# The report on demonstrable progress under the Kyoto protocol Finland

According to the United Nation's Convention on Climate Change

Ministry of Trade and Industry

# Foreword

This document is a Finnish report of demonstrable progress under Article 3 of the Kyoto Protocol. The report provides an overview of the steps taken by Finland to meet its Kyoto Protocol commitments. The report also shows the expected level of greenhouse gas emissions in the Commitment period as well as the measures to meet the obligation, as required by the Article. The report is comparable with the Finnish 4th National Communication to the UNFCCC and with the report submitted to the EU according to Article 5(3) of decision 280/2004/EY.

The report was prepared by the Working Group established for reporting of Demonstrable Progress and some other related reporting. The Working Group was chaired by the Ministry of Trade and Industry and members representing also the Ministry of Environment, Ministry of Agriculture and Forestry, Ministry of Finance and Statistics Finland.

The report was accepted by the High Level Working Group of Government Officials. The report is based on the updated Energy and Climate Strategy (2005) and is comparable with the Finnish 4th National Communication submitted to the UNFCCC. The GHG inventory data used in the report is consistent with the latest inventory (2006).

Ministry of Trade and Industry

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# Executive summary

Finland is a sparsely inhabited northern country with 5.3 million people and about 338,145 $km^2$ in area. The distances are long and the climate of Finland is cold, although, on the average, several degrees warmer than in most areas in the same latitudes.

The economy is highly industrialised and is rapidly integrating with the global economy. The key economic sector is manufacturing – principally the pulp- and paper industry, iron and steel production and the engineering-, telecommunications-, and electronics industries. Trade is important, with exports equalling two-fifths of GDP. Almost 90% of the paper and board production is exported, and in the base metal industry the share of export products is also high. Thus, a lot of energy is also used to export products.

Climate change mitigation has been one of the top energy- and environmental policy priorities for many years. Finland ratified the UN Framework Convention on Climate Change (UNFCCC) on May 3, 1994. Finland signed the Kyoto Protocol on 29 May 1998 and ratified it on 31 May 2002, together with the other 14 EU member states. The target level for Finland under the Kyoto Commitment and The EU Burden Sharing Agreement is to reduce the level of greenhouse gas emissions (GHG) to the level of 1990.

Finland has carried out consistent climate policy since the ratification of the Framework Climate Convention in 1994. Comprehensive Climate Strategy was given to Parliament in 2001. The strategy defined the measures to meet Finlands obligation under the Kyoto Protocol. These were for example the Energy Conservation Programme and the Programme for Promoting Renewables. Also the replacement of coal-based production of electricity by natural gas or nuclear power was an alternative.

The Finnish Government's Resolution issued in 2003, determined the institutional framework concerning climate policy issues in Finland. Finland’s National System according to the Kyoto Protocol was established at the beginning of 2005.

The proposal for an allocation plan under the EU Emission Trading Scheme (ETS) was submitted to the EU Commission in March 2004. After some amendments the Commission approved the plan late 2004 and the emission allowances were distributed to installations under ETS in December 2004. EU ETS covers about half of Finnish emissions and so it has a significant role for Finland in meeting its Kyoto Target.

GHG-emissions have fluctuated according to the state of economy, precipitation conditions not only in Finland but in the whole Nordic area and the coldness of the winter. In 2004 the GHG-emissions of Finland were 14% over the Kyoto Commitment.

The total consumption of primary energy will grow approximately 6% from 2004 to 2010, and further by 13% to 2020. The growth of consumption will clearly slow down compared to 1990–2004. The average annual growth in the years 2004–2020 is only 0.6% per year, whereas it was over two per cent a year in 1990–2004. The use of renewable energy has almost doubled from 1990 up to 2004.

Finland is part of the electricity markets for Nordic Countries and the foreign trade of electricity depends on the precipitation in the Nordic market area. In a dry hydrological year like 2003 and 1996, the production of hydropower and imports of electricity have been minor and the GHG-emissions have been more than the average and vice versa.

The energy sector constitutes about 80% of the total GHG-emissions. Emissions in this sector excluding transport sector have grown 1.7% annually during the period 1990–2004. Emissions in the transport sector have remained rather constant between 1990 and 2004. The annual growth of emissions in the sector has been 0.7%. The emissions from industrial processes have grown 0.7% annually. Emissions in the other sectors have declined. The most significant reduction of emissions, 3.1% annually, has been in the waste sector.

A new updated Energy and Climate Strategy was given to Parliament in late 2005. It included also the National Strategy for Adaptation to Climate Change.

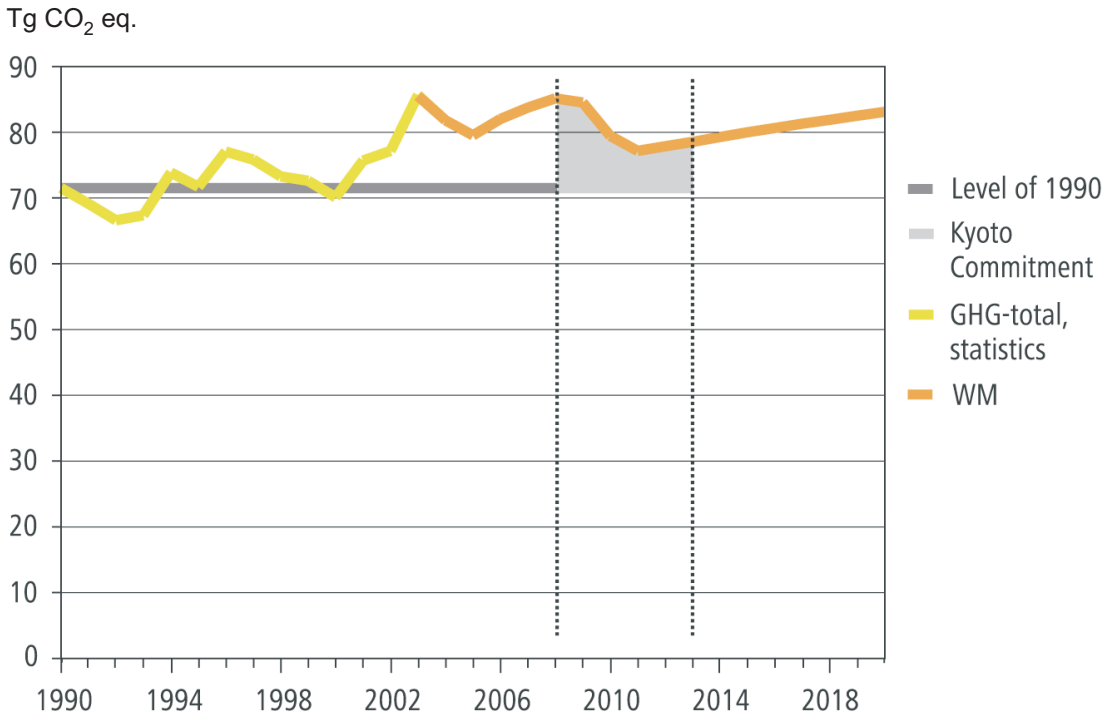


*Figure 1. Total greenhousegases in With Measures-scenario and the deficit to be covered in the Kyoto Commitment period, Tg $CO_2$-eq.*

The strategy defines the measures for meeting Finland's obligations under the Kyoto Protocol. Finland will meet her target level for the Kyoto Commitment period. The main measures to be used are allocation of emission allowances under the EU's Emissions Trading Scheme, domestic measures such as energy conservation and facilitation of the use of renewable energy. In order to improve cost-efficiency and to promote international co-operation the Government has decided to acquire emission reductions. The strategy will ensure a reliable supply of energy at competitive prices and improve the efficiency of the use of energy. The strategy will also increase the use of renewable energy.

# 1 Introduction

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Finland is a sparsely inhabited northern country with 5.3 million people and about 338,145 $km^2$ in area. The distances are long and the climate of Finland is cold, although, on the average, several degrees warmer than in most areas in the same latitudes.

The economy is highly industrialised and is rapidly integrating with the global economy. The key economic sector is manufacturing – principally the pulp- and paper industry, iron and steel production and engineering-, telecommunications-, and electronics industries. Trade is important, with exports equalling two-fifths of GDP. Almost 90% of the paper and board production is exported, and in the base metal industry the share of export products is also high. Thus, a lot of energy is also used to export products.

According to the Environmental Sustainable Indicator (ESI), which is developed by the World Economic Forum and measures sustainability with more than 70 variables from threatened amphibians to energy efficiency, Finland has been the leading country from the group of 140 countries in 2001, 2002 and 2005. Finland's strengths have been air- and water quality, science and technology, effective environmental administration and initiatives from the private sector. If sustainability is measured with ESI in relation to GDP per capita Finland is again among the leading countries (Figure 2).

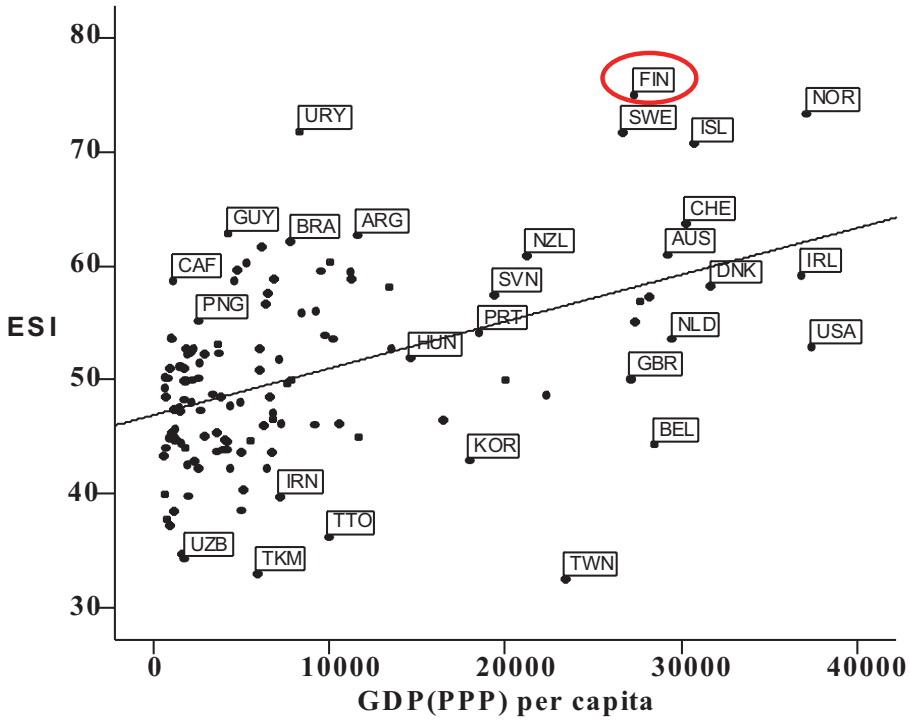


*Figure 2. Environmental Sustainable Indicator in relation to GDP per capita in 2004.*

Finland has carried out consistent climate policy since the ratification of the Framework Climate Convention in 1994. These measures of climate policy can be referred to in the National Communications of Finland (NC1–4: 1995, 1998, 2001, 2006).

The Comprehensive Climate strategy was given to Parliament in spring 2001. The strategy included the Energy Conservation Programme and the Programme for Promoting Renewables. It was estimated that with these programmes Finland would be able to reduce greenhousegas emissions by 7–8 Tg in 2010. However, the allocation of resources has not materialised in the amount drafted and the reduction of emissions may be a bit lower. The strategy included also a measure to lower the emissions of electricity production by replacing coal in power production by either natural gas or by nuclear power. A private energy company sent an application to Parliament to construct a new nuclear power unit. A favourable decision by Parliament was given in 2002.

The measures of the Energy Conservation Programme and the Programme for Promoting Renewables are under implementation.

The Finnish Government's Resolution issued in 2003, determined the institutional framework concerning climate policy issues in Finland. Finland's National System according to the Kyoto Protocol was established at the beginning of 2005.

The growth of Finnish GDP has been 2,0% and greenhousegas emissions 1,0% respectively in the period 1990–2004. At the beginning of 1990 Finland had gone through a deep recession and as a consequence both the economy and greenhouse gas emissions declined. In 1993 the economy turned to an upward trend and has been growing at the rate of 3,7% up to year 2004. However, the growth of greenhousegas emissions has been only 1,5% percent in the period. Thanks to early actions since 1970 in energy efficiency, Finland has been able to decouple the link between economic growth and greenhouse gas emissions.

The GHG inventory data in the report is consistent with 2006 inventory.

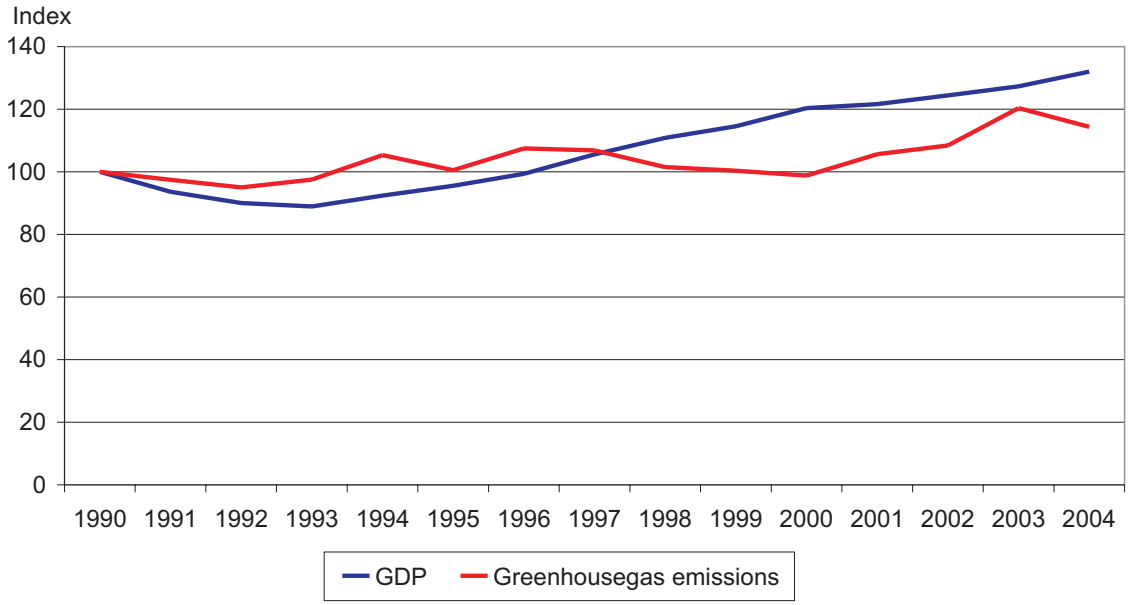


*Figure 3. The development of GDP and greenhouse gas emissions in 1990–2004, index 1990 = 100.*

A new updated Energy and Climate Strategy was given to Parliament in late 2005. It included also the National Strategy for Adaptation to Climate Change.

# 2 Description of Finnish Climate Policy

## 2.1 Policy-making process

Finland ratified the UN Framework Convention on Climate Change (UNFCCC) on May 3, 1994. Finland signed the Kyoto Protocol on 29 May 1998 and ratified it on 31 May 2002, together with the other 14 EU member states.

Finland joined the European Union at the beginning of 1995. In the field of climate policy, it is recognised that the Common and Coordinated Policies and Measures (CCPM) at Community level are an important cornerstone. However, these measures are a supplement to national climate policy. The Member States are responsible for their obligations under the EU Burden Sharing Agreement; Finland's target is to bring her average annual greenhouse gas emissions down to their 1990 level by the period 2008–2012.

Finland has an extensive institutional framework for climate policy issues. As to the international climate policy, the Government and Parliament are in charge of important decisions. The United Nations Framework Convention on Climate Change falls within the administrative responsibility of the Ministry of the Environment.

The Ministerial Working Group on Climate Change and Energy, headed by the Ministry of Trade and Industry, was responsible for example co-ordination of the National Energy and Climate Strategy. The group also prepares Finnish guidelines for international climate negotiations, and ensures planning at the national level and the coherence of Finland's position before matters are discussed in the Cabinet Committee on EU Affairs.

The High Level Working Group of Government Officials, again headed by the Ministry of Trade and Industry, has an essential role in the preparation of national climate policy issues. Stakeholder involvement and support for the preparation and implementation takes place via the Climate Forum, expert organisations, universities and others. The Climate Forum is a body with representatives from ministries and other Government organisations, regional and municipal administration, industry and NGOs.

## 2.2 Policies and measures by sector

### 2.2.1 Policies and measures in the Energy sector

The Electricity Market Act was implemented in 1995 in order to increase competition in electricity markets. The electricity market in Finland operates as a part of the regional Nordic market; all customers have been able to change their supplier since November 1998, but consumers have been quite passive. Market liberalisation has resulted in situation in which power plants are operated according to their cost-efficiency. In a wet hydrological year in the Nordic countries the price of electricity is low because of remarkable hydropower production. In a dry hydrological year the price is higher and the marginal mode of production is condensing power. GHG-emissions fluctuate according to the hydrological situation, but on the whole the market liberalisation seems to have a positive effect on emission reduction.

Finland was the first country to introduce a $CO_2$ tax in 1990, initially with few exemptions for specific fuels or sectors. Since then, however, energy taxation has been changed many times and substantially, from a low but "pure" $CO_2$ tax to a much higher but less $CO_2$-related tax. In 2003, the $CO_2$ tax was about 15 times higher than in 1990. The introduction of $CO_2$-related tax has surely curbed the growth of energy consumption and steered the production and use of energy towards alternatives causing less emissions. However, it is difficult to give a quantitative estimate of emission reduction.

The Energy Conservation programme, started in 1992 consists of conservation measures in all sectors of the economy. When the Energy Conservation Programme was drafted, the total effect of energy conservation measures was estimated to be 3–4 Tg $CO_2$-eq. in 2010. However, allocation of resources has not come true to the extent planned, so the actual reduction may be slightly lower. One of the most remarkable measures of the programme is the Voluntary Agreement Scheme on Energy Efficiency. The Agreement Scheme has been run since 1997. It has been estimated that the effect of the Scheme on emissions is about 2.0 Tg $CO_2$ annually.

The Action Plan for Renewable Energy Sources (RES) was approved in 1999. The target of the programme was to increase the use of RES by 30% in relation to year 2001. The key instruments to promote the use of RES are investment grants, taxation, subsidies and supporting research. The total effect of the Action Plan on Renewable Energy Sources on $CO_2$ emissions was estimated to be 4–5 Tg in 2010.

The use of renewable energy has almost doubled between 1990 and 2004 in Finland (Figure 4). The growth of renewables is due to both an increase in the forest indust-

ry and the constant policy to promote renewable energy sources. The forest industry uses all its by-products as energy sources.

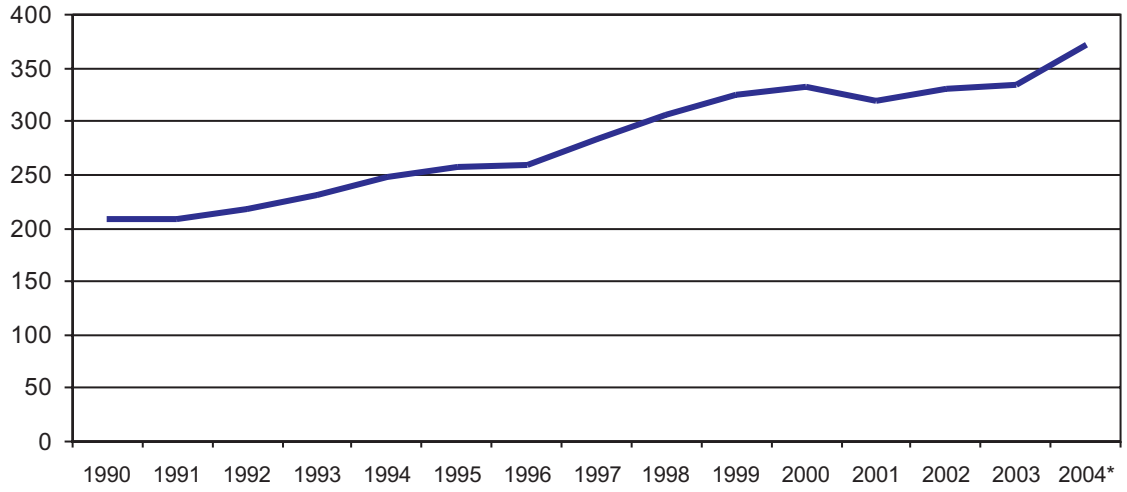


*Figure 4. Use of renewable energy sources in 1990–2004, PJ.*

### 2.2.2 Policies and measures in the Transport sector

Climate change policy is an integrated part of the transport policy both at the national level and within the European Union, when aiming at restraining the growth of transport and thereby reducing the negative environmental impacts from it. However, many of the transport policy measures supporting reduction of greenhouse gas emissions are taken primarily for reasons other than climate change policy. Such reasons are especially objectives for improving traffic safety (limiting traffic speeds), maintaining and developing public transport services, promoting cycling and walking (national health aspects), developing vehicle and fuel taxation (fiscal targets), or EU and other international standards for vehicle emissions (reduction of exhaust emissions and improving air quality).

As regards the EU transport policy, promotion of sustainable modes of transport is one of the main objectives that has been also enforced in the Commission White Paper of year 2001 "*European Transport Policy till 2010: Time to decide*". Recently adopted Community legislation or topical proposals for new Community legislation, such as the third railway package, promotion of freight transport logistics, intermodal transport (Marco Polo programme), or short sea shipping as well as the Eurovignette Directive, also support mitigation of climate change.

Among the most important and efficient measures taken at the Community level to reduce transport related greenhouse gas emissions are the voluntary agreements the

European Commission has made with car manufacturers (ACEA, JAMA and KAMA). The aim is that average $CO_2$ emissions of new registered cars should not exceed the level of 120 g/km for diesel cars and 140 g/km for petrol cars.

As to national transport policy, the newest version of the environmental management programme was recently adopted (Ministry of Transport and Communications 2005), covering the years 2005–2010.

Since the adoption of the first environmental management programme in 1994, one of the main objectives has been to maintain transport related carbon dioxide emissions at the level of 1990. This target is not binding but provides guidance for action in the transport sector. Reaching the target does not seem to be easy judging by the rapid growth of $CO_2$ emissions in the last couple of years.

### 2.2.3 Policies and measures in the Industrial Processes sector

GHG-emissions from industrial processes are fairly low in Finland and they have been quite stable from year to year. The most important sources were $CO_2$ emissions from metal production, $N_2O$ emissions from nitric acid production and $CO_2$ emissions from mineral products (cement production and lime and soda ash production and use) with their respective shares of 39%, 21% and 20% of the total industrial greenhouse gas emissions.

The level of F-gas emissions has risen rapidly and amounted to 12% of the emissions from industrial processes in 2004. Without further measures their share will be about 14% by 2010. A new directive on F-gases is under preparation in the European Union. It would for example limit the use of these gases in certain applications and set requirements for regular inspections to prevent leakages. The use of F-gases in air conditioning systems of cars would also be limited by the directive.

### 2.2.4 Policies and measures in Agriculture

The objectives for Finnish agricultural policy are based on the view that the permanent competitive handicap due to natural conditions (such as short growing period, low temperatures, frosts and problematic drainage conditions) must be compensated for in order for the domestic production to succeed and to make agriculture sustainable and multifunctional. The concept of sustainable and multifunctional agriculture takes into account the greenhouse gas emissions and possible needs for adaptation measures along with other environmental and socio-economic consider-

ations. These objectives can be reached by the common agricultural policy of the EU as well as through national measures.

In 2000 a new kind of agricultural policy, Agenda 2000, became fully effective in Finland as the five-year EU transitional period came to an end in 1999. The objective is to secure the income level of farms, and develop the profitability and efficiency of the production of farms taking into account the environmental considerations and expansion of the industrial basis of the countryside, which maintains the viability and contributes to the better management of the rural areas.

One part of the programme is the agri-environmental support for 2000–2006 based on the Council Regulation (1257/1999). The main focus is not to reduce greenhouse gas emissions but the support which together with the structural change in the Finnish agriculture sector have enabled a significant reduction of greenhouse gas emissions in agriculture; they have decreased from 6.9 Tg $Co_2$ eq. in 1990 to 5.4 Tg $CO_2$ eq. in 2003.

The agri-environmental support is an essential tool to promote sustainable development in agriculture. About 90% of Finnish farmers are implementing the measures of the support programme. The objectives are to decrease nutrient load on the environment, especially on the surface and ground waters, and to maintain the biodiversity of animal and plant species and the rural land-scape. The measures also aim at maintaining or improving the productive capacity of the agricultural land. The agri-environmental programme is under review in 2005. The new programme with improved measures is expected to support achieving the fulfilment of the greenhouse gas emissions from 2006 onwards.

### 2.2.5 Land use, land-use change and forestry

This sector affects the mitigation of climate change in three different ways:

- by protecting and increasing existing carbon storages and sinks
- by creating new carbon storages and sinks
- by replacing fossil-based energy, raw materials and products with biomass.

In 2004, the net sink reported under this sector was 18.5 Tg $CO_2$-eq., corresponding to one fifth of the national greenhouse gas emissions without LULUCF. In 1990–2003, this sink has varied between 15.4 and 36.1 Tg, mainly depending on the level

of commercial roundwood removals. The carbon content of forestry products has not yet been estimated in the national greenhouse gas inventory; the role of bioenergy in curbing greenhouse gas emissions is reflected in the inventory via the energy sector.

The role of forests in the protection and enhancement of sinks and reservoirs of greenhouse gases can best be ensured and protected through sustainable forest management that meets the multiple purposes and objectives. A number of forest-related policies and measures have been implemented and further elaborated.

Finnish forest policy has been based on medium- and long-term programmes since yjr 1960s, when drain exceeded increment of forests. Due to increased investments into silviculture and state incentives to forest owners, the annual increment of forests has been increasing. This trend has continued throughout the 1990s.

The Environmental Programme for Forestry in Finland (1994) includes the strategy for sustainable forestry, together with the targets for the year 2005. A group of experts has followed up the implementation of the programme's objectives. Many of the targets were attained already in 2000.

The basic framework for forest management is set by forest legislation.This legislation was renewed in 1990 and includes today the Forest Act (1997), Act on Financing of Sustainable Forest (1997) and acts on forestry organisations.

### 2.2.6 Policies and measures in the Waste sector

Emissions from the waste sector consist of $CH_4$ and $N_2O$ emissions, and have had a decreasing trend since 1990. Overall, the annual emissions have decreased by over 33% since the 1990 level. The decrease has been mainly due to the implementation of the Waste law introduced in 1994, which requires increased recycling and recovery of waste as material or energy.

### 2.2.7 Cross-sectoral policies and measures

Several cross-sectoral policies and measures also affecting GHG-emissions can be identified, including national programmes and policies related to biodiversity, sustainable development, regional structure, ecologically sustainable construction, protection of the ozone layer, transboundary air-borne pollution and co-operation

in environmental protection in neighbouring areas. National sustainable development policies and activities in Finland have been guided by the Government Programme for Sustainable Development since 1998. Implementation of the Programme was assessed in 2000–2002, and a national evaluation report on sustainable development in Finland was published in 2003. In December 2004, the Finnish National Commission on Sustainable Development decided to launch a process leading to a newnational strategy on sustainable development which is due to be ready by the end of May 2006.

As a response to the outcomes of the Johannesburg Summit (2002) on the promotion of eco-efficiency and sustainable consumption and production patterns, a national programme proposal for sustainable consumption and production was prepared and adopted by a multi-stakeholder Committee on Sustainable Consumption and Production in June 2005. The key objectives of the programme are to increase the efficiency of the usage of materials and energy through all stages of product life cycles, and to promote environmental education and development, and adoption of environmental technologies.

Other policies and measures affecting GHG-emissions include environmental management systems and environmental labels and declarations. A particularly important cross-sectoral factor is development of the urban structure, which has long-term effects on greenhouse gas emissions.

The urban and regional planning activities of municipalities and provinces shall be monitored with a view to reducing emissions, in order to ensure that the objectives of the Land Use and Building Act (132/1999) will be met. The Act aims at a safe, healthy, environmentally-friendly and socially well-functioning city structure in which the availability of public transport services and non-motorised transport should be taken into account.

The intention agreements between the Government, municipalities and regional councils provide an instrument for the implementation of transportation system plans in urban areas. Municipalities are responsible for maintaining and developing the transport infrastructure inside urban agglomerations.

With the intention agreements the Government provides funding for the implementation of such transport projects that are in accordance with the transportation system plans. With the help of intention agreements the Government has some possibilities for guiding the transport planning of municipalities, which can otherwise autonomously decide about their local transportplanning. Thus far, 15 intention agreements have been made.

### 2.2.8 Research and development

There are several important national research and development programmes that have an impact on GHG-emissions. Development of energy technology is one of the key activities in national energy and climate policy. Advanced technology and utilisation of technology play an important role in achieving reductions in energy use and emissions. Furthermore, the goal is to increase the export of energy technology. The Government contributes to determined development of new technology for energy generation and use. Supporting energy technology R&D with Government funds serves the strategic goals of national energy policy. Public support is directed at the development, commissioning and commercialisation of new environmentally-benign technology. Development of new technology and promotion of its introduction to the market is directed at sectors of technology and know-how that are inherent in Finnish conditions. Thus, promotion of energy conservation and use of bioenergy are in a prominent position.

The National Technology Agency, TEKES is the main public funding organisation for research and development for technology and innovation in Finland. Other funding organisations are the Academy of Finland and the Finnish National Fund for Research and Development (SITRA). Ministries and several foundations also fund climate-change related research. The Technical Research Centre of Finland (VTT) is responsible for the implementation of a number of national energy technology research programmes. VTT carries out both its own technical research work and testing and work commissioned by companies and the public sector.

# 3 Description of trends in, and projections of greenhouse gas emissions

## 3.1 Past trends in GHG-emissions (overall/by sector – gas combination)

A summary of the Finnish national emissions and removals for 1990–2004 is presented in Figure 5. More detailed information on the emissions and removals by sector and gas can be found in Tables 2–3. In 2004, Finland's greenhouse gas emissions totalled 81.8 Tg $CO_2$-eq., which exceed the level for the year 1990 by 14% (10.3 Tg). Emissions decreased from that of 2003 by 5%. According to preliminary data the total emissions decreased significantly further in 2005.

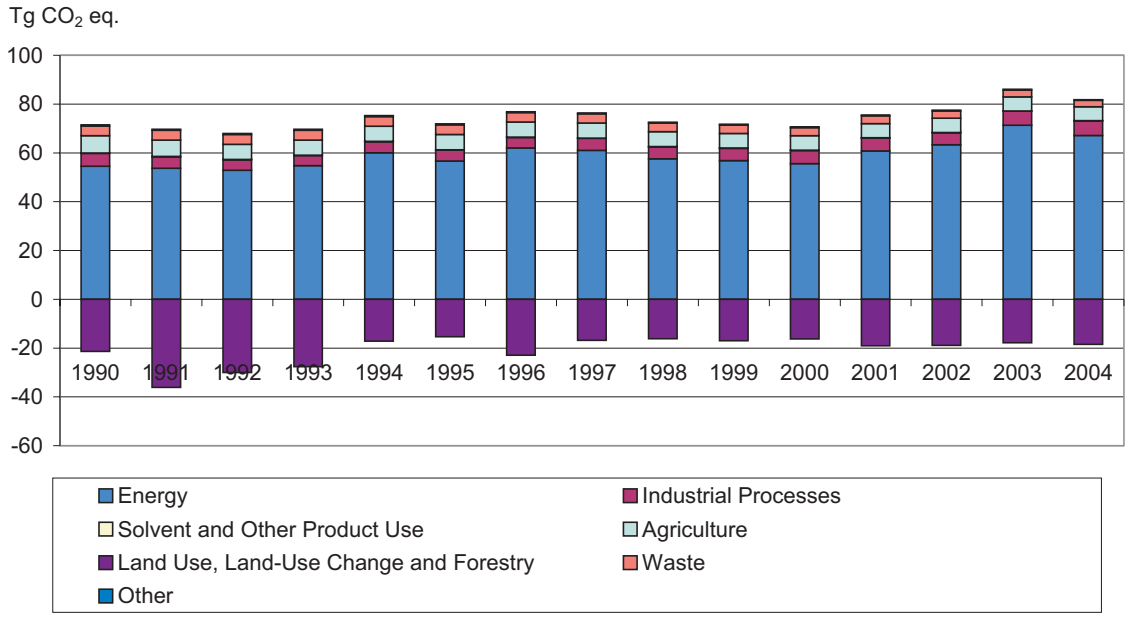


*Figure 5. Greenhouse gas emissions in Finland in 1990–2004 by reporting categories, LULUCF sector included*

The total carbon dioxide intensity of the Finnish economy increased in the early 1990s, but started to decline in the latter half of the decade. The change has taken place as growth in the economy has shifted to less energy-intensive activities such as the electronics industry. Relative to GDP, carbon dioxide emissions were at their lowest in 2000 but have been growing since then. In recent years, and especially in 2003, the growth has been caused by variation in the supply of electricity. Shortage

of hydropower in the Nordic electricity market has led to increased use of coal and other fossil fuels in electricity generation. This is the main reason for the significant increase in Finnish greenhouse gas emissions compared to the previous years.

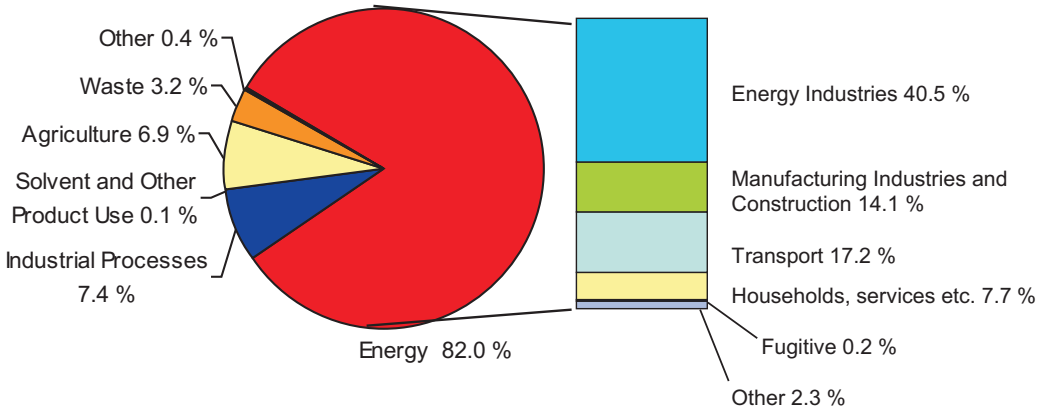


*Figure 6. Composition of Finnish greenhouse gas emissions in 2004, LULUCF excluded.*

The emissions from industrial processes including $CO_2$, $CH_4$, $N_2O$ and F-gases were in 2004 about 7% of total greenhouse gas emissions in Finland. Emissions from process industry have increased about 15% (~0.80 Tg $CO_2$-eq.) since the 1990 level, but their share of the total greenhouse gas emissions has remained relatively constant. The share of solvents and other products in the Finnish greenhouse gas emissions is small, about 0.5% of the total emissions.

The waste sector accounted for 3% (2.6 Tg $CO_2$-eq.) of total emissions in 2004. Emissions from the waste sector consist of $CH_4$ and $N_2O$ emissions, and have had a decreasing trend since 1990. Overall, the annual emissions have decreased by over 30% since the 1990 level. The decrease has been mainly due to the preparation and implementation of the new Waste law in Finland in 1993.

The LULUCF sector acts as a net sink for carbon dioxide emissions, currently absorbing approximately 20% of the annual emissions from other sectors. The net sinks, 18.5 Tg $CO_2$-eq. in 2004, are mainly due to the increases in carbon stocks in forests.

### 3.1.1 Past trends in the Energy sector

Energy-related activities are the primary source of anthropogenic greenhouse gas emissions in Finland with over 85% of the total emissions. This reflects the high en-

ergy intensity of Finnish industry, extensive consumption during the long heating period, as well as energy consumption for transport in a large and sparsely inhabited country. Energy-related $CO_2$ emissions vary mainly according to the economic trend, the energy supply structure, and climate conditions.

In 2004 the emissions from the energy sector without transport were 53.0 Tg $CO_2$ -eq. There was a 11.1 Tg $CO_2$ (+31%) increase in the energy sector's $CO_2$ emissions between the years 1990 and 2004. Total energy sector emissions were 11.3 Tg $CO_2$-eq. higher in 2004 than in 1990.

Because of low precipitation in the Nordic Countries in 1994 and 1996 the production hydropower was on a lower level than on average. As a consequence the imports of electricity were on a lower level than on average. Reduced imports and increased exports were mainly covered by coal condensing power. This increased greenhousegas emissions as can be seen from Figure 7.

Emissions decreased because of higher precipitation and lower need for heating energy in the period 1997–2000. However, greenhousegas emissions turned up in 2001 mainly due to decreased precipitation and higher need for heating energy.

In 2003, the level of emissions was an all-time high in the energy sector. The main driver for the high emissions was the weather, i.e. a persistent drought in Nordic countries and the soaring of electricity price in the Nordic electricity market. Consequently, the domestic electricity production in Finland increased 12% as compared to the year 2002. The use of coal increased over 40%, equivalent to over 5 Tg of $CO_2$ emissions. Net import of electricity decreased by 59%, the production of domestic hydro-power by 12%. In 2002, Finland's net import of electricity from Sweden was 4.0 TWh, in 2003 the net export was 6.4 TWh. From Russia Finland imported 7.9 TWh of electricity in 2002, and 11.3 TWh in 2003.

Due to increased precipitation in the Nordic Countries in 2004, emissions were in 2004 however at a 4.6 Tg lower level than in 2003. Emissions in 2005 are according to preliminary data on a much lower level than in 2004.

Energy consumption has grown in Finland by almost 75% since the energy crisis in the mid-1970s. The growth stagnated for a few years in the early 1990s when Finland experienced a severe recession, but has continued after that. The growth in energy consumption was 33% during 1990–2004; in the same period, the $CO_2$ emissions from fuel combustion increased by 27%. The $CO_2$ emissions have grown at a slower rate than the energy consumption due to a shift from coal and peat to natural gas, upgrading of the existing nuclear power plants, and improved energy efficiency.

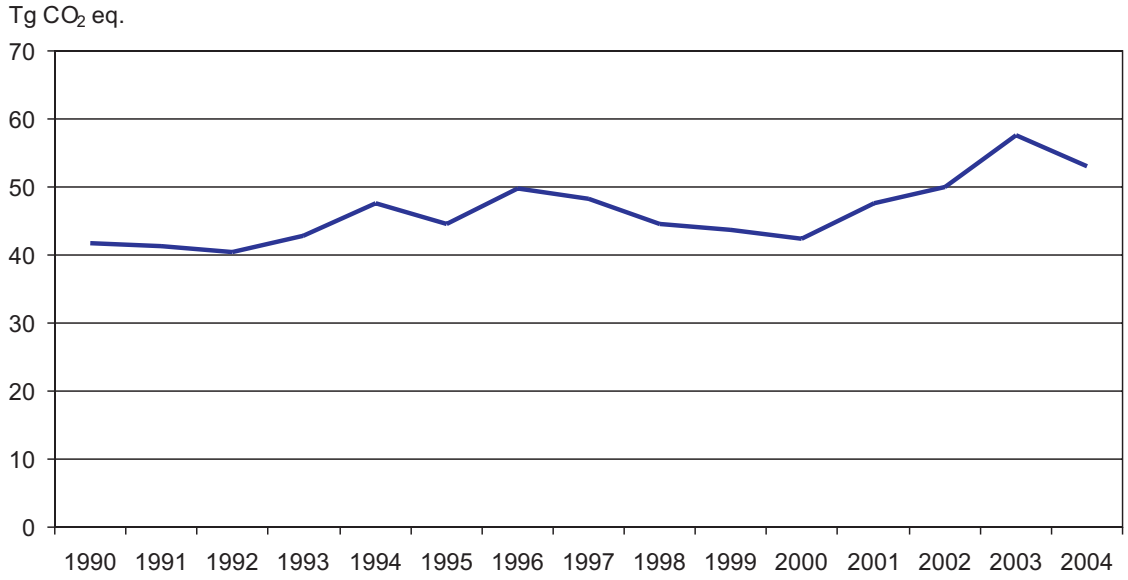


*Figure 7. Total GHG-emissions from the Energy sector in 1990–2004, Tg $CO_2$-eq.*

### 3.1.2 Past trends in the Transport sector

Finland has been able to keep the growth of emissions in the transport sector quite moderate. The growth has been only 7% in the period 1990–2004. Greenhouse gas emissions from the transport sector remained rather constant in 1990–2001, but after that emissions have increased about 2% per year. Almost 90% of the emissions in the transport sector originate from road transport, where the volume of passenger transport increased by 15% and the volume of goods transport by 23% in 1990–2003. However, the $CO_2$ emissions from passenger transport decreased during this period, because of the improved fuel efficiency of cars, and also due to an increase in the share of diesel-fuelled cars. In goods transport the emissions have increased.

The turn towards higher $CO_2$ emissions in the transport sector is due to several factors. The financing of public transport has decreased and the measures to promote light traffic have been inefficient. Average distances from home to work have increased in large urban areas, because affordable housing is not available in the vicinity of city centres. High oil prices have, however, restricted the increasing of consumption of traffic fuels.

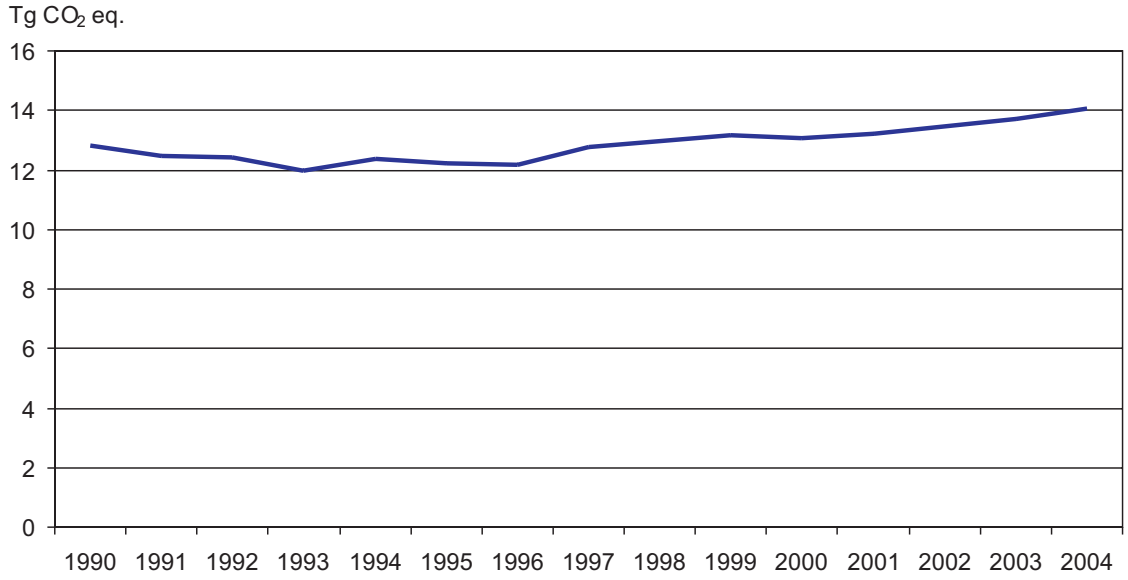


*Figure 8. Total GHG-emissions from the Transport in 1990–2004, Tg $CO_2$-eq.*

### 3.1.3 Past trends in the Industrial Processes sector

Industrial greenhouse gas emissions contributed 7.4% to the total anthropogenic greenhouse gas emissions in Finland in 2004. The most important greenhouse gas emissions from industrial processes in Finnish inventory in 2004 were the $CO_2$ emissions from iron and steel production, the $N_2O$ emissions from the nitric acid production and $CO_2$ emissions from cement production with the 2.9%, 1.8% and 0.7% shares of the total greenhouse gas emissions, respectively. F-gas emissions comprised together about 0.9% of the total greenhouse gas emissions in Finland. The small amount of F-gases emissions in Finland is explained by the absence of certain large industrial point sources that account for most of the F-gases emissions globally.

The emissions have fluctuated somewhat during the 1990s (Figure 9). The most significant change is the increase of emissions of F-gases, which are now almost sevenfold compared to the 1990 emissions. The $N_2O$ emissions have remained quite constant. The $CH_4$ emissions have increased by nearly 71% but their contribution to the total industrial emissions is very small. Industrial $CO_2$ emissions decreased considerably at the beginning of the 1990s, but have increased since 1996 and are currently approximately at the same level as in 1990.

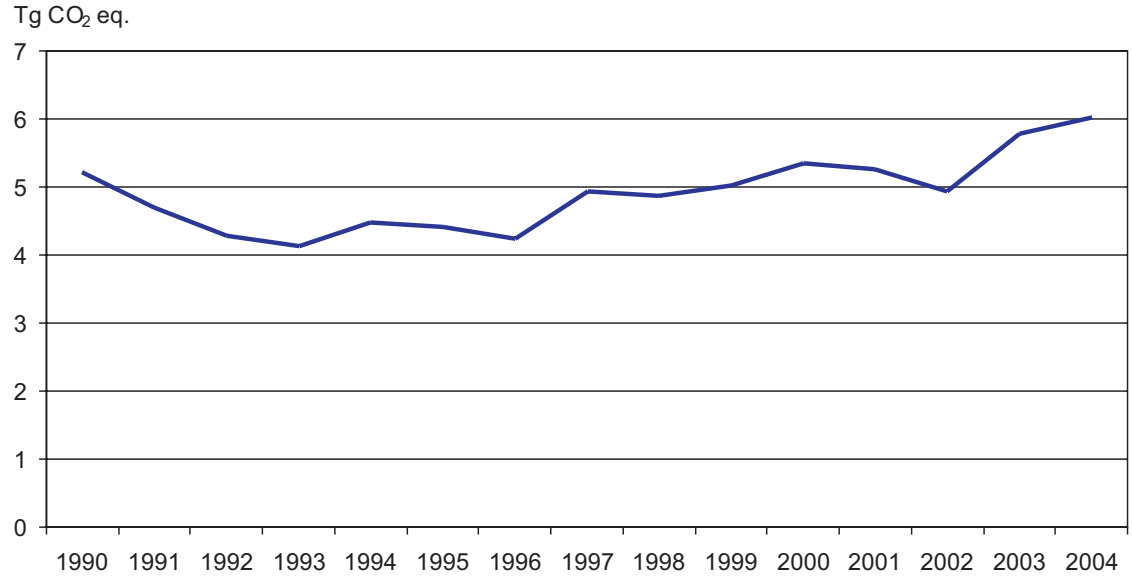


*Figure 9. Total GHG-emissions from Industrial processes in 1990–2004, Tg $CO_2$-eq.*

### 3.1.4 Past trends in the Agricultural sector

Finland's agricultural greenhouse gas emissions in 2004 were 5.6 Tg $CO_2$ equivalents in total. The increase in the emission level compared to the last submission is due to the development of calculation methods and updating of calculation parameters and activity data. Agriculture is the third largest greenhouse gas emission source category after the energy sector and industrial processes with a 6.9% share of total greenhouse gas emissions in 2004.

Agricultural emissions have decreased about 21% over the period of 1990–2004 (Figure 10). One reason for this is Finland's membership in the EU that resulted in changes in the economic structure followed by an increase in the average farm size and a decrease in the number of small farms (Pipatti 2001). Those changes caused also a decrease in the livestock numbers except for the number of horses that has increased in the recent years. The reduced use of nitrogen fertilisers and improved manure management resulting from the measures taken by the farmers as a part of an agri-environmental program aiming to minimise nutrient loading to water courses has also decreased the emissions.

Some fluctuation can be noticed in the time series. This is mainly due to changes in animal numbers, which is largely affected by agricultural policy. Also, $CH_4$ and $N_2O$ emissions from manure management are affected by the fluctuation in animal numbers as well as the proportion of manure managed in different manure manage-

ment systems which is dependent on animal species. $N_2O$ emissions from agricultural soils are affected for example by the amount of synthetic fertilisers sold annually, animal numbers and crop yields of cultivated crops which may have large variation between the years.

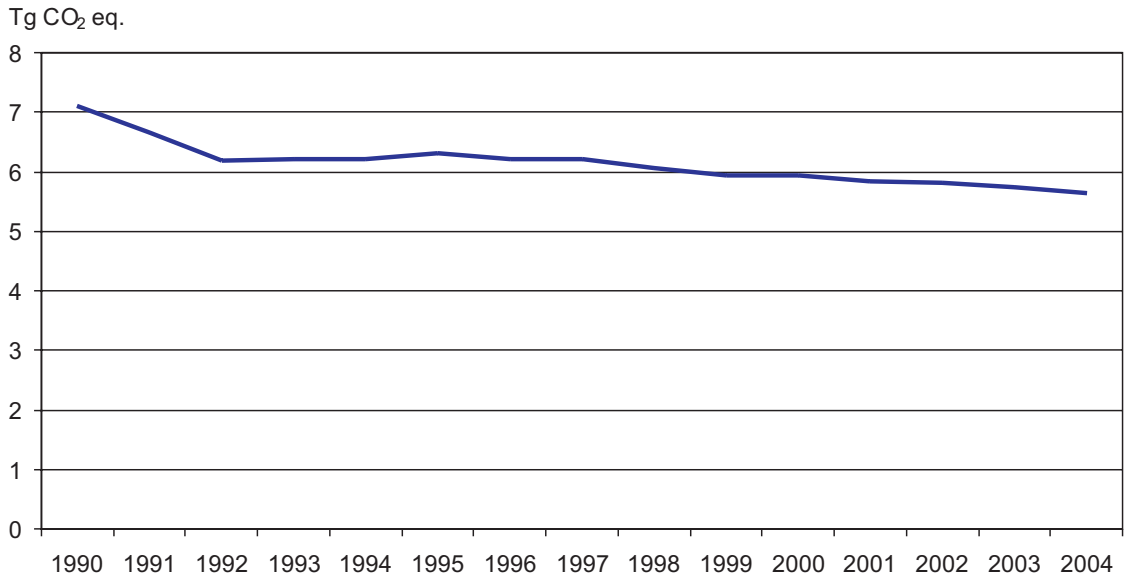


*Figure 10. Total GHG-emissions from the Agriculture in 1990–2004, Tg $CO_2$-eq.*

### 3.1.5 Past trends in the Waste sector

Emissions from the waste sector were 2.6 Tg $CO_2$ equivalent in 2004. This was about 3% of the total greenhouse gas emissions in Finland. Solid waste disposal on land (landfills and dumps) causes relatively large $CH_4$ emissions in Finland while emissions from wastewater handling and from composting are smaller. $CH_4$ emissions from landfills are the most important greenhouse gas emissions in the waste sector. Since 1990 these emissions have decreased by more than 30%. The decrease has been mainly due to the implementation of the new Waste law in Finland in 1994. At the beginning of the 1990s, around 80% of the generated municipal waste was taken to solid waste disposal sites (landfills). After the implementation of the new waste law, minimisation of waste generation, recycling and reuse of waste material and alternative treatment methods to landfills have been endorsed. Similar developments have occurred in the treatment of industrial waste, and municipal and industrial sludges.

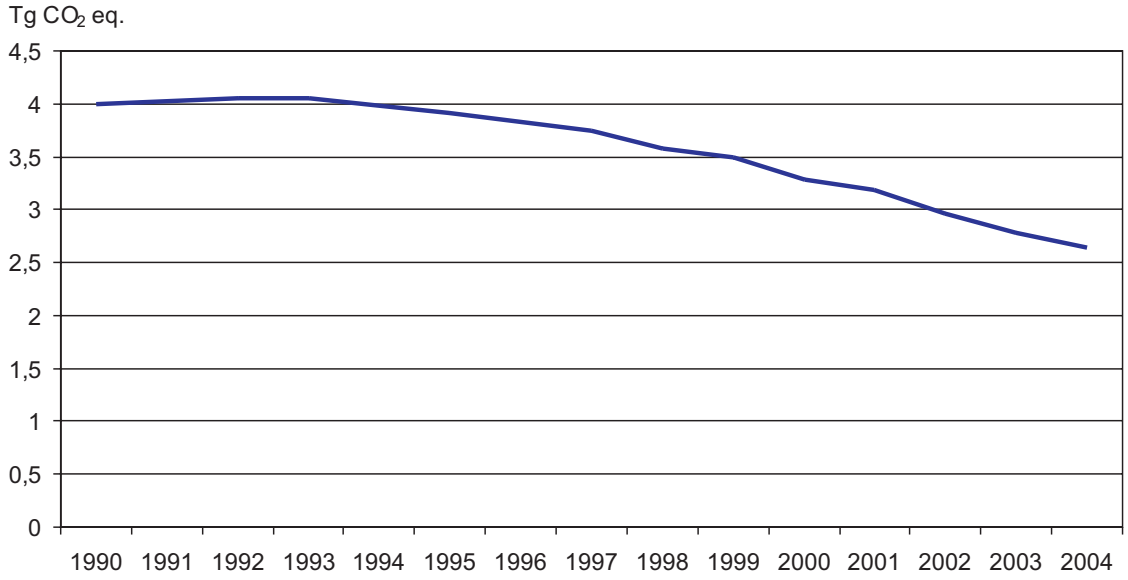


*Figure 11. Total GHG-emissions from the Waste sector in 1990–2004 (Tg $CO_2$-eq.)*

### 3.1.6 Trends in Land use, land-use change and forestry

The LULUCF sector as a whole acts as a net carbon dioxide sink in Finland. The $CO_2$ emissions from cropland and grassland, direct $N_2O$ emissions from fertilisation of forest land and $CO_2$, $N_2O$ and $CH_4$ emissions from biomass burning on forest land are much smaller than removals, i.e. the increase in carbon stock in tree biomass on forest land (Figure 12). In 2004 the LULUCF sector as a total was a sink of about 18.5 Tg $CO_2$-eq., which is about one fifth of the total greenhouse gas emissions from other sectors in Finland.

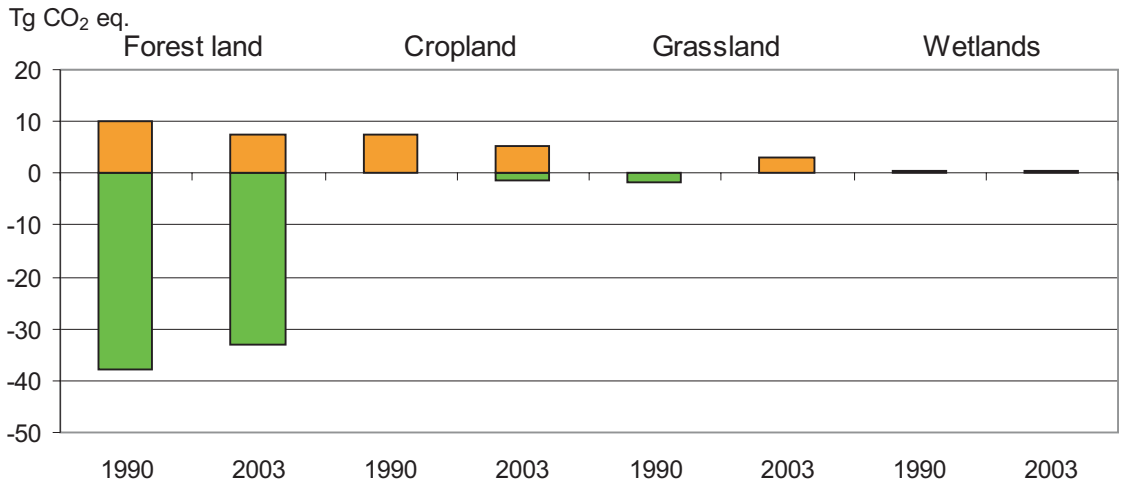


*Figure 12. Greenhouse gas removals (negative figures) and emissions (positive figures) in the LULUCF sector in 1990 and 2004 by land use categories (Tg $CO_2$-eq).*

### 3.1.7 Other sectors

The only direct greenhouse gas source identified in this sector is the use of $N_2O$ in industrial, medical and other applications. In Finland $N_2O$ is used in hospitals and by dentists to relieve pain and calm fear, and for detoxification. In addition to the medical use, $N_2O$ is used also for other purposes, but no specific data are available on this.

All delivery is currently based on import of the $N_2O$ to Finland. These $N_2O$ emissions have been fairly constant during the whole of the 1990s, around 0.2 Gg per year (less than 0.1% of the total national emissions).

In this category, Finland also reports indirect greenhouse gas emissions (NMVOC), half of which are due to paint application, the other half coming from a large number of sources. The NMVOC emissions in this category have declined by 45% since the year 1990.

## 3.2 With Measures projections

### 3.2.1 The starting points of the With Measures-projection

For the updated Energy and Climate Strategy, the energy consumption and procurement scenarios and emission scenarios have been updated. The scenarios have

been compiled so that the "WM scenario" (With Measures) shows the trend with no new measures taken.

Key for the future trend in emissions is, on the one hand, economic growth and its structure, and, on the other, the structure of energy production, especially the solutions in energy procurement. The long-term variation in emissions may be several million tonnes annually, depending on whether the Finnish procurement of electricity is based on emission-free or low-emission fuels and forms of procurement, such as renewable energy sources, nuclear power or electricity imports. However, only some of these decisions can be directly influenced through energy policy.

The calculations of With Measures-projection are based on average growth of over 2% in the gross domestic product over the whole period considered. At the end of the period examined, the economic growth will be somewhat slower than at its beginning.

*Table 1. The growth in the period 1990–2004 and in the future 2005–2020, %/a.*

| | 1990–2004 | 2005–2020 |
|---|---|---|
| **Industry** | **3.8** | **2.3** |
| Manufacture of metals | 4.2 | 1.7 |
| Chemical industry | 2.5 | 1.4 |
| Pulp and paper production | 3.1 | 1.4 |
| **Services** | **1.8** | **2.4** |
| **Other sectors** | **-1.6** | **0.7** |
| **Total GDP** | **2.0** | **2.2** |

It is estimated that services will grow slightly more quickly in the whole period examined than the gross domestic product, which increases the proportion of services of the national economy. The industrial production will become less energy- and capital-intensive. The fastest growing industry will be the electrotechnical industry, which is estimated to grow by an average of 3.5% per year in the period examined. The average growth of production in energy-intensive lines of business, the forest industry, the chemical industry and the metal manufacture is estimated to remain clearly below the average growth level of industry, which will reduce their proportion of industrial production.

The trends of prices for fossil fuels are based on assessments of IEA and European Commission.

The technological development is assumed to proceed as a trend both in energy and other sectors. No quick technological leaps or transfers are expected in the period examined. The best commercial technology will be introduced gradually and the increasingly efficient technology will be commercialised evenly.

EU's Emission Trading Scheme is not included in the WM-scenario.

As a result of demand assumption above the total consumption of electricity will grow by an average of a little more than 1% per year for the period examined. The most remarkable change in the supply of electricity is the fifth nuclear power unit, which is anticipated to be completed in 2009. Net imports of electricity are assumed to decrease due to decreasing opportunities of other Nordic countries to export electricity. The production of hydropower will remain at approximately the current level. The amount of wind power and other new modes of electricity production will increase but remain at a quite slow level.

The Finnish greenhouse gas emissions have grown since 1990, and reached a peak in 2000–2004 which was 20% above the 1990 level. Figure 13 shows the trend in greenhouse gas emissions. The increase in emissions is almost entirely caused by the increased emissions from the ETS sector, as referred to in the EU emissions trading directive, or mainly energy production and industrial processes. The emissions of the non-ETS sectors, mainly traffic, individual heating and agriculture, remain at the current level as a whole.

Finnish greenhouse gas emissions will take a downward turn during the Kyoto Protocol period between 2008 and 2012 once the fifth nuclear power plant is completed. According to estimates, the emissions will, however, exceed the obligation level by about 45 million tonnes, or by about 13% during those years. Calculated in terms of annual averages, the emissions exceed the Finnish commitment by about 9 million tonnes. After the Kyoto obligation period, the greenhouse gas emission will start to grow if no measures are taken. However, the growth rate will be clearly slower than in the past.

### 3.2.2 Greenhouse gases by sectors in WM-scenario

The greenhouse gas emissions by sectors in the history and according the WM-projection in the future are summarised in Table 2. Emission trends by sector are presented in detail in the following.

*Table 2. The greenhouse gas emissions by sector in WM-projection, 1990–2020, Gg $CO_2$-eq. (Gg = kt).*

| | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|---|---|---|
| Energy | 41 718.4 | 44 492.6 | 42 500.6 | 50 891 | 49 454 | 50 344 | 53 313 |
| Transport | 12 822.6 | 12 201.2 | 13 094.4 | 13 747 | 13 982 | 13 851 | 13 908 |
| Industry | 5 219.2 | 4 416.7 | 5 343.9 | 6 057 | 7 219 | 7 512 | 7 774 |
| Agriculture | 7 108.4 | 6 308.8 | 5 949.1 | 5 404 | 4 718 | 4 381 | 4 309 |
| Waste | 3 991.8 | 3 924.7 | 3 292.3 | 2 961 | 2 692 | 2 524 | 2 416 |
| Solvents and other use | 621.3 | 527.3 | 464.3 | 469 | 474 | 478 | 483 |
| **Total** | **71 481.7** | **71 871.4** | **70 644.6** | **79 529** | **78 538** | **79 091** | **82 202** |

## Energy

Due to growth in the economy, the demand for energy will increase and thus the emissions. Although the consumption of energy and electricity will increase 30% and 33% from year 2000 to 2020, respectively, the emissions from this sector will not increase consequently due to the start of the fifth nuclear power unit of 1600 $MW_e$ around 2009. Of course the hydropower production in the Nordic area and the temperature effects the emissions from the energy sector. The economic growth and climate, especially annual precipitation in the Nordic countries swings the emissions.

## Transport

The traffic is estimated to grow a little slower than the total economy (GDP). More than 90 % of the transport sectors energy consumption is either gasoline or diesel. The passenger traffic will increase 20% from year 2000 to 2020. The freight traffic on roads will increase 27% from 2000 to 2020. The increasing energy efficiency in new vehicles will offset the increase in traffic. The consumption of gasoline will decrease and the consumption of diesel will increase moderately. The emissions from the transport sector will continue to be fairly stable and will increase only slightly.

## Industrial processes

Emissions from the industrial processes will increase aligned with the increasing production of the mineral products, mainly cement and lime and chemical products, mainly hydrogen.

**Agriculture**

The starting point for estimating the future agricultural production in the WM-scenario, or projection is that agricultural policy will continue to be implemented between 2007 and 2020 according to the decisions of the Agriculture and Fisheries Council of the summer of 2003 regarding the reform of the Common Agricultural Policy (CAP) of the EU. After 2007, the relative significance of income support compared to the total amount of subsidy is assumed to decrease.

In this scenario, agricultural production will gradually be adapted to the reform, which will directly reflect itself in the development of various production lines, income and foreign trade of agricultural products. A further starting point is the maintenance of the total amount of agricultural support on the current level in Finland. The agricultural reform involves the opportunity to implement national flexibility, which makes it possible to consider national special needs in agricultural production to some extent. The use of flexibility is not expected to have a considerable impact on the WM-scenario.

**Forestry (Land use, land-use change and forestry**)

In forestry, the National Forest Programme forms the backbone to national forest policy. The aim of the National Forest Programme is to meet the domestic and international requirements in order to develop forest management and protection along such lines that the forests will provide the Finns with as much work and sources of livelihood as possible, help them to remain healthy, vital and diverse and provide spiritual and physical recreation for the Finnish people.

Under the programme, the promotion of sustainable forest management will continue. This will ensure significant removals of carbon from the atmosphere in the future as projected by the Finnish Forest Research Institute (FFRI).

In addition, the Government and stakeholders continue jointly to carry out initiatives to promote use of wood as an environmentally-friendly product. The NFP and other programmes also promote the use of wood for energy (biofuels). Climate impacts of these measures are not quantified.

**Waste**

The waste sector has steady decline in its emissions due to the waste management policy in force.

### 3.2.3 Greenhouse gas emissions by gases

The greenhouse gas emissions by gases according to the WM-projection both historically and in the future are presented in Table 3. The $CO_2$ emissions are expected to be about 10 Tg over the level of 1990 as a result of increasing demand for energy. The other $CO_2$ emissions apart from combustion and $CH_4$ and $N_2O$ are fairly stable or have a steady declining trend. The emissions from the F-gases are relatively sharply increasing.

*Table 3. The greenhouse gas emissions by gases in WM-projection, 1990–2020, Gg $CO_2$-eq. (Gg = kt)*

| Emissions by Gases | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|---|---|---|
| $CO_2$ | 57 116.6 | 58 414.0 | 57 727.1 | 67 239 | 66 850 | 67 706 | 70 814 |
| $CH_4$ | 6 409.0 | 6 187.7 | 5 496.4 | 4 688 | 4 195 | 3 996 | 3 945 |
| $N_2O$ | 7 928.0 | 7 212.7 | 6 897.8 | 6 813 | 6 505 | 6 261 | 6 215 |
| HFCs | 0.0 | 29.3 | 501.6 | 742 | 930 | 1 061 | 1 155 |
| PFCs | - | - | - | 13 | 16 | 19 | 20 |
| $SF_6$ | 86.5 | 57.5 | 31.9 | 34 | 43 | 49 | 53 |
| **Total GHG-emissions** | **71 481.7** | **71 871.4** | **70 644.6** | **79 529** | **78 538** | **79 091** | **82 202** |

The total emissions in 2010 are above the target level for Finland. The average annual emissions (excluding LULUCF) in the Kyoto Commitment period 2008–2012 are estimated to be 79.9 Tg $CO_2$-eq. Finland‘s decision regarding Articles 3.3. and 3.4 of the protocol lifts the total emissions up by 0.9 Tg, although the LULUCF as a whole is expected to be a net sink. The average annual emissions in the Commitment period 2008–2012 are as follows:

| | |
|---|---|
| GHG emissions according to WM-scenario | 79.9 Tg |
| The net effect of Article 3.3 of the Kyoto Protocol | 0.9 Tg |
| Total | 80.8 Tg |
| AAUs to be used | 71.5 Tg |
| The deficit to be covered | 9.3 Tg |

### 3.2.4 Sensitivity analysis

There are many driving forces causing GHG-emissions of which government actions have little if any effect, for example, activities such as net electric import, do-

mestic hydropower production and the growth of energy-intensive industry. Many other assumptions also affect the projections or scenarios.

The trend of emissions will decisively depend on few factors that are difficult to predict. The general economic growth is one factor, but the growth of the energy-intensive branches of the industry, especially pulp and paper industry, manufacture of metals and the chemical industry, will have a special role. These branches constitute about 5% of the gross domestic product, but they consume more than one third of energy and also electricity.

If the growth of the energy-intensive industrial sectors of industry is only moderate the GHG-emissions will remain on a lower level than expected.

On the other hand, the emissions might be on a higher level than expected if the production conditions of the energy intensive sectors of industry are better than expected.

The main assumption and the emissions of the sensitivity analysis are presented in Tables 4–5.

*Table 4. Economic growth of energy-intensive industry in the different sensitivity analysis in 2004–2020, %/a.*

| | 2004–2020 | |
|---|---|---|
| | WM+1%/a | WM-1%/a |
| Manufacture of metals | 2.7 | 0.7 |
| Chemical industry | 2.4 | 0.4 |
| Pulp and paper production | 2.4 | 0.4 |

The results of the sensitivity analysis are presented in Table 5.

*Table 5. Total GHG-emissions in the case of different sensitivity analysis, Gg $CO_2$-eq.*

| | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|
| WM | 79 529 | 78 538 | 79 091 | 82 202 |
| WM energy intensive industry +1 %/a | 79 529 | 80 920 | 84 101 | 90 057 |
| WM energy intensive industry -1 %/v/a | 79 529 | 76 259 | 74 928 | 75 388 |

# 4 How Finland will meet its commitment under the Kyoto Protocol and BSA

## 4.1 Introduction

As shown in the Chapter 3.2 greenhousegas emissions will be some 9 Tg over the target of Kyoto Protocol for Finland. However, Finland will meet its obligation under the Kyoto Protocol and the Burden Sharing Agreement with the measures defined in Finland's Energy and Climate Strategy. The most important measures are presented in Table 6.

## 4.2 The starting points of the With Additional Measures -projection

The assumptions on the development of the national economy and on energy prices on the world market are identical in the WAM (With Additional Measures) Scenario and in the WM Scenario. In addition, the assumptions concerning nuclear power, hydropower, natural gas network and the capacity of cross-border electricity transfer are similar as well as the assumptions concerning the prices of fuels. The differences between the scenarios are in the political sector. Most importantly, the EU emissions trading and the use of Kyoto mechanisms are included in the WAM Scenario. It was assumed that the price will be EUR 15/t $CO_2$ in 2005–2007 and EUR 20/t $CO_2$ thereafter.

Domestic measures defined in the strategy together with the EU's emissions trading will decrease the total consumption of energy and change the energy balances from that of the WM Scenario. The price of emission allowances is a central element in the WAM Scenario. The price of energy depends on the price of emission allowances. Higher price of allowances will decrease the demand for energy and increase the competitiveness of renewable energy; energy conservation will also be more efficient.

The starting point for the use of additional measures is that their technical implementation requirements and profitability would correspond with those of the emissions trading sector. In practice, such an accurate criterion will not be achieved, because the profitability of the reduction measures on the use of fuels by transport and

agricultural machines or the use of electricity in households and services as a function of electricity price is difficult, if not impossible to estimate.

The EU Emission Trading Scheme is introduced in the WAM-projection. In this there is only made a decision concerning the first trading period, 2005–2007 and this first period is estimated to have only little effect compared to the next trading period 2008– 2012. The EU emission trading system allows the emission trading sector – which covers about 50% of the greenhouse gas emissions – to have flexibility whether to reduce emissions or buy allowances. As and have someone else do the emission reduction. In this sense any national projection of emissions with the emission trading system inside it presents only one possibility how emissions could develop. However, EU ETS limits the total emissions within the EU from the entire emission trading sector.

The price of emissions allowances is a remarkable one. The price is expected to be 15 €/t $CO_2$ in the period 2005–2007 and 20 €/t $CO_2$ in the period 2008–2012 and thereafter.

Because there are no internationally agreed targets for emissions after the Kyoto period or targets that Finland would have set to itself, the emissions after the Kyoto period are not limited in the WAM-scenario under any gap. The policies and measures in place during the Kyoto period are assumed to continue at the same level. The EU emission trading is assumed to continue and the constant flat price (~ 20 t/€) for the allowance is used.

### 4.2.1 Domestic measures

The emissions trading sector covers about half of the total greenhousegas-emissions in Finland. The main domestic measure is the allocation of emission allowances under the EU's Emission Trading Scheme. This is estimated to reduce greenhousegas emissions by 5.9 Tg annually in the Kyoto Commitment period. Measures in the Transport Sector reduce greenhousegases by 0.5 Tg annually in the period. Emissions of F-gases are estimated to reduce 0.3 Tg by implementaion of F-gas Regulation. Measures in other sectors are estimated to reduce 0.2 Tg annually.

*Table 6. Measures to meet the Kyoto Commitment level and emission reductions, Tg.*

| | 2008–2012 |
|---|---|
| Allocation of emission allowances under ETS | 5.9 Tg |
| Use of Kyoto mechanisms | 2.4 Tg |
| Measures in the transport sector | 0.5 Tg |
| Implementation of F-gas Regulation | 0.3 Tg |
| Measures in waste and other sectors | 0.2 Tg |
| **Total** | **9.3 Tg** |

The promotions of energy efficiency and of renewable energy sources are the key policies in the Energy and Climate Strategy. They both go into all the sectors according to UNFCCC reporting guidelines (energy, transport, industrial processes etc.) but have biggest effect in energy sector, which again is almost the same as ETS. Both in energy efficiency and in use of renewable energy sources Finland is in the front line with a large share of combined heat and power (CHP) production, use of renewable, especially biofuels etc.

The energy efficiency and renewable energy sources have several directives or other Community legislation to promote them. This Community legislation will give the boundary conditions for promoting them but the national strategy and implementation will adjust these policies and measures with other policies and measures, mainly ETS and taxation. Both energy efficiency and renewable energy sources have national programmes and targets, which have be reviewed and adjusted to the present situation in the Climate and Energy Strategy.

In the WAM-projection of the non-ETS, the development of emissions is calculated assuming that more measures reducing emissions are implemented than those included in the WM-projection. The calculated starting point for the measures is that their technical implementation requirements and profitability would correspond to those of the emissions trading sector and the trading and non-trading sectors would be treated equally.

In practice, such an equally accurate measurement criterion will of course not be achieved, because the profitability of the reduction measures of the use of fuels of transport and agricultural machines or the use of electricity in households and services as a function of electricity price is difficult, if not impossible to estimate.

## Energy

The EU ETS covers almost the whole energy sector, with only small district heating plants and space heating outside its scope. So the allocation of emission allowances under the EU's Emission Trading Directive is the main additional measure in the energy sector. The reduction of emissions due to the ETS is estimated to be 0.8 Tg per year in the 2005–2007 period. In the second ETS-period, 2008–2012, the reduction is estimated to be 5.9 Tg per year.

The implementation of the EU emissions trading system will have a major impact on a more efficient use of energy. Caused by emissions trading, the increase in the market price of electric power and the increase in the cost of emission-intensive fuels will substantially improve the cost-efficiency of energy saving, thereby contributing to the attainment of energy saving objectives not only in the ET sector but also in the sectors outside it. Energy savings are particularly important in the non-ET sector because the emissions there are not limited through the use of emission rights, as is the case in the ET sector.

The energy saving measures include voluntary actions, such as energy saving agreements, energy audits and programmes specific to a sector or measure. The economic subsidies targeted at the development and implementation of energy efficient technology and innovative modes of operation play a central role in this respect. These measures are complemented, as necessary, with targeted regulatory steering, with due attention paid to cost-efficiency, as well as with communications aimed at specific target groups. Economic subsidies also play a central role in the promotion of renewable energy.

## Transport

Since the 1990's, the target of the transport policy has been that the growth in transport is kept below the growth of the national economy. Similarly, the indicative target for carbon dioxide emissions from transport set by the Ministry of Transport and Communications since 1994 has been to keep the emissions at the 1990 level. This target is not binding, but mainly intended to direct the action in this sector. The implementation of the target and measures has been followed on an annual basis. Unlike in many other countries, Finland has been able to maintain the emissions of transport at the level of 1990. The transport part of the WAM-projection of traffic is based on the above-mentioned indicative targets.

In the WAM-projection, economic guidance intensifies the measures presented in the National Energy and Climate Strategy. In particular, vehicle taxation and fuel taxation are developed in order to affect the consumers' choices, so as to increase the market share of the most energy-efficient vehicles and to shorten the daily distances travelled.

Energy-saving measures according to the energy conservation agreements concluded with the transport branch, e.g. transportation logistics are intensified. They include the utilisation of cargo-positioning systems and telematics for traffic guidance, so as to reduce the number of kilometres driven and driving with empty cars.

Guidance for the acquisition of heavy-duty transportation stock is also added in order to promote the choice of optimal vehicles in terms of fuel efficiency. Traffic policy measures and urban planning measures also have an impact on the growth of traffic and on the allocation of work between different forms of traffic. In particular in urban regions, the growth of traffic is controlled by including a point in the letters of intent related to traffic system plans that the municipalities in the region should promote land use planning that generates as little traffic as possible. The guidance of mobility will be increased in co-operation with various operators. Similarly, an increase in the market share of public transportation service and light traffic in urban regions is aimed at with numerous measures mentioned in the public transportation strategy and in the programmes for promoting light traffic.

By these measures the GHG-emissions are assumed to reduce by 0.5 Tg in 2010.

**Agriculture**

In agriculture the Common Agriculture Policy and its implementation is the key factor in determining emission in agriculture. In agriculture WAM-projection has not been developed. However, as part of national implementation the feasibility of additional measures will be assessed. The aim is to find out how small-scale production of biomass of fields and other renewable energy forms, such as biogas, on farms could be promoted. In addition, low-tillage measures will be explored. Impacts of these measures are not quantified.

**Measures in Waste and Other Sectors**

With regard to waste management, the additional measures included in the WAM -projection cover the pre-treatment and initial sorting of waste and the impact of the reduction of the treatment of waste on landfill in accordance with the implementation of the EC Landfill Directive, and the influence of the intensified waste prevention and collection of landfill gas. The projection restricts the treatment of biodegradable waste on landfill, restricts the growth of the amount of waste and promotes the treatment of landfill gases.

Emissions caused by machinery are reduced in the WAM-projection by developing information dissemination on the energy use of machinery and logistics and by uti-

lising voluntary energy conservation agreements. The opportunities to use biofuels as fuels for working machines are also studied, and initiatives in order to decrease greenhouse gas emissions are supported at the EU level.

The suggested measures of the heating sector in the WAM-projection regarding the production of new buildings include promotion of low-energy construction, as well as information guidance and development activity. The WAM-projection also includes the assumption that in accordance with the Energy Efficiency Directive, the regulations and operation models of energy certificates and audits will be completed by the beginning of the 2006. The deadline for the drawing up of the energy certificates is the beginning of the 2009. A calculation method will be introduced for the total energy efficiency of buildings. Requirements will be set for the energy efficiency of new buildings. Energy-efficiency demands will be set for existing buildings in connection with large renovations, either for the whole building or parts of it.

By these measures in the waste and heating sectors and with Machinery the greenhousegas-emissions are assumed to reduce by 0.2 Tg in the Kyoto Commitment period.

**F-gases**

The WAM-projection assesses the impact of the F-gas Regulation proposed by the Commission on emissions. The implementation of the Regulation would not affect the WM-projections of electricity distribution equipment and cellular plastics. In the WAM-projection, the emissions from other sources would change in the WM -projection as a result of the suggested measures included in the regulation. The emission reduction reached by these measures is estimated to be 0.3 Tg in the Kyoto Commitment period.

### 4.2.2 Use of the Kyoto mechanisms

According to the calculations ordered by the European Commission, the costs incurred by Finland for greenhouse gas reduction are the third highest in the Union. For this reason, and considering the economic burden caused by emission reduction, Finland begins with the premise that the State contributes to emission reduction by utilising the flexibility mechanisms provided by the Kyoto Protocol, which makes it possible to increase the Finnish allowable emissions correspondingly. The flexibility mechanisms available to government are the Joint Implementation (JI) projects, Clean Development Mechanism (CDM) and emissions trading (ET) bet-

ween the states. The State will be prepared to finance about 10 million tonnes of emissions procured through these mechanisms during the period from 2008 to 2012. When AAUs are being procured, the mutual cost-efficiency of various flexibility mechanisms will be taken into account. Moreover, the State can avail itself of approximately 2.0 million tonnes of verified emission reductions obtained through a pilot programme for 2008–2012.

The management of the flexibility mechanisms will be organised as follows: the Ministry of Trade and Industry is responsible for co-ordination while the Ministry of the Environment is in charge of the JI projects and the Ministry for Foreign Affairs for CDM projects. The JI and CDM are international projects to reduce greenhouse gas emissions. JI projects are implemented between industrialised countries whereas CDM projects are conducted between industrialised and developing countries. The administrative and financing plans and decisions related to the projects will be included in the plant-specific plan proposal for the allocation of emission rights focused on the period from 2008 to 2012. The respective legislation should be completed well before June 2006, the deadline for submitting the proposed allocation plan to the Commission.

The Ministry of the Environment will prepare the JI strategy and also study the feasibility of the national JI projects on that occasion. The implementation plan for the CDM projects will be drawn up by the Ministry for Foreign Affairs, with special consideration to the status of developing countries in the upcoming climate convention negotiations.

### 4.2.3 Articles 3.3. and 3.4 of the Kyoto Protocol

Articles 3.3 and 3.4 of the Kyoto Protocol concern emissions and removals from land use, land-use change and forestry (LULUCF) activities. Article 3.3 activities (afforestation, reforestation and deforestation) are based on land use changes and these activities are mandatory for the Annex I Parties. Activities under Article 3.4 (forest management, cropland management, grazing land management and revegetation) are optional for Parties.

The LULUCF sector as a whole acts as a net sink in Finland because emissions under this sector are smaller than removals. Reported net sink from LULUCF has been between 15.4 Tg $CO_2$-eq. to 36.1 Tg $CO_2$-eq. during 1990–2004.

Based on the study prepared by the Finnish Forest Research Institute (FFRI), article 3.3 is expected to cause net emissions about 0.9 Tg $CO_2$-eq./yr. over the period

2008–2012. This is due to some land-use changes from forest land to other land-uses and low carbon-sequestration rate in areas afforested or reforested since 1990.

The FFRI also studied various projections for future LULUCF indicating that Finnish forests would act as a net sink also in the future. The potential of cropland management activities has also been assessed. It is expected that $CO_2$ emissions from agriculture soils are declining. However, uncertainties associated with soil $CO_2$ emissions and removals and non- $CO_2$ emissions are still significant. Due to uncertainties, Finland will not apply activities defined in Article 3.4 of the Kyoto Protocol.

## 4.3 Greenhouse gases by sectors in WAM

Greenhouse gas emissions by sector according to the WAM-projection both historically and in the future are presented in Table 7. The emissions from the energy sector are decreased compared to the WM-projection and most of the energy sector belongs to the EU emission trading system. The reduction in the transport sector between WM- and WAM-projection is about ½ Mt. The measures in that sector are relatively expensive. Emissions from the industrial processes are about the same in WM- and WAM-projection as the emission reduction in an industrial process is generally very expensive or impossible. The emissions from the agriculture and waste sectors are almost the same as in WM-projection, because most of the cost-effective measures have already been implemented.

*Table 7. The greenhouse gas emissions by sector in WAM-projection, 1990–2020, Gg $CO_2$-eq. (Gg = kt).*

| | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|---|---|---|
| Energy | 41 718.4 | 44 492.6 | 42 500.6 | 48 350 | 41 890 | 40 461 | 42 365 |
| Transport | 12 822.6 | 12 201.2 | 13 094.4 | 13 488 | 13 246 | 13 144 | 13 172 |
| Industry | 5 219.2 | 4 416.7 | 5 343.9 | 5 862 | 6 765 | 6 872 | 6 991 |
| Agriculture | 7 108.4 | 6 308.8 | 5 949.1 | 5 404 | 4 718 | 4 382 | 4 310 |
| Waste | 3 991.8 | 3 924.7 | 3 292.3 | 2 958 | 2 618 | 2 338 | 2 097 |
| Solvents and other use | 621.3 | 527.3 | 464.3 | 469 | 474 | 478 | 483 |
| **Total** | **71 481.7** | **71 871.4** | **70 644.6** | **76 531** | **69 710** | **67 675** | **69 418** |

The greenhouse gas emissions by sector in WAM-projection without the use of Kyoto mechanisms is a bit higher than the emission level for Finland in the Kyoto

Commitment period. Finland will use on average 2.4 Tg Kyoto mechanisms in the period 2008–2012 to reach the commitment level.

## 4.4 Greenhouse gas emissions by gases in WAM-scenario

The greenhouse gas emissions by gases in the history and according the WM-projection in the future are presented in Table 8. The $CO_2$ emissions vary the most and the combustion of fossil fuels and peat is the main reason for these variations. The other $CO_2$ emissions apart from combustion and the $CH_4$ and $N_2O$ emissions are fairly stable or have a steady declining trend as well as F-gas emissions.

*Table 8. The greenhouse gas emissions by gases in WAM-projection, 1990–2020, Gg $CO_2$-eq. (Gg = kt).*

| Emissions by Gases | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|---|---|---|
| $CO_2$ | 57 058.1 | 58 384.2 | 57 716.9 | 64 303 | 58 356 | 56 900 | 58 896 |
| $CH_4$ | 6 409.0 | 6 187.7 | 5 496.4 | 4 798 | 4 237 | 3 938 | 3 768 |
| $N_2O$ | 7 928.0 | 7 212.7 | 6 897.8 | 6 765 | 6 488 | 6 243 | 6 195 |
| HFCs | 0.0 | 29.3 | 501.6 | 584 | 553 | 521 | 490 |
| PFCs | - | - | - | 17 | 16 | 15 | 14 |
| $SF_6$ | 86.5 | 57.5 | 31.9 | 65 | 61 | 58 | 54 |
| **Total GHG emissions** | **71 481.7** | **71 871.4** | **70 644.6** | **76 531** | **69 710** | **67 675** | **69 418** |

The total greenhouse gas emissions are presented in Figure 13.

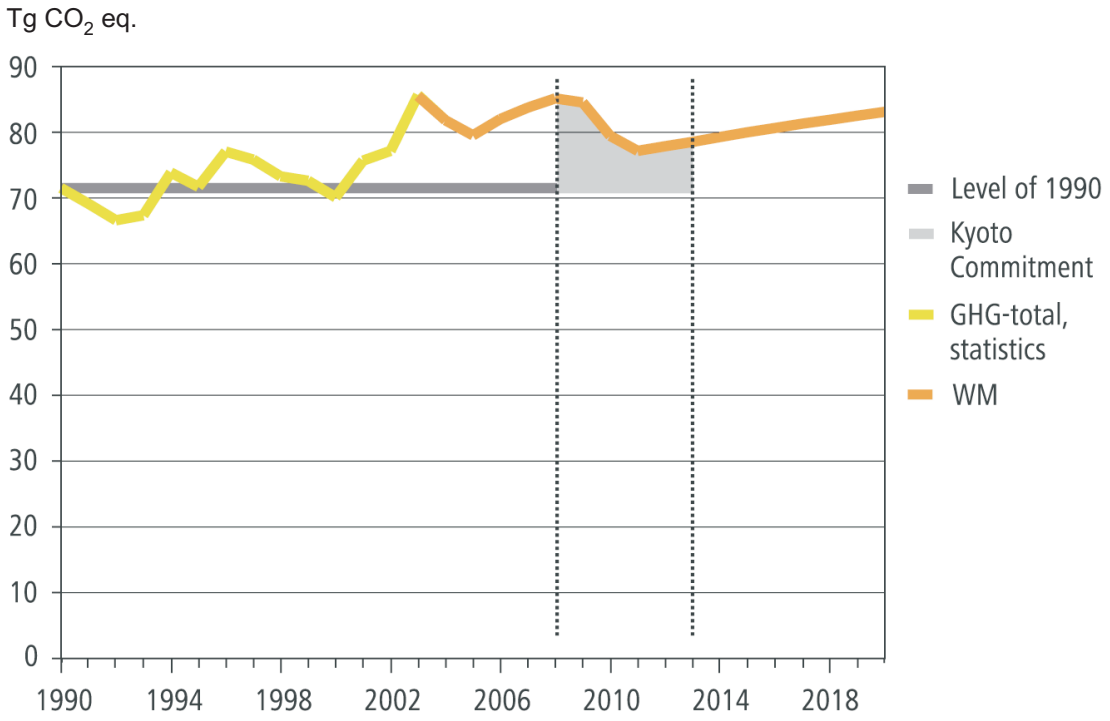


*Figure 13. Total greenhousegases in With Measures-scenario and the deficit to be covered in the Kyoto Commitment period, Tg $CO_2$-eq.*

# 5 Progress on other commitments

According to the Governments Resolution concerning the authority tasks in the field of climate policy was made in 2003.

Finland sent the proposal for its allocation plan under the Emission Trading Directive (EY87/2003) in March 2004. After some amendments the European Commission approved the Finnish Allocation Plan in autumn 2004. Emission allowances were distributed to installations under the directive and Emission Trading Act in December 2004 by a decision of the Government.

An updated energy and climate strategy was given to the Finnish Parliament in late 2005. The strategy defines the measures which are needed to achieve the Kyoto target for Finland.

## 5.1 National system for greenhouse gas information

According to the Resolution by Finnish Government of 30 January 2003, Statistics Finland assumed the responsibilities of the National Authority for Finland's greenhouse gas inventory at the end of 2004. Finland's National System was among the first to be established in accordance with the requirement of the Kyoto Protocol (Article 5.2). It is based on regulations concerning Statistics Finland, on agreement between the Statistics Finland and expert organisations (Finnish Environment Institute, MTT Agrifood Research Finland, Finnish Forest Research Institute) on the production of emission calculations and documentation as well as on co-operation between the responsible ministries. Statistics Finland also acquires parts of the inventory as a purchased service.

The resources of the National System for the participating expert organisations are channelled through the relevant ministries' performance guidance (Ministry of the Environment, Ministry of Agriculture and Forestry). In addition, other ministries participating in preparation of the climate policy take care in their administrative branches that the data collected in management of public administration duties can be used in the emission inventory.

In accordance with the Government Resolution, the ministries produce the data needed for international reporting on the content, enforcement and effects of the climate strategy. Separate agreements have been made on co-operation between Sta-

tistics Finland and several ministries. The structure of the estimation system corresponds to the horizontally organised preparation of Finland's climate policy. Statistics Finland assists in the technical preparation of the policy reporting.

The structure of the National System is shown in Figure 14. Statistics Finland has also set up an advisory board to which representatives from the expert organisations and the responsible ministries are invited. The advisory board decides about changes to the division of responsibilities in the National System. In addition, the advisory board supervises longer-term research and review projects related to the development of the inventory and reporting, as well as the responsibilities of international co-operation in this area (UNFCCC, IPCC, EU), including inventory reviews.

In September 2005, the staff of the Greenhouse Gas Inventory Unit in Statistics Finland included seven persons.

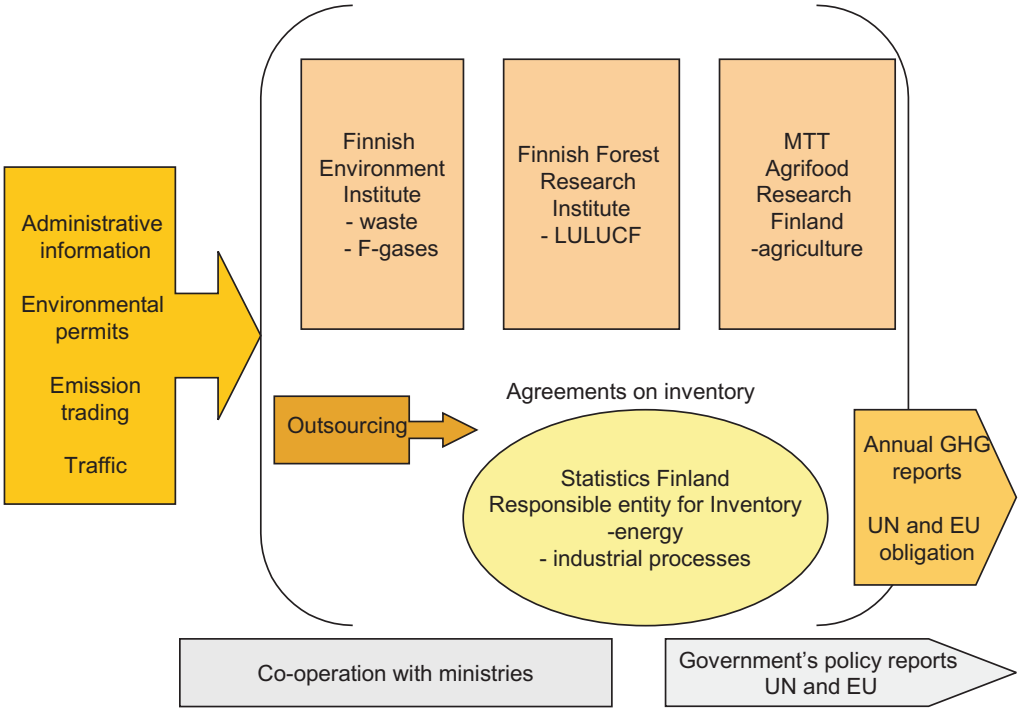


*Figure 14. The National System for greenhouse gas inventory in Finland.*

## Energy sector co-operation

Energy-related pollution is increasing rapidly in many parts of the developing world, and its prevention is becoming an important factor in the Finnish development co-operation. Over a long term it is important to introduce gradually renewable energy resources. Finland's involvement in this field has been directed in the

use of biomass via an enhancement in fuel wood production through sustainable forest management and community participation projects in e.g. Malawi, Tanzania, Zambia, Namibia and Mozambique. Finland has also supported solar and wind energy projects in Bolivia, Senegal and Afghanistan.

A partnership initiative in energy and environmental co-operation with Central American countries was announced by Finland at the Johannesburg World Summit on Sustainable Development (WSSD). Partnership initiatives are a new form of development co-operation. The idea is to seek financing from both the public and private sectors. The countries involved in the energy sector partnership initiative between Finland and Central America are Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama. The project promotes the use of renewable energy sources and clean technology in partner countries. It comprises experimental activity in the field of wind, solar, small hydro-electric and bio-energy sectors, energy resources surveys and feasibility studies, utilisation of Kyoto Protocol's clean development mechanism, development of energy markets and financing models, and technology transfer and training. The aim is to slow down the climate change and to improve the availability of energy services to the most impoverished people in these partner countries. Finland finances this three-year project to the amount of EUR 3 million.

In China, Finland has also participated in district heating projects in urban areas by giving concessional credits to minimise the emissions related to heat production. A concessional credit scheme has also been utilised to finance solar PV systems in remote areas in Vietnam.

**Other climate change related co-operation**

Finland has been participating in protection of marine coastal areas in the Mediterranean and Africa, which are also counted as actions under the UNFCCC. The flood control project in the Yellow River in China is one of the preventative measures to mitigate the factors related to the water level rise caused by climate change.

In Nicaragua, Finland has been involved in budgetary support to the environmental sector for the decentralisation of the environmental administration and to reverse the degradation process of the Nicaraguan environment. In Africa Finland has supported IPALAC (International Program for Arid Land Crops), which improves the utilisation and research concerning crops and trees in arid and semi-arid areas.

Finland has specific programmes and financial arrangements for transferring environmentally sound technology to developing countries. One example of Finnish bi-

lateral projects is a project called Energy and Environment Partnership with Central America. The aim of the project is to promote the use of renewable energy sources and clean technologies in the Central American region, to combat climate change and to make energy services more accessible to the poor.

The technology tranferred via projects includes solar systems for the vaccination programme in Honduras, photovoltaic systems for Panama, solar electrification in Guatemala and solar pumping system in El Salvador; use of sawdust, cofee residues and sugar cane bagasse as biomass which is suitable for energy co-operation in Belize Costa Rica, El Salvador and Nicaragua.

Another example is a project to support meteorological services in Mozambique. The aim is to rebuild the country's meteorological service and infrastructure which were damaged in a flood catastrophe in 2000. The meteorological observation system is being rebuilt and strengthened under the project. Also the telecommunication connections are improved under the project.

**Assistance to developing countries in implementing the Convention**

Since the early 1970s, Finland has actively participated in the building up of a global meteorological network to observe and monitor the physical and chemical elements of the atmosphere by providing systems for measuring the basic variables. Major programmes have been launched in co-operation with WMO. Under these programmes data is gathered on climate change, ozone depletion and transboundary dispersion of pollutants relevant to the implementation of UN global conventions. The purpose of the programmes is not just to collect information but also to contribute to preparedness for natural disaster prevention.

During the last ten years, Finland's total contribution to co-operation projects concerning meteorological technology transfer and education/training has been about EUR 16.5 million (Table 8–1). Projects have been carried out in some thirty countries all over the world. The Finnish Meteorological Institute has had the main responsibility in this work. Other Finnish institutions and companies have participated in some of these programmes.

A comprehensive Finnish programme to enhance systematic climatic observations in the developing world took place in 1987–1993 in SADC countries in southern Africa. The aim of this programme was to strengthen the national meteorological services in this region. The project was implemented in two phases; the objective of the first phase was to create the conditions for basic weather services in the region, while the second phase was designed to guarantee the continuity of these services

and establish the provision of applications of meteorology to the officials responsible for food production.

The total project budget of this programme amounted to EUR 11 million, of which 42% was for fellowships/expert services and 54% for equipment procurement and services. The programme, together with the meteorology programmes for Central America, was evaluated in 1999 as part of the thematic evaluation on environment and development in Finnish development co-operation. The findings proved favourable. Finland started a new project in Mozambique in 2000 with the aim of reconstructing the country's meteorological institute after the devastating floods earlier that year. Finland's allocation to this project will be around EUR 4 million.

## 5.2 Climate change impacts and adaptation measures

### 5.2.1 Observed changes

A comprehensive assessment of observed changes in Finland's temperature and precipitation was made by Tuomenvirta (2004). The longest temperature and precipitation data series had a length in excess of 150 years, but the systematic analysis was mainly focused on the 20th century.

According to linear trend tests, the mean temperature in Finland increased by 0.76°C in the 20th century. The warming took place during the first two and last three decades of the century, while a slight but statistically insignificant cooling occurred in the time period between them. There was also some evidence on warming in the late 19th century, but the number of observation stations was too small for a reliable analysis.

Most of the warming occurred in spring. The mean temperature in March–May over the whole country was 1.8°C higher in 1963–2002 as compared to 1847–1876. The diurnal temperature variation had become smaller, again mainly in spring. A similar trend has been observed widely on the land areas of the Northern Hemisphere, together with an increase of cloudiness.

The warmest year in the record was 1938, when the average over the whole country was 2.4°C higher than the mean for the reference period 1961–90. The second warmest year was 1989 (Fig. 6–1), the third warmest was 2000. By far the coldest

was 1867, a year of the great famine, with nation-wide average 3.4°C below the reference period.

No significant, nation-wide precipitation trends were found. The wettest year in Finland has been 1974, with a nation-wide mean of 740 mm, while the driest has been 1941, only 394 mm. As to the snow conditions, there is rather strong evidence that the maximum snow storage has increased in eastern and northern Finland since the late 1980s, while the snow accumulation has decreased in southern and western parts of the country.

### 5.2.2 Scenarios for the future

The first climate change scenarios for Finland were developed for SILMU, the Finnish Research Programme for Climate Change, in 1991. SILMU was a multidisciplinary programme of the Academy of Finland, and common scenarios were considered necessary in order to make the results of different research projects comparable. Three scenarios of temperature and precipitation change were developed

A new, more comprehensive set of scenarios for Finland's future climate and its impacts was developed in the FINSKEN project. The project developed scenarios up to 2100 of four key environmental attributes:

- climate
- sea level
- surface ozone
- sulphur and nitrogen deposition

In addition, a fifth set of scenarios was constructed to characterise future socio-economic developments in Finland, as these were considered to be important in determining the adaptive capacity of society to meet the challenges of global change (Kaivo-oja & al. 2004).

One of the key objectives of FINSKEN project was to develop scenarios that are mutually consistent. The consistency was pursued by relating all scenarios to the same global driving factors. Two types of future world, comparable with the IPCC scenarios, were described in FINSKEN: a consumer-driven “A-world” and a community-minded “B-world”. In the A-world there is strong economic growth in Finland accompanied by rapid increases in CO2 concentration, increased ozone pollution and nitrogen deposition, rapid climate warming and increased precipitation.

The B-world shows lower economic growth than the A-world, and less rapid increases in CO2 concentration, temperature and precipitation. After initial increases, ozone pollution and deposition are unlikely to exceed present levels and will probably be much lower by the end of the century.

During the period 2010–2030 an increasing concentration of greenhouse gases is projected to reinforce the warming of the atmosphere. While scenarios for temperatures and precipitation indicate marked differences from the Finnish climate in 1961–1990, natural variation in the climate is still of the same magnitude as the anticipated changes. This means that the natural climate variation may still considerably reduce or conversely might reinforce the changes caused by the strengthening greenhouse effect. By 2025 the average temperature is projected to rise slightly over 2°C relative to 1961–1990.

Over the period 2030–2080 ever-increasing greenhouse gas concentrations are projected to change both the global and Finnish climate signifi cantly. There are some differences in the magnitude of these changes, depending on alternative emission scenarios: in Finland the average temperature is projected to rise by 4 to 6°C and average precipitation by 15 to 25% by the 2080s compared to the period 1961–1990. Temperatures will rise the most in winter and precipitation also increases especially in winter. Total precipitation during the summer is not expected to increase as much as in the winter; some climate models even suggest that it could decline slightly.

### 5.2.3 Impacts of climate change and national measures for adaptation

The Finland's National Strategy for Adaptation to Climate Change was published in January 2005. It was based on the available scenarios, such as FINSKEN and other scenarios, other research information and expert assessments and judgements. A large number of leading Finnish researchers of climate change and its impacts, other experts and representatives of different sectors were involved in the preparation process, coordinated by the Ministry of Agriculture and Forestry. The comments sent by stakeholders were also taken into account in finalising the Strategy.

The strategy describes the impacts of climate change in the following sectors: agriculture and food production, forestry, fisheries, reindeer husbandry, game husbandry, water resources, biological diversity, industry, energy, traffic, land use and communities, building, health, tourism and recreation, and insurance. Anticipated impacts of climate change are related to:

- Increase in extreme weather phenomena: floods and heavy rains, drought, storms and wind and frost damages
- Reduced snow cover and changes in ground frost
- Increased precipitation
- Climate warming

The strategy describes the present sensitivity to climate change and outlines actions and measures to improve the capacity and to adapt to future climate change. Priorities identified for increasing adaptation capacities for the next 5 to ten years include: (i) mainstreaming climate change impacts and adaptation into sectoral policies; (ii) targeting long-term investments; (iii) coping with extreme weather events; (iv) improving monitoring systems; (v) strengthening research and development; and (vi) international cooperation. The strategy aims at reducing the negative consequences and taking advantage of the opportunities associated with climate change. The adaptation strategy includes a proposal on starting a research programme.

# References

Finnish Forest Research Institute. 2005. Maankäytön ja maankäytön muutosten seurannan ja raportoinnin kehittäminen kasvihuonekaasuinventaarion näkökulmasta. (The development of the monitoring and reporting of LULUCF from the viewpoint of GHG inventory), 36 p. (in Finnish)

Government of Finland. 2004. Government decision on the proposal for a national allocation plan by virtue of section 34 of the Emissions Trading Act (683/2004). Helsinki, 34 p.

METLA. 2004. Selvitys Suomen metsiä koskevista nieluarvioista (The carbon sinks of the Finnish forests). Maa- ja metsätalousministeriön tilaama muistio. (in Finnish)

Ministry of Agriculture and Forestry. 1999. Finland's National Forest Programme 2010. Ministry of Agriculture and Forestry, Publications 2/1999, 40 p.

Ministry of the Environment. 2002. Revised National Waste Plan for the period up to 2005. Helsinki, 26 p.

Ministry of Trade and Industry. 2001. Outline of the Energy and Climate Policy for the Near Future – National Strategy to Implement the Kyoto Protocol. Government report to Parliament. 24 November 2005, Helsinki 46 p.

Ministry of Trade and Industry. 2001. National Climate Strategy, Government Report to Parliament, MTI Publications 5/2001, Helsinki. 99 p.

Ministry of Trade and Industry. 2004. Implementation of the national climate strategy. MTI Publications 4/2004, Helsinki, 57 p.

Ministry of Trade and Industry. 2005. Kioton mekanismien hallinnoinnin työnjako ja resurssit (The division of responsibilities in the administration of the Kyoto mechanisms). MTI Publications 3/2005, Helsinki, 65 p.

Ministry of Trade and Industry. 2005. Energiatutkimuspolitiikan muutos Suomessa (The change of the energy research policy in Finland). MTI Publications 5/2005, Helsinki, 124 p.

Ministry of Transport and Communications, 2000. Towards intelligent and sustainable transport 2025, Publications of the Ministry of Transport and Communications, 1/2000, Helsinki.

Ministry of Transport and Communications, 2001b. Incorporating Walking into Transport Policy – A Proposal for a Walking Policy Programme, Reports and Memoranda B 6/2001, Helsinki (English Summary).

Ministry of Transport and Communications, 2001c. Public Transport Strategy. Publications and reports 2/2001.

Ministry of Transport and Communications. 2004. Promoting Pedestrian and Bicycle Traffic in Finland. The JALOIN programme 2001–2004. Publication 66/2004, 21 p.

Ministry of Transport and Communications, 2005. Environmental Guidelines for the Transport Sector until 2010. Programmes and strategies 5/2005, Helsinki, 40 p.

Statistics Finland. 2004. Statistical Yearbook of Finland 2004. Helsinki, 718 p.

Statistics Finland. 2004. Energy Statistics 2005. Helsinki, 153 p.

Statistics Finland. 2005. Report to facilitate the estimation of Finland's assigned amount under the Kyoto Protocol. Helsinki, 153 p.

Statistics Finland. 2005. Greenhousegas emissions in Finland 1990–2004. National Inventory Report to the European Union 15 January 2006. Helsinki, 153 p.

# Annex 1

# List of Finnish CCPM's

| CCPM | Implementation In MS | Status in MS | PAM quantitative reduction or qualitative category | Note. |
|---|---|---|---|---|
| **Taxation of energy products, Council directive 2003/96/EC** | Energy Taxation<br>*Act on Excise Duty on Electricity and Certain Fuels (1260/1996) Act on Excise Duty on Liquid Fuels (1472/1994)* | Implemented in 1997, latest change in 2003 (raised tax rates, extension of tax subsidies) | | *National PAM already in force but enforced by a CCPM* |
| **Emissions Trading Directive 2003/87** | Emissions Trading Act (683/2004) | Implemented | 0.8 Tg CO2 annually in 2005–2007 | |
| **Directive 2002/91/EC on the energy performance of buildings** | Two new laws are under drafting. Some amendments will be made in the existing Land Use and Building Act. | Under implementation | | *National PAM already in force but enforced by a CCPM* |
| **Directive 2001/77/ECon the promotion of electricity produced from renewable energy sources in the internal electricity market** | New action plan for renewable energy sources,<br>***Act No 1129 on certification and notification of the origin of electricity,***<br>*Government Decree No 1357 on certification of the origin of electricity* | Implemented in 2003 | | The Action Plan is partly under the Directive 2001/77/EC |

| | | | | |
|---|---|---|---|---|
| **The Act is mainly under the directive IEM 96/62/EC and partly under the directive 2001/77/EC** | Electricity Market Act *(386/1995)* | Implemented in 1995, last modified in 2003 | | *National PAM already in force but enforced by a CCPM* |
| **Council directive 1999/31/EC of 26 April 1999 on the landfill of waste** | Government decisions on landfills *(861/1997)* | Implemented | | *National PAM already in force but enforced by a CCPM* |
| **Council Regulation (EC) No 1783/2003** | Horizontal Rural Development Programme in Continental Finland (2000–2006) | Under implementation. Implementation started in 2005. | | Programme modification approved by the Commission in April 2005. |
| **Shifting the balance between modes of transport, in particular towards rail transport 2001/12/EC, 2001/13/EC, 2001/14/EC of 15/03/01** | Railway Act, which entered into force on 15 March 2003. | Implemented in 2003 | | |
| **Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport** | National report sent to Cion 30 Dec. 2004. | Under implementation | | Pilot programme 2003–2004; 5 % of 98E gasoline (sold in Southern Finland) was ethanol. The effect: 0.1 % of all gasoline and diesel was replaced by ethanol (2003). Programme ended, new under preparation (both gasoline and diesel) |

| | | | | |
|---|---|---|---|---|
| **Directive 2004/8/EC on the promotion of cogeneration based on a useful heat demand in the internal energy market** | Energy Taxation<br>*Act on Excise Duty on Electricity and Certain Fuels (1260/1996, amendment 1168/2002)* | Labeling under implementation | | *National PAM already in force but enforced by a CCPM* |
| **EMAS Regulation (EC) No 761/2001** | Act 914/2002 | implemented | | |
| **Energy labelling directives 2003/66/EEC, 2002/40/EEC,2002/31/EEC, 1999/9/EC, 98/11/EC, 97/17/EC, 96/89/EC, 96/60/EC, 95/12/EC, 92/75/EEC** | Various decrees and rules | implemented | | |