UNITED NATIONS
NATIONS UNIES

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

FCCC/WEB/IRI/2004/NLD 08 December 2004

THE NETHERLANDS

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

EXECUTIVE SUMMARY

1. This report covers the in-country review of the 2004 greenhouse gas (GHG) inventory submission of the Netherlands, coordinated by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, in accordance with decision 19/CP.8 of the Conference of the Parties. The review took place from 6 to 10 September 2004 in Bilthoven, the Netherlands, and was conducted by the following team of nominated experts from the roster of experts: Generalist – Ms. Sirintornthep Towprayoon (Thailand), Energy – Mr. Hristo Vassilev (Bulgaria), Industrial Processes – Mr. Charles Jubb (Australia), Agriculture – Ms. Batima Punsalmaa (Mongolia), Land-use Change and Forestry – Ms. María José Sanz Sánchez (Spain), Waste – Mr. Philip Acquah (Ghana). Ms. Sirintornthep Towprayoon and Mr. Charles Jubb were the lead reviewers. The review was coordinated by Mr. Javier Hanna Figueroa (UNFCCC secretariat).

2. In accordance with the "UNFCCC guidelines for the technical review of greenhouse gas inventories from Annex I Parties", (hereinafter referred to as UNFCCC review guidelines), a draft version of this report was communicated to the Government of the Netherlands, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

3. In the year 2002, the most important greenhouse gas in the Netherlands was carbon dioxide (CO_2), contributing 82.6 per cent to total[2] national greenhouse gas emissions expressed in CO_2 equivalent, followed by methane (CH_4) – 8.8 per cent, and nitrous oxide (N_2O) – 7. 1 per cent. Perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF_6) taken together contributed 1.5 per cent of the overall greenhouse gas emissions in the country. The Energy sector accounted for 83.5 per cent of total GHG emissions, followed by Agriculture (7.0 per cent), Industrial Processes (5.3 per cent) and Waste –(3.5 per cent). In aggregate, the Solvent and Other Product Use and Other sectors accounted for 0.7 per cent in 2002.

4. Total greenhouse gas emissions (excluding Land-use Change and Forestry) amounted to 213,765.05 Gg CO_2 equivalent in 2002 and increased by 1.1 per cent from 1990 to 2002. Tables 1 and 2 provide data on emissions by gas and by sector from 1990 to 2002. Over the period 1990–2002, CO_2 emissions increased by 10.0 per cent, mainly because of increased emissions from energy and transport. CH_4 emissions decreased by 31.6 per cent largely as a result of a decrease in the Waste sector; N_2O emissions decreased by 6.8 per cent because of a fall in emissions from industrial processes. Emissions of HFCs and PFCs declined by 64.5 and 50.3 per cent, respectively. SF_6 emissions increased by 58.1 per cent. Trends in emissions of the different gases are similar to the those reported in the previous year's inventory. CO_2 emissions show an upward trend, whereas CH_4, N_2O and fluorinated greenhouse

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

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

gases each show a declining trend. Total greenhouse gas emissions decreased by 1.1 per cent from 2001 to 2002, primarily because of a reduction in emissions of CH_4, N_2O, PFCs and SF_6.

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

GHG emissions	Gg CO_2 equivalent													Change from 1990–2002 %
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	
CO_2 (with LUCF)[a]	159,156	166,176	164,959	166,648	167,524	172,016	180,174	165,047	171,042	166,026	169,305	175,650	175,240	**10.1**
CO_2 (without LUCF)	160,578	167,704	166,446	168,454	169,453	173,248	181,572	166,228	172,421	167,261	170,718	177,063	176,654	**10.0**
CH_4	27,348	27,844	26,933	26,482	25,894	24,995	24,809	23,206	22,434	21,422	20,337	19,925	18,715	**31.6**
N_2O	16,392	16,661	17,637	18,369	17,975	18,102	17,809	17,746	17,540	17,278	16,552	15,815	15,280	**–6.8**
HFCs	4,432	3,452	4,447	4,998	6,487	6,018	7,676	8,307	9,360	4,922	3,879	1,507	1,572	**–64.5**
PFCs	2,416	2,419	2,079	2,095	1,864	1,836	2,014	2,164	1,738	1,471	1,578	1,482	1,200	**–50.3**
SF_6	217	134	143	150	191	301	312	345	329	317	335	356	344	**58.1**
Total (with CO_2 from LUCF)	209,962	216,686	216,198	218,742	219,934	223,268	232,796	216,816	222,443	211,436	211,986	214,735	212,351	**1.1**
Total (without CO_2 from LUCF)	211,384	218,213	217,685	220,548	221,864	224,500	234,193	217,996	223,823	212,671	213,399	216,149	213,765	**1.1**

[a] LUCF = Land-use Change and Forestry

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

GHG source and sink categories	Gg CO_2 equivalent													Change from 1990–2002 %
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	
Energy	163,111	171,387	170,059	172,214	173,151	175,980	184,514	168,172	175,463	169,720	173,661	179,889	178,570	**9.5**
Industrial Processes	16,269	15,235	15,738	16,833	17,998	17,146	19,011	19,787	20,267	15,283	14,182	11,352	11,410	**–29.9**
Solvent Use	225	301	302	186	174	198	146	129	160	154	138	115	90	**–59.8**
Agriculture	17,401	17,797	18,402	18,378	18,001	18,341	17,918	17,417	16,955	16,748	15,813	15,606	14,972	**–14.0**
LUCF[a]	–1,422	–1,528	–1,487	–1,806	–1,929	–1,232	–1,398	–1,180	–1,380	–1,236	–1,413	–1,413	–1,413	**–0.6**
Waste	13,155	12,269	11,959	11,714	11,316	11,608	11,379	11,264	9,752	9,541	8,380	7,963	7,500	**–43.0**
Other	1,224	1,224	1,225	1,223	1,225	1,227	1,226	1,226	1,226	1,225	1,224	1,224	1,223	**–0.1**

[a] LUCF = Land-use Change and Forestry

5. The national inventory submitted by the Netherlands is generally in conformity with the UNFCCC reporting guidelines, the *Revised 1996 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC Guidelines) and the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance). The Netherlands' submission for 2004 consisted of a national inventory report and a complete set of common reporting format tables for all years from 1990 to 2002. The detailed national inventory report along with supporting trend analysis tables, combined with actions aimed at improving data, demonstrate the Netherlands' commitment to producing an inventory that adheres to the reporting principles of consistency, completeness, transparency, comparability and accuracy. With some exceptions, the national inventory report and common reporting format tables submitted by the Netherlands covered all major sources and sinks as well as indirect and direct gases identified in the IPCC and UNFCCC guidelines. The exceptions include estimates for several sources in the Agriculture sector and the Land-use Change and Forestry sector, and emissions of CH_4 and N_2O from industrial, domestic and commercial waste water in the Waste sector, which were omitted.

6. The Netherlands has a well established emissions reporting system (the Pollutant Emission Register, PER) which has been adapted to the extent possible to enable reporting of greenhouse gas emissions in accordance with the requirements of the UNFCCC guidelines. Various organizations are involved in the inventory compilation and reporting process, each with clearly defined responsibilities. The Party recognizes that adaptation of the existing emissions reporting system and the prevailing institutional structure require additional reforms in order to improve the overall quality of the inventory

and facilitate full conformity with the UNFCCC reporting requirements. Specifically, the existing system does not permit allocation to the appropriate subsector of large quantities of fuels and emissions in the Energy sector, and significant amounts of emissions in the Industrial Processes sector. This distorts comparisons of summary measures, such as implied emission factors, both at a single point in time and over time. In addition, the present system causes some difficulties in revising or correcting data because data once included in the PER are taken to be definitive.

7. The Party is undertaking a major revision of the inventory compilation process which comprises, among other things, basing the Energy sector emissions on sectoral energy statistics from Statistics Netherlands, revising the feedstock emissions to enable them to be included in the Industrial Processes sector rather than the Energy sector, and reviewing and revising the unallocated emissions in both sectors. Other areas being addressed by the Netherlands include the collection of data and the revision of methodology in order to improve the completeness and accuracy of emissions estimates for Land-use Change and Forestry. All these changes will require recalculations, and these should be undertaken for all the years affected to ensure consistency of the time series.

8. The expert review team considers that the actions proposed by the Netherlands will result in substantial improvements to the inventory and address many of the issues raised in the sector reviews. It commends the Netherlands for its thorough approach to the identification of problems with the inventory and the detailed and transparent disclosure of these problems.

I. OVERVIEW

A. Inventory submission and other sources of information

9. The Netherlands submitted common reporting format (CRF) tables and a national inventory report (NIR) on 1 April 2004. These were resubmitted on 18 May 2004 following corrections and the resubmitted documents were used for the review by the expert review team (ERT).

10. In its 2004 submission, the Netherlands submitted a complete set of CRF tables for the years 1990–2002. In addition, it provided a set of supporting Excel workbooks that included detailed trend analyses. During the review the Netherlands provided the ERT with additional reference documents. These documents are not part of the inventory submission but are in many cases referenced in the NIR. The full list of materials used during the review is provided in annex 1 to this report.

B. Key sources

11. The Netherlands has reported key source tier 1 and tier 2 analyses, both level and trend assessments, as part of its 2004 submission. Twenty-seven key sources have been identified by the Party, with several sources presented at an aggregate level. The secretariat identified 18 key sources based on a tier 1 level assessment as described in the IPCC good practice guidance.[3] The analytical approach used in the Party's key source assessment differs from that of the secretariat. Specifically, the secretariat's assessment for stationary combustion is analysed by fuel type (gas, coal, oil) and the Netherlands' assessment is by subsector (Energy Industries, Manufacturing Industries and Construction, Other Sectors). In addition, the Netherlands analyses feedstock emissions by fuel type, with the exception of iron and steel, rather than by subsector or category. Nevertheless, key sources identified by the Party include all the categories included in the secretariat's assessment.

12. Key source categories are prioritized within the national inventory system in accordance with the IPCC good practice guidance. The ERT recommends that the Party review the key source analysis and

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

categories and, where appropriate, assess and report key sources in a manner that is consistent with the requirements of the IPCC good practice guidance. With regard to changes in key sources from the previous submission, CO_2 from civil aviation and CH_4 from waste-water handling are no longer key sources, and CO_2 from the category Other (Industrial Processes) along with CO_2 from Other (Fireworks) are key sources in 2002. These changes resulted from the revision of data and the increased importance of small sources which have associated high uncertainties when using the tier 2 assessment.

C. Cross-cutting topics

Completeness

13. The Netherlands has provided inventory data for the years 1990–2002 and included all required tables in the CRF. Recalculation and trends tables are provided. The majority of the main source/sink categories and direct and indirect GHGs are reported. Not all relevant cells in the CRF include a data entry or notation key, and it is recommended that these be included. The source categories that are not reported include the potentially significant subcategories of CO_2 emissions and removals from agricultural soils, and forest and grassland conversion. The Party advised the ERT that a new method was being developed for the Land-use Change and Forestry (LUCF) sector, and the Party is encouraged to use it and report on all resulting changes in the next inventory. The source categories reported as "included elsewhere" ("IE") in Industrial Processes and Waste Incineration (Biogenic Wastes) appear to be assigned to inappropriate categories (see CRF table 9). To avoid confusion, the ERT recommends that the Party reconsider these allocations.

Transparency

14. The NIR is generally complete, carefully documented and well organized. An executive summary outlines the major changes from the previous submission, which is informative and helpful. The information provided in the NIR is highly transparent. Contents and methodologies are clearly described. The NIR includes appendices with additional information, as well as clearly noted web site references for key supporting materials. Reference materials provided to the ERT during the review increased the level of transparency.

Recalculations and time-series consistency

15. The Netherlands provides detailed reporting on recalculations and the reasons for recalculations in section 10 of the NIR. In 2002, recalculations were undertaken because of methodological changes (revised data based on revised or different estimations methods), changes in the allocation of emissions between sectors and the correction of errors (due to incorrect data transfer from the Pollutant Emission Register (PER) to the CRF).[4] Recalculations for the 2002 submission affected the Energy, Industrial Processes, Agriculture and Waste sectors. The effect of the recalculations for the base year (1990), as reported in the CRF tables, was an increase of 0.66 per cent in CO_2 equivalent emissions (excluding LUCF). For the year 2001, the effect was a decrease of 1.61 per cent (excluding LUCF). It is noted that the Party's reporting deadlines mean that the most recent reported data are partly based on estimated activity data (AD). Final data become available after the inventory has been submitted, which results in the need to recalculate these emissions for the subsequent submission. For example, estimates for 2002 will need to be recalculated when the inventory for 2003 is submitted. It is recognized that the Party's obligations across a range of reporting requirements (domestic reporting (to the PER), European Community (EC) reporting, UNFCCC reporting) imposes constraints; however, the Party is encouraged to investigate approaches to reducing the use of estimated AD and its impact on the inventory. Nonetheless, it is accepted that due to the early reporting requirements to the EC, the Netherlands has limited capability for using more the final activity data for the last year reported.

16. As noted in the 2003 centralized review report, there are apparent gaps in the data for the years 1991–1994 that are related to the integration of the PER data set and the transfer of data to the CRF

[4] NIR 2004; p. 10–1.

categories. These gaps are commented upon in the NIR and were referred to in more detail during the review. The consistency of the time series for the Energy and Industrial Processes sectors is affected by the procedures used to fill the gaps for those years. In addition, the consistency of the values reported for all years is affected by the association of groupings of unallocated AD in some cases with unallocated emissions in the Energy sector, and the grouping of unallocated emissions in the Industrial Processes sector. In both cases these are effectively balancing items. This results in reporting of emissions where the source composition of the emissions along with changes in the source composition over time cannot be identified. The Party recognizes the problems and has invested substantial effort to improve the allocation of emissions and reduce the impact of the categories of indeterminate composition. The Netherlands is encouraged to continue these improvements and ensure that they apply to the complete time series, including the years 1991–1994.

Uncertainties

17. Uncertainty analyses of both annual emissions and emission trends are undertaken using the IPCC tier 1 and tier 2 uncertainty approaches. The uncertainties of AD and emission factors (EFs) have been estimated and presented by source category and by gas. Total emissions uncertainty is estimated to be around 5 per cent. The uncertainty for CO_2 is ±3 per cent; that for CH_4 is ±25 per cent; and those for N_2O and fluorinated gases (F-gases) are ±50 per cent. The largest uncertainty is reported for direct and indirect N_2O emission from agricultural soils. The trend uncertainty from 1990 to 2002 of total emissions is approximately ±4 per cent (using 1995 as the base year for F-gases) and the trend uncertainties of CO_2, CH_4, N_2O and F gases are approximately ±3 per cent, ±6 per cent, ±11 per cent and ±9 per cent, respectively.

Verification and quality assurance/quality control approaches

18. During the review, the ERT was provided with substantial and comprehensive documentation on quality assurance/quality control (QA/QC) issues and the application of the national QA/QC system. As part of the implementation of what is referred to as the National System, a three-phase project coordinated by the Netherlands Organization for Energy and Environment (SenterNovem) was started. Phase 1 involved assessment of the present situation, and was completed in 2002; Phase 2 involves the elaboration and description of relevant processes and procedures; and Phase 3 comprises the formal and legal arrangements needed for the structural embedding of the QA/QC procedures. The outcomes will be central to the development, direction and implementation of an integrated QA/QC system that encompasses the requirements of the PER, the EC and the UNFCCC.

19. At present, at the level of data preparation, the quality of the Netherlands' inventory data is dependent on the QA/QC processes that apply to the PER, which is subject to ISO 9001. The PER contains records of industry data collected through the environmental reports, and other non-industrial data. Industrial data are collected from mandatory annual environmental reports (AERs) for major companies, and from collective statistical AD and EFs estimated for small and medium-sized enterprises (SMEs). Non-industrial sources are statistically estimated. Around 50 per cent of the AERs are submitted electronically. The data sources used for the AERs and required for environmental control and management are documented in metadata sets for each source category. This is being upgraded to contain all the information necessary to complete the CRF file. QC activities for the PER are sequentially implemented. CRF data checks at IPCC source category level are performed.

Institutional arrangements

20. During the review, the Netherlands explained the institutional arrangements for preparation of the inventory. The Ministry of Spatial Planning, Housing, and the Environment (VROM) has overall responsibility for the national inventory through organizing and managing the reporting processes. The National Institute for Public Health and Environment (RIVM) is responsible for the PER and publication of the NIR. SenterNovem is responsible for the National System for monitoring of GHG, and the Netherlands Organisation for Applied Scientific Research (TNO) is responsible for the CRF. Most statistical data are from Statistics Netherlands (CBS). The Netherlands system allocates clear responsibilities to individual organizations, although the structure is slightly complex and can create

difficulties. The ERT found that the complex organizational structure and the fact that the PER data for individual industrial companies are treated as definitive constrain the Party's ability to adjust or revise data for earlier years. The changes to the collection of data on energy, including feedstocks, which the Party is to implement will reduce these difficulties.

Record keeping and archiving

21. The archiving system depends on the activity for which each organization involved in the inventory is responsible. All data used in the compilation of the CRF (AD and emissions) are archived at TNO. It is noted that the Netherlands has developed a web site that includes the main data and documentation, with the data presented according to the national method. Emissions according to the UNFCCC reporting guidelines and IPCC definitions are provided on another web site. In addition, the Party is developing a set of protocols which clearly document the methods used and data sources used for AD and EFs. These will be made publicly available and translated into English in early 2005.

Follow-up to previous reviews

22. The Netherlands provides a detailed listing of issues raised in previous reviews and the actions taken to address the issues in the NIR.[5] To the extent that the timing of review reports allows, the Party reports on issues raised by reviews in the subsequent submission. In addition, following extensive study and analysis of the inventory and inventory processes, the Netherlands has identified the need for substantial improvements in data, methods and reporting which will be implemented in future submissions.

D. Areas for further improvement

Identified by the Party

23. The Netherlands provides an extensive discussion of planned improvements to the inventory in the NIR. Several issues are pending following the 2003 review activity and these are clearly recognized by the Party in the NIR. The timing of the review reports and the internal reporting requirements for the Netherlands mean that not all issues are taken into account in the submission immediately following the review activities. Within the framework of an integrated national system applying to the PER and GHG emissions monitoring, the Party intends to improve CO_2 EFs for fuel combustion, the data used for estimating emissions from fuel combustion and feedstocks (non-energy use), the estimation of CO_2 emissions from waste incineration, the estimation of CH_4 and N_2O emissions from various sources, uncertainty analyses, and the treatment of sinks. These improvements are scheduled to be implemented in 2005. The proposed changes result from extensive investigations and consultations, and represent a major step forward in ensuring the overall quality of the inventory.

Identified by the ERT

24. The ERT endorses the Netherlands' monitoring improvement programme and identified the following cross-cutting issues for improvement:

a) Consistency of the explanations provided in the recalculation tables in the CRF and the methodological changes described in the NIR and the CRF needs to be maintained. This could be achieved through the provision of more detailed information in the CRF recalculation tables.

b) Checking of data for errors needs to be undertaken to ensure that there is no misreporting of emissions, even though some emissions estimates are not considered final and will be revised in future submissions; that is, year t (latest inventory year submitted) estimates as described in the NIR. The fact that some year t estimates will be revised does not obviate the requirement to ensure that reported data are as accurate as possible.

[5] Section 10.4.6, p. 10–11.

c) The composition of aggregated sources of emissions needs to be explained in the NIR with comment provided on whether the composition is changing over time.

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

II. ENERGY

A. Sector overview

26. In the year 2002, the Energy sector accounted for 83.5 per cent of total emissions (excluding LUCF) in the Netherlands. The subsector 1.A.1 Energy Industries is the major source category in the Energy sector, accounting for 35.9 per cent of emissions from the Energy sector and 30 per cent of total emissions in the Netherlands. Subsectors 1.A.2 Manufacturing Industries and Construction, 1.A.3 Transport, and 1.A.4 Other contributed 16.8 per cent, 17.2 per cent and 17.6 per cent, respectively, to the total emissions in 2002.

27. During the period 1990–2002, emissions from the Energy sector increased by 9.5 per cent, primarily due to increased emissions from 1.A.1 Energy Industries and 1.A.3 Transport. Emissions from these source categories increased by 24.3 and 23.3 per cent, respectively, from 1990 to 2002. Total Energy sector emissions decreased by 0.7 per cent between 2001 and 2002 as a result of increased electricity imports from neighbouring countries.

Completeness

28. The CRF tables for 2002 are largely complete. Estimates for most gases and sources are included consistently with the requirements of the IPCC Guidelines. Emissions not fully included are primarily emissions of CO_2 and N_2O from solid and other fuels from Manufacturing Industries and Construction, as well as emissions from the Petroleum Refining subsector.

29. Notation keys are used extensively in the CRF tables although some seem to be applied incorrectly. The meaning of "0.0" is often unclear as there is no explanation as to whether this indicates negligible amounts, lack of available data, "not estimated" ("NE") or "not occurring" ("NO"). The use of "0.0" is no longer accepted as an appropriate entry and it is recommended that the Party reconsider it. The use of the notation keys "IE" and "NE" should be supported by additional information in CRF table 9 (Completeness), as required. At present, the information provided in table 9 is not complete. The Party advised that these issues will be addressed as part of the continuous improvement program.

Transparency

30. The NIR includes information about and discussion of methodological issues along with discussion of emission trends, recalculations, key and non-key sources, the reference and sectoral approaches, uncertainty and confidentiality. The level of detail on these issues is variable. The NIR also includes references and comments on data sources.

31. The Netherlands has improved its inventory considerably since the previous submission. Some deficiencies in the reporting of the Energy sector still exist, namely the lack of full documentation on data sources used and EFs applied in the preparation of the inventory. The Netherlands noted that this will be included in the detailed methodology and data source descriptions that will be prepared after the next round of recalculations that were already announced.

32. During the review national experts explained additional aspects of data collection for all emission sources (irrespective of size) and the structure of the PER. National energy balance tables and lists of the EFs used in the compilation of the emissions inventories were also provided to the ERT.

33. The notable characteristics detected in the emission trends of the Energy source categories are not all described fully in the NIR. The national experts made available to the ERT a description of the

reasons for some fluctuations in the trends observed in the Netherlands. The Party is encouraged to include this information in future NIRs.

34. The only biomass fuel included in the energy statistics in the Netherlands is organic waste gas. Fuel data reported by individual companies may include information which is inconsistent, as there is no well defined procedure for companies to report biomass data in the AERs. The ERT recommends that the Party establish such a procedure.

Recalculations and time-series consistency

35. Recalculations are reported in the CRF for the years 1990, 1995 and 2000–2001. These were undertaken in order to achieve time-series consistency because of methodological changes, changes in the allocation of emissions and error corrections. The following methodological changes were implemented: updating of the EFs for road transport; updating of gas oil consumption data for other transportation; and including CH_4 and N_2O emissions from international bunkers as memo items in the inventory for 1990–2002.

36. The source allocation was improved by reallocating fugitive emissions of CH_4 for the years 1991–1994 over the subcategories of 1.B.2 instead of including them in the total under Other in 1.B.2. The most obvious error corrections were for the Residential subsector and chemical industry. The effect of the recalculations on the Energy sector as a whole is addressed in the NIR. The differences in total emissions between the 2004 NIR and the 2003 NIR range from –1.8 per cent to +0.8 per cent for CO_2, from –2.5 per cent to +1.8 per cent for CH_4, and from –1.8 per cent to –0.2 per cent for N_2O.

Uncertainties

37. The NIR provides quantitative uncertainty estimates for all emission sources and EFs in the Energy sector, disaggregated by fuel. These estimates are based on approaches discussed at a national workshop in 1999 and take into account uncertainty values proposed in the IPCC good practice guidance and information in the RIVM fact sheets on calculation methodology and data uncertainty.

B. Reference and sectoral approaches

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

38. Energy consumption and CO_2 emissions for 2002 are 29.5 per cent and 1.5 per cent higher, respectively, for the reference approach than for the sectoral approach. The differences in the consumption of liquid and solid fuels are very high (110.6 per cent and 48.8 per cent, respectively). The Netherlands lists some reasons for the discrepancies in the NIR and during the review elaborated further on the discrepancies observed, as follows:

a) The CRF tables for the sectoral approach do not add data for liquefied petroleum gas (LPG) to consumption and corresponding emissions to the group of liquid fuels in the Transportation source category.

b) The data for other fuels in the sectoral approach are unspecified by reporting companies and this results in very high implied emission factors (IEFs), in the range of 232 to 842 kg/TJ. This means that the AD reported, which are not disaggregated by fuel type, do not necessarily correspond with the associated reported emissions.

c) Consumption of fuels for non-energy use is not excluded from the apparent consumption of the reference approach. This leads to an overestimate of the energy AD in the reference approach compared to the sectoral approach.

d) Individual reporting firms use different EFs and carbon storage factors.

e) There are differences in the precise source and source group definitions for bunker fuels (allocation of emissions as domestic or international).

39. The NIR does not explain the evolution over time of the differences in AD and CO_2 emissions between the reference approach and the sectoral approach for liquid and solid fuels (1990–2002). The emissions obtained using the reference approach are lower than those obtained using the sectoral approach for 1991–1994 (the smallest discrepancy is a difference of 0.1 per cent in 1993 and the highest is 1.9 per cent in 1992). For these years, the NIR reports the inclusion in national totals of CO_2 emissions associated with statistical differences, while for other years the energy balance does not show these differences. The ERT encourages the Party to recalculate the CO_2 emissions for 1991–1994 without including statistical differences. In its response to the draft review report, the Netherlands noted that as part of the recalculation of fuel combustion emissions based on sectoral energy statistics, the energy statistics for 1991–1994 will be assessed for a better concordance with the emission inventory framework.

40. National experts attribute the deviations to the 20–50 per cent of solid fuel emissions omitted from the sectoral approach due to aggregation of data for the iron and steel industry, and high inter-annual variation of derived fuels (coke oven gas and blast furnace gas) sold to other sectors. No explanation is provided as to why after 1998 the difference between the reference approach and the sectoral approach for liquid fuels increases every year – from 57 per cent in 1998 to 86 per cent in 1999, 87 per cent in 2000 and 116 per cent in 2001. In addition, the maximum difference in CO_2 emissions between the two approaches occurs in 1997, when it is 5.8 per cent. Values reported in the NIR tables for 1997 are inconsistent and conflict with the CRF for 1997. Table 3.4 of the NIR reports a zero entry for feedstock emissions for 1997, compared with tables 3.9 and 3.11 where a value of 9.5 Mt is reported; however, the total, including feedstock emissions, shown in table 3.9 is the same as the value for fuel combustion emissions from industry reported in table 3.4. The ERT encourages the Party to review and revise the values for 1997 and other years in order to ensure consistency. The Party recognizes that there is an inconsistency and has undertaken to correct any error in future inventories.

International bunker fuels

41. International bunker fuels and associated emissions are reported in the CRF and the NIR. Emissions of CO_2 from international aviation increased by 128.6 per cent in 2002 compared with 1990, and those from international navigation increased by 33.6 per cent. Because of the growth in international air traffic, its share in international bunker emissions increased from 11 per cent in 1990 to about 18 per cent in 2002.

42. Marine bunker sales include fuel deliveries to professional domestic inland shipping (1.A.3d Navigation) and deep-sea fishing boats (1.A.4c Agriculture/Forestry/Fishing). This allocation is not consistent with the IPCC Guidelines and in 2003 actions were started to correct the calculation.

43. Non-CO_2 emissions (CH_4 and N_2O) were reported for international transport for the first time in the 2004 submission.

Feedstocks and non-energy use of fuels

44. In the NIR a description is provided of feedstocks and non-energy use of fuels reported in the CRF. The Party explained that the allocation to fuel combustion from Manufacturing Industries (source category 1.A.2) is used since the estimates are partly based on subsectoral non-energy use statistics in the national energy balance. This was also done since the required comparison of sectoral CO_2 emissions from fossil fuel combustion with the IPCC Reference Approach, that includes an estimate for the non–energy use CO_2 emissions, seems to suggest that these emissions should be mostly included in the Energy sector rather than in the Industrial Processes and Solvent and Other Product Use sectors.

45. The Netherlands has a relatively large petrochemical industry, which is reflected in CO_2 emissions associated with non-energy use of oil products and natural gas. These emissions are key sources based on the tier 1 level assessment of the Party. There is a difference between the CO_2 emissions from liquids (oil) in table 3.28 and the figure shown in table A1.2 in the NIR. National experts explained that the figures in table A1.2 are incorrect and will be revised in future submissions.

46. The factors 0.1 and 0.0 are used to estimate carbon (C) stored for natural gas and lubricants used as feedstocks. These values are not consistent with the IPCC Guidelines. The Party stated that the greater part of natural gas consumed as feedstocks is used for the production of ammonia and fertilizers, with large quantities being exported. This is the reason for the smaller value compared with the IPCC default (0.333). The ERT have not received clear explanation for the assumption of zero carbon stored factor for lubricants. The ERT recommends that the lubricants' C storage value be reconsidered.

C. Key sources

Stationary combustion – all fuels – CO_2

1.A.1. Energy industries

47. The share of CO_2 emissions from the Energy Industries subsector in total national CO_2 emissions (excluding LUCF) was 32 per cent in 1990 and 36.1 per cent in 2002. Emissions of CO_2 in this subsector increased by 24.3 per cent between 1990 and 2002. A country-specific tier 2/tier 3 method is used for calculating the CO_2 emissions. The method is based on emissions data from large individual point sources provided by the AERs of large companies and supplemented by estimates based on fuel consumption per sector and country-specific EFs. A detailed description of the methodology provided in Spakman et al. (2003) was made available to the ERT, which considers that the methodologies used are appropriate and in line with the IPCC good practice guidance.

48. The CO_2 IEFs for other fuels as a rule are very high (the share of CO_2 emissions from other fuels is around 17 per cent of the total for Energy Industries). The Party explained that all emissions and fuels that cannot be allocated by source are reported under Other Fuels. As a result, the IEFs are substantially meaningless because there is a bundle of unspecified emissions associated with a bundle of unspecified fuels that may not have any real relationship with one another at a particular point in time or over time. The ERT encourages the Party to make efforts to improve the reporting under Other Fuels and to provide more transparent explanations for the trends and the values of this CO_2 IEF. The Netherlands recognizes the problems of this approach and is undertaking substantial efforts to improve the allocation and reporting of emissions under the Energy sector. These efforts will be reflected in future inventories. It is recommended that the Party ensure time-series consistency through review and revision of all years, including the years 1991–1994, which constitute a particular problem.

49. The 2000 value of the CO_2 IEF (177.22 t/TJ) for solid fuels for public electricity and heat production is the highest of those reported by any Party (the range is 87.32–177.22 t/TJ). The trend of the CO_2 IEFs is unstable: the 2000 value is 71.3 per cent higher than the 1999 value and the 2001 value is 42.8 per cent lower than the 2000 value. The Party explained that the share of solid fuels had decreased compared with the share of other fuels (unspecified) for 2000, and that the share of coke oven gas varied. The ERT recommends that the Party provide more detailed explanation of the reasons for the changes.

50. The 2002 value of the CO_2 IEF (48.69 t/TJ) for liquid fuels for public electricity and heat production has been identified as an outlier. It is the lowest of those reported (the range is 48.69–79.21 t/TJ). The values for 1999, 2000 and 2001 of the CO_2 IEFs (57.08 t/TJ, 46.06 t/TJ and 48.77 t/TJ, respectively) have also been identified as outliers, and in these years they are the lowest of those reported by any Party. The Netherlands has not provided an explanation, and is encouraged to do so.

1.A.2. Manufacturing industries and construction

51. In 2002, CO_2 emissions from this source category, as reported by the Party in the NIR, contributed 10 per cent of total emissions (excluding feedstock emissions from coal, oil and gas, and emissions from production in Iron and Steel). In addition, the Party reported industrial processes emissions of CO_2 from Iron and Steel, and CO_2 feedstock emissions from gas and oil, as key sources. Emissions of CO_2 in this source category decreased by 15.2 per cent between 1990 and 2002.

52. Country-specific EFs and tier 2/tier 3 methods are used for calculating CO_2 emissions, except for CO_2 emissions from non-energy use of fuels. For these the IPCC tier 1 method is used, which the Party recognizes is not fully in compliance with the IPCC good practice guidance.

53. The trends of CO_2 emissions and production data are closely related, with the exceptions of the categories Iron and Steel for 1996 and 1997, Food Processing, Beverages and Tobacco in 1997, and Pulp, Paper and Print in 1999. The Party explained that these discrepancies could be caused by large annual stock changes or by calculation error. The ERT encourages the Party to investigate further and clarify the reasons for the differences.

54. The inter-annual changes in total fuel consumption for Iron and Steel between 1995 and 2000 have been identified as outliers (–66.8 per cent, +8.7 per cent, –17.6 per cent, –99.2 per cent and 8,833.3 per cent, respectively). The trend fluctuates. It is suggested that the Party provide an explanation for the extreme fluctuations.

55. As mentioned above, in cases where CO_2 and related fossil fuel consumption were not reported by fuel type by individual companies, or when they did not properly match, fuel consumption and CO_2 emissions are allocated under Other Fuels. For example, about 50 per cent of CO_2 emissions from this source category are reported under Other Fuels (in the case of Chemicals, 64 per cent are reported under Other Fuels, and 89 per cent in the case of Iron and Steel). Moreover, there have been significant changes in the IEFs for all industries in this source category. The Party is encouraged to reduce the contribution of the category Other Fuels in this source category by disaggregating the fuels to a greater extent.

56. The trend of the CO_2 IEFs for solid fuels for iron and steel production is unstable. The 1996 value is 64.9 per cent lower than the 1995 value because the share of blast furnace gas was higher in 1995.

57. The 2002 value of the CO_2 IEF (88.76 t/TJ) for liquid fuels for Chemicals is the highest of those reported by Parties (the range is 5.98–88.76 t/TJ). The CO_2 IEFs for 1995 and 1997–2000 (58.64 t/TJ in 1995; 55.24 t/TJ in 1997; 45.51 t/TJ in 1998; 53.03 t/TJ in 1999; and 46.09 t/TJ in 2000) are the lowest of those reported (except in 1999, when the CO_2 IEF is the second-lowest). The large inter-annual changes between 1995 and 2002 are in the range of a 17.6 per cent decrease (between 1997 and 1998) and a 58.95 per cent increase (between 2000 and 2001). The ERT encourages the Party to improve the fuel data collection for this category. The Party advised the ERT that changes are to be made to the methods of data collection and these are expected to result in substantial improvements in the fuel data.

58. The 1995 and 1998 values of the CO_2 IEFs (60.84 t/TJ and 61.48 t/TJ, respectively) for gaseous fuels for Chemicals are the highest of those reported by Parties in these years. This has been stated to be a result of the use of so-called "non-standard" gas. It is not clear what is meant by non-standard gas and the ERT suggests that the Party provide further explanation.

1.A.4. Other sectors

59. Country-specific EFs and the tier 1 method are used for estimating CO_2 emissions from this source category, which complies with the IPCC good practice guidance.

60. Only stationary emissions are included in this source category, while emissions from mobile machinery are accounted for in the Transport source category under Other Transportation. Emissions from national fisheries are reported under International Bunkers, which does not comply with the IPCC good practice guidance. The Party will consider this compliance issue and try to include these emissions in this source category in future submissions.

61. CO_2 emissions from the Commercial/Institutional source category increased by 54.1 per cent from 1990 to 2002. The much higher emissions in the period 1991–1994 may be a consequence of the generic uncertainty of 20 per cent in the AD and the lack of revision of energy balances to eliminate statistical differences, as the Party reports in the NIR.

62. CO_2 emissions from the residential source category increased by around 1.6 per cent from 1990 to 2002. The trend over the years is stable, but this source category is quite sensitive to weather conditions since the largest part of the fuel use is for space heating. When the temperature correction is included the trend in CO_2 emissions shows a decrease of 6 per cent for the same period. The Residential source category is the largest source of CO_2 emissions included in Other. It accounts for 56.9 per cent of total source category emissions in 1990 and 54.3 per cent in 2002.

63. CO_2 emissions from the Agriculture/Forestry/Fisheries source category decreased by 18.9 per cent from 1990 to 2002. This is mainly due to energy conservation measures in greenhouse horticulture, which accounts for approximately 85 per cent of the primary energy use in this source category.

64. The 1995 and 2000 values of the CO_2 IEFs (177.83 and 2.51 t/TJ, respectively) for other fuels in Commercial/Institutional are the highest and the lowest, respectively, among the reporting Parties and across the time series. The Party reports on the methodological specifications in the determination of other fuels. This category includes all unspecified fuels, and the high IEF values are the result of the mismatch between AD and emissions. The ERT encourages the Party to improve the methodology for estimating emissions from other fuels.

Mobile combustion – oil – CO_2

1.A.3.b. Road transportation – CO_2

65. Emissions of CO_2 increased by 29.1 per cent from 1990 to 2002 and in 2002 contributed 90.3 per cent to the CO_2 emissions from transport.

66. Emissions are estimated using the IPCC tier 2 method for CO_2, and tier 3 methods for CH_4 and N_2O. CO_2 emissions are calculated using data on fuel sales from the CBS and country-specific EFs in accordance with the IPCC good practice guidance.

67. There is a difference between the IPCC approach, under which fuel consumption is calculated on the basis of fuel sold in the country, and the national approach, which is based on transport statistics and expressed in terms of vehicle-km travelled. Estimates based on the national approach are 4–10 per cent (for gasoline, diesel oil and LPG) lower than estimates based on the IPCC approach. In the past five years the discrepancy has tended to decrease and stabilize at around 4 per cent. The Party has not fully explained the reasons for the differences but concludes that both methods show approximately similar trends in fuel consumption by fuel type over the past 10 years.

1.A.3.e. Other transportation – CO_2

68. The Netherlands indicates in the NIR that this source category comprises emissions from off-road vehicles used in agriculture and construction. This specification should be provided in the relevant documentation box of the CRF.

69. CO_2 emissions from off-road vehicles used in agriculture are estimated using the IPCC tier 2 method, data on fuel sales from the Agricultural Economics Institute (LEI) and country-specific EFs. The source for the AD of construction machinery is not reported in the NIR.

70. The ERT encourages the Party to update the fuel consumption data for 2002, which are preliminary, and to correct the difference of 5 per cent between the figures in CRF table 1.A(a)s3 and those in table A1.2 of the NIR.

Fugitive emissions – oil and natural gas – CH_4

1.B.2. Natural gas production and distribution

71. CH_4 emissions are estimated using the IPCC tier 1 method. The Party provided the ERT with additional information about country-specific EFs which are not discussed in the NIR. The method does

not fully comply with the IPCC good practice guidance, as this is a key source, and the Netherlands is encouraged to investigate whether a tier 2/3 method can be applied.

72. CH_4 emissions decreased from 1990 to 2002 by 41.6 per cent for production and 19.7 per cent for distribution. This substantial reduction is a result of the implementation of cost-effective measures to prevent venting of natural gas during production and the gradual replacement of old cast-iron pipes by modern materials in the distribution networks.

73. The AD and emissions from 1.B.2.a.v Distribution of Oil Products are reported as "NE". The Party noted that data are not available. The ERT recommends that the Party develop procedures for the collection and inclusion of data for this source in the inventory.

74. The inter-annual changes in CH_4 emissions for natural gas between 1991 and 1992, 1995 and 1998, 1999 and 2000, and 2001 and 2002 have been identified as outliers. The changes range from a decrease of 17 per cent (between 1996 and 1997) to an increase of 10.6 per cent (between 1995 and 1996). The Party explained that the variations are due to changes in consumption, which are the result of weather conditions (domestic and abroad), and thus an artefact of the specific tier 1 method used for calculating emissions for gas distribution.

1.B.2.c. Venting and flaring

75. CH_4 emissions from venting and flaring are reported as "IE", and AD and emissions for oil and gas combined from venting and flaring are reported as "NE". The ERT encourages the Netherlands to estimate the volumes vented and flared and to calculate subsequent emissions using the tier 1 approach, as recommended in the decision trees of the IPCC good practice guidance. It would be helpful if the Party included a clear explanation of the use of the notation key "IE" in CRF table 9.

D. Non-key sources

Mobile combustion – waterborne navigation – oil – CO_2

76. The exclusion of domestic commercial shipping from the calculation of domestic waterborne navigation emissions results in an underestimation of the CO_2 emissions. This also applies for national fisheries, emissions from which are currently included in international bunker emissions. The ERT encourages the Party to revise the allocations according to the IPCC good practice guidance.

Stationary combustion – all fuels – CH_4

77. The 2002 value of the CH_4 IEF (140.2 kg/TJ) for gaseous fuels from manufacture of solid fuels and other energy industries is the second–highest of those reported by Parties. The ERT recommends the Party to analyse the CH_4 emissions and AD for possible errors or gaps.

78. The 2002 CH_4 IEF (7–37 kg/TJ) for the Commercial/Institutional and Residential categories – gaseous fuels – is outside the IPCC default range (1–1.2 kg/TJ), but the reasons for this are not explained. The ERT suggests that the Party provide additional explanations.

Mobile combustion – all fuels – N_2O

79. For road transport the Party uses country-specific EFs for N_2O, reflecting the decreasing EF for catalyst-equipped cars at the end of the time series and the increasing share of diesel cars with relatively low N_2O EFs. However, the N_2O IEFs for gasoline and diesel oil reported by the Netherlands are much lower than those reported by neighbouring countries and are the lowest in the European Union. The ERT recommends the Party to review the country-specific N_2O EFs used. In its response to the draft review report, the Netherlands stated that the EFs for petrol and diesel vehicles are based on measured, country-specific data. However, the further assumptions used in the annual emission calculation (e.g., mix of driving modes and average actual driving conditions) result in aggregated EFs that have a substantial

uncertainty. Also the Party informed that the emission calculation model is subject to continuous improvements.

80. The Party reports in the NIR that it uses IPCC default EFs for N_2O emissions from other transportation. This does not appear to be correct because the IEF in the CRF (1.87 kg/TJ) is about one-fifteenth of the IPCC EF (diesel, 30 kg/TJ; gasoline, 2–4 kg/TJ). The ERT suggests that the Party review the EFs and AD used.

E. Areas for further improvement

Identified by the Party

81. In its 2004 NIR the Netherlands recognizes the need to improve the quality of data in the PER. There is a concrete plan (started in the second half of 2004) to improve the methodology for Energy sector emissions through the use of sectoral energy statistics of the national energy balances. The ERT welcomes the significant improvements that will be made as a result.

82. For the emissions source Distribution of Natural Gas, the Party will make efforts to comply with the methods recommended by the IPCC good practice guidance. This will include the collection of data on the length of the distribution network and leaks classified by pipeline type.

83. The Party will further develop the actions started in 2003 to revise and expand the non-CO_2 emissions calculations for international transport in accordance with the IPCC good practice guidance.

Identified by the ERT

84. The data reported in the CRF tables for the Energy sector are largely complete. The reporting can be further improved by correcting some notation keys and providing explanations in the documentation boxes and in table 9 (Completeness) where appropriate.

85. Full documentation relevant to the country-specific EFs used in the preparation of the inventory for the Energy sector (such as disaggregated EFs for combustion sources, along with an adequate description of how they are used) is another element that would greatly enhance the quality of the NIR. The Party should also discuss the quality (reliability, consistency, deficiencies) of the energy-related data supplied by individual companies, although the ERT recognises that this will be obsolete for the historical time series 1990–2003 after the recalculation of fossil fuel related emissions.

86. Substantial effort is needed to improve the national inventory for the years 1991–1994 since the data for this period, as the Netherlands recognizes, are of lower quality than the data for more recent years. The ERT also recommends revising all the AD for 1997, which are very different from the AD for all other years in the period 1990–2002. The ERT emphasizes that a consistent time series is one in which all reported data are consistent. Consequently, when the Party implements the changes in the Energy sector methodology, it is essential that all reported years, including the years 1991–1994, be recalculated to ensure complete time-series consistency.

87. The ERT recommends that the Party obtain the information necessary to apply tier 2/3 methods for fugitive CH_4 emissions from oil and gas production and distribution.

III. INDUSTRIAL PROCESSES AND SOLVENT USE

A. Sector overview

88. In the year 2002, emissions from the Industrial Processes sector contributed 5.3 per cent of total national emissions (without LUCF), the same proportion as in 2001, compared with 7.7 per cent in 1990. From 1990 to 2002, emissions declined by 29.9 per cent, and from 2001 to 2002 they increased by 0.5 per cent. N_2O emissions accounted for 54.8 per cent of CO_2 equivalent emissions from the sector, and CO_2, HFCs, PFCs and SF_6 for 17.4, 13.8, 10.5 and 3 per cent of emissions, respectively, in 2002. Methane emissions were negligible (0.4 per cent).

89. Total CO_2 emissions from the sector increased by 25.9 per cent from 1990 to 2002 and by 46.8 per cent from 2001 to 2002; CH_4 emissions, although trivial, decreased by 31.7 per cent from 1990 to 2002 and by 5.6 per cent from 2001 to 2002; N_2O emissions fell by 17.2 per cent from 1990 to 2002 and by 5.2 per cent from 2001 to 2002; HFC emissions declined by 64.5 per cent from 1990 to 2002 and increased by 4.4 per cent from 2001 to 2002; PFC emissions decreased by 50.3 per cent from 1990 to 2002 and by 19.0 per cent from 2001 to 2002; and SF_6 emissions increased by 58.1 per cent from 1990 to 2002 and declined by 3.6 per cent from 2001 to 2002.

90. The Industrial Processes sector contributed 1.1 per cent of total CO_2 emissions in 2002, and 0.3 per cent of total CH_4 emissions. Emissions of N_2O from industrial processes accounted for 41.0 per cent of total N_2O emissions.

91. The Netherlands inventory for this sector is dependent on reports from companies that are compiled and collated for the PER. In most cases emissions estimates are compiled from individual emission reports, and emissions for remaining sources are estimated. This means that emissions are not derived directly by the inventory agency or organizations acting on their behalf from AD and EFs. With respect to HFCs, an annual report on national HFC use is the basis for the emissions estimation.

Completeness

92. The source coverage and gases included are substantially complete. Minor sources such as asphalt roofing and road paving with asphalt are shown as "NE", but all significant sources along with estimates of direct and indirect GHG emissions appear to be included. Many of the tables include blank cells where data or a notation key should be entered. It is recommended that the Party include an entry in all relevant cells to ensure that a comprehensive overview of the completeness of the inventory can be obtained. The ERT suggests that the Netherlands endeavour to include emissions from asphalt roofing and road paving with asphalt. In addition, CRF table 9 (Completeness) appears to be incorrect in respect of the emissions for industrial processes shown as "IE", namely, CO_2, CH_4 and N_2O, and the Party is encouraged to review and revise the entries in this table.

Transparency

93. The CRF provides footnote explanations for various source where required, and the NIR includes summary information on the methods used to estimate industrial process emissions along with references to supporting documents. A copy of the reference Spakman et al. (2003), which provides additional detail on methods, was made available to the ERT and this assisted in explaining the methods used, especially for HFC consumption.

94. Overall the level of transparency is adequate; however, several important factors reduce transparency for the Industrial Processes sector. Specifically, there are five aggregate categories of emissions in the sector report that are denoted as "Not attributable to specific sectors" or "All other emissions"; some table notes are not clear, for example, "Empty cells: included in 2.G"; emissions from feedstocks, reductant use and anode consumption are not allocated to the appropriate industrial sources; explanations as to why some information is confidential are not included; and, as noted above, not all cells include data or a notation key. It is recommended that these issues be addressed in future submissions and more complete explanations be provided in the NIR. The Netherlands informed the ERT that proposed changes in the method for calculating the inventory will result in improvements to the allocation of emissions and in the specification of the composition of the aggregated categories.

Recalculations and time-series consistency

95. Recalculations for the Industrial Processes sector have been included in the 2004 submission, and the data affected and reasons for the recalculations are adequately explained in the NIR. Additional detail is provided in supporting tables provided by the Party. The recalculations resulted in a fall in the figures for emissions of HFCs for each year from 1994 to 2001, a fall in estimated emissions of PFCs for each year from 1990 to 1996, followed by an increase for each year from 1997 to 2001, and an increase in

estimated emissions of SF_6 for each year from 1990 to 2001. The ERT identified a potential inconsistency in the amount of CO_2 reported in 2002 compared with earlier years, which affects two of the categories where emissions are not attributed to specific sources. The Netherlands indicated that this was attributable to an estimation error that will be corrected in the 2005 submission. An inconsistency in the emissions for cement production for 1990 and 1991 will also be corrected in the 2005 submission.

Uncertainties

96. Quantitative uncertainty assessments are included in the NIR covering uncertainties in AD and EFs. Some of the EF uncertainties appear high in view of the fact that they are stated to be based on plant-specific measurement data, for example, the N_2O EF from nitric acid production. This issue was raised in the 2003 centralized review report and it is suggested that the Party reconsider the uncertainty values and include an explanation in the NIR of the reasons why plant measurements are as uncertain as reported.

Verification and quality assurance/quality control processes

97. The Industrial Processes inventory is closely linked to the PER, and verification and QA/QC depend on the processes that are in place for ensuring the accuracy and quality of data that are entered in the PER. In addition, the processes used appear to constrain the extent to which bottom–up data and top–down data, along with any additional calculations, can be reconciled and used to improve the estimates reported in the inventory. That is, reports included in the PER appear to be definitive in terms of the estimates that are accepted to be reported in the inventory. A process exists for querying estimates obtained from the PER and individual AERs but it is not clear how frequently this is used or whether the outcomes have been considered acceptable. A further issue for verification and QA/QC is the number of categories where emissions are aggregated but the source composition is not fully specified. This raises the questions whether and how the category composition is disaggregated for verification, as well as the question how far quality is maintained by ensuring that source composition is constant over time (that is, the same sources are included every year). As noted in the 2003 centralized review report, it is important to explain how data are reconciled each year and from year to year.

98. The Party has a number of QA/QC phases as part of the compilation of the PER, and is in the process of implementing several actions arising from a Task Forces workshop on trend verification to improve the Industrial Processes inventory along with reports for other sectors.[6] Changes proposed to methods that will improve the allocation of emissions by source, and reduce the extent to which emissions are allocated to other sectors or aggregated in a category of unspecified composition, will facilitate improvements to QA/QC procedures. The Party is encouraged to report briefly the QA/QC outcomes resulting from inventory improvements.

B. Key sources

Nitric acid production – N_2O

99. Only emissions are reported. AD are confidential and it is not possible to derive an IEF for the purposes of comparison with the IPCC good practice guidance default factors or the IEFs derived from data reported by other Parties. The EFs from which the emissions are estimated are based on plant-specific measurement data.[7] No additional explanation of the reason for the data being confidential is provided (as was suggested in the 2003 centralized review report) and it would be useful if the reasons for this were clarified. In its response to the draft review report, the Party stated that data are confidential due to competition issues as between the reporting companies.

100. The uncertainty of the EF is stated as 50 per cent in the NIR. The Netherlands acknowledged the need to reconsider the level of uncertainty. Although further consideration is yet to be undertaken, the

[6] NIR 2004; p. 1–21.
[7] NIR 2004; p. 4–4.

ERT was advised that the EFs were available to the Netherlands and that the values were within the ranges that would be expected given the technology used. Given that the emissions are based on plant-specific measurement data, it is suggested that the level of uncertainty be reconsidered and commented on in future submissions.

Aluminium production – PFCs

101. Activity and emissions data are obtained from the AERs submitted by companies as part of the reporting requirements under the Netherlands PER. A minor error was identified in the formulae in the CRF used for calculating the IEFs and this will be corrected.

102. An assessment of the ratio of emissions of perfluoroethane (C_2F_6) to emissions of CF_4 indicated that the ratio ranges from a high of 0.24 in 2000 to a low of 0.10 in 2002. In most cases C_2F_6 emissions are determined through ratioing with the IPCC good practice guidance for all technologies, providing EFs with a ratio of C_2F_6 to CF_4 of 0.10. The higher ratios derived from the emissions reported could indicate that either emissions of CF_4 are underestimated or emissions of C_2F_6 are overestimated, or that a different method is being used by the companies to estimate emissions. This raises the question whether the time series is consistent – that is, the same method has been used for all years from 1990 to 2002 – or whether a different method has been used in 2002 and some of the earlier years. It was agreed that this issue would be investigated and an explanation provided.

103. Analysis of the time series for PFC emissions shows that they fell by 49.6 per cent from 1997 to 2002. The 2004 previous review stage comments on large inter-annual changes in emissions and IEFs. The Netherlands explained that the inter-annual changes were due to variations in production, and the overall fall in emissions was attributable to a change in the anode feeding method by one of the producers in 1998.[8] It is noted that PFC emissions increased between 1995 and 1996, and between 1996 and 1997, whereas production was stable from 1995 to 1996 and increased by 16 kt between 1996 and 1997. It would be helpful if the Party clarified the reasons why the introduction of a different anode feeding technology impacted on PFC emissions.

104. The Party advised the ERT that it had received a complete time series of AD from 1990 and that these data would be used to validate data already reported and recalculate emissions if required. The results will be reflected in the next submission.

Production of halocarbons and SF_6 – HFC-23

105. Emissions of HFC-23 from the production of HCFC-22, the main production source of emissions, fell from 665.9 tonnes (7,791 Gg CO_2 equivalent) in 1998 to 58.5 tonnes (68.4 Gg CO_2 equivalent) in 2002. This is the result of the installation of a thermal afterburner with the operation time of the control equipment being increased over time.[9] Minor CO_2 emissions arise from the thermal decomposition of the HFC-23 and these are not accounted for in the inventory. The magnitude of these emissions will be investigated to determine whether they need to be included.

106. A category of "All other emissions" is included under Other for this source – table 2(II) sheet 1. Some speciation and a classification of "Unspecified" is provided for the category. In response to this issue being raised in the 2003 centralized review report, the Netherlands explained that these emissions originate from the company that produces HCFC-22. The classification is explained in the 2002 CRF as including HFC-23, HFC-32, HFC-43-10mee, HFC-152a and HFC-227ea (Table 2(II).F sheet 1).

107. The inclusion of the "Unspecified" classification causes some confusion in that the value reported for "All other emissions" in table 2(I) sheet 2 is the CO_2 equivalent quantity of the speciated emissions in table 2(II).F sheet 1, and the "Unspecified" emissions are omitted. The 2003 centralized review report noted the discrepancy between these tables for the 2001 CRF, and the Party stated that the correct value

[8] NIR 2004; p. 4–5.
[9] NIR 2004; p. 4–6.

includes "Unspecified" emissions. It is recognized that inclusion of these emissions in the source category in table 2(I) sheet 1 could cause additional confusion between tables 2(I) and 2(II).F, on the one hand, and on the other hand table 10, where emissions are speciated to the extent possible and unspecified emissions correspond with the value in table 2(II).F sheet 1. It is suggested that a note be included in table 2(I) to explain that "All other emissions" do not include "Unspecified" emissions.

108. AD are obtained from AERs submitted by companies and included in the PER.

Consumption of halocarbons and SF_6 – HFCs and PFCs

109. Emissions are allocated to refrigeration and air conditioning, and aerosols/metered dose inhalers. The majority of emissions are speciated with a small amount only classified as "Unspecified". Since 1998 the quantity of HFC-134a emitted has decreased from 764.9 tonnes to 327.8 tonnes, a reduction of 57 per cent. The Party explained that this rapid decline was attributable to the substitution of hydrocarbons (propane and butane) for HFC-134a used as a propellant in aerosols for foams. Emissions from aerosols/metered dose inhalers increased sharply from 43.5 tonnes in 1994 to 586.5 tonnes in 1999 and declined to 129.3 tonnes in 2002. Given the very high growth in emissions from 1994 to 1999, followed by a similarly rapid decline from 1999 to 2002, the ERT recommends that the Party provide more explanation in the next NIR.

110. As with the production of halocarbons, reported emissions from the consumption of halocarbons include a group of unspecified substances, in addition to unallocated emissions of SF_6, on both of which data are stated to be confidential. No additional explanation is provided and the ERT considers that it would be of assistance if the reasons were outlined in the NIR.

111. Consistently with the IPCC good practice guidance, potential emissions are reported but are not allocated to source categories for reasons of confidentiality. The reporting is in accordance with the undertaking given by the Party as a result of the 2003 centralized review report. It is not clear why actual emissions can, in most cases, be allocated to source categories whereas potential emissions cannot. The ERT considers that additional explanation in the NIR would help to clarify the reasons for the different approaches to reporting. Further discussion revealed that there was some uncertainty as to what should be reported as potential emissions. It was indicated that potential emissions are total substance use in the reporting year, and the Party advised the ERT that these would be reported by source category in future years.

112. Recalculations have been reported for actual emissions of PFCs and SF_6 for 1990 onwards, and actual emissions of HFCs from 1994 onwards have been revised. The reasons are explained in the NIR (p. 4–7). CRF table 8(b) does not include detailed explanatory information on recalculations by sector; rather it indicates that all energy and industrial sources have been recalculated with reference to data quality. It is not clear whether this refers to all years or some years only. It is recommended that more explanation of the recalculations be provided in the table.

C. Non-key sources

Cement production – CO_2

113. Emissions from cement production are derived from data on clinker production with both emissions and production reported by the company. These AD need to be specified in the CRF in the space provided. Analysis of the IEFs indicates that for 1990 and 1991 they are relatively low, and in 2002 the IEF appears to be relatively high. The Netherlands commented that EFs and emissions for 1990 and 1991 were incorrect and will be revised and reported in the next submission, and undertook to investigate whether there is a problem with the EF for 2002.

Glass production – CO_2

114. The AD for glass production are shown as confidential although CO_2 emissions are not. The ERT considers that it would assist if the reason why data are confidential were explained and if a brief

comment could be provided on the source of emissions, for example, limestone use and soda ash use in glass manufacture.

Mineral products: other – CO_2

115. This category is not disaggregated by source category. Neither the CRF nor the NIR provides a clear explanation of the sources that are included. In terms of total emissions allocated to the category, it is classified as a key source in the Netherlands key source analysis for 2002. In 1990, emissions were 585.0 Gg CO_2, and in 2001 and 2002 they were 406.5 Gg CO_2 and 817.9 Gg CO_2, respectively – an increase from 2001 to 2002 of 101.2 per cent. The Party advised the ERT that there is an error in the estimation of emissions and this will be corrected in the 2005 submission.

116. The reporting of emissions under aggregate categories is not transparent, especially where it is unclear what sources are included and whether the source composition is changing from year to year. Compositional changes will also have an impact on time-series consistency. Under such circumstances it appears inappropriate to define the source as a key source.

117. There is a clear need to improve the reporting for the category and it is recommended that the Party investigate how far the sources can be disaggregated and reported individually. When those sources that can be reported individually are removed from the category, the source composition of any residual emissions that cannot be disaggregated needs to be clarified. The Party advised the ERT that this category is expected to be reported by source category in future submissions, which will require recalculations from 1990 to ensure time-series consistency.

Chemical industry: other – CH_4, N_2O

118. The emissions reported under this category are relatively small amounts of CH_4 (2.1Gg) and N_2O (2.5 Gg – a data entry error in table 2(I) sheet 1 which needs to be corrected shows 8.5 Gg). The CH_4 emissions arise from miscellaneous chemical industries and the N_2O emissions are attributable to caprolactam and acrylonitrile production. AD for all producers are confidential and the ERT considers that it would be of assistance if the reasons for this were briefly explained.

Metal production: other – CO_2

119. Between 1990 and 1994, 1998 and 1999, and 2001 there were no emissions allocated to this category. In 2002 emissions reported are 172.4 Gg CO_2. The CRF indicates that the IE entries for ferroalloys and aluminium refer to the emissions reported for this category (2.C.5) (table 2(I)s1) but this contradicts the reference in table 2(I).A-Gs2, which states that emissions are reported under category 1.A.2. The share of these emissions attributable to each of the sources specified is not clear, nor is it clear how the emissions are determined, why none are reported for earlier years, or whether the source composition of the category is stable. It is recommended that, to improve transparency, time-series consistency and comparability, the Party provide a more detailed explanation of this category. The Netherlands informed the ERT that these emissions were included in error and this will be corrected in the 2005 submission.

Other – CO_2

120. Reported emissions for this category are 456.6 Gg CO_2, 396.4 Gg CO_2, and 385.6 Gg CO_2 in 1990, 2001 and 2002, respectively. CRF table 9 (Completeness) suggests that these emissions are attributable in part to ammonia production, but this is inconsistent with information that feedstock emissions for ammonia are accounted for under 1.A.2. The explanation of the source composition of this category could be improved, and the Party is encouraged to clarify the source composition and disaggregate the reported emissions by source. The Party advised the ERT that this category is expected to be disaggregated in future submissions.

121. Information was provided to the ERT that this category also includes CO_2 from flue gas desulphurization (FGD) calculated on the basis of gypsum production, a product resulting from the FGD

process. Given that gypsum results from the reaction of sulphur dioxide with lime, unless the initial input is limestone, the source of CO_2 emissions from FGD is unclear. The Party agreed to investigate the source of emissions and provide an explanation.

Paint application – solvent and other product use

122. No AD are provided for this source. It is suggested that AD be included in future submissions. The Netherlands agreed to include AD in future submissions.

Other product use – solvent and other product use

123. Several miscellaneous activities are attributed to this category but are reported under sector 7 Other (table 1.A sheet 2). It is suggested that the allocation be reviewed as some of the activities could be allocated more transparently to other sectors; for example, degassing drinking water appears to fall within the definition of Industrial Processes. The Party agreed to reconsider the source allocation of these miscellaneous activities.

Ammonia production, iron and steel production, and aluminium production – CO_2

124. The Netherlands reports CO_2 emissions from industry feedstocks under 1.A.2. This category includes feedstock emissions from natural gas input into ammonia production, reductant use in iron and steel production, and carbon anode consumption in aluminium smelting. To be consistent with the IPCC good practice guidance, these emissions should be reported under Industrial Processes. Allocation to the Energy sector and aggregation with other CO_2 emissions diminishes the transparency of the inventory, reduces comparability, and limits the usefulness of the key source analysis where key sources are not identified by source but are an aggregation of sources. It is recommended that the allocation and reporting be reviewed and revised to ensure compliance with the IPCC good practice guidance, and that changes in allocation be reflected in recalculation of the time series from 1990 to ensure time-series consistency. The Netherlands informed the ERT that the approach to emissions estimation is being reconsidered and that this is expected to result in a change in allocation along with improved emissions estimates.

D. Areas for further improvement

Identified by the Party

125. Several issues are pending from the 2003 review and these are clearly recognized by the Party in the NIR. The NIR outlines major review activities that have been undertaken concerning non-energy use of fuels, including a detailed study by Neelis et al. (2003) and the acquisition of additional data from the CBS. The Party proposes to recalculate emissions from 1990 and to allocate process emissions to the Industrial Processes sector, and indirect emissions to the Other Product Use sector. This will result in a substantial improvement to the transparency, comparability and accuracy of the inventory.

Identified by the ERT

126. All cells need to include a data entry or notation key to ensure completeness and transparency.

127. Brief explanations of why data are confidential need to be provided.

128. Aggregate categories denoted “Not attributable to specific sectors”, “All metal production” and “All other emissions” need to be disaggregated wherever possible and, where it is not possible, the category composition and any changes to composition over time need to be explicitly specified.

129. Where there are substantial changes in emissions from one year to the next, or where there is a distinct variability in trend (suggesting a potential time-series inconsistency), a brief explanation would improve the transparency of the values reported, for example, the substantial changes over time in the consumption of HFC-134a.

130. Errors in CO_2 emissions estimates reported under 2.A.7 and 2.C.5 need to be corrected.

131. Emissions of CO_2 reported under 2.G are stated in the completeness table as attributable to ammonia production, and elsewhere are stated as attributable to FGD. This needs to be explained, and may impact on the feedstock estimates allocated to this sector.

IV. AGRICULTURE

A. Sector overview

132. Emissions from the Agriculture sector declined by 14 per cent from 1990 to 2002, largely because of decreases in CH_4 emissions from enteric fermentation (23.9 per cent) and manure management (19.5 per cent) which are due to reductions in the numbers of livestock and manure management policy relating to manure production and field application.

133. CH_4 emissions from enteric fermentation are the largest source of CH_4, contributing 34.3 per cent of total national CH_4 emissions in 2002 compared with 30.9 per cent in 1990. Enteric fermentation accounted for around 78.6 per cent of CH_4 emissions from the Agriculture sector in 2002. Direct soil emissions of N_2O are the largest source of N_2O in the Agriculture sector and contributed 97.3 per cent of N_2O emissions from the sector in 2002, and 43.3 per cent of total national N_2O emissions.

Completeness

134. The information provided in the NIR is generally complete and well documented. Explanations for inter-annual changes in the CH_4 IEFs for enteric fermentation, as well as manure management, are not included in the NIR, however the Party explained the ERT that these inter-annual changes are due to changes in the animal population in most cases. These changes in the animal population result from variations in farming practices, marketing and/or animal diseases.

135. The CRF includes estimates of CH_4 emissions from enteric fermentation and manure management, and N_2O emissions from manure management and agricultural soils, as recommended by the IPCC Guidelines. The other IPCC subcategories, Rice Cultivation (4.C), Prescribed Burning of Savannas (4.E), Field Burning of Agricultural Residues (4.F) and Other (4.G) do not occur in the Netherlands. Burning of residues in the field is prohibited by law and negligible in practice.

136. Indirect N_2O emissions from atmospheric deposition are not estimated. Indirect N_2O emissions from leaching and run-off of nitrogen are reported as a fixed value of 3.8 Gg N_2O under IPCC sector 7, Other, as "polluted surface water" since this value also includes nitrogen from non-agricultural sources. The subcategory 4.D.1d Direct N_2O Emissions from Crop Residues and subcategory 4.D.1e N_2O Emissions from Cultivation of Histosols (Organic Soils) are not estimated separately. They are included in 4.D.4 Other as "background emissions from agricultural soils" and the value of 4.7 Gg N_2O is held constant for the entire period. However, indirect emissions from agricultural soils are reported as a key source, which is confusing and requires clarification by the Party.

137. Enteric fermentation emissions from poultry are not estimated, although AD are provided. For completeness, the 2003 centralised review report encouraged the Party to estimate these emissions. The Netherlands informed the ERT that emissions are not estimated because the IPCC default as well as EFs used by other countries that could be used by the Netherlands are lacking.

138. CH_4 and N_2O from horse manure (category 4.B) are omitted. This is because manure production estimates from horses are not available and no EFs for this source category have been defined.

Transparency

139. The information contained in the NIR and CRF tables submitted by the Netherlands is generally complete and well documented. The NIR includes appendices with additional information, as well as clearly noted web site references for key supporting materials.

Recalculations and time-series consistency

140. Recalculations of N_2O emissions from agricultural soils (4.D) have been performed for the years 1990–1995 because data on ammonia emission from manure applied to soils have been revised.

141. There are minor problems with the consistency of the data provided in the NIR (table 6.4) and in the CRF (table 4.A) for the CH_4 IEF for non-dairy cattle for 2001 and 2002, and in the methodology used for manure management (NIR, page 6-5 and summary table 3).

Uncertainties

142. Uncertainty estimates in emissions are based on the IPCC tier 1 method. By source, the uncertainty of CH_4 emissions from enteric fermentation from cattle is estimated to be about 21 per cent, and the uncertainty of CH_4 emissions from manure management from cattle and swine is estimated at around 100 per cent. The uncertainty in direct N_2O emissions from agricultural soils is estimated to be 61 per cent, while the uncertainty in indirect N_2O emissions from nitrogen used in agriculture is estimated to be 206 per cent. The latter uncertainty appears high and the ERT suggests that the Party review the uncertainty to determine whether it should be revised.

Verification and quality assurance/quality control approaches

143. Substantial and comprehensive documentation is provided in the NIR, which discusses QA/QC issues and the implementation of a system for QA/QC activities in three phases. Also included is a background report on independent QA/QC evaluation of the inventory and of the CRF review and checking procedures.

B. Key sources

Enteric fermentation – CH_4

144. The Netherlands uses "enhanced" livestock subcategories, which is consistent with the IPCC good practice guidance. Country-specific EFs for enteric fermentation in accordance with the IPCC tier 2 method are used for dairy and non-dairy cattle, with specific factors applied to four dairy and three non-dairy cattle subcategories (table 6.4 of the NIR). The country-specific EFs vary between 49.25 and 102.13 kg CH_4/head/year for dairy cattle, and between 17.65 and 102.13 kg CH_4/head/year for non-dairy cattle, according to the population age structure. A weighted average of the CH_4 IEFs for dairy cattle was therefore considerably lower than the IPCC default. However, it is noted that the EF for milk producing cows used by the Party is 102 kg CH_4/head/year, which is slightly higher than the IPCC default for Western Europe (100 kg CH_4/head/year).

145. Several inter-annual changes in the CH_4 IEFs for non-dairy cattle between 1990 and 2002 were identified as relatively high. The changes range from a 6.9 per cent decrease (between 2001 and 2002) to a 3.8 per cent increase (between 2000 and 2001). The 2002 value (43.39 kg/head/year) is 23.6 per cent lower than the 1990 value (56.76 kg/head/year). The overall decrease in the CH_4 IEF was explained by the Party as being due to a decrease in the animal population accompanied by an increase in the proportion of veal calves, which produce little CH_4 compared to the other categories of animals. To improve transparency, the ERT would welcome further details (e.g., formulae) on the calculation of the EFs in the NIR as well as information on the uncertainties.

Manure management – CH_4

146. The CH_4 IEF increased by 16 per cent from 1990 (7.18 kg/head/year) to 2002 (8.33 kg/head/year). The CH_4 IEF for dairy cattle increased by 12.9 per cent from 1999 to 2000. The Party explained that an increase in milk production (the result of increased feed uptake) had led to an increase in the amount of manure per head. In 2002, the amount of manure from dairy cows kept indoors in the summer increased as a result of the Netherlands' manure management policies. Inter-annual changes were explained by the Party to the ERT as due to changes in the dairy cattle animal population; namely, a decrease in the number

of milk producing adult females, and changing numbers of young and male livestock for breeding resulting from variations in farming practices, marketing and diseases.

147. In 2002 the CH_4 IEF for non-dairy cattle (12.16 kg/head/year) was 6.5 per cent lower than the 1990 value (13.01 kg/head/year). Inter annual changes in the CH_4 IEF for non-dairy cattle are attributed to changes in the composition of the total animal population over the period 1990–2002. These changes result from variations in farming practices, marketing and animal diseases. However, inter-annual fluctuations need to be explained in more detail in future NIRs in order to facilitate review. Volatility in the CH_4 IEF for non-dairy cattle is due to changes in the composition of the total animal population over the period 1990–2002.

148. The CH_4 IEFs for sheep (0.44–0.5 kg/head/year) between 1990 and 2002 are at the high end of the range of reporting Parties and outside the IPCC default range (0.19–0.37 kg/head/year). The CH_4 IEFs for goats (2.03–2.47 kg/head/year) between 1990 and 2002 have been identified as the highest by an order of magnitude of reporting Parties. According to the explanations given in the NIR (annex 3, p. A-22), first, the Party uses a country-specific EF in unit per m^3 (Van Amstel et al., 1993) and a country-specific volatile solids (VS) rate (250 kg/m^3), so that the unit of conversion factor is not consistent with the units in the IPCC good practice guidance. The ERT encourages the Netherlands to use or develop methodologies consistent with the IPCC good practice guidance. Second, in the Netherlands milking goats, including corresponding young stock, produce large amounts of manure because they are kept in animal housing at all times.

Agricultural soils: direct and indirect N_2O emissions from nitrogen used in agriculture

149. In the calculation of N_2O emissions from agricultural soils, country-specific EFs have been used. The method is equivalent to the IPCC tier 1a and 1b methods.

150. The direct N_2O IEFs for animal wastes applied to soils (in 2002 0.02 kg N_2O-N/kg N) between 1992 and 2002 have been identified as the second-highest of all reporting Parties. The 2002 value is 83.1 per cent higher than the 1990 value (0.011 kg N_2O-N/kg N). The inter-annual changes in N_2O direct emissions from synthetic fertilizers show a 12.1 per cent decrease between 2000 and 2001 and a 9.3 per cent increase between 1994 and 1995. The 2002 value (5.02 Gg) is 27.6 per cent lower than the 1990 value (6.93 Gg). The Party explained that, as a result of changes in the Dutch manure management policy aimed at reducing nitrogen (N) leaching and run-off, different manure application methods were adopted (manure is injected rather than spread).

C. Non-key sources

Manure management – N2O

151. Country-specific EFs with an IPCC tier 1 method are used for calculating manure management for sheep, goats, horses and swine. Emissions from sheep and swine decreased by 25 per cent from 1990 to 2002, and emissions from goats have tripled since 1990.

152. Nitrogen excretion is reported as not applicable ("NA") and N excretion per animal waste management system (AWMS) is reported as "NE". An aggregated value of N excretion for all animals is reported under Other – AWMS. The Dutch inventory system calculates total N excretion by all animal husbandry on an annual basis. This does not fully comply with the IPCC good practice guidance and the ERT recommends that the Party use methodologies that accord with the IPCC good practice guidance for N excretion.

D. Areas for further improvement

Identified by the Party

153. The present methodologies used to estimate the CH_4 emissions from enteric fermentation from cattle, CH_4 emissions from manure management for swine and cattle, and direct and indirect N_2O

emissions from agricultural soils do not fully comply with the IPCC good practice guidance. For this reason the Netherlands is investigating what is required to revise and extend calculations in order to comply with the IPCC good practice guidance.

154. A study is under way to investigate whether the country-specific EFs that were developed in 1990 have changed as a result of increased milk production following increased feed intake. The revised results will be used in the NIR 2005 if results are available in time. Otherwise results will be used in NIR 2006.

Identified by the ERT

155. The ERT considers that transparency could be improved if further details (preferably formulae) on the calculation of the country-specific EFs were included in the NIR as well as information on its uncertainties.

V. LAND-USE CHANGE AND FORESTRY

A. Sector overview

156. In the year 2002, the LUCF sector offset less than 1 per cent of total gross emissions. The Netherlands only reported emissions/removals under subcategory 5.A Changes in Forest and Other Woody Biomass Stocks. However, emissions/removals from other subcategories may be important (for example, 5.B Forest and Grassland Conversion and 5.D CO_2 Emissions/Removals from Soils).

157. The Netherlands recognized in its 2000 NIR that it did not have sufficient information to improve reporting for the LUCF sector. The Party started a process to develop a new system ("Meetnet Functievervulling") for reporting, but this was not fully implemented when the 2002 inventory was compiled. The new system is not compatible with the earlier system, and the Party states in the NIR that time-series consistency may be a problem due to differences in the classifications. Pending full implementation of the new system, the Party decided to report the same estimates for 2000, 2001 and 2002. The ERT recommends that the Party make the necessary efforts to achieve full consistency in the time series when the new system is implemented.

Completeness

158. The CRF includes estimates for CO_2 sources and sinks from subcategory 5.A only. The estimates of emissions and removals for this subcategory are reported for the whole period 1990–2002.

159. Estimates for CO_2, N_2O and CH_4 for categories 5.B, 5.C, 5.D and 5.E are not included in the CRF because adequate information is not available. However, emissions/removals in categories 5.B and 5.D may be significant and it is recommended that the Party compile estimates for these sources. The Party advised the ERT that under the new reporting system it will report these subcategories.

Transparency

160. Estimates of CO_2 emissions/removals due to changes in forest and other woody biomass stocks (5.A) are based on average increment minus harvest, consistently with the IPCC Guidelines. Data on forested areas are based on the National Forest Inventory. The NIR does not provide clear information on sources of AD for the estimation of the CO_2 emissions/removals from the LUCF sector from 1990 to 2002, or information on changes of data sources (although it indicates that there were changes in data sources).

161. The ERT believes that descriptions of how methods are applied would assist the review. For example, when information provided in the NIR is used to reproduce estimates reported by the Party in the CRF, different values are obtained. These inconsistencies are further considered in the discussion of recalculations and time-series consistency and in section B below. It is recommended that more information be included in the NIR on different data sources for fellings and growth increments, and that

the description of the methodology be improved. More details can be found in some of the additional documents provided during the review (for example, Daamen, 2002, part I and II, in Dutch).

Recalculations and time-series consistency

162. Net emissions and removals show a significant increase between 1992 and 1993 (21.5 per cent) and a significant decrease between 1994 and 1995 (36.1 per cent) for which no explanation is provided in the NIR. The inter-annual changes in CO_2 emissions for the subcategory Other under Temperate Forest between 1994 and 1995 (a 32.3 per cent increase), and between 1996 and 1997 (a 7.6 per cent increase), appear to be high. The 2002 value of CO_2 removals –2,180 Gg) is 15.9 per cent higher than the 1990 value (–1,881 Gg). The Party indicated that a change in the stem volume function may be the cause of the variations.

163. The figure for CO_2 removals for the subcategory Other under Temperate Forest is 9.3 per cent lower in 1993 than in 1992. The 2002 value (–3,593 Gg) is 8.8 per cent higher than the 1990 value (–3,302 Gg). The Netherlands explained that fellings declined between 1992 and 1993 and then increased substantially. However, the volume of biomass removed (which is assumed to be equal to fellings reported in NIR table A.3.3.) according to the CRF does not correspond to fellings reported in the NIR, even if the biomass expansion factor (1.2) is applied. One possible explanation may be that a correction is being included to account for fuel wood that is not being reflected in the NIR. The NIR notes that fuel wood is not reported separately because it is included elsewhere. It is recommended that the data source be checked in order to ensure concordance between the NIR and the CRF. The Party agreed to investigate the discrepancy.

164. The inter-annual change of the C uptake estimates reported in the CRF for non-forest trees fluctuates (from 8 to 110 Gg C), whereas the area of non-forest trees is constant from 1990 to 2002. The C uptake estimates reported in the CRF for non-forest trees are not described in the NIR. The NIR does not report annual growth increments, and in the CRF the average growth rate is reported as "NA". It is assumed in the NIR that the stock is constant, and increases in emissions or removals will be due to increases/decreases in area. However, no changes in area are reported that explain the emissions/removals for the period 1999–2002. If no further explanation is provided it is recommended that the value of the C uptake increment be reported as "NO".

Uncertainties

165. There is no uncertainty assessment for this sector.

Verification and quality assurance/quality control approaches

166. The NIR does not include information on national verification and QA/QC procedures for the LUCF sector. The Netherlands advised the ERT that under the new monitoring system for LUCF which it is implementing a QA/QC process and uncertainty analysis will be included.

B. Sink and source categories

Changes in forest and other woody biomass stocks

167. Methodologies are based on the IPCC Guidelines, with a combination of country-specific and default EFs. Since 5.A is the only subsector reported this has been discussed in the sector overview above.

Forest and grassland conversion, and abandonment of managed lands

168. Emissions and removals have not been estimated for the years 1990–2002 for any gas. The Netherlands notes in the CRF that these activities occur, but data are lacking. The Party is encouraged to collect data to enable estimates to be compiled. Under the new system the Netherlands will start to report these subcategories.

CO_2 emissions and removals from soils

169. Emissions and removals have not been estimated for the years 1990–2002 for any gas. The Netherlands notes in the CRF that these activities occur, but data are lacking. AD for liming are reported for the period 1990–1999 but emissions are not estimated. From 2000, AD were not collected and reported. The ERT recommends that the Party investigate the availability of AD and the significance of emissions from this source.

C. Areas for further improvement

Identified by the Party

170. The Party is establishing a new system ("Dutch National System for GHG reporting for the LUCF sector") for reporting emissions and removals for this sector that will follow the methodology and recommendations of the IPCC good practice guidance for the Land Use, Land-use Change and Forestry (LULUCF) sector (chapter 3). The system is designed to accord with the carbon cycle. It consists of a combination of data from ongoing monitoring and/or existing literature data and land use maps (the most reliable information available is topographic maps for 1990 and 2000). When implemented the new system will allow reporting of above-ground, below-ground, dead wood, litter, and soil organic carbon pools. For litter and soil organic carbon and for biomass in other natural terrain it will be assumed that the stock does not change, and stocks only will be reported. In addition, the Netherlands intends to provide uncertainty estimates in future inventories.

Identified by the ERT

171. It is recommended that the estimates and methodology used until 2000 be reviewed, especially regarding the consistency of estimates in the CRF with the information provided in the NIR. Furthermore, in order to improve transparency, more explicit descriptions of methods used in the NIR would be helpful.

172. The proposed new system represents a substantial improvement. However, it also leads to a discontinuity with respect to the earlier reporting period (1999–2002). It is therefore recommended that, once the new system is established and fully implemented, recalculations be undertaken for the period 1990–2002 as far as possible. The Party indicated that it may be possible for some years. In addition, it is recommended that the Party include a QA/QC plan and estimates of uncertainties for the sector.

VI. WASTE

A. Sector overview

173. In the year 2002, Waste sector emissions accounted for 3.5 per cent (7,500 Gg CO_2 equivalent) of total national emissions (excluding LUCF) compared with 6.2 per cent (13,155 Gg CO_2 equivalent) in 1990. The source emissions reported are CH_4 from 6.A.1 Managed Waste Disposal on Land, identified as a key source by both the tier 1 and the tier 2 trend and level assessments, and sludge emissions (CH_4 and N_2O) from domestic and commercial waste-water handling reported under 6.B.3 Other. All emissions from waste incineration are allocated to the Energy sector. Emissions decreased by about 43.0 per cent from 1990 to 2002. The decline is the result of increased methane recovery for heat and power generation, and the reduction of municipal solid waste (MSW) disposal at landfills (by around 66 per cent) through increased recovery and recycling of waste for composting and/or incineration. This achievement has been driven by national policy and legislation aimed at reducing landfill disposal and promoting the hierarchy of recycling, reuse and incineration of waste.

Completeness

174. The CRF reports estimates of most gases and significant sources of emissions from the Waste sector consistently with the IPCC Guidelines. Waste incineration (6.C) is reported as "IE" (under the Energy sector) because all operations are performed in waste-to-energy plants. Not estimated are N_2O

and CH_4 emissions from 6.B.2 Waste-water Handling, with the exception of emissions from sludge management in waste-water treatment plants (WWTPs), and AD for the biogenic fraction of waste incinerated under 6.C Waste Incineration. The Netherlands is encouraged to complete the validation of the preliminary country-specific EFs already developed for use in the estimation of emissions from municipal WWTPs, septic tanks and industrial waste water in order to improve the completeness of its future submissions.

175. The ERT recommends that, for consistency with the UNFCCC reporting guidelines, emissions from sludge treatment be reported under 6.B.2 Domestic and Commercial Waste Water instead of 6.B.3 Other.

Transparency

176. The NIR references methodologies and provides adequate information on the key source 6.A.1 CH_4 Emissions from Managed Waste Disposal on Land. Online documentation on methodologies and country-specific EFs and new data from the recent waste survey, which were made available to the ERT, provided additional information that facilitated the review and enhanced transparency.

Recalculations and time-series consistency

177. The NIR outlines the reasons for the recalculations reported in the 2004 submission. They include: a) removal of CH4 and N2O emissions from biogas combustion at WWTPs reported in previous years under 6.D but now reported as "IE" and included in 1.A.1 Energy Industries under the Energy sector; b) removal of CO2 emissions from 6.D that could not be accounted for in the energy statistics for 1998–2001; and c) improvements in the AD and EFs for CH4 emissions from 6.A.1 Managed Waste Disposal on Land. The ERT notes that all of these explanations as well as the required information in the documentation box should be reported in CRF table 8(b) to improve transparency. The Party agreed to review the information included in the recalculation tables. The reporting of the recalculated CH_4 emissions from landfill for the entire time series fulfils the Netherlands' commitment in its response to the 2003 centralized review report comments and has improved consistency.

Uncertainties

178. The Netherlands estimated the uncertainties for AD and EFs for CH_4 emissions from 6.A.1 Managed Waste Disposal on Land and for CH_4 emissions from 6.B.3 Other (waste-water sludge handling) on the basis of collective expert judgement. The uncertainties for these two sources are estimated at 15 per cent for AD and 30 per cent for EFs.

B. Key sources

Solid waste disposal on land – CH_4

179. CH_4 emissions from solid waste disposal on land contributed 3.4 per cent to total national emissions of CH_4 in 2002. Emissions from this source decreased by 39.6 per cent between 1990 and 2002, and represented 96.7 per cent of emissions from the Waste sector in 2002. The Netherlands attributes this decline to increased methane recovery for energy – from 5 per cent in 1990 to 20 per cent in 2002 – and a large reduction in MSW disposal at landfills – by about 66.5 per cent, from 13,900 Gg in 1990 to 4,661Gg in 2002 – as a result of increased recovery and recycling for composting and/or incineration.

180. The Netherlands has used a country-specific methodology and EF based on the first order decay (FOD) model, which is consistent with the IPCC good practice guidance. The methodology is referenced and adequately summarized in the NIR. The MSW generation rate, reported as 8.90–9.82 kg/cap/day (kcd) from 1990 to 2002, is high in comparison with the IPCC default for the Netherlands (1.58 kcd) and IPCC defaults for EC member states (0.85–1.9 kcd). The corresponding disposal rates are EC (0.47–1.7 kcd) and the Netherlands (1.06 kcd). The ERT observed that the Netherlands includes industrial inorganic waste (e.g., construction and demolition waste), which the UNFCCC Guidelines

exclude from the CRF for the purposes of comparability. Recalculated on the basis of additional data provided to the ERT, the estimated MSW disposal rate ranges from 1.18 kcd (1996) to 0.80 kcd (2002), which is comparable with the values cited. The Netherlands is encouraged to report the generation and disposal rates in accordance with the CRF definition in order to improve transparency.

181. The 1998 value of the CH_4 IEF (0.08 t/t MSW) for managed waste disposal on land was identified in the 2004 previous review stage as relatively high. Additional information on the methodology indicates that the methane generation constant and other FOD model parameters have been revised to reflect new data on the changing composition of MSW to landfill and actual gas recovery data. The ERT notes that the Netherlands has addressed this issue.

C. Non-key sources

Waste-water handling – CH_4 and N_2O

182. N_2O emissions from sludge handling are the only sub-source category reported. As part of the improvement plan, the Netherlands is committed to monitoring and reporting waste-water emissions from WWTPs and septic tanks in addition to emissions from sludge digestion. The total emissions would also cover the N_2O emissions from human waste for the 5 per cent of the population who are currently not connected to municipal WWTPs.

183. The inter-annual changes over the time series in CH_4 and N_2O emissions from waste-water handling have been identified as unstable. The Netherlands attributed the large variations to CH_4 venting from the largest WWTP during the period as a result of the introduction of a stabilization system in the sludge digestion operation, which suffered long delays in the process of optimization, followed by a decline in emissions due to recovery of the CH_4 emissions for energy uses.

Waste incineration – CO_2, CH_4 and N_2O

184. Emissions from 6.C Waste Incineration have been reported as "IE" and included under the sub-source category 1.A.1 in the Energy sector, which is consistent with the IPCC Guidelines. Additional data provided indicate that the percentage of biomass in waste incinerated has been estimated at about 49–58 per cent; however, biogenic emissions are not estimated separately. The ERT notes that the Netherlands' improvement plan includes splitting the total emissions into biogenic and non-biogenic, and reporting the emissions in accordance with the UNFCCC reporting guidelines in future submissions.

185. The inter-annual changes in CO_2 emissions for sub-source category 6.D exhibit substantial instability. Some years have not been reported and no notation key is used. The Netherlands explains in the NIR that CO_2 emissions from the combustion of biogas for heat or power generation at WWTPs, which were previously allocated to 6.D, are reported as "IE" and included under 1.A.1 in the Energy sector, consistently with the IPCC Guidelines.

D. Areas for further improvement

Issues identified by the Party

186. The improvement programmes outlined by the Netherlands in response to comments made during previous reviews and as result of the new national system which is being developed are summarized as follows:

a) Improvement in the collection of data on methane venting from sludge digestion, and on recovery from landfills and domestic and commercial waste-water handling, in order to ensure adequate explanation of any significant changes in CH_4 emissions and thus improve the transparency of the inventory

b) Incorporation of estimates of CH_4 and N_2O emissions for source category 6.B Industrial and Domestic and Commercial Waste-Water, including septic tanks, to improve

completeness. At present, only emissions from sludge digestion are reported. Preliminary studies have been completed with the development of country-specific EFs

c) Estimation of biogenic and non-biogenic emissions from incineration to ensure the reporting of the biomass combustion emissions as memo items in order to improve accuracy. The biomass fractions of incinerator feed are currently estimated at 49–58 per cent on the basis of annual surveys

d) Reporting of methane emissions from composting of organic waste under 6.A.3 Other

e) Development of sectoral documentation of methodologies, EFs and AD into national inventory workbooks for ease of reference and accessibility in order to improve the overall transparency, completeness, consistency, comparability and accuracy of the Netherlands' inventories.

Issues identified by the ERT

187. The areas identified for potential improvement are summarized as follows:

a) Improvement in the use of notation keys in the CRF to improve transparency. These include:

i. Using "NA" for CO_2 from solid waste disposal sites (SWDS) instead of "NO". This is because CO_2 emissions occur but they are not estimated because of lack of methodologies in the IPCC guidelines.

ii. Using "NE" for CH_4 from waste water and "IE" for sludge. The AD for sludge should be reported in 6.B.1 instead of 6.B.3 Other.

b) Estimation of the national MSW generation rate should exclude inert industrial waste, in accordance with the UNFCCC reporting guidelines, so as to improve comparability;

c) In CRF table 9 (Completeness), CH_4 emissions from waste combustion of fossil fuel-related C should be reported as category 1.A.1a and not as 6.D Other.

VII. OTHER SECTORS

188. Under 7 Other, the Netherlands reports three source categories which cannot be allocated to source categories of the standard IPCC sectors I to VI or cannot be allocated properly in the CRF tables. These source categories are CO_2, CH_4 and N_2O from solvent and other product use; CH_4 from degassing drinking water (from groundwater); and N_2O from polluted surface water.

189. According to the Netherlands' key source analysis, N_2O from polluted surface water is a key source by level, and N_2O from solvent and other product use (miscellaneous) is a key source by level and trend. CO_2 emissions from solvent and other product use include emissions from fireworks use. CH_4 emissions from solvent and other product use comprise emissions from fireworks, product use in industry (paints and lacquers, and food storage/warehouses) and burning of candles. The N_2O included under solvent and other product use comes from emissions from fireworks. N_2O from polluted surface water comprises the indirect emissions from leaching and run-off from agricultural activities and other nitrogen sources, including human sewage. Country-specific methodologies are used in all cases. The ERT suggests that the allocation be reviewed as some of the activities could be allocated to other sectors; for example, degassing drinking water appears to fall within the definition of Industrial Processes. The Party agreed to reconsider the source allocation of these miscellaneous activities.

ANNEX 1: MATERIALS USED DURING THE REVIEW

A. Support materials used during the review

2004 Inventory submissions of the Netherlands including CRF for the years 1990–2002 and an NIR.
2003 Inventory submissions of the Netherlands.
UNFCCC secretariat (2004). "Report of the individual review of the greenhouse gas inventory of the Netherlands submitted in the year 2003 (Centralized review)". FCCC/WEB/IRI(3)/2003/NLD (available on the secretariat web site http://unfccc.int/program/mis/ghg/countrep/nldcentrev02.pdf).
UNFCCC secretariat (2003). "Report of the individual review of the greenhouse gas inventory of the Netherlands submitted in the year 2002 (Centralized review)". FCCC/WEB/IRI(3)/2002/NLD (available on the secretariat web site http://unfccc.int/program/mis/ghg/countrep/nldcentrev02.pdf).
UNFCCC secretariat. "2004 Status report for the Netherlands" (available on the secretariat web site http://unfccc.int/program/mis/ghg/statrep04/nld04.pdf).
UNFCCC secretariat. "Synthesis and assessment report of the greenhouse gas inventories submitted in 2004. Part I": FCCC/WEB/SAI/2004 (available on the secretariat web site http://unfccc.int/program/mis/ghg/s_a2003.html), and Part II – the section on the Netherlands) (unpublished).
The Netherlands' comments on the draft "Synthesis and assessment report of the greenhouse gas inventories submitted in 2003 and 2004" (unpublished).
UNFCCC secretariat. Review findings for the Netherlands (unpublished).
UNFCCC secretariat. "Handbook for review of national GHG inventories." 2004 (unpublished).
UNFCCC secretariat. "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories", "Part II: UNFCCC reporting guidelines on national communications" and "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention." FCCC/CP/1999/7 (available on the secretariat web site http://unfccc.int/resource/docs/cop5/07.pdf).
UNFCCC secretariat. "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" and "Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention." FCCC/CP/2002/8 (available on the secretariat web site http://unfccc.int/resource/docs/cop8/08.pdf).
UNFCCC secretariat. Database search tool – *Locator* (unpublished).
IPCC. *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, 2000* (available on the following web site: http://www.ipcc-nggip.iges.or.jp/public/gp/gpgaum.htm).
IPCC/OECD/IEA. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, volumes 1–3, 1997* (available on the following web site: http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm).

B. Additional materials

Responses to questions during the review were received from Dr. Jos Olivier (RIVM), Mr. Kees Peek (RIVM), Dr. Peter Coenen (TNO), Dr. Harry Vreuls (SenterNovem), Ms. Marjan van Schijndel (RIVM) Mr. Joost Huurman (CBS), Mr. Ed Zonneveld (CBS), Dr. W.P. Daamen (Bureau Daamen), and Dr. G.-J. Nabuurs (Alterra), including additional material on the methodology and assumptions as follows:
Daamen, W.P. (2002). *Forest biomass stocks (IPCC). Part 1: Calculation method Netherlands´ National Inventory Reports/national Comunications; Part 2: Analysis of the consequences of application of IPCC Guidelines for reporting and recommendation for calculation method* (in Dutch). Forest Data Foundation (St. Bosdata), Wageningen.
DHV (2002). *Quality Assurance and Quality Control for the Dutch National Inventory Report; report on phase 1*, January 2002, report no. ML-BB-20010367. DHV, Amersfoort.
Olsthoorn, X. and A.Pielaat, *Tier-2 uncertainty analysis of Dutch greenhouse gas emissions 1999*
Van Amstel, A., J.Olivier, P. Ruyssenaars, *Monitoring of GHG in the Netherlands*, Proceedings of National Workshop, Bilthoven, 1 September 1999.

Oonk, J. and M. Vosbeek (1995). *Methane emissions due oil and natural gas operations in the Netherlands*, TNO/IMET, rep. No. 410 100 037.

Spakman, J. et al. (2003)., *Method for calculating GHG emissions*, report No. 37b, March 2003.

Neelis, M., M. Patel and M. de Feber (2003). *Improvement of CO_2 emission estimates from the non-energy use of fossil fuels in the Netherlands*, Copernicus Institute, April 2003.

- - - - -