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Statistikcentralen
Statistics Finland

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Report to facilitate the estimation of Finland's assigned amount under the Kyoto Protocol

Draft report to the European Commission

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Foreword

Statistics Finland has prepared this Draft report to the European Commission, pursuant to Article 8(1)(e) of Decision No 280/2004/EC, to facilitate the estimation of Finland's assigned amount for the commitment period pursuant to Articles 3.7 and 3.8 of the Kyoto Protocol and to demonstrate Finland's capacity to account for its emissions and assigned amount.

In accordance with the Government resolution of 30 January 2003 on the organisation of climate policy activities of Government authorities Statistics Finland assumed the responsibilities of the National Authority for Finland's greenhouse gas inventory 1 January 2005. In this capacity, Statistic Finland is also responsible for the compilation of the above mentioned Draft report to European Commission as well as the corresponding report to the United Nations Framework Convention on Climate Change (UNFCCC). The latter report will be submitted to the UNFCCC by 31 December 2006.

This report is divided into two parts in accordance with the Annex to the draft decision -/CMP.1 (Modalities for the accounting of the assigned amounts).

Part I contains following information on:

- complete inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol for the years 1990 - 2004;
- identification of the selected base year for emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6);
- calculation of the assigned amount pursuant to Article 3.7 and 3.8 of the Kyoto Protocol.

For the reporting to the UNFCCC, this part will complemented with information on the EU burden sharing agreement required for agreements under Article 4 of the Kyoto Protocol.

Part II contains information on:

- calculation of the commitment period reserve pursuant to decision -/CMP.1 (Article 17);
- identification of the minimum values for tree crown cover, land area and tree height for use in accounting of activities under Articles 3.3 and 3.4, with justification that the values are consistent with the information historically reported to the Food and Agriculture Organisation of the United Nations;
- identification of elected activities under Article 3.4;
- identification how accounting of Article 3.3 and 3.4 accounting will be done, annually or for the whole commitment period.

In addition, Part II contains descriptions of the National System (in accordance with Article 5.1 and the reporting guidelines under Article 7) and the National Registry (in accordance with reporting guidelines under Article 7).

The information provided in Part I and Part II is complemented with information in separate reports which are included in the submission:
- Greenhouse Gas Emissions in Finland 1990 - 2004 (Finland's national inventory report and the common reporting tables)
- National Greenhouse Gas Inventory System in Finland (a detailed description of the National System)
- Finland's National Registry under Article 7 of the Kyoto Protocol (a detailed description of the National Registry).

This draft report has been reviewed by the ministries participating in the contact network on climate policy issues and it has been approved by the Cabinet Committee on European Union Affairs meeting on 14 December 2005.

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Part I

1 Greenhouse gas inventory for 1990 - 2004

1.1 National Inventory Report and CRF Tables

A complete inventory on greenhouse gas emissions and removals for the years 1990 - 2004 is provided in the report *Greenhouse Gas Emissions in Finland 1990 - 2004* (Finland's national inventory report and the common reporting tables). This report is prepared in accordance with the UNFCCC *Guidelines for the preparation of national communications by Parties included in Annex I to the Convention: Part I: UNFCCC reporting guidelines on annual inventories (following incorporation of the provisions of decision 13/CP.9)*.

Information on emission and removals from land-use, land-use change and forestry activities under Article 3.3 (or Article 3.4) is not included in the inventory report as the reporting on these activities will begin only during the commitment period of the Kyoto Protocol. *Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol (Decision 22/CP.7)* require that the emissions from sources listed in Annex A to the Protocol are clearly distinguished from estimates for Articles 3.3 and 3.4. Even if reporting under these Articles is not yet done, Finland has clarified its reporting to facilitate this task in the future. The emissions from peat production areas have been moved from the Energy sector to the land use, land-use change and forestry (LULUCF) sector, as part of the production areas will be reported as units of land subject to activities under Article 3.3. This change is also in accordance with *IPCC Good Practice Guidance on Land Use, Land-Use Change and Forestry*. No other potential overlaps with the emission sectors (Energy, Industrial Processes, Solvents and Other Product Use, Agriculture and Waste) with the estimates under Article 3.3 (or Article 3.4) have been identified.

The methodologies used in the preparation of Finland's greenhouse gas inventory are consistent with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* as complemented by the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and the *IPCC Good Practice Guidance on Land Use, Land-Use Change and Forestry*.

For the submission in 2006, Finland has made extensive quality checks and evaluation of the activity data and emission factors used in the inventory. This has resulted in more consistent allocation of the emissions as well as increased the accuracy of the emissions and removals. The quality checks have involved, among others, applying the current fuel classification consistently to the whole time series, revision of some fuel characteristics, oxidation factors and emission factors to take into account new national data. In the Energy some changes have been implemented to make the inventory system and the EU emission trading system compatible, as Finland plans to use the data from this scheme, included in the national emission trading register, in it future inventory submissions.

Also, the implementation of the *IPCC Good Practice Guidance on Land Use, Land-Use Change and Forestry* has continued, and inclusion of new pools (dead organic matter, soils) into the inventory have resulted in significant changes in the LULUCF sector.

The recalculations and the reasoning behind them are described in detail in the national inventory report. The recalculations have resulted in following changes: the base year emissions (without LULUCF) have increased with 1.5%, and emissions

in 2003 with 0.4%. The corresponding changes with the LULUCF sector included are 5.1% and 0.5%, respectively.

1.2 Base year inventory and times series consistency

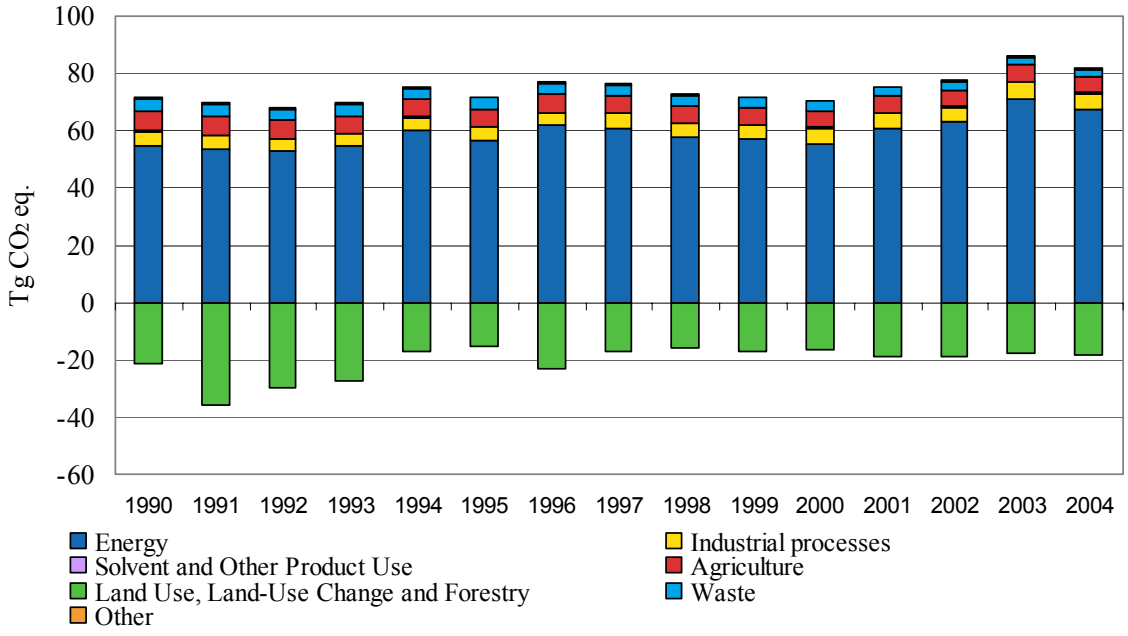
The greenhouse gas emissions in 1990 - 2004 are given in Table 1.1 by gas and in Figure 1.1 by sector.

Table 1.1. **Finnish greenhouse gas emissions and removals in 1990-2004.**

(Tg CO_2 equivalents)	1990 (base year)	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
CO_2															
Fuel combustion	53.31	52.43	51.55	53.37	58.72	55.31	60.54	59.47	56.09	55.35	54.12	59.21	61.67	69.55	65.39
Industrial processes	3.47	3.20	2.95	2.72	3.00	2.85	2.73	3.27	3.22	3.29	3.41	3.33	3.15	3.54	3.82
Other sources	0.34	0.32	0.32	0.36	0.25	0.26	0.23	0.28	0.22	0.20	0.20	0.19	0.19	0.19	0.18
CH_4	6,39	6,37	6,35	6,36	6,31	6,17	6,11	6,03	5,84	5,71	5,49	5,36	5,16	4,95	4,77
N_2O	7,89	7,30	6,75	6,87	6,98	7,20	7,15	7,13	6,96	6,84	6,88	6,80	6,90	7,01	6,93
SF_6, HFCs, PFCs	0.09	0.07	0.04	0.03	0.04	0.10	0.15	0.25	0.30	0.40	0.57	0.74	0.52	0.70	0.73
TOTAL	**71,49**	**69,69**	**67,96**	**69,72**	**75,31**	**71,88**	**76,91**	**76,42**	**72,63**	**71,79**	**70,66**	**75,64**	**77,59**	**85,96**	**81,81**
Land-Use Change and Forestry	-21.38	-36.13	-29.99	-27.60	-17.12	-15.38	-22.90	-16.85	-16.16	-16.98	-16.29	-19.02	-18.86	-17.85	-18.49

(Remark: Due to rounding the sum of subtotals does not equal to total figures.)

Figure 1.1. Greenhouse gas emissions in Finland in 1990-2004 by reporting sectors (Tg CO_2 eq).



In the base year the most important source of emissions was the Energy sector, which contributed about 76% to the total emissions without LULUCF. Agriculture (10%), Industrial Processes (7%) and Waste (6%) were also important sources of emissions, whereas Solvent and Other Product Use and Other sectors contributed together less than 1% to the emissions.

During 1990 to 2004 the Energy emissions have remained the most important category in the inventory, in 2000 - 2004 the share has ranged from 77 to 83%. In the other sectors the emissions have grown less rapidly (e.g. in the Industrial Processes sector) or even decreased (Agriculture and Waste sectors). The total national emissions (without LULUCF) in 2004 are about 14% higher in 2004 than in 1990. In 2003 the emissions were even higher, about 20% over the base year emissions. The reason for the fluctuation can be attributed largely to the structure of the electricity supply in Finland. Finland is part of the Nordic Electricity Market, and the availability of hydropower influences the emissions much. In 2003, the precipitation in Norway, Sweden and Finland was exceptionally low, and the shortage of hydropower was largely compensated by increased combustion of coal and peat in Finland, and also Denmark. The year 2004 was by large “a normal year” in this regard.

The Energy emissions have been calculated with the same model (ILMARI) at Statistics Finland for the whole time series, except for the year 1991. The ILMARI model was developed in early 1990’s and the first inventory to be calculated with the model was the inventory for the year 1992. ILMARI uses plant-specific data for large point sources, whereas earlier inventories were produced using more aggregated data. Due to the importance of the base year, it has been included in the ILMARI model using plant-specific data collected by the Air Protection Registry and annual survey data by Statistics Finland. The inclusion of the year 1991 in the ILMARI has not been initialised, as it is a very resource-consuming task.

The emissions estimates for the Industrial Processes sector are calculated using the same methods for the whole time series. The emissions are about 15% higher than in 1990, largely due to increased industrial activity. The most important sources of CO_2 emissions in the sector are the cement industry and the iron and steel industry, for which the process emissions have for the first time been allocated in the Industrial Processes sector. The emissions from these sources have been calculated using plant-specific data. The same method and emission factors are used for the whole time series.

For nitric acid production, the emissions are based on a series of measurements done at the plants in recent years, the earliest measurement were done in 1999. Since 2004 the measurement frequency has been increased from occasional one-time measurements, to regular, periodic measurements. At the newest plant, which started its operation in late 2004, the emissions are measured online. The historical estimates for the plants have been estimated using the plant-specific emission factors that have been developed based on the measurements, assuming the emission factors constant for the whole time series. This is a conservative estimate (may underestimate base year emissions), as the processes have in recent years been run to limit also the N_20 emissions, within the constraints of the NO_x emission limits.

The emissions from the Solvent and Other Product Use are largely NMVOC emissions; the amount of N_2O emitted from its medical and other uses is very small. The indirect CO_2 emissions from the NMVOC emissions have been taken into account in the emissions from this sector for the first time, their importance to the total national emissions is very small.

In Agriculture, the emissions for the base year and the time series have been calculated using the same methods without exceptions. The activity data and emission factors are dependent on the agricultural practices and productivity, which have been taken into account. Examples of changes in practices are improved feeding of animals, which has resulted in growing emission factors for enteric fermentation since 1990. The manure management practices have also changed; a larger amount of the manure is now treated in liquid systems than in 1990. This has resulted in growing methane, but declining nitrous oxide emissions from manure management. The decreasing number of animals, decreasing nitrogen fertiliser use and decreasing

area of organic arable land has lead to an overall decreasing trend in the emissions from Agriculture.

The emissions from the waste sector are calculated using the First Order Decay method. The activity data collection in the sector has improved significantly in recent years. All landfills require a permit, and the amount of waste annually disposed has been reported to the VAHTI database since 1997. The landfill tax has increased, and hence weighing of the disposed waste has become more frequent. Data on waste disposal for the years 1992 - 1996 is based on the landfill register, which is comparable to the current VAHTI database. The values for 1990 are based on the Development programme on municipal waste management 2000. In this context, surveys and research on the amount and composition of waste generated and treated in Finland in 1989 were done. The values for 1990 are based on results of these studies published by the Advisory Board for Waste Management in 1992. The waste composition data from these studies have been used for the whole times series.

The methane emissions from landfills show a declining trend. The Waste sector has undergone significant changes since the beginning of the 1990's. The new waste law in 1993 demanded waste reduction at source, to the extent possible, as well as increased utilisation of waste as material and energy. Similar requirements have since been introduced with legislation based on the EU landfill directive. Waste has therefore been increasingly treated by other ways than landfills, such as composting and energy utilisation. Also landfill gas recovery has increased substantially, in 1990 only one pilot landfill recovery plants was operational, in 2004 landfill gas is recovered from nearly 30 landfill sites. The possible changes in waste composition since 1990 have not been incorporated in the estimates yet. As the changes made have aimed at reducing the organic fraction in disposed waste, it is estimated that is overestimates the emissions from recent years. However, this overestimation is estimated to be small.

The emissions from the LULUCF sector do not influence the estimation of the assigned amount for Finland, as the sector was a sink in 1990, as also for the whole time series since. The LULUCF sector offsets about 20 - 30% of emission of the other sectors in Finland. In 1991 this percentage was even higher, more than 50%, as Finland was experiencing a serious recession at that time. The total emissions were low due to decreased industrial and other activities, which include also reduced harvesting of wood that year.

Overall, the base year and the recent year estimates have been estimated with consistent methods, to the extent the available activity data and emission factors make it possible, taking the IPCC Good Practice Guidance on time series into account. For some sectors, the accuracy of the data have increased in recent inventory years due to improved data collection measures and improved knowledge on the emission levels based on measurements and other research. However, no evidence suggests that this would have resulted in overestimation of the base year emissions in comparison with the recent inventory years. Detailed descriptions of the methods, activity data collection and emission factors, as well as associated uncertainties can be found in the national inventory report and the CRF tables.

2 Selected base year for HFCs, PFCs and SF_6 in accordance with Article 3.8

Article 3.8 of the Kyoto Protocol reads *"any Party included in Annex I may use 1995 as its base year for hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride"* for the purposes of calculating its assigned amount in accordance with Article 3.7. In accordance with this, Finland has chosen the year 1995 as the base year for the emissions of the hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulphur hexafluoride (SF_6). Finland has done this decision according to the latest revised inventory information, and the earlier choice in favour of the year 1990 has been rejected.

The time series for the emissions of the hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulphur hexafluoride (SF_6) can be seen in Table 1.2. The emissions expressed in CO_2 equivalent are 3.5Gg CO_2 equivalent higher in 1995 than in 1990, this being the reasoning for the choice of the base year for these gases, also called F-gases.

Table 1.2 Actual emissions of HFCs, PFCs and SF_6, 1990-2004 (CO_2 equivalent Gg).

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
HFCs	0.02	0.05	0.10	0.10	6.52	29.33	77.30	167.8	245.2	318.6	501.7	565.9	463.4	652.1	695.1
PFCs	0.07	0.08	0.09	0.10	0.12	0.14	0.16	0.18	0.21	27.97	22.46	20.06	13.37	14.85	12.23
SF_6	94.39	67.32	36.64	33.61	34.90	68.53	72.20	75.98	53.18	51.98	51.49	55.03	51.31	41.71	23.18
Total F-gases	**94.48**	**67.45**	**36.83**	**33.81**	**41.54**	**98.00**	**149.7**	**244.0**	**298.6**	**398.6**	**575.7**	**641.0**	**528.1**	**708.7**	**730.5**

3 Calculation of Finland's assigned amount

The assigned amount is calculated according to Articles 3.7 and 3.8 of the Kyoto Protocol, on the basis of the base year inventory of anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol.

Finland's assigned amount pursuant to Article 3.7 and 3.8 of the Kyoto Protocol is calculated in accordance with Draft Decision -/CMP.1 (Modalities for the accounting of the assigned amounts) equal to the percentage corresponding to the emission level allocated to Finland in the EU burden sharing agreement of Finland's aggregate anthropogenic CO_2 equivalent emissions of greenhouse gases in the base year (1990 except for emissions of HFCs, PFCs and SF6 1995), multiplied by five.

Land use, land-use change and forestry constituted a net sink in 1990, therefore the emissions and removals from this sector do not affect the calculation of Finland's assigned amount.

Equation for the accounting of Finland's assigned amount is:

Finland Assigned Amount = Base year emissions (1990, except 1995 for the F-gases) x 5 x the percentage corresponding to the emission level allocated to Finland in the EU burden sharing agreement (100%)

The estimation of the Finland's assigned amount is illustrated in Table 1.3. The estimated assigned amount is **357 Tg CO_2 equivalent** (357466 Gg CO_2 equivalent).

Table 1.3 Estimation of Finland's assigned amount.[1]

Base year emission Gg CO_2 equivalent	Emissions in column 1 times five Gg CO_2 equivalent	Percentage corresponding to the emission level allocated to Finland in the EU burden sharing agreement	Estimated assigned amount Gg CO_2 equivalent
Emission without HCFs, PFCs and SF6 and the LULUCF sector in 1990: **71395**	**356976**	100%	**356976**
Emissions of HCFs, PFCs and SF6 in 1995 **98**	**490**	100%	**490**
Total Base Year Emissions **71493**	**357466**	100%	**357466**

[1] The estimates have been calculated with the values as calculated by the CRF Reporter using more digits than given in the table).

Part II

1 Calculation of Finland's commitment period reserve

The commitment period reserve is calculated in accordance with decision -/CMP.1 (Article 17) as 90% of the proposed assigned amount or 100% of its most recently reviewed inventory times five, whichever is lowest.

Finland has interpreted the "most recently reviewed inventory" to mean the inventory, which will be reviewed as part of the reporting to facilitate the estimation of Finland's assigned amount, that is the inventory for the year 2004. This would mean, that the 90 % of the assigned amount would be lower, than five times the emissions from the total inventory of 2004. This would give an estimated commitment period reserve of **322 Tg CO_2 equivalent** (321719 Gg CO_2 equivalent).

2 Selection of threshold values for the forest definition to be used for reporting under Articles 3.3 and 3.4

Finland has selected as threshold values for the forest definition for reporting under Article 3.3 (including activities afforestation, reforestation and deforestation) the following: forest land includes land with minimum tree crown cover of 10 % for trees capable to reach minimum height of 5 m in situ. The minimum area for forest land is 0.5 ha. Temporarily unstocked areas are included (forest regeneration areas). For linear formations, a minimum width of 20 m is applied. This definition would be applicable also for reporting, under Article 3.4 - however, Finland has decided not to use Article 3.4 activities in meeting is commitments for the first commitment period.

The selected threshold values are consistent with those values used in the reporting to the Food and Agriculture Organisation of the United Nations (the FAO TBFRA 2000 and FRA 2005 forest definition).

3 Selection of activities under Article 3.4

Finland has chosen not to use any activities under Article 3.4 (forest management, cropland management, grazing land management and revegetation) for meetings its commitment under the first commitment period of the Kyoto Protocol.

4 Accounting of activities under Article 3.3

Finland has chosen to account for the activities under Article 3.3 (afforestation, reforestation and deforestation) for the whole commitment period.

5 Finland's national greenhouse gas inventory system

Finland's National System under Article 5.1 of the Kyoto Protocol is described in accordance with the guidelines for the preparation of information under Article 7 in the report *National Greenhouse Gas Inventory System in Finland*, which is part of this submission.

6 Finland's National Registry

Finland's National Registry under Article 7 of the Kyoto Protocol is described in accordance with the guidelines for the preparation of information under Article 7 in

the report *Finland's National Registry under Article 7 of the Kyoto Protocol*, which is part of this submission.