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This investigation has been performed by order and for the account of the Directorate-General for Environmental Protection, Climate Change and Industry Division, of the Netherlands Ministry of Spatial Planning, Housing and the Environment, within the framework of RIVM project 773201, project title ‘International emission reports’.

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Acknowledgements

Many colleagues from a number of organisations (CBS, EC-LNV, LEI, RIVM, TNO and AOO) have been involved in the annual update of the Netherlands Pollutant Emission Register (PER), also called the Emission Registration (ER) system, which contains emissions data on hundreds of pollutants (see Section 1.6). This annual project is led by the VROM Inspectorate (VI) and the Co-ordinating Committee on Target Group Monitoring (CCDM). The emission calculations, including those for greenhouse gas emissions, are performed by members of so-called ER Task Forces (see Section 1.3). This is a major task, since the Netherlands’ inventory contains many detailed emission sources.

Subsequently, the emissions and activity data of the Netherlands’ inventory is converted by TNO into the IPCC source categories contained in the CRF files, which form a supplement to this report.

The description of sources, analysis of trends and uncertainty estimates in emissions (see Chapters 3 to 9) of the various sources has been made in cooperation with the following RIVM experts: Mr. Jan-Anne Annema (transport), Mr. Guus van den Berghe (AOO) (waste), Mr. Gert-Jan van der Born (land use), Mr. Laurens Brandes (key sources), Mr. Anco Hoen (transport, bunkers), Mr. Romuald te Molder (miscellaneous), Mrs. Johanna Montfoort (energy, fugitive emissions), Mr. Durk Nijdam (small combustion, solvent and product use), Mr. Kees Peek (industrial processes, waste water, other waste) and Mrs. Marian van Schijndel (agriculture). In addition, Mr. Ed Zonneveld of CBS has provided pivotal information on CO2 related to energy use. This group has also provided activity data and additional information for the CRF files in cases where these were not included in the data sheets submitted by the ER Task Forces.

We greatly appreciate the contributions of each of these groups and individuals to this National Inventory Report and supplemental CRF files, as well as the external reviewers that provided comments on the draft report. In addition, we thank Mrs. Ruth de Wijs-Christensen for checking and improving the English of the general chapters of the report.
Contents

SAMENVATTING (DUTCH)........................................................................................................................................... XI

EXECUTIVE SUMMARY ........................................................................................................................................... XV

ES.1. BACKGROUND INFORMATION ON GREENHOUSE GAS INVENTORIES AND CLIMATE CHANGE .......... XV
ES.2. SUMMARY OF NATIONAL EMISSION AND REMOVAL RELATED TRENDS ............................................... XVIII
ES.3. OVERVIEW OF SOURCE AND SINK CATEGORY EMISSION ESTIMATES AND TRENDS ......................... XIX
ES.4. OTHER INFORMATION .......................................................................................................................... XXII

1. INTRODUCTION .............................................................................................................................................. 1-1

1.1 BACKGROUND INFORMATION ON GREENHOUSE GAS INVENTORIES AND CLIMATE CHANGE .......... 1-1
1.1.1 Greenhouse gases and climate change: Global Warming Potential ......................................................... 1-2
1.1.2 Climate Convention and Kyoto Protocol .................................................................................................. 1-2
1.1.3 Reporting requirements: UNFCCC and IPCC .......................................................................................... 1-4
1.1.4 Role of the European Union .................................................................................................................... 1-4
1.1.5 Differences with the domestic national emission inventory ...................................................................... 1-5
1.1.6 Correspondence between Netherlands Target Sectors and IPCC source categories ............................. 1-5
1.1.7 CRF files: printed version of summary tables and completeness .......................................................... 1-6
1.1.8 Territorial aspects; import/exports ........................................................................................................... 1-7
1.1.9 Presentation of figures: rounding off and summation ............................................................................. 1-7
1.1.10 Organisation of the report .................................................................................................................... 1-7

1.2 DESCRIPTION OF THE INSTITUTIONAL ARRANGEMENT FOR INVENTORY PREPARATION ............. 1-8
1.2.1 The Pollutant Emission Register (PER) .................................................................................................. 1-8
1.2.2 The National Inventory Report and CRF files ........................................................................................ 1-10

1.3 BRIEF DESCRIPTION OF THE PROCESS OF INVENTORY PREPARATION .................................... 1-11

1.4 BRIEF GENERAL DESCRIPTION OF METHODOLOGIES AND DATA SOURCES USED .................... 1-11
1.4.1 Carbon dioxide emissions ...................................................................................................................... 1-14
1.4.2 CO₂ from sinks ....................................................................................................................................... 1-14
1.4.3 Methane .................................................................................................................................................. 1-14
1.4.4 Nitrous oxide ........................................................................................................................................... 1-15
1.4.5 HFCs, PFCs and SF₆ ............................................................................................................................. 1-16
1.4.6 Data sources .......................................................................................................................................... 1-16

1.5 BRIEF DESCRIPTION OF KEY SOURCE CATEGORIES ............................................................................. 1-17
1.5.1 Key source identification and methodological choice ............................................................................. 1-18
1.5.2 Limitations ............................................................................................................................................ 1-19

1.6 INFORMATION ON THE QA/QC PLAN ................................................................................................. 1-19
1.6.1 The Pollutant Emission Register (PER) .................................................................................................. 1-19
1.6.2 The National Inventory Report and CRF files ........................................................................................ 1-22

1.7 GENERAL UNCERTAINTY EVALUATION .............................................................................................. 1-24
1.7.1 Data used .............................................................................................................................................. 1-24
1.7.2 Results .................................................................................................................................................. 1-25
1.7.3 Limitations ........................................................................................................................................... 1-27

1.8 GENERAL ASSESSMENT OF THE COMPLETENESS ............................................................................ 1-28

2. TRENDS IN GREENHOUSE GAS EMISSIONS ......................................................................................... 2-1

2.1 EMISSION TRENDS FOR AGGREGATED GREENHOUSE GAS EMISSIONS ........................................... 2-1
2.2 EMISSION TRENDS BY GAS ................................................................................................................... 2-4
2.3 EMISSION TRENDS BY SOURCE .......................................................................................................... 2-8
2.3.1 Energy Sector ......................................................................................................................................... 2-8
2.3.2 Industrial processes ............................................................................................................................... 2-9
2.3.3 Solvents and other product use ............................................................................................................ 2-10
2.3.4 Agriculture .......................................................................................................................................... 2-10
2.3.5 Changes in biomass stocks (LUCF) ...................................................................................................... 2-11
3. ENERGY [CRF SECTOR 1] .................................................................................................................. 3-1

3.1 OVERVIEW OF SECTOR .................................................................................................................. 3-1

3.1.1 Temperature correction for CO₂ .................................................................................................. 3-3

3.2 FUEL COMBUSTION [CRF CATEGORY 1A] .................................................................................. 3-5

3.2.1 Energy industries (CRF category 1A1) ...................................................................................... 3-6

3.2.1.1 Source category description ...................................................................................................... 3-6

3.2.1.2 Methodological issues ............................................................................................................... 3-7

3.2.1.3 Uncertainty and time-series consistency .................................................................................. 3-7

3.2.2 Manufacturing industries and construction (CRF category 1A2) ............................................... 3-9

3.2.2.1 Source category description ...................................................................................................... 3-9

3.2.2.2 Methodological issues ............................................................................................................... 3-10

3.2.2.3 Uncertainty and time-series consistency .................................................................................. 3-10

3.2.2.4 Source-specific recalculations .................................................................................................. 3-13

3.2.3 Transport (CRF category 1A3) .................................................................................................... 3-14

3.2.3.1 Source category description ...................................................................................................... 3-14

3.2.3.2 Methodological issues ............................................................................................................... 3-19

3.2.3.3 Uncertainty and time-series consistency .................................................................................. 3-20

3.2.3.4 Verification of road transport: vehicle-km approach versus IPCC approach ....................... 3-21

3.2.3.5 Source-specific recalculations .................................................................................................. 3-22

3.2.3.6 Source-specific planned improvements .................................................................................... 3-22

3.2.4 Other sectors (CRF category 1A4) ............................................................................................. 3-23

3.2.4.1 Source category description ...................................................................................................... 3-23

3.2.4.2 Methodological issues ............................................................................................................... 3-24

3.2.4.3 Uncertainty and time-series consistency .................................................................................. 3-24

3.2.4.4 Source specific recalculations .................................................................................................. 3-27

3.2.5 Others (CRF category 1A5) ....................................................................................................... 3-28

3.2.5.1 Source category description ...................................................................................................... 3-28

3.2.6 Comparison of the Sectoral Approach with the Reference Approach ....................................... 3-29

3.2.7 Feedstocks and non-energy use of fuels ..................................................................................... 3-29

3.2.7.1 Source category description ...................................................................................................... 3-29

3.2.7.2 Methodological issues ............................................................................................................... 3-30

3.2.7.3 Uncertainty and time-series consistency .................................................................................. 3-31

3.2.8 International bunker fuels ......................................................................................................... 3-31

3.2.8.1 Source category description ...................................................................................................... 3-31

3.2.8.2 Methodological issues ............................................................................................................... 3-32

3.2.8.3 Uncertainty and time-series consistency .................................................................................. 3-32

3.2.8.4 Source-specific planned improvements .................................................................................... 3-32

3.2.8.5 Verification of road transport: vehicle-km approach versus IPCC approach ....................... 3-32

3.2.8.6 Table 3.2 Trend in greenhouse gas emissions (Tg; Others in Gg) from international bunkers 1990-2002 ......................................................................................................................... 3-33

3.3 FUGITIVE EMISSIONS FROM SOLID FUELS, OIL AND NATURAL GAS [CRF CATEGORY 1B] ............................. 3-34

3.3.1 Source category description ....................................................................................................... 3-34

3.3.2 Methodological issues ............................................................................................................... 3-35

3.3.3 Uncertainty and time-series consistency of fugitive emissions .................................................. 3-35

3.3.4 Source-specific planned improvements ....................................................................................... 3-36

4. INDUSTRIAL PROCESSES [CRF SECTOR 2] .................................................................................... 4-1

4.1 OVERVIEW OF SECTOR .................................................................................................................. 4-1

4.2 MINERAL PRODUCTS (2A) .............................................................................................................. 4-3

4.2.1 Source category description ....................................................................................................... 4-3

4.2.2 Methodological issues ............................................................................................................... 4-3

4.2.3 Uncertainties and time-series consistency .................................................................................. 4-3

4.3 CHEMICAL INDUSTRY (2B) ........................................................................................................... 4-4

4.3.1 Source category description ....................................................................................................... 4-4

4.3.2 Methodological issues ............................................................................................................... 4-4

4.3.3 Uncertainties and time-series consistency .................................................................................. 4-4

4.4 METAL PRODUCTION (2C) ............................................................................................................ 4-4

4.4.1 Source category description ....................................................................................................... 4-4
4.4.2 Methodological issues ................................................................................................................. 4-5
4.4.3 Uncertainties and time-series consistency .................................................................................. 4-5

4.5 PRODUCTION OF HALOCARBONS AND SF₆ (2E) ................................................................................ 4-5
4.5.1 Source category description ........................................................................................................ 4-5
4.5.2 Methodological issues ................................................................................................................ 4-5
4.5.3 Uncertainties and time-series consistency .................................................................................. 4-5

4.6 CONSUMPTION OF HALOCARBONS AND SF₆ (2F) ........................................................................... 4-6
4.6.1 Source category description ........................................................................................................ 4-6
4.6.2 Methodological issues ................................................................................................................ 4-6
4.6.3 Uncertainties and time-series consistency .................................................................................. 4-6
4.6.4 Source-specific recalculations ................................................................................................... 4-7

4.7 OTHER INDUSTRIAL PROCESSES (2G) ............................................................................................ 4-8
4.7.1 Source category description ........................................................................................................ 4-8
4.7.2 Methodological issues ................................................................................................................ 4-8
4.7.3 Uncertainties and time-series consistency .................................................................................. 4-8

5. SOLVENT AND OTHER PRODUCT USE [CRF SECTOR 3] ................................................................. 5-1
5.1 OVERVIEW OF SECTOR .................................................................................................................... 5-1
5.1.1 Source category description ........................................................................................................ 5-2
5.1.2 Methodological issues ................................................................................................................ 5-2
5.1.3 Uncertainties and time-series consistency .................................................................................. 5-2

6. AGRICULTURE [CRF SECTOR 4] ........................................................................................................... 6-1
6.1 SECTOR OVERVIEW .......................................................................................................................... 6-2
6.2 ENTERIC FERMENTATION [CRF CATEGORY 4A] .................................................................................. 6-3
6.2.1 Source category description ........................................................................................................ 6-3
6.2.2 Methodological issues ................................................................................................................ 6-3
6.2.3 Uncertainty and time-series consistency ................................................................................... 6-4
6.2.4 SOURCE-SPECIFIC PLANNED IMPROVEMENTS ........................................................................... 6-5
6.3 MANURE MANAGEMENT [CRF CATEGORY 4B] .................................................................................. 6-6
6.3.1 Source category description ........................................................................................................ 6-6
6.3.2 Methodological issues ................................................................................................................ 6-6
6.3.3 Uncertainty and time-series consistency ................................................................................... 6-6
6.3.4 SOURCE-SPECIFIC PLANNED IMPROVEMENTS ........................................................................... 6-7
6.4 AGRICULTURAL SOILS [CRF CATEGORY 4D] .................................................................................. 6-8
6.4.1 Source category description ........................................................................................................ 6-8
6.4.2 Methodological issues ................................................................................................................ 6-8
6.4.3 Uncertainty and time-series consistency ................................................................................... 6-9
6.4.4 Source-specific recalculations ................................................................................................... 6-10
6.4.5 Source-specific planned improvements ...................................................................................... 6-10

7. LUCF [CRF SECTOR 5] .......................................................................................................................... 7-1
7.1 OVERVIEW OF SECTOR .................................................................................................................... 7-3
7.2 CO₂ FROM CHANGES IN FORESTRY AND OTHER WOODY BIOMASS STOCK [5A] ..................... 7-4
7.2.1 Source category description ........................................................................................................ 7-4
7.2.2 Methodological issues ................................................................................................................ 7-4
7.2.3 Uncertainty and time-series consistency ................................................................................... 7-4
7.2.4 Planned improvements ............................................................................................................... 7-5

8. WASTE [CRF SECTOR 6] .......................................................................................................................... 8-1
8.1 OVERVIEW OF SECTOR .................................................................................................................... 8-1
8.2 SOLID WASTE DISPOSAL ON LAND (6A) .................................................................................... 8-2
8.2.1 Source category description ........................................................................................................ 8-2
8.2.2 Methodological issues ................................................................................................................ 8-3
8.2.3 Uncertainty and time-series consistency ................................................................................... 8-4
8.2.4 Source-specific recalculations ................................................................................................... 8-4
8.3 WASTEWATER HANDLING (6B) ...................................................................................................... 8-5
8.3.1 Source category description ........................................................................................................ 8-5
8.3.2 Methodological issues ................................................................................................................ 8-5
8.3.3 Uncertainties and time-series consistency .................................................................................. 8-5
8.4 WASTE INCINERATION (6C) ................................................................. 8-6
  8.4.1 Source category description .......................................................... 8-6
  8.4.2 Methodological issues ................................................................. 8-6
  8.4.3 Uncertainties and time-series consistency ................................. 8-6
8.5 OTHER WASTE HANDLING (6D) ..................................................... 8-6
  8.5.1 Source category description .......................................................... 8-6
  8.5.2 Methodological issues ................................................................. 8-6
  8.5.3 Uncertainties and time-series consistency ................................. 8-6
  8.5.4 Source-specific recalculations ................................................... 8-6
9. OTHER [CRF SECTOR 7] ................................................................. 9-1
  9.1 OVERVIEW OF SECTOR ................................................................. 9-1
    9.1.1 Source category description .......................................................... 9-1
    9.1.2 Methodological issues ................................................................. 9-2
    9.1.3 Uncertainties and time-series consistency ................................. 9-2
    9.1.4 Source-specific planned improvements ...................................... 9-2
10. RECALCULATIONS AND IMPROVEMENTS ....................................... 10-1
   10.1 EXPLANATION AND JUSTIFICATION FOR RECALCULATIONS .................. 10-1
     10.1.1 Methodological changes ............................................................. 10-1
     10.1.2 Source allocation ........................................................................ 10-1
     10.1.3 Error corrections ......................................................................... 10-2
   10.2 IMPLICATIONS FOR EMISSION LEVELS ......................................... 10-2
     10.2.1 Recalculation of base year and (now final) year 2000 ..................... 10-3
     10.2.2 Recalculation of other years/gases ............................................... 10-3
   10.3 IMPLICATIONS FOR EMISSION TRENDS, INCLUDING TIME-SERIES CONSISTENCY .......... 10-4
   10.4 RECALCULATIONS, RESPONSE TO THE REVIEW PROCESS AND PLANNED IMPROVEMENTS ........ 10-5
     10.4.1 Revised source allocations ....................................................... 10-5
     10.4.2 Completeness of sources ............................................................ 10-5
     10.4.3 Changes in CRF files compared to the previous submission .......... 10-6
     10.4.4 Completeness of the CRF files .................................................. 10-7
     10.4.5 Response to the issues raised in external reviews ...................... 10-8
     10.4.6 Response to the issues raised in UNFCCC reviews .................... 10-11
     10.4.7 Planned improvements .............................................................. 10-12
REFERENCES ......................................................................................... R-1
ANNEXES.......................................................................................................................... A-1

ANNEX 1: KEY SOURCES........................................................................................................... A-3

1.1 INTRODUCTION.................................................................................................................. A-3
1.2 TIER 1 KEY SOURCE AND UNCERTAINTY ASSESSMENT ............................................. A-6
1.3 UNCERTAINTY ASSESSMENT ........................................................................................ A-7
1.4 TIER 2 KEY SOURCE ASSESSMENT ................................................................................. A-7

ANNEX 2: DETAILED DISCUSSION OF METHODOLOGY AND DATA FOR ESTIMATING CO2 EMISSIONS FROM FOSSIL FUEL COMBUSTION ............................................ A-13

2.1 ESTIMATION OF ACTUAL FINAL FOSSIL-FUEL RELATED CO2 EMISSIONS FROM FUEL COMBUSTION (INCLUDING NON-ENERGY USE) .......................................................... A-13
2.2 TEMPERATURE CORRECTION FOR CO2 FROM ENERGY CONSUMPTION FOR SPACE HEATING .......................................................................................................................... A-17

ANNEX 3: OTHER DETAILED METHODOLOGICAL DESCRIPTIONS FOR INDIVIDUAL SOURCE OR SINK CATEGORIES ........................................................................................................ A-21

3.1 DETAILED METHODOLOGICAL DESCRIPTION FOR OTHER SOURCES .................. A-21
3.2 DETAILED METHODOLOGICAL DESCRIPTION OF LUCF CATEGORY 5A .................. A-24

ANNEX 4: CO2 REFERENCE APPROACH AND COMPARISON WITH THE SECTORAL APPROACH ........................................................................................................................................... A-29

ANNEX 5: ASSESSMENT OF COMPLETENESS AND (POTENTIAL) SOURCES AND SINKS OF GREENHOUSE GAS EMISSIONS AND REMOVALS EXCLUDED ........................................ A-33

ANNEX 6: ADDITIONAL INFORMATION TO BE CONSIDERED AS PART OF THE NIR SUBMISSION ................................................................................................................................. A-35

ANNEX 7: SELECTION OF COMMON REPORTING TABLES ............................................................ A-37

7.2 RECALCULATION AND COMPLETENESS TABLES FOR 1990 AND 1995-2001 ....... A-44
7.3 CRF TREND TABLES 10 FOR GREENHOUSE GASES ................................................. A-68
7.4 TREND TABLES FOR PRECURSOR GASES AND SO2 .................................................. A-74

ANNEX 8: CHEMICAL COMPOUNDS, UNITS, GLOBAL WARMING POTENTIALS, OTHER CONVERSION FACTORS AND INTERNET LINKS ........................................................................ A-81

ANNEX 9: LIST OF ABBREVIATIONS ......................................................................................... A-83
x
Samenvatting (Dutch)

National Inventory Report (NIR)


Belangrijkste wijzigingen ten opzichte van het vorige NIR-rapport

Emissies: De CO₂-emissies zijn 3 tot 4 Tg lager voor 1997 en later, in verband met een herberekening bij de industrie. Kleinere wijzigingen zijn er in hogere CH₄-emissies in de vroege 90-er jaren en in hogere emissies vanaf 1999 die vooral het gevolg zijn van een herberekening van de emissies van stortplaatsen, lagere N₂O-emissies in verband met een herberekening van overig wegtransport, lagere HFK- en PFK-emissies en hogere SF₆-emissies. De emissies in 1990 zijn hierdoor 0,7% hoger en de uitstoot in 2001 is nu 1,6% lager, waarmee de toename in de periode 1990-2001 daalde van 3,8% naar 2,3%. Bij dit National Inventory Report zijn nu ook spreadsheets toegevoegd met checktabellen en trendtabellen die op de bijgevoegde CRF-data files gebaseerd zijn.

Sleutelbronnen: 2-CO₂-Overige industrie en 3-CO₂-Diversen zijn nu sleutelbronnen; 1A3-CO₂-Luchtvaart en 6B-CH₄-Afvalwater zijn nu geen sleutelbron meer.

Secties: Methodiekwijzigingen in Sectie 1.4; resultaten van de trendverificatie in Box 1.2 en in Hoofdstuk 10 over herberekeningen en verbeteringen. Secties over herberekeningen zijn toegevoegd bij CO₂ van de industrie (1A2), overig transport (1A3e) en overige sectoren (1A4); bij N₂O van wegtransport (1A3b); HFK’s en PFK’s van het gebruik van F-gassen (2F); CH₄ van stortplaatsen (6A) en CO₂ van overig afval (6D).

Emissietrends broeikasgassen

De totale broeikasgasemissies waren in 2002 gelijk aan die in het basisjaar (1990, maar 1995 voor de F-gassen). Na temperatuurcorrectie voor de zachte winter in 2002 zijn de emissies 3% hoger. In periode 1990-2002 zijn de emissies van CO₂ met 10% toegenomen, terwijl de CH₄ en N₂O-emissies met resp. 32% en 7% afnamen. Van de zogenaamde F-gassen, waarvoor 1995 het referentiejaar is, nam de totale emissie met 60% af. De HFK- en PFK-emissies namen met resp 65% en 35% af in 2002 ten opzichte van 1995, terwijl de emissies van SF₆ met 14% toegenomen. Hieronder wordt per IPCC-categorie de verklaring voor de trend 1990-2002 gegeven:

- De emissies van energiegebruik en -productie (categorie 1) is met ca. 10% toegenomen ten opzichte van 1990, met name door de toename van CO₂-emissies van de centrales en de transportsector (resp. 24 en 23% toename). De verdubbeling van de elektriciteitsimport in 1999 van 10 naar 20% voor het binnenlandse elektriciteitsverbruik veroorzaakte een tijdelijke afname van de CO₂-emissies in deze sector en het landelijk totaal. De stijging van de CO₂-emissies die in de periode vóór 1999 te zien was zet zich vanaf 2000 weer door.
De industriële procesemissies (d.w.z. niet-verbrandingsemissies) (categorie 2) zijn 30% gedaald ten opzichte van 1990, met name door de sterke afname van de HFK-emissies en een afname van de N₂O-emissies van de salpeterzuurproductie. Ook de PFK-emissies zijn met 50% afgenomen.

Emissies van oplosmiddelen en andere producten (categorie 3) dragen maar weinig bij tot het nationale totaal, de emissietrend vertoont een daling door een afname van de emissie van N₂O van spuitbussen.

De landbouwemissies (categorie 4) zijn sinds 1990 met 14% afgenomen. Dit komt door de sterke afname van het aantal dieren, waardoor CH₄-emissies afkomstig van fermentatie en mest met 23% zijn gedaald.

De CO₂-vastlegging in bossen (categorie 5) bedraagt circa 1% van het landelijke totaal. De jaarlijkse fluctuaties (-1,2 tot -1,9 Mton) worden veroorzaakt door jaarlijkse veranderingen in de dataset die gebruikt wordt voor het berekenen van deze categorie zoals houtkap en aangroeí.

De emissies van de afvalsector (categorie 6) zijn sinds 1990 circa 43% afgenomen, met name door een afname van CH₄-emissies van stortplaatsen. De aan fossiele brandstoffen gerelateerde emissie van afvalverbrandingsinstallaties zijn opgenomen in categorie 1A1.

De sector 'overig' (categorie 7) bestaat grotendeels uit de emissie van N₂O door vervuild oppervlaktewater; deze bijdrage is constant gehouden over de jaren.


De grootste wijzigingen in totale broeikasgasemissies in 2002 ten opzichte van 2001 worden veroorzaakt door een afname van de methaanuitstoot van 58 Gg, wat correspondeert met 1,2 Mton CO₂-eq. en de afname van de CO₂-emissies met resp. 0,4 Mton CO₂. Ook de N₂O-uitstoot is in 2002 afgenomen met 1,7 Gg, ofwel 0,5 Mton CO₂-eq. De daling in 2002 van 6% van de methaanemissies komt vooral door een sterke afname van de uitstoot bij de landbouw (met name veeteelt), bij stortplaatsen en bij de productie van olie en gas.

**Wijzigingen ten opzichte van de NIR-rapportage van 2003**


- **Methodiekwijzigingen:** met name herberekening van emissies van verkeer voor alle stoffen en jaren (1A3), van CH₄-emissies van stortplaatsen en toevoeging van de – zeer geringe – CH₄- en N₂O-emissies van internationaal transport;
- **Allocatie van bronnen:** nadere opsplitsing van vluchtige CH₄-emissies voor 1991-1994 in de categorie 1B2 en verschuiving van de emissies van verbranding van biogas van RWZI’s van de afvalsector (6D) naar de energiesector (1A4);
Als gevolg van deze herberekeningen zijn in het basisjaar de totale CO₂-equivalente emissies nu 1,4 Mton CO₂-eq. of 0,7% hoger dan in de vorige opgave. Door herberekeningen is de trend ten opzicht van het basisjaar met 2% naar beneden is bijgesteld. Volgens de huidige inventarisatie is totale uitstoot van broeikasgassen in 2002 gelijk aan die in het basisjaar (1990 maar 1995 voor de F-gassen). De CO₂-emissies zijn in het basisjaar (1990) bij de ‘Overige sectoren’ (huishoudens, diensten) nu 0,7 Mton hoger door een herberekening in het aardgasgebruik, bij de industrie 0,3 Mton hoger door een foutcorrectie en in de transportsector nu 0,4 Mton hoger door herberekeningen. De wijzigingen bij de andere gassen zijn minimaal.

Onzekerheden

De onzekerheid in de emissiecijfers voor 2002 en in de emissietrend is waarschijnlijk groter als gevolg van een tijdelijk verslechtering van de kwaliteit van de emissiecijfers voor de laatste jaren ten opzichte van de data voor eerdere jaren. Dit wordt veroorzaakt door (a) een andere rapportagewijze door individuele bedrijven (thans rechtstreeks via de milieujaarverslagen) en (b) vertraging in de beschikbaarheid van (voorlopige) statistieken voor het voorgaande kalenderjaar, met name voor het energiegebruik.

De onzekerheid in de totale jaarlijkse emissies wordt geschat op ±5%; de onzekerheid in de trend over de periode 1990/95-2002 wordt op ±4%-punten geschat bij een toename van de broeikasgasmissemisn van 3%, gebaseerd op de zgn. ‘Tier 1’ methodiek van de IPCC voor trendonzekerheden (met 95% betrouwbaarheidsinterval). Voor de afzonderlijke stoffen wordt de onzekerheid in de jaarlijkse emissies als volgt geschat: voor CO₂ ±3%, CH₄ ±25%, N₂O ±50%; HFK’s, PFK’s en SF₆: ±50%. De trendonzekerheid wordt voor CO₂, CH₄, N₂O en voor alle F-gassen als groep geschat op resp. ±3%, ±6%, ±11% and ±9%-punten. Deze onzekerheden zijn exclusief het mogelijke effect op de emissies van herberekeningen als gevolg van methodiekwijzigingen.

Respons naar aanleiding van reviews


Verbeteringen in de toekomst

Om te voldoen aan de richtlijnen van het IPCC met betrekking tot de emissieregistratie van broeikasgassen is in 2000 een programma gestart om de bestaande monitoringprocedures aan te passen aan de internationale eisen. Dit programma valt onder verantwoordelijkheid van het Ministerie van VROM en wordt gecoördineerd door Novem. Er is een interdepartementale werkgroep geformeerd – de Werkgroep Emissiemonitoring Broeikasgassen, WEB – die belast is met advisering over de verschillende uit te voeren acties. Volgens EU-afspraken moeten de lidstaten zgn. National Systems zo spoedig mogelijk, maar uiterlijk per 31 december 2005, geïmplementeerd hebben. In het kader van de afronding van het verbeterprogramma zal daarom volgens plan vóór 31 december 2004 opnieuw een bijstelling worden gedaan van mogelijk enkele procenten: voor veel bronnen en stoffen zullen de emissies herberekend worden opdat voldaan wordt aan de eisen van de EU, de UNFCCC en het Kyoto Protocol. Voor een belangrijk deel bestaan deze uit herberekeningen van zgn. sleutelbronnen om de kwaliteit (transparantie, consistentie in de tijd, compleetheid en nauwkeurigheid) te verbeteren van de CO₂-emissies, als hierover overeenstemming is bereikt.
• De verbrandingsemissies van stationaire bronnen (IPCC categorie 1A) zullen, indien goedgekeurd, mogelijk volledig worden herbereken voor de periode 1990-2003 op basis van sectorale energiestatistieken in plaats van met gebruikmaking van de MJV/ER-data, waarbij dan ook een aantal verbeterde emissiefactoren gebruikt worden.

• De emissies van mobiele bronnen zullen worden aangepast aan verbeterde toerekening van brandstofgebruik aan binnenlandse en buitenlandse scheepvaart en luchtvaart, en voor wegtransport, indien goedgekeurd, aan nieuwe voor Nederland specifieke emissiefactoren.

• Herberekening van de CO₂-emissies van non-energetisch gebruik van energiedragers (als chemische grondstof), waarbij de directe emissies tijdens de productie van de petrochemische producten en de emissies bij het gebruik van deze fossiel-koolstofhoudende producten apart worden onderscheiden (resp. IPCC categorieën 2 en 3). Behalve een toerekening naar industriële processen en productgebruik conform de UNFCCC-rapportagerichtlijnen in plaats van de huidige rapportage als onderdeel van de verbrandingsemissies, verbetert hiermee ook de berekening van de Nederlandse emissies. Bij de huidige methodiek worden namelijk de gebruiksemmissies berekend voor alle in Nederland geproduceerde petrochemische producten, terwijl een groot deel hiervan geëxporteerd wordt. Daarnaast worden de koolstofvastleggingsfracties bij de productie aangepast aan de laatste inzichten.

• De fossiele CO₂-emissies van afvalverbranding (IPCC categorie 6C of 1A) worden herberekend voor de hele periode 1990-2003 met een verbeterde, consistente splitsing van de koolstof in de fossiele en organische fracties. Ook bij de methaan- en lachgas-emissies zijn belangrijke herberekeningen voorzien:

  • CH₄-emissies: De emissies van de distributie van aardgas (1B) zullen worden herberekend op basis van de lengte van het leiding-netwerk en het materiaaltipe in plaats van de aardgas doorvoer als basis voor de emissiefactor. Ook zullen de emissies van het afblazen van gas (1B) bij de olie- en gaswinning worden herberekend. De methaanemissies van enterische fermentatie bij vee (4A) worden mogelijk herberekend met behulp van nieuwe voor Nederland specifieke emissiefactoren. Verder zullen de methaanemissies van stormplaatsen (6A) en van RWZI’s worden herberekend terwijl de emissies van industriële waterzuiveringen indien mogelijk zullen worden toegevoegd.

  • N₂O-emissies: De zgn. indirecte emissies van N₂O van landbouwbodems (4D) als gevolg van depositie uit de atmosfeer worden nu niet gerapporteerd. Alle indirecte N₂O-emissies zullen worden herberekend met behulp van de aanbevolen IPCC-methodiek met gebruikmaking van met nieuwe voor Nederland specifieke factoren en activiteitendata.
Executive Summary

Major changes from the previous National Inventory Report

Emissions: Decreased CO₂ emissions by 3 to 4 Tg from 1997 onwards, in particular due to revision in the manufacturing industry. Smaller changes are found in increased CH₄ emissions in the early '90s and increased emissions from 1999 onwards mainly due to revision of landfill emissions, decreased N₂O emissions due to revision in other transport, decreased HFC and PFC emissions and increased SF₆ emissions. Resulting 1990 emissions increased by 0.7% and 2001 emissions decreased by 1.6%, adjusting the 1990-2001 increase from 3.8% to 2.3%.

In addition, the user will find the check tables compiled from CRF data and other information spreadsheets and the (trend) tables presented in this National Inventory Report (NIR) as a supplement to this report.

Key sources: 2-CO₂ Other Industrial and 3-CO₂ Miscellaneous: are now key; 1A3-CO₂ Aircraft and 6B-CH₄ Wastewater are now non-key.

Sections: Methodological changes in Section 1.4; results of the trend verification in Box 1.2 and Chapter 10 on recalculation and improvements. Recalculation sections were added for CO₂ from manufacturing industry (1A2), other transport (1A3e) and other sectors (1A4); N₂O from road transport (1A3b); HFC and PFCs from F-gas consumption (2F); CH₄ from landfills (6A) and CO₂ from other waste (6D).

ES.1. Background information on greenhouse gas inventories and climate change

This report documents the 2004 Netherlands’ annual submission of its greenhouse gas emission inventory in accordance with the guidelines provided by the United Nations Framework Convention on Climate Change (UNFCCC) and the European Union’s Greenhouse Gas Monitoring Mechanism. These guidelines, which also refer to Revised 1997 IPCC Guidelines and IPCC Good Practice Guidance reports, provide a format for the definition of source categories and for calculation, documentation and reporting of emissions. The guidelines aim at facilitating verification, technical assessment and expert review of the inventory information by independent Expert Review Teams by the UNFCCC. Therefore, the inventories should be transparent, consistent, comparable, complete and accurate as elaborated in the UNFCCC Guidelines for reporting and be prepared using good practice as described in the IPCC Good Practice Guidance.

This National Inventory Report (NIR) 2004 therefore provides explanations of the trends in greenhouse gas emissions for the 1990-2001 period and summary descriptions of methods and data sources of (a) Tier 1 assessments of the uncertainty in annual emissions and in emission trends; (b) a preliminary assessment of key sources following the Tier 1 and Tier 2 approaches of the IPCC Good Practice Guidance; and (c) Quality Assurance and Quality Control activities. This report gives no specific information on the effectiveness of government policies for reducing greenhouse gas emissions; this information can be found in RIVM’s Environmental Balance 2003. Please note that the emissions presented in this dataset for 2002, i.e. for the most recent year, have been compiled using sometimes estimated activity data and may therefore have been calculated somewhat differently than the emissions of other years (see Annexes 2.1 and 3).

So-called Common Reporting Format (CRF) spreadsheet files, containing data on emissions, activity data and implied emission factors, accompany this report. The complete set of CRF files as well as the NIR in pdf format can be found at the website www.greenhousegases.nl, which provides links to the RIVM’s website (www.rivm.nl), where these files reside. In addition, trend tables and check tables compiled from CRF data and other information presented in this National Inventory Report (NIR) are also available as spreadsheets.

Climate Convention and Kyoto Protocol

The Kyoto Protocol shares the Convention’s objective, principles and institutions, but significantly strengthens the Convention by committing Annex I Parties to individual, legally-binding targets to limit or reduce their greenhouse gas emissions. The EU-15 has a target of -8% in the 1990-2008/2012 period. The EU has redistributed its targets among the 15 Member States. The (burden-sharing) target
of Netherlands is -6%. Please note that the definition of what should be reported under the source/sink category ‘Land-use change and forestry’ (LUCF) to the United Nations Framework Convention on Climate Change is considerably different from the definition of emissions/sinks to be included in the national total under the Kyoto Protocol.

**Reporting requirements: UNFCCC and IPCC**

Annex I Parties to the UNFCCC must submit annually an inventory of their greenhouse gas emissions, including data for their base year (1990, except for some Economies-In-Transition) and data up to the last but one year prior to submission. Inventories due 15 April 2004, for example, should contain emission data up to the year 2002. The UNFCCC Guidelines prescribe the source categories, calculation methodologies, and the contents and the format for the inventory report. For the definition of the source categories and calculation methodologies, the UNFCCC Guidelines generally refer to the IPCC Guidelines for Greenhouse Gas Inventories and the IPCC Good Practice Guidance reports. The IPCC often uses the concept of a 'Tiered Approach', by which a stepwise approach is meant: Tier 1 is simplest, requires least data and effort; Tier 2 is more advanced and/or data intensive; Tier 3 is still more advanced; etc.

Generally, more detailed/advanced emission calculation methods are recommended – data and capacity permitting – and more detailed/advanced uncertainty assessments or more advanced key source assessments. To aid priority setting, the Good Practice Guidance recommends using higher tier methods in particular for so-called key sources. Uncertainty estimates can serve to refine both the key source identification and prioritise inventory improvement activities. The Netherlands generally applies country-specific, higher tier methods for calculation of greenhouse gas emissions (see Section 1.5).

**Key sources**

For preliminary identification of so-called ‘key sources’ according to the IPCC Good Practice approach we allocated the national emissions according to the IPCC’s potential key source list wherever possible. The Netherlands has a high share of feedstock use of fuels, which is a non-combustion category of CO2, therefore, this source category has been added to the list. The IPCC Tier 1 method consists of ranking this list of source category-gas combinations, for the contribution to both the national total annual emissions and the national total trend. The results of these listings are presented in Annex I: the largest sources of which the total adds up to 95% of the national total are 18 sources for annual level assessment and 16 sources for the trend assessment out of a total of 56 sources. Both lists can be combined to get an overview of sources, which meet any of these two criteria. The IPCC Tier 2 method for identification of key sources requires the incorporation of the uncertainty to each of these sources before ordering the list of shares. This refined result is a list of about 27 source categories out of a total of 56 that could be identified as ‘key sources’ (see Table 1.4).

For these sources in principle a higher Tier emission calculation method should be used. For key sources a brief comparison is made of the Netherlands’ methodologies with the IPCC Tiers in the methodological sections of the sectoral Chapters 2 to 9 (also see Table 1.4). From this analysis it seems clear that for CH4 from natural gas distribution and CH4 from enteric fermentation of cattle, for instance, the methods used will probably need to be improved in future.

**Description of the institutional arrangement for inventory preparation**

The preparation of the greenhouse gas emission data in the Netherlands is based on the national Pollutant Emission Register (PER). This general process has existed for many years and is organised as a project with an annual cycle. To meet the UNFCCC and IPCC requirements additional actions are (still) necessary. In 2000 a programme was started to adapt the monitoring of greenhouse gases in the Netherlands and transform this into a National System, as stated in Article 5 of the Kyoto Protocol. The Climate Change and Industry Division of the Ministry of VROM (VROM/DGM/KVI) is responsible for organising the reporting process. Figure ES.1 presents this process, the relation with the PER and the responsibilities. The Co-ordination Committee for Target Sector Monitoring (CCDM) under
auspices of the VROM Inspectorate is responsible for the data collection in the PER process, resulting in an intermediate database, hosted by TNO. The NIR report, also containing a selection of CRF tables, has been primarily drafted by RIVM, with contributions by CBS, TNO and Novem. This year organisations and individuals could make, for the second time, comments to the draft NIR. This process was organised by Novem and RIVM, using the site www.greenhousegases.nl. Six persons provided comments, which is much less than last year, mostly on the LUCF chapter. Data collected in the National Inventory Report are based on the PER. A Greenhouse Gas Inventory Improvement Programme was started in 2000. This programme is guided by the Working Group Emission Monitoring of Greenhouse Gases (WEB), which directs future actions aimed at improving the monitoring of greenhouse gas emissions, relevant to reporting to the UNFCCC in all aspects. At the end of this Executive Summary we summarise the main actions; more details can be found in Section 10.4. Some actions already resulted in improved data; others are related to future improvements. One of the actions is aimed at improving the process of data collection and calculations by the use of protocols, which should be included in the PER system from 2004 onwards.

Figure ES.1. NIR and CRF preparation process, relation with the Pollutant Emission Register (PER) and responsibilities

Organisation of the report

The structure of this report complies with the new UNFCCC reporting guidelines for this year’s submission (UNFCCC, 2002). The report starts with an introductory Chapter 1, containing background information on the Netherlands’ process of inventory preparation and reporting; key sources and their uncertainties; a description of methods, data sources and emission factors, and a description of the quality assurance system, along with verification activities applied to the data. Chapter 2 provides a summary of trends for aggregated greenhouse gas emissions by gas and by main source. The final Chapter 10 presents information on recalculations, improvements and response to issues raised in external reviews. In addition, the report contains 9 Annexes that provide more detailed information on key sources, methodologies, other relevant reports and detailed emission tables selected from the CRF files.
ES.2. Summary of national emission and removal related trends

In Table ES.1 the trends in national total (net) CO₂-equivalent emissions are summarised for 1990-2002. Total greenhouse gas emissions were in 2002 the same as in the base year, which is defined as 1990 for greenhouse gases and 1995 for fluorinated gases. The 2002 emissions would be 3%-points higher when corrected for temperature (the mild winter). In Table ES.2 the same trends per gas have been summarised but now with CO₂ emissions corrected for outside temperature in order to exclude the climatic influence that partially masks the anthropogenic trend in the CO₂ emissions. Using temperature-corrected CO₂ emissions in 1990 and 2002, the structural anthropogenic trend of total greenhouse gas emissions in the past 11 years is estimated to be a 1%-point lower than the actual trend in CO₂-eq. emissions of 1% increase. CO₂ emissions increased by about 10% from 1990 to 2002, mainly due to the increase in the emissions in the energy (24%) and transport sectors (23%). The doubling of imported electricity in 1999 from 10% to 20% of the domestic electricity consumption only temporarily decreased CO₂ emissions from the energy sector and total national CO₂ emissions. In 2000 and 2001 the annual increase of the pre-1999 years has resumed. CO₂ emissions peaked in 1996 due to a very cold winter.

Table ES.1. Total greenhouse gas emissions in CO₂-eq. and indexed 1990-2002 (no temperature correction)

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1) The 't-1' dataset is holds a higher uncertainty than the 't-2' dataset due to the data collection process (see Section 1.2).
2) National emissions, excluding LUCF (category 5A).
3) Base year = 100.
4) Emissions from international marine and aviation bunkers are not included in the national totals.
5) Base year emissions (1990 for CO₂, CH₄ and N₂O and 1995 for the F-gases, shaded/bold-italic figures): 212.4 Tg CO₂-eq.
Table ES.2. Total greenhouse gas emissions with temperature correction, in CO2-eq. and indexed, 1990-2002

<table>
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<tbody>
<tr>
<td>Emissions (Tg CO2-eq)</td>
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<tr>
<td>CO2 with LUCF (T-corrected)</td>
<td>165.4</td>
<td>166.6</td>
<td>169.1</td>
<td>167.5</td>
<td>170.7</td>
<td>174.6</td>
<td>175.8</td>
<td>167.4</td>
<td>174.7</td>
<td>171.2</td>
<td>174.7</td>
<td>178.0</td>
<td>179.5</td>
</tr>
<tr>
<td>CO2 excluding LUCF (T-corrected)</td>
<td>166.8</td>
<td>168.1</td>
<td>170.6</td>
<td>169.3</td>
<td>172.7</td>
<td>175.9</td>
<td>177.2</td>
<td>168.6</td>
<td>176.1</td>
<td>172.4</td>
<td>176.1</td>
<td>179.4</td>
<td>181.0</td>
</tr>
<tr>
<td>Total [group of six] 1)</td>
<td>217.6</td>
<td>218.6</td>
<td>221.7</td>
<td>224.9</td>
<td>227.1</td>
<td>229.8</td>
<td>227.5</td>
<td>225.4</td>
<td>227.5</td>
<td>217.8</td>
<td>218.8</td>
<td>218.5</td>
<td>218.1</td>
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<tr>
<td>Index (1990 = 100)</td>
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</tr>
<tr>
<td>Index CO2 excluding LUCF (T-corrected)</td>
<td>100</td>
<td>100.8</td>
<td>102.3</td>
<td>101.5</td>
<td>103.5</td>
<td>105.4</td>
<td>106.2</td>
<td>101.1</td>
<td>105.6</td>
<td>103.4</td>
<td>105.6</td>
<td>107.6</td>
<td>108.5</td>
</tr>
<tr>
<td>Total [group of three] 1)</td>
<td>100</td>
<td>101.0</td>
<td>102.1</td>
<td>101.6</td>
<td>102.8</td>
<td>104.0</td>
<td>104.4</td>
<td>99.5</td>
<td>102.6</td>
<td>100.3</td>
<td>101.2</td>
<td>102.2</td>
<td>102.1</td>
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<tr>
<td>Index [1990; F-gases 1995]</td>
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</tr>
<tr>
<td>Index [group of 6 composite]</td>
<td>99.5</td>
<td>100.0</td>
<td>101.4</td>
<td>101.1</td>
<td>102.8</td>
<td>103.8</td>
<td>105.1</td>
<td>100.8</td>
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<td>99.6</td>
<td>100.0</td>
<td>99.9</td>
<td>99.7</td>
</tr>
</tbody>
</table>

1) Excluding LUCF.

CH4 emissions decreased by 32% in 2002 compared to the 1990 level, mainly due to the decrease in the waste sector (-40%), the agricultural sector (-23%) and fugitive emissions from oil and gas (-33%). N2O emissions decreased by about 7% in 2002 compared to 1990, mainly due to the decrease in the emissions from industrial processes (-17%), which compensated increases of emissions from fossil fuel combustion of 38% (mainly from transport).

Of the fluorinated greenhouse gases, emissions of HFCs and PFCs decreased in 2001 by about 75% and 35%, respectively, while SF6 emissions increased by 14%. Total emissions of all F-gases decreased by about 60% compared to the 1995 reference year level. In 2001 the largest changes showed an increase of 6 Mton of CO2 – of which 3 Mton was due to the colder winter compared to 2000 – and decrease of over 1 Mton in HFC emissions. Along with the increased import of electricity since 1999, this is the primary reason why total greenhouse gas emissions have stabilised since 1997.

ES.3. Overview of source and sink category emission estimates and trends

Table ES.3 provides an overview of the CO2-eq. emission trends per IPCC source category. It clearly shows the energy sector (category 1) to be by far the largest contributor to national total greenhouse gas emissions with a share that increased from 75% in 1990 to about 82% in 2002. In contrast, emissions of the other main categories decreased, the largest being those of industrial processes (from 8 to 5% share), waste (from 6 to 4% share) and agriculture (from 8 to 7% in 2002). The sectors showing the largest growth in CO2-eq. emissions since 1990 are the transport sector (23%) and the energy sector (24%). CO2-eq emissions from the energy combustion as a whole showed a growth of about 9%. Clear exceptions are the waste sector, industrial processes and agriculture, which showed a decrease in CO2-eq. emissions of 42% 30% and 14% respectively. Emissions from the residential sector increased by 2%, but weather effects substantially influence these: when the temperature correction was included, these emissions decreased by about 3%.

Energy Sector (CRF sector 1)

The emissions from the energy sector (category 1) are dominated by CO2 from fossil fuel combustion, with fugitive emissions from gas and oil (methane and CO2) contributing a few per cent and CH4 and N2O from fuel combustion adding one per cent. Responsible for the increasing trend in this sector are the energy industries and the transport sector, of which CO2 emissions increased by 24 and 23% since 1990. In contrast, the energy-related CO2 emissions from manufacturing industries decreased a few per cent in 2000 and 2002. Actual CO2 emissions from the other sectors (residential, services and agriculture) increased by about 2%. The relatively strong increases in emissions from the energy sector and the transport sector result in increases of their CO2 share in the national CO2-eq. total (by 6% and 3%-points, respectively) to 30% and 17% in the 2002. The 24% increase of the energy sector emissions is partly mitigated by about 10%-points due to the strong increase in net import of electricity since 1999,
which is equivalent to about 4 Mton of CO₂ coming from domestic fossil-fuel generated electricity. We note that fugitive methane emissions from oil and natural gas decreased by 33% since 1990.

### Table ES.3. Summary of emission trend per source category and per gas (in Tg CO₂-eq.)

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<tbody>
<tr>
<td>1A. Energy: fuel combustion</td>
<td>159.0</td>
<td>167.0</td>
<td>165.9</td>
<td>168.0</td>
<td>168.6</td>
<td>171.6</td>
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<td>165.2</td>
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<td>174.4</td>
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<td>CO₂ 1. Energy industries</td>
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<td>54.1</td>
<td>53.8</td>
<td>56.0</td>
<td>56.5</td>
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<td>56.7</td>
<td>61.2</td>
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<td>CO₂ 2. Manufacturing industries</td>
<td>42.2</td>
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<td>39.9</td>
<td>41.0</td>
<td>42.6</td>
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<td>36.3</td>
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<td>CO₂ 3. Transport</td>
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<td>36.3</td>
</tr>
<tr>
<td>CO₂ 4. Other sectors</td>
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<td>37.4</td>
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<tr>
<td>N₂O</td>
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<tr>
<td>CH₄</td>
<td>0.5</td>
<td>0.6</td>
<td>0.6</td>
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<td>0.6</td>
<td>0.7</td>
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<tr>
<td>1B2. Energy: fugitives from oil &amp; gas</td>
<td>4.4</td>
<td>4.4</td>
<td>3.7</td>
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<td>4.4</td>
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</tr>
<tr>
<td>CO₂</td>
<td>0.3</td>
<td>0.5</td>
<td>0.4</td>
<td>0.4</td>
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<td>0.8</td>
<td>1.0</td>
<td>1.0</td>
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<td>1.7</td>
<td>1.6</td>
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<tr>
<td>CH₄</td>
<td>3.8</td>
<td>4.0</td>
<td>3.4</td>
<td>3.3</td>
<td>3.5</td>
<td>3.6</td>
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<td>3.0</td>
<td>2.8</td>
<td>2.8</td>
<td>2.6</td>
</tr>
<tr>
<td>N₂O</td>
<td>0.7</td>
<td>0.8</td>
<td>0.8</td>
<td>0.7</td>
<td>0.7</td>
<td>0.8</td>
<td>0.8</td>
<td>0.6</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
</tr>
</tbody>
</table>

1) Emissions from the use of the F-gases HFCs, PFCs and SF₆ are according to the IPCC reporting guidelines all reported under source category 2 ‘Industrial processes’.

2) The national total does not include the CO₂ sink reported under category 5A. This CO₂ sink is not complete and refers to the definition under the UN Framework Convention on Climate Change (UNFCCC), which is different from the amount to be calculated under the Kyoto Protocol (see Section 1.1.2).

### Industrial processes (CRF sector 2)

The greenhouse gas emissions from industrial processes (category 2) have decreased by 30% since 1990. As can be seen in Table ES.3, N₂O emissions, mainly from nitric acid manufacture, is the main contributor to this source category. However, the strong decreasing trend in HFC emissions (of 2/3 reduction since 1990 and 3/4 reduction since 1995), notably of HFC-23 from HCFC-22 manufacture, is primarily responsible for the decreasing trend in this source category. The F-gas emissions had a share of almost 50% in total source category emissions in 1995; their share is now about 25%, of which HFCs and PFCs form by far the largest part. PFC emissions in the Netherlands stem mainly from aluminium production. CO₂ emissions from industrial processes contribute 18% to the group total.
tal and stem only for 1/3 from cement clinker production. A large fraction of cement production in the Netherlands uses imported cement clinker. Emissions of SF$_6$ contribute about 3% to the group total.

**Solvents and other product use (CRF sector 3)**

The emissions from ‘Solvent and other product use’ (category 3) should be discussed in conjunction with (very small) methane emissions reported under category 7, since the IPCC tables do not allow for methane emissions under category 3. This category contributes very little to the national total: only 0.1%, primarily in the form of N$_2$O from dispersive uses. We note the CO$_2$ emissions related to the use of products from non-energy use of fuels (e.g. lubricants, waxes, etc.) are not reported in this category but are included in the fuel combustion emissions reported under the manufacturing industry (1A2).

**Agriculture (CRF sector 4)**

The emissions of the agricultural sector have decreased by 14% since 1990, mainly through a decrease in CH$_4$ emissions from enteric fermentation (4A) of 24% by reduced livestock numbers. In its wake, CH$_4$ from manure management (4B) has also decreased similarly over time. At present, enteric fermentation contributes about 45% to this category’s emissions as does N$_2$O emissions from agricultural soils (4D); N$_2$O from manure management only contributes 1% to the group total. N$_2$O from agricultural soils increased until 1995 due to changing practices in animal manure spreading on the fields (incorporation into the soil with the aim of reducing ammonia emissions). The decrease since 1998 is mainly due to a reduction of the use of synthetic fertilisers. At present, due to historic reasons, the Netherlands reports no CO$_2$ emissions from agricultural soils. Indirect N$_2$O emissions from leaching and run-off of nitrogen from agricultural soils are reported under IPCC category 7, because the Netherlands’ method provides only aggregated figures that include industrial sources as well.

**Changes in biomass stocks (LUCF) (CRF sector 5)**

Of the Land Use Change and Forestry (LUCF) sector, the Netherlands presently only reports the net changes of CO$_2$ due to changes in forests and other biomass stocks (IPCC category 5A). These result in a sink of about 1% on the national net total emissions. The variation over time is between -1.2 and -1.9 Mton CO$_2$. Emissions for 2001 and 2002 are set on the same level as for the year 2000.

**Waste (CRF sector 6)**

The emissions from the waste sector have decreased by about 40% since 1990, mainly through decreasing CH$_4$ emissions – predominantly from landfills – which is the dominating gas (97% of total emissions, CO$_2$ and N$_2$O emissions contributing the remaining 3%). The fossil-fuel related emissions from waste incineration are included in the fuel combustion emissions from the energy sector (1A1), since most large-scale incinerators also produce electricity or heat for energetic purposes.

**Other (CRF sector 7)**

The Netherlands uses IPCC category 7 to reports its – very minor – CH$_4$ emissions from solvents and other product use, because the present reporting framework does not allow for CH$_4$ emissions under IPCC category 3. Total indirect N$_2$O emissions from leaching and run-off of nitrogen from agricultural soils and industrial sources are reported here, because the Netherlands’ method provides only aggregated figures that include industrial sources. The indirect N$_2$O emissions are labelled as ‘Polluted surface water’ and are constant over time.

**International transport**

Emissions from international transport are not part of the national total but are reported separately. This year the – very minor – CH$_4$ and N$_2$O emissions from international bunkers were included in the inventory. Total CO$_2$ emissions from this source category have increased by 44% or 17.6 Mton since 1990. In particular, marine bunker emissions contributed (+33% or 12 Mton) due to the large share in
this category, but percentage-wise the emissions from international aviation increased much more (+130% or about 5 Mton). Total international transport emissions have increased as percentage of the national total greenhouse gas emissions from 19% in 1990 to 27% in 2002.

**ES.4. Other information**

**Differences with the domestic national emission inventory**

The Climate Convention uses a specific definition of the emissions that should be included in the national total. The UNFCCC and the Kyoto Protocol do not include CO₂ emissions from combustion of biomass fuels (such as fuelwood, wood, wood waste, agricultural waste and biogas) in the totals from fuel combustion, since these are by default assumed to be produced in a sustainable way. To the extent that biofuels are not produced sustainably, i.e. according to the UNFCCC Guidelines, this should be taken into account when reporting on Land Use Change and Forestry (LUCF), not under CO₂ from fuel combustion. Furthermore, the IPCC source categories make a clear distinction between fuel combustion and non-combustion emissions from an economic sector (see Section 1.1.6), where the Netherlands’ emissions of so-called Target Sectors are mostly analysed by their total emissions. Another specific issue is the distinction that the IPCC makes between CO₂ from non-energy/feedstock use of fuels, CO₂ emissions from other non-combustion processes and CO₂ from fossil fuel combustion. The requirement of separating CO₂ emissions from a Target Sector into these specific subcategories poses limitations to the Netherlands. In the Netherlands these different sources of CO₂ cannot be decomposed in cases where individual companies report their emissions at a too aggregated level. Another difference is found in the definition of national versus international transport. Whereas the national method uses vehicle statistics to estimate road transport emissions, the UNFCCC requires the use of fuel delivery data as the basis for calculating the emissions from this source category. As illustrated in Chapter 3, this results for the Netherlands in annual differences between 5 and 10%.

**Differences with other national publications**

The emission data presented in this report are identical to the PER dataset that has been fixed in mid 2003 and officially published for 1990, 1995 and 1999-2002 in the Emission Monitor for the Netherlands in a Nutshell 2003, published by the VROM Inspectorate. The emissions differ from the figures published in the Environmental Balance 2004 in May 2004 of RIVM, since these are based on the most recent update (spring 2004) of the national Pollutant Emission Register (PER).

**General uncertainty evaluation**

Based on a simple Tier 1 calculation of annual uncertainties, the actual annual uncertainty of total annual emissions per compound and of the total is currently estimated by RIVM at:

<table>
<thead>
<tr>
<th>Compound</th>
<th>Uncertainty</th>
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<tbody>
<tr>
<td>CO₂</td>
<td>±3%</td>
</tr>
<tr>
<td>CH₄</td>
<td>±25%</td>
</tr>
<tr>
<td>N₂O</td>
<td>±50%</td>
</tr>
<tr>
<td>HFCs</td>
<td>±50%</td>
</tr>
<tr>
<td>PFCs</td>
<td>±50%</td>
</tr>
<tr>
<td>SF₆</td>
<td>±50%</td>
</tr>
</tbody>
</table>

The resulting uncertainty in national total annual CO₂-eq. emissions is estimated to be about 5%. If we rank the sources according to their contribution to the uncertainty in total national emissions the top-10 of sources contributing most to total annual uncertainty in 2002 is:
The result is a trend uncertainty in the total CO₂-eq. emissions for 1990-2002 (1995 for F-gases) of ±3% points. This means that the increase in total CO₂-eq. emissions between 1990 and 2002, will be between +1 and +7%. Per individual gas, the trend uncertainty in total emissions of CO₂, CH₄, N₂O and the total group of F-gases has been calculated at ±3%, ±6%, ±11% and ±9% points, respectively.

The top-10 of sources contributing most to trend uncertainty in the national total is:

<table>
<thead>
<tr>
<th>IPCC</th>
<th>IPCC Source category</th>
<th>Uncertainty (as % into trend in total national emissions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>CO₂ Emissions from stationary combustion: energy industries</td>
<td>1.3%</td>
</tr>
<tr>
<td>6A</td>
<td>CO₂ emissions from solid waste disposal sites</td>
<td>1.0%</td>
</tr>
<tr>
<td>1A</td>
<td>CO₂ Emissions from mobile combustion: other</td>
<td>0.8%</td>
</tr>
<tr>
<td>1A</td>
<td>CO₂ Emissions from stationary combustion: other sectors</td>
<td>0.7%</td>
</tr>
<tr>
<td>1A</td>
<td>CO₂ Emissions from mobile combustion: water-borne navigation</td>
<td>0.6%</td>
</tr>
<tr>
<td>2X</td>
<td>HFC-23 emissions from HCFC-22 manufacture</td>
<td>0.6%</td>
</tr>
<tr>
<td>1A</td>
<td>CO₂ Emissions from feedstock oil</td>
<td>0.6%</td>
</tr>
<tr>
<td>4D</td>
<td>Indirect N₂O emissions from nitrogen used in agriculture</td>
<td>0.5%</td>
</tr>
<tr>
<td>1A</td>
<td>CO₂ Emissions from mobile combustion: road vehicles</td>
<td>0.4%</td>
</tr>
<tr>
<td>1A</td>
<td>CO₂ Emissions from stationary combustion: manufacturing industries</td>
<td>0.4%</td>
</tr>
</tbody>
</table>

If we compare this list with the 10 largest contributors to annual uncertainty, we can conclude that six of the 10 key sources are included in both lists.

**Completeness**

At present, the Netherlands greenhouse gas emission inventory includes all sources identified by the *Revised 1996 IPCC Guidelines except* for the following:

- Indirect N₂O emissions from *atmospheric deposition* (category 4D) are not estimated/reported due to historic reasons;
- CO₂ emissions from *agricultural soils* (category 4D) are not estimated/reported due to historic reasons;
- In addition, it has been observed that *CH₄ and N₂O from horse manure* (category 4B) is missing; this is because no manure production estimates from horses have been made to date and no emission factors for this source category have been defined;
- CH₄ emissions from soils decreased in the last 40 years due to drainage and lowering of water tables; these emissions have been included in the natural total; thus there are no net (i.e. positive) anthropogenic emissions, on the contrary, the decrease of total methane from soils acts in fact as methane sink;
- Emissions/sinks for *LUCF subcategories 5A to 5E*, except for the CO₂ sink in category 5A2. New datasets are being compiled but are still under discussion, so no data for these subcategories have been included in this submission.
- CH₄ and N₂O emissions from industrial wastewater treatment (6B) and from large-scale compost production from organic waste (6D) (DHV, 2000).
This year CH₄ and N₂O emissions from international bunkers were included in the inventory for the complete 1990-2002 period.

The incorporation of these sources into the national greenhouse gas inventory is part of the inventory improvement programme. For some of these sources, for example indirect emissions of N₂O, bringing the methodology in compliance to IPCC Good Practice Guidance may result in adjustments of a few percent (i.e. several Tg [= Mton] of CO₂-eq.) The impact of these methodological changes on emissions is not included in the uncertainty estimates presented here.

Recalculations and improvements

The consequences of recalculations on the different greenhouse gas emissions compared to the previous NIR are presented in the Table ES.4. Since recalculations were mostly only performed for 1990 and 1995, emission figures have, in general, remained unchanged for the years 1991-1994 compared to the previous submission.

Table ES.4. Differences between NIR 2003 and NIR 2004 for 1990-2001 due to recalculations

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<tbody>
<tr>
<td>CO₂ [Tg]</td>
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<td>164.2</td>
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<td>-0.6%</td>
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<td>PFCs [Mg]</td>
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<td>353</td>
<td>354</td>
<td>304</td>
<td>307</td>
<td>273</td>
<td>269</td>
<td>295</td>
<td>312</td>
<td>246</td>
<td>203</td>
<td>214</td>
<td>205</td>
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<td>302</td>
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<td>270</td>
<td>265</td>
<td>292</td>
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<tr>
<td>HFCs [Mg]</td>
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<td>295</td>
<td>406</td>
<td>474</td>
<td>680</td>
<td>700</td>
<td>1113</td>
<td>1496</td>
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<td>NIR2004</td>
<td>379</td>
<td>295</td>
<td>406</td>
<td>474</td>
<td>680</td>
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<td>1113</td>
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<td>12</td>
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<td>NIR2004</td>
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<td>Total [Tg CO₂-eq.]</td>
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<td>219.6</td>
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<tr>
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<td>-1.7%</td>
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</tr>
<tr>
<td>Total [Tg CO₂-eq.]</td>
<td>NIR2003</td>
<td>208.6</td>
<td>216.3</td>
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<td>217.8</td>
<td>218.9</td>
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<td>NIR2004</td>
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<td>0.4%</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.6%</td>
<td>-1.1%</td>
<td>-0.6%</td>
<td>-1.8%</td>
<td>-1.6%</td>
<td>-1.6%</td>
</tr>
</tbody>
</table>

Note: base year values are indicated in bold.

For recalculation a distinction is made between:

- **Methodological changes**: new data based on revised or new estimation methods; improved emission factors are also included under methodological changes;
- **Allocation**: changes in allocation of emissions to the different sectors (only affect the totals per sector);
• **Error corrections:** repair of incorrect data transfer from the PER to the CRF.

This year methodological changes were made for the years 1990, 1995, 2000, 2001 and (new) 2002. This means that for 1991-1994 and 1996-1999 no recalculations were made, except in the cases explicitly mentioned below. The following methodological changes were made:

- Recalculation of the emissions from traffic and transport (all gases, all years) based on updated emission factors and recalculated gas oil data for other mobile sources (category 1A3);
- Revision of HFC emissions for the years 2000-2002 based on improved analysis of data (category 2);
- Revision of PFC and SF$_6$ emissions for the years 1990-2001 based on improved data from the industry (category 2);
- Recalculation of the CH$_4$ emissions from landfills based on improved calculation parameters, activity data and recovery rates (category 6A);
- CH$_4$, N$_2$O emissions from international bunkers (international transport) are now included in the inventory for the years 1990, 1995 to 2002 (category Memo Items).

In this submission the source allocation was improved in the following case:

- **Waste:** The emissions from combustion of biogas at wastewater treatment facilities were previously allocated in category 6D. Because this combustion is partly used for heat or power generation at the plant we now allocated the emissions under category 1A4.

The most obvious error corrections were:

- Recalculations of the natural gas use and thus emissions in chemical industry category 1A2c (1990, 1997-2001) based on in-depth analysis of fuel data of about 1 Tg CO$_2$ and identification of a double-counting error for 1997-2001 of about 2.5 Tg CO$_2$;
- Recalculations of the gas oil use and thus emissions in refinery category 1A1b (1995-2001), based on in-depth analysis of fuel data;
- Removal of part of the CO$_2$ emissions (in other waste, 6D) in the years 1998 to 2001 which could not be accounted for in the energy statistics;
- Error correction in calculation of CO$_2$ and N$_2$O emissions from the residential sector (fire places, using non fossil fuels e.g. wood and N$_2$O from aerosols) for the total period 1990-2002;
- Error correction of NO$_2$ emissions from agricultural soils (4D) for the years 1990 to 1995 based on revised data for manure applied to soil.

**Recalculation of base year**

The total CO$_2$-eq. emissions in the base year 1990 increased by 1.4 Tg CO$_2$-eq or 0.7% compared to last submission. This increase can be explained by the following changes (all in CO$_2$ equivalent):

- For CO$_2$: +0.7 Tg in the category Other sectors (1A4) due to recalculations of natural gas use based on new statistics; and +0.3 Tg in the category Manufacturing industry (1A2) due to error correction on the basis of detailed analysis of inventory data an energy statistics; and +0.3 Tg in Transport (3) due to recalculation (see Sections 3.2.2.4, 3.2.2.5 and 3.2.2.5 for more information);
- For the other gases the changes are very small; the largest: 0.01 Tg for CH$_4$ in Waste (6) due to recalculation of emissions from landfills.

The changes for F-gases in 1995 (the base year for the F-gas emissions) due to recalculations amount to +0.06 Tg CO$_2$-eq.: +0.02 Tg for PFCs and +0.03 Tg for SF$_6$ emissions.

**Recalculation of year 2001**

The data for 2001 are now based on the final 2001 energy and production statistics, which implicitly leads to changes in almost all emission data, related to these statistics. The decrease in the total CO$_2$-eq. emissions for 2001 was -3.5 Tg CO$_2$-eq or -1.6% compared to last submission. For the finalisation
of the 2001 figures a different method is used than the last year, when the emissions of 2001 had to be estimated partly by extrapolation of incomplete data, which obviously leads to changes in emission data. The main changes are (all in CO2 equivalent):

- For CO2: -3.7 Tg in Manufacturing industry (1A2) due to removal of double counting of the emissions from a major chemical plant. During detailed analysis of fuel data this major error was detected (see Section 3.2.2.4 for more information);
- For CO2: +1.3 Tg in the category Other sectors (1A4) due to recalculations of natural gas use based on new statistics (see Section 3.2.2.4 for more information);
- For CO2: In the sectors Energy (1A1) and Transport (1A3) and Waste (6D) the emissions decreased (-0.1, -0.1 and -0.4 Tg). In the industrial processes the emissions increased + 0.2 Tg. These changes were based on final statistical data. In the waste sector an error correction lead to a decrease of 0.4 Tg.
- For CH4: -0.5 Tg mainly due the final statistics for the emissions from Landfills (6A);
- For N2O: -0.001 Tg mainly due the an decrease in the energy sector and Agricultural soils (4D);
- For HFCs, PFCs and SF6: -0.07, +0.03 Tg and -0.06 Tg, respectively due to recalculations based on new data from the industry.

Implications for emission trends, including time-series consistency

The trend in emissions for the years 1990 to 2002 is shown in Table ES.5. From this table it can be concluded that due to recalculations the trend in the total national emissions decreased by 1.5% compared to the NIR 2003. The largest relative changes in emission trends are for CH4 and SF6.

Table ES.5 Differences between NIR 2003 and NIR 2004 for the emission trends 1990-2001

<table>
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<td>-6,705</td>
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<td>-718</td>
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<td>N2O</td>
<td>-729</td>
<td>-578</td>
<td>151</td>
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<td>HFCs</td>
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<td>PFCs</td>
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<tr>
<td>SF6</td>
<td>109</td>
<td>139</td>
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<td>63.9%</td>
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<td>Total 1)</td>
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<td>-1.5%</td>
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1) Excluding LUCF.

Emission trends for indirect greenhouse gases and SO2

Trends in total emissions of CO, NOx, NMVOC and SO2 are presented in Table ES.6. The CO and NMVOC emissions were reduced in 2002 by 40 and 50%, respectively, compared to 1990. For SO2 this is even 60%, and for NOx, the 2002 emissions are about 30% lower than the 1990 level. The uncertainty in the activity data is small compared to the accuracy of the emission factors. Therefore, the uncertainty in the overall total of sources included in the inventory is estimated to be in the order of 25% for CO, 15% for NOx, 5% for SO2, and about 25% for NMVOC.

Table ES.6 Trend in emissions of ozone and aerosol precursors 1990-2002 (in Gg)

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<tr>
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<td>104.8</td>
<td>90.8</td>
<td>90.1</td>
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Response to the issues raised in UNFCCC reviews

The Netherlands greenhouse gas inventories were subject to the following reviews by the UNFCCC Secretariat: a Desk Review of the NIR 2000 and Centralised Reviews of the NIR’s of 2001 to 2003 and country sections in the Synthesis & Assessment reports on the NIR’s of 2001 to 2003. In general the findings of the different UNFCCC reviews are well observed and described. The Netherlands response to the general remarks is as recorded below. The Netherlands responded and made improvements in this NIR on the following aspects: inconsistency in time series, missing notation keys, incompleteness of CRF, additional information on methodology and data sources in the NIR. Partly in response to the reviews and partly as a result of the national improvement programme changes were made in the CRF tables (see Section 10.4.6 for details):

- CRF tables were improved further by replacing 0 by notation keys NE, NA, NO, IE, C, where applicable;
- Correction of typing/unit errors as observed;
- In the 2003 submission the fuel split was made uniform for the years 1990, 1995 to 2002;
- A physical link between the CRF files and the tables of the NIR was established to make sure that the data in both are equal.

Planned improvements

The UNFCCC Guidelines for reporting the emissions and the Guidelines for National Systems for annual emission monitoring under the Kyoto Protocol have added additional requirements to the present Pollutant Emission Register (PER) of the Netherlands. In 2000 a programme was started to adapt the monitoring procedures of greenhouse gases in the Netherlands to meet these requirements. Similar requirements were imposed by the European Union, which is also a Party to the Convention and the Protocol, which require the EU Member States’ National Systems to be operational as early as possible and in any case by 31 December 2005 at the latest.

The national system improvement programme is being implemented under the responsibility of the Netherlands Ministry of Spatial Planning, Housing and the Environment (VROM), who delegated the practical co-ordination to Novem. To comply with the EU requirements, the intention for the Netherlands National System is to be operational by early 2005.

Ultimately, all improvements and arrangements will become an integral part of the larger system of annual emission monitoring (PER). In recent years a series of source-specific activities to improve the greenhouse gas inventory have been concluded. Some examples are a re-evaluation of CO₂ emission factors for fuels, a Tier 2-feedstock analysis, identification of non-CO₂ sources that are not yet included in the inventory, and a sinks assessment. Other more general activities aim at improving the national system, such as the development of protocols and process descriptions (methodologies, procedures, tasks and responsibilities, described in a transparent way), elaboration and implementation of a QA/QC system as part of the National System (through a three phased project by developing – or rather adapting – the QA/QC system for the Netherlands’ greenhouse gas monitoring (part of the PER) and the NIR/CRF compilation process).

To meet the early 2005 goals, final recalculations of the Netherlands’ greenhouse gas inventory are planned for the second half of 2004, which will include all remaining key issues identified by the Netherlands’ improvement programme and by the UNFCCC reviews carried out to date. These improvements of the quality (transparency, consistency over time, completeness and accuracy) of emissions will comprise most sectors and most gases, such as:

- CO₂ emissions from fuel combustion (1A) for stationary sources, if approved and agreed upon (based on the results of a feasibility study which is underway), based on the sectoral energy statistics for the period 1990-2003 instead of using reported emissions from individual industrial companies and including corrections of bunker and domestic transport statistics for shipping and aviation and, if approved, newly established country-specific emission factors for road transport;
- CO₂ emissions from non-energy use of fuels distinguishing direct (prompt) process emissions during manufacture of products and emissions from the domestic use of non-energy-use products,
the latter based on statistics of the usage of the products, and allocated to IPCC sectors 2 and 3, respectively, instead of including these in fossil fuel combustion (sector 1A);

- Fossil-fuel related CO₂ emissions from waste incineration (6C/1A) (improved split into organic and non-organic carbon);
- CH₄ emissions from natural gas distribution (1B), based on data on the length of the natural gas network and the leak rate per type of material, and from venting of associated gas (1B);
- CH₄ emissions from enteric fermentation by cattle (4A), based on updated country-specific emission factors, if available;
- N₂O emissions (indirect) from soils (4D) due to atmospheric deposition will be added (not yet included), based on specific Netherlands activity data in conformity with the recommended IPCC Good Practice method;
- CH₄ emissions from landfills (6A) and (non-industrial) wastewater treatment plants (6B), using e.g. updated information on methane venting/recovery;
- CH₄ and N₂O emissions CH₄ and N₂O emissions from industrial wastewater treatment (6B) and from large-scale compost production from organic waste (6D) will be added if possible (not yet included).