

# **Denmark's Report on Assigned Amount**

- to the European Commission

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# FOREWORD

On behalf of Denmark I present this report with information for the final establishment of Denmark's base year and assigned amount for burden sharing of the EU target for reductions in emissions of greenhouse gases 2008-2012 in accordance with the Kyoto Protocol. The report has been prepared with a view to submission to the European Commission.

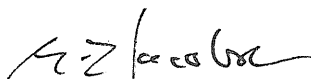
The report includes information on Danish choices regarding the base year for the industrial gases and choices regarding the question of including the emissions and removals from a number of specific agricultural and forestry activities.

In connection with ratification by the EU of the Kyoto Protocol in 2002, under the EU burden sharing agreement Denmark has accepted a legal commitment to reduce emissions of greenhouse gases by 21 per cent in 2008-12 compared with the base year.

The basis for Denmark accepting this legal commitment was that the Council and the Commission simultaneously adopted a joint declaration that, when establishing the assigned amounts in 2006, account would be taken of the assumptions regarding the base year which the Member States made in connection with the burden sharing agreement of June 1998. As stated in Denmark's declaration on the burden sharing agreement of June 1998, Denmark's assumptions included that the 21 per cent should be regarded in relation to an adjusted base year as the figures for emissions of CO<sub>2</sub> in 1990, which Denmark used as a basis, had been adjusted for the extraordinarily large imports of electricity in the base year 1990.

The Danish government assumes that this assumption is taken into account.

Copenhagen, March 2006



Erik Jacobsen  
Permanent Secretary

# Summary

This report is the Danish report to the European Commission with information to establish the assigned amount for emissions of greenhouse gases in the period 2008-2012 which Denmark is committed to comply with under the agreement between 15 EU countries on joint fulfilment of reduction targets under the Kyoto Protocol, – also known as the Assigned Amounts Report<sup>1</sup>.

On the basis of the following information:

- Denmark's latest inventory of emissions of the greenhouse gases listed in annex A of the Kyoto Protocol in the period 1990-2004,
- Denmark's choice of 1995 as the base year for industrial greenhouse gases (HFCs, PFCs and SF<sub>6</sub>) cf. Article 3(8) of the Kyoto Protocol, and
- that there was no deforestation in Denmark in 1990 and therefore no supplement, cf. Article 3(7) of the Kyoto Protocol,

the total emissions in the base year for Denmark under the Kyoto Protocol amount to 69.3 mill. tonnes CO<sub>2</sub> equivalents cf. the table below. As also shown in the table below, the total emissions in the base year with CO<sub>2</sub> emissions in 1990 corrected for electricity import amounts to 75.6 mill. tonnes CO<sub>2</sub>-equivalents.

Greenhouse gas	Base Year	Emissions	Units (Gg=1000 t.)
Carbon dioxide (CO <sub>2</sub> )	1990	52,710	Gg CO <sub>2</sub> eq.
Methane (CH <sub>4</sub> )	1990	5,683	Gg CO <sub>2</sub> eq.
Nitrous oxide (N <sub>2</sub> O)	1990	10,593	Gg CO <sub>2</sub> eq.
Hydrofluorocarbons (HFCs)	1995	218	Gg CO <sub>2</sub> eq.
Perfluorocarbons (PFCs)	1995	1	Gg CO <sub>2</sub> eq.
Sulphur hexafluoride (SF <sub>6</sub> ):	1995	107	Gg CO <sub>2</sub> eq.
Total		69,311	Gg CO <sub>2</sub> eq.
Total		69.3	Million tonnes CO <sub>2</sub> eq.
Correction of CO <sub>2</sub> emissions in 1990 for electricity import		6.3	Million tonnes CO <sub>2</sub> eq.
Total with CO <sub>2</sub> emissions in 1990 corrected for electricity import		75.6	Million tonnes CO <sub>2</sub> eq.

Denmark's reduction commitment under the Kyoto Protocol is related to the EU's total reduction commitment through the Burden Sharing Agreement.

In this connection, Denmark has undertaken a legal commitment to reduce total emissions of greenhouse gases by 21 per cent in the years 2008 to 2012, compared to the base year.

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<sup>1</sup> This Assigned Amounts Report to the European Commission only contains information for Denmark. A similar Assigned Amounts Report, which according to the Kyoto Protocol must be submitted to the Climate Convention secretariat no later than 31 December 2006, must contain information about both Denmark and Greenland. Following a request from the Faeroese Parliament, in connection with ratification of the Kyoto Protocol, a territorial reservation was made for the Faeroe Islands.

Taking into account the extraordinarily large electricity import in 1990, Denmark's assigned amount under the Burden Sharing Agreement amounts to 299 mill. tonnes CO<sub>2</sub> equivalents (corresponding to 59,733 mill. tonnes CO<sub>2</sub> equivalents per year in 2008-2012).

On the basis of the legal commitment, the commitment period reserve for 2008-2012 of 90 per cent of the assigned amount is almost 246.4 mill. CO<sub>2</sub> equivalents (246,401.2 Gg).

For inventories of emissions and removals associated with afforestation, reforestation and deforestation since 1990 under Article 3(3) and forest management under Article 3(4) of the Protocol the following forest definition will be applied:

- Minimum values for tree crown cover: 10 per cent crown cover for forest, 5-10 per cent crown cover for other areas with forest vegetation.
- Minimum values for land area: 0.5 ha and with a minimum width of 20 m.
- Minimum value for tree height: Trees must be able to reach a minimum height of 5 m on the site.

Denmark will prepare inventories of emissions and removals under Article 3(3) and Article 3(4) for each year in the period 2008-2012 and report these annually in 2010-2014 together with the other greenhouse gas inventory information.

For the first commitment period, it is possible to include emissions and removals from agricultural and forestry activities under Article 3(4) of the Kyoto Protocol. In this regard it has been decided to include emissions and removals from forest management, cropland management and grazing land management.

The Danish national system of emissions inventories has been built up so that since 31 December 2005 it has met the requirements under the Kyoto Protocol and the Council Decision for a monitoring mechanism.

The national system will identify land areas associated with the activities under Article 3(4) of the Kyoto Protocol in accordance with definitions, modalities, rules and guidelines relating to land use, land-use change and forestry activities under the protocol by satellite monitoring, use of EU Land Parcel Information System (LPIS), detailed crop information data on field level, soil mapping and sample plots from the national forest inventory (NFI).

Denmark's national allowances register was opened on 1 January 2005. The register has been designed to manage holdings and transactions in emissions allowances allocated to enterprises covered by the European Union greenhouse gas emission trading scheme (EU ETS). It will also be possible to use the register to manage holdings and transactions in EU allowances and Kyoto units during the Kyoto Protocol's first commitment period.

# 1 Introduction

This report is the Danish report to the European Commission with information to establish the assigned amount of greenhouse gases in the period 2008-2012, which Denmark is committed to comply with under the agreement between 15 EU countries to fulfil the reduction targets under the Kyoto Protocol jointly – also known as the Assigned Amounts Report<sup>1</sup>.

In accordance with Article 7(1) and Article 8(1)e of DECISION No 280/2004/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol, and in accordance with Article 23 of the provisions adopted pursuant to Article 3(3) of the decision (COMMISSION DECISION No 2005/166/EC of 10 February 2005 laying down rules implementing Decision No 280/2004/EC of the European Parliament and of the Council concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol), EU Member States must send the Commission certain information no later than 15 January 2006 to be used in setting Assigned Amounts for emissions of greenhouse gases in the period 2008-2012, and this must be done in accordance with the Commission Decision on joint fulfilment of the reduction target under the Kyoto Protocol (COUNCIL DECISION 2002/358/EC of 25 April 2002 concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfilment of commitments thereunder).

This report collates the required information. However, the report only relates the overall results for the information on the most recent emissions inventory for the period 1990-2004. For more detailed information on the emissions inventory for 1990-2004, including information on methods and emissions factors, please see the separate emissions report which is to be submitted to the Commission at the same time as this report.

## 2 Danish emissions and removals of greenhouse gases 1990-2004

Denmark's greenhouse gas inventories are prepared in accordance with the guidelines from the Intergovernmental Panel on Climate Change (IPCC) and are based on the methods developed under the European CORINAIR programme.

Denmark's total emissions for the period 1990 to 2004 of the greenhouse gases CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O and the industrial gases HFCs, PFCs and SF<sub>6</sub> from 1990 to 2001, calculated in CO<sub>2</sub> equivalents in accordance with the general rules for inventories under the Climate Convention are shown in table 2.1. Inventory based on the rules under the Kyoto Protocol will involve some changes with respect to base year and removals in connection with land use change and forestry (LUCF).

For further information please see the January 2006 Inventory Report<sup>2</sup> from the National Environment Research Institute to the European Commission, which includes emissions data in the Common Reporting Format (CRF) and the required information on the methods etc.

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<sup>2</sup> [http://cdr.eionet.eu.int/dk/Air\\_Emission\\_Inventories/Submission\\_EU/envq8jhcq](http://cdr.eionet.eu.int/dk/Air_Emission_Inventories/Submission_EU/envq8jhcq)

TABLE 2.1 DENMARK'S TOTAL EMISSIONS AND REMOVALS OF GREENHOUSE GASES 1990-2004<sup>3</sup>

Source: National Environmental Research Institute (NERI)

	CO <sub>2</sub> equivalents (Gg)															
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	
Net CO <sub>2</sub> emissions/removals	53260	61700	56052	58591	61626	58779	72752	63291	58453	56304	54710	53910	52295	57511	51659	
CO <sub>2</sub> emissions (without LUCF)	52710	63392	57599	59750	63240	60447	73964	64461	60400	57530	53068	54667	54260	59452	53938	
CH <sub>4</sub>	5683	5747	5749	5888	5885	6016	6098	5979	6002	5881	5864	6007	5962	5943	5739	
N <sub>2</sub> O	10593	10403	9980	9766	9600	9514	9171	9102	9039	8752	8545	8297	7946	7898	7587	
HFCs	0	0	3	94	135	218	329	324	411	503	605	647	672	695	749	
PFCs	0	0	0	0	0	1	2	4	9	12	18	22	22	19	16	
SF <sub>6</sub>	44	64	89	101	122	107	61	73	59	65	59	30	25	31	33	
Total (with net CO <sub>2</sub> emissions/removals)	69580	77913	71874	74440	77368	74634	88413	78773	73974	71517	69800	68913	66923	72098	65783	
Total (without CO <sub>2</sub> from LUCF)	69030	79605	73421	75599	78982	76303	89625	79943	75921	72743	68158	69670	68888	74039	68062	
<b>GREENHOUSE GASES SOURCE AND REMOVALS CATEGORIES</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	
<b>CO<sub>2</sub> equivalents (Gg)</b>																
1. Energy	52121	62722	56824	59032	62608	59984	73574	63907	59884	57109	52601	54231	53853	59197	53525	
2. Industrial processes	2189	2294	2331	2405	2504	2676	2780	2970	3011	3185	3367	3293	3190	3213	3060	
3. Use of organic solvents and other products	134	132	130	128	126	121	125	125	117	113	117	110	104	105	111	
4. Agriculture	13038	12893	12576	12436	12164	11974	11600	11420	11425	10843	10595	10557	10238	10008	9973	
5. Land-use change and forestry (LUCF)	550	-1692	-1548	-1159	-1614	-1669	-1212	-1170	-1947	-1226	1642	-757	-1965	-1941	-2280	
6. Waste	1547	1564	1561	1598	1580	1548	1546	1521	1483	1493	1478	1479	1502	1515	1394	
7. Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

<sup>3</sup> In accordance with COMMISSION DECISION No 2005/166/EC these inventories may be updated until 15 March 2006.



### 3 Base Year – including for the industrial gases HFCs, PFCs and SF<sub>6</sub>

According to Article 3(7) of the Kyoto Protocol, Denmark's base year must be calculated on the basis of emissions in 1990 of the greenhouse gases (carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>)) and sources (energy, industry, agriculture, waste) listed in Annex A of the Protocol, although for HFCs, PFCs and SF<sub>6</sub> 1995 can be chosen as the base year, cf. Article 3(8) of the Protocol.

In accordance herewith, Denmark has chosen 1995 as the base year for the industrial greenhouse gases (HFCs, PFCs and SF<sub>6</sub>). In this connection it should be noted that the collection of data for the inventory of emissions of these greenhouse gases started around the date of entry into force of the Climate Convention in 1994. Therefore the emissions inventory for 1995 should be regarded as more certain than the inventory for 1990.

According to the regulations covering implementation of the Protocol, the supplement to the base year mentioned in Article 3(7) of the Kyoto Protocol only cover net emissions from deforestation in 1990, and these may only be added if there were net emissions from the category "land-use change and forestry" (LUCF).

As there was no deforestation in Denmark in 1990, the supplement is not relevant for Denmark. A calculation shows that deforestation of 3,500 ha forest would correspond to emissions of CO<sub>2</sub> corresponding to 1 per cent of the total net emissions of CO<sub>2</sub> in 1990. Maximum deforestation in 1990 was no more than 50 ha, and this figure is negligible in this context. Therefore the supplement is not relevant.

On the basis of the following information:

- Denmark's latest inventory of emissions of the greenhouse gases listed in annex A of the Kyoto Protocol in the period 1990-2004,
- Denmark's choice of 1995 as the base year for industrial greenhouse gases (HFCs, PFCs and SF<sub>6</sub>) cf. Article 3(8) of the Kyoto Protocol, and
- that there was no deforestation in Denmark in 1990 and therefore no supplement, cf. Article 3(7) of the Kyoto Protocol,

the total emissions in the base year for Denmark under the Kyoto Protocol amount to 69.3 mill. tonnes CO<sub>2</sub>-equivalents cf. the table below. As also shown in the table below, the total emissions in the base year with CO<sub>2</sub> emissions in 1990 corrected for electricity import amounts to 75.6 mill. tonnes CO<sub>2</sub>-equivalents.

<b>Greenhouse gas</b>	<b>Base Year</b>	<b>Emissions</b>	<b>Units (Gg=1000 t.)</b>
Carbon dioxide (CO <sub>2</sub> )	1990	52,710	Gg CO <sub>2</sub> eq.
Methane (CH <sub>4</sub> )	1990	5,683	Gg CO <sub>2</sub> eq.
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Perfluorocarbons (PFCs)	1995	1	Gg CO <sub>2</sub> eq.
Sulphur hexafluoride (SF <sub>6</sub> ):	1995	107	Gg CO <sub>2</sub> eq.
Total		69,311	Gg CO <sub>2</sub> eq.
Total		69.3	Million tonnes CO <sub>2</sub> eq.
Correction of CO <sub>2</sub> emissions in 1990 for electricity import		6.3	Million tonnes CO <sub>2</sub> eq.
Total with CO <sub>2</sub> emissions in 1990 corrected for electricity import		75.6	Million tonnes CO <sub>2</sub> eq.

## 4 Denmark's proposal for Assigned Amounts 2008-2012

Denmark's reduction commitment under the Kyoto Protocol is related to the EU's total reduction commitment through the Burden Sharing Agreement.

In this connection, Denmark has undertaken a legal commitment to reduce total emissions of greenhouse gases by 21 per cent in the years 2008 to 2012, compared to the base year 1990.

Taking into account the extraordinarily large electricity import in 1990, Denmark's assigned amount under the Burden Sharing Agreement amounts to **299 mill. tonnes CO<sub>2</sub> equivalents** (corresponding to 59,733 mill. tonnes CO<sub>2</sub> equivalents per year in 2008-2012).

The basis for this assigned amount is that a condition of agreement by Denmark to a reduction contribution of 21 per cent to the EU's total reduction commitment of 8 per cent from 1990 to 2008- 2012 was that account would be taken of Denmark's extraordinarily large electricity import in 1990, corresponding to adjusting CO<sub>2</sub> emissions in 1990 to a situation where Danish electricity production corresponded to the national energy consumption. It can thus be seen from Denmark's declaration, given in connection with adoption of the Burden Sharing Agreement in June 1998, that the basis for the 21 per cent reduction contribution has been corrected.

In connection with EU ratification of the Kyoto Protocol, Denmark gave a legal commitment to contribute a 21 per cent reduction on the basis of the actual emissions level in 1990. The Council decision on the EU's ratification of the Protocol also refers to the fact that, in connection with the signing of the EU's agreement on burden sharing in June 1998, certain Member States presented assumptions concerning corrected emissions in the base year and common and coordinated policies and measures. In June 1998, Denmark was the only country to present a declaration with written assumptions concerning the base year. In connection with the decision on ratification by the EU, the Council and the Commission agreed on a joint declaration. This stated, inter alia, that the permitted emission levels (measured in tonnes CO<sub>2</sub> equivalents) for the period 2008-2012 should be set taking account of the assumptions concerning emissions in the base year that also appear in the relevant declarations made in connection with the signing of the agreement on burden sharing in June 1998.

By chance, precipitation in Norway and Sweden was significantly above normal in 1990. Due to the co-operation on the Nordic electricity market, Denmark increased the import of electricity from the surplus produced by hydro power plants and lowered its own production of electricity. The extraordinarily large import of electricity in 1990, corresponding to emissions having been reduced extraordinarily by 6.3 mill. tonnes CO<sub>2</sub>, means that Denmark's reduction burden is increased by 5 mill. tonnes CO<sub>2</sub> per year in the period 2008-2012. If account is not taken of Denmark's base year problem complex, Denmark will have to undertake a reduction burden corresponding to reduction of 27.6 per cent from the base year to 2008-2012.

Therefore, it is of vital importance that the considerations declared previously are implemented in connection with determining Denmark's assigned amounts in 2006.

## 5 Commitment Period Reserve

Based on the legal reduction commitment, the commitment period reserve for the commitment period 2008-2012 of 90 per cent of assigned amounts can be calculated at about 246.4 mill. tonnes CO<sub>2</sub> equivalents (246,401.2 Gg).

## 6 LULUCF

For the estimation of anthropogenic emissions by sources and removals by sinks associated with afforestation, reforestation and deforestation since 1990 under Article 3(3) and forest management under Article 3(4) of the Kyoto Protocol, the following forest definition will be applied:

- Minimum values for tree crown cover: 10 per cent tree crown cover for forests, 5-10 per cent tree crown cover for other areas with forest vegetation.
- Minimum values for land area: 0.5 ha and a minimum width of 20 m.
- Minimum value for tree height: trees must be able to reach a minimum height of 5 m in the site.

In addition, the forest area includes temporarily unstocked areas, smaller open areas in the forest needed for management purposes and fire breaks. Forests in national parks, reserves, or areas under special protection are included. Windbreaks and groves covering more than 0.5 ha and with a minimum width of 20 m are also considered as forests. Farmland, orchards, gardens (houses and summer houses) are NOT included in the forest area.

Afforestation covers new forests established since 1990. Sources of information on afforestation are:

- A forest map for the year 1990, based on NFI<sup>4</sup> monitoring combined with satellite pictures.
- NFI monitoring, with combined evaluations of the age and origin of individual sample spots. For vegetation below 1.3 m, previous use is also indicated. For vegetation above 1.3 m established after 1990, information is recorded about the previous use of the spot.

The Kyoto Protocol assumes human-induced afforestation. For Denmark it is expected that all afforestation is human-induced – either by direct afforestation (with or without subsidies), or by actively choosing not to use the land for purposes preventing forest growth.

As regards the possibility of including in the first commitment period emissions and removals associated with land use, land-use change and forestry activities under Article 3(4) of the Kyoto Protocol, it has been decided to include emissions and removals from forest management, cropland management and grazing land management.

The Danish national system of emissions inventories will identify land areas associated with the activities under Article 3(4) of the Kyoto Protocol in accordance with definitions, modalities, rules and guidelines relating to land use, land-use change and forestry activities under the protocol by satellite monitoring, use of EU Land Parcel Information System (LPIS), detailed crop information data

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<sup>4</sup> National Forest Inventory

on field level, soil mapping and sample plots from the national forest inventory (NFI).

Denmark will draw up inventories of emissions and removals under Article 3(3) and Article 3(4) for each of the years 2008-2012, and report such data annually in the years 2010-2014 together with the other annual reporting of greenhouse gas emissions.

# 7 Description of the national system for emissions inventories

Denmark's national emissions inventory system has been developed so that from 31 December 2005 it meets the requirements set out in the Kyoto Protocol and the Council Decision for a monitoring mechanism. A detailed description of the national emissions inventory system is given below.

## 7.1 OBJECTIVES

In pursuance of Article 5(1) of the Kyoto Protocol, the Parties to the Protocol must establish national systems for the calculation of greenhouse gas emissions. The objective of establishing the national systems is to ensure good quality inventories. This is achieved by following the IPCC Guidelines for planning, implementation and execution of the activities connected with the work on the greenhouse gas inventories. The national system must also ensure that the inventories are transparent, consistent, comparable, complete and accurate.

## 7.2 ORGANISATION OF WORK ETC.

The Danish National Environmental Research Institute (NERI) is responsible for producing the Danish greenhouse gas emission inventories and the annual reporting to the UNFCCC. NERI is therefore the contact point for Denmark's national system for greenhouse gas inventories under the Kyoto Protocol:

National Environmental Research Institute (NERI)  
Frederiksborgvej 399  
POB 358  
DK-4000 Roskilde  
Phone : +45 46 30 12 00  
Fax: +45 46 30 11 14  
Email: [dmu@dmu.dk](mailto:dmu@dmu.dk) / [jbi@dmu.dk](mailto:jbi@dmu.dk)

Furthermore, NERI participates in work under the auspices of the UNFCCC, where guidelines for reporting are discussed and decided upon, as well as participating in the EU monitoring mechanism for inventories of greenhouse gases, where guidelines for reporting to the EU are regulated.

The work on the annual inventories is carried out in cooperation with other Danish ministries, research institutes, organisations and private enterprises. The most important partners for this work are:

The Danish Energy Authority, the Danish Ministry of Transport and Energy:  
Annual energy statistics that are compatible with the format used for emission inventories and fuel consumption data for large incineration plants.

The Danish Environmental Protection Agency, the Danish Ministry of the Environment:  
Database on waste volumes and emissions for potent greenhouse gases (F gases).



Statistics Denmark, the Danish Ministry of Economic and Business Affairs:  
Statistical yearbook, sales statistics for industry, and agricultural statistics.

The Danish Institute of Agricultural Sciences, the Danish Ministry of Food, Agriculture and Fisheries:

Data on use of fertilizer, fodder consumption, and nitrogen emissions from livestock.

The Danish Road Directorate, the Danish Ministry of Transport and Energy:

Number of vehicles grouped by categories corresponding to the EU classifications, kilometres travelled and speeds shown by town, main roads and motorways.

Forest and Landscape Denmark, the Royal Veterinary and Agriculture University (KVL), the Ministry of Science, Technology, and Innovation:

Background data for forests and removals of CO<sub>2</sub> by forests.

The Civil Aviation Administration, the Danish Ministry of Transport and Energy:

Aircraft data (aircraft types and flight routes) for all flight departures and arrivals in Danish airports.

DSB, the Danish Ministry of Transport and Energy:

Fuel related emission factors for diesel locomotives.:

Danish enterprises:

Environmental accounts and other information.

These partners provide a range of data that are needed to produce the inventory. NERI is therefore in the process of drawing up formal agreements that will ensure that NERI receives the necessary data on time.

### 7.3 CALCULATION METHODS

The Danish emissions inventory is based on the IPCC guidelines for calculation of greenhouse gas emissions (the Revised 1996 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories (Houghton et al., 1997) and the Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (Penman et al., 2000)) and the European CORINAIR (COoRdination of INformation on AIR emissions) program for calculation of national emissions. Generally, emissions are calculated by multiplying the activity data (e.g. fuel consumption, number of animals or vehicles) by an emission factor (e.g. the mass of material emitted per unit of energy, per animal or per vehicle). Activity data are mainly based on official statistics. The emission factors are either national values or values recommended in the IPCC guidelines.

### 7.4 IMPORTANT SOURCES

Choice of calculation method for the individual sources depends among other things on how significant the source is. The sources that together accounted for 95 per cent of greenhouse gas emissions in 2003 or accounted for 95 per cent of the change in emission levels from 1990 to the most recently calculated year (2003) are defined as significant sources according to the IPCC guidelines. An analysis of the Danish sources shows that 21 sources account for 95 per cent of total

greenhouse gas emissions and that the three largest sources - that together account for 62 per cent - are CO<sub>2</sub> from the combustion of coal at stationary incineration plants, CO<sub>2</sub> from road transport and CO<sub>2</sub> from combustion of natural gas at stationary incineration plants.

#### 7.5 PROCEDURE FOR RECALCULATION

At the same time as the annual calculation of emissions for a new year takes place, any necessary recalculations of emissions inventories from previous years are also carried out. Recalculations are made if errors or oversights are found or if better knowledge becomes available. If better knowledge becomes available, statistical data, improvements of method, activity data or emission factors are updated according to new knowledge and research. In order to ensure consistent emission inventories, recalculations will be carried out on the whole time series, as much as circumstances permit.

#### 7.6 UNCERTAINTY

Uncertainty in the greenhouse gas inventories is calculated as recommended in the IPCC guidelines and covers 93 per cent of total Danish greenhouse gas (GHG) emissions. The result of the calculations shows that total GHG emissions were calculated to have an uncertainty of 46 per cent, and the increase in GHG emissions since 1990 was calculated to be 4.8 per cent  $\pm$  19 per cent. Uncertainty is greatest for N<sub>2</sub>O emissions from agricultural land, whilst the uncertainty for CO<sub>2</sub> emissions from stationary incineration plants is only 8 per cent, and the uncertainty for the development is 1.8 per cent.

For CO<sub>2</sub> removal in forests, uncertainties are currently only based on estimates. The overall uncertainty for binding of carbon resulting from afforestation, is calculated at 91 per cent for reports based on the Inventory of Forests 2000 (Skovtælling 2000). The main contributors to the high overall uncertainty for afforestation are expansion factors for calculation of the total biomass and calculation of area. Similarly, the uncertainty for forests from before 1990 is calculated at 44 per cent based on the Inventory of Forests 2000.

With the new National Forest Inventory (NFI), contributing with data from 2007, uncertainty is expected to drop considerably. The uncertainty for binding of carbon is expected to be reduced by 27 per cent, and uncertainty for forests from before 1990 is expected to be reduced to 15 per cent. In addition to improved area and wood mass estimates, reduced uncertainty is also due to the fact that it is expected that certain biomass expansion functions are applicable under Danish conditions.

#### 7.7 QUALITY ASSURANCE AND CONTROL

As part of the national system, NERI is drawing up a manual to use in quality assurance and quality control of the emissions inventories. The manual contains precise and detailed guidelines on how to assure and control quality of the inventories. The quality plan described in the manual is based on the IPCC guidelines and ISO 9000, 9001, 9004 and 10005 standards. The objective of the quality planning is to ensure the quality of the inventories in a manner that optimises resources. The quality control includes routine checks of data correctness and completeness as well as ensuring that any possible errors and deficiencies are

identified and corrected. All calculation methods are documented and all material concerning data, methods and recalculations is filed.

Reports are written for all sources of emissions that describe in detail and document the data and calculation methods used. These reports are evaluated by persons external to NERI who are experts in the area in question, but not directly involved in the inventory work.

In addition, a project has been started in which the Danish calculation methods, emission factors and uncertainties are compared with those of other countries, in order to further verify the correctness of the inventories.

#### 7.8 ANNUAL REPORTING

NERI produces an annual report (National Inventory Report) for the Climate Convention in which the results of the calculations are presented and the background data, calculation methods, plan for quality assurance and control, uncertainty and recalculations are described and documented. At the request of the Climate Convention, the report is evaluated each year by international experts. During the last few years, improvements have been made in the inventories' quality and documentation, as a result of the quality assurance and control procedures and the evaluations of national and international experts.

# 8 Description of the National Emissions Trading Registry

Denmark's National Emissions Trading Registry was opened on 1 January 2005. The registry is designed to manage holdings and transactions in emissions quotas allocated to enterprises covered by the EU Emissions Trading Directive. The Registry can also be used to manage holdings and transactions in EU allowances and Kyoto units under the first commitment period of the Kyoto Protocol. In the following, the National Emissions Trading Registry is described in more detail.

## 8.1 INFORMATION ON THE REGISTRY ADMINISTRATOR

Danish Environmental Protection Agency  
Strandgade 29  
DK-1401 Copenhagen K  
Phone : +45 32 66 01 60  
Fax: +45 32 66 02 01  
Email: [mst@mst.dk](mailto:mst@mst.dk)

## 8.2 COOPERATION WITH OTHER COUNTRIES CONCERNING OPERATION OF THE REGISTRY

Denmark does not cooperate with other countries concerning the administration or operation of the Danish CO<sub>2</sub> emissions trading registry.

## 8.3 DATABASE STRUCTURE

The database structure of the Danish Registry system is described in Annex 1.

## 8.4 STANDARDS FOR DATA EXCHANGE

The Danish registry system follows the UN Data Exchange Standards 7.

## 8.5 PROCEDURES FOR ADMINISTRATION AND OPERATION OF THE EMISSIONS TRADING REGISTRY

The procedures are described in the Commission regulation (EC) no. 2216/2004 on a standardised and secure system of registries adopted pursuant to the Parliament and Council directive 2003/87/EC and the Parliament and Council decision 280/2004/EC.

Denmark is in compliance with the procedures stated in the regulation

## 8.6 SAFETY STANDARDS

The registry is safeguarded with a FireWall based on 2 Cisco FireWall Software Modules (FWSM) in a Catalyst 6507.

There is dual access from all servers to the Internet, ensuring that a single error will not cause disconnections.

The RILO ports on the servers are connected to the internal networks, making it possible to have remote control of the machines via a secure net. Software is updated as required.

The entire system is monitored regularly and all security violations are recorded and corrected as soon as possible.

As regards the network, administrative access to the machines from the Ministry's internal network is secure.

The Registry can only be accessed via the programme through WEB-Services. These WEB-Services can be accessed either through an open part (the initial communication) or a secure part (the register software application itself). The secure part of the system is based on SSL. Similarly the system is designed so as to make it impossible to use the same password more than once in the system.

The Registry's production system consists of 2 servers, a WEB server and a database server. The servers are configured so that a single disc error will not stop the system. Furthermore as regards the disc, the DB server is set up so that the transaction log and the database are physically located on separate discs.

Everyone who registers as users of the registry receives their own username and password and is instructed to ensure that these remain confidential. If a user discovers that an unauthorized person has gained access to his/her password, the password must be changed in the registry immediately and the registry administration must be notified.

The registry automatically disconnects when access has been inactive for some time. You must log on again using your username and password.

## 8.7 INFORMATION AVAILABLE TO THE PUBLIC

Only the information stated in Article 9 and the corresponding appendices in the Commission regulation (EC) no. 2216/2004 on a standardised and secure system of registries adopted pursuant to the Parliament and Council directive 2003/87/EC and the Parliament and Council decision 280/2004/EC is available to the public.

## 8.8 INTERNET ADDRESS FOR THE REGISTRY

<http://dketreu.mst.dk/>

## 8.9 PROTECTION, MAINTENANCE AND RECREATION OF DATA

A total back-up is carried out on a nightly basis. The system is configured with a high error tolerance level. Furthermore the configuration of the system makes it possible to re-install it at a different physical location.

The registry is covered by the general emergency plan for the Danish Ministry of the Environment.

Only persons authorised by the ministry will be granted access to the production environment.

Only representatives appointed by the administrator of the registry and a small number of employees in the host organisation have access to all data in the registry system. All of these persons are covered by a duty of non-disclosure. Any physical or technical access to the system from the system administrator (the host organisation) will be logged.

The registry administrators change their passwords every three months and when needed.

Emergency plan for the Danish CO2 Emissions Trading Registry:  
The description below includes a check list to be used in the event of an emergency situation affecting the Danish Emissions Trading Registry.  
The check list is to be used if the telephone company's (TDC) service centre is out of order, or if the equipment the system uses is damaged. The check list refers to the general system documentation for the Danish Emissions Trading Registry, which includes a detailed description of procedures. The starting point for reinstallation is to give priority to actions so as to ensure that an operative system is established as soon as possible, and that users, including CITL/ITL, experience as little down time as possible.

Check list:

1. Contact the hardware group of the Centre for Corporate Management to get a server/PC.
2. Place the server/PC in the hub at the Centre for Corporate Management, IT Services, Rentemestervej 8, building A, first floor.
3. Install Microsoft Windows 2003 on the server.
4. Install Microsoft SQL2000 on the server.
5. Install Microsoft Internet Information Server on the server.
6. Install Backup client on the server.
7. Install the ETR system and adapt it to Danish conditions (menu bar, the EPA logo, EPA fonts and colours, conditions etc.).
8. Set up user on the SQL server.
9. Re-establish the certificate for a secure connection between CITL and the Danish ETR.
10. Read in a backup of the Danish ETR database.
11. Start Register services on the server.

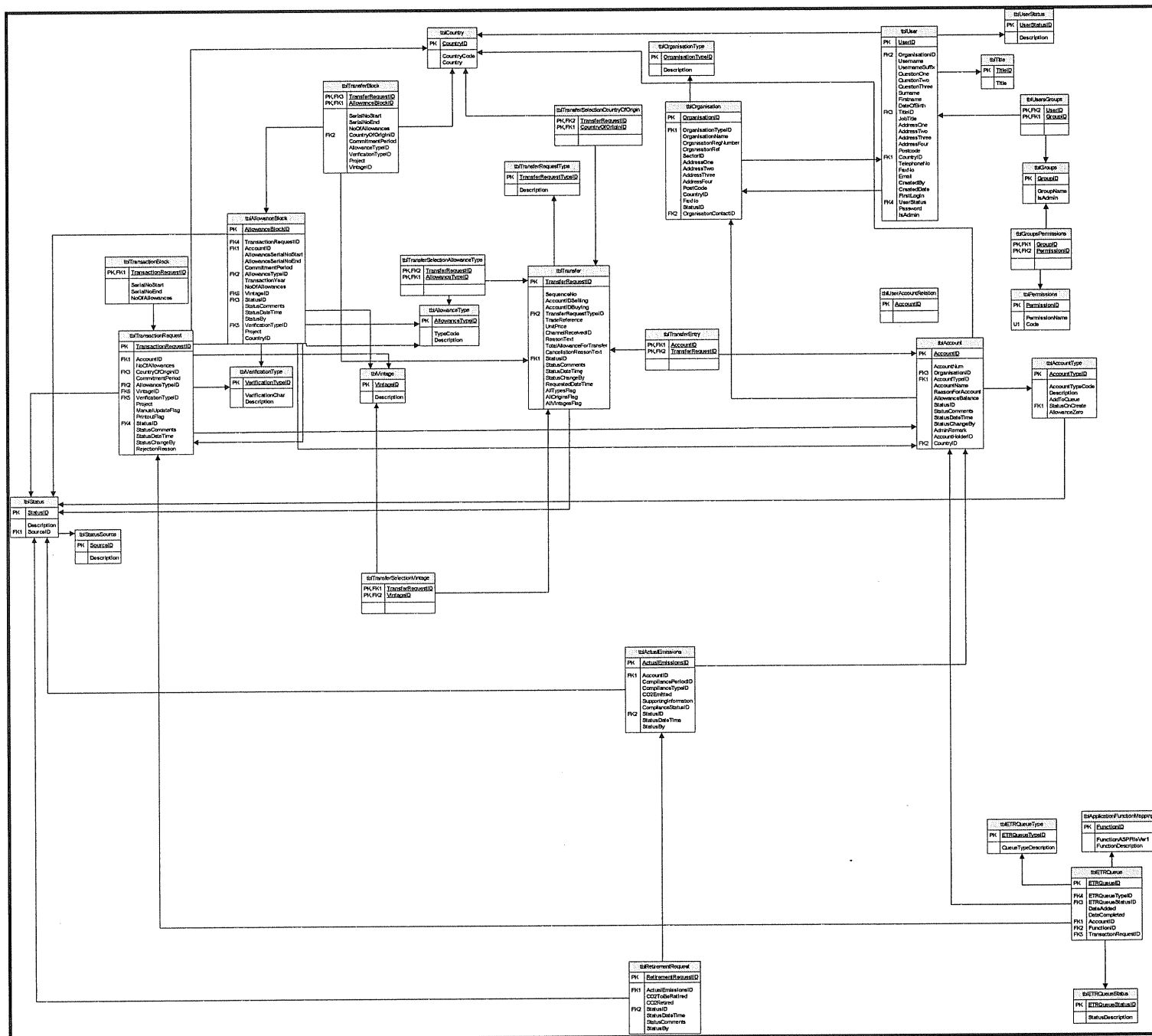
The Danish ETR will now run on a temporary installation, and work to re-establish a new permanent production system will be continued.

#### 8.10 TEST RESULTS

The most recent test results available, obtained in the European Commission's test of the Danish registry system, are reproduced in Annex 2.

# Annex 1: Database structure

Database structure of the Danish registry system<sup>5</sup>:



<sup>5</sup> A more legible version of the chart is available within the European Commission. An electronic version can be obtained from the Danish EPA.

## Annex 2: Test results

The following test results have been obtained:

### PHASE 7 TEST RESULTS FOR DENMARK

<b>Step</b>	<b>Transaction</b>	<b>Result</b>	<b>Remarks</b>
1	Napload – period 0	Not applicable	CITL action
2	Napload – period 1	Not applicable	Not supported by Danish registry
3	Napload – correction period 0	Not applicable	CITL action
4	Napload – correction period 1	Not applicable	Not supported by Danish registry
5	CreateAccount – PyHA, CA and RA (Party accounts)	Successful	
6	CreateAccount – PnHA, OHA	Successful	
7	01-51 Allowance issue (2005-2007)	Successful	
8	10-53 Allowance allocation	Successful	
9	10-00 Internal transfer	Successful	
10	10-00 Internal transfer	Successful	
11	01-51 Allowance issue (2005-2007)	Successful	
12	Napload – correction period 0	Successful	
13	10-55 Correction to allowance	Successful	Amendment to programming code required such that a zero is recognised as a valid entry.
14	03-21 External transfer	Successful	Done against Sweden.
15	UpdateAccount	Successful	
16	UpdateVET	Successful	
17	CloseAccount	Successful	
18	GetTransactionStatus	Successful	
19	TimeSynchronisation	Successful	
20	Reconciliation	Successful	New programming code required to ensure that the totals request from the CITL can be automatically held in a queue by the registry until the registry has taken a snapshot of its database.
	<p>Further remarks:            Test environment is in a different location to the production environment; production environment will be placed in a building owned by the hosting company as described in the annexes.            Blocking an account, in response to verified emissions not being submitted, is currently not allowing the movement of non-allowance units out of the holding account, with the exception of the surrender process.            It is currently not possible to flag units in a blocked account, which is a necessary functionality given that non-allowance units can still be transferred out of a blocked account if it has been blocked due to non-submission of verified emissions.            It is currently possible to close an operator holding account even if that installation is out of compliance. An operator holding account must not be closed unless the related installation is in compliance, the only exception being the provision made under Article 17(1) of the Regulation.            It is currently not possible to select specific project credits as part of the internal/external transfer interface.            The administrative interface for the reconciliation process is not yet available.            The reporting functionality, pursuant to Annex XVI of the Regulation, of the Danish registry is not yet complete.</p>		