75. For $N_2O$ emissions from waste incineration with "other fuels", an IPCC default emission factor for coal has been used. However, this choice is not substantiated in the NIR. The ERT noted that $N_2O$ EFs for waste incineration are available in the Revised 1996 IPCC Guidelines or in the IPCC good practice guidance, and recommends that the Party substantiate the choice of this EF or revise the estimate in accordance with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. The Party indicated that national measurements of $N_2O$ for waste incinerators had already been carried out. During the review process, the Party provided to the ERT revised emission estimates based on $N_2O$ EFs stemming from two studies and further information. Data from measurements are reflected in these studies. As a result of the revision, $N_2O$ emissions in 1990 increased by 0.038 Gg (from 0.032 to 0.070 Gg). The revised estimates also reflect different $N_2O$ abatement technologies and the proportion of overall waste incinerated for which they have been installed. The ERT reviewed these revised values and concluded that they are correct and appropriate.

## 6. Industrial processes and solvent and other product use

### Sector overview

76. In the base year (1990 for $CO_2$, $CH_4$ and $N_2O$, and 1995 for HFCs, PFCs and $SF_6$), emissions from the industrial processes sector contributed 11.0 per cent to total national emissions. $CO_2$ contributed 31.7 per cent to sectoral emissions; the contributions of the other gases were 34.1 per cent for $N_2O$, 1.2 per cent for $CH_4$ and 33.1 per cent for HFCs, PFCs and $SF_6$ taken together. In 2004, $CO_2$ accounted for 42.3 per cent of emissions from the sector, $N_2O$ for 43.1 per cent, and HFCs, PFCs and $SF_6$ taken together for 12.7 per cent; the share of $CH_4$ emissions was low at 1.9 per cent.

77. The 2006 submission is essentially complete in terms of source categories covered and gases included. Although emissions from some sources such as lime production, asphalt roofing and road paving with asphalt are reported as not estimated ("NE"), all significant sources of direct and indirect GHG emissions are included. For the sake of completeness, the ERT suggests that the Netherlands estimate and include in its inventory emissions from asphalt roofing and road paving with asphalt.

78. The uncertainties in the annual emissions from nitric acid production (of 50 per cent), from caprolactam production (70 per cent) and from aluminium production (20 per cent), which remained unchanged after the recalculations of emissions based on new measurements, are considered by the ERT as either too high or inaccurate because plant-specific estimates have been used. The ERT suggests that the uncertainty estimates should be reconsidered.

79. The ERT noted that the transparency of the NIR in the chapter on industrial processes could be improved. In particular, process technologies and the methods used for estimating emissions should be described in sufficient degree to enable the ERT understand them, even if the AD and EFs are confidential. The Party is encouraged to improve transparency in this respect, and also to provide more information on how QA/QC procedures are applied for individual categories, including, if possible, those where AD and EFs are confidential.

Key categories[7]

*Nitric acid production – $N_2O$*

80. Emissions of $N_2O$ from nitric acid production decreased by 20.1 per cent between 1990 and 2003 and then increased by 11.0 per cent from 2003 to 2004. The NIR does not explain these changes satisfactorily. During the in-country visit, the Party explained that the reduction from 2001 to 2003 was obtained only by optimization of the converter, and that as yet no abatement technology is used at any of the plants of the three companies in the Netherlands, although such technologies are planned in the future. The increase of emissions between 2003 and 2004 is explained in the NIR as being due to an increase in production. However, there is no information to explain why emissions are stable between 1990 and 1998 (except for 1993, when they increased). As the AD are confidential, the ERT suggests that the Party explain qualitatively the increase of emissions during 1993 and 2004 and improve the transparency of the NIR by reporting in greater detail the plant-specific methodology used to estimate these emissions.

81. The ERT noted in particular that emissions are estimated by plants using the methodology described in the monitoring protocols, which is based on a plant-specific EF and the AD for each plant. However, appendix 2 of the protocol entitled "2B2: $N_2O$ emissions resulting from the production of nitric acid" states that emissions from one plant which uses a non-selective catalytic reduction (NSCR) technology have been estimated using an EF of 9 kg/t instead of 2 kg/t, which the ERT considers to be an error. The Party has carried out recalculations since its previous inventory submissions but this information is not reported in the NIR or in the protocol. The ERT recommends the Party to report in its next submission that this error has been corrected and recalculations carried out, and to report on the plants which stopped production in 1999 and 2000, which could be responsible for the fluctuations in emissions.

*Other (chemical industry) – $N_2O$*

82. The Netherlands reports emissions from caprolactam production as constant (4 kt) over the whole period 1990–2002. This estimate is based on a plant-specific methodology and plant-specific EFs. AD and the EF are reported as confidential.

83. The ERT considers that production could not be so stable over that the whole period 1990–2002 for the country's Geleen plant as the global production of the group fluctuates. The AD of the group for many years are published on a website and fluctuations in production are noticeable.[8] The emissions should also fluctuate accordingly. The ERT therefore considers this estimate as not sufficiently justified, and this could lead to an adjustment for the base year when the emissions may be overestimated. If the EF obtained by measurement is too uncertain or potentially inaccurate, the ERT suggests that the Netherlands consider using the default factor of 9 kg/t from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.

[7] This section and similar sections for the other sectors are structured by those categories that were key categories in 1990, except for the fluorinated gases, for which the categories which were identified as key categories in 2004 are also included.

[8] See, for example, <http://www.dsm.com/en_US/html/dfi/cpl_home.htm>.

84. The ERT encourages the Netherlands to check with the plant the AD and EF used in order to investigate why emissions are constant over this period. The emission estimates should then be either confirmed (and better documented) or recalculated. After the in-country review, the Party recalculated its emissions on the basis of real production and EFs based on measurements by the plant, which yielded a better estimate of emissions and a decrease in estimated emissions in the base year by 1.528 Gg $N_2O$, (from 4.000 to 2.472 Gg $N_2O$). The ERT wishes to highlight the transparency with which the Party acted in this particular instance, where the data are confidential.

*Aluminium production – PFCs*

85. Emissions from all aluminium production plants have been recalculated in the 2006 submission based on new measurements which were made prior to a technology switch – made in 1998 for the smallest company and in 2002/2003 for the largest company – from side worked prebaked (SWPB) to centre worked prebaked (CWPB) in the two plants of the Netherlands. PFC emissions increased during the period 1996–1997 and no explanation is provided in the NIR. The ERT recommends the Party to give more information about the increase of emissions during these years bearing in mind the decreasing trend between 1990 and 1995.

86. After recalculation, estimated base year emissions increased from 2,097.07 Gg $CO_2$ equivalent (in the 2003 inventory, submitted in 2005) to 2,246.21 Gg $CO_2$ equivalent as reported in the 2006 submission. During the in-country visit, the Party explained the methodology applied and the new ratio used for recalculation for both aluminium plants; this information should be reported in detail in the NIR of the next submission. In 2006 the Party also recalculated the emissions of PFCs using a new ratio of tetrafluoromethane ($CF_4$) and hexafluoroethane ($C_2F_6$) for one of the two plants, and recalculated emissions of $C_2F_6$ based on the new ratio determined by plant measurements. This led to an increase in estimated emissions in the base year. However, the ERT believes that the new ratios of $C_2F_6$ to $CF_4$ are either too high or too low, as they fluctuate in the range of 0.14–0.20 for CWPB and 0.16–0.17 for SWPB, which is not in line with the values of 0.12 for CWPB and 0.25 for SWPB given in the Revised 1996 IPCC Guidelines. The ERT recommends the Party to check the methodology and the calculation with the company, and to report further on the $C_2F_6$ : $CF_4$ ratio in its next submission in order to improve transparency.

87. After the in-country review, the Party's national experts gave the ERT more details about the methodology used to split the PFC emissions into $CF_4$ and $C_2F_6$ for the two companies. They explained that estimates for one of the two companies were previously missing, and that the addition of these had contributed to the increase in estimated emissions in the 2006 submission. The Party will improve its estimates by using an appropriate emission factor for CWPB for $C_2F_6$ for the period 1999–2004. The ERT recommends the Party to include all the relevant information in the NIR of its next submission for the sake of greater transparency, and to carry out recalculations as the EF used will change.

*Production of halocarbons and $SF_6$ – HFCs*

88. Emissions of HFC-23 from HCFC-22 production decreased by 55.8 per cent between 1998 and 1999 and no explanation is given in the NIR for the decrease. During the in-country visit the Party explained that in 1998 the plant installed a thermal afterburner which reduces emissions. The ERT recommends that in its future submissions the Netherlands specify the year of installation of the afterburner in order to clearly identify the reason for the reduction in emissions between 1998 and 1999.

89. For HFC emissions from handling activities, a sudden decrease is observed in 1995, after which estimated emissions return to their pre-1995 level. This is unusual because handling activities occur regularly. In its response to the ERT's questions, the Party explained the sudden fluctuation in emissions for the two companies as being due to the great variation in handling activities during that period. The ERT recommends the Party to improve the explanation of the trends in its future submissions.

*Other (industrial processes) – $N_2O$*

90. The Netherlands estimates indirect emissions of $N_2O$ from $NO_X$ deposition and reports them under the category other (2.G). The methodology used is the methodology used for estimating indirect $N_2O$ emissions from agriculture, which, in the opinion of the ERT, is supported by the Revised 1996 IPCC Guidelines and the IPCC good practice guidance.

91. However, the methodologies used for estimating $NO_X$ emissions from all sources are not described in the NIR, which is not in line with the IPCC good practice guidance because $N_2O$ emissions are calculated from $NO_X$ emissions and these $N_2O$ emissions are part of a key category. Accordingly, the ERT recommends that the Party provide sufficient information about the methodologies used to improve transparency. After the in-country review, the Party decided not to include indirect $N_2O$ emissions from $NO_X$ deposition. As a consequence, $N_2O$ emissions in the base year decreased by 3.03 Gg and the category became a non-key source category.

92. $NO_X$ emissions from almost all sources (2.B.1, 2.B.2, 2.C.1, 2.C.2, 2.C.3) are estimated and aggregated under the category other (2.G), and the notation key "included elsewhere" ("IE") is used in the CRF table cells (2.B.1, 2.B.2, 2.C.1, 2.C.2, 2.C.3); $NO_X$ emissions from the category road paving with asphalt (2.A.6) and from glass production (2.A.7) have not been estimated. To improve transparency, the ERT encourages the Party to estimate $NO_X$ emissions from all sources and to report them accordingly under each category separately, which will bring the estimates into line with the Revised 1996 IPCC guidelines and the IPCC good practice guidance.

93. The ERT noted that for 2004 the value of total $NO_X$ emissions reported in CRF table 2(I)A-Gs2 is 429.86 Gg, whereas sectoral $NO_X$ emissions are reported in table 2(I)S1 as 1.08 Gg for industrial processes and in table 1S1 as 352.46 Gg for the energy sector, which makes a total of 353.54 Gg instead of 429.86 Gg. Similarly, for the base year total $NO_X$ emissions are reported in table 1AS1 as 543.93 Gg and in table 2(I)S1 as 12.03 Gg, making a total of 555.42 Gg instead of 595.49 Gg as reported in table 2(I)A-Gs2. This means that there may be overestimation in emissions – by 40.07 Gg in 1990 and 76.32 Gg in 2004. The ERT recommended that the Party check the CRF tables and either explain the difference or correct the figure for $NO_X$ emissions, with a subsequent recalculation of $N_2O$ emissions. In the Party's response to the ERT after the in-country review, the Party revised the numbers in the CRF tables and the value has been corrected.

Non-key categories

*Cement production – $CO_2$*

94. The NIR and the relevant protocol provide no information on the methodology used by the plant to estimate $CO_2$ emissions from clinker production. The $CO_2$ implied emission factor (IEF) is among the highest of all reporting Parties.

95. During the in-country visit the Party explained that the plant (there is only one in the country) conducts measurements to estimate $CO_2$ emissions and that natural gas is the fuel used. The ERT recommends that the Party describe the measurements undertaken and the methodology applied to estimate emissions. The technology process should be described and the fuels used in the kiln or material added as combustible should be reported. The chemical content data of lime (CaO) in clinker and the methodology used by the plant to estimate emissions should be described to justify the relatively high IEF for the whole time series (e.g. the $CO_2$ IEF was 0.555 t/t in 2004). In the Party's response to the ERT's comments, the methodology used by the plant to estimate emissions from this category is described and further information is given to clarify the high value of the EF used by the Netherlands. The Party will update the monitoring protocols.

*Lime production – $CO_2$*

96. Lime emissions are reported as "NE" in the CRF tables and emissions are considered to be negligible. Nevertheless, the Party reports in the NIR that there are four production plants in the Netherlands. Activity data are not provided and emissions are not estimated because of lack of consistent AD from the four lime production sites.

97. During the in-country visit, the Party explained that lime production no longer exists in the Netherlands but without giving any more detailed information related to the behaviour of the four plants or the year when each of them ceased production. As no AD are available for this category, the ERT was not able to determine the order of magnitude of emissions from this source since 1990. The Party should give more information about this subcategory for the years when lime production existed in order to improve both completeness and transparency. For the years when lime production did not occur, the notation key "not occurring" ("NO") should be used in the CRF tables instead of "NE".

*Other (mineral products) – $CO_2$*

98. The Netherlands accounts for $CO_2$ emissions from glass production using the EF of 0.16 t/t, which is a three-year average of EFs obtained from measurements conducted at plants. The plant's emission estimates are available for 1990 (0.13 t/t), 1995 (0.15 t/t) and 1997 (0.18 t/t). Available data from plants for other years (1996, 1998, 1999, 2000) have not been considered.

99. Given that $CO_2$ emissions from glass production have been estimated on the basis of incomplete data, the ERT considered that the average EF used is not representative. Furthermore, the ERT considered that the use of a constant EF of 0.16 t/t leads to an overestimation of emissions for the base year, which could lead to an adjustment.

100. The ERT recommends the Party to reconsider the $CO_2$ estimate using all available data. The recalculation should be based on annual EFs and extrapolation for the years when EF values are not available. In its response to the ERT's questions, after the in-country review, the Party carried out recalculations using plant-specific EFs when available, and estimating the missing data by interpolation, which improved the emission estimates and led to a decrease of estimated base year emissions by 33.65 Gg (from 176.00 to 142.35 Gg).

## 7. Agriculture

Sector overview

101. In the base year (1990 for $CO_2$, $CH_4$ and $N_2O$, and 1995 for HFCs, PFCs and $SF_6$), total emissions from the agriculture sector in the Netherlands amounted to 22,097.8 Gg $CO_2$ equivalent or 10.4 per cent of total national emissions. $CH_4$ emissions from the sector amounted to 10,494.0 Gg equivalent (41.2 per cent of national $CH_4$ emissions), and $N_2O$ emissions amounted to 11,606.8 Gg equivalent (54.4 per cent of national $N_2O$ emissions). From 1990 to 1995, sectoral emissions remained relatively stable, but they then started to decrease and in 2004 were 17.1 per cent lower than in 1990. The decrease was largely due to decreases in $N_2O$ emissions from soil (by 19.4 per cent between 1990 and 2004) and in $CH_4$ emissions from enteric fermentation (by 15.6 per cent) as a result of reductions in livestock populations and in manure production. These reductions are a result of policies relating to milk production (milk quota) and policies relating to manure production and manure application.

102. The inventory submission is complete in terms of gases, sources and years covered. The CRF tables, however, are not complete: the additional information tables and all other parameters – average gross energy intake (GE), average $CH_4$ conversion rate (Ym), animal mass, volatile solid excretion (VS), methane producing capacity (Bo) and nitrogen excretion (Nex) – have not been provided. For its future submissions the ERT recommends that the Netherlands fill in the additional information tables, such as

sheet 2 in table 4.B(a) and sheet 2 in table 4.D, and also fill in other additional parameters for categories where country-specific EFs have been used.

103. The NIR describes well the trends in and reasons for the fluctuations in emissions, but only basic activity data and emission factors are provided. More information is found in the monitoring protocols, but many important data items are available only in the background papers. To improve the transparency of the inventory, the ERT recommends that the Netherlands include in the NIR all other essential data, in addition to the basic AD and EFs (e.g. the methane correction factor (MCF) for enteric fermentation, the distribution of manure management systems, VS, Bo and the MCF for methane emissions from manure management, etc.).

104. The most important recalculations have been done for enteric fermentation. In response to the comments of previous review teams, a comprehensive dynamic model for the calculation of $CH_4$ emissions from dairy cattle has been developed and the IPCC default EF for $CH_4$ emissions from goats has been applied. Some minor corrections have been made for other categories as well, in particular for agricultural soils. Altogether, the 2006 recalculations result in an increase in estimated emissions from this category by 0.65 per cent, or 141.1 Gg $CO_2$ equivalent, in the base year, leading to a corresponding increase in estimated base year emissions.

105. In all categories the IEFs fluctuate greatly between years even though constant EFs have been used. This happens because the Party has rounded the values of the AD and the final estimates of emissions before importing them into the CRF tables. During the review process, the Party resubmitted the CRF tables for the period 1990–2004 with more accurate import of data. The ERT reviewed these revised estimates and decided that this problem has been corrected. This revision has resulted in a decrease in $CH_4$ emissions in the base year by about 3.11 Gg $CO_2$ equivalent (or by about 0.03 per cent) and nearly the same increase in $N_2O$ emissions (2.99 Gg $CO_2$ equivalent, or about 1.06 per cent); altogether, this has led to a decrease in GHG emissions from agriculture by 0.12 Gg $CO_2$ equivalent.

106. The Netherlands plans to examine the possibility of including anaerobic treatment in the methodology for calculating $CH_4$ emissions from manure management and to conduct more research on $N_2O$ emissions from soil, in particular with respect to emissions from leaching and run-off. The ERT supports this intention.

Key categories

*Enteric fermentation – $CH_4$*

107. $CH_4$ emissions have been estimated using a tier 2 method and country-specific EFs for cattle, and a tier 1 method and default EFs (for developed countries) for all other animals, which is in line with the IPCC good practice guidance, as the share in total $CH_4$ enteric fermentation emissions of other livestock categories is 10 per cent or less. Due to the lack of methodology and an EF, emissions from poultry are not estimated.

108. The country-specific EFs vary between 108 and 126 kg $CH_4$/head/year for dairy cattle, between 67 and 74 kg $CH_4$/head/year for non-dairy cattle, and between 35 and 39 kg $CH_4$/head/year for young cattle. Detailed data about feed intake and feed composition have been taken into account in calculating emissions from cattle and the main differences between these EFs and the IPCC default EFs are explained by the different feeding practices.

*Manure management – $CH_4$*

109. For calculating these $CH_4$ emissions the Netherlands has applied the IPCC tier 2 method and country-specific EFs, which is in line with the IPCC good practice guidance. The values of the $CH_4$ IEF for goats are among the highest of reporting Parties. The difference can be explained by the fact that in

the Netherlands goats are mostly kept indoors and are bred for milk production, as goat milk is not included in the Party's milk quota.

*Agricultural soils – $N_2O$*

110. The most important sources of $N_2O$ emissions from soils are direct emissions resulting from the application of synthetic fertilizers and animal manure to soil, and indirect emissions caused by nitrogen leaching and run-off. Country-specific emission factors have been used for the calculations relating to the emissions from animal production and direct $N_2O$ emissions, and IPCC default EFs have been used to calculate indirect $N_2O$ emissions from atmospheric deposition and nitrogen leaching and run-off.

111. In many cases the IEFs are much lower than the IPCC default EFs, and in some instances are the lowest of all reporting Parties. This happens because erroneous AD are reported in the CRF tables. To avoid this problem and enable comparability, the ERT recommends that the Netherlands insert the correct values of AD in the CRF tables of its future submissions. Nitrogen (N) in synthetic fertilizers and N in animal manure should be adjusted to the N that volatilizes as ammonia, and $NO_X$ and (for leaching and run-off) all N from synthetic fertilizers and animal manure should be multiplied by $Frac_{LEACH}$.

112. Emissions from adding sewage sludge to soil have been reported in the CRF tables, but no information is provided in the NIR and the information available in the corresponding protocol appears unclear. Not enough data were provided to the ERT during the review to enable it to verify the calculations of $N_2O$ emissions from this source. The ERT recommends the Netherlands to include more information on these emissions in its future NIRs.

Non-key categories

*Manure management – $N_2O$*

113. In estimating $N_2O$ emissions from manure management, N from ammonia volatilization from manure has been subtracted, and default $N_2O$ EFs for liquid or solid manure have been applied. According to the IPCC good practice guidance, N in manure should not be adjusted to the N that volatilizes as ammonia when estimating emissions from manure management. During the review process the Party provided the ERT with revised estimates for $N_2O$ emissions from manure management for the whole period 1990–2004. The revision resulted in an increase in $N_2O$ emissions in the base year by 0.38 Gg, or by 17.0 per cent (from 2.24 to 2.62 Gg). The ERT reviewed these revised estimates and decided that they are now consistent with the IPCC good practice guidance.

114. The notation key "IE" is used for nitrogen excretion per animal waste management system in many cases but no explanation is provided in the NIR or the CRF tables as to where these emissions are accounted for. The ERT recommends that the Netherlands reconsider the use of the notation keys in its future submissions and, in particular, provide an explanation in the NIR and the CRF tables whenever the notation keys "NE" or "IE" are used.

## 8. Land use, land-use change and forestry

Sector overview

115. In 1990, the LULUCF sector in the Netherlands was a net source of 2,667.3 Gg of $CO_2$, which represents 1.5 per cent of total $CO_2$ emissions. The sector continued to be a net source until 2004 when net emissions of $CO_2$ were equal to 2,598.1 Gg. From 1990 to 2004, net $CO_2$ emissions by the LULUCF sector decreased slightly, by 2.6 per cent. Since this sector was a net source of GHG emissions in 1990, the net emissions[9] from areas of land reported under forest land converted to different land uses

[9] Emissions minus removals.

(cropland, settlements, grassland, wetlands, other land), that is, net emissions from deforestation, need to be added to the Party's assigned amount.

116. The Netherlands has reported carbon stock changes in living biomass only for the forest-related categories and net changes in dead organic matter only for the category forest land remaining forest land, although litter has been assumed to be constant. Net carbon stock changes in mineral soil consequent to land-use changes have been estimated only for conversion to and from other land. $N_2O$ and $CH_4$ emissions have not been estimated.

117. The ERT noted that the time series from 1971 for each land-use change has not been reconstructed, although the Party agreed to a 20-year period for stabilization of carbon stocks after conversion. Moreover, the Netherlands reports on page 146 of the NIR that "for soil carbon stock changes after land use change it is assumed that the average carbon stock in the soil under the new and old land use are the same (Groot et al., 2005)". However, the IPCC good practice guidance for LULUCF on page 3.14 states that "the basic default assumption is that land use changes have a linear impact on soil organic matter for 20 years before a new equilibrium is reached (tier 1). This means that, when a piece of land changes use, then it is followed in that "changed status" ("land converted to . . . " categories) for 20 years, with each year 1/20 of the $CO_2$ and non-$CO_2$ effects reported. Tier 3 modelling approaches may utilize different assumptions". The ERT encourages the Party to make additional efforts to reconstruct the time series of each land-use change and recommends that the Party use linear extrapolation until additional data become available. The ERT also recommends that the Party report carbon stock changes in mineral soils where a land-use change occurs, or report in the NIR data and scientific evidence to show that such a change does not occur.

118. The ERT noted that the data in the land-use change matrix reported by the Party are inconsistent since the methodologies of classification applied to the two maps (1990 and 2000) differ. This inconsistency is clearly shown by the area (9.7 per cent in 10 years) which, according to the matrix reported by the Netherlands, has been converted from settlements to all the other uses (mainly grassland – 6.3 per cent); in practice, this would imply that the country's cities and infrastructure are being abandoned or disrupted by the inhabitants. The ERT recommends that the Party apply the same methodology of classification to each set of land-referred data in order to make it possible to compare them in a consistent manner and thus estimate land-use changes accurately.

Key categories

*Forest land remaining forest land – $CO_2$*

119. The Netherlands has estimated net carbon stock changes in litter and in soil organic matter using a tier 1 method (i.e. assuming that the stocks do not change) although the category has been identified as a key category. The ERT encourages the Party to estimate net carbon stock changes for these pools using a higher-tier method.

120. The Netherlands reports the areas of "trees outside forest" and "heather" as subdivisions of the forest land category; however, it reports in the NIR that the areas of "trees outside forest" and "heather" do not match the definition of forest land of the IPCC good practice guidance for LULUCF. The ERT therefore recommends that the Party allocate these areas to an appropriate category.

Non-key categories

*Land converted to forest land – $CO_2$*

121. The ERT noted that the IEF reported for increases in carbon stock in living biomass grows continuously and rapidly along the time series up to the unrealistic value of 20.25 tonnes of carbon per hectare (i.e. circa 80 $m^3$ of wood increment per hectare!) for the year 2004. The ERT requests the Netherlands to revise its carbon stock change estimates for living biomass in afforested land.

Category not considered in Party's key category analysis

*Forest land converted to other land-use categories (deforestation) – $CO_2$*

122. As requested in table 5.4.1 and explained in bullet six of section 5.4.3 of the IPCC good practice guidance for LULUCF, the net emissions from deforestation are part of the qualitative criteria that should be applied in a key category analysis. The Netherlands did not apply this criterion in its key category analysis.

123. The ERT noted that in the official documents provided by the Netherlands for its initial report under the Kyoto Protocol eight different values for the net $CO_2$ emissions from deforestation are reported:

(a) Initial report under the Kyoto Protocol: 280.212 Gg $CO_2$;

(b) CRF (table 5): 369.673 Gg $CO_2$;

(c) Revised CRF (sum of tables 5.C and 5.F): 647.482 Gg $CO_2$;

(d) NIR (page 150): 125.000 Gg $CO_2$;

(e) Updated national system for LULUCF (table 2.2): 216.000 Gg $CO_2$;

(f) Updated national system for LULUCF (table 4.2): –124.670 Gg $CO_2$;

(g) Final response to ERT,[10] 1 June 2007 (page 16): 487.562 Gg $CO_2$;

(h) Final response to ERT,[11] 1 June 2007, Annex 1 (page 18): 400.330 Gg $CO_2$.

124. These estimates vary greatly even though the same methodology and data set were used for calculating all of them. The ERT considers that the very high inconsistency of the data reported in different documents, and even in different parts of the same document, demonstrates a serious problem in the QA/QC procedures of this sector.

125. The ERT noted that the inconsistency of the land-use change matrix caused high overestimation of changes in land uses throughout the different classes and, consequently, of the deforested area.[12] Moreover, the ERT noted that the reporting of activity data does not include the time series of deforested areas from 1971 to 1990, which has resulted in carbon stock changes in these areas not being estimated for the base year. Finally, the ERT noted that each area under deforestation has been reported under forest land converted to grassland instead of under the relevant category of conversion. These and some other problems (see the next paragraph) resulted in the ERT's deciding to calculate and apply an adjustment for net $CO_2$ emissions from deforestation (see section II.C) to ensure as far as possible that these emissions are not overestimated.

126. The ERT noted that in the resubmitted CRF tables the Netherlands had increased its emission factor for losses in living biomass from –55.79 MgC/ha to –70.99 MgC/ha. The ERT judges this new EF to be too high considering, for instance, the data reported by the Netherlands to the Food and Agriculture Organization of the United Nations (FAO) for the Forest Resource Assessment (FRA) 2005[13] and those

[10] This refers to the document sent by the Netherlands to the ERT on 1 June 2007 as the Netherlands' response to the potential problems identified by the ERT during the in-country visit.

[11] This refers to the document sent by the Netherlands to the ERT on 1 June 2007 as the Netherlands' response to the potential problems identified by the ERT during the in-country visit.

[12] In the official document *Updates of the Dutch National System for Greenhouse Gas Reporting of the LULUCF Sector* a tentative exercise to correct the estimate of deforested area of the land-use change matrix shows an error of circa 150 per cent.

[13] *Global Forest Resource Assessment 2005, Netherlands*, Country Report 028, Rome, 2004.

contained in the Bosdata report entitled *Aspecten van bos en bosbeheer in Nederland: Resultaten Houtoogststatistiek 1995–1999.*[14] The ERT therefore requests the Netherlands to reconsider the new EF.

## 9. Waste

### Sector overview

127. In the base year, GHG emissions from the waste sector amounted to 12,815.4 Gg $CO_2$ equivalent, which was 6.0 per cent of total national emissions. In 2004, the waste sector contributed 3.3 per cent to total national emissions in the Netherlands and emissions from the sector had decreased by 43.4 per cent since 1990. This is mainly attributed to increased recycling activities, a decrease in the amount of organic waste disposed in landfills and increased methane recovery from landfills. In 2004, solid waste disposal on land contributed 89.8 per cent of the total emissions from the sector, while wastewater handling contributed 8.6 per cent. Emissions from composting, a source category not required by the Revised 1996 IPCC Guidelines, contributed 1.6 per cent of the total emissions of the sector. Emissions from waste incineration are included in the energy sector. $CH_4$ emissions from solid waste disposal on land were identified as a key category on both the level and the trend assessments (tiers 1 and 2).

128. The CRF tables include estimates of all direct gases and all sources of emissions except for $N_2O$ emissions from industrial wastewater. Moreover, non-methane volatile organic compounds (NMVOCs), $NO_X$, sulphur dioxide ($SO_2$) and carbon monoxide (CO) emissions from the sector have been estimated.

129. No recalculations have been carried out since the previous submission.

130. The uncertainties for AD and EFs are mainly based on expert judgement. The Party is encouraged to justify the choice of these uncertainties in its future submissions.

131. The Party relies mainly on activity data collected by SenterNovem for solid waste and incineration and on Statistics Netherlands for data on wastewater handling. Other sources of data are also used as a check for these sources. The Party is recommended to formalize this check as a source-specific QC procedure in the QA/QC plan.

### Key categories

#### *Solid waste disposal on land – $CH_4$*

132. In estimating $CH_4$ emissions from this source category, the Party has assumed that all sites have been managed since 1945. During the review, the ERT suggested that this assumption may not be justified since the monitoring protocol (for $CH_4$ from managed landfill sites) clearly states that before 1970 sites were not managed in accordance with the definition of managed landfills. Moreover, the same protocol states that *most* landfills have been managed from 1970 onwards. The ERT recommended the Party to provide documentation to identify the management practices in sites prior to and post-1970. In response, the Party provided a translation of a report[15] which states that the method of "controlled tipping" became common practice in the Netherlands after 1930, resulting in waste being landfilled in defined layers and covered with ashes, soil or sand such as dirt from street sweeping. Moreover, the Party provided a copy of a sample permit that shows the management practices for landfills constructed after 1970, and follows the code of practice for landfilling that was issued in 1970. The Party also stated that the text in the monitoring protocol (to the effect that before sites 1970 were not managed in accordance with the definition of managed landfills) was most probably based on an old report from the early 1970s, long before the IPCC definition of managed landfills was formulated. The Party is therefore of the view that the definition of "controlled" in that report cannot be compared with the term "managed"

[14] Bosdata report entitled Aspecten van bos en bosbeheer in Nederland: Resultaten Houtoogststatistiek 1995–1999, HOSP, Bosdata nr 4, 2000.

[15] Background information to the *Advice for Long-Term Follow Up for Closed Landfill Sites*, NAVOS, April 2005.

according to the IPCC definition, and it is accordingly considering revising the text in the monitoring protocol for its forthcoming submissions. The ERT concluded that the documents provided by the Party are sufficient to justify the use of an MCF value equal to unity associated with managed solid waste disposal sites (SWDS) according to the IPCC definitions, since the waste was disposed in a controlled manner and was covered.

133. In estimating $CH_4$ emissions from solid waste disposal on land, the normalization factor ($A = \frac{1-e^{-k}}{k}$) has not been used in the first order decay (FOD) model, contrary to the IPCC good practice guidance. This normalization factor is introduced to correct for the mathematical error in the model. The ERT recommended the Party to use this factor in the model. The Party explained that the parameters used in the model were derived from a validation study where the model was fit to the actual annual generation of methane. The estimated parameters for methane rate constant (k) and the degradable organic carbon dissimilated (DOCf) therefore compensate for the mathematical error in the model. The ERT concluded that this explanation was sufficient and that the use of the normalization factor in this case is not needed.

134. Equation 3 in the monitoring protocol for estimating emissions from SWDS is not correct. During the review process, the Party acknowledged that an error had occurred during the translation of the protocol. The Party is recommended to correct the equation for its future submissions.

135. Measurements conducted to determine the share of methane in recovered landfill gas during the period 2002–2004 showed values below 60 per cent. According to the IPCC good practice guidance of 2000, this value should not be used as the share of methane in landfill gas generated. During the review, the Party clarified that the lower values for methane fraction in landfill gas were only used to estimate methane in the recovered biogas and not for that generated. The Party is recommended to add further explanation on this issue in its future submissions.

136. The NIR states that emissions from this source category decreased between 1990 and 2004 because of (a) a decrease in the amount of solid waste disposed of in landfills as a result of increased recycling, (b) an increase in the recovery of methane from landfills and (c) a decrease in the amount of organic waste disposed of in landfills. The NIR does not, however, provide documentation to support this reasoning, and this creates a transparency problem. The Party is encouraged to provide more information to support the explanation of the trend in its future submissions.

137. The methane rate constant (k) value is assumed to be 0.094 until 1990, and then decrease to 0.069 in 1994. The monitoring protocol for $CH_4$ emissions from landfills mentions that the 0.094 value was based on a local study. During the review, the Party clarified that the change after 1990 is due to the fact that the organic waste fraction is decreasing due to recycling policies adopted since the early 1990s and that the change in the k value was based on expert judgement. The Netherlands is recommended to provide additional explanation for the reasons behind this assumption in the NIR of its next submission.

138. During the review, the Party clarified that contaminated soils are not included in the amount of waste disposed to landfills after 1992. The Party is recommended to investigate the composition of these soils in order to verify the fraction of organic carbon present and to include this fraction in the estimation of $CH_4$ emissions.

139. The degradable organic carbon (DOC) values reported in the NIR are based on the composition of all waste types, including construction and demolition waste. The amount of waste disposed at SWDS reported in the CRF should exclude construction and demolition waste and other inorganic waste. The Netherlands is recommended to include the estimate of DOC excluding construction and demolition waste and to follow the guidelines included in the CRF tables.

140. In CRF table 6.A, the oxidation factor and the fraction of methane in landfill gas are not correctly reported. The oxidation factor is reported to be 0.58 instead of the value of 0.1 used in the NIR, while the fraction of methane in landfill gas is reported to be 0.05 instead of the value used in the NIR of 0.6. These values should be correctly reported.

141. The values of DOC degraded reported in the CRF tables need to be corrected. The percentage share should be related to the degradable organic carbon and not to the amount of municipal solid waste.

142. The Party has assumed a value of 58 per cent for the DOC dissimilated but the basis for adopting this value is not justified in the NIR. During the review, the Party provided a national study which was used as the source of this parameter. The Party is encouraged to explain the reason for assuming this value and to cite the reference in its future submissions.

Non-key categories

*Wastewater handling – $CH_4$ and $N_2O$*

143. The activity data show that the quantities of wastewater treated decreased sharply in and after 2003. The Party explained this decrease as being due to the dry weather conditions during the year 2003. However, no explanation was given for exactly the same volume of treated wastewater in 2004. During the review process, the Party acknowledged that there was a mistake in the AD for 2004 and agreed to correct this in its future submissions.

144. The rationale for the selection of emission factors for $CH_4$ and $N_2O$ is not sufficiently explained, either in the NIR or in the relevant protocol. During the review, the Party provided background information on the sources of these factors. The Party should provide this explanation in the NIR of its future submissions.

145. The assumed split between households connected to septic tanks and those connected to the sewer system is not explained clearly in the NIR. During the review the Party provided background information which explained how the estimate for the amount of wastewater treated in septic tanks was arrived at. This explanation should be included in the Netherlands' future NIRs.

*Other – $CH_4$ and $N_2O$ from composting*

146. The Party is commended for reporting emissions from composting, which is not a source category in the Revised 1996 IPCC Guidelines. However, emissions from the application of compost to land are not reported elsewhere in the inventory. Since composting activities have been increasing in the Netherlands, the ERT recommends that the Party estimate and report emissions from the application of compost to land.

## C. Adjustments

147. The ERT identified the need for one adjustment in the LULUCF sector for the base year, which is an adjustment for the estimate of net $CO_2$ emissions from deforestation. The following sections describe the adjustment in accordance with the requirements defined in the annex to decision 22/CMP.1.[16] Because of space constraints, only the key components of the methodology and calculation of the adjustment are shown in this section; a full description of the adjustment is provided in annex II to this report.

### 1. The original estimate

148. In its initial report, the Netherlands provided an estimate for net $CO_2$ emissions from deforestation of 280.212 Gg $CO_2$. On 1 June 2007, after the ERT's in-country visit, the Netherlands

[16] See paragraph 83 in decision 22/CMP.1 (page 66 in FCCC/KP/CMP/2005/8/Add.3).

submitted a complete set of revised CRF tables and, based on these tables, revised the value for net $CO_2$ emissions from deforestation from 280.212 Gg $CO_2$ to 487.562 Gg $CO_2$.

2. The underlying problem

149. In various documents provided with the inventory submission or during the review process, the Netherlands provided eight different values for net $CO_2$ emissions from deforestation in the base year, ranging from –124.670 Gg $CO_2$ to 647.482 Gg $CO_2$ (see paragraph 123). Given this high variability of the values for what is essentially the same parameter, it was a challenge for the ERT to understand how the estimate was made and whether it was correct. Having analysed the methodology and the data set used, the ERT came to the conclusion that, in summary,[17] the estimate of net $CO_2$ emissions from deforestation made by the Netherlands deviates from the IPCC good practice guidance and the IPCC good practice guidance for LULUCF because of: (a) the overestimation of activity data that have been derived from an inconsistent land-use change matrix; (b) the failure to account for so-called inherited net emissions (i.e. net emissions occurring in 1990 on the areas deforested in the previous 19 years, from 1971 to 1989); and (c) the inconsistent value of the EF for decreases of carbon stock in the living biomass pool. All these factors have led to $CO_2$ net emissions from deforestation being overestimated.

3. The rationale for the adjustment

150. At the end of the in-country visit, the ERT informed the Netherlands that there was a potential problem in the estimate of net $CO_2$ emissions from deforestation. The ERT formulated the problem as follows*:* "The estimates of net carbon stock changes of the categories relating to forest land converted to different land uses (cropland, settlements, grassland, wetlands, other land) are affected by two main problems related to the measurement and reporting of the activity data*:* incoherence between some elements in the methodologies of map classification (e.g. definition of land categories) applied for the 1990 and the 2000 maps, which resulted in an inconsistency of the land-use change matrix data; absence of a time series of deforested areas from 1971, which resulted in non-estimation of carbon stock changes in these areas for the base year".

151. Considering the shortness of the time available to prepare a comprehensive revision of the whole estimate, the ERT suggested that the Netherlands address the problem in the following manner:

(a) Reconstructing the time series of deforested areas from 1971 by a linear extrapolation of the values from 1990 back to 1971;

(b) Discounting the area reported under the categories relating to forest land converted to different land uses (cropland, settlements, grassland, wetlands, other land) on the basis of additional, conservative assumptions;

(c) Using the National Forest Inventory (NFI) data for carbon stock changes in living biomass;

(d) Using the data on litter that have been collected in 1990 in order to report carbon stock changes in this pool as a consequence of deforestation.

152. In response to this notification of a potential problem, the Netherlands provided, within the required six-week period, a revision of its estimate and additional information. The revised estimate for net $CO_2$ emissions from deforestation (used for the calculation of the assigned amount) was 487.562 Gg $CO_2$, whereas the original estimate, used by the Netherlands in the calculation of the assigned amount in the initial report, was 280.212 Gg $CO_2$.

[17] See annex II for a full description of these issues.

153. Having reviewed the revised estimate and all the additional information provided, the ERT concluded that its recommendations to the Netherlands had not been followed sufficiently to bring the estimate into full compliance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. In particular, the following have not been done in the Netherlands' revised estimate: (a) the time series of deforested areas from 1971 to 1990 has not been reconstructed and, consequently, inherited emissions/removals have not been accounted for; and (b) the very high uncertainty of the estimate of deforested area, due to the inconsistency of the land-use change matrix, has been not reduced by the inclusion of either additional assumptions or discount factors in the recalculation process. Moreover, the revised estimate shows an additional problem – the high EF for decrease in the living biomass pool. The ERT therefore decided to calculate and apply an adjustment.

4. The assumptions, data and methodology used to calculate the adjustment

154. Since the estimate of net $CO_2$ emissions from deforestation is a sum of many LULUCF subcategories, the ERT decided that the adjusted estimate for $CO_2$ net emissions should be provided at the level of the category forest land converted to other land-use categories, as reported in CRF table 5 (column B, row 30). Since data are available to make it possibly to apply the default IPCC tier 1 method, and this method is the first one in the hierarchical order reported in table 1 of the annex to decision 20/CMP.1, the ERT decided to apply the default IPCC tier 1 method.

155. The adjustment is complex because several parameters (sources and sinks under different categories), not just one, need to be changed. The changed parameters should then be aggregated in order to arrive at an adjusted estimate for total net $CO_2$ emissions from deforestation. The adjustment was calculated in three steps*:* recalculation of activity data; recalculation of the EF for decreases in living biomass; and recalculation of inherited net emissions. For each of these steps, the ERT used documents and information officially submitted by the Netherlands. In using such documents and information, the ERT made some assumptions aiming (a) to ensure a sound and consistent approach, and (b) to ensure that the resulting estimate is conservative. A detailed description of the assumptions, data and methodology is provided in annex II to this report.

5. The adjusted estimate

156. Table 5 presents the results of ERT's calculation, including the original estimate as reported by the Party, the adjusted estimate as calculated by the ERT, and the impact of the adjustment on the Netherlands' total GHG emissions in the base year. As shown, the adjusted (conservative) estimate for net $CO_2$ emissions from deforestation in the base year amounts to 38.676 Gg $CO_2$, compared to 487.562 Gg $CO_2$ presented by the Netherlands as a revised estimate after the in-country visit (and to 280.212 Gg $CO_2$ used originally in the initial report for the calculation of the assigned amount). The application of the adjustment leads to a decrease in the base year emissions by 448.886 Gg $CO_2$, or 0.2 per cent of total base year emissions.

6. Conservativeness of the ERT's calculation of the adjustment

157. As described above, some assumptions have been made in order to ensure that the recalculated estimate is conservative. The main assumptions relating to conservativeness are:

(a) The gross deforestation annual rate has been taken close (500 ha vs 494 ha) to the net deforestation annual rate as reported by the National Forest Inventory;

(b) Removals from deforested area belonging to the "trees outside forest" subcategory have been accounted for;

(c) In reconstructing the time series the ERT assumed a constant rate of gross deforestation for the whole period 1971–1990, although forest inventory data[18] show a higher rate of net deforestation for the period 1984–1990.

158. A conservativeness factor of 0.73 has been applied at the aggregate level for the determined total net $CO_2$ emissions from deforestation. The ERT therefore judges that the resulting adjusted value is very likely to be conservative.

**Table 5. Calculation of adjustment for net $CO_2$ emissions from deforestation**

| Parameter/Estimate | Value | Unit | Source |
|---|---|---|---|
| Category: V. LULUCF | | | |
| Party estimate of $CO_2$ net emissions from deforestation | 487.562 | Gg $CO_2$ | Party's submission of revised estimates after in-country visit |
| Calculated estimate for $CO_2$ net emissions from deforestation | 52.981 | Gg $CO_2$ | Recalculated by the ERT on the basis of Party's data and applying default IPCC tier 1 method (see annex II) |
| Conservativeness factor | 0.73 | | Table 3.a of annex III to the Technical Guidance for Adjustments attached to decision 20/CMP.1 |
| Adjusted conservative estimate for $CO_2$ net emissions from deforestation | 38.676 | Gg $CO_2$ | |
| Total aggregate GHG emissions in the base year (including deforestation) as reported by Party | 213,483.384 | Gg $CO_2$ eq. | Party's submission of revised estimates after in-country visit |
| Total aggregate GHG emissions in the base year (including deforestation) after application of adjustment | 213,034.498 | Gg $CO_2$ eq. | ERT's calculation |
| Difference between original and adjusted aggregate GHG total in the base year | 448.886<br>0.2 | Gg $CO_2$ eq.<br>% | ERT's calculation |

## D. Calculation of the assigned amount

159. The assigned amount pursuant to Article 3, paragraphs 7 and 8, has been calculated in accordance with the annex to decision 13/CMP.1.

160. The Netherlands' base year is 1990 and the Party has chosen 1995 as the base year for HFCs, PFCs and $SF_6$. The Netherlands' quantified emission limitation is 92 per cent as included in Annex B to the Kyoto Protocol. However, as the Netherlands is part of the European Community, whose member States will meet their reduction commitment jointly in accordance with Article 4 of the Kyoto Protocol, the Netherlands' quantified emission limitation to be applied under the Kyoto Protocol is 94 per cent. Accordingly, the Netherlands' assigned amount is calculated based on the Party's Article 4 commitment.

161. Land-use change and forestry constituted a net source of GHG emissions in 1990 and the Party's aggregate anthropogenic $CO_2$ equivalent emissions by sources minus removals by sinks in 1990 from land-use change (deforestation) have been included in the emissions of the base year or period for the purpose of calculating the assigned amount.

162. Based on the Netherlands' base year emissions including land-use change – 214,588,451 tonnes $CO_2$ equivalent – and its Kyoto Protocol target – 94 per cent, the Party calculated and presented in the initial report its assigned amount as 1,008,565,720 tonnes $CO_2$ equivalent. The ERT has reviewed the calculation and confirms that the assigned amount pursuant to Article 3, paragraphs 7 and 8, has been calculated in accordance with the annex to decision 13/CMP.1.

[18] *Aspecten van bos en bosbeheer in Nederland: Resultaten Houtoogststatistiek 1995–1999.* HOSP, Bosdata nr. 4, 2000.

163. In response to inventory issues identified during the review, the Party submitted revised estimates of its base year inventory, which resulted in a recalculation of the assigned amount. Based on the revised estimates, the Party calculates its assigned amount to be 1,003,371,907 tonnes $CO_2$ equivalent. The ERT has reviewed the revised estimate and confirms that the assigned amount pursuant to Article 3, paragraphs 7 and 8, has been calculated in accordance with the annex to decision 13/CMP.1.

164. However, as described in section II.C, the ERT decided to calculate and apply an adjustment for one component of the assigned amount – net $CO_2$ emissions from land-use change (deforestation). The adjusted value for net $CO_2$ emissions from deforestation is 38.676 Gg $CO_2$ compared to 487.562 Gg $CO_2$ presented by the Netherlands as a revised estimate after the in-country visit (and to 280.212 Gg $CO_2$ used originally in the initial report for the calculation of the assigned amount). Accordingly, the ERT recalculated the assigned amount and the adjusted value of the assigned amount is 1,001,262,141 tonnes $CO_2$ equivalent, which is 0.2 per cent lower than the revised estimate made by the Party (1,003,371,907 tonnes $CO_2$ eq.).

### E. Calculation of the commitment period reserve

165. The calculation of the required level of the commitment period reserve is in accordance with paragraph 6 of the annex to decision 11/CMP.1.

166. Based on its calculated assigned amount – 1,008,565,720 tonnes $CO_2$ equivalent – the Netherlands calculated its commitment period reserve as 90 per cent of the assigned amount, or 907,709,148 tonnes $CO_2$ equivalent. The ERT has reviewed the calculation and confirms that the commitment period reserve has been calculated in accordance with the annex to decision 11/CMP.1.

167. In response to inventory issues identified during the review, the Party submitted revised estimates of its base year inventory, which resulted in a recalculation of the commitment period reserve. Based on the revised estimates, the Party calculates its commitment period reserve to be 903,034,718 tonnes $CO_2$ equivalent. The ERT has reviewed the revised estimate and confirms that the commitment period reserve has been calculated in accordance with the annex to decision 11/CMP.1.

168. However, as described in section II.C, the ERT decided to calculate and apply an adjustment for one component of the assigned amount – for net $CO_2$ emissions from land-use change (deforestation). Accordingly, the ERT also recalculated the commitment period reserve and its adjusted value is 901,135,927 tonnes $CO_2$ equivalent, which is 0.2 per cent lower than the revised estimate made by the Party (903,034,718 tonnes $CO_2$ eq.).

### F. National registry

169. The Party has provided most of the information on the national registry system as required by the reporting guidelines under Article 7, paragraphs 1 and 2, of the Kyoto Protocol (decision 15/CMP.1). The information provided is transparent and in accordance with the reporting requirements. Table 6 summarizes the information on the mandatory reporting elements on the national registry system, as stipulated by decisions 13/CMP.1 and 15/CMP.1.

170. The ERT noted that most of the information provided in the initial report relates to the registry that has been successfully in operation for about two years under the EU ETS. The registry required under the Kyoto Protocol was not yet operational at the time of the in-country visit (April 2007). However, the ERT was informed that the software developer will upgrade the existing version of the software[19] to accommodate the additional functionalities required by the Kyoto Protocol. Most of the procedures and descriptions provided in the initial report should therefore be fully applicable to the new version that is currently under development.

[19] The Netherlands uses the Greta software developed in the United Kingdom within a joint project of 16 EU member States, including the Netherlands.

**Table 6. Summary of information on the national registry system**

| Reporting element | Provided in the initial report | Comments |
|---|---|---|
| **Registry administrator** | | |
| Name and contact information | Yes | |
| **Cooperation with other Parties in a consolidated system** | | |
| Names of other Parties with which the Netherlands cooperates, or clarification that no such cooperation exists | Yes | The Party cooperates with other EU member States within the European CITL; however, this cooperation does not take the form of a registry operating in a consolidated system with other Parties. |
| **Database structure and capacity of the national registry** | | |
| Description of the database structure | Yes | |
| Description of the capacity of the national registry | Yes | Covered in the independent assessment report (IAR) [a] |
| **Conformity with data exchange standards (DES)** | | |
| Description of how the national registry conforms to the technical DES between registry systems | Yes | Covered in the IAR |
| **Procedures for minimizing and handling of discrepancies** | | |
| Description of the procedures employed in the national registry to minimize discrepancies in the transaction of Kyoto Protocol units | Yes | Current procedures are for the EU CITL. The same approach is used for the registry under the Kyoto Protocol. |
| Description of the steps taken to terminate transactions where a discrepancy is notified and to correct problems in the event of a failure to terminate the transaction | Yes | The required functionality is implemented in the new software version. |
| **Prevention of unauthorized manipulations and operator error** | | |
| An overview of security measures employed in the national registry to prevent unauthorized manipulations and to prevent operator error | Yes | The procedures established for the registry under the EU ETS are applied to the Kyoto Protocol registry. |
| An overview of how these measures are kept up to date | Yes | The procedures established for the registry under the EU ETS are applied to the Kyoto Protocol registry. |
| **User interface of the national registry** | | |
| A list of the information publicly accessible by means of the user interface to the national registry | No | Information will be covered by the new version of the software that is being developed. |
| The Internet address of the interface to the Netherlands national registry | Yes | |
| **Integrity of data storage and recovery** | | |
| A description of measures taken to safeguard, maintain and recover data in order to ensure the integrity of data storage and the recovery of registry services in the event of a disaster | Yes | The procedures established for the registry under the EU ETS are applied to the Kyoto Protocol registry. |
| **Test results** | | |
| The results of any test procedures that might be available or developed with the aim of testing the performance, procedures and security measures of the national registry undertaken pursuant to the provisions of decision 19/CP.7 relating to the technical standards for data exchange between registry systems | No | A full regression test has been conducted for the existing version. The new version has been tested during the IAR process and the status was evaluated to be green (no significant concerns about the state of registry readiness are identified). |

[a] Pursuant to decision 16/CP.10, once registry systems become operational, the administrator of the international transaction log (ITL) is requested to facilitate an interactive exercise, including with experts from Parties to the Kyoto Protocol not included in Annex I to the Convention, demonstrating the functioning of the ITL with other registry systems. The results of this exercise will be included in an independent assessment report (IAR). They will be also included in its annual report to the CMP.

171. During the in-country visit, the ERT was informed that the virtual private network (VPN) connection had been completed, while the secure sockets layer (SSL) connection was still under development. The SSL connection and the web service communication were completed and tested during the technical assessment of the national registry.

172. The ERT was also informed about the procedures and security measures to minimize discrepancies, terminate transactions and correct problems, and minimize operator error that are currently used for the European Community independent transaction log (CITL). The procedures and security measures included access via user name and password, as set out in the EU Registry Regulations; control of the actions that can be performed by a user through a permissions system, hence preventing unauthorized access to restricted actions; and the recording of all actions performed by means of audits. The same procedures and security measures are used in the new version of the software, which was successfully tested during the technical assessment of the national registry.

173. The ERT acknowledged the effort made by the Netherlands to put in place these adequate procedures and security measures, especially the geographical separation of the production and backup environments and the firewall that is in place. For example, the operational server for the registry is located in the town of Apeldoorn, whereas the backup server is in Amsterdam. There are also procedures to recover data and minimize the loss of data even when both servers are lost. The ERT gained the overall impression that the Party attaches adequate importance, and has allocated adequate resources, including human resources, to the development, operation and maintenance of the registry.

174. The ERT took note of the results of the technical assessment of the national registry, including the results of standardized testing, as reported in the independent assessment report (IAR) that was forwarded to the ERT by the UNFCCC secretariat as the administrator of the international transaction log (ITL) on 19 September 2007 as well as of the additional information forwarded to the ERT by the Netherlands on 21 September 2007.

175. The ERT reiterated the main findings of the IAR, including that the registry has fulfilled all of its obligations regarding conformity with the data exchange standards (DES). These obligations include having adequate transaction procedures, adequate security measures to prevent and resolve unauthorized manipulations, and adequate measures for data storage and registry recovery.

176. Based on the results of the technical assessment, as reported in the IAR, the ERT concluded that the Netherlands' national registry is fully compliant with the registry requirements as defined by decisions 13/CMP.1 and 5/CMP.1, noting that registries do not have obligations regarding operational performance or public availability of information prior to the operational phase.

### G. Land use, land-use change and forestry parameters and election of activities

177. Table 7 shows the Party's choice of parameters for forest definition as well as the accounting method for Article 3, paragraph 3, activities in accordance with decision 16/CMP.1. These values are within the agreed values in decision 16/CMP.1 and consistent with those reported to the FAO. The Netherlands has not selected any activities under Article 3, paragraph 4 of the Kyoto Protocol.

178. The ERT judges the national system for LULUCF reporting to be in line with the Kyoto Protocol requirements even though it found an inconsistency in the land-use change matrix and errors in some calculations in the LULUCF sector. The ERT's judgement is based on the fact that data collection and management seem to be correctly and appropriately done. However, some problems exist in the accounting methods in the LULUCF sector, which is not in line with the IPCC good practice guidance for LULUCF (see paragraphs 126, 147–158).

**Table 7. Selection of LULUCF parameters**

| **Parameters for forest definition** | | |
|---|---|---|
| Minimum tree cover | 20% | |
| Minimum land area | 0.5 ha | |
| Minimum tree height | 5 m | |
| **Elections for Article 3, paragraphs 3 and 4, activities** | | |
| **Article 3, paragraph 3 activities** | **Election** | **Accounting period** |
| Afforestation and reforestation | Mandatory | Commitment period |
| Deforestation | Mandatory | Commitment period |
| **Article 3, paragraph 4 activities** | | |
| Forest land management | Not elected | |
| Cropland management | Not elected | |
| Grazing land management | Not elected | |
| Revegetation | Not elected | |

# III. Conclusions and recommendations

## A. Conclusions

179. The ERT concludes that the information provided by the Netherlands in its initial report is complete and is submitted in accordance with the provisions of paragraphs 5, 6, 7 and 8 of the annex to decision 13/CMP.1, section I of the annex to decision 15/CMP.1 and other relevant decisions of the CMP; that the assigned amount pursuant to Article 3, paragraphs 7 and 8, has been calculated in accordance with the annex to decision 13/CMP.1, and is consistent with the revised inventory estimates as submitted and reviewed; and that the calculation of the required level of the commitment period reserve is in accordance with paragraph 6 of the annex to decision 11/CMP.1, and the LULUCF definitions are within the agreed range. At the same time, the ERT notes that it has applied an adjustment to Party's estimates of $CO_2$ emissions from deforestation which has resulted in changes in the values of the assigned amount and the commitment period reserve.

180. Overall, the Netherlands' inventory is of good quality and is generally consistent with the UNFCCC reporting requirements and IPCC good practice. Its national system meets the requirements for implementation of the general functions as well the specific functions of inventory planning, inventory preparation and inventory management.

181. The NIR is, in general, well prepared but it does not provide enough information to enable the ERT fully to assess the inventory. The ERT came to the conclusion that the Netherlands' monitoring protocols do not provide enough information on the background data and intermediate parameters, and that the data presented are in some cases inconsistent with the data in the NIR. The ERT recommends the Netherlands to revise the report structure, either by increasing the amount of information given in the NIR or by redesigning the annexes. The large amount of confidential data (mainly in the industrial processes sector) meant that the ERT had only limited opportunity to assess how far the emission estimates for these categories conform to the inventory guidelines.

182. The assigned amount pursuant to Article 3, paragraphs 7 and 8, has been calculated in accordance with the annex to decision 13/CMP.1. The calculation of the required level of the commitment period reserve is in accordance with paragraph 6 of the annex to decision 18/CP.7. The Party's choice of parameters for forest definition, and its elections for Article 3, paragraphs 3 and 4, activities, are in accordance with decision 16/CMP.1. However, the ERT identified the need for

adjustment for one component of the assigned amount –$CO_2$ emissions from land-use change (deforestation). Accordingly, the ERT also calculated new values for the assigned amount (1,001,262,141 tonnes $CO_2$ eq.) and the commitment period reserve (901,135,927 tonnes $CO_2$ eq.) (see also section III.C below).

183. Based on the results of the in-country review visit and the technical assessment, as reported in the IAR, the ERT concluded that the Netherlands's national registry is fully compliant with the registry requirements as defined by decisions 13/CMP.1 and 5/CMP.1.

184. The Netherlands has defined forests within the agreed values in decision 16/CMP.1 and consistent with those reported to the FAO. The Netherlands has not chosen any activities under Article 3, paragraph 4, of the Kyoto Protocol.

### B. Recommendations

185. In the course of the review, the ERT formulated a number of recommendations relating to the completeness and transparency of the information presented in the Netherlands' initial report. Many recommendations have been implemented during the review process and most potential problems that could have led to an overestimation of base year emissions have been solved. The key remaining recommendations[20] are that the Netherlands:

(a) Provide more detail in the NIR of its future submissions, as well as greater transparency;

(b) Improve the transparency of the inventory by revising the report structure, either by increasing the amount of information given in the NIR or by redesigning the annexes to increase transparency and consistency with the NIR;

(c) Improve the archiving procedures of the inventory in order that inventory data and information can be accessed in a fully centralized way.

186. The Party responded to most of the ERT's requests and clarified potential problems in a timely and professional manner. However, the ERT could not reach agreement with the Party on the method for estimating emissions from deforestation, and an adjustment was therefore conducted. The LULUCF sector will need to be considered in greater depth in the Party's forthcoming submission.

### C. Adjustments

187. The ERT identified the need for one adjustment in the LULUCF sector for the base year, which is an adjustment for the estimate of net $CO_2$ emissions from deforestation. The adjusted conservative estimate for net $CO_2$ emissions from deforestation in the base year amounts to 38.676 Gg $CO_2$, compared to 487.562 Gg $CO_2$ presented by the Netherlands as a revised estimate after the in-country visit (and to 280.212 Gg $CO_2$ used originally in the initial report for the calculation of the assigned amount). The application of the adjustment leads to a decrease in estimated base year emissions by 448.886 Gg $CO_2$ or by 0.2 per cent of total base year emissions.

188. Accordingly, the ERT has recalculated the assigned amount and the new value of the assigned amount is 1,001,262,141 tonnes $CO_2$ equivalent, which is 0.2 per cent lower than the revised estimate made by the Party (1,003,371,907 tonnes $CO_2$ eq.). The ERT has also recalculated the commitment period reserve and its new value is 901,135,927 tonnes $CO_2$ equivalent (compared to the revised estimate made by the Party, 903,034,718 tonnes $CO_2$ eq.).

[20] For a complete list of recommendations, the relevant sectoral sections of this report should be consulted.

189. In its communication to the ERT on 17 October 2007, the Netherlands informed the ERT that it has decided to accept the adjustment as applied by the ERT.

## D. Questions of implementation

190. No questions of implementation were identified by the ERT during the initial review.

Annex I

# Documents and information used during the review

## A. Reference documents

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

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

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

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

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

UNFCCC. Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol. FCCC/KP/CMP/2005/8/Add.3. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

UNFCCC. Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol. FCCC/KP/CMP/2005/8/Add.2. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

UNFCCC. Guidelines for review under Article 8 of the Kyoto Protocol. FCCC/KP/CMP/2005/8/Add.3. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

UNFCCC secretariat. Status report for the Netherlands. 2006. Available at <http://unfccc.int/resource/docs/2006/asr/nld.pdf>.

UNFCCC secretariat. Synthesis and assessment report on the greenhouse gas inventories submitted in 2006. FCCC/WEB/SAI/2006. Available at <http://unfccc.int/resource/docs/webdocs/sai/sa_2006.pdf>.

UNFCCC secretariat. Report of the individual review of the greenhouse gas inventory of the Netherlands submitted in 2005. FCCC/ARR/2005/NLD. Available at <http://unfccc.int/resource/docs/2006/arr/nld.pdf>.

UNFCCC secretariat. Independent assessment report of the national registry of the Netherlands. Reg_IAR_NL_2007_1. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

## B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Dick Both (SenterNovem) and Mr. Harry Vreuls (SenterNovem) including additional material on the methodology and assumptions used. The following additional information was provided by the Netherlands during the review.[1]

Amstel AR van, Olivier JGJ and Ruyssenaars PG (eds). 2000. *Monitoring of Greenhouse Gases in the Netherlands: Uncertainty and Priorities for Improvement*, Proceedings of a National Workshop held in Bilthoven, the Netherlands, 1 September 1999. WIMEK report/RIVM report No. 773201003. Bilthoven.

*Aspecten van bos en bosbeheer in Nederland: Resultaten Houtoogststatistiek 1995–1999.* HOSP, Bosdata nr 4, 2000.

FAO. 2004. Global Forest Resources Assessment 2005*:* Netherlands Country Report, in *Global Forest Resources Assessment 2005, Country Report 028* (Rome, 2004). Forestry Department of the Food and Agriculture Organization (FAO) of the United Nations.

Groot, WJM de et al. 2005. *National System of Greenhouse Gas Reporting for Land Use and Land Use Change: Carbon stock changes in the Netherlands due to land use changes 1990–2000*. Alterra Report 1035-3. Alterra, Wageningen.

Harmelen, AK van and Koch WRR. 2002. *$CO_2$ Emission Factors for Fuels in the Netherlands*. Netherlands Organisation for Applied Scientific Research (TNO), Apeldoorn.

Hoek, KW van der et al. 2006. *Direct and Indirect Nitrous Oxide Emissions from Agricultural Soils, 1990–2003: background document on the calculation method for the Dutch National Inventory Report*. Netherlands Environmental Assessment Agency (MNP), National Institute for Public Health and the Environment (RIVM), RIVM Report 680125003/2006, MNP Report 500080003/2006.

Hoek, KW van der and Schijndel MW van. 2006. *Methane and Nitrous Oxide Emissions from Animal Manure Management, 1990–2003: background document on the calculation method for the Dutch National Inventory Report*, RIVM Report 680125002/2006, MNP report 500080002/2006. Netherlands Environmental Assessment Agency (MNP), National Institute for Public Health and the Environment (RIVM).

Kroeze C. 1994. *Nitrous Oxide ($N_2O$) Emission Inventory and Options for Control in the Netherlands*, Report 773001004. National Institute of Public Health and Environmental Protection (RIVM), Bilthoven.

Kuikman, PJ et al. 2003. *Stocks of C in Soils and Emissions of $CO_2$ from Agricultural Soils in the Netherlands*. Alterra Report 561. Alterra, Wageningen.

Kuikman, PJ et al. 2005. *Emission of $N_2O$ and $CO_2$ from Organic Agricultural Soils*. Alterra Report 1035-2. Alterra, Wageningen.

[1] This list does not include the presentations made by Dutch experts during the in-country visit. It includes only selected protocols with methodological descriptions; all protocols which describe the methodologies used to estimate emissions can be found at <http://www.greenhousegases.nl/>.

Kuikman, PJ et al. 2006. *Update of Emission Factors for Direct Emissions of Nitrous Oxide from Agricultural Soils on the Basis of Measurements in the Netherlands*. Alterra Report 1217. Alterra, Wageningen.

MNP. 2004. *Memorandum on $CO_2$ Emission Factors for Petrol, Diesel and LPG*. Netherlands Environmental Assessment Agency (MNP), December 2004.

Nabuurs, GJ et al. 2005. *National System of Greenhouse Gas Reporting for Forest and Nature Areas under UNFCCC in the Netherlands - version 1.0 for 1990–2002*. Alterra Report 1035-I. Alterra, Wageningen.

Olsthoorn X and Pielaat A. 2003. *Tier-2 Uncertainty Analysis of the Dutch Greenhouse Gas Emissions 1999*. RIVM Report no. R03-06. Institute for Environmental Studies (IVM), Free University, Amsterdam.

Ramírez R et al. 2006. *Monte Carlo Analysis of Uncertainties in the Netherlands Greenhouse Gas Emission Inventory for 1990–2004*. Report NWS-E-2006-58. Copernicus Institute for Sustainable Development and Innovation.

RIVM. 2006. *Methods for Calculating the Emissions of Mobile Sources in the Netherlands*. Task Group Traffic and Transport of the Commission Registration Project, National Institute for Public Health and the Environment (RIVM), November 2006.

SenterNovem. 2005. *The Netherlands National System: QA/QC programme, Version 1.0, 22 December 2005*. SenterNovem, Utrecht.

Smink W et al. 2005. *Calculation of Methane Production from Enteric Fermentation in Dairy Cows*. SenterNovem, Utrecht.

TNO. 2004. *Uncertainty Assessment of $NO_X$, $SO_2$ and $NH_3$ Emissions in the Netherlands*. Netherlands Organisation for Applied Scientific Research (TNO), TNO Environment, Energy and Process Innovation, Apeldoorn.

TNO. 2006. *Memorandum on Recalculations as Presented in the CRF Submission 2006*. Netherlands Organisation for Applied Scientific Research (TNO), 31 August 2006.

Vreuls HHJ. 2006a. *Recommendation for a New $CO_2$ Emission Factor for Natural Gas (from 1990 onwards)*. SenterNovem, March 2006.

Vreuls HHJ. 2006b. *The Netherlands: List of Fuels and Standard $CO_2$ Emission Factors*. Steering Group for Emissions Registration, SenterNovem, August 2006.

Wyngaert IJJ van den et al. 2006. *Updates of the Dutch National System for Greenhouse Gas Reporting of the LULUCF Sector*. Alterra, Wageningen.

Zeeman G. 1994. Methane Production/emission in Storages for Animal Manure. *Fertilizer Research* (Department of Environmental Technology, Agricultural University, Wageningen), 37, pp. 207–211, Kluwer Academic Publishers.

Annex II

# Calculation of the adjustment

1. The ERT identified the need for one adjustment in the LULUCF sector for the base year, which is an adjustment to the estimate of net $CO_2$ emissions from deforestation. The following sections describe the adjustment in accordance with the requirements defined in the annex to decision 22/CMP.1.[1]

## 1. The original estimate

2. In its initial report, the Netherlands provided an estimate for net $CO_2$ emissions from deforestation of 280.212 Gg $CO_2$. On 1 June 2007, after the ERT's in-country visit, the Netherlands submitted a complete set of revised CRF tables and revised the value for net $CO_2$ emissions from deforestation from 280.212 Gg $CO_2$ to 487.562 Gg $CO_2$.

## 2. The underlying problem

3. In various documents provided with the inventory submission or during the review process, the Netherlands provided eight different values for net $CO_2$ emissions from deforestation in the base year:

(a) Initial report under the Kyoto Protocol: 280.212 Gg $CO_2$;

(b) CRF (table 5): 369.673 Gg $CO_2$;

(c) Revised CRF (sum of relevant values in tables 5.C and 5.F): 647.482 Gg $CO_2$;

(d) NIR (page 150): 125.000 Gg $CO_2$;

(e) Updated national system for LULUCF (table 2.2): 216.000 Gg $CO_2$;

(f) Updated national system for LULUCF (table 4.2): –124.670 Gg $CO_2$;

(g) Final response to ERT, 1 June 2007 (page 16): 487.562 Gg $CO_2$;

(h) Final response to ERT, 1 June 2007, annex 1 (page 18): 400.330 Gg $CO_2$.

4. These estimates vary greatly even though the same methodology and data set were used for calculating all of them. Given this high variability of the values for what is essentially the same parameter, it was a challenge for the ERT to understand how the estimate was made and whether it was correct. Having analysed that methodology and the data set used, the ERT came to the conclusion that there are three problems in the Dutch calculation of net $CO_2$ emissions from deforestation*:* the inconsistency of the land-use change matrix data; a high EF for decrease in the living biomass pool; and the fact that the estimate is incomplete.

*Inconsistency of the land-use change matrix data*

5. The land-use change matrix has been built on the basis of two reconstructed maps which "still held methodological differences and differences based on colouring in the hard copy maps",[2] so that "some land use changes are more unlikely to take place, e.g. the 10,310 ha changing from forest to grassland, the 26,971 ha changing from settlement to grassland and the 4,125 ha changing from settlement to forest. These are conversions that are not likely to take place, and could be the result of small methodological differences in drawing the hard copy topographical maps or a shift of grid cells".[3]

[1] See paragraph 83 in decision 22/CMP.1 (page 66 in FCCC/KP/CMP/2005/8/Add.3).
[2] Alterra Report 1035.1, page 17.
[3] Alterra Report 1035.1, page 42.

Thus, the ERT's view is that several problems affect the land-use change matrix calculation. The main problems, which all lead to land-use change being overestimated, are as follows.

(a) As reported by the Netherlands, "some methodological differences are carried through in the topographical maps between 1990 and 2000, e.g. yards and farmyards are delineated clearly and coloured differently from the neighbouring land use in the 2000 map. This was not the case in the 1990 map".[4] This means that differences in the definitions of the land-use categories and potential differences in land classification methodologies have been found between the 1990 and 2000 maps; in practice, the same land element has been classified under two different categories from the 1990 to the 2000 maps without any change in the land use (and land cover) having actually occurred;

(b) The hard copies of the 1990 maps were digitalized and, considering that the Dutch landscape is highly fragmented, it is very likely that problems due to registration[5] occurred when the land-use change matrix was calculated from an overlay of the digitalized topographical maps of 1990 and 2000, causing a high level of land-use change and a very fine pattern of land-use changes. The Netherlands' land-use change matrix does in fact show the symptoms of a registration problem because:

(i) "642,000 ha have changed in land use between 1990 and 2000; which is the 15 per cent of the land!";[6]

(ii) The value of deforestation (and each other land-use change subcategory) "seemed high, as other types of previous information indicated deforestation areas in the range of 500 ha/year (personal communication with Mr. Van Tol) … and … a very fine pattern of single grid cell deforestation seemed to occur (fig. 2.1)";[7]

(c) "The basis for the 1990 grid map was a 1 : 25,000 map, the basis for the 2000 grid map was a 1 : 10,000 map … When applying re-gridding on these polygon-based maps, small errors may occur";[8]

(d) Finally, further confusion rises from the fact that the Netherlands has included in the forest land category three different subcategories – one corresponding to forest according to the country's definition of forest, and the other two "trees outside forest" and "heather/peat and other nature terrains" which had to be reported under other land-use categories and have been reported here because they contain some wooden vegetation.

6. In order to correct the land-use change estimates provided by the matrix, the Netherlands carried out two exercises. The first tried to validate the year 2000 maps by overlaying the grid cells with the ground sample points of the NFI. The results showed that "out of the 1723 visited forest inventory plots, the 2000 map was corrected in 84 per cent".[9] The second (in April 2005) tried to validate the land-use change matrix as follows: "two areas for field validation were selected … both measuring some 10x10 km … From the situation in the field it was decided whether a land use change had actually occurred, or whether a land use change did not seem plausible over the past 15 years (2005–1990)".[10] The analysis was done at plot level (each single plot where a changed was detected by the matrix was visited in the

[4] *Updates of the Dutch National System for Greenhouse Gas Reporting of the LULUCF Sector*, page 13.
[5] Registration is the process of superposing two or more images or photographs so that equivalent geographic points coincide: see <http://rst.gsfc.nasa.gov/AppD/glossary.html>.
[6] Alterra Report no. 1035.1, page 32.
[7] *Updates of the Dutch National System for Greenhouse Gas Reporting of the LULUCF Sector*, page 12.
[8] *Updates of the Dutch National System for Greenhouse Gas Reporting of the LULUCF Sector*, page 13.
[9] Alterra Report no. 1035.1, page 43.
[10] *Updates of the Dutch National System for Greenhouse Gas Reporting of the LULUCF Sector*, page 12.

field) and the "correctness percentages between the cases varied only slightly (between 41 and 47 per cent, average 44 per cent). Correctness for either forest according to definition and trees outside the forest were also very comparable".[11] This exercise was not carried out on a statistically sound basis because a sampling design was not implemented and it did not produce representative data for the whole land area of the country.

7. Overall, as noted by the Netherlands, a "validation against other independent data sources (e.g. land use maps derived for the Netherlands from remote sensing) was not carried out. … The Netherlands have assumed that the topographical maps as such represent the truth … topographical maps may serve as a good source of data for land use type estimation however, the maps themselves are already a product of generalization of the original background data and may thus contain a mapping error. It would be interesting to assess this error and use it error calculus in the NIR. Digitalization, classification and aggregation will introduce their own method related errors. The errors may be used to determine the minimal area of land use change event, which may be estimated with the known significance level".[12] Finally, the ERT noted that the correctness of the 1990 digital map has been not validated. In practice, all the Netherlands' attempts at validation checked whether a pixel/plot was without forest in either 2000 or 2005 but did not check whether that pixel/plot was really forested in 1990. All this (i.e. the problems outlined in paragraphs 5, 6 and 7 of this annex) means that net $CO_2$ emissions from deforestation must have been overestimated.

*A high EF for the decrease in the living biomass pool*

8. In the resubmitted CRF tables the Netherlands applied an EF for decreases in the living biomass pool that was higher than that in the original 2006 submission. The new value is consistent with the value reported on page 144 of the NIR but is not consistent with the data reported by the Netherlands to the FAO for the Global FRA 2005.[13] On page 21 of Alterra Report 1035-1 the Netherlands reported that "HOSP[14] plot level data (2007 plots ~ 400 plots per year) for growing stock volume, increment, age, tree species, height, tree number and dead wood were used for 1990 situation. Forward calculation with these data was applied to the year 1999"; moreover, the ERT found the HOSP data in the Bosdata report entitled *Aspecten van bos en bosbeheer in Nederland: Resultaten Houtoogststatistiek 1995–1999.*[15] The ERT was therefore able to recalculate the EF in an appropriate way, taking into consideration additional information provided by the Netherlands on the nature of the forest areas (i.e. parks, shrubs, bushes, coppices, harvested areas and very young plantations)[16] that are excluded from the HOSP but included in the CRF. The conclusion was that net $CO_2$ emissions from deforestation have been overestimated.

*Incompleteness of the estimate*

9. The time series from 1971 for each land-use change has not been reconstructed, although the Party agreed a 20-year period for stabilization of carbon stocks after conversion of land use. In practice, the Party has reported for 1990 the net emissions produced in the area deforested in 1990 only, while the correct application of the 20-year period requires the calculation of the 1990 net emissions produced on the whole area deforested from 1971 to 1990. Net $CO_2$ emissions from deforestation have therefore been overestimated, since so-called inherited removals have not been accounted for.

10. To summarize, the estimate of net $CO_2$ emissions from deforestation made by the Netherlands deviates from the IPCC good practice guidance and the IPCC good practice guidance for LULUCF

[11] *Updates of the Dutch National System for Greenhouse Gas Reporting of the LULUCF Sector*, page 13.
[12] *Updates of the Dutch National System for Greenhouse Gas Reporting of the LULUCF Sector*, page 13.
[13] *Global Forest Resource Assessment 2005, Netherlands*, Country Report 028, Rome, 2004; table T7, page 24.
[14] HOSP = Timber Production Statistics and Forecast (in Dutch: "Hout Oogst Statistiek en Prognose oogstbaar hout").
[15] HOSP, Bosdata nr 4, 2000.
[16] From " response_last_email_sandro_version_290607.doc"

because of (a) the overestimation of activity data that have been derived from an inconsistent land-use change matrix; (b) the failure to account for inherited net emissions (i.e. net emissions occurring in the 1990 on the areas deforested in the previous 19 years, from 1971 to 1989); and (c) the inconsistent value of the EF for decreases of carbon stock in the living biomass pool. All these factors have led to $CO_2$ net emissions from deforestation being overestimated.

3. The rationale for the adjustment

11. At the end of the in-country visit, the ERT informed the Netherlands that there was a potential problem in the estimate of net $CO_2$ emissions from deforestation. The ERT formulated the problem as follows: "The estimates of net carbon stock changes of the categories relating to forest land converted to different land uses (cropland, settlement, grassland, wetland, other land) are affected by two main problems related to the measurement and reporting of the activity data: incoherence between some elements in the methodologies of map classification (e.g. definition of land categories) applied for the 1990 and the 2000 maps, which resulted in an inconsistency of the land-use change matrix data; absence of a time series of deforested areas from 1971, which resulted in non-estimation of carbon stock changes in these areas for the base year".

12. Considering the shortness of the time available to prepare a comprehensive revision of the whole estimate, the ERT suggested that the Netherlands address the problem in the following manner:

(a) Reconstructing the time series of deforested areas from 1971 by a linear extrapolation of the values from 1990 back to 1971;

(b) Discounting the area reported under the categories relating to forest land converted to different land uses (cropland, settlements, grassland, wetlands, other land) on the basis of additional, conservative assumptions;

(c) Using the NFI data for carbon stock changes in living biomass;

(d) Using the data on litter that have been collected in 1990 in order to report carbon stock changes in this pool as a consequence of deforestation.

13. In response to this notification of a potential problem, the Netherlands provided, within the required six-week period, a revision of its estimate and additional information. The revised estimate for net $CO_2$ emissions from deforestation (used for the calculation of the assigned amount) was 487.562 Gg $CO_2$, whereas the original estimate, used by the Netherlands in the calculation of the assigned amount in the initial report, was 280.212 Gg $CO_2$. The additional information provided by the Netherlands together with the estimate consisted of two documents: "Final response to ERT 1_6_07.doc" and "Netherlands reaction to the ERT 01062007.doc". In response to additional queries from the ERT, the Netherlands also submitted further clarification and information, such as "070612 additional information on calculating and reporting deforestation.doc" (e-mail of 14 June 2007), "Additional information for the ERT related to LULUCF.doc" (e-mail of 14 June 2007), "Response last email sandro version 290607.doc" (e-mail of 29 June 2007), "Country report FRA 2005 (Version 26-01-2005)1.doc" (e-mail of 3 July 2007), "Answer part reaction to sandro comment to response 030707.doc" (e-mail of 3 July 2007) and "Additional information on specific LULUCF elements 3 july.doc" (e-mail of 3 July 2007).

14. Having reviewed the revised estimate and all the additional information provided, the ERT concluded that its recommendations to the Netherlands had not been followed sufficiently to bring the estimate into full compliance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. In particular, the following have not been done in the Netherlands' revised estimate: (a) the time series of deforested areas from 1971 to 1990 has not been reconstructed and, consequently, inherited emissions/removals have not been accounted for; and (b) the very high uncertainty of the

estimate of deforested area, due to the inconsistency of the land-use change matrix, has not been reduced by the inclusion of either additional assumptions or discount factors in the recalculation process. Moreover, the revised estimate shows an additional problem – the high EF for decrease in the living biomass pool. The ERT therefore decided to calculate and apply an adjustment.

4. The assumptions, data and methodology used to calculate the adjustment

15. Since the estimate of net $CO_2$ emissions from deforestation is a sum of many LULUCF subcategories, the ERT decided that the adjusted estimate for $CO_2$ net emissions should be provided at the level of the category forest land converted to other land-use categories, as reported in CRF table 5 (column B, row 30). Since data are available to make it possibly to apply the default IPCC tier 1 method, and this method is the first one in the hierarchical order reported in table 1 of the annex to decision 20/CMP.1, the ERT decided to apply the default IPCC tier 1 method.

16. The adjustment is complex because several parameters (sources and sinks under different categories), not just one, need to be changed. The changed parameters should then be aggregated in order to arrive at an adjusted estimate for total net $CO_2$ emissions from deforestation. The adjustment is presented below in three steps.

*Step 1: recalculation of the activity data*

17. Together with the revised estimates submitted on 1 June 2007 in response to the ERT's questions, the Netherlands also submitted a whole set of revised CRF tables. In these tables net $CO_2$ emissions from deforestation in the base year had increased, compared with the original 2006 inventory submission, from 369.673 Gg $CO_2$ to 647.482 Gg $CO_2$, because the parameters applied changed between the 2006 submission to the revised estimates. The activity data – the total deforested area – changed from 1.400 kha to 2.042 kha. Since this represents such a large change, the ERT asked the Netherlands to provide technical documentation describing the correction procedure for the land-use change matrix in detail. The ERT received only a general document in which this procedure is briefly described, without the specific detailed information required. The ERT therefore still considers that the problem of inconsistency of the land-use change matrix has not been solved and that the revised estimate of deforested area is not acceptable since it is not in line with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF.

18. The only alternative source of data that the ERT found on gross deforestation in Netherlands is an expert judgement on total aggregated deforested area that is reported in the Dutch official document entitled *Updates of the Dutch National System for Greenhouse Gas Reporting of the LULUCF Sector*. The ERT considered this document to be a more reliable source of data and therefore used it extensively in the calculation of this adjustment. The assumptions and data used to calculate the adjustment are listed here, taking into consideration that all the assumptions are made on a conservative basis and that all the data applied have been provided by the Netherlands in *Updates of the Dutch National System for Greenhouse Gas Reporting of the LULUCF Sector* and other appropriate official documents.

19. Because of the absence of alternative data sources, the ERT adopted the distribution of deforested areas among different final land uses which is reported in the Netherlands' land-use change matrix (see table 1 below).[17]

[17] *Updates of the Dutch National System for Greenhouse Gas Reporting of the LULUCF Sector*, page 13.

**Table 1. Distribution of deforested areas by different final uses, 1990–2000**

| Final land use | Area, ha | Share, % |
|---|---|---|
| Grassland | 10 309.94 | 36.60 |
| Cropland | 1 273.69 | 4.52 |
| Heather and other nature terrains | 2 897.50 | 10.28 |
| Settlement and roads | 9 012.63 | 31.99 |
| Water | 945.50 | 3.36 |
| Sand/dunes | 603.63 | 2.14 |
| Trees outside forest | 3 130.19 | 11.11 |
| **Total** | **28 173.06** | **100.00** |

20. The ERT noted that "water" and "sand/dunes" are reported in the Netherlands' GHG inventory under the category other land. The ERT further noted that "heather and other nature terrains" and "trees outside forest" are erroneously reported under the category forest land. They should not be, since the Netherlands declared that neither matches the country's definition of forest; therefore, to ensure conservativeness for the adjustment calculation, the ERT considered these two types of land to be part of a virtual additional land-use category – 5.A*bis* – which does not belong to the category forest land although the same rules are applied.

21. Using the distribution shown in table 1, the ERT reconstructed the time series of deforested areas from 1971 to 1990 by a linear extrapolation of the values calculated for the period 1990–2000 back to 1971 (see table 2). Since no data are available, no further use changes on deforested land were assumed to occur, even if this is not a conservative assumption.

22. Average annual area deforested is therefore 500 ha/year. This is the value reported on page 12 of the official document *Updates of the Dutch National System for Greenhouse Gas Reporting of the LULUCF Sector*. This represents 0.14 per cent of the Netherlands forest area in 1990 and is comparable to the German gross deforestation rate, which is 0.13 per cent[18] (Germany is the only country in the region that reports a complete set of deforested areas in the year 1990). Moreover, the value selected is consistent with the value (494 ha/year) calculated by the ERT on the basis of data reported in Summary table I on page 18 of the Bosdata report entitled *Aspecten van bos en bosbeheer in Nederland: Resultaten Houtoogststatistiek 1995–1999*.[19]

23. After the in-country visit, the Netherlands revised the data related to only one of the two test areas, collected during the field exercise of April 2005. In its final response to the ERT's questions, the Netherlands stated that "the re-assessment was made at the pixel level (25 by 25 m) rather than at the plot or parcel level as was done in the previous validation. The re-assessment has shown that the deforestation of area forest under the Kyoto Protocol definition was 61.4 per cent of the observed changes … Thus the correctness percentages are about 20 per cent higher if corrected for surface".[20] As mentioned above, this exercise was not done on a statistically sound basis (i.e. the exercise did not produce representative data for the whole land area; and a sampling design has not been implemented). Moreover, during the in-country visit, the national experts explained how the April 2005 field exercise was conducted, and the ERT in its presentation raised two problems: (a) a non-systematic error that occurred in the localization of the pixel on the field (it is very difficult and time-consuming to localize in the field one by one the square pixels of a digitalized map); and (b) a systematic error due to the fact that the reclassification of the pixels on the field has been done on the basis of the presence of at least 50 per cent tree cover, while the Netherlands' definition sets the minimum coverage as 20 per cent. The

[18] <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/x-zip-compressed/deu_2007_crf_2may.zip>.
[19] HOSP, Bosdata nr 4, 2000.
[20] "Final response to ERT 1_6_07".

ERT therefore could not agree to the view that the data reported by the Netherlands in the revised CRF tables are of better quality than those of the 2006 submission.

**Table 2. Distribution of the area to be reported as deforested in 1990 among different final uses**

| Area to be reported as deforested in 1990, ha | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Final land-use category | | | | | | | |
| | 5.B | 5.C | 5.E | 5.F | | (5.G) - 5.A*bis* | | Total |
| Year of deforestation | Cropland | Grassland | Settlement | Water | Sand/ dunes | Trees outside forest | Heather | |
| | Ha | | | | | | | |
| 1971 | 22.60 | 182.98 | 159.95 | 16.78 | 10.71 | 55.55 | 51.42 | 500.00 |
| 1972 | 22.60 | 182.98 | 159.95 | 16.78 | 10.71 | 55.55 | 51.42 | 500.00 |
| …* | … | … | … | … | … | … | … | … |
| 1989 | 22.60 | 182.98 | 159.95 | 16.78 | 10.71 | 55.55 | 51.42 | 500.00 |
| 1990 | 22.60 | 182.98 | 159.95 | 16.78 | 10.71 | 55.55 | 51.42 | 500.00 |
| **Total** | **452.09** | **3 659.50** | **3 199.02** | **335.6** | **214.26** | **1 111.06** | **1 028.46** | **10 000.00** |
| **Total area deforested in 1990** | | | | | | | | **10 000.00** |

* The same values, as shown for 1971, 1972, 1989, 1990, are used for all years from 1971 to 1990.

*Step 2: recalculation of the EF for decreases in living biomass*

24. In its submission of revised estimates after the in-country visit the Netherlands changed the EF value from –55.79 Mg ha$^{-1}$ in the original 2006 submission to –70.99 Mg ha$^{-1}$ in the revised estimates. Since this is a very large change, the ERT asked the Netherlands to explain the reason for it and how the old and the new EFs were calculated. The Netherlands explained in two documents – entitled "Additional information on the calculation process of specific LULUCF elements" and "Additional information on specific LULUCF elements, 3 July 2007" – (a) that the lower EF was the result of a calculation error, while the higher is the appropriate one, and (b) that the inconsistency with the FAO data is due to the fact that the FRA 2005 data were taken from an old version of the Netherlands report, while the data reported in an updated version (which was submitted to the ERT), entitled *Global Forest Resources Assessment Update 2005: The Netherlands Country Report* (Wageningen, 26–01–2005), are close to the reported new EF. The ERT did not consider the updated version of the report to the FAO FRA 2005 to be an official document of the Netherlands; nor did it contain the official, updated estimates of the FAO FRA 2005. Moreover, although the ERT agreed that the old and lower value of the EF was the result of a calculation error, it did not consider the new one to be correctly calculated, because it contains the questionable assumption that marginal forest areas (which are excluded from the 1990 NFI – the HOSP - but included in the national inventory report to the UNFCCC) have the same average carbon stock in the living biomass pool as high forest stands. The ERT judged this assumption to be incorrect because the Netherlands declared that those marginal areas consist of parks, shrubs, bushes, coppices, harvested areas and very young plantations, which in practice have no or only limited living biomass stock.

25. To support the adjustment, the ERT recalculated the EF on the basis of data collected from the Bosdata report entitled *Aspecten van bos en bosbeheer in Nederland: Resultaten Houtoogststatistiek 1995–1999* and from the document sent to the ERT by the Netherlands, entitled "Additional information on the calculation process of specific LULUCF elements".[21] The assumptions and data used to calculate the adjustment are listed below. It should be noted that all the assumptions are made on a conservative basis and all the data applied have been provided by the Netherlands in its official documents, as follows.

[21] From Response_last_email_sandro_version_290607.doc.

(a) Average growing stock per hectare of forest included in the NFI (1988–1992): 172 $m^3$ – from summary table I on page 18 of *Aspecten van bos en bosbeheer in Nederland: Resultaten Houtoogststatistiek 1995–1999*;

(b) Basic wood density: 0.45 – from "Additional information on the calculation process of specific LULUCF elements";

(c) Average carbon density: 0.5 – from "Additional information on the calculation process of specific LULUCF elements";

(d) Biomass expansion factor (from stem to whole tree): 1.66 – from "Additional information on the calculation process of specific LULUCF elements";

(e) To the marginal areas – that is, 79,794 ha of forest area, which is the difference between the HOSP data (281,106 ha) and the CRF data (360,900 ha) – half of the average carbon stock of the forest area sampled in the HOSP has been assigned since these areas include areas with stock similar to high stands (parks) and areas without any biomass stock (areas "harvested between plot assignment and the actual field measurements").

26. On this basis, the ERT calculated that the EF for any kind of conversion from forest to other uses – with the exception of conversion from forest to "trees outside forest", where the change in land use does not affect the carbon stocks (i.e. the trees are still there even if they are grouped in smaller patches) – is equal to 57.14 Mg C/ha, as illustrated in table 3.

**Table 3. Calculation of the EF for decreases in carbon stock in the living biomass pool**

| Parameter | Value | Unit |
|---|---|---|
| Average growing stock in HOSP areas | 172 | $m^3$ $ha^{-1}$ |
| Biomass expansion factor (from stem to whole tree) | 1.66 | |
| Basic wood density | 0.45 | |
| Average carbon density | 0.5 | |
| Average living biomass carbon stock in the HOSP areas | 64.24 | MgC $ha^{-1}$ |
| Average living biomass carbon stock in the non-HOSP areas | 32.12 | MgC $ha^{-1}$ |
| Average living biomass carbon stock in the whole area | 57.14 | MgC $ha^{-1}$ |

27. The ERT noted that the value thus calculated is consistent with the data submitted in the document Global Forest Resources Assessment 2005*:* Netherlands Country Report, in *Global Forest Resources Assessment 2005, Country Report 028* (Rome, 2004), where the following data were reported for the year 1990: "carbon in living biomass" = 20 Mt C (table T7), and "total forest area" = 345 kha (table T1), for which the resulting calculation shows 20 Mt C/345 kha = 57.97 Mg C $ha^{-1}$. Applying the recalculated EF, the ERT then recalculated the emissions due to living biomass carbon stock decreases, as shown in table 4.

**Table 4. Calculation of decreases in living biomass carbon stock subdivided among different final land uses**

| **Living biomass decrease in areas reported as deforested in 1990** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Final land use category, ha** | | | | | | | |
| | **5.B** | **5.C** | **5.E** | **5.F** | | **(5.G) - 5.A*bis*** | | **Total** |
| Year of deforestation | Cropland | Grassland | Settlement | Water | Sand/ dunes | Trees outside forest | Heather | |
| 1990 | –1.29 | –10.46 | –9.14 | –0.96 | –0.61 | 0.00 | –2.94 | –25.40 |
| **Total** | **–1.29** | **–10.46** | **–9.14** | **–0.96** | **–0.61** | **0.00** | **–2.94** | **–25.40** |
| **Living biomass decrease in 1990** | | | | | | | | **–25.40** |

28. After the ERT had notified the Netherlands about the inconsistency of the reported value of the EF (with the data reported to the FAO and the data of its (HOSP) National Forest Inventory for the year 1990), it received the following comment in a document entitled "Additional Information on Specific LULUCF Elements, 3 July 2007": "The reaction from the ERT expert for LULUCF on the value of calculation of the value of –70.99 Mg $ha^{-1}$ referring to HOSP is an example of the misunderstanding that can occur when one does not use the best available combination of sources. We use a combination of HOSP and MFV data to calculate this value, so only using HOSP data has to show not the same value. Our calculation method is documented in detail in the report National System of Greenhouse Gas Reporting for Forest and Nature Areas under UNFCCC in the Netherlands, Alterra-report 1035.1, 2005, starting on page 23 with 'Following calculations are carried out to derive the annual carbon balance from the HOSP and MFV data and to forward calculate the balance'". However, the ERT noted on page 21 of Alterra Report 1035.1 that "HOSP plot level data (2007 plots ~ 400 plots per year) for growing stock volume, increment, age, tree species, height, tree number and dead wood were used for 1990 situation. Forward calculation with these data was applied to the year 1999". The ERT therefore considers the EF calculation based on the HOSP data to be appropriate and consistent.

*Step 3: recalculation of inherited net emissions*

29. The Netherlands has not reported inherited net emissions in either the original or the revised estimates, justifying this in annex 2 to the file named "final response to ERT 1_6_07.doc", entitled "Effect of ageing prior to 1990 on carbon dynamics in forests and reconstructing time series of deforestation back to 1970". The ERT considered this comment as being out of the context, and asked for justification once again, to which the Netherlands experts responded by recalling paragraph 5(b) of the annex to decision 13/CMP.1 which, in their interpretation, excludes inherited net emissions from the accounting. The ERT does not agree to this interpretation of decision 13/CMP.1 because net $CO_2$ emissions from deforestation in the base year are to be estimated, as in any other year, following the rules set out in the IPCC good practice guidance for LULUCF, which clearly states the need for reporting of net emissions occurring on deforested areas (i.e. areas where a land-use change is occurred) for a default period of 20 years.

30. To complete the adjusted estimate, the ERT calculated the inherited net emissions using the biomass data reported by the Netherlands in CRF table 5.A and the soil data reported by the Netherlands in appendix 1 to the "Protocol 5_$CO_2$_land_use_categories_2006" (for soil, the ERT did not use the data reported in the CRF because these data are not differentiated on the basis of the final land use and are not related to the reported activity data, that is, the IEF is not calculated).

31. For data on litter losses it should be noted that the Netherlands responded to that ERT's suggestion that they should be included as follows: "The Netherlands has reported stocks of carbon in litter but no stock changes in forest remaining forest. For deforestation the Netherlands account for the loss of carbon stocks in litter".[22] Nevertheless, litter losses are not reported either in the 2006 CRF tables or in the revised CRF tables. Since national data on litter were not available to the ERT, and the exclusion of this pool from the estimate of net emissions from deforestation makes it conservative, the ERT did not include litter losses in its calculation of the adjusted estimate of net $CO_2$ emissions from deforestation.

32. All the assumptions and data used and resulting from steps 1 and 2 are used, and the additional assumptions and data are listed below. Again, all the assumptions made are made on a conservative basis and all the data applied have been provided by the Netherlands in its official documents.

(a) In accordance with the default IPCC tier 1 method, living biomass changes after conversion in deforested areas converted to categories 5.B, 5.C, 5.E and 5.F have been set equal to 0. On the other hand, to ensure conservativeness, living biomass changes

[22] From "Final response to ERT 1_6_07.doc", page 16.

after conversion in deforested areas converted to "trees outside forest" have been calculated since, as reported by the Netherlands, the living biomass stock increases in those areas;

(b) Living biomass carbon decreases for conversion from forest to "trees outside forest" has been set equal to 0 since, in this case, the change in land use does not affect the carbon stocks (i.e. the trees are still there even if they are grouped in smaller patches);

(c) Average increase in living biomass in "trees outside forest" areas[23] is 2.69 MgC $ha^{-1}$ $year^{-1}$ – from table 5.A (cell D12) of the Excel file named "NLD-2006-1990-v1.6";[24]

(d) Average soil carbon stock in forest is 79.95 MgC $ha^{-1}$ – from appendix 1 to "Protocol 5_$CO_2$_land_use_categories_2006";

(e) Average soil carbon stock in cropland is 95.07 MgC $ha^{-1}$ – from appendix 1 to "Protocol 5_$CO_2$_land_use_categories_2006";

(f) Average soil carbon stock in grassland is 111.82 MgC $ha^{-1}$ – from appendix 1 to "Protocol 5_$CO_2$_land_use_categories_2006";

(g) Average soil carbon stock in settlements is 96.98 MgC $ha^{-1}$ – from appendix 1 to "Protocol 5_$CO_2$_land_use_categories_2006";

(h) Average soil carbon stock in either water or sand/dunes is 0 MgC $ha^{-1}$ – from appendix 1 to "Protocol 5_$CO_2$_land_use_categories_2006";

(i) Average soil carbon stock in trees outside forest is 101.65 MgC $ha^{-1}$ – from appendix 1 to "Protocol 5_$CO_2$_land_use_categories_2006";

(j) Average soil carbon stock in heather and nature terrain is 111.82 MgC $ha^{-1}$ – from appendix 1 to "Protocol 5_$CO_2$_land_use_categories_2006".

33. With these data the ERT calculated net emissions from soil, as shown in table 5.

**Table 5. Net carbon stock changes in soil subdivided among different final land uses**

| **Net carbon stock changes in soil in areas reported as deforested in 1990** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Final land use category | | | | | | | |
| | **5.B** | **5.C** | **5.E** | **5.F** | | **(5.G) –5.A*bis*** | | **Total** |
| Year of deforestation | Cropland | Grassland | Settlement | Water | Sand/ dunes | Trees outside forest | Heather | |
| | Gg C | | | | | | | |
| 1971 | 0.02 | 0.29 | 0.14 | –0.07 | –0.04 | 0.06 | 0.00 | 0.40 |
| 1972 | 0.02 | 0.29 | 0.14 | –0.07 | –0.04 | 0.06 | 0.00 | 0.40 |
| …* | … | … | … | … | … | … | … | … |
| 1989 | 0.02 | 0.29 | 0.14 | –0.07 | –0.04 | 0.06 | 0.00 | 0.40 |
| 1990 | 0.02 | 0.29 | 0.14 | –0.07 | –0.04 | 0.06 | 0.00 | 0.40 |
| **Total** | **0.34** | **5.83** | **2.72** | **–1.34** | **–0.86** | **1.21** | **0.05** | **7.95** |
| **Net carbon stock changes in soil in 1990** | | | | | | | | **7.95** |

* The same values, as shown for 1971, 1972, 1989, 1990, are used for all years from 1971 to 1990.

[23] This annual increment shall be applied to areas that have been converted within the period 1971–1990 from forest (according to the Kyoto Protocol definition) to other land uses which still contain trees (i.e. trees outside forest).

[24] <http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/x-zip-compressed/nld_2006_crf_18sep.zip>.

34. On the issue of net carbon stock changes in soil it should be noted that during the in-country visit the ERT disagreed with the Netherlands' decision not to report changes in soil carbon stock related to changes in land use (see section II.B.8 on the LULUCF sector) since this is not in line with the IPCC good practice guidance for LULUCF. However, since the data on soil carbon stocks reported in the Excel file named "LUC Matrix Final and Defor and Afforest C Balance after Validation"[25] show very small differences between different land uses, and forest soils have the second-highest carbon content, the ERT agreed to apply, for this recalculation only, the assumption made by the Party that "for soil carbon stock changes after land use change it is assumed that the average carbon stock in the soil under the new and old land use are the same (Groot et al., 2005), since it makes the deforestation estimates more conservative".[26]

35. Nevertheless, the Netherlands' resubmitted estimate of net emissions from deforestation including carbon stock change in soil does not link soil carbon changes to a land area (see CRF table 5.F); moreover, analysing data reported twice (in the table of appendix 1 to "Protocol 5_$CO_2$_land_use_categories_2006" and in table 9 of Alterra Report 1035-3) on carbon stocks in soils for the different land uses, the ERT found very different data from those reported in the Excel file named "LUC Matrix Final and Defor and Afforest C Balance after Validation". Those data show that, on average, forest soils contain less carbon stock that any other land-use category (with the exclusion of other land), which suggests that, on average, a forest conversion results in a net increase in carbon stocks. The ERT, therefore, following the default IPCC tier 1 method in the recalculation, to be conservative, estimated soil carbon stock changes due to forest conversion using data from the two above-mentioned tables; these data have been used not only on inherited areas (areas deforested from 1971 to 1989) but also for estimating soil carbon stock changes in area deforested in the 1990, since the data reported in CRF table 5.F were too aggregated to be useful for this recalculation. Accordingly, the ERT calculated living biomass carbon stock increases as shown in table 6.

**Table 6. Living biomass carbon stock increases subdivided among different final land uses**

| **Living biomass increase in areas reported as deforested in 1990** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Final land-use category | | | | | | | |
| | **5.B** | **5.C** | **5.E** | **5.F** | | **(5.G) - 5.A*bis*** | | **Total** |
| Year of deforestation | Cropland | Grassland | Settlements | Water | Sand/dunes | Trees outside forest | Heather | |
| | Gg C | | | | | | | |
| 1971 | – | – | – | – | – | 0.15 | – | 0.15 |
| 1972 | – | – | – | – | – | 0.15 | – | 0.15 |
| …* | … | … | … | … | … | 0.15 | … | 0.15 |
| 1989 | – | – | – | – | – | 0.15 | – | 0.15 |
| 1990 | – | – | – | – | – | 0.15 | – | 0.15 |
| **Total** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **2.99** | **0.00** | **2.99** |
| **Living biomass increase in 1990** | | | | | | | | **2.99** |

* The same values, as shown for 1971, 1972, 1989, 1990, are used for all years from 1971 to 1990.

## 5. The adjusted estimate

36. To summarize,[27] the following parameters have been adjusted by the ERT in the course of the calculation of this adjustment:

[25] The file was submitted to the ERT during the in-country visit.
[26] From the document "Overview of problems identified for the base year for the consideration of potential adjustments".
[27] The comparison is made among revised estimates submitted by the Netherlands after the in-country visit and estimates calculated by the ERT.

(a) deforested area: Party's estimate = 2,042 ha $year^{-1}$; adjusted estimate = 500 ha $year^{-1}$;

(b) emission factor for living biomass decrease: Party's estimate = –70.99 MgC $ha^{-1}$; adjusted estimate = –57.14 MgC $ha^{-1}$.

37. These adjusted parameters have been combined to obtain the adjusted estimate as follows:

(a) Total living biomass decrease in areas that have been deforested from 1971 to 1990 = [area deforested in 1990[28] (500 ha) – area changed from forest to trees outside forest in 1990 (55.55 ha)] * EF (–57.14 MgC $ha^{-1}$) = +93.118 Gg $CO_2$ (–25.40 Gg C);

(b) Total net carbon stock change in soils in areas that have been deforested from 1971 to 1999 = $\sum_{fLUc}\left[\left(SOC_{iLU} - SOC_{fLU}\right)\bullet\sum_{1971}^{1990}A\right]/20$ where: "fLUc" is the final land-use category, $SOC_{iLU}$ is the soil organic carbon stock in the initial land use, $SOC_{iLU}$ is the soil organic carbon stock in the final land use (both have been derived from appendix 1 to the "Protocol 5_$CO_2$_land_use_categories_2006") and $\sum_{1971}^{1990}A$ is the sum of all the areas converted to a final land-use category (see table 2.); 20 is the number of years needed for soil to reach a new equilibrium when a land-use change occurs. The result of this calculation is = –29.168 Gg $CO_2$ (+7.95 Gg C);

(c) Total living biomass increase in areas that have been converted from forest to "trees outside forest" from 1971 to 1990 = sum of area deforested from 1971 to 1990 (1,111.06 ha) * EF (+2.69 MgC $ha^{-1}$) = –10.969 Gg $CO_2$ (+2.99 Gg C);

(d) Adjusted net $CO_2$ emissions from deforestation = bullet (a) + bullet (b) + bullet (c) = +52.981 Gg $CO_2$; that multiplied per the conservativeness factor (0.73) results in +38.676 Gg $CO_2$.

38. Table 7 shows the main adjustment steps as well as the overall result of adjustment. The adjusted conservative estimate for net $CO_2$ emissions from deforestation amounts to 38.676 Gg $CO_2$, compared to 487.562 Gg $CO_2$ presented by the Netherlands as a revised estimate after the in-country visit (and to 280.212 Gg $CO_2$ used originally in the initial report for the calculation of the assigned amount).

[28] The IPCC default tier 1 method does not account for changes in living biomass following the removal of tree coverage.

**Table 7. Calculation of adjustment for net $CO_2$ emissions from deforestation**

| Parameter/estimate | Value | Unit | Source |
|---|---|---|---|
| Category: V. LULUCF | | | |
| Party estimate of $CO_2$ net emissions from deforestation | 487.562 | Gg $CO_2$ | Party's submission of revised estimates after in-country visit |
| Party's activity data for deforestation | 2,042 | ha $year^{-1}$ | Party's submission of revised estimates after in-country visit |
| Party's emission factor for losses in living biomass | –70.99 | Mg C $ha^{-1}$ | Party's submission of revised estimates after in-country visit |
| Applied activity data in adjustment | 500 | ha $year^{-1}$ | *Updates of the Dutch National System for Greenhouse Gas Reporting of the LULUCF Sector* |
| Applied emission factor for losses in living biomass in adjustment | –57.14 | Mg C $ha^{-1}$ | Recalculated by the ERT on the basis of HOSP data (see table 3) |
| Calculated estimate for $CO_2$ net emissions from deforestation | 52.981 | Gg $CO_2$ | Recalculated by the ERT on the basis of Party's data and applying the default IPCC tier 1 method (see tables 4, 5 and 6) |
| Conservativeness factor | 0.73 | | Table 3.a of annex III of Technical Guidance for Adjustments attached to decision 20/CMP.1 |
| Adjusted conservative estimate for $CO_2$ net emissions from deforestation | 38.676 | Gg $CO_2$ | |
| Total aggregate GHG emissions in the base year (including deforestation) as reported by Party | 213,483.384 | Gg $CO_2$ eq. | Party's submission of revised estimates after in-country visit |
| Total aggregate GHG emissions in the base year (including deforestation) after application of adjustment | 213,034.498 | Gg $CO_2$ eq. | ERT's calculation |
| Difference between original and adjusted aggregate GHG total in the base year | 448.886 | Gg $CO_2$ eq. | ERT's calculation |
| | 0.2 | % | |

## 6. Conservativeness of the ERT's calculation of the adjustment

39. As described above, some assumptions have been made in order to ensure that the recalculated estimate is conservative. The main assumptions relating to conservativeness are:

(a) The gross deforestation annual rate has been taken close (550 ha vs 494 ha) to the net deforestation annual rate as reported by the NFI;

(b) Removals from deforested area belonging to the "trees outside forest" subcategory have been accounted for;

(c) In reconstructing the time series the ERT assumed a constant rate of deforestation for the whole period 1971–1990, although the forest inventory data[29] show a higher rate of net deforestation for the period 1984–1990.

40. A conservativeness factor of 0.73 has been applied at the aggregate level for the determined total net $CO_2$ emissions from deforestation. The ERT therefore judges that the resulting adjusted value is very likely to be conservative. The conservativeness factor was selected from table 3.a of annex III to the technical guidance for adjustments attached to decision 20/CMP.1: the value of 0.73 is the value recommended by the technical guidance for emission estimates for the category land converted to grassland – carbon stock changes in living biomass. This value was selected because the loss of carbon

[29] *Aspecten van bos en bosbeheer in Nederland: Resultaten Houtoogststatistiek 1995–1999.* HOSP, Bosdata nr. 4, 2000.

due to conversion from forest to grassland is the most important source of emissions from deforestation (see tables 4, 5 and 6). Moreover, this value is the most conservative one.

Annex III

# Acronyms and abbreviations

| | |
|---|---|
| AD | activity data |
| Bo | methane-producing capacity |
| $C_2F_6$ | hexafluoroethane |
| $CF_4$ | tetrafluoromethane |
| $CH_4$ | methane |
| CITL | community independent transaction log (European Community) |
| CMP | Conference of the Parties serving as the Meeting of the Parties |
| CO | carbon monoxide |
| $CO_2$ | carbon dioxide |
| $CO_2$ eq. | carbon dioxide equivalent |
| CRF | common reporting format |
| CWPB | centre worked prebaked |
| DOC | degradable organic carbon |
| EC | European Community |
| EF | emission factor |
| EIT | economy in transition |
| EF | emission factor |
| ERT | expert review team |
| ETS | emissions trading scheme |
| EU | European Union |
| FAO | Food and Agriculture Organization of the United Nations |
| FRA | Forest Resource Assessment |
| GHG | greenhouse gas; unless indicated otherwise, GHG emissions are the sum of $CO_2$, $CH_4$, $N_2O$, HFCs, PFCs and $SF_6$ without GHG emissions and removals from LULUCF |
| GJ | gigajoule (1 GJ = $10^9$ joule) |
| GWP | global warming potential |
| HFCs | hydrofluorocarbons |
| HOSP | Timber Production Statistics and Forecast (in Dutch: "Hout Oogst Statistiek en Prognose oogstbaar hout") |
| IAR | independent assessment report |
| IE | included elsewhere |
| IEA | International Energy Agency |
| IEF | implied emission factor |
| IPCC | Intergovernmental Panel on Climate Change |
| kg | kilogram (1 kg = 1 thousand grams) |
| kgoe | kilograms of oil equivalent |
| LPG | liquefied petroleum gas |
| LULUCF | land use, land-use change and forestry |
| $m^3$ | cubic metre |
| MCF | methane correction factor |
| MFV | Measuring Network Functions (in Dutch: Meetnet Functievervulling) |
| Mg | megagram (1 Mg = 1 tonne) |
| Mt | million tonnes |
| Mtoe | millions of tonnes of oil equivalent |
| N | nitrogen |
| $N_2O$ | nitrous oxide |
| NA | not applicable |
| NE | not estimated |
| NFI | National Forest Inventory |
| $NH_3$ | ammonia |
| NIR | national inventory report |
| NO | not occurring |
| $NO_x$ | nitrogen oxide |
| PFCs | perfluorocarbons |
| PJ | petajoule (1 PJ = $10^{15}$ joule) |
| QA/QC | quality assurance/quality control |
| $SF_6$ | sulphur hexafluoride |
| $SO_2$ | sulphur dioxide |
| SWDS | solid waste disposal site |
| SWPB | side worked prebaked |
| Tg | teragram (1 Tg = 1 million tonnes) |
| TJ | terajoule (1 TJ = $10^{12}$ joule |
| UNFCCC | United Nations Framework Convention on Climate Change |
| VPN | virtual private network |
| VS | volatile solid excretion |

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