YMPÄRISTÖMINISTERIÖ
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MINISTRY OF THE ENVIRONMENT

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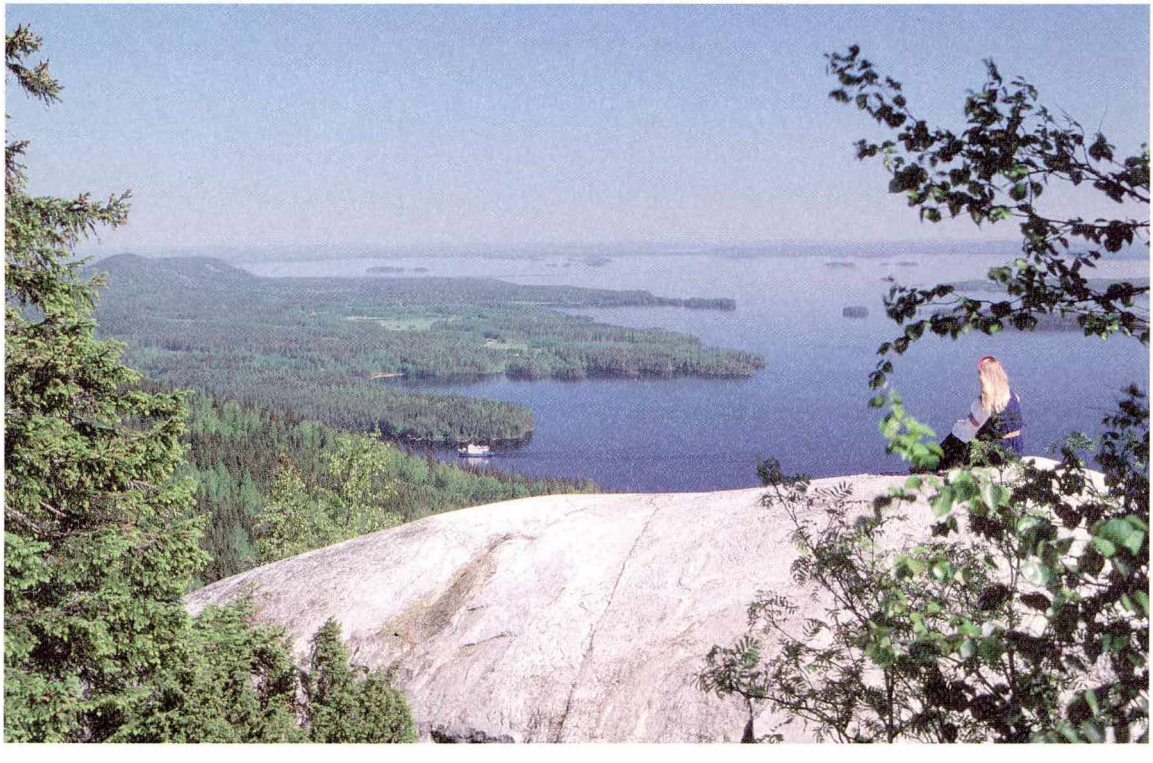
Finland's Natural Resources and the Environment 2003



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Ympäristö ja luonnonvarat 2003:3C
Miljö och naturresurser
Environment and Natural Resources

Tilastokeskus
Statistikcentralen
Statistics Finland

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Finland's Natural Resources and the Environment 2003

Helsinki 2003

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Foreword

The policy of sustainable development defined at the 1992 UN Conference on Environment and Development in Rio de Janeiro currently forms the basis of international environmental policy. The current state of affairs and the degree to which measures had been implemented were assessed at the 10-year follow-up meeting on sustainable development held in Johannesburg in August-September 2002. The implementation of sustainable development has been slower and has proven to be more difficult politically than was perhaps envisaged in Rio de Janeiro. Numerous agreements and measures are now perceived to be insufficient in the face of ever-worsening problems. On the other hand, the political advances achieved so far can be viewed as significant progress towards sustainable development. The European Union has taken a leading role in promoting sustainability. The EU's sustainable development strategy closely integrates ecological, social and economic sustainability, and the EU's sixth environmental programme integrates environmental challenges into other policy areas.

Finland has committed itself to implementing the Johannesburg Plan of Implementatition on a national level. The time scale of the Johannesburg Plan of Implementation is long – around 15 years. This review, Finland's Natural Resources and the Environment, reports on the national implementation yearly. The Finnish government programme is inclined towards economical, social and ecological sustainability, which means the balanced dovetailing of production activity, economic growth and environmental considerations. This review concentrates on following commitments that concern the environment and the maintenance of the carrying capacity of ecosystems. In accordance with the Johannesburg activity programme and the Government's programme for sustainable development, this review is published together with the Government budget proposal.

Finland's Natural Resources and the Environment review has been drawn up by a working group appointed by the Ministry of the Environment and chaired by Markku Nurmi, Director General at the Ministry of the Environment. The other members of the group were Pekka Pelkonen, Counsellor at the Ministry of Finance; Carita Putkonen, Financial Counsellor at the Ministry of Finance; Nina Broadstreet, Senior Adviser at the Ministry of Trade and Industry; Kati Ruuth, Researcher at the Ministry of Agriculture and Forestry; Saara Jääskeläinen, Senior Adviser at the Ministry of Transport and Communications; Jarmo Muurman, Senior Adviser at the Ministry of the Environment, and Helena Säteri, Development Director at the Ministry of the Environment. The secretaries to the working group were Jukka Hoffrén, Senior Researcher at Statistics Finland, who has also edited the review, and Maire Repo, Planning Officer, and Stella From, Project Coordinator, at the Finnish Environment Institute.

Helsinki, September 2003

Ministry of the Environment

Minister of the Environment
Jan-Erik Enestam

Statistics Finland

Director General
Heli Jeskanen-Sundström

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1 Environmental policy

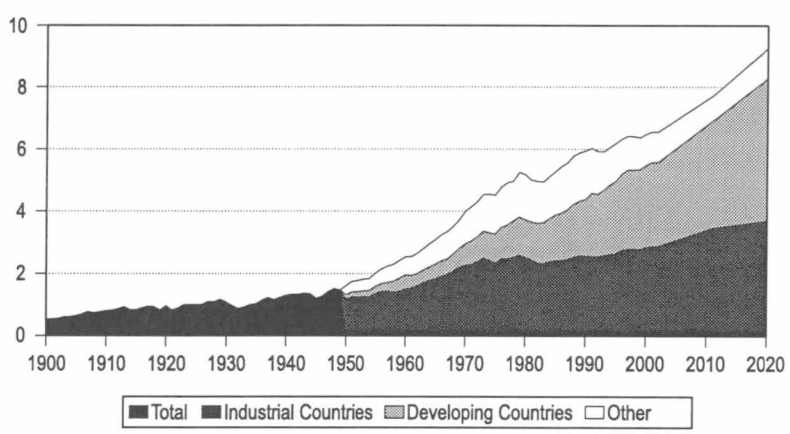
International environmental policy

The World Summit on Sustainable Development (WSSD) was held from 26 August to 4 September 2002 in Johannesburg, South Africa. New sustainability objectives were agreed upon, and Agenda 21 of the Rio de Janeiro Environment and Development Conference was accelerated. The principal issues of the summit were globalisation, poverty, production and consumption methods, environmental health, ecosystems and ecological management. One of the aims was to find a balance between ensuring the quality of the environment, strengthening the global economy and increasing social equality.

One of the biggest challenges for sustainable development is to prevent the acceleration of the greenhouse effect. At the UN Climate Summit in Kyoto in 1997 a global protocol was written for the reduction of greenhouse gas emissions. According to the protocol, industrial countries must reduce their greenhouse gas emissions by an average of 5.2 per cent under 1990 levels by the end of the 2008-2012 period. The reduction for the United States is seven per cent, for the European Union eight per cent and for Japan six per cent. The Kyoto Protocol is a first step towards lowering the amounts of greenhouse gases to a safe level, although this will not yet have a significant effect in slowing down climate change. According to the Intergovernmental Panel on Climate Change (IPCC), the global reductions requirement is in the region of 50-90 per cent.

Agreement was reached on the legal details of implementing the Kyoto Protocol at the UN Climate Change Conferences held in Bonn and Marrakesh in 2001. Ratifications were agreed upon within the European Union (EU) in May 2002 and these decisions also confirmed a Burden Sharing Agreement between the member states. The EU's environmental policy includes the long-term climate goal of limiting the average temperature increase to no more than 2 degrees Celsius above the preindustrial level. The EU has estimated that this will probably require a 70

Figure 1. World carbon dioxide emissions from fossil fuels, with forecasts until 2020 (billion tonnes)



NB. Figures for 2002-2020 are OECD forecasts.

per cent global reduction in the use of greenhouse gases compared to the 1990 level. Japan, Canada and Poland have also ratified the Kyoto Protocol, but the United States and Australia have remained outside. By early summer 2003, the number of countries ratifying the Protocol had risen to 108, with its entry into force still dependent on ratification by Russia, which is currently being prepared.

According to a UN estimate the costs to industrial countries of implementing the Kyoto Protocol will vary between 0.1 and 1.1 per cent of GDP per year, provided that emissions trading is practised. Without emissions trading the costs will be almost 2 per cent of GDP. If global emissions trading is adopted the costs will fall to 0.5 per cent of GDP. On the other hand, climate change is a serious risk factor for the global economy. Economic losses due to natural disasters have doubled at ten year intervals, rising over the last 15 years to a trillion euros. If the current trend continues, the economic losses over the next ten years will amount to EUR 150 billion per year.

The EU's sustainable development strategy was accepted by the European Council in Gothenberg in 2001. The strategy added an ecological dimension to the Lisbon longterm strategy, by which the EU is to become the world's most competitive and dynamic information based economy. It contains objectives and measures to tackle the challenges of climate change, traffic congestion, threats to public health and the depletion of natural resources. The European Council's annual spring meeting checks the implementation of the strategy and gives political guidance in support of sustainable development.

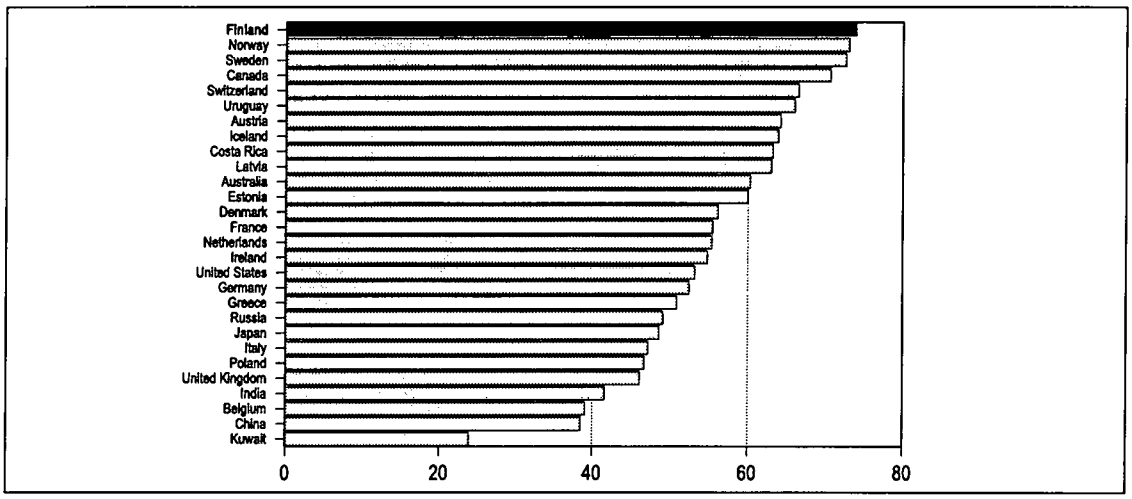
The EU's Sixth Environmental Action Programme aims to promote sustainable development and to contribute to the implementation of a European strategy. The programme's key challenges are climate change, health, environment and quality of life, nature and biodiversity, as well as the sustainable use of natural resources and waste management. With respect to climate policy, the primary goals are ratification of the Kyoto Protocol and the reduction of emissions accordingly. Concerning the use of natural resources, the emphasis is on sustainability and waste reduction. Attempts are being made to guide the consumption habits of citizens in more sustainable directions. An important tool in this is the Integrated Product Policy (IPP).

Sustainable development in Finland

According to the World Economic Forum (WEF) Environmental Sustainability Index (ESI), Finland made the most progress globally towards sustainable development in both 2001 and 2002. The index shows how well a country is achieving environmental sustainability in comparison with other countries. Finland's strengths are its water quality, the initiative shown by the private sector, the standard of science and technology, participation in international activities, air quality, environmental management and environmental health. Finland was poorly ranked in the indicators that measured consumption per capita. It was also weak in terms of the size of the ecological footprint and in its amounts of nuclear waste, greenhouse gases and emitted transnational pollutants.

The Finnish Government was one of the first in the world to set up a sustainable development programme, which it adopted in the summer of 1998. The key objectives of the programme include slowing down climate change, altering production and consumption

Figure 2. Environmental sustainability index (ESI) for designated countries, 2002



habits, reducing the use of non-renewable natural resources and maintaining biodiversity. A review of Finland's progress in meeting these goals was compiled in August 2002 for the World Summit on Sustainable Development in Johannesburg. An overall assessment of the efficiency of the sustainable development programmes and of the necessity for supplementary action was completed in May 2003. The Finnish Committee on Sustainable Development, established in 1993, was reappointed in January 2003. Its term of office will last until the end of 2007.

The Finnish national climate strategy was completed in March 2001, when the Finnish Government presented it to the Parliament. The strategy emphasises that Finland's greenhouse gas emissions will exceed the Kyoto targets unless determined efforts are made to combat present trends. Actions are needed in energy production and consumption, transportation, construction, community planning, the control of agricultural and forest industry emissions, and waste management.

The growth in electricity consumption and the closing down of old power plants require that new plants be built. Calculations show that more efficient use of energy and greater use of renewable energy sources can cover half of the required reductions in greenhouse emissions. The national climate strategy notes that the use of coal should not increase, and that a choice must be made between building new nuclear power capabilities and replacing coal with natural gas. The Government resolution of May 2002 on the construction of additional nuclear power is an action in line with the climate strategy and one which reduces the use of coal. Nevertheless, the production of co-generated heat and electricity plants should be explored as much as possible, with either natural gas or renewable energy sources as the primary source of fuel. In the national climate strategy it is estimated that the Government's financing requirement and the annual financing requirement that is satisfied through the energy tax system will rise from its current level by a good EUR 50 million per year on average by 2010. The most significant expenditures

would be for energy conservation and for financing the development of renewable energy sources.

The Finnish national climate policy is being implemented through broad collaboration. A Government resolution on actions and cooperation related to climate policy within the public administration was made in January 2003 and the work to update the national climate strategy was begun in summer 2003. This update, which focuses on checking the key issues, will be completed in 2004. The update will include more detailed guidelines related to Parliament's nuclear power decision and accompanying statements, the use of the Kyoto mechanisms and emissions trading.

Finland's Government programme aims to further the practical implementation of the actions decided on at the Johannesburg summit. The goal is to draft a national programme across administrative borders on behalf of ecologically, socially and economically sustainable production and consumption methods. The objective is more efficient use of materials and energy at all stages of the product life cycle.

Instruments of environmental protection

Government intervention in the realm of sustainable development has clearly stepped up in recent years. The current legislation on environmental protection came into force in March 2000, updating and harmonising existing legislation and permitting procedures. The environmental protection legislation aims to bring uniformity to the process of restricting and managing emissions. Special emphasis is laid on applying the best available technology (BAT) principle, on risk management and on the efficiency of energy use. A new Land Use and Building Act supporting sustainable development came into force at the beginning of 2000 and was reviewed in 2001. Its key objectives include promoting a good living environment and sustainable development in communities, as well as increasing citizen involvement and influence at the grassroots level. Other environmental laws that have been revised to meet the requirements of sustainable development include the Act on Compensation for Environmental Damage (1999), the Act on the

Figure 3. Trends in real GDP and the consumption of energy and materials in Finland (1990=100)

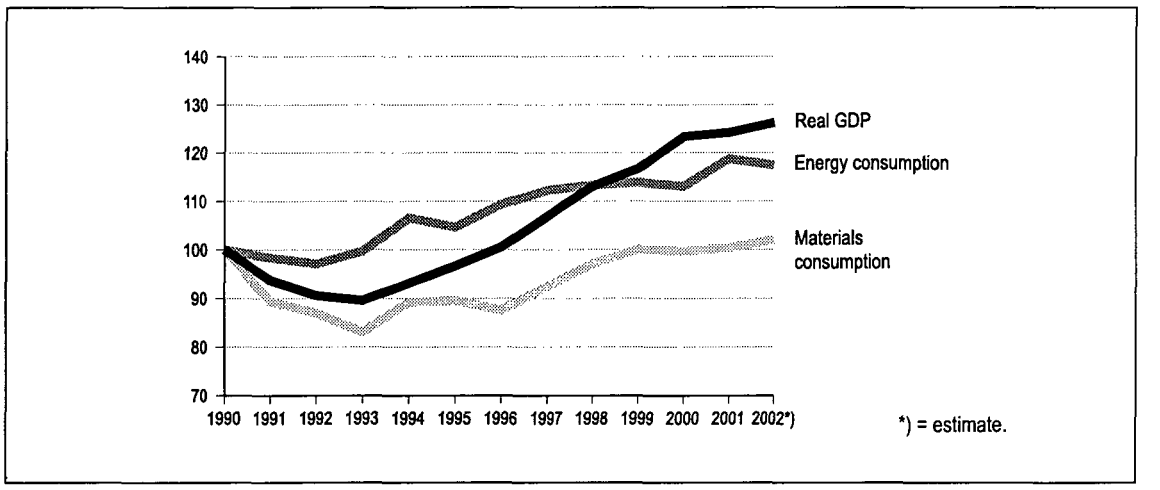
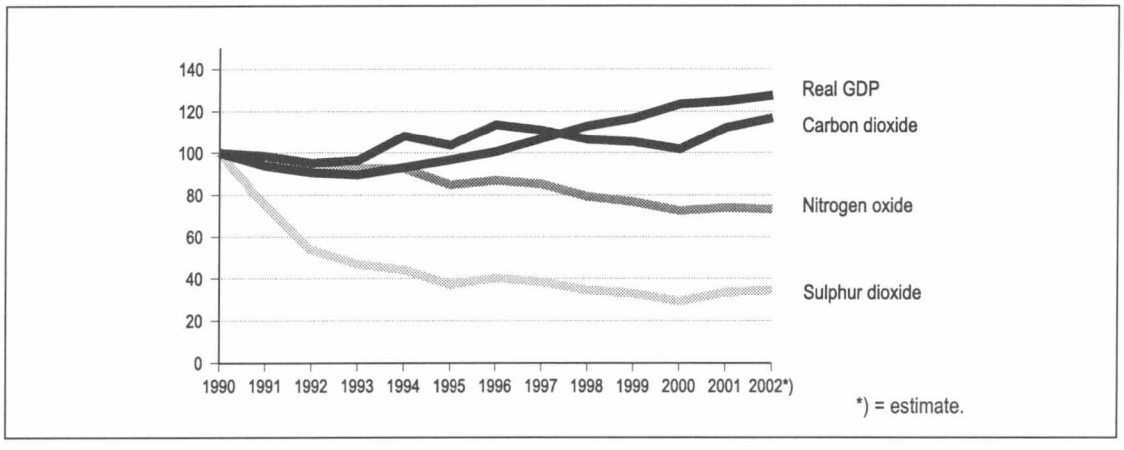


Figure 4. Trends in real GDP and atmospheric emissions in Finland (1990=100)



Assessment of Environmental Damage (1999), the Waste Act (1994), the Forest Act (1997), the Nature Conservation Act (1997) and the Extractable Land Resources Act (1997).

These laws have been complemented by a range of other measures, including environmental taxes, environmental labelling schemes and voluntary agreements. In terms of the amount of environmental taxes levied relative to GDP, Finland ranks well above the OECD (Organisation for Economic Co-operation and Development) average. In 1999 these taxes and fees equalled 3.4 per cent of the Finnish GDP. The major environmental tax in all countries is taxation on fossil fuels, particularly petrol and diesel. According to the Government programme, the structure of taxation will be revised in ways which advance sustainable development. Such ecological tax reform is aimed at reducing the use of non-renewable energy sources and environmental damage, encouraging recycling and improving the eco-effi-

1. Government taxes and fees relating to the environment (EUR million)

	2000 A	2001 A	2002 A	2003 B	2004 BP
Alcoholic beverage surtax*)	12	12	18	18	18
Soft drink surtax*)	1	1	2	2	2
Pesticide fee	2	2	2	2	2
Energy taxes	2 596	2 652	2 756	2 900	2 990
Oil waste fee	3	3	4	3	3
Car tax	1 059	922	1 023	850	1 020
Water protection fee	1	0	0	0	0
Oil pollution control fee	5	5	6	9	9
Vehicle tax	220	227	237	247	285
Motor vehicle tax	181	208	209	218	228
Waste tax	33	31	32	47	49
Total	**4 113**	**4 063**	**4 289**	**4 296**	**4 606**

A = Final accounts. B = Budget. BP = Budget proposal. *) = packaging tax.

ciency of products, and their consumption and energy supply.

A Government survey in 2000 indicated that increases in environmental taxes had helped to curb carbon dioxide emissions in the 1990s, so that by 1998 they were a few million tonnes lower than expected. However, the survey saw as a main probrem that any increases in energy taxation place a particularly heavy burden on energy- intensive industries and low-income households.

The ISO 14001 Environmental Management Standard was first published in 1996. In the same year, the first industrial companies joined the Eco-Management and Audit Scheme (EMAS) set up on the basis of an EU regulation. A reform that came into force in 2001 broadened the scope of the EMAS to include organisations from all sectors, not just industries. In addition, it became necessary for new entrants to the EMAS to have an environmental system meeting the ISO 14001 standard. The main difference between these two systems is the public environmental report that is required by the EMAS.

Since the reform of the EMAS, organisations can register several sites under the same registration number, instead of registering them on a site-by-site basis. At the end of May 2003 there were 40 EMAS-registered organisations in Finland, with a total of 45 sites. In many European countries the EMAS or ISO 14001 environmental management systems have had a positive effect on permit and supervision procedures. For example, companies have been granted reductions on permit and supervision costs, the number of supervision visits has been reduced, or the term of permits has been lengthened. In some countries the EMAS report fulfils the requirements of public environmental reporting. In Finland a reduction

2. ISO 14001 and EMAS environmental management systems in use in Europe

	ISO14001*)	EMAS**)
Germany	3 700	2 414
Spain	3 228	286
United Kingdom	2 917	77
Sweden	2 730	201
Italy	1 894	141
France	1 780	24
Denmark	1 088	126
Netherlands	1 073	27
Finland	**781**	**40**
Austria	301	319
Norway	278	56
Belgium	264	20
Ireland	170	8
Portugal	137	4
Greece	72	9
Liechtenstein	20	0
Luxembourg	17	1
Iceland	2	0
Total	**20 452**	**3 753**

*) = status on 31.12.2002. **) = status on 25.3.2003.

can be obtained on the fee for processing an environmental permit if the environmental system shortens the processing time. A decision was made in June 2000 to renew the ISO 14001 standard. The primary objective of this work will be to improve compatibility with the ISO 9000 quality standard. The new standard is due to be completed in 2004.

According to the Government programme, ecologically sustainable development will be fostered through an environmentally responsible purchasing policy. The public sector is indeed a major purchaser of industrial investment and consumer goods. Public sector purchasing can also take environmental perspectives into account in evaluating the total economic benefit of tenders. The objective of the "commitment to a sustainable future" process, started in the autumn of 2001, is to promote working practices that are ben-

eficial for sustainable development. The idea is that the local and central government organisations involved in environmentally responsible purchasing projects will learn from each other in developing the best practices. The economically most significant item in the government environmental protection expenditures is environmental support for agriculture, which is used to decrease water loading originating from agriculture, and which is partly financed by the EU. The second highest expenditures are directed at basic and applied research in the environmental sector and at development of environmental technology. The next largest contributions concern the operating costs of environmental administration and purchase and management of conservation areas. The public administration also plays a significant

3. Government taxes and fees relating to the environment (EUR million)

	2000 A	2001 A	2002 A	2003 B	2004 BP
Environmental administration	92	98	102	108	111
Central government	*40*	*41*	*42*	*46*	*47*
Local government	*52*	*57*	*60*	*62*	*64*
Development co-operation	49	83	81	..	..
Co-operation with neighbouring areas	10	10	13	10	10
Nordic Environment Finance Corporation	1	1	1	1	1
Research and development	158	154	157	156	159
Environmental conservation and management [1]	*17*	*17*	*17*	*17*	*17*
Use and management of natural resources[2]	*29*	*29*	*31*	*26*	*27*
Universities)*	*47*	*54*	*57*	*58*	*61*
Development of environmental technology [3]	*59*	*48*	*43*	*45*	*45*
Other environmental research [4]	*6*	*7*	*9*	*10*	*10*
Environmental NGOs	1	1	1	1	1
Environmental protection	37	37	40	54	59
Clean air and waste management	*10*	*10*	*11*	*8*	*18*
Water protection	*3*	*4*	*6*	*8*	*8*
Environmental management and decontamination	*24*	*23*	*23*	*38*	*33*
Nature conservation	75	63	59	57	69
Promotion of energy savings	3	3	6	10	10
Renewable energy investment support	20	17	28	24	24
Energy repairs for dwellings	–	–	–	15	15
Environmental protection of road traffic*)	37	39	49	126	146
Manure pit investment support	1	5	2	2	2
Environmental support for agriculture	276	282	284	306	312
Basic support	*250*	*248*	*252*	..	..
Special support	*25*	*32*	*31*	..	..
Others	*1*	*2*	*1*	..	..
Environmental support for forest management	4	4	4	4	6
Total	**764**	**797**	**827**	**874**	**925**

A = Final accounts. B = Budget. BP = Budget proposal. – = not in use. .. = data not available. *) = estimate.

1) = Environmental administration and the Academy of Finland.

2) = Agriculture and forestry administration.

3) = Technical research.

4) = Other administrative branches.

role in conducting and funding environmental research and development. The bodies involved in this work include the Academy of Finland, the National Technology Agency (TEKES) and the ministries operating in the environment, energy and natural resources sectors. It is estimated that these sources provide one-third of university environmental research funding. However, most university environmental research (nearly 60 per cent) is self-financed.

The financial instruments will be strengthened in 2004 through the introduction of a fixed-term waste management grant for end-of-life vehicles, which will prevent worsening of the environmental hazards from vehicle demolition and support implementation of the new stipulations regarding the producer's responsibility that will enter into force in 2007. The vehicle stock in Finland is currently renewing at a rapid pace. At the same time, increasingly stringent environmental requirements are being imposed on the vehicles for dismantling end-of-life vehicles. As a consequence of this, the past preconditions for the recycling system that were based on the demand for end-of-life vehicles for spare parts and on the demand formany small businesses engaged in stripping and dismantling old vehicles are gradually eroding as far as the oldest vehicle stock is concerned. The grant system is to remain in place until 2006.

Development co-operation

Finland is committed to helping developing countries achieve environmentally sustainable development. This is achieved in practice by supporting the use of sustainable natural resources and by developing environmental protection in co-operation with partner countries. Finland's development co-operation work aims to prevent environmental problems by, for example, supporting the development of environmental legislation and management, the transfer of environmental protection technology, the sustainable use of natural resources and the equitable division of the benefits obtainable from them, ecologically sustainable ways of making a living from the land, environmental research, training and education, and opportunities for citizens to participate in and prepare for the growing environmental requirements of trading. Every attempt is made to cater the need for environmental protection and the sustainable use of natural resources, as well as the possibilities of taking action in all forms of development co-operation including the strategic planning process and the actual creation of development co-operation programmes and projects.

The most important environmental projects in development co-operation are the agreements on the prevention of climate change and desertification, the agreements on the

4. Environmental aid in Finnish development co-operation 1996-2002 (EUR million)

	1996	1997	1998	1999	2000	2001	2002*)
Bilateral development co-operation							
Environmental aid as main aim	17	23	26	31	22	40	42
Environmental aid as significant side aim	20	22	21	18	25	42	35
Multilateral development co-operation							
Support to GEF	5	6	3	4	1	0	3
Support to multilateral ozone fund	1	1	1	1	1	1	1
Total	**43**	**52**	**51**	**54**	**49**	**83**	**81**

*) = preliminary data.

protection of biodiversity, and the activities of the UN Forest Forum (UNFF). Also important are the agreements on protecting the ozone layer in the upper atmosphere and on treating problem waste and environmentally hazardous chemicals. The Global Environment Facility (GEF) financing that supports the implementation of environmental agreements has been increased to EUR 7.5 million per year since the beginning of 2003. Around EUR 0.8 million per year has also been directed to a multilateral ozone fund that finances actions aimed at reducing the production and use of atmospheric ozone-depleting substances in developing countries. Support is also given to environmental protection projects organised by civic organisations in Finland and developing countries, as well as to the activities of several international environmental organisations. A pilot programme focused on environmental co-operation between municipalities in Finland and in developing countries was started at the beginning of 2002.

At the Johannesburg summit on sustainable development, Finland announced its own partnership initiative in energy and environmental co-operation with Central American countries. Partnership initiatives are a new form of co-operation in which financing is sought 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. The aim is both to slow down climate change and to improve the availability of energy services to the most impoverished people in these countries. The project comprises experimental activity in the wind, solar, small hydro-electric and bio-energy sectors, energy resources surveys and feasibility studies, utilisation of the Kyoto Protocol's clean development mechanism, development of energy markets and financing models, and technology transfer and training. Finland will finance this three-year project to the tune of EUR 3 million.

An agreement made under the partnership initiative was signed in June 2003 in Panama. The chairman of the board responsible for the practical activities of the partnership initiative is from Finland and the office is located in San Salvador. In addition to the respective governments, the project involves 15 Finnish partners and nearly 30 local ones. These include energy sector companies, research institutes, universities and financial institutions. The funding for the first nine projects, worth EUR 520,000 altogether, was also approved in June 2003.

Co-operation with neighbouring areas

Finland's environmental co-operation with northwestern Russia, Estonia, Latvia, Lithuania and Poland began in 1991. Finland has aimed to foster the ability of these countries to either solve their own environmental problems or prevent them before they occur. The goal has been to improve the state of the environment in neighbouring regions and the state of the Baltic Sea by giving assistance in water and air protection projects and waste management projects. Other areas of co-operation have included the development of environmental administration, the preservation of biodiversity, housing and construction, and land use. During 1991-2002, the Ministry of the Environment has backed environmental protection investments and technical aid projects at a total cost of EUR 122 million.

The Ministry of the Environment's neighbouring area strategy places emphasis on the protection of the Baltic Sea. In 2002 a Gov-

ernment resolution was made on Finland's Baltic Sea Protection Programme, with measures to be carried out both nationally and in nearby countries. Reducing the pollution originating from Finland is nevertheless the central objective of the programme. Maritime traffic on the Gulf of Finland has proliferated in recent years because of new ports having been built in Russia in the eastern end of the Gulf of Finland. The advancement of the safety of maritime traffic and the improvement of open sea oil spill prevention and response are the main aims of neighbouring area co-operation and are the priorities of Finland's Baltic Sea Protection Programme.

Co-operation to improve the environment in Estonia, Latvia and Lithuania has continued since the early 1990s. Joint efforts have been particularly focused on water protection. In those Baltic States that are about to become EU members in May 2004, the Ministry of the Environment has supported projects which promote the development of environmental management and support the application of EU environmental legislation. Efforts are still needed, though, so that the EU's environmental legislation will be implemented within the agreed transition periods. Bilateral co-operation has created a basis for implementing projects between multiple parties and financiers. This creates a good platform from which to continue projects aiming at a high level of environmental protection and for which EU funding is available. No new significant bilateral projects will be started in the Baltic States anymore - with the exception, however, of the prevention of external threats, such as oil spill prevention co-operation. The last Baltic environmental investments under the old commitments, supported by Finland, are either ongoing or almost underway.

International financial institutions, the European Union, Russia, and bilateral grant donors have committed themselves to promoting environmental protection in northwestern Russia. In 2002 a significant decision was made for the advancement of environmental investments in northern regions, with the formation of the Northern Dimension Environmental Partnership Fund. It is hoped that the new fund will accelerate and facilitate the implementation of environmental projects in northwestern Russia and the Kaliningrad region. Finland continues to back environmental investments in northwestern Russia and is preparing and implementing joint projects to reduce greenhouse gas emissions in Finland's neighbouring areas. In Russia, Finland supported the construction of a wastewater treatment plant in southwestern St. Petersburg under the Baltic Sea Protection Programme. The completion of the plant is the single most significant project reducing the pollution of the Baltic Sea.

Technical assistance has been given to countries near Finland to support nature conservation training and environmental research, and also projects that aim to preserve biodiversity and promote the sustainable use of forests. Technical also helps to implement the Clean Production programme and small co-operation projects in land use and construction.

5. Finland's contribution to projects in neighbouring areas 1991-2002 (EUR million)

	Investment projects	Technical assistance
Estonia	27	6
Latvia	12	2
Lithuania	9	2
Russia	23	11
Ukraine	1	0
Poland	16	0
Others*)	0	13
Total	**88**	**34**

*) = contributions to international financial institutions and co-operation projects in above countries.

Environmental protection by municipalities

The Rio Declaration requires the drawing up of local action plans for sustainable development. In Finland there are currently around 300 local municipalities (out of a total of 446) with ongoing projects related to Local Agenda 21, covering over 80 per cent of the population. Finnish legislation concerning the local administration and organisation of environmental protection was extended in 1997. Municipalities may assign the duties of the environmental protection authority to joint municipal bodies, but each municipality will still be responsible for taking environmental considerations into account in its own activities.

The campaign that was started in 1997 for reducing greenhouse gas emissions in municipalities was continued and expanded in 2000. Amongst the municipalities in the campaign some of Finland's largest cities can be found . The campaign covers 44 municipalities, representing over 45 per cent of the Finnish population. The campaign is part of the "Cities for Climate Protection" project for the reduction of greenhouse gas emissions in cities, which was set up by the International Council for Local Environmental Initiatives (ICLEI). The participating municipalities first formulate their greenhouse gas balance sheets and emissions forecasts. Next, they formulate and implement their own emissions reduction plans.

The model Finnish municipalities for sustainable transportation - Jyväskylä, Kerava and Lempäälä - are continuing projects started in 2001 to find new ways of promoting more environmentally friendly and human-friendly transportation, and to consider ways of disseminating information on these principles and adapting them for other localities. The projects are aimed at encouraging municipalities to improve the conditions and popularity of light transport, to develop public transport and to rationalise car traffic. Activities are based on the action plans of each municipality and are directed in each case by a local committee. The intention is to make the promotion of sustainable transportation a permanent part of municipal policy. The idea of setting up model municipalities for sustainable transportation has not been tried before in Finland. Similar projects have been undertaken in Odense (Denmark) and Lund (Sweden).

As part of the national climate strategy, the Ministry of Trade and Industry and the Association of Local and Regional Authorities have drawn up a municipal energy and climate agreement that is in force until 2005. The agreement continues the procedures agreed upon in 1997 for greater energy savings in municipal activities. Energy can be saved not only in the heating of buildings and in the consumption of electricity and water, but also in procurement and the fuel consumption of work machines. The agreement also covers the use of renewable energy

6. Environmental protection costs of municipalities (EUR million)

	2000	2001	2002*)
Waste management			
Investments	21	17	20
Operating costs	113	129	123
Waste water treatment			
Investments	39	44	40
Operating costs	109	116	121
Sewerage			
Investments	95	106	97
Operating costs	127	135	141
Environmental management			
Investments	6	11	7
Operating costs	50	52	59
Total	**560**	**610**	**608**
Investments	161	178	164
Operating costs	399	432	444

*) = preliminary data.

sources and an increase in combined electricity and heat production. Municipalities can either extend their current agreements (valid to the end of 2003) until 2005, or make a new agreement including renewable energy sources to last until 2005. To date, municipalities and joint municipal boards have made 75 co-operation agreements covering around 55 per cent of the municipalities' public housing. As a result of the agreement, municipalities will gain government grants for energy reviews, energy savings investments and training in efficient energy use.

The biggest environmental expense items for municipalities, joint municipal boards and municipal corporations are sewerage and wastewater treatment. Most of the costs arising from waste management, sewerage and wastewater treatment are covered by the fees collected from users, but part of the monies for investments in these projects comes from State funding. Expenditure on environmental management is financed by municipalities' own funding and through State support.

Environmental health

Many environmental problems clearly affect human health. The factors that harm health the most globally are related to air pollution, water pollution and traffic accidents. According to an estimate by the WHO, air pollution causes around 100,000 early deaths in Europe alone. In the future the greenhouse effect and the depletion of the ozone layer may be seriously hazardous to our health.

Finland has an excellent environmental health record in the areas of household water supply, food hygiene and safety from radiation. In contrast, there remains room for improvement in indoor and outdoor air quality, noise reduction, accidents, and in containing the psychological and social health risks of the environment. Estimating the number of health hazards and the economic impacts from a certain type of hazard is difficult, and the proposed figures vary a lot. In Finland it has been estimated that the impurities of community air and especially particles cause 200-400 early deaths per year, 30,000 cases of worsening asthma symptoms, and 30,000-40,000 children's respiratory infections. The expenses of health problems caused by street dust in Helsinki have been estimated to be as much as EUR 17.6 million per year. The costs of removing street dust are estimated at EUR 1.7 million per year. Poor indoor air quality at the workplace causes around EUR 1.4 billion in expenses per year, of which sick leave makes up EUR 0.5 billion and allergies make up EUR 0.5 billion. Significant expenses also result from drops in productivity, cigarette smoke, asbestos and radon.

Attempts have been made to limit the problem of suspended dust in the outdoor air by reducing street sanding in the winter, by improving the quality of the sand, and by more efficient street cleaning, especially during the spring. Despite preventive measures, the amounts of the most dangerous particles, those under 2.5 micrometers in diameter, have not been significantly reduced. These particles are so small that they can enter the air cells in the lungs and then intensify the symptoms of asthmatics and people suffering from lung and heart illnesses. Problems are also caused by carbon monoxide from traffic and oxides of nitrogen, especially in the centres of built-up areas and alongside busy roads.

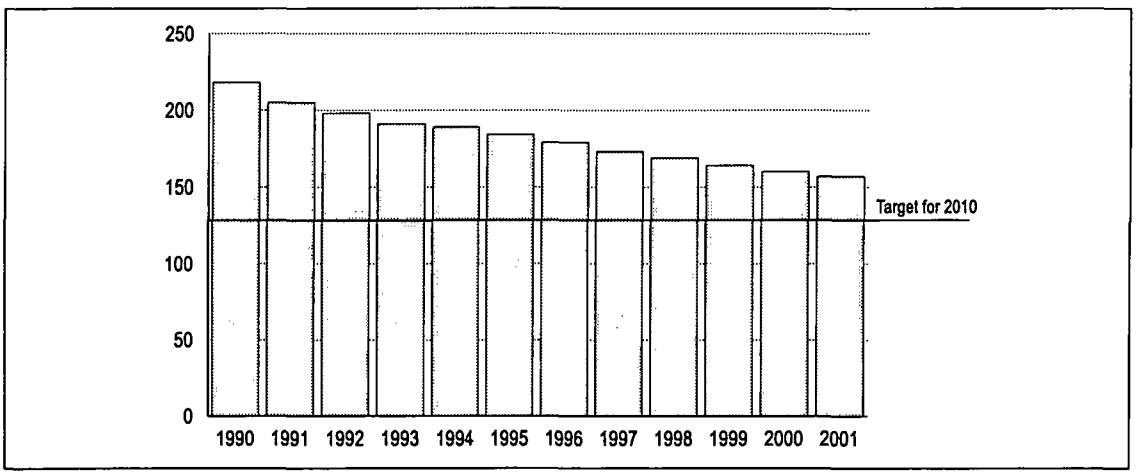
In addition, the ozone concentrations measured in the lower atmosphere have repeatedly exceeded the WHO guidelines. Ozone

concentra- tions are increased in Finland particularly by the long-range transportation of emissions from Western Europe. The formation of ozone is by nature a non-linear process and largely depends on the meteorological conditions and general levels of ozone in the northern hemisphere. For this reason it is not always easy to establish clear cause-effect relationships. It is estimated that during the growing season of crops, critical ozone exposure levels are exceeded almost every year in Finland. The only way that the ozone content in the lower atmosphere can be significantly reduced is through a marked reduction in emissions of nitrogen oxides and volatile hydrocarbons throughout the northern hemisphere.

The use of ozone layer-depleting substances, such as CFC compounds, has been almost totally terminated in Finland. The measurements of the Finnish Meteorological Institute show the ozone depletion to be no more than 35 per cent overall, although in places it is more than 60 per cent. Even in the best-case scenario, it will still take decades before the ozone layer returns to normal. It is estimated that upper atmosphere ozone depletion, which increases the amount of ultraviolet radiation reaching earth and is detrimental to people, plants and animals, will increase in the early years of the new millennium, especially over northern regions. Finland currently has stricter legislation than many other EU countries limiting the use of substances that contribute to ozone depletion. In 1998 the EU Council of Environment Ministers made a decision to further tighten restrictions on the manufacture and use of ozone-depleting substances. Additional restrictions were imposed on methyl bromide and HCFC compounds, for example. The use of methyl bromide will be phased out in the EU by 2005, and the production of HCFC compounds will be frozen at its current level by 2008 and discontinued by the end of 2025. As a result of this decision the EU exceeds almost all the requirements set out in the Montreal Protocol.

Noise is becoming an ever-growing challenge to quality of living. Around 20 per cent of Finns live in areas where traffic noise exceeds the harmful level of 55 decibels. Nuisance from road traffic is especially increasing. To control the problems of noise, technical improvements are needed, such as efficient soundproofing and noise barriers, as well as more diligent attention to noise questions when zoning.

Figure 5. Finland's NMVOC (Non-Methane Volatile Organic Compounds) discharges and target for 2010 (tonnes)



2 Natural resources

Sustainable use of natural resources

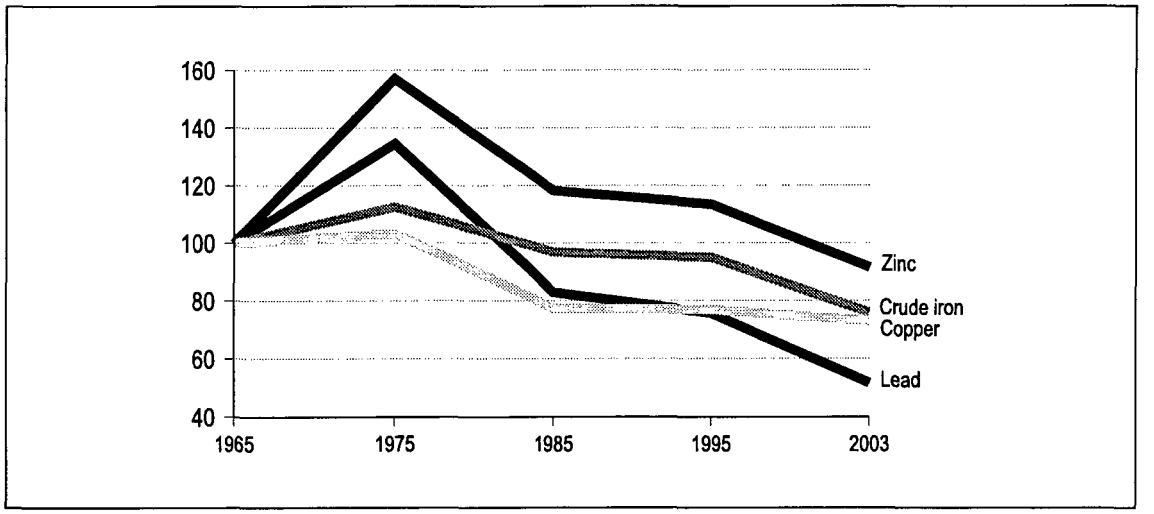
The continuing growth of the world population and rise in the standard of living are leading to increased material consumption. Awkward the environmental damage caused by the accelerating use of fossil fuels and natural resources is seriously jeopardising the renewal and tolerance of the natural environment. One of the greatest challenges for sustainable development is indeed to change existing production and consumption patterns without allowing those changes to affect economic competitiveness. The utilisation of most raw materials has steadily increased and their real prices have declined over the past 25 years. In the light of what we know today there is no threat of the non-renewable natural resources being depleted over the next few decades.

Market prices do not allow for external costs that result from inadequate proprietary rights and underpricing of natural resources. This is why the market prices of natural resources are low and these resources are often used excessively. One solution is now being sought in the concept of eco-efficiency, which combines the sparing use of natural resources, economic efficiency and consid-

7. The ecological footprint in different countries according to WWF (hectares per inhabitant)

United Arab Emirates	10.13
United States	9.70
Canada	8.84
Finland	**8.42**
Norway	7.92
Kuwait	7.75
Australia	7.58
Sweden	6.73
Denmark	6.58
Ireland	5.33
France	5.26
Estonia	4.94
Japan	4.77
Germany	4.71
Russia	4.49
Italy	3.84
Brazil	2.38
Costa Rica	1.95
China	1.54
India	0.77

Figure 6. Trends in world market prices of selected metals (1965=100)



erations of environmental protection, the ultimate aim being to reduce the excessive use of natural resources with a view to alleviating the adverse environmental consequences that exceed the carrying capacity of the global ecosystem.

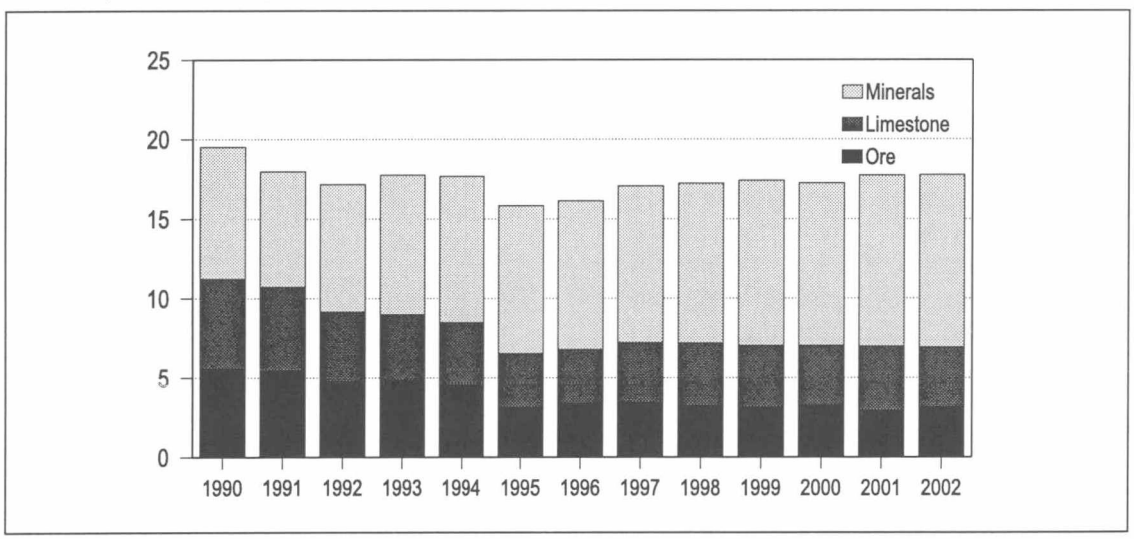
The Government programme sets the aim for Finland to base its competitiveness on production and consumption that fulfil the conditions of ecologically sustainable development. The Government aims to reduce the use of non-renewable natural resources and to promote recycling through an ecological tax reform. In 2002, over 214 million tonnes of primary materials were consumed in Finland. Of this, 129 million tonnes were non-renewable and 85 million tonnes were renewable natural resources. Direct overall consumption of natural resources per GDP unit has declined steadily in the 1980s, 1990s and 2000s. In other words, greater economic wealth has been produced with fewer resources.

Ores and other land extractable resources

Finland is self-sufficient in just one metallic mineral, chromium. Other known ore deposits are becoming rapidly depleted. However, experts say there is still considerable potential for the discovery of new deposits in the Finnish bedrock. Since the metallurgical industry in Finland is modern and highly competitive, there is every reason to believe that the processing of metals will continue in the country for quite some time, even though it will largely have to rely on imported raw materials and recycling. For instance, most of the steel that is produced in Finland is manufactured from iron concentrates imported from Sweden and Russia and from scrap iron.

The ore production in domestic mines declined quite considerably in the 1990s, while metal imports increased very sharply. In 2002 ore production in Finland amounted to 3.2 million tonnes, down by 0.2 million tonnes from the previous year. In 2002 the

Figure 7. Mining of ores and industrial minerals and quarrying of limestone in Finland in 1990-2002 (million tonnes)



import of metallic minerals was 0.9 million tonnes, limestone production was 3.7 million tonnes and domestic industrial mineral production was 10.8 million tonnes. The most important ores are chromium, zinc, nickel, copper and gold; the main industrial minerals are limestone, granite and talc.

Consumption of gravel and other aggregates declined from the record level of 97 million tonnes reached in 1989 by one-third during the recession of the early 1990s. The figures started to rise again towards the late 1990s with the revival of the building sector. In 2002, 36 million tonnes of gravel and sand and 39 million tonnes of rock materials were consumed. In recent years the use of natural rock as a substitute for gravel has sharply increased as gravel resources close to residential areas are becoming depleted. In 1990 rock materials accounted for 27 per cent of total consumption; in 2002 the figure was 43 per cent.

Forest resources

Forests are Finland's most important natural resource. Most of the country is covered by naturally regenerated forests that are in commercial use: Finland has over 26 million hectares of forestry land, accounting for 86 per cent of its total land area. Forestland proper (ie. productive forests) amounts to 20 million hectares. Altogether 54 per cent of the forestry land is in private ownership, 33 per cent is owned by the state, 8 per cent by companies and 5 per cent by others. The figure for state-owned forestland also comprises areas set aside for conservation. The total volume of growing stock is just under two billion cubic metres. Some 69 per cent of this is owned privately, 18 per cent by the state, 8 per cent by companies and 5 per cent by others. The total annual increment of 79.4 million cubic metres exceeds the total drain. In 2002, 60 million cubic metres were felled for industrial and other uses. Allowing for waste and natural losses, the total drain was 69 million cubic metres. Timber imports to Finland in 2002 totalled 16.2 million cubic metres (solid measure).

The purpose of the National Forest Programme 2010 is to develop the management, use and protection of the country's forests so that considerations of economic, ecological, social and cultural sustainability are taken into account in the exploitation of forests. The target identified in the Forest Programme is to gradually increase the total cut to 63-68 million solid cubic metres a year by 2010. As the Finnish Forest Research Institute's estimates put the growth of timber at 90 million solid cubic metres by 2030, the increase in felling will fix the total volume of growing stock at its current level.

The way that Finland's commercial forests are managed is of key significance to preserving the biodiversity of Finnish nature. Intensive silviculture has had negative effects on the diversity of forests, especially regarding, for instance, the amount of old-growth forests and the amount of rotting wood. However, the new silviculture recommendations for private forests also take into account the requirements of biodiversity. An important way to promote the diversity of commercial forests is to preserve in their natural state the important natural habitats identified by the Forest Act, as well as other valuable nature areas as defined by silviculture recommendations and certification. Environmental assistance is paid to private landowners for losses caused by preservation of important natural habitats. The support has become more sought-after every year. The Forest Biodiversity Programme for Southern Finland (METSO)

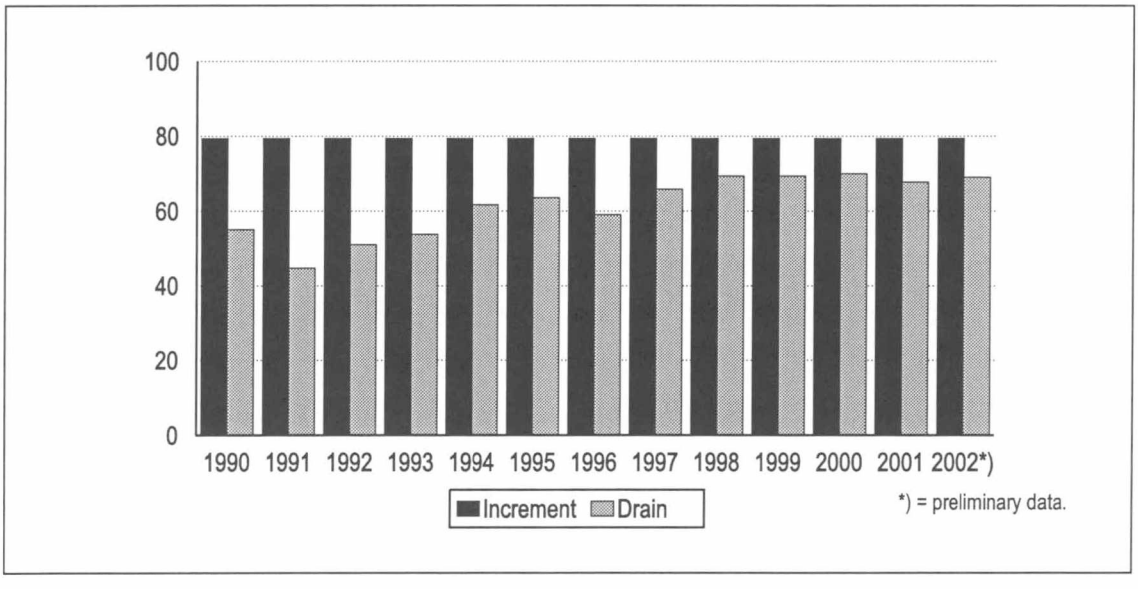
has gotten off to a good start. The Finnish Forest and Park Service has set up many environmental restoration programmes, and trading in sites with specific natural value is being tested in Satakunta.

Finnish forest owners have a positive attitude towards developing silviculture in a more natural direction. Certifications based on the Finnish Forest Certification System (FFCS) were started in 1999 and by the end of 2000 all of Finland's 13 forestry districts had a certificate for practising sustainable silviculture. Altogether 21.9 million forest hectares, or 95 per cent of Finnish forest, have been awarded FFCS certificates. Finland's national forest certification system was adopted as part of the Pan European Forest Certification Scheme (PEFC) and the PEFC brand was introduced in 2000. The estimated 60,000 hectares of private forests identified by the Forest Act are currently being surveyed.

The statutory regional target programmes for forestry, drawn up for the first time in 1997-98 and revised in 2001, aim to reconcile the objectives set for the different uses of commercial forests. Prepared jointly with forest owners and various stakeholders, the programmes provide an overall picture of the state of forestry in each district administered by forestry centres, any development needs within that district and the sector's development potential more generally. The programmes also include surveys of forest resources, forest protection and diversity and the employment effects of forestry and related business. The National Forest Programme 2010 is based essentially on these target programmes.

In recent years, the Finnish Forest and Park Service, the government body responsible for the administration of state forests, has made greater allowances for social and environmental considerations by working closely with stakeholders and local residents to draw up natural resource plans for areas covering 0.5 to2 million hectares. The plans provide the framework for the Service's landscape ecological planning, which deals with large forest areas covering between 40,000 and 100,000 hectares as single enti-

Figure 8. Growing stock increment and drain (million solid cubic metres)



ties. Regional landscape ecological planning, which reconciles the different uses of forests, is aimed at securing nature's biodiversity and the diverse utilisation of commercial forests. For example, rotting wood is left in forests and protection zones are established. Valuable forest sites are left intact and, where necessary, ecological corridors are established to connect these areas.

8. Values of forest products in 2001 (EUR million)

Net income from stump wood	1740.0
Firewood	60.0
Berries*)	8.1
Mushrooms*)	2.1
Lichen**)	1.2
Reindeer husbandry	13.0
Game	61.0
Christmast trees	7.0

*) = amounts entering markets. **) = export value.

Cultivated resources

Some eight per cent of Finland's land area is in agricultural use. There is a total of some 2,236,000 hectares of farmland, i.e. fields and gardens, of which 1,992,900 hectares were under cultivation and 210,700 hectares lying fallow in 2002. Agricultural production in Finland is primarily based on animal husbandry, and 80 per cent of the arable land is devoted to growing grass, silage and fodder crops or used for grazing. In 2002 there was a total of 74,328 farms with more than one hectare under cultivation. Most farms engage in production that entitles them to receive agricultural subsidies, the mean cultivated area being 30 hectares. The mean cultivated area has increased by 45 per cent since Finland joined the EU. According to estimates, the number of farms will continue to decline. In 2002 the total agricultural turnover in Finland was EUR 3.9 billion. In 2002, fully or partly EU-funded subsidies were given out for a total of EUR 1.164 billion. In 2002, national subsidies funded by Finland totalled EUR 590 million.

The adverse effects of agriculture on the environment include the runoff of nutrients from fertilisers and farmyard manure into lakes, rivers and groundwater. Apart from cultivation and animal husbandry, other, more diffuse sources of watercourse pollution include natural leaching, settlements in sparsely populated areas and holiday homes. The Finnish Environment Institute estimates that around 60 per cent of the total phosphorus load and about 50 per cent of the nitrogen load caused by human activity can be traced to agriculture. The impacts of agriculture on eutrophication are most clearly visible in coastal areas and in small rivers. The first EU environmental subsidy programme, implemented in 1995-1999, made agricultural practices much more environmentally friendly. In spite of various measures, target levels for decreasing agricultural pollution of watercourses have not been met. Environmental support was estimated to reduce the amount of total phosphorus, originating from agriculture and ending up in the watercourses, by 40 per cent and total nitrogen by 30 per cent. However, the reduction in ntrogen was only 4-15 per cent and that of phosphorus 5-13 per cent.

The Government decree on nitrates passed in 2000 is used to fulfil the European Commission's directive on the protection of lakes and rivers against agricultural nitrate pollution. The decree includes regulations for the storage, application and quantity of manure and the location and maintenance of livestock shelters and exercise areas. It also

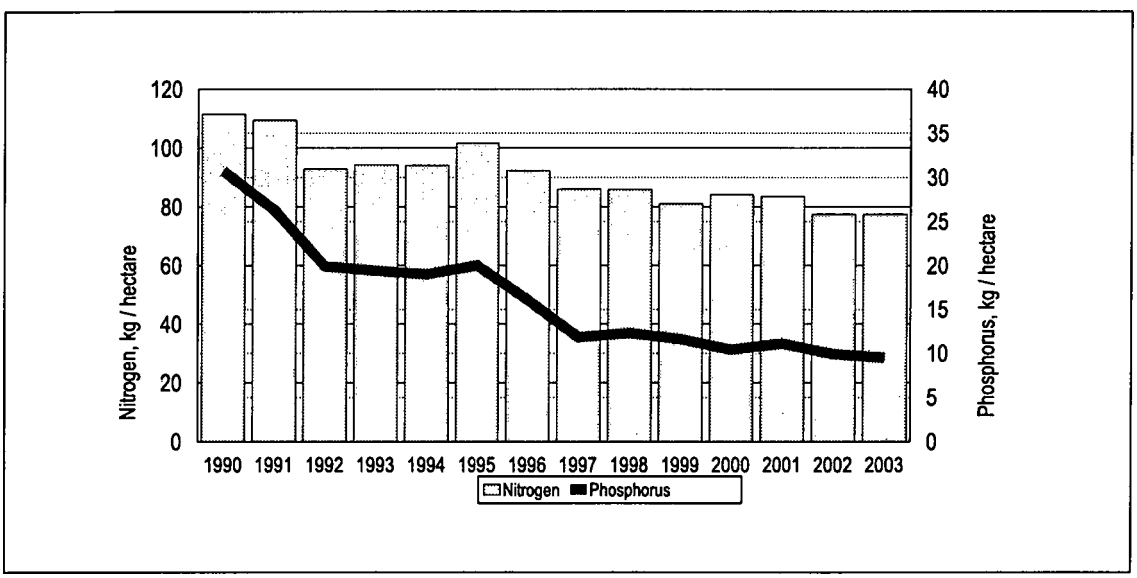
deals with matters concerning the size of manure storage facilities, periods when manure may not be spread on the land, and the maximum nitrogen content of manure and fertilisers.

According to the Agenda 2000, a major reform of the European Union's agricultural policy, a greater prominence is given to environmental considerations in the common agricultural policy. The aim is to encourage an integrative and comprehensive approach to agriculture and the development of rural areas, the protection of the environment and the maintenance of the European rural heritage. The productivity of agriculture in Finland is clearly below the EU average because of the unfavourable climatic conditions. For this reason, agricultural subsidies are far more significant to Finland than the other EU countries.

In 2000 the European Commission approved Finland's proposal for a horizontal rural development plan, which also includes a new environmental aid scheme for agriculture for 2000-2006. Total appropriations for environmental aid were reduced from EUR 286 million to EUR 235 million as LFA (Less Favoured Areas) grants were made available in the whole country. Around 91 per cent of the farmers are committed to the new environmental aid scheme and its coverage is 96 per cent of arable land. The scheme is more flexible with regard to differences in environmental management between individual farms. It is estimated that in the long term, the environmental subsidy to be provided to agriculture in 1995-2006 will reduce the phosphorus and nitrogen load on watercourses.

Organic farming is one of the areas of agriculture receiving special environmental subsidy. Organic farming methods imitate and make use of nature's own processes by means of diverse crop rotation. Use of artificial fertilisers and synthetically manufactured pesticides is forbidden on organic

Figure 9. Fertiliser use in agriculture



farms. The authorities inspect the operations of organic farms at least once during the growing season. In 2002 a total of 156,692 hectares were organically farmed in Finland.

9. Organic farming and transition phase area in EU member states in 2001

	Hectare	Per cent of arable land
Austria	285 500	11.3
Italy	1 230 000	7.9
Finland	**147 943**	**6.6**
Denmark	174 600	6.5
Sweden	193 611	6.3
United Kingdom	679 631	4.0
Germany	632 165	3.7
Netherlands	38 000	1.9
Portugal	70 857	1.8
Spain	485 079	1.7
Belgium	22 410	1.6
France	420 000	1.4
Luxembourg	1 030	0.8
Ireland	32 355	0.7
Greece	24 800	0.5
EU-15	**4 437 981**	**3.2**

Water resources

Finland has abundant water resources in proportion to its population and water consumption. On the basis of the Water Poverty Index (WPI) developed by the World Water Council and the UK-based Centre for Ecology and Hydrology, Finland is the world's richest country in terms of water - ahead of 146 other countries included in the study. The index is compiled on the basis of the abundance, usability, know-how, use, and environmental impacts of water resources. Inland watercourses cover some 10 per cent of the country's total area, i.e. 33,500 square kilometres, and territorial waters extend over 36,000 square kilometres. Finland has an estimated 56,000 lakes of at least one hectare in size. The total groundwater yield is estimated at 10-30 million cubic metres a day, of which approximately six million cubic metres is suitable for water supply purposes. Two to four per cent of the water suitable for water supply purposes is utilised yearly. The annual rate of usage for usable water is 15 per cent.

10. Environmental subsidy for agriculture (EUR million)

	2000 A	2001 A	2002 A	2003 B	2004 BP
1. Basic and additional procedures	250	248	252	..	..
2. Special subsidy	25	32	31	..	..
2.1 Organic production	16	16	17	..	..
2.2 Protective zones	1	2	2	..	..
2.3 Treatment of runoff	4	6	4	..	..
2.4 More efficient use of manure	1	2	3	..	..
2.5 Landscape management and biodiversity	3	6	5	..	..
2.6 Farming in groundwater areas	0	0	0	..	..
2.7 Native breeds	0	0	0	..	..
3. Training and advisory services	1	2	1	..	..
4. Experimental projects	–	–	..	..	..
5. Other environmental management programmes	–	–	..	..	..
Total	**276**	**282**	**284**	**306**	**312**

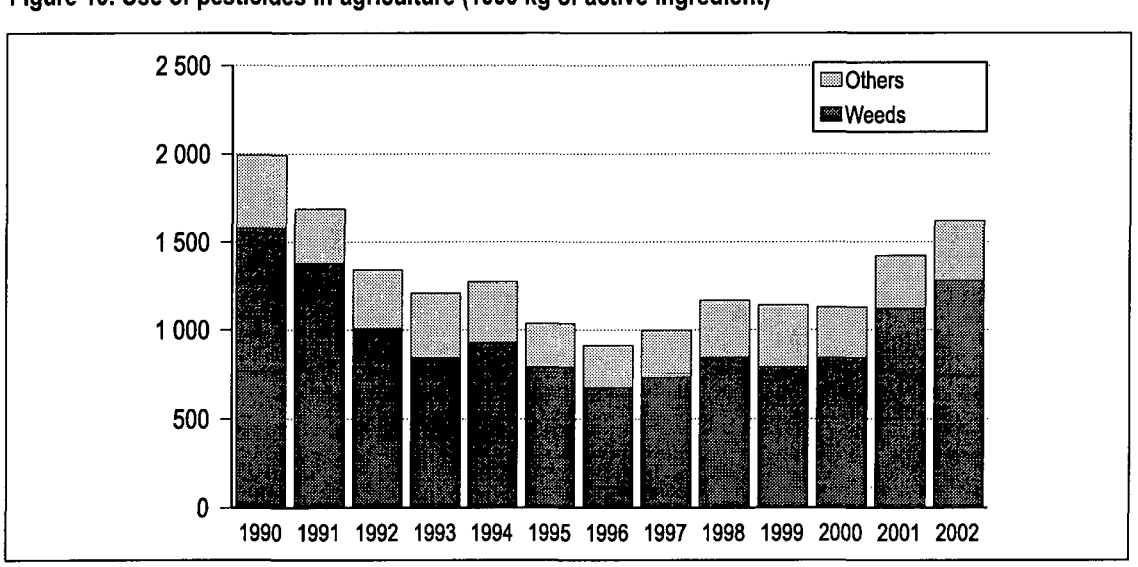
A = Final accounts. B = Budget. BP = Budget proposal. – = not in use. .. = data not available.

2002 was exceptionally dry in Finland. Surface waters and groundwaters were depleted over a wide area in central and southern Finland to record-low levels. Many properties in sparsely populated areas, cattle farms and small water companies were suffering from a water shortage. Special arrangements had to be made to provide household water for everybody, for example by supporting water supply investments on farms. The transfers from the Saimaa area were smaller than usual and started at the end of September 2002. This reduced the damages and effects that low water level causes primarily to ship traffic and also to the nesting of the Saimaa ringed seal.

The use and protection of water resources and water areas is regulated in Finland by the Water Act. Activities and construction that either take place on the watercourses or affect the groundwater resources require a permit as stated in the Water Act. For surface water and groundwater, the primary regulation is contained in the Environmental Protection Act. The Water Supply Act concerns water supplies and water companies. As an EU member, Finland is also bound by the Union's water sector regulations. To fulfil the EC's Water Framework Directive, the necessary changes are being prepared to the aforementioned regulations. The UN has also declared 2003 as the International Year of Freshwater.

Public waterworks networks serve almost 4.6 million Finns. Both surface and groundwater are used for producing household water. The daily per capita consumption of water supplied by the waterworks to households and industry is 242 litres, the figure for households alone is 150 litres. In sparsely populated areas, water is mainly drawn from private wells. Some 0.7 million Finns rely on small water companies, co-operatives or their own wells. Communities, industry, and electricity production use an annual total of 2.4 billion cubic metres of freshwater produced from surface or groundwater by waterworks and industrial water catchments. About 3.5 million inhabitants use groundwater.

Figure 10. Use of pesticides in agriculture (1000 kg of active ingredient)



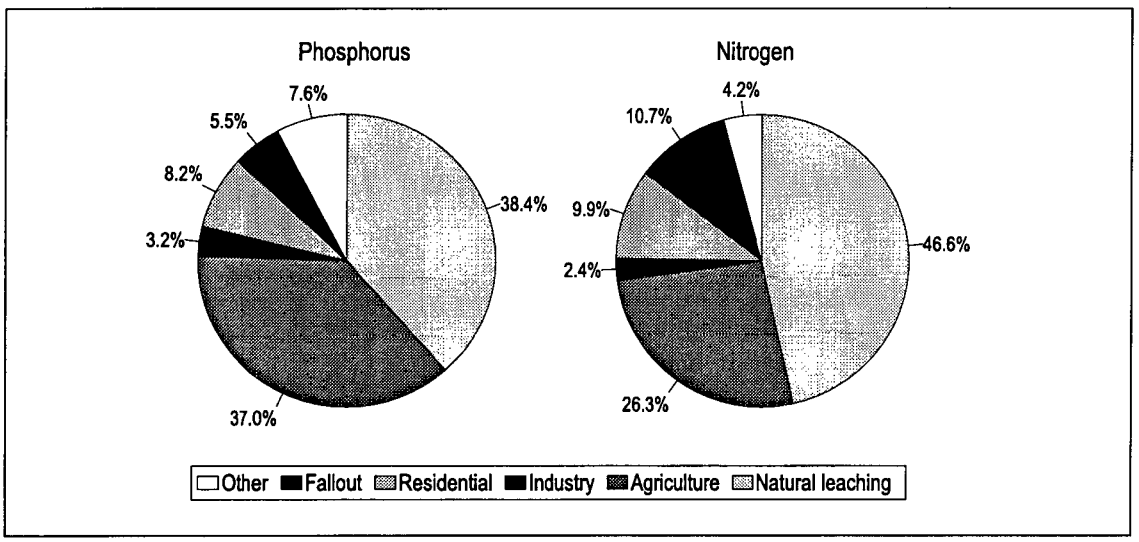
Around 4.1 million inhabitants are served by a sewerage system and there are some 560 sewage treatment plants in population centres of over 50 inhabitants. The treatment plants remove 94 per cent of the organic matter in waste water, 93 per cent of the phosphorus, and 44 per cent of the nitrogen. One of the great challenges for the near future is to decrease the amount of nitrogen in waste water. The target for waste water originating from outside the sewerage system, either round-the-year or from holiday homes, is to reduce its environmental pollution levels by 2005 by reducing the biological oxygen demand by 60 per cent (to 3,800 tonnes per year) and phosphorus levels by 30 per cent (to 300 tonnes).

11. Water resource usage in European countries (billion cubic metres per year)

	Renewable water resources	Water usage	Intensity of water usage (%)
Belgium	12.0	9.0	75
Spain	111.8	35.5	32
Italy	160.7	47.9	30
Denmark	6.0	0.9	15
Greece	54.0	7.0	13
England	145.0	9.3	6
Switzerland	40.0	2.6	6
Russia	4 312.7	77.1	2
Finland	**107.0**	**2.4**	**2**
Sweden	178.0	2.7	2
Norway	382.2	2.0	1
Estonia	12.7	0.2	1

The vast majority, or 88 per cent, of the total area of Finland's coastal waters is classified as good or excellent in terms of water quality. The eutrophication levels in the Finnish coastal waters increase from the Gulf of Bothnia south to the Archipelago and to the Gulf of Finland. The greatest sources of pollution of the Gulf are agriculture, urban areas and the industry of the surrounding countries. In the eastern parts of the Gulf of Finland where the loads are highest, algae concentrations in the summertime are on average three times greater than in the open seas up in the Gulf of Bothnia. According to the latest estimates, the annual load is 3,400 tonnes of phosphorus and 50,000 tonnes of

Figure 11. Phosphorus and nitrogen sources of the Finnish waters



nitrogen. About 75 per cent of the freshwater moving into the Gulf of Finland is discharged from Lake Ladoga through the river Neva. Consequently, the water quality in Neva and pollution from St. Petersburg largely determine the state of the eastern Gulf of Finland.

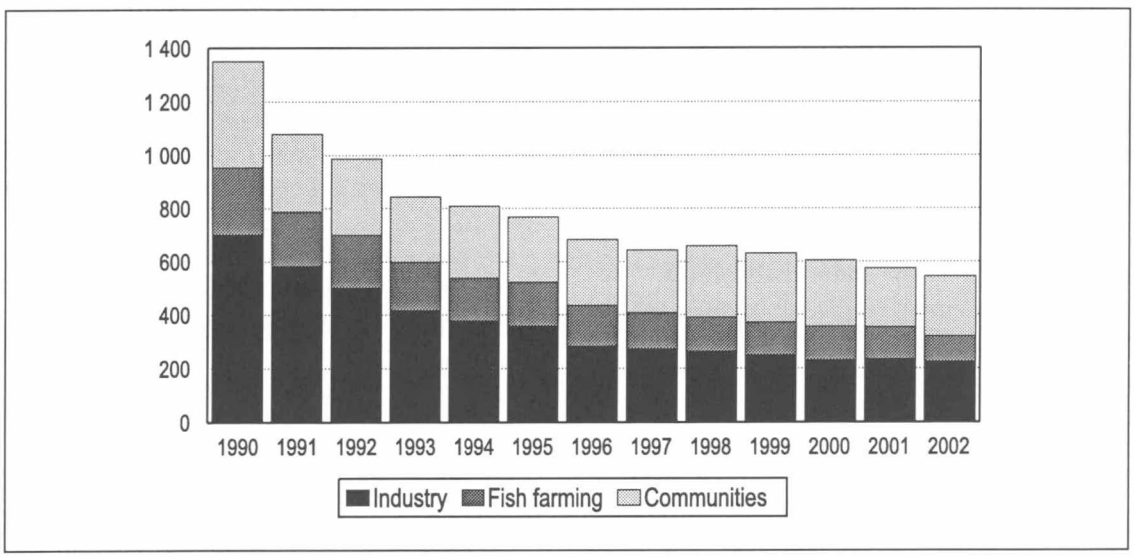
The goals in water protection for 2005 are to stop the deterioration of the surface layers of the Baltic Sea and inland watercourses and to improve the state of degenerated watercourses. The aim is to reduce the pollutant loads caused by human activity, with the loads of nitrogen decreasing by 40 per cent and phosphorus by 45 per cent by 2005, compared to the levels of the early 1990s. In April 2002 the Government decided on their policy for Finland's Baltic Sea environmental action programme and a detailed action plan will be prepared to implement it. The outlined policies will be implemented in the next 10-15 years. Domestic investment is estimated at EUR 300-370 million. The highest priority is given to improving waste water treatment facilities and sewerage in the city of St. Petersburg and increasing the capacity for oil spill prevention and response on the Gulf of Finland.

Oil transports on the Gulf of Finland reached some 68 million tonnes in 2002. New harbours in Russia and Estonia have increased the risk of oil spills in the eastern Gulf of Finland. Other types of shipping have increased greatly as well. Therefore, in response to the higher risk, Finland has co-operated with Estonia and Russia in creating the Vessel Traffic Management and Information Service (VTMIS) for the Gulf of Finland. The sys-

12. Breakdown of daily household water use in Helsinki in 2002 (litres per inhabitant)

	Litres	Per cent
Drinking	2	1
Food preparation	32	19
Laundry	24	14
Toilet flushing	34	20
Personal hygiene	73	43
Other use	5	3
Totalt	**170**	**100**

Figure 12. Finland's phosphorus discharge from industry, households and fish farming sources into watercourses (tonnes)



tem should be operational in 2004 and it will be used to connect the Vessel Traffic Systems (VTS) of these countries. In addition, the Automatic Identification System (AIS) will be implemented globally and the capacity to combat oil and chemical spills in the Gulf of Finland will be stepped up.

In the Baltic Sea, marine protection co-operation is founded on the socalled New Convention on the Protection of the Marine Environment of the Baltic Sea, which was signed in 1992 and came into force at the beginning of 2000. The main goal of the Convention is that all the parties take any necessary legislative, administrative, or other measures either individually or jointly to prevent and end the pollution that causes contamination. The task of the Baltic Marine Environment Protection Commission (HELCOM) is to monitor the implementation of the Convention continuously, to make recommendations concerning actions taken to support the Convention's purpose and, if necessary, to make changes to either the Convention or its attachments. In addition to the Convention on the Protection of the Baltic Sea, HELCOM's Baltic Sea Joint Comprehensive Environmental Action Programme (JCP) is an important instrument in marine protection. Of the 132 most significant sources of pollution (hot spots) in the Environmental Action Programme, 55 have so far been crossed off the list. Although pollution of the Baltic Sea has reduced as a result of water protection measures and political and economic changes in eastern Europe, the improvement of the state of the Baltic Sea still remains a great challenge because of the special characteristics of the Baltic Sea. To improve its state, national and international co-operation is required between various agents.

The Water Framework Directive came into force in 2000 with the purpose of fundamentally renewing the EU legislation on surface water and groundwater. It both unifies existing EU water legislation and brings in fresh viewpoints. The deadline for member states to make necessary legislative changes is 2003. The deadline for catchment area assessments is 2004; for starting follow-up programmes, 2006; for completing the action plan and catchment area management plan, 2009; for starting the action plan, 2012; and for reaching environmental goals, 2015. A key objective is to achieve an ecologically and chemically good state for surface water and a quantitatively and chemically good state for groundwater. A new ecological classification system will be needed to classify the state of surface waters and to replace the current system based primarily on the usability of water systems. The Water Framework Directive requires numerous procedures, for example, water classification, monitoring, economic analyses, identifying environmental pressures and plans, and action plans for water conservation areas. These procedures are under development.

Waste management

Some 127 million tonnes of waste and waste-like materials were generated in Finland in 2000. Around 530 kilos of urban waste was collected per year per person. By comparison, the figure elsewhere in Europe varies between 300 and 650 kilos. About 95 per cent of all waste is generated in production, chiefly in industry, agriculture and construction. Industrial waste consists of production, mining and energy supply waste. The volume of construction waste is magnified particularly by the large volumes of earth moved during construction. Agri-

cultural waste mainly consists of manure, 95 per cent of which is recycled.

Industrial waste in 2000 amounted to 17 million tonnes. This figure includes not only solid waste but also waste waters, emulsions and sludge. The biggest producers of waste are the pulp and paper industry, the mechanical forest industry and the metallurgical and chemical industries. More than one-third of industrial waste consists of waste wood and bark from the pulp and paper industry, although this is nowadays increasingly utilised in manufacturing processes and in energy production. In 2000, 70 per cent of industrial waste was utilised; 5.2 million tonnes were re-used as material input and 6 million tonnes were used in energy generation. Some 4.9 million tonnes of industrial waste were taken to landfill sites.

In an attempt to improve and intensify waste recycling, Finland has adopted the principle of producer responsibility, where the manufacturer or the importer is to take an active role in organising the eventual disposal and treatment of waste products. The principle has already been applied to used car tyres, waste paper and packaging materials. In 2000, the EU member states agreed on a directive on the application of producer responsibility for the disposal of end-of-life vehicles. According to the directive, car manufacturers will be required to cover all or a substantial part of the costs incurred from the recovery of scrap vehicles so that as from the beginning of 2001, manufacturers will be responsible for vehicles that have entered the market in 2000 or later. In practice, the costs are included in the prices of new cars. As from the beginning of 2007, producers will also bear the responsibility for vehicles that came onto the market before 2001. A directive for electrical and electronic waste, corresponding to the end-of-life vehicles directive, is under preparation in the EU.

The National Waste Plan which is based on the Waste Act and the EU's waste directive presents the current status of the waste sector and sets the targets for the development of the sector up to 2005. A National Biological Waste Strategy is being prepared on the basis of a proposal made in April 2003. The aim of the strategy is to reduce the amount of biodegradable waste being taken to landfills, and to prevent the climate warming methane emissions that are formed in landfills.

Finland had 243 operational landfills in 2002, of which 110 were landfills for community waste. Today there are fewer landfills for community use, but the ones now in use are larger. At the same time, waste recycling has increased and waste treatment intensified. By 2007, many of Finland's old landfill sites must be closed down, because they do not fulfil the strict new ground water protecton regulations. From that time onwards, landfill sites must be leak-proof pools and completely isolated from their surroundings, so that landfill water and gases can be controlled. The target is that in 2005 a maximum of 30 per cent of waste material will

13. Finland's waste accumulation in 2000 (thousand tonnes)

	Accumulation	Recycled
Municipal solid waste	2 600	39%
Sewage sludge	160	92%
Hazardous waste	1 203	11%
Industrial waste	16 800	70%
Energy supply waste	775	59%
Mineral excavation waste	26 400	..
Agricultural waste	25 500	95%
Building and demolition waste	1 400	..

.. = data not available.

end up at landfills. The remaining 70 per cent is utilised as secondary raw materials, energy, soil or in landscaping. As a result of the tightened requirements, the 110 currently operating landfill sites will be reduced to 60 or 70 and the costs of waste management will grow an estimated 50 per cent to EUR 1.6 billion.

The EU directive on the incineration of waste was brought into effect in Finland with a Government decision in May 2003. It clarifies and standardises the requirements for all waste incineration. As a result of the decision, small-scale energy use of urban waste will end after the transition period at the end of 2005 and will be carried out in medium-sized to large-scale energy production plants. In Finland, 300,000 tonnes of urban waste is incinerated, by co-incineration in ten plants and in one special incineration plant. This represents around 10 per cent of total urban waste. In addition, there are two plants in Finland specialising in the incineration of hazardous waste.

3 Nature conservation and the built environment

Nature conservation

Intensive forestry and agriculture are the main culprits behind the loss of biodiversity in Finland. According to a survey on endangered species in Finland completed in 2000, one in ten of the 15,000 or so studied species, or a total of 1,505 species, are currently endangered. There are 186 species that have become extinct and 1,060 species need to be closely watched. The most important habitat for endangered species is the forest, but the threat of extinction has increased most among species living in habitats of traditional agicultural landscapes.

One of the aims of nature conservation is the maintenance of biodiversity by setting up conservation areas to preserve unspoilt environments, by protecting endangered species and by integrating the interests of nature conservation with the demands of land use planning. Strictly protected areas and areas in which careful tree harvesting is permitted amount to 1,762,000 hectares, i.e. 7.6 per cent of Finland's total forests and scrublands. Forests and scrublands that are strictly protected amount to around 1,665,000 hectares, or 7.2 per cent. Of the actual productive forestland, 4.1per cent is protected, i.e. 834,000 hectares.

The nature conservation area network has been established in Finland with the help of various conservation programmes. A financing package for the nature conservation programmes was started in 1996. The aim is to complete all programmes by 2004, with funding extending to 2007 due to the accrual of purchase prices. In 2002 nature conservation programmes were implemented for a total of 25,580 hectares. The government acquired 17,490 hectares of land covered by approved nature conservation programmes and 8,080 hectares of privately protected forest were established. All in all, nature conservation areas have been established on 1.6 million hectares of government-owned and private property. An additional 1.5 million hectares of wilderness areas are protected by law.

In southern Finland, 1.1 per cent of the productive forestland has been fully protected while 1.8 per cent is less strictly protected. In

14. The funding of conservation areas and programmes (EUR million)

	2000 A	2001 A	2002 A	2003 B	2004 BP
Purchase of areas	31	32	23	22	29
Purchases of private land	*12*	*17*	*13*	*7*	*14*
Land exchanges	*10*	*15*	*10*	*15*	*15*
Income from sale of land	*8*	*0*	*0*	*0*	*0*
Management of conservation areas	13	14	16	23	21
Compensation payments	12	12	16	9	16
Protection of rapids	16	0	0	0	0
Life (Natura)	1	2	2	2	2
Employment promotion scheme	2	3	2	1	1
Total	**75**	**63**	**59**	**57**	**69**

A = Final accounts. B = Budget. BP = Budget proposal.

addition to commercial forests and strictly protected forests, it is necessary to have commercial forests that are managed in accordance with the goals of nature conservation. For example, camping and hiking areas, recreational forests and parks would be such partially commercially utilised areas. The conservation of southern Finland's forests was considered by the broadly-based METSO committee, and its report was completed in July 2002. The committee presented new experimental conservation methods, largely based on volunteerism. These include the trading of natural assets, bidding competitions and co-operation networks for forest biodiversity. Networks are formed around a certain core area that has particular significance for biodiversity. These include national parks, government camping areas and local recreation areas.

In order to fulfil the European Commission's Habitats and Birds directives, attempts are being made to create a common network of areas to be protected: Natura 2000. In the Natura areas, conservation can be carried out in many ways depending on the need for protection of biotopes and species. Natura comprises conservation areas protected by the Habitats directive (SCI) and the Birds directive (SPA). In practice, there is overlap between the SCI and SPA areas. Finland's proposal for the Natura areas was delivered to the European Commission in 1998. According to the proposalt, Finland's Natura network comprises 4.9 million hectares in total. The proposal contains 3.2 million hectares of government-owned land, of which 41,000 hectares were not previously under conservation. The revised proposal comprises 324,000 hectares of private land, of which 66,000 hectares have not been previously protected. At the request of the European Commission, Finland completed its proposal in May 2002 with 264 new areas and extended the boundaries of 33 already proposed Natura areas. A final decision on the Natura 2000 network will be made by the European Commission.

According to a scientific evaluation carried out in March 2003, the network of Natura Boreal regions in compliance with Finland's and Sweden's nature conservation legislation is 99 per cent complete and only requires small additions. In Finland's completion proposal in April 2003, three new areas were proposed for inclusion in the Natura 2000 network and the expansion of five current Natura areas was suggested, as well as the reduction of 27 areas and the striking off of one area. The government is to make a decision on the completion proposal in the fall of 2003. The finishing touches to the Natura networks will be added in negotiations between the Commission and the Member States. The Commission has requested that the final list of Natura areas be confirmed by the summer of 2004. The evaluation of the so-called alpine region of the northernmost parts of Lapland was completed already in 2002 and the final decision is expected during 2003.

15. Nature conservation funding plan 2003-2007 (EUR million)

	2003	2004	2005	2006	2007
Funds allocated	31	31	31	31	31
Interest	2	2	1	1	1
Land exchanges	10	10	–	–	–

– = not in use.

The LIFE fund that was set up by the European Union in 1992 subsidises nature conservation and environment projects that support the development of community environmental policy and legislation. The programme's three-stage budget covering 2000-2004 is around EUR 640 million, of which 47 per cent is directed to nature conservation (LIFE Nature) and around 47 per cent to new creative environmental technology projects (LIFE Environment). LIFE Nature is designed for the protection of the species and biotopes listed under the Habitats directive and in particular for the implementation of the Natura 2000 network.

In 2002 the Commission allocated more than EUR 71 million to LIFE Nature projects. Six Finnish projects are receiving a total of over EUR 4.4 million and between 1995 and 2000 EUR 27.4 million for 36 LIFE Nature projects. Between 1995 and 2001 Finland received EUR 12.5 million for 32 LIFE Environment projects. In 2002 the EU granted eight Finnish LIFE Environment projects approximately EUR 3.8 million.

16. Natura barometer in the EU countries, 3 April 2003

	Number of SCI-areas	Total area (km^2)	Propotion of ttotal land area (%)	Hectares per capita
Denmark	194	10 259	23.8	0.19
Spain	1 276	118 496	23.5	0.30
Greece	236	27 228	20.6	0.27
Portugal	94	16 502	17.8	0.17
Netherlands	76	7 330	17.7	0.05
Ireland*)	364	9 953	14.1	0.27
Finland	**1 666**	**47 500**	**14.0**	**0.91**
Sweden	3 420	57 476	12.8	0.67
Italy	2 369	41 266	13.7	0.07
Luxembourg	38	352	13.7	0.09
Austria	160	8 896	10.6	0.11
Belgium*)	270	3 178	10.4	0.03
United Kingdom*)	567	24 064	9.9	0.04
Germany*)	3 535	32 143	9.0	0.04
France*)	1 174	40 632	7.4	0.07
Total	**15 439**	**445 275**	**13.7**	**0.12**

*) = Proposal for programme partly completed.

The built environment

The Land Use and Building Act and Decree, which came into force in 2000, are clearly supportive of sustainable development. The goal is to organise land use and building in areas in such a way as to create the requirements of a good living environment and promote ecologically, economically, socially and culturally sustainable development. The preservation of biodiversity and other natural assets, the advancement of environmental protection, the sparing use of resources and the prevention of environmental damage are among the general aims of the law. In addition, the law requires advancement of the utilisation of the existing urban structure and building stock and the continuous maintenance of the built environment and building stock.

Zoning is the most important tool in land use planning. The quality of zoning affects not only citizens' wellbeing, but also the functioning of society at large, the economy and sustainable development. From the viewpoint of sustainable development, it is important how residences, work places, services and other businesses are located in relation to one another and what the distances and traffic will be like between them. In zoning, a certain area will be treated as a whole by co-ordinating measures targeted at different sectors. The quality of the environment may be affected and environmental damage prevented by zoning. In drafting

zoning plans, the environmental effects of their implementation must be sufficiently studied.

In 2002, the Ministry of the Environment issued a decree concerning requirements on energy consumption in buildings. The new ordinances and directions concern heat insulation, indoor air quality, and ventilation in new buildings. The ordinances aim to reduce the energy consumption of buildings by 25-30 per cent. The improvement of energy-efficiency is demanded by the Kyoto Protocol and the Finnish Climate Strategy. In the European Union, over 40 per cent of energy is estimated to be consumed by the building stock. According to a Commission estimate, a 22 per cent saving on consumption could be made by 2010. The Energy Efficiency in Buildings directive, agreed on in November 2002, will take effect partly in the beginning of 2006 and fully in 2009.

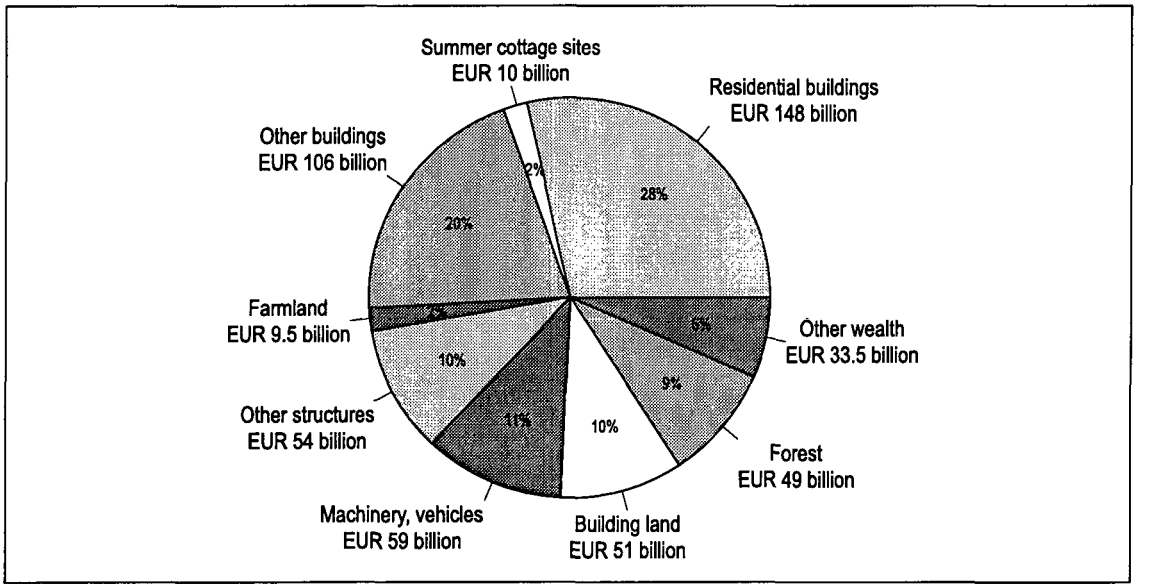
The development of the built environment is strongly affected by the concentration of work places and subsequent migration. The long-standing migration to the cities and suburbs is quickly emptying the countryside. Differentiation is also going on inside

17. Population density and housing structure in the EU

	Population density in 2000 (resident/km^2)	Detached houses in 2001 (%)	One-person households in 2001 (%)
Netherlands	390	70.9	33.5
Belgium	337	80.0	31.6
United Kingdom	246	..	..
Germany	230	45.6	37.0
Italy	192	30.3	23.0
Denmark	124	58.5	37.0
Portugal	112	56.8	17.0
France	109	55.9	..
Austria	96	65.8	30.8
Greece	83	57.8	..
Spain	81	37.7	12.0
Ireland	55	92.4	20.0
Sweden	22	45.7	40.0
Finland	**15**	**40.3**	**38.0**

.. = data not available.

Figure 13. Breakdown of Finland's national wealth in 2001



cities. In areas of population growth the new residences are situated on the outskirts. Because work places are mainly located in the city centre, the mean distance to the work place has increased.

The infrastructure of the built environment includes many buildings, structures, roads, streets, parks and various other facilities. In Finland, nearly a third, i.e. 28 per cent, of the national wealth is composed of apartments and 30 per cent is composed of other buildings and structures. In Finland there are around 2.6 million buildings that needed building permits. There are fewer than 2.5 million residences and 450,000 holiday homes. Even though the traditional Finnish residence has been a house or a farmhouse, the numbers of these have decreased due to urbanisation, with the proportion of apartments and row houses growing correspondingly.

18. Different types of residences and holiday homes (1000s of residences)

	Houses	Row houses	Apartments	Others	Holiday homes
1980	774	126	766	116	252
1995	898	291	928	64	416
1996	904	295	941	59	423
1997	909	299	954	60	429
1998	916	303	968	61	435
1999	923	308	980	63	444
2000	930	312	992	61	450

4 Industry

Progress in environmental protection

In the 1990s an increasing proportion of Finland's GDP was accounted for by industrial production; the corresponding shares of the service, construction and agricultural sectors were all on the decline. Growth was fastest in the electronics industry, which showed a sevenfold increase in production in the wake of soaring sales. In 2001 the metal and electronics industry accounted for 52 per cent of total industrial output, the forest industry for 19 per cent and the chemical industry for 10 per cent. Electronics generated just under 28 per cent of the value of Finnish exports in 2002, the metallurgical industry 27 per cent, the forest industry a good 26 and the chemical industry just under 12 per cent.

Finland's industrial sector has invested more and more in environmental protection in recent years, and the emphasis has started to shift to the various dimensions of social responsibility. The European Commission's Integrated Pollution Prevention and Control (IPPC) directive stresses companies' responsibility to employ the best available technology (BAT) in their processes and other functions. In Finland, the BAT requirement has been included in the Environmental Protection Act and in legislation dealing with water protection, waste disposal and marine protection. The Act contains the major elements of legislation tackling environmental pollution. The Environmental Protection Act and Decree require environmental permits to be acquired for any operation that carries the risk of environmental pollution.

The water protection programme extending to 2005 and the related action plan oblige the industrial sector to reduce its discharges considerably. By 2005, the aim is to cut phosphorus and nitrogen discharges by 50 per cent compared to 1995, and chemical oxygen demand by 45 per cent. The targets of a 55-90 per cent reduction in chromium, oil, nickel, copper and zinc discharges have been established. According to an interim estimate made in 2002 by the target programme, phosphorus discharges from industry were 35 per cent, chemical oxygen demand 22 per cent, and nitrogen emissions 7 per cent lower in 2000 than in 1995. With the exception of copper, the other metal and oil discharges had been cut down to the 2005 target level. According to the estimate, nitrogen discharges from the forest industry and metallurgical industry discharges should be reduced more vigorously.

Forest industry

Finland accounts for five per cent of the world forest industry production and 10 per cent of its exports. Of the 10 million tonnes of paper produced in Finland in 2002, 91 per cent was exported and of the 2.7 million tonnes of board, 84 per cent. In recent years the forest industry has been producing record quantities of paper and other wood products. In 2002, production in the forest industry was higher than in 2001. The paper industry's average capacity utilisation in 2002 was 88 per cent.

Virtually all companies now have an environmental management system in place and they publish environmental reports in connection with their annual reports. Continued efforts to raise the standards of environmental protection in the forest industry call for good control of the entire production process. The key concern in the improvements to the production processes in the pulp and

paper industry is to minimise raw material consumption: wood, water, chemicals and pigments. In 2002, the forest industry used a total of 71.3 million solid cubic metres of wood, of which 55 million were of domestic origin and 16.3 million imported. Wood consumption grew by 3.5 per cent fom the previous year. Imported timber for the Finnish forest industry is covered by ISO quality and environment certification.

In 2002 pulp and paper mills used 25.8 terawatt hours (TWh) of electricity, i.e. 59 per cent of Finland's industrial electricity consumption and 31 per cent of all Finnish electricity consumption. The most important fuel is wood, which is used in the form of bark, wood chips and black liquor in the pulp industry. Wood accounts for over 70 per cent of total fuel consumption by forest industry power plants. The forest industry is the largest consumer of biomass fuel.

Forest industry companies have been actively involved in the energy conservation agreements agreed upon by the Ministry of Trade and Industry and the Confederation of Finnish Industry and Employers. According to the annual report on industrial energy conservation agreements that was published in 2002, the coverage of the agreements at the end of 2001 was 94 per cent concerning electricity use in the forest industry. In all the industries together, the coverage of the agreements averaged 76 per cent for electricity use and 87 per cent for fuel. The saving effect from increases in efficiency of energy use reported within the scope of the agreement system by the end of 2001 was 2.3 TWh for heat and fuels, and 0.5 TWh for electricity.

In 2002 the pulp and paper industries' environmental investments were EUR 52 million, i.e. the investments were reduced by 40 per cent from the previous year. Also, the total investments of the forest industry fell by 40 per cent in the same period. Of the completed environmental investments, most were directed to water conservation.

The use of recycled paper and board has increased substantially all over the world, and it is expected that by 2010 recycled fibre will account for around half of the raw materials used in paper production. According to a 1998 policy decision by the Finnish Govern-

Figure 14. Pulp and paper industry production and load on the rivers and lakes (1990 =100)

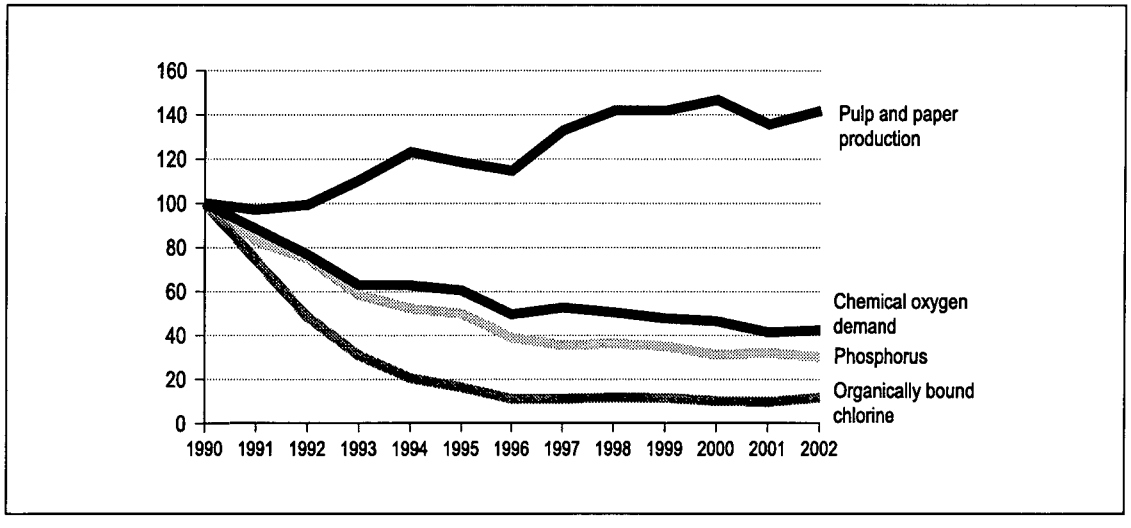
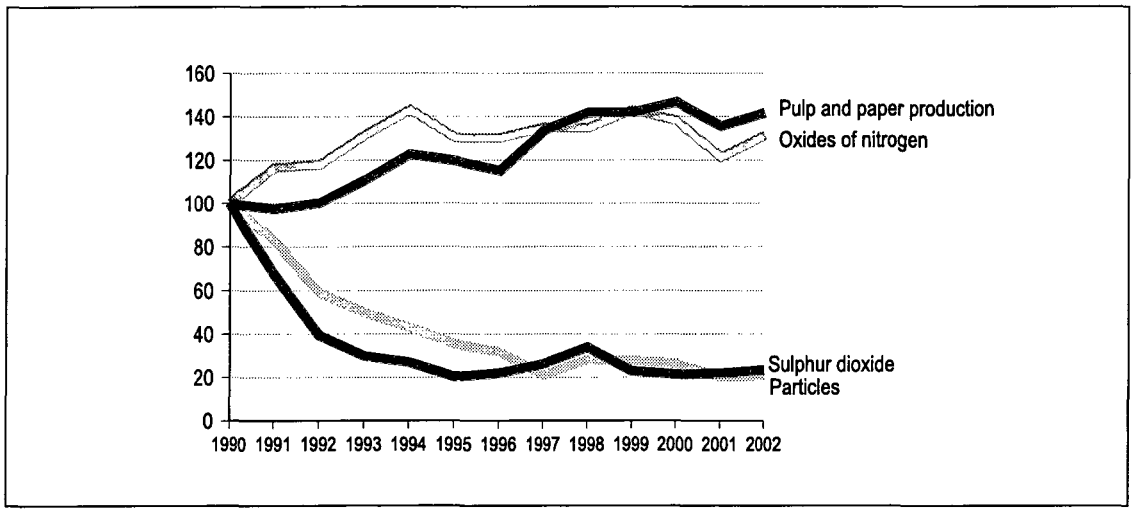


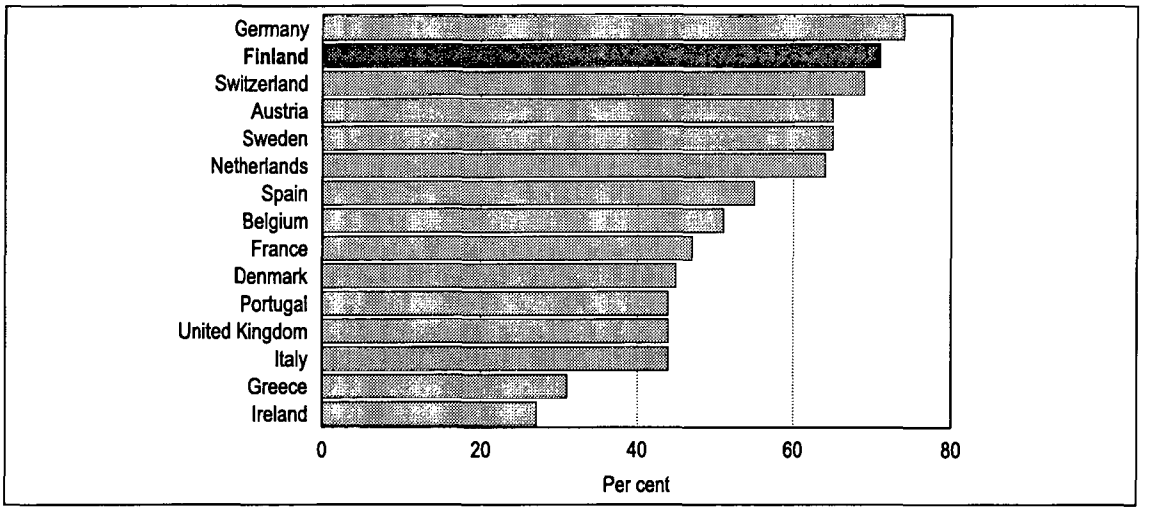
Figure 15. Pulp and paper industry production and emissions into the atmosphere (1990=100)



ment, the recovery and utilisation of recycled paper will be intensified so that by 2005 at least 75 per cent of the volume of paper products sold in Finland will be reused primarily as recycled material. In 2002, 764,700 tonnes of paper and board were recycled in Finland, making up 72 per cent of all paper used. The average global recovery rate is around 40 per cent. Only around 10 per cent of the Finnish paper and board industry's production is consumed domestically, so the potential for increasing the share of recycled fibre is limited.

In 2002, over 88,000 tonnes of waste paper was imported into Finland to be used in the production of recycled fibre, and the Finnish paper and board industry used 702,500 tonnes of reclaimed paper as raw material, so that reclaimed fibre accounted for five per cent of the paper and board industry's raw materials. This was used primarily in the production of different types of board, newsprint and tissue.

Figure 16. Recovery of waste paper in different countries 2001



Chemical industry

Chemicals are an important branch of industrial production in Finland in terms of both end products intended for consumers and, particularly, intermediate products supplied to other branches. However, even small quantities of many of the hazardous substances used and processed in the chemical industry may have serious environmental impacts, which underlines the need for reliable and comprehensive environmental protection. Most investments by the chemical industry in environmental protection consist of conventional external measures to purify emissions, whereas investments in process technology are at a low level. However, the industry has succeeded in siqnificantly reducing some of its discharges into water and air, and the volume of waste has been declining since 1994.

The chemical industry has taken voluntary steps to raise the standards of its environmental protection and industrial safety in the context of the international Responsible Care programme. In 2002 the programme covered more than 80 per cent of Finland's chemical industry production and over 60 per cent of the industry's employees, i.e. 24,300 employees. Of those companies committed to the Responsible Care programme, more than 85 per cent were using some quality management or environmental management system. Of the various systems, 44 per cent complied with ISO quality standards, 35 per cent with ISO environmental standards, 3 per cent with EMAS, 12 per cent with OHSAS standards, and 6 per cent with other systems.

Companies taking part in the Responsible Care programme invested EUR 77 million (27 per cent more than the previous year) in improving environmental, health and safety matters. Most of the investments dealt with energy efficiency, air pollution control and other unspecified areas. The operating costs

19. The chemical industry's discharges into the watercourses (tonnes)

	1998	1999	2000	2001	2002
Production volume (1998=100)	**100.0**	**102.9**	**111.9**	**113.3**	**112.1**
Sulphate	66 265	61 742	62 529	64 550	64 500
Phosphorus	15	13	15	13	11
Nitrogen	454	391	461	465	438
Mercury*)	12	7	8	7	6
Cadmium *)	0	1	0	0	0
Lead *)	7	5	3	3	2

*) = kg.

20. Emissions from oil refining (tonnes)

	1997	1999	2000	2001	2002
Production volume (1997=100)	**100.0**	**110.0**	**107.4**	**99.9**	**107.3**
Evaporable hydrocarbons	4 745	4 873	4 748	4 590	2 993
Nitrogen oxides	2 985	3 053	2 877	2 915	3 203
Sulphur dioxide	3 069	3 188	3 266	3 383	3 199
Oil spills to waters	5	4	5	9	3

of companies involved in the programme were EUR 101 million (8 per cent more than in the previous year) which was used to promote environmental, health, and safety issues. The greatest expenses were paid in water conservation, air pollution control and waste management.

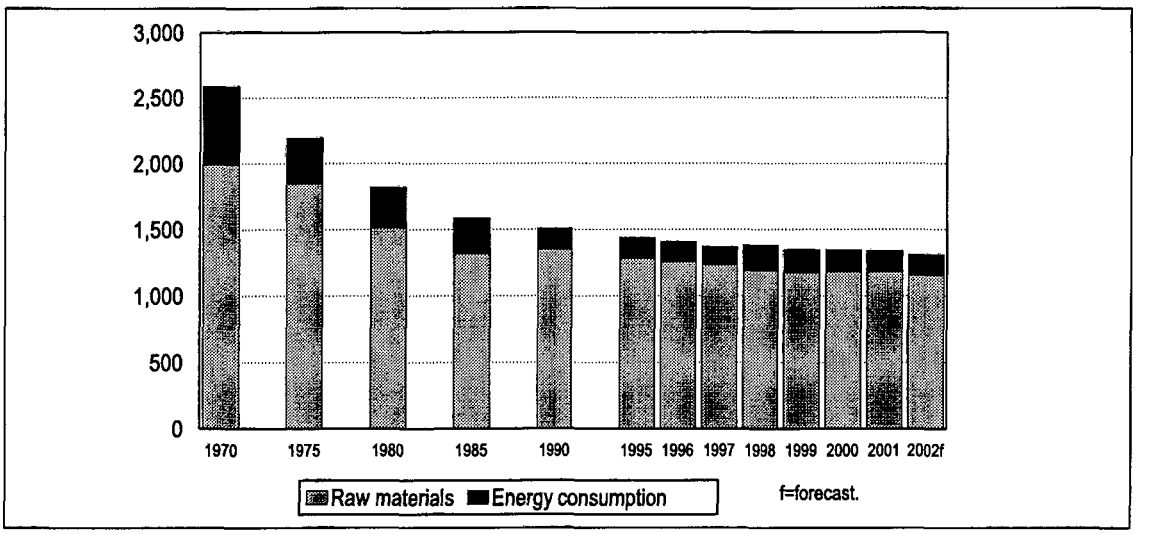
The most noteworthy emissions reductions under the Responsible Care programme were made in the early 1990s. In 2002 the reduction of emissions was stable, but most of the emissions levels fell in proportion to production volumes. Nitrogen discharges to water proportioned to the production volumes fell by some 14 per cent and the chemical oxygen demand in wastewater by 12 per cent from 2001. The release of emissions into the atmosphere proportioned to the quantity of production fell by around three per cent while the emissions of volatile organic compounds proportioned to the quantity of production fell by 10 per cent. Energy use in the chemical industry increased in 2002, though. The total consumption grew by nine per cent and if proportioned to the quantity of production, the increase was slightly over three per cent.

The amount of waste for disposal for companies taking part in the Responsible Care programme was 470,000 tonnes in 2002, which is around 11 per cent more than in the previous year. In 2002 the amount of waste directed for recycling was around 125,000 tonnes, which is around 22 per cent less than in the previous year. Hazardous waste for disposal amounted to some 116,000 tonnes in 2002, which is about five per cent more than in the previous year.

Metallurgical and electronics industries

The production of metal refining has grown steadily, having doubled over the last ten years. During the same period, production in the electronics and electrical industry grew almost five-fold. Of the total sales in the

Figure 17. Characteristic emissions of carbon dioxide in metal production (kilograms of carbon dioxide per tonne of metal produced)



metal and electronics industries in 2002, 45 per cent were from the electronics and electrical industry, 43 from the machine and metalworking industry, and 11 from metals refining. Most of the environmental effects in the metalworking industry arise from metals refining, where raw materials are being produced for use by other industries.

Extensive recycling of metals reduces the need for extracting virgin ores, as metals are almost entirely recyclable. Measured in terms of volume, the most recycled material in the world is steel: each year the volume of recycled steel exceeds the figure for all other materials put together. In 2001 some 400 million tonnes of scrap iron was used to produce 847 million tonnes of steel in the world, i.e. almost half of it was made from recycled material. Recycling raw materials significantly reduces energy consumption when making metals. For instance, the manufacture of steel from scrap iron requires some 58 per cent less energy per unit than does the use of virgin raw materials. The recycling of aluminium also saves significant amounts of energy. The smelting of recycled aluminium only requires five per cent of the energy that is needed to produce the same amount of aluminium from bauxite. Also, metals do not lose their properties when recycled.

Since the manufacture of metals requires large amounts of energy, emissions into the atmosphere have the greatest environmental impact in this sector. The Finnish smelting industry has worked on improving its production processes and significantly raised the efficiency of its raw materials and energy use and reduced its emissions. Half of the world's copper and 30 per cent ofits nickel are produced by the Finnish flash smelting method, which has a low external energy demand and which effectively recovers sulphurous gases.

The Kyoto protocol and carbon dioxide emissions are great challenges to metal refining. Coal is an indispensable deoxidiser in the manufacturing of iron in a furnace and in the production of chrome iron. The level of carbon dioxide emissions depends on the amount of raw material used. In Finland the furnace efficiency is world-class, and carbon dioxide emissions per unit produced are among the world's lowest. Modern technology can do little more to help reduce emissions.

21. Emissions from metal production

	1995	1996	1997	1998	1999	2000	2001	2002
Production volume (1995=100)	**100.0**	**106.3**	**111.6**	**118.0**	**122.2**	**127.7**	**124.5**	**124.6**
Emissions into the atmosphere (thousand tonnes)								
Sulphur dioxide	8.1	8.1	7.5	7.6	8.1	7.8	8.4	7.6
Nitrogen oxides	3.2	3.1	3.5	3.5	4.1	4.1	4.0	4.0
Discharges into water (tonnes)								
Nitrogen	420.6	449.3	421.6	526.0	490.0	520.5	351.4	307.5
Chromium	3.5	2.3	3.9	4.2	5.8	3.0	1.4	1.1
Nickel	12.4	6.0	10.3	6.8	9.3	7.2	5.6	3.8
Copper	8.2	8.7	8.9	6.8	7.1	9.7	7.9	3.3
Zinc	10.7	9.9	9.4	6.9	7.6	7.3	4.0	3.2

Investments in environmentally acceptable process technology in the metalworking industry exceeded the costs arising from the purchase of traditional emission control technologies already in 1996. Most investments aimed at combating air pollution in the industry concern the recovery of emitted particles and dust. Water protection investments involve reducing wastewater loads by developing production processes and treatment methods. The aims of waste management investments have been to reduce the amount of by-products and to increase recycling. In the smelting industry, the development of environmental protection has focused on the introduction of environmental management systems and related life-cycle analyses. The electrical and electronics industry has focused on reducing the use of CFC compounds and improving the recovery and utilisation of scrap.

5 Energy supplies

Energy production

In 2002 Finland's total energy consumption totalled 33 million oil equivalent tonnes. The consumption grew by 2.6 per cent from the previous year. Of energy consumption, oil accounts for 26 per cent, coal for 13 per cent, natural gas for 11 per cent, nuclear power for 17 per cent and peat for 6 per cent. The share of domestic energy sources was 30 per cent while 20 per cent originated from wood. Finland has a high level of per capita energy consumption, which is due to the considerable need for heating, the dominant role of heavy industry in the economy and the long distances in what is a sparsely populated country.

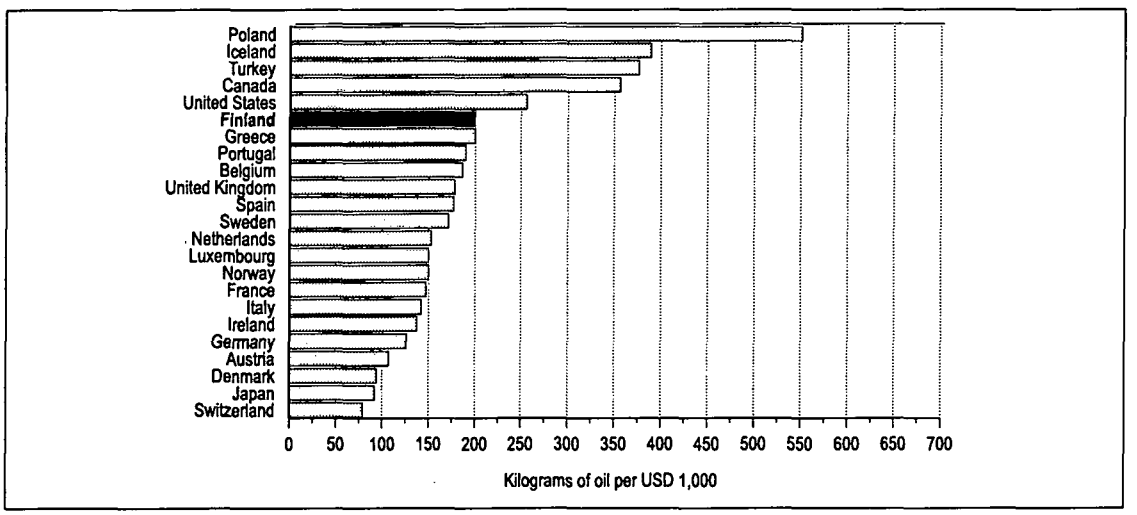
Electricity consumption amounted to 83.9 TWh in 2002, up by 3.3 per cent from 2001. The electricity supply was hindered by reductions in hydroelectric power generation, caused by the dry summer and autumn. Hydroelectric power production fell by 18 per cent, amounting to only 15 per cent of the total electricity produced. The increased electricity demand was met mainly by increasing separate electricity production with coal and peat. Net imported electricity also grew by 20 per cent. The use of electricity in the home and in agriculture grew by six per cent, mostly because the winter was colder than average. Electricity consumption grew by five per cent from the previous year in the service and public sectors. In industry and construction, electricity consumption grew by two per cent. Industry and construction accounted for 52.6 per cent of the electricity demand or 44.1 TWh.

In May 2002 the Finnish parliament made a decision in principle to approve the building of a fifth nuclear power plant. In connection with this, the parliament also required that quick measures be taken to limit the use of

22. Total energy consumption 2002

	Petajoules (PJ)	Per cent
Industry	531	49
Heating	240	22
Transport	173	16
Others	141	13
Total	**1 085**	**100**

Figure 18. Total energy consumption in selected countries by GDP unit in 2000



coal, to speed up the implementation of the country's energysaving programme and regulations, as well as to promote the research, development and introduction of renewable energy sources; a report will be made to the parliament concerning these actions during the next election period. According to Finland's National Climate Strategy, electricity consumption in 2010 will amount to 90 TWh unless additional savings measures are taken, and a few terawatthours less if the savings measures called for in the strategy are implemented. Nevertheless, even with the savings measures, electricity consumption will rise slightly to 90 TWh in 2015, in industry, households and the service sector.

Use of fossil fuels

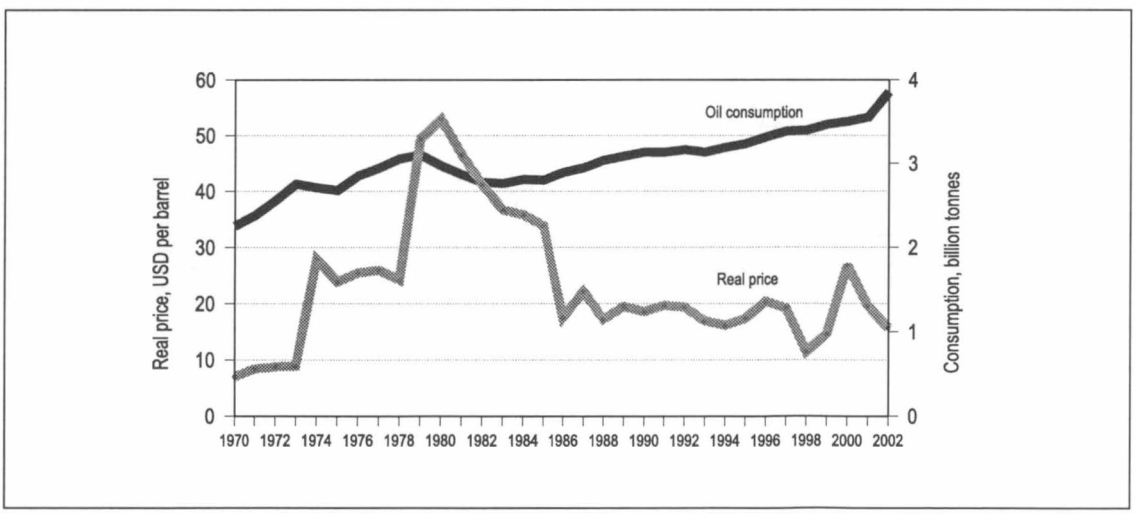
Much of the environmental damage caused by energy production is due to the use of fossil fuels. The adverse environmental impacts resulting from their use are considerable, and in many places they are by now seriously jeopardising the power generation and the carrying capasity. In light of what we know today, there is no threat that fossil energy resources will be depleted over the next few decades. Given the currently known fossil fuel reserves, the world's oil resources will last for the next 40 years, those of natural gas for 55 years and those of coal for 200 years.

23. Total consumption of oil, coal and natural gas in Finland

	Oil, millions of tonnes	Coal, millions of tonnes	Natural gas billion m^3
1973	12.3	4.0	–
1980	11.0	6.7	0.9
1985	9.2	6.4	0.9
1990	9.0	6.2	2.5
1995	8.2	6.1	3.3
1996	8.5	7.6	3.4
1997	8.4	7.0	3.4
1998	8.7	5.7	3.9
1999	8.7	5.6	3.8
2000	8.4	5.8	4.0
2001	8.6	6.4	4.3
2002	8.7	5.9	4.1

– = not in use.

Figure 19. World oil consumption and real world market price



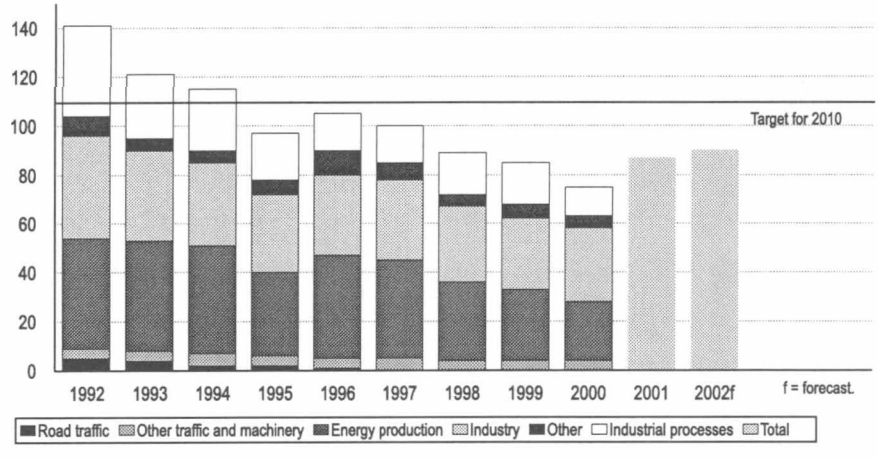
In recent years the world market prices of oil have been rising as a result of declining supply and rising demand. In the late 1990s, when the supply still greatly exceeded demand, the real price of crude oil fell and, and at its lowest it was in real terms below the price level preceding the first oil crisis in 1973. In 2002 global oil production totalled 3,855 million tonnes.

In Finland, oil consumption peaked in the 1970s at about 10 to 12 million tonnes a year. Consumption declined sharply in the 1980s, and during the 1990s annual consumption fell to less than nine million tonnes. In 2001, however, the consumption of oil products increased. In 2002, consumption of fossil fuels continued to grow in Finland. Petrol consumption increased by less than two per cent and that of diesel fuel by more than two per cent, whereas the consumption of light fuel oil fell by 3.5 per cent, heavy fuel oil by 1 per cent and coal by 0.7 per cent.

Air pollution and acid deposition

Acidification affects the soil and water in those areas of Finland that are the most sensitive and under the biggest load. The major sources of acid deposition are emissions of sulphur dioxides and oxides of nitrogen, largely from longrange transboundary pollution and somewhat less from domestic energy production and transport. In 2002 Finland's sulphur dioxide emissions totalled 90,000 tonnes, which meant a reduction of 65 per cent from the 1990 level. This reduction was the result of changes in the structure of energy production, lower use of heavy fuel oil, a fall in the sulphur content of fuel and improvements in process technology. Finland's sulphur dioxide emissions in proportion to GDP are about one-third less than the average in the European OECD countries. Electricity and heat generation account for 32 per cent of the emissions, and industry for 55 per cent. Already in 1994, Finland reached the targets set down for 2000 in the

Figure 20. Finland's sulphur emissions and reduction targets for 2010 (thousand tonnes of sulphur dioxide)



Oslo Protocol on Further Reduction of Sulphur Emissions.

In 2002 Finland's total emissions of oxides of nitrogen were around 208,000 tonnes, a good 20 per cent less than in 1990. Almost 60 per cent of these emissions were caused by domestic traffic. Energy generation accounted for 26 per cent of nitrogen emissions. Measured against the country's GDP, these emissions are comparatively high in Finland, about 70 per cent higher than in European OECD countries on average. Finland has achieved the targets set out in the Sofia Protocol, according to which emissions were to be halted at the 1987 level by 1994.

Acid deposition has caused damage to a number of fish populations in Finland, and evidence of damage has been observed in some 2000 lakes in southern and central Finland. There have, however, been some signs of recovery during the past few years as a result of reduced airborne loads. The sulphate concentrations in the lakes of southern and central Finland are on the decrease. Additionally,the buffering capacity, ie. the resistance to acidification of the lakes has im-

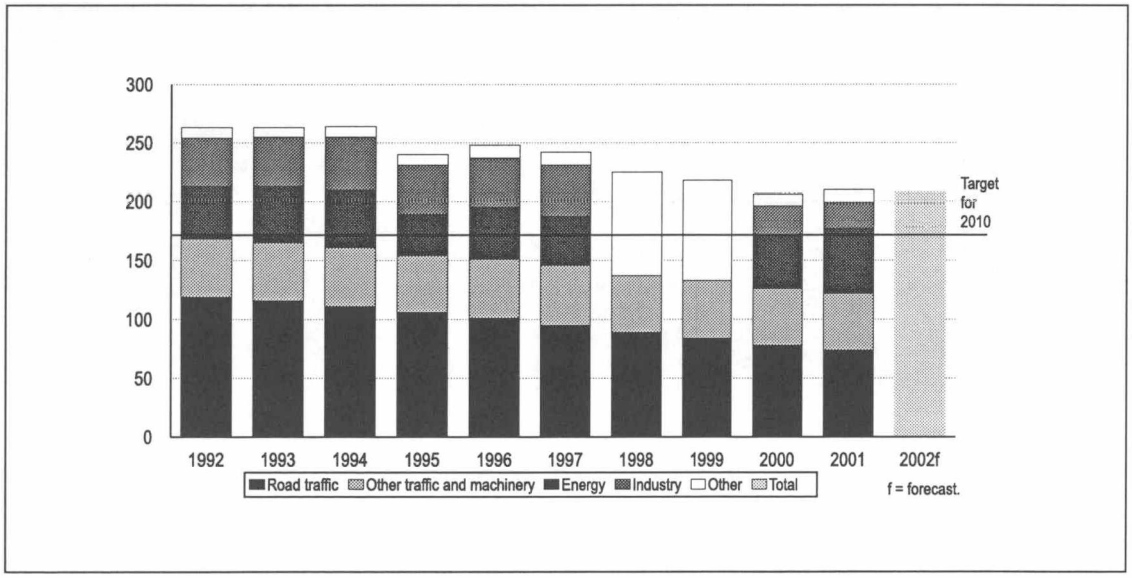
24. Origin of acid deposition in Finland 1998 (per cent)

	Sulphur	Nitrogen
Finland	17	29
Western Europe	13	23
Russia	29	9
Baltic States	7	4
Other Eastern Europe	17	7
Others (background deposition)	16	27
Total	**100**	**100**

25. Long-range transport of Finnish emissions in 1998 (per cent)

	Sulphur	Nitrogen
Finland	46	25
Western Europe	9	7
Russia	16	14
Baltic States	3	2
Other Eastern Europe	1	2
Others (background deposition)	25	49
Total	**100**	**100**

Figure 21. Finland's nitrogen oxides emissions and reduction targets for 2010 (thousand tonnes)



proved significantly during the past ten years. In spite of these favourable trends, critical loads are still being exceeded in certain parts of Finland. Improvements have also been recorded elsewhere in Europe, where acid deposition has decreased by 30-40 per cent since the 1980s. At least in the near future, groundwater acidification cannot be expected to pose any major threat to the country's forests. The situation may well change in the long term unless deposition levels can be reduced below critical loads in the whole country.

Climate change

Among the most serious environmental problems caused by the use of fossil fuels are greenhouse gases which lead to global warming. The Intergovernmental Panel on Climate Change (IPCC) produces scientific evaluations of climate change which are utilised in international climate negotiations and in calculating the greenhouse gas emissions of different nations. The IPCC has produced three extensive reports on climate change in 1990, 1996 and 2001. The latest report indicates that global temperatures could rise by 1.4-5.8 degrees Celsius by 2100. The corresponding average water temperature rise in Finland has been estimated at 2.4-7.4 degrees Celsius. The average winter temperature change according to the same estimate is 3.7-10.9 degrees Celsius, and for the summer, 1.6-5.3 degrees Celsius.

The reduction requirements of greenhouse gas emissions for industrial countries were agreed upon in the 1997 Kyoto Protocol. The requirements directed to the EU by the Protocol have been divided among the EU member states in the EU Burden Sharing Agreement. The agreement was accepted in 1998 and ratified in 2002. The EU member states will fulfil their duties by taking measures domestically, complemented by mea-

26. The sulphur dioxide, nitrogen oxides and ammonia emissions of the EU countries in 2000 and the emission ceilings reported by the countries for 2010 (thousand tonnes)

	Sulphur dioxide (SO_2)		Nitrogen oxides as NO_2		Ammonium (NH_3)	
	Emissions	Emission ceiling	Emissions	Emission ceiling	Emissions	Emission ceiling
Spain	1 535	746	1 419	847	518***)	353
United Kingdom	1 166	585	1 513	1 167	297	297
Germany*)	832	520	1 637	1 051	623	550
Italy*)	923	475	1 485	990	448	419
France	659	375	1 432	810	792	780
Greece**)	541	523	382	344	74	73
Belgium*)	181	99	289	176	100	74
Portugal**)	376	160	369	250	103	90
Ireland	132	42	125	65	123	116
Denmark	28	55	207	127	101	69
Netherlands	92	50	422	260	152	128
Finland	**74**	**110**	**237**	**170**	**33**	**31**
Sweden	58	67	246	148	56	57
Austria	41	39	184	103	67	66
Luxembourg	2	4	17	11	7	7
EU-15	**6 640**	**3 842**	**9 964**	**6 519**	**3 494**	**3 110**

*) = emission data from 1999. **) = emission data from 1998. ***) = emission data from 1996.

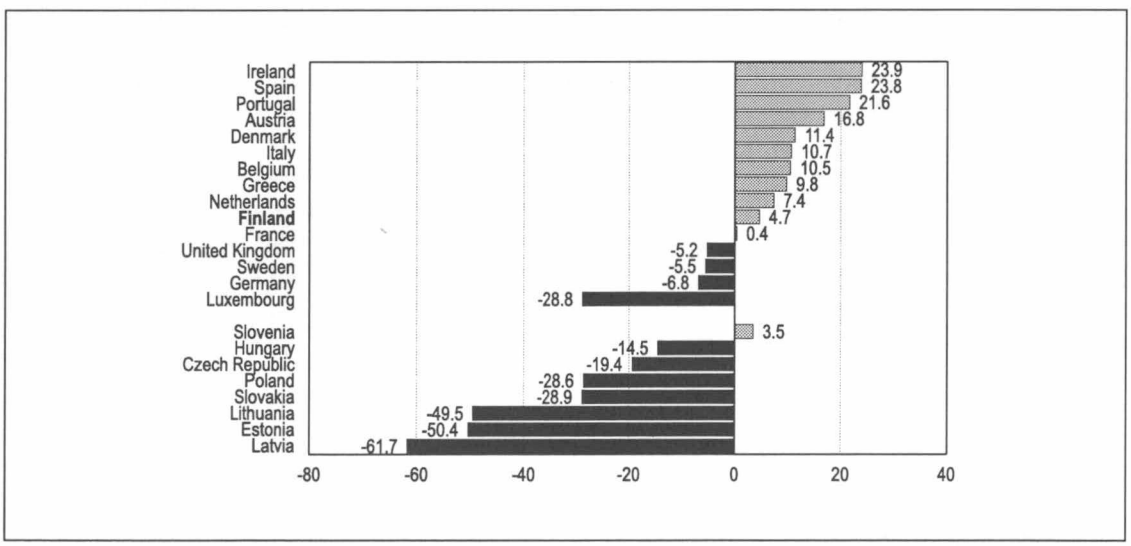
sures on the Community level. Within the EU Burden Sharing Agreement, Finland is committed to reducing its greenhouse gas emissions to the 1990 level by 2008-2012. The Kyoto Protocol specifies reductions for six gases: carbon dioxide, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbon (HFC), perfluorocarbon (PFC) and sulphur hexafluoride (SF_6). At unit level, the other gases have much stronger effects than CO_2: for instance, methane is 20 times, nitrous oxide more than 300 times and the three other gases are 1,000 times more harmful over a hundred-year period.

All EU member states have made or are in the process of making national implementation strategies to fulfil the Kyoto Protocol requirements. The member states' greenhouse gas strategies show a lot of variation. Some of the countries will buy a significant amount of their required emissions reductions from other countries within the framework of the Kyoto Protocol's flexible mechanisms. The European Environment Agency's (EEA) estimate in 2002 indicated that measures taken by the EU member states thus far will not suffice to reduce greenhouse gas emissions as set out in the Kyoto Protocol. With the existing measures

27. EU greenhouse gas emissions (carbon dioxide equivalent tonnes) and burden-sharing target

	Emissions 2001 (million tonnes)	Change 1990-2001 (%)	Burden sharing target 2008-2012
Luxembourg	6	- 44 %	- 28.0 %
Germany	994	- 18 %	- 21.0 %
Denmark	69	0 %	- 21.0 %
Austria	86	+ 10 %	- 13.0 %
United Kingdom	657	-12 %	- 12.5 %
Belgium	150	+ 6 %	- 7.5 %
Italy	545	+ 7 %	- 6.5 %
Netherlands	220	+ 4 %	- 6.0 %
France	561	0 %	0.0 %
Finland	**81**	**+ 5 %**	**0.0 %**
Sweden	71	- 3 %	+ 4.0 %
Ireland	70	+ 31 %	+ 13.0 %
Spain	383	+ 32 %	+ 15.0 %
Greece	132	+ 24 %	+ 25.0 %
Portugal	84	+ 36 %	+ 27.0 %
Total	**4 109**	**- 2 %**	**- 8.0 %**

Figure 22. EU member states in relation to Kyoto target levels in 2001 and new member states in relation to Kyoto target levels in 2000 (per cent)



for emissions reductions, it will be possible to reduce emissions by 4.7 per cent by 2010, leaving 3.3 per cent of the targeted reductions unattained. According to the EEA, with the planned supplementary measures the EU will be able to surpass the eight per cent target which has been set, and achieve reductions of up to 12.4 per cent.

Although many EU countries are hard-pressed to achieve the targets that have been set for them, some of the countries will voluntarily reduce their emissions more than has been agreed. Sweden, for instance, will cut its emissions by four per cent from the 1990 levels by 2012, even though the EU Burden Sharing would permit emissions in Sweden to increase by four per cent. The United Kingdom has also voluntarily committed itself to achieving substantial reductions, as stated in its energy strategy published in March 2003. It intends to reduce emissions by 20 per cent by 2010, instead of the 12.5 percent stated in the EU Burden Sharing Agreement. The German goal is a reduction of 25 per cent by 2005, although according to Burden Sharing, the target is a reduction of 21 per cent by 2012. The United Kingdom and Sweden have further announced that they will strive for reductions of 60 per cent by 2050 and have proposed that the European Union should act towards reducing emissions by 60 per cent by 2050.

The European Commission regards the establishment of emissions trading throughout the EU as a primary method in achieving the reduction targets for carbon dioxide emissions. The idea of the proposed system is to reduce greenhouse gas emissions as cheaply as possible and in an environmentally efficient way. The proposal on the Emissions Trading Directive was published in October 2001. This was founded on the Green Book on Climate Trading published by the Commission, and the European Climate Change Programme's (ECCP) preparatory work on emissions trading. The European Council reached political agreement on the directive in December 2002, after which the European Parliament has processed it further. The final acceptance is expected during 2003.

Emissions trading within the European Community is intended to function so that each member state divides the emissions allowances among the participants site by site, after which the emissions allowances can be traded within the Community. Those who find it easier to reduce emissions can sell their allowances to those for whom the reductions would be more expensive. Thus, cost-effectiveness can be achieved in the reduction of carbon dioxide emissions, as the emissions reductions are being made by those for whom it is the least expensive. Alongside cost-effectiveness, by starting emissions trading without delay, the EU is looking to be in a strong position for setting up emissions trading systems, and aims to prevent the development of incompatible national emissions trading systems. In the early stages, the trading would only include carbon dioxide emissions.

The European Council proposes that energy-intensive industries and energy production be included within the scope of EU emissions trading. The emissions of these sectors will account for an estimated 46 per cent of EU carbon dioxide emissions in 2010. The institutions taking part in the system could also under certain conditions form groupings. Other sectors and greenhouse gases could be incorporated into the system under certain conditions. According to the Council's common position, emissions trading is set to begin in 2005. During phase one, 2005-2007, the member states will distribute the emissions allowances for free. In phase

two, from 2008 to 2012, the member states must distribute at least 90 per cent of the emissions allowances for free. The emissions allowances are distributed to the institutions according to an initial national distribution plan and under criteria set down in the directive. These criteria include previous action to reduce emissions and the sector's capacity to reduce emissions.

In Finland, it has been proposed that the EU emissions trade cover around 60 per cent of the country's carbon dioxide emissions, which will have a significant impact on the Finnish climate policy. Since emissions reduction expenses are comparatively high in Finland, Finnish companies would primarily be purchasing emission rights. The matter still depends largely on the strictness of the initial distribution plan, among other things. According to a study by the Government Institute for Economic Research, it is possible that emissions trading will reduce the total costs arising from emissions reductions. In Finland, compatibility of emissions trading with other steering methods is important because political actions for reducing emissions, e.g. energy taxation, have already been introduced.

A test programme led by the Ministry for Foreign Affairs was started in 2000 to learn more about the project-based Kyoto mechanisms: Joint Implementation and the Clean Development Mechanism (JI/CDM). The test programme has EUR 22.5 million of funding for its operations. Some EUR 10 million of this has been invested in the World Bank's Prototype Carbon Fund (PCF), and the rest goes to bilateral JI and CDM projects and administration. The projects started under the test programme will provide emissions reductions until at least 2012.

The aim is to have a variety of project types that produce emissions reductions cost-effectively and in an environmentally friendly way. The projects should also maximise the learning potential through the test programme. Countries have been chosen which possess the means and the will for co-operation in relation to the mechanisms and with which Finland has had previous co-operation. One of the aims of the test programme is indeed to create co-operative relationships with the target countries and bases for agreement for the fulfilment of CDM and JI projects.

Experiences gained from the test programme can provide useful insights for the selection of viable mechanisms applied to the Kyoto mechanisms. One aim is also to compile a guideline for the preparation of projects. The test programme organised an international bidding contest in the beginning of 2003 to identify new CDM projects. The contest concentrated on small CDM projects because their implementation is estimated to be faster and cheaper than with larger projects. Contract negotiations have been started with those who have made the best-value offers for emissions reductions.

The United Nations Framework Convention on Climate Change (UNFCCC), in force since 1994, binds its signatories to submit an annual inventory report of their anthropogenic greenhouse emissions for the last but one year. In Finland, these inventory reports, and also the development of the inventory system, have been handled by a special greenhouse gas working group. The Intergovernmental Panel on Climate Change is preparing Good Practice Guidance for land use and land use change, and for calculation of emissions and sinks in the forestry. Sinks are, for example, soil and forests, which absorb carbon from the atmosphere in the carbon cycle.

In 2002, the Finnish fossil fuel and carbon dioxide emissions from peat rose to a new high, 63 million tonnes, exceeding the 1990 levels by 17 per cent. The reasons for the growth were the increase in energy consumption, the reduction of hydroelectricity production, and satisfying electricity demand with coal and peat. Furthermore, the comparison year, 1990, was notably warmer than 2002.

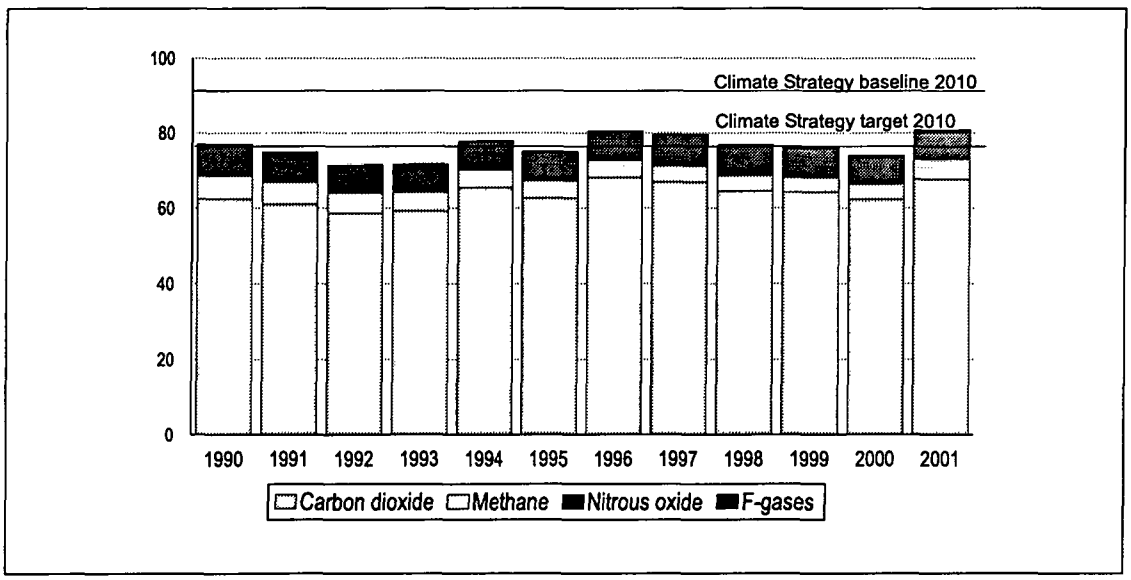
In 2001 Finland's net greenhouse gas emissions were the equivalent of 80.8 million tonnes of carbon dioxide. This is nearly four million tonnes more than in 1990, the Kyoto Protocol benchmark year, when emissions were 77 million carbon dioxide equivalent tonnes. The figures do not include carbon dioxide emissions from wood-based fuels, as these are considered to be reabsorbed by the forests. The most significant greenhouse gas is carbon dioxide, which accounted for 84 per cent of the total in 2001. The major sources are energy and traffic, which accounted for 79 per cent of total emissions and 95 per cent of carbon dioxide emissions. Finland's nitrous oxide emissions in 2001

28. Finland's greenhouse gas emissions by sectors in 2001

	Million CO_2 equivalent tonnes	Per cent
Energy	53 376	66.0
Traffic	13 133	16.2
Agriculture	7 451	9.2
Waste	3 140	3.9
Industry	3 048	3.8
Others	739	0.9
Total	**80 887**	**100.0**

amounted to 7.1 million carbon dioxide equivalent tonnes, or 8.8 per cent of Finland's total emissions. Nitrous oxide emissions have fallen by 1.2 million equivalent tonnes, i.e. 14.5 per cent, since 1990. These emissions are produced by the agriculture, energy, industry and waste sectors. The N_2O emissions of the agriculture sector, which is the most important of the aforementioned, were 3.7 million equivalent tonnes in 2001. Finland's methane emissions in 2001 were around 5.4 million equivalent tonnes, while in 1990 they were 6.3 million carbon dioxide equivalent tonnes. On the other hand, the F-gas emissions, i.e. HFC_5, PFC_5 and SF_6,

Figure 23. Finland's greenhouse gas emissions 1990–2001 (million equivalent carbon dioxide tonnes)



have increased considerably. However, they only accounted for 0.8 per cent of all greenhouse emissions in 2001. These gases arise primarily in industry and energy production.

The National Climate Strategy report presented to the Finnish parliament in 2001 mapped out procedures for decreasing greenhouse gas emissions. According to the report, Finland's greenhouse gas emissions will increase from the 1990 level of about 77 million carbon dioxide equivalent tonnes by 20 per cent to about 90 million tonnes in 2010, unless no additional restrictive measures are employed to complement the ones already agreed upon. The biggest challenge is posed by the increase in electricity consumption.

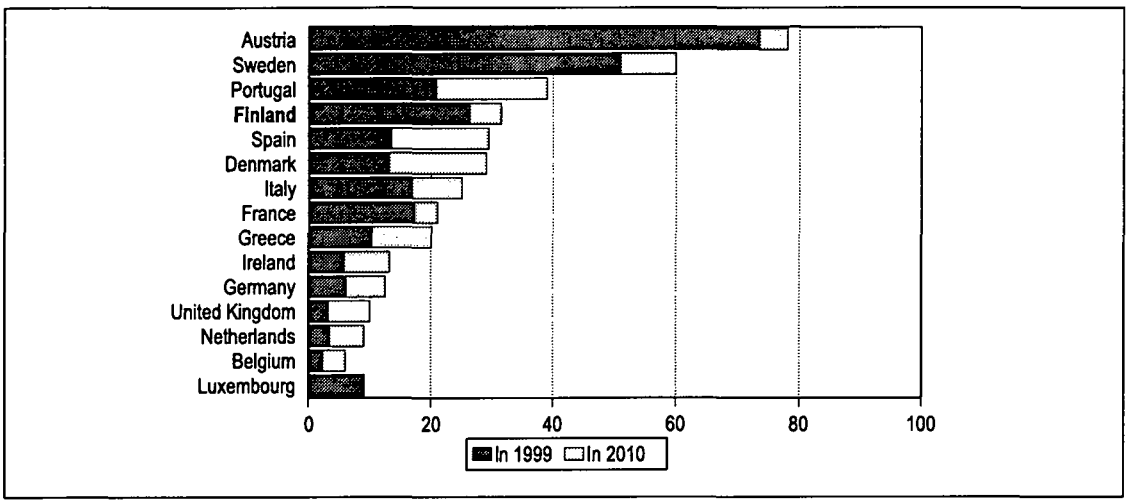
Sustainable energy supply

The promotion of renewable energy sources and increased efficiency in energy use are key conditions for sustainable development. The European Commission's proposal for a multi-annual programme on the energy sector's activities, Intelligent Energy for Europe (2003-2006), will continue along the lines of the framework programme for actions in the energy sector that expired at the end of 2002. The programme has been organised into four specific areas of activity. ALTENER promotes the use of new and renewable energy sources, SAVE is aimed at promoting the improvement of energy conservation, STEER is concerned with energy conservation in transport and fuels, and COOPENER is concerned with energy co-operation with developing countries. The general aim of the programme is to ensure the stability of energy supply in the Community, and to promote competitiveness and environmental protection in the energy sector. Starting in 2003, the EU's sixth framework programme on energy research will focus on sustainable development and global change.

In the directive promoting the use of electricity produced by renewable energy sources, each member state has an individual indicative target for the percentage of total energy consumption to be produced from renewable energy sources in 2010. The indicative target for Finland is 31.5 per cent. To promote combined heat and power (CHP) production, the European Commission has set a target for the whole EU to double the share of CHP by 2010. To achieve this target, a directive for promoting combined heat and power production is under preparation. The European Commission's aim is to double the percentage of renewable energy sources from the current figure of six per cent by 2010.

Initiated in 1999 as a part of the National Climate Strategy, the programme for the promotion of renewable energy sources aims to increase the use of renewable energy sources by 50 per cent from the 1995 level by 2010. Most, or 90 per cent, of the increase would come from bioenergy, mainly from wood, four per cent from heat pumps, three from hydropower, and less than 0.5 per cent from solar energy. The target would imply an increase of 5-6 percent in the use of renewable energy sources as a proportion of total energy consumption compared to 1995. Biofuels emit less harmful greenhouse gases and sulphur into the air than fossil fuels. To complement the Climate Strategy and to respond to the parliament's statements on the Climate Strategy and the resolution for a fifth nuclear power plant, a working group appointed by the Ministry of Trade and Industry proposed to renew the programme for the

Figure 24. Renewable energy sources as a proportion of electricity consumption in 1999, and the target for 2010 (per cent)



promotion of renewable energy sources at the end of 2002.

One of the goals of the National Forest Programme's and the Ministry of Trade and Industry's Action Plan for Renewable Energy Sources is to increase wood fuel use. In 2002, 13.3 million solid cubic metres of wood fuel was used in heat and power plants to produce 25 TWh of energy, representing six per cent of Finland's total energy consumption. An even greater source of energy was wood-derived waste liquor. Of the other wood fuels, the most significant is burning firewood. The most significant solid fuel is bark, with 65 per cent of the total. Bark, like sawdust and industrial and forest chips, originates from, and is thus dependent on, the wood-processing industry. Wood-based fuels accounted for around 20 per cent of Finland's energy consumption in 2002.

The world's wind power capacity has grown swiftly in recent years. Finland has both the know-how and the wind conditions to be able to achieve a rapid increase in the use of wind energy over the next few years. At the end of 2002, wind power capacity was 43 megawatts. In 2002 Finland produced 63 GWh of energy by wind power, which is 9 per cent less than during 2001. The goal is to increase Finland's wind power capacity to 500 MW by 2010. The construction of more wind power has been hampered by the low price of electricity. The EU's wind power ca-

29. The total consumption of forest chips in Finland in 2000–2002

	2000 GWh	2000 1000 k-m^3	2001 GWh	2001 1000 k-m^3	2002 GWh	2002 1000 k-m^3
Heat and power production	1 516	790	1 852	960	2 525	1 282
Combined heat and power production	*932*	*494*	*1 044*	*547*	*1 571*	*788*
Heat production	*584*	*296*	*808*	*413*	*954*	*494*
Small real estates	284	142	763	381	774	387
Total	**1 800**	**932**	**2 615**	**1 341**	**3 299**	**1 669**

30. EU wind power capacity December 31, 2002 and increase during 2002 (megawatts)

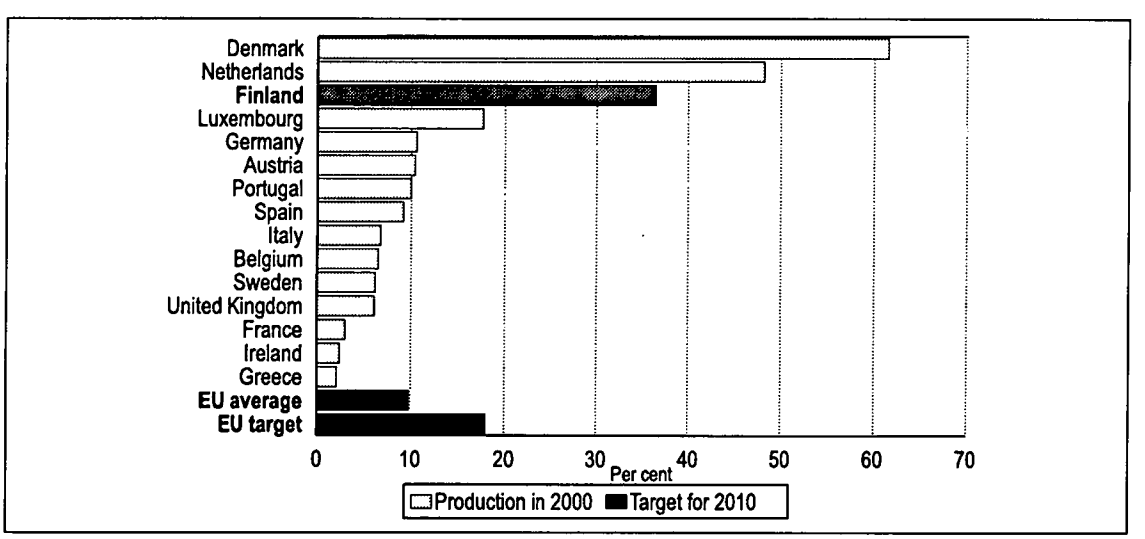
	Capacity	Increase
Germany	12 001	3 247
Spain	4 830	1 493
Denmark	2 880	497
Italy	785	103
Netherlands	688	217
United Kingdom	552	87
Portugal	194	63
France	145	52
Austria	139	45
Sweden	328	35
Ireland	137	13
Belgium	44	12
Greece	276	4
Finland	**41**	**2**
Luxembourg	16	1
EU total	**23 384**	**5 906**

pacity was 23,056 megawatts at the end of 2002, the United States', 4,685, and the rest of the world's, 2,470 megawatts.

Finland also has a high standard of know-how in the field of solar energy. Current applications of solar energy are mainly for the provision of electricity for holiday homes and remote regions. A total of some 30,000 solar panel units have been sold to generate electricity for holiday homes. Solar energy is used to light 1,500 shipping beacons and four experimental solar power stations have been connected to the electricity network.

Finland's energy supply system relies largely on conventional forms of energy. It is highly efficient, particularly on account of the combined heat and power (CHP) production. Co-generation uses two-thirds of the amount of fuel required in separate generation of power and heat. In 2002, 32 per cent of all electricity in the country was co-generated with heat. These co-generating plants generated a total of 24 billion TWh of district heating. All in all, the consumption of district heating in 2002 amounted to 29.5 TWh. Some 46 per cent of the population live in housing connected to a district heating system. In the larger cities, the figure is around 90 per cent.

Figure 25. Percentage of combined heat and power production (CHP) in EU countries in 2000



Energy taxes

The excise tax levied on energy products is divided into a basic tax and an additional tax. The basic tax is levied on liquid fuels such as petrol, diesel, and light fuel oil. The surtax is levied according to carbon content, and currently it is at EUR 18.05 per carbon dioxide tonne. Natural gas and combustible peat get a reduction on the surtax. Energy taxes amounted to EUR 2,756 million in 2002.

Electricity taxes are levied on all electricity regardless of production method. Electricity taxes are divided into two brackets. The lower tax applies to industry and market gardeners using greenhouses. The higher tax is applied to households, agriculture and forest industries, the service sector, and the public sector. Since an excise tax is not levied on the energy product used in electricity production, the size of the electricity tax is not affected by whether the electricity was produced with oil, coal, natural gas or wind power. Electricity produced from renewable energy sources does receive energy tax support, though; this totalled EUR 45 million in 2001.

In accordance with the government programme, energy taxation and environmental taxation are being developed to improve the state of the environment and to improve the chances of reducing work-related taxes. Changes in energy and electricity taxation take into account the solutions to be found within the scope of the EU and the viewpoints of companies in international competition. Fuel taxation supports the targets for reduction of fossil fuels, taking into account the particular traffic conditions in Finland. The most important areas of development in energy and environmental taxation concern the reform of the National Climate Strategy, and these areas are determined in conjunction with the Strategy.

The review of the Climate Strategy will be completed by the end of 2004. When reviewing the Climate Strategy, the use of different steering methods will be evaluated. The Ministry of Trade and Industry has set up a working group to evaluate the effects of energy taxation and energy production assistance as a steering mechanism when emission trading begins throughout the EU. The guidelines on the use of the steering mechanism will be drawn up within a rather short time, if emissions trading starts at the beginning of 2005.

An agreement was reached in March 2003 concerning the directive on a framework for energy taxation, under preparation since 1992. The directive is to take effect at the beginning of 2004. The minimum taxation levels for energy products in the taxation directive are lower than the taxation levels applied in Finland.

31. Finland's energy tax revenue in 2002 (EUR million)

Petrol	1 368
Diesel	673
Light fuel oil	162
Heavy fuel oil	49
Coal	58
Peat	16
Electricity	418
Natural gas	12
Total	**2 756**

6 Transport

Trends in traffic volumes

In many countries, traffic growth has been tightly connected to economic growth. In Finland, traffic growth during the first years of the new millennium was slightly slower than economic growth, whereas in EU countries on average, traffic growth was faster than economic growth. The situation changed in Finland in 2002, and economic growth grew more slowly than traffic. What is typical for Finland is that the growth focuses on passenger traffic, while in most other EU countries traffic growth is the result of greater freight transport volumes. Road traffic has increased in all the EU countries in both passenger traffic and freight transport.

Of total passenger kilometres in Finland, 70 per cent are travelled in private cars by drivers or passengers, a good 25 per cent are in public transport, and the rest mainly in light traffic. Considering the figures by activity, leisure journeys make up the largest travel group, 55 per cent of kilometres. Work and study journeys account for some 20 per cent of the kilometres and trips to do shopping and run errands, 10 per cent.

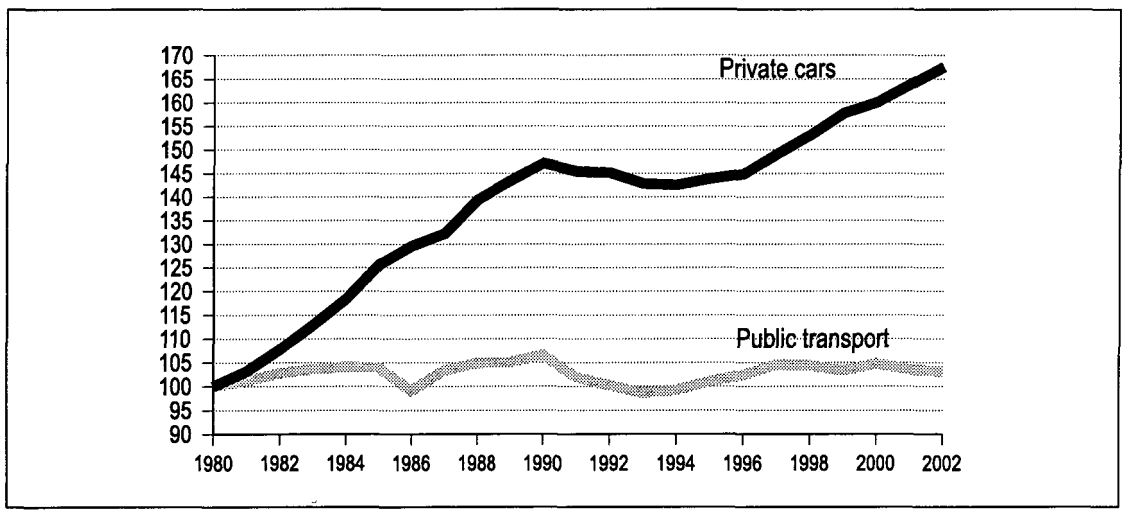
In freight transportation, over 70 per cent of kilometres are in road traffic, 25 per cent on rail and the rest on inland waterways. Compared with other EU countries, the proportion of freight transportation in rail traffic is somewhat higher than the EU average, and the proportion of road traffic is slightly lower. In passenger transportation, the situation is more or less the opposite.

Environmental impact

Transport has the following environmental effects:

- greenhouse gas emissions (carbon dioxide, methane and nitrous oxide emissions)
- other exhaust gas emissions detrimental to the environment or human health (ox-

Figure 26. Trends in the use of public transport and private cars (1980=100)



ides of nitrogen, sulphur dioxide, hydrocarbons, carbon monoxide and particles)

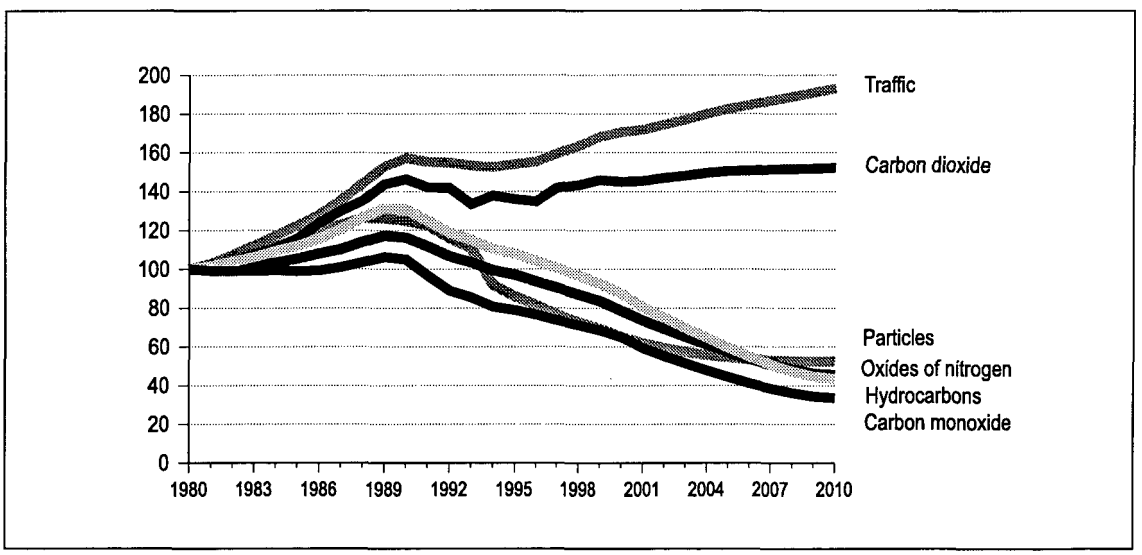
- noise
- impacts on ground and surface water, the soil, natural resources and/or biodiversity
- impacts on the social environment (e.g. on well-being).

Finland is attempting to reduce the adverse environmental impacts of transport by means of an ISO 14001 compliant environmental system. The programme is based on the environmental programme for transportation, containing the targets, actions, timetables and division of responsibility for 1999-2004. Administrative institutions and companies will complement the programme with their own programmes. Implementation of the programmes will be monitored annually.

The carbon dioxide emissions of Finnish traffic totalled 12 million tonnes in 2002, i.e. constituting some 20 per cent of all carbon dioxide emissions. Of this, road traffic accounted for around 90 per cent. Traffic accounted for around 15 per cent of methane emissions, just over 30 per cent of nitrous oxide emissions and around 10 per cent of HFC compound emissions. If no further action is taken, traffic emissions are estimated to increase by a million carbon dioxide tonnes by 2020-2025. The goal, though, is to freeze emission levels at the 1990 level.

Attempts are being made to reduce greenhouse gas emissions, for example, by means of the climate strategy of the transportation sector. The measures proposed in the strategy have been grouped into nine types of action designed to enable reaching the1990 level by 2010. The measures aim to reduce the need for transportation (most importantly by condensing and integrating the social structure) and to affect the modal split. Attention has also been paid to goods transport, international transport, driving habits and solutions provided by information technology.

Figure 27. Trends in emissions from road traffic (1980=100)



32. Finland's traffic emissions in 2002 (tonnes)

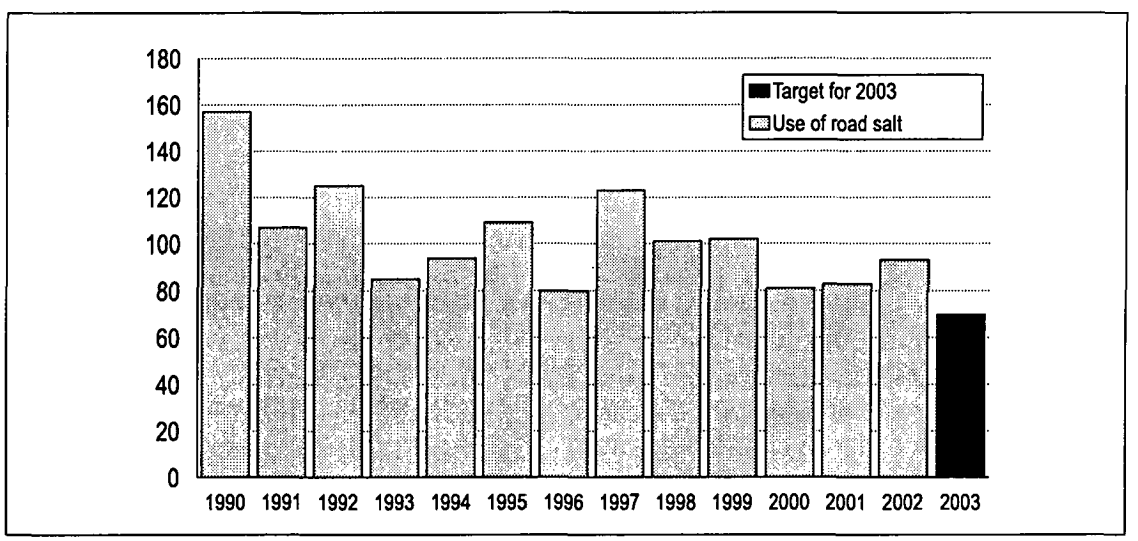
	Carbon monoxide	Hydro-carbons	Oxides of nitrogen	Particles	Sulphur dioxide	Carbon dioxide
Road traffic	304 693	37 490	69 676	3 633	228	11 256 408
Rail transport	536	200	3 437	104	297	276 817
Water transport	29 338	10 650	71 364	2 117	19 097	3 241 407
Air transport	2 978	331	3 007	0	262	1 051 078
Total	**337 545**	**48 671**	**147 484**	**5 854**	**19 884**	**15 825 710**
Percentage of total emissions	60 %	30 %	50 %	15 %	20 %	20 %

NB. The figures include power plant emissions caused by electric train transportation, and the emissions of internationally-bound water and air transportation in the Finnish economic zone.

The first contract period of the first energy conservation agreement for the trucking industry finished at the end of 2002. In March 2003, a new energy conservation programme for light commercial vehicle and lorry transportation was published. The programme is the result of joint efforts by the Ministry of Transport and Communications, the Ministry of Trade and Industry, the Ministry of the Environment, the Finnish Trucking Association, the Finnish Vehicle Administration and Motiva (an information centre for energy efficiency). The aim of the new programme is to help energy conservation measures take root in the sector on a wider basis and to change attitudes towards more active environmental management. In numbers, the goal is that in lorry and light commercial vehicle transportation, fuel consumption per transportation trip is reduced by two per cent in 2005 compared to 2000, and the goal for 2010 is for consumption to be reduced by five per cent compared to 2000.

The aim is to achieve technical improvements in the specific consumption of vehicles through agreements made between the EU and the automotive industry. According to the agreements, the average fuel consumption of private cars should decrease to 5-6 litres per 100 km and the average carbon dioxide emissions to 140 grams per km by

Figure 28. Use of road salt and target level in 2003 (tonnes)



2009. In 2001, the average fuel consumption in new petrol-driven cars was 7.5 litres and carbon dioxide emissions were around 178 grams per 100 km. For diesel cars, the corresponding figures were six litres and 155 grams.

The transport sector's environmental considerations will in the future also focus on urban air quality and noise abatement. Thanks to improvements in fuel quality and engine technologies, air quality norms are exceeded less often nowadays, although the limits for particles and oxides of nitrogen are still sometimes exceeded. The total particle content of city air peaks in spring when sand spread on the roads during the winter rises into the air as dust because of air currents caused by the traffic. Levels of oxides of nitrogen are highest in busy and poorly ventilated street canyons.

Motor vehicle emissions limits have been significantly tightened over the last few decades and these continue to be revised. In 2000 a change in the heavy vehicle emissions directive was put into force in Finland, which should cut current particle emissions by 80 per cent compared to current levels by 2006, and nitrogen oxide emissions should fall by 40 per cent by 2009. Passenger car and light commercial vehicle emissions limits were tightened in 2001 and will tighten further in 2006, while those for motorcycles will tighten in 2003 and 2005. The quality requirements of fuels have also been tightened in EU countries, most recently in 2000 and next in 2005.

The problems of noise from traffic will continue to increase with the ever-growing number of people and vehicles in the major cities and towns. According to estimates, nearly a million Finns live in areas with traffic noise at over 55dBA. Of these, around 560,000 live in street and planned-road noise areas, around 320,000 near public hihways, around 35,000 in the proximity of a railway and around 30,000 in a flight traffic noise area. Up until now, the noise problem has been mainly tackled by technical improvements to vehicles and by noise barriers, but in the future, zoning and regulating the traffic volumes in cities will need to play a more prominent role in dealing with the problem.

An EU environmental noise directive came into force in July 2002. The noise mappings and action plans required by the directive must be drawn up for municipalities of over 100,000 inhabitants and for main traffic routes (more than 3 million cars per year, i.e. around 8,000 cars per day, or over 30,000 train pass-bys per year) and for main airports (more than 50,000 operations per year). In Finland, the directive calls for action in the Helsinki region, in Oulu, Tampere, Turku, and Jyväskylä.

In 2002 the Finnish Road Administration's and the Ministry of Transport and Communication's pilot project for the creation of a

33. Material flows in road maintenance (thousand tonnes)

	1997	1998	1999	2000	2001	2002
Construction						
Rock materoial from outside	6 051	7 703	5 466	3 368	3 668	2 858
Road network maintenance						
Salt	120	102	103	82	83	93
Sand	650	610	560	570	524	680
Waste collected	11	10	13	12	11	11

common noise database was continued. The database was expanded to include the noise data of the Civil Aviation Administration and the Finnish Rail Administration. The project will be expanded in the future to create a noise database for the whole country, covering all sources of environmental noise.

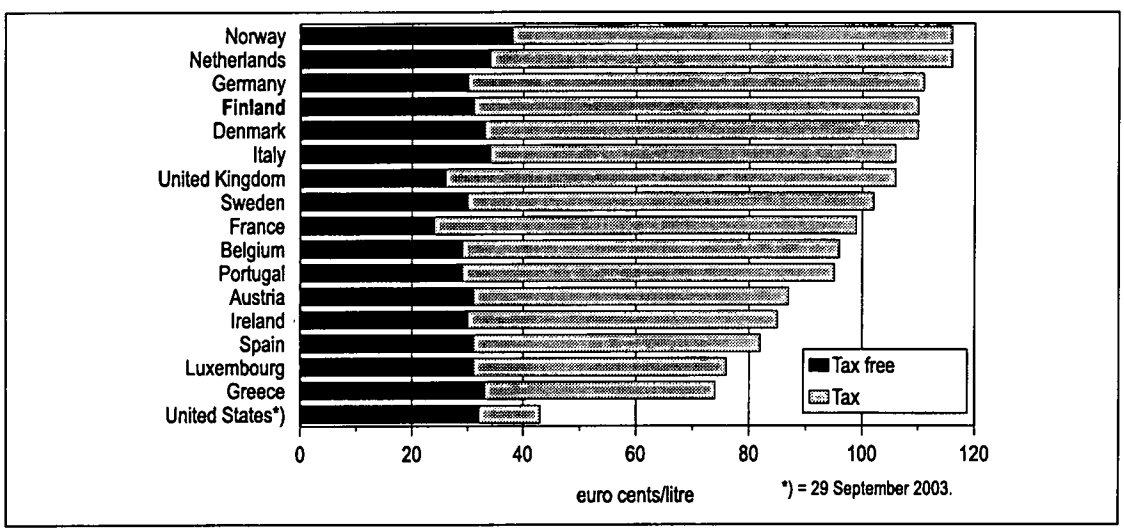
In the traffic sector, the protection of groundwater and soil is taken into account already in the planning phase of projects. The environmental impact assessment (EIA) scheme is designed to prevent problems from taking shape. As to existing road traffic routes, a groundwater protection programme has been put into effect that protects the most critical sites. In 2002 there were around 40 of these, and around 110 km of road are in need of this protection. Less groundwater protection was put in place in 2002 than in the previous years, around seven kilometres, because of poor funding for road maintenance. Use of road salt to prevent roads from freezing was reduced especially in groundwater areas. To prevent slippery conditions at airports, there has been an almost complete change to using chemicals that consume less oxygen.

Natural resource use and waste generation have decreased somewhat in the traffic sector over the last decade. Road policy is slowly undergoing a shift from the construction of new roads to the maintenance of existing ones. Furthermore, in road construction, the policy is to increasingly use soil material recoverable from near the site itself, thereby decreasing the amount of soil materials transported to and from the construction site.

Transport costs and taxation

In the EU the basis for economic steering is the "marginal social cost" charging principle, in which transport expenses dependent on the distance covered are incorporated into transport fees. The pricing of traffic through various kinds of taxes and fees is an important means of steering consumption in an environmentally friendlier direction. Taxes targeted at road traffic include the automobile or motorcycle tax levied on acquisition, the annual vehicle license tax and motor vehicle tax, and the fuel tax. The fuel tax on road traffic is partly based on environmental effects, so the fuel tax for sulphur-free and

Figure 29. Retail prices of petrol (95E) on 15 August 2003



34. Special taxes levied on road traffic (EUR million)

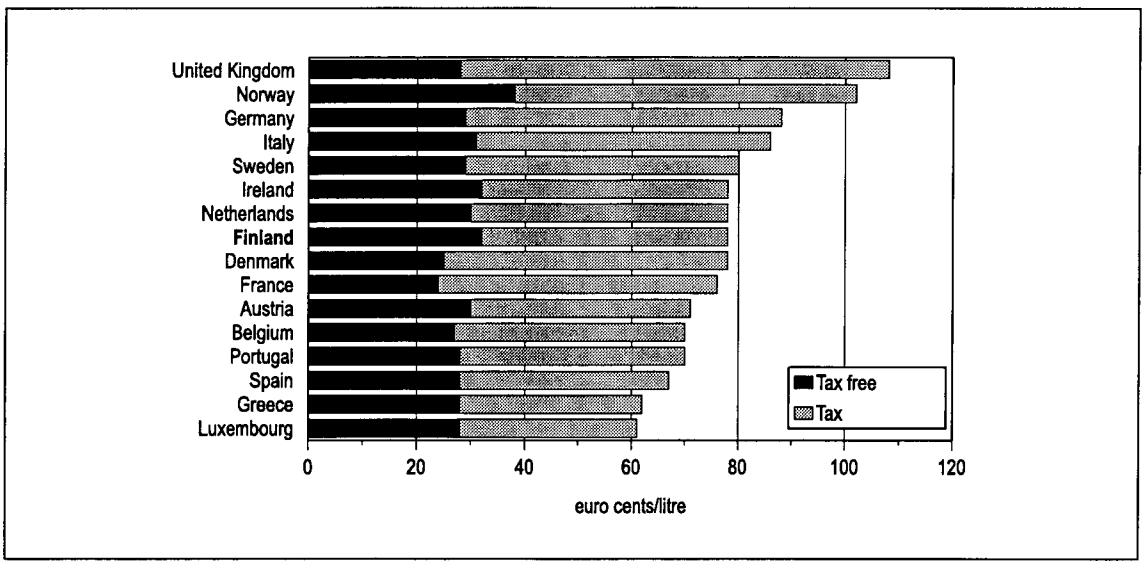
	2000 A	2001 A	2002 A	2003 B	2004 BP
Vehicle tax	220	227	237	247	285
Motor vehicle tax	181	208	209	218	228
Motor car tax	1 059	922	1 023	850	1 020
VAT on motor car tax	186	162	180	150	180
Fuel tax	1 939	1 960	1 971	2 196	2 231
VAT on fuel tax	274	296	296	329	334
Total	**3 859**	**3 775**	**3 916**	**3 990**	**4 278**

A = Final accounts. B = Budget. BP = Budget proposal.

lead-free fuel is lower. Moreover, the surtax is based on the carbon content, being EUR 17.2 per tonne of carbon dioxide. Economic steering has also been applied to rail traffic in Finland. The rail fee, renewed in 2000, is based on the "marginal social cost" charging principle and takes into account the external costs caused by traffic volume. In 2002, EUR 53 million were collected in rail fees. The tax on fuel is the main source of revenue of the special taxes levied on road traffic. Taxes currently make up around 70 per cent of the price of unleaded petrol in Finland, and 54 per cent of diesel.

In 2002, EUR 629 million of net appropriations in the state budget were used for basic road maintenance, and around EUR 154 million for road development projects. EUR 328 million were used for basic rail maintenance and EUR 88 million for rail traffic development investments.

Figure 30. Retail prices of diesel on 15 August 2003



7 Towards sustainable development

The journey towards sustainable development began with the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992. The progress of sustainable development was evaluated at the ten-year follow-up summit on sustainable development (the World Summit on Sustainable Development, WSSD) held in Johannesburg in August-September 2002. Some of the most significant findings of the summit were that world poverty is the largest obstacle to sustainable development and that the implementation of sustainable development requires broad participation at all levels. Current aims in sustainable development include sustainable production and consumption, eradication of poverty and the protection and sustainable use of natural resources.

Over the last decade, the European Union has taken a leading role in promoting the policies and actions of sustainable development. The EU's sustainable development strategy, which closely integrates the policies of economically, socially and ecologically sustainable development, was at the same time the Community's contribution to the United Nations' ten-year follow-up to the Rio process in August-September 2002. Additionally, the EU ratified the Kyoto protocol before the Johannesburg summit. One of the important achievements of the summit was a plan of action to halve the number of people living in poverty, part of the UN Millennium Declaration. Another result of the Johannesburg summit was that the balanced integration of the three dimensions of sustainable development was strengthened. Some of the most important commitments agreed upon at Johannesburg were the decision on the ten-year framework programme on sustainable production and consumption, and the scheduled targets concerning biodiversity, chemicals and fish populations.

The Finnish government is committed to implementing the Johannesburg Plan of Implementation (JPoI) of the UN World Summit on Sustainable Development. The government's intention is to draw up a national programme that covers different administrative branches for production and consumption methods that are ecologically, socially and economically sustainable. All in all, Finland has to analyse its own activities to find even better sustainable development practices.

Finland was able to significantly reduce environmental damage in the 1980s and 1990s. Indeed, now at the beginning of the new millennium, the level of environmental protection in Finland is high by international comparison. According to the government programme, the goal of Finland's environmental policy is to firmly establish Finland's position as an information and knowledgebased society known for its high level of environmental protection; a society whose competitiveness is based on consumption and production which meets the requirements of ecologically sustainable development. Also, Finland actively participates in international co-operation for solving global environmental problems and promoting international environmental policy.

One of the most important tasks that lies ahead in the near future, both in Finland and internationally, is to get an overall picture of the state of the environment and any potential threats. The effects of global warming are already observable in the flora and fauna, with coral reefs showing the greatest effects. Climate changes can also be seen in the shortening of European winters and the effect on the migration of birds, for instance. Unfortunately, painting a clear general picture of the state of the environment is problematic, because many environmental matters exhibit contradictory trends. The ten-year follow-up summit on sustainable development aimed at forming a general picture of the environment and the results achieved within the framework of sustainable development. Work is currently under way to develop the tools and methods needed for this analysis. Finland participated in the testing of the UN's sustainable development indicators between 1996-1999. In addition, the UN, the World Bank, the OECD and Eurostat, the Statistical Office of the European Communities, are revising guidelines for the calculation of an environmentally adjusted green GDP.

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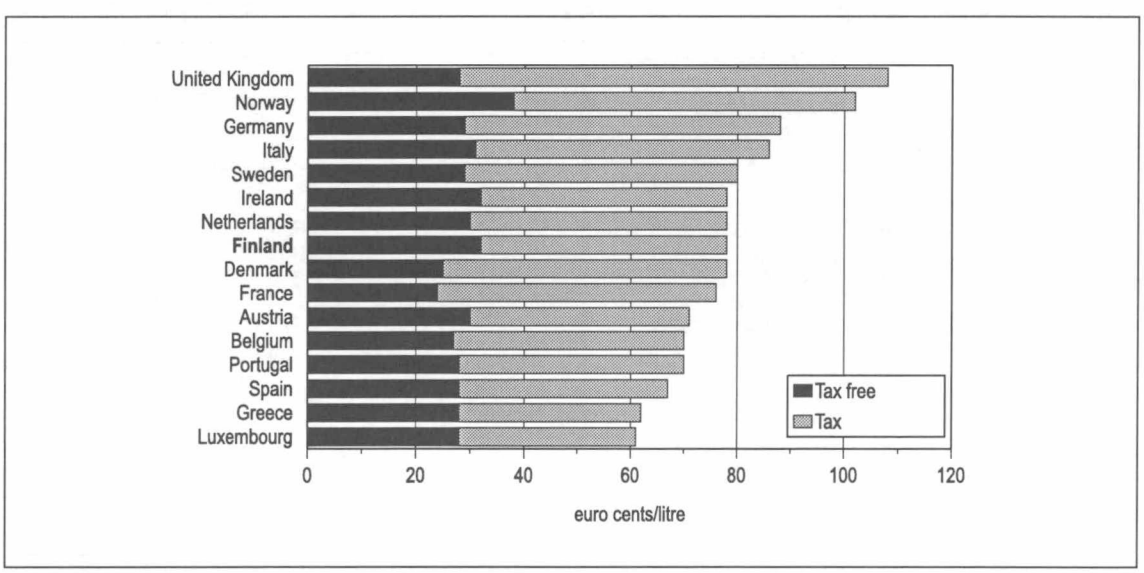

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Principal agreements on the conservation of natural resources and the environment to which Finland is committed

Agreement	Objectives	Implementation
Climate change • UN Framework Agreement on Climate Change, Rio de Janeiro, 1992. • Kyoto Protocol, 1997.	To stabilise greenhouse gas concentrations in the atmosphere at a safe level. Kyoto protocol industrial countries committed themselves to reducing their greenhouse gas emissions altogether by 5% from the 1990 level by 2008-2012. Finland's obligation in the joint EU target is to keep emissions at the 1990 level during the 2008-2012 period.	The protocol has been ratified by 104 countries and the EU. The EU and its member states ratified the protocol on 31 May 2002. In 2000 Finland's emissions were somewhat higher than the 1990 level.
Substances depleting the ozone layer • The Vienna Convention for the Protection of the Ozone Layer, 1985. • Montreal Protocol, 1987.	To stop the use of substances causing depletion of the ozone layer in the upper atmosphere.	The production, consumption, use, import and export of substances causing depletion of the ozone layer have been restricted by EU regulation 2037/2000 and a Government decision (262/1998).
Wild fauna and flora Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973, and protocols.	To regulate the international trade of endangered species and their products.	The Convention has been signed by 162 countries and ratified by 161 countries including the EU. The Convention will be implemented through corresponding EU regulations.
Biological diversity • Convention on Biologica Diversity, Rio de Janeiro, 1992. • Cartagena Biosafety Protocol, 2000.	To protect the diversity of global ecosystems, animal and plant species and their genes, to establish a pattern for their sustainable use, and to achieve an equitable division of the benefits gained from the use of genetic resources. The Protocol aims to ensure the safety of importing genetically modified organisms in terms of both biological diversity and human health.	The second follow-up report of the Finnish national action programme on biological diversity was completed in 2002. The Cartagena Protocol has not yet entered into force. It has been signed by 103 countries (incl. Finland) and ratified by 39 countries. The preparation of Finland's ratification started in spring 2002.
Hazardous waste • Basel Convention on the Control of Trans boundary Movements of Hazardous Waste and their Disposal, 1989. • Protocol on liability/compensation for damage, 1999.	Environmental viewpoints to be considered in transboundary transport of hazardous waste. The production of waste to be limited and attempts made to utilise and process waste as close as possible to its place of origin.	The protocol on liability and compensation for damage was signed in Dec. 2000. All EU countries prohibit the export of hazardous waste from industrial countries to developing countries. Finland has assisted developing countries in the management of hazardous waste disposal.
Persistent organic pollutants • Stockholm Convention on persistent organic pollutants (POPs), 2001.	To halt production and use of ten pesticides and industrial chemicals, to regulate dioxin and furan emissions.	The convention has been signed by 151 countries, and ratified by 30. Finland ratified the convention on 3 Sept. 2002. The EU ratification is pending.
Trade in hazardous chemicals • Rotterdam Agreement on Prior Consent for Certain Chemical Substances and Dangerous Pesticides in International Trade (PIC), 1998.	The export of dangerous chemicals and pesticides listed in the Agreement is allowed only with the prior consent of the importing state, which may also refuse to accept the chemicals. The Agreement applies to five industrial chemicals and 22 pesticides.	The Agreement has not yet entered into force, but the PIC system is already adhered to voluntarily. The Agreement has been ratified by 41 countries. In Finland, the ratification is pending. The EU ratified the Agreement on 22 Dec 2002.
Environmental impact assessment • Convention on Environmental Impact Assessment in a Transboundary Context, Espoo, 1991.	To assess the environmental effects, as well as prevent and limit the harm from projects that cause significant transboundary environmental damage, before making decisions related to them.	The Convention came into force in 1997. By the end of 2000, it had been ratified by 39 states and the EU. Finland has applied the Convention to 7 projects and has been the recipient 5 times.

Agreement	Objectives	Implementation
Convention on Long-Range Transbpundary Air Pollution, 1979. • Volatile organic compounds (VOCs) (Geneva, 1991).	To cut emissions of volatile hydrocarbons by 30% from the 1998 level by 1999.	The Protocol has been signed by 22 countries and the EU, and ratified by 21 countries. Finland ratified the Protocol on 11 Jan 1994. Finland's emissions in 2000 were 27% lower than in 1998.
• Sulphur (Oslo, 1994).	To ensure in the long run that sulphur deposition does not exceed the critical load for each area. Finland is committed to cutting down its sulphur emissions by 80% from the 1980 level by 2000.	Finland's emissions in 2000 were 87% lower than in 1980.
• Nitrogen oxides (Sofia, 1988).	Finland has committed itself to freezing its emissions of oxides of nitrogen to the 1987 level by the end of 1994.	Finland's emissions in 2000 were 18% lower than in 1987.
• Heavy metals (Århus, 1998).	To reduce emissions of mercury, lead and cadmium below the 1990 level.	The Protocol has not yet entered into force. It has been signed by 35 countries and the EU, and ratified by 13 countries and the EU. Finland ratified the Protocol on 20 June 2000.
• Persistent organic pollutants (POP's) (Århus, 1998).	To restrict or discontinue the use of persistent organic compounds (e.g. pesticides).	The Protocol has not yet entered into force. It has been signed by 35 countries and the EU, and ratified by 14 countries. Finland ratified the Protocol on 3 September 2002.
• The abatement of acidification, eutrophication and ground-level ozone, Gothenberg, 1999.	To cut emissions of sulphur dioxide, oxides of nitrogen, ammonia and volatile organic compounds (VOCs). Finland's emission ceilings as from 2010 are 116,000 tonnes of sulphur, 170,000 tonnes of oxides of nitrogen, 130,000 tonnes of VOC and 31,000 tonnes of ammonia.	The Protocol has not yet entered into force. It has been signed by 31 countries and ratified by four.
Access to information and participation • Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, Århus, 1998.	To guarantee public participation and the supply of information concerning environmental matters, as well as the right of appeal and the right to the institution of proceedings.	The Convention came into force on 30 Oct. 2001. The Protocol has been signed by 40 countries, and ratified by 23. Finland has not yet ratified the Protocol but the preparations are at an advanced stage. Finnish legislation mostly fulfils the requirements of the Convention.
Protection of the Baltic Sea • Helsinki Convention on the protection of the marine environment of the Baltic Sea, 1992.	To prevent and stop the pollution of the Baltic Sea, to promote its ecological recovery and to preserve its ecological balance.	A revised Agreement came into force on 17 Jan. 2000 and the revisions to the appendices III and IV on the prevention of pollution from agriculture and on the organisation of reception of ship-originated waste came into force on 31 Dec. 2000.
• Baltic Environmental Programme, 1992.	To eliminate the Baltic Sea's worst local point sources and non-point source inputs.	Will be implemented through national permits and bilateral and multilateral co-operation, especially in the neighbouring areas.
• HELCOM Recommendations and Ministerial Statements, 1988 and 1998.	To reduce emissions of nutrients, heavy metals and persistent or toxic organic substances into the Baltic Sea by 50% from the 1987 level by 2005.	The targets will be implemented through the "Targets for Water Protection 2005" programme accepted by the Government and the "Water Protection Programme to 2005" accepted by the Ministry of the Environment, the baltic Environmental Programme and through EU regulations.

Statistical appendix

1. World's carbon dioxide emissions from fossil fuels and forecast until 2020 (million tonnes of coal)

	Total	Industrialised countries	Developing countries	Others
1900	526	..	..	..
1910	806	..	..	..
1920	960	..	..	..
1930	1 079	..	..	..
1940	1 303	..	..	..
1950	1 612	1 176	141	295
1955	2 013	1 355	230	428
1960	2 535	1 504	452	579
1965	3 087	1 840	465	782
1970	3 997	2 272	686	1 039
1975	4 518	2 341	931	1 246
1980	5 177	2 531	1 202	1 444
1985	5 274	2 426	1 454	1 394
1990	5 939	2 576	1 810	1 553
1995	6 182	2 642	2 317	1 223
2000	6 480	2 847	2 631	1 001
2001	6 553	2 887	2 692	974
2002	6 553	2 887	2 692	974
2003	6 682	2 952	2 775	955
2004	6 812	3 016	2 859	937
2005	6 942	3 081	2 943	918
2006	7 072	3 146	3 026	900
2007	7 201	3 210	3 110	881
2008	7 332	3 275	3 194	863
2009	7 461	3 340	3 277	844
2010	7 590	3 404	3 361	825
2015	8 402	3 575	3 945	882
2020	9 254	3 706	4 571	977

Sources : Worldwatch Institute, Vital Signs (1900-2001) and OECD World Energy Outlook 2000 (2002-2020).

.. = data not available. *) =forecast.

2. Environmental sustainability index (ESI) of certain countries in 2002

Country	Index	Country	Index	Country	Index
Finland	**73.9**	New Zealand	59.9	United States	53.2
Norway	73.0	Brazil	59.6	Zimbabwe	53.2
Sweden	72.6	Bolivia	59.4	Honduras	53.1
Canada	70.6	Colombia	59.1	Venezuela	53.0
Switzerland	66.5	Slovenia	58.8	Belarus	52.8
Uruguay	66.0	Albania	57.9	Germany	52.5
Austria	64.2	Paraguay	57.8	Nicaragua	51.8
Iceland	63.9	Namibia	57.4	Jordan	51.7
Costa Rica	63.2	Lithuania	57.2	Thailand	51.6
Latvia	63.0	Portugal	57.1	Greece	50.9
Hungary	62.7	Peru	56.5	Tunisia	50.8
Croatia	62.5	Denmark	56.2	Turkey	50.8
Botswana	61.8	France	55.5	Israel	50.4
Slovakia	61.6	Netherlands	55.4	Czech Republic	50.2
Argentina	61.5	Chile	55.1	Romania	50.0
Australia	60.3	Ireland	54.8	Guatemala	49.6
Panama	60.0	Mongolia	54.2	Malaysia	49.5
Estonia	60.0	Spain	54.1	Algeria	49.4

2. Environmental sustainability index (ESI) of certain countries in 2002 (continued...)

Country	Index	Country	Index	Country	Index
Bulgaria	49.3	Kenya	46.3	Belgium	39.1
Russia	49.1	United Kingdom	46.1	China	38.5
Morocco	49.1	Mexico	45.9	Somalia	37.1
Egypt	48.8	Vietnam	45.7	Nigeria	36.7
El Salvador	48.7	Indonesia	45.1	Sierra Leone	36.5
Uganda	48.7	Sudan	44.7	South Korea	35.9
South Africa	48.7	Iran	44.5	Ukraine	35.0
Japan	48.6	Lebanon	43.8	Haiti	34.8
Tanzania	48.1	Syria	43.6	Saudi Arabia	34.2
Italy	47.2	Angola	42.4	Iraq	33.2
Mali	47.1	Pakistan	42.1	North Korea	32.3
Bangladesh	46.9	Ethiopia	41.8	Kuwait	23.9
Poland	46.7	India	41.6		

Source : 2002 Environmental Sustainability Index. An Initiative of the Global Leaders of Tomorrow . World Economic Forum.

3. Trends in real GDP and consumption of energy and materials in Finland

	GDP at 1995 prices (EUR billion)	Consumption of materials (million of tonnes)	Total consumption of energy 1000 Mtoe
1980	72.3	163.6	22 606
1981	73.9	158.2	22 404
1982	76.2	164.1	22 005
1983	78.3	179.4	22 463
1984	81.0	181.1	23 369
1985	83.5	188.1	24 946
1986	85.6	183.3	24 748
1987	89.2	194.5	26 218
1988	93.4	194.8	26 517
1989	98.2	218.6	26 679
1990	98.2	210.1	27 220
1991	92.1	187.8	26 775
1992	89.0	182.8	26 436
1993	88.0	174.5	27 149
1994	91.5	187.4	29 014
1995	95.0	188.2	28 478
1996	98.8	184.0	29 766
1997	105.0	194.2	30 587
1998	111.0	204.0	31 056
1999	114.6	210.3	31 705
2000	121.2	209.5	31 341
2001	122.6	211.0	32 330
2002*)	125.3	214.4	31 962

Source: Statistics Finland. *) = preliminary data.

4. Trends in real GDP and atmospheric emissions in Finland

	GDP at 1995 prices (EUR billion)	Carbon dioxide emissions**) (million tonnes)	Sulphur dioxide emissions (1000 tonnes)	Emissions of oxides of nitrogen (1000 tonnes)
1980	72.3	54	584	285
1981	73.9	45	534	287
1982	76.2	44	484	264
1983	78.3	43	372	253
1984	81.0	45	368	248
1985	83.5	51	382	263
1986	85.6	49	331	265
1987	89.2	53	328	277
1988	93.4	52	302	280
1989	98.2	52	244	284
1990	98.2	54	260	284
1991	92.1	53	194	269
1992	89.0	51	140	262
1993	88.0	52	122	263
1994	91.5	58	115	263
1995	95.0	56	97	241
1996	98.8	61	105	247
1997	105.0	60	100	242
1998	111.0	57	90	225
1999	114.6	57	86	218
2000	121.2	55	76	206
2001	122.6	61	87	210
2002 *)	125.3	63	90	208

Source : Statistics Finland. *) = preliminary data. **) = from fossil fuels and peat.

5. Finland's NMVOC (Non-Methane Volatile Organic Compounds) discharges and target for 2010 (tonnes)

1990	218	1994	189	1998	169	2010*)	130
1991	205	1995	184	1999	164		
1992	198	1996	179	2000	160		
1993	191	1997	173	2001	157		

Source: Finnish Environment Institute. *) = target.

6. Trends in the world market prices of certain metals (1965=100)

	Pig iron	Copper	Lead	Zinc
1965	100.0	100.0	100.0	100.0
1975	103.3	112.5	134.5	157.0
1985	77.4	96.8	82.9	118.2
1995	76.9	94.9	75.7	113.4
2003*)	73.0	75.9	51.7	91.5

Source : United Nations, United Nations Conference on Trade and Development - UNCTAD, Monthly Commodity Price Bulletins. http://www.worldbank.org/prospects/pinksheets/ *) = I-IV/03.

7. Mining of ores and industrial minerals and quarrying of limestone (million tonnes)

	Ores	Limestone	Industrial minerals		Ores	Limestone	Industrial minerals
1980	10.5	3.1	3.1	1992	4.7	4.4	8.0
1981	9.9	5.0	3.5	1993	4.9	4.1	8.7
1982	9.7	5.5	5.1	1994	4.6	3.9	9.2
1983	9.0	6.0	6.0	1995	3.2	3.4	9.3
1984	9.5	5.6	7.1	1996	3.4	3.4	9.3
1985	8.4	5.8	7.2	1997	3.5	3.7	9.9
1986	6.9	5.0	7.2	1998	3.2	4.0	10.0
1987	6.1	5.0	7.9	1999	3.1	3.9	10.4
1988	6.1	5.4	8.3	2000	3.3	3.8	10.2
1989	5.5	5.5	8.6	2001	2.9	4.1	10.7
1991	5.5	5.3	7.2	2002	3.2	3.7	10.8

Source: Mining Industry Association.

8. Forest increment and total drain in 1953-2002 (million solid cubic metres)

Year	Increment	Total drain	Year	Increment	Total drain	Year	Increment	Total drain	Year	Increment	Total drain
1953	53.8	44.5	1966	57.0	54.3	1979	67.0	57.2	1992	79.4	51.0
1954	53.8	50.7	1967	57.0	54.4	1980	72.0	59.7	1993	79.4	53.8
1955	51.8	56.4	1968	57.0	54.1	1981	72.0	56.0	1994	79.4	61.7
1956	51.8	52.4	1969	57.0	57.5	1982	72.0	48.5	1995	79.4	63.6
1957	51.8	52.7	1970	58.3	58.7	1983	72.0	49.3	1996	79.4	59.0
1958	51.8	53.1	1971	58.3	55.0	1984	72.0	52.3	1997	79.4	65.8
1959	51.8	53.9	1972	58.3	54.8	1985	75.6	55.2	1998	79.4	69.4
1960	54.8	60.4	1973	58.3	55.0	1986	75.6	49.6	1999	79.4	69.4
1961	54.8	63.4	1974	58.3	52.0	1987	75.6	54.1	2000	79.4	70.0
1962	54.8	58.7	1975	67.0	40.7	1988	75.6	57.1	2001	79.4	67.7
1963	54.8	57.5	1976	67.0	40.7	1989	75.6	58.7	2002*)	79.4	69.0
1964	54.8	58.0	1977	67.0	43.0	1990	79.4	55.1			
1965	57.0	55.9	1978	67.0	47.4	1991	79.4	44.7			

Source: Finnish Forest Research Institute. *) = preliminary data.

9. Use of fertilisers in agriculture (kilograms per arable hectare)

Year of fertilisation 1 July - 30 June	Nitrogen	Phosphorus	Year of fertilisation 1 July - 30 June	Nitrogen	Phosphorus	Year of fertilisation 1 July - 30 June	Nitrogen	Phosphorus
1979/80	83.3	27.9	1987/88	98.2	32.0	1988/89	100.3	29.7
1980/81	82.4	27.8	1989/90	111.5	30.7	1996/97	86.0	11.8
1981/82	78.7	26.8	1990/91	109.4	26.3	1997/98	85.9	12.3
1982/83	91.4	29.9	1991/92	92.8	19.9	1998/99	81.0	11.6
1983/84	90.7	30.9	1992/93	94.3	19.4	1999/00	84.2	10.4
1984/85	88.9	30.8	1993/94	94.1	19.0	2000/01	83.5	11.1
1985/86	90.0	30.2	1994/95	101.6	20.0	2001/02	77.5	9.9
1986/87	94.4	31.0	1995/96	92.3	16.1	2002/03	77.5	9.5

Source: Kemira Agro.

10. Use of pesticides in agriculture 1990-2002 (thousand kilograms of active ingredient)

	Weed killers	Others	Total
1990	1 580.1	413.8	1 993.9
1991	1 375.4	312.3	1 687.7
1992	1 006.7	332.8	1 339.5
1993	842.8	364.8	1 207.6
1994	929.2	342.5	1 271.7
1995	791.4	244.2	1 035.6
1996	677.3	234.8	912.1
1997	733.9	264.5	998.4
1998	843.9	320.3	1 164.2
1999	790.2	349.9	1 140.1
2000	842.4	284.9	1 127.3
2001	1 120.1	303.1	1 423.2
2002	1 277.8	342.4	1 620.2

Source: Plant Production Inspection Centre.

11. Sources of water loading and natural runoff (tonnes)

	Phosphorus	Nitrogen
Agriculture	2 600	39 500
Natural runoff	2 700	70 000
Households	558	14 343
Others	535	6 285
Depositions from air	390	16 000
Industry	220	3 520
Total	**7 003**	**149 648**

Source: Finnish Environment Institute.

12. Phosphorus loading from industry, households and fish farming (tonnes)

	Industry	Fish farming	Households
1990	702	252	397
1991	583	204	292
1992	501	199	286
1993	417	182	245
1994	378	160	270
1995	358	165	245
1996	282	154	247
1997	273	135	235
1998	263	128	268
1999	250	122	259
2000	231	125	249
2001	234	120	220
2002	220	95	203

Source: Finnish Environment Institute, Pollution Prevention Unit.

13. The components of Finland's national wealth in 2001 (EUR billion)

Residential buildings	148.0
Holiday home sites	10.0
Other buildings	106.0
Farmland	9.5
Other structures	54.0
Machinery and vehicles	59.0
Land for construction	51.0
Forests	49.0
Others	33.5
Total	**520.0**

Source: Statistics Finland.

14. Pulp and paper industry production and load on rivers and lakes (tonnes per year)

	Paper and board production	Pulp production	Chemical oxygen demand	Organic chlorine compounds	Phosphorus
1990	8 958 000	5 093 000	430 000	9 700	641
1991	8 777 000	4 894 000	380 000	7 200	532
1992	9 145 000	4 913 000	330 000	4 700	480
1993	9 953 000	5 589 000	270 000	3 000	375
1994	10 909 000	6 331 000	270 000	2 000	335
1995	11 012 000	5 797 000	260 000	1 600	320
1996	10 442 000	5 739 000	213 000	1 100	250
1997	12 149 000	6 620 000	227 000	1 300	228
1998	12 704 000	6 718 000	217 000	1 144	233
1999	12 947 000	6 977 000	205 267	1 127	225
2000	13 509 000	7 101 000	199 769	990	202
2001	12 503 000	6 548 000	178 246	949	206
2002	12 776 000	7 143 000	182 354	1 142	193

Source: Finnish Forest Industries Federation, Yearbooks of Environmental Protection.

15. Pulp and paper industry production and emissions to the atmosphere (tonnes per year)

	Paper and board production	Pulp production	Sulphur dioxide	Oxides of nitrogen	Particles
1990	8 958 000	5 093 000	24 100	16 200	22 000
1991	8 777 000	4 894 000	16 300	18 900	18 300
1992	9 145 000	4 913 000	9 500	19 100	13 000
1993	9 953 000	5 589 000	7 200	21 300	11 000
1994	10 909 000	6 331 000	6 500	23 000	9 500
1995	11 012 000	5 797 000	4 900	21 100	7 800
1996	10 442 000	5 739 000	5 300	21 100	7 000
1997	12 149 000	6 620 000	6 315	21 878	4 609
1998	12 702 000	6 718 000	5 435	21 834	6 219
1999	12 947 000	6 977 000	5 521	23 169	6 109
2000	13 509 000	7 101 000	5 178	22 351	5 809
2001	12 503 000	6 548 000	5 279	19 656	4 433
2002	12 776 000	7 143 000	5 649	21 269	4 614

Source: Finnish Forest Industries Federation, Yearbooks of Environmental Protection.

16. Recovery of waste paper in certain countries 2001 (per cent)

Country	Recovery Rate
Germany	74
Finland	**71**
Switzerland	69
Austria	65
Sweden	65
Netherlands	64
Spain	55
Belgium	51
France	47
Denmark	45
Portugal	44
United Kingdom	44
Italy	44
Greece	31
Ireland	27

Source : CEPI. Annual statistics 2002.
http://www.cepi-eurokraft.org/
http://www.paperinkerays.fi/tietoa/tietopankki/tilastot

17. Specific emissions of carbon dioxide from metal refining (kilograms of carbon dioxide per tonne metal produced)

	Raw materials	Energy used
1970	1 992	595
1975	1 848	347
1980	1 513	308
1985	1 319	268
1990	1 351	156
1991	1 399	149
1992	1 322	154
1993	1 383	136
1994	1 383	145
1995	1 281	155
1996	1 255	150
1997	1 235	132
1998	1 190	192
1999	1 176	169
2000	1 182	163
2001	1 180	160
2002	1 156	157

Source : Federation of Finnish Metal, Engineering and Electrotechnical Industries

18. Total energy consumption in selected countries by GDP in 2000

	Total energy consumption kilograms of oil/EUR 1000
Poland	551
Iceland	389
Turkey	376
Canada	356
United States	256
Finland	**200**
Greece	200
Portugal	190
Belgium	186
United Kingdom	178
Spain	177
Sweden	171

	Total energy consumption kilograms of oil/EUR 1000
Netherlands	153
Luxembourg	150
Norway	150
France	147
Italy	142
Ireland	137
Germany	126
Austria	107
Denmark	94
Japan	92
Schwitzerland	79

Source : IEA/OECD; Energy Balances of OECD Countries 1999-2000.

19. Trends in world oil consumption and oil prices in real terms on the global market (USD per barrel)

Year	Current prices	Real (1996) prices	Billion tonnes	Year	Current prices	Real (1996) prices	Billion tonnes	Year	Current prices	Real (1996) prices	Billion tonnes
1970	2.1	7.0	2 254	1982	31.4	41.2	2 776	1994	15.5	16.2	3 192
1971	2.6	8.4	2 377	1983	28.4	36.7	2 761	1995	16.9	17.4	3 235
1972	2.8	8.8	2 556	1984	28.3	35.8	2 809	1996	20.4	20.4	3 316
1973	3.1	8.9	2 754	1985	27.0	33.8	2 801	1997	19.2	19.2	3 388
1974	11.2	27.9	2 710	1986	13.8	17.5	2 893	1998	13.1	11.5	3 398
1975	10.6	23.9	2 678	1987	17.8	22.2	2 949	1999	18.1	14.7	3 469
1976	11.8	25.5	2 852	1988	14.2	17.3	3 039	2000	28.2	26.8	3 504
1977	12.8	26.0	2 944	1989	16.9	19.5	3 088	2001	24.5	23.1	3 554
1978	12.9	24.3	3 055	1990	17.6	19.6	3 136	2002	24.9	23.2	3 855
1979	29.2	49.4	3 103	1991	18.3	19.7	3 134	2003*)	29.1	26.2	..
1980	35.5	52.9	2 972	1992	18.2	19.4	3 165				
1981	34.1	46.6	2 868	1993	16.1	17.0	3 135				

*) = I – IV/03. .. = data not available. NB. Concerns Crude petroleum/Dubai, UK Brent and Alaska Average/W.Texas Average, spot, F.O.B.
Source : United Nations Conference on Trade and Development - UNCTAD, Monthly Commodity Price Bulletins.

20. Sulphur emissions in Finland and reduction targets for 2010 (thousand tonnes of sulphur dioxide)

	Road traffic	Other traffic and work machines	Energy production	Industry	Other	Industrial processes	Total
1980	9	5	230	192	44	104	584
1981	9	5	180	200	43	98	534
1982	8	5	90	252	32	96	484
1983	8	5	58	179	29	93	372
1984	8	5	76	172	21	86	368
1985	8	5	94	170	16	90	383
1986	7	5	72	145	15	87	331
1987	7	5	78	145	19	74	327
1988	6	5	67	129	14	81	303
1989	7	4	68	94	12	59	242
1990	5	5	81	107	13	49	258
1991	5	5	62	70	10	43	195
1992	5	4	45	42	8	37	141
1993	4	4	45	37	5	26	122
1994	2	5	44	34	5	25	115
1995	2	4	34	32	6	19	97
1996	1	4	42	33	10	15	105
1997	0	5	40	33	7	15	99
1998	0	4	32	31	5	17	90
1999	0	4	29	29	6	17	85
2000	0	4	24	30	5	12	76
2001	0	4	..	..	..	..	87
2002*)	..	..	..	..	..	..	90
2010**)	..	..	..	..	..	..	110

Source : Ministry of the Environment; Environmental Protection Department and Statistics Finland.
.. = data missing. *) = forecast. **) = target.

21. Emissions of oxides of nitrogen in Finland and reduction targets for 2010 (thousand tonnes)

	Road traffic	Other traffic	Energy	Industry	Other	Total
1980	127	42	77	26	13	285
1981	127	43	75	31	11	287
1982	127	46	32	49	10	264
1983	128	45	26	44	10	253
1984	128	44	25	41	9	248
1985	129	45	38	42	9	263
1986	132	45	37	43	8	265
1987	133	48	43	44	9	277
1988	135	50	44	44	7	280
1989	138	47	46	46	7	284
1990	134	50	47	45	7	284
1991	124	50	47	40	8	269
1992	119	49	45	41	9	262
1993	116	49	48	42	8	263
1994	111	50	49	45	9	263
1995	106	48	35	42	9	241
1996	101	50	44	42	11	247
1997	95	51	41	44	11	242
1998	89	48	..	..	..	225
1999	84	49	..	..	..	218
2000	78	48	45	25	10	206
2001	74	48	55	22	11	210
2002*)	..	..	..	..	..	208
2010**)	..	..	..	..	..	170

Source: Ministry of the Environment; Environmental Protection Department and Statistics Finland.
.. = data missing. *) = forecast. **) = target.

22. EU Member States in relation to Kyoto target levels in 2001 and new Member States in relation to Kyoto target levels in 2000 (per cent)

Ireland	23.9	Netherlands	7.4	Hungary	-14.5
Spain	23.8	**Finland**	**4.7**	Czech Republic	-19.4
Portugal	21.6	France	0.4	Poland	-28.6
Austria	16.8	United Kingdom	-5.2	Slovakia	-28.9
Denmark	11.4	Sweden	-5.5	Lithuania	-49.5
Italy	10.7	Germany	-6.8	Estonia	-50.4
Belgium	10.5	Luxembourg	-28.8	Latvia	-61.7
Greece	9.8	Slovenia	3.5		

Source: European Union.

23. Greenhouse gas emissions in Finland (million equivalent tonnes of carbon dioxide)

	Carbon dioxide	Methane	Nitrous oxide	F-gases	Climate strategy target	Climate strategy trend
1990	62.4	6.1	8.4	0.1	–	–
1991	61.0	5.8	7.9	0.1	–	–
1992	58.6	5.4	7.3	0.0	–	–
1993	59.2	5.0	7.5	0.0	–	–
1994	65.4	4.7	7.6	0.0	–	–
1995	62.6	4.6	7.8	0.0	–	–
1996	68.1	4.5	7.8	0.1	–	–
1997	66.9	4.3	8.1	0.2	–	–
1998	64.5	4.1	7.9	0.3	–	–
1999	64.2	3.9	7.7	0.4	–	–
2000	62.3	4.0	7.2	0.5	–	–
2001	67.6	5.4	7.1	0.7	–	–
2010	–	–	–	–	77.0	90.0

Source: Statistics Finland. – = not in use.

24. Renewable sources of energy as a proportion of total energy consumption in 1999 and goal for 2010

	1999	2010
Austria	73.5	78.1
Sweden	51.0	60.0
Portugal	20.9	39.0
Finland	**26.3**	**31.5**
Spain	13.5	29.4
Denmark	13.1	29.0
Italy	16.9	25.0
France	17.2	21.0
Greece	10.3	20.1
Ireland	5.8	13.2
Germany	6.1	12.5
United Kingdom	3.2	10.0
Neterherlands	3.4	9.0
Belgium	2.3	6.0
Luxembourg	9.1	5.7
EU-15	**14.9**	**22.0**

Source : EEA and Eurostat.

25. Combined heat and power production (CHP) as a percentage of electricity generation in EU countries in 2000

Denmark	61.6
Netherlands	48.2
Finland	**36.4**
Luxembourg	17.7
Germany	10.6
Austria	10.4
Portugal	10.0
Spain	9.2
Italy	6.8
Belgium	6.5
Sweden	6.2
United Kingdom	6.1
France	3.0
Greece	2.1
Ireland	2.4
EU on average	**9.8**
EU goal for 2010	18.0

Source: European Union.
http://europa.eu.int/comm/energy_transport/etif/energy_electricity/cogeneration.html

26. Trends in the use of public transport and private cars (millions of passenger kilometres)

	Total	Private cars	Motorcycles	Public transport
1980	48 051	34 800	800	12 451
1981	49 300	35 900	800	12 600
1982	51 100	37 500	800	12 800
1983	53 000	39 300	800	12 900
1984	54 960	41 200	800	12 960
1985	57 445	43 700	800	12 945
1986	58 245	45 100	800	12 345
1987	59 669	46 000	800	12 869
1988	62 364	48 500	800	13 064
1989	63 779	49 900	800	13 079
1990	65 273	51 200	800	13 273
1991	64 196	50 600	900	12 696
1992	63 884	50 500	900	12 484
1993	62 882	49 700	900	12 282
1994	62 855	49 600	900	12 355
1995	63 540	50 060	900	12 580
1996	63 890	50 400	900	12 590
1997	65 820	51 900	900	13 020
1998	66 833	53 830	900	13 002
1999	68 662	54 900	900	12 862
2000	69 653	55 700	900	13 053
2001	70 802	57 000	900	12 902
2002	72 032	58 300	900	12 832

Sources: Finnish Road Administration, VR-Group Ltd, Finnish Maritime Administration, Civil Aviation Administration and Helsinki City Transport.

27. Trends in emissions from road traffic (thousand tonnes)

	Carbon monoxide (CO)	Hydrocarbons (HC)	Oxides of nitrogen (NO_x)	Particles	Carbon dioxide (CO_2)
1980	485.0	64.5	126.9	7.1	7 400
1981	489.9	65.0	127.3	7.4	7 500
1982	492.0	65.6	127.4	7.6	7 700
1983	496.6	66.2	127.6	7.8	8 000
1984	497.9	67.0	128.2	8.0	8 200
1985	491.5	66.7	129.4	8.2	8 600
1986	485.7	67.0	131.6	8.4	9 200
1987	485.7	67.8	132.5	8.3	9 700
1988	485.4	69.0	135.3	8.3	10 100
1989	485.6	70.2	137.7	8.1	10 700
1990	469.1	68.0	134.3	7.9	10 900
1991	446.0	64.2	123.8	7.4	10 600
1992	432.5	62.0	119.0	7.1	10 500
1993	414.0	59.4	115.5	7.0	10 100
1994	399.6	57.0	110.7	6.7	10 400
1995	391.0	55.2	106.3	6.4	10 200
1996	378.9	52.6	100.7	6.0	10 200
1997	370.2	50.4	95.2	5.6	10 700
1998	360.4	48.0	89.3	5.1	10 800
1999	349.3	45.5	84.3	4.7	10 900
2000	332.8	42.5	78.4	4.2	10 800
2001	320.3	40.1	73.8	3.9	11 000
2002	304.7	37.5	69.7	3.6	11 300
2003*)	273.3	33.5	64.5	3.3	11 300
2004*)	244.3	29.8	59.5	3.0	11 300
2005*)	219.6	26.3	54.8	2.8	11 400
2006*)	194.0	23.1	50.1	2.6	11 400
2007*)	170.3	20.0	45.4	2.4	11 400
2008*)	151.2	17.6	41.1	2.2	11 400
2009*)	135.2	15.6	37.1	2.0	11 500
2010*)	124.7	14.4	34.0	1.9	11 400

*) = forecast.

Source: Technical Research Centre of Finland; LIISA-Calculation Model.

28. Use of de-icing salt and target level for 2003 (tonnes)

1990	157
1991	107
1992	125
1993	85
1994	94
1995	109
1996	80
1997	123
1998	101
1999	102
2000	81
2001	83
2002	93
2003*)	70

Source: Finnish Road Administration.

*) = target.

29. Retail prices of motor fuel (95E) on 15 August 2003 (euro cents per litre)

	Consumer price	Refinery price	Taxes	Proportion of tax, %
Norway	116	38	78	67.1
Netherlands	116	34	82	70.7
Germany	110	30	81	73.2
Finland	**110**	**31**	**79**	**71.5**
Denmark	110	33	77	70.0
Italy	106	34	72	68.0
United Kingdom	105	26	80	75.5
Sweden	102	30	72	70.5
France	100	24	75	75.5
Belgium	96	29	67	70.1
Portugal	95	29	66	69.4
Austria	87	31	56	64.3
Ireland	85	30	55	64.5
Spain	81	31	51	62.4
Luxembourg	77	31	45	59.1
Greece	74	33	41	55.1
United States*)	43	32	11	26.2

Source : EU/Oil Petrolier and the Finnish Petroleum Association.

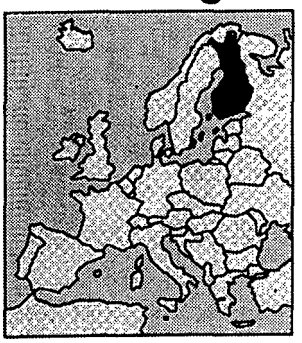
*) = California Statewide Gasoline Prices, Regular, Branded, 29 September 2003. Source: California Energy Commision.

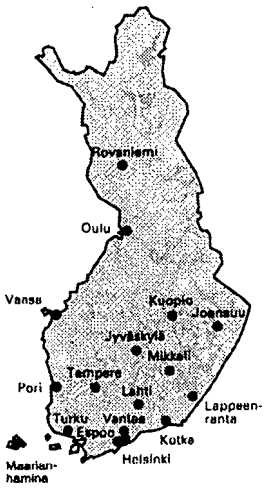
30. Retail prices of diesel on 15 August 2003 (euro cents per litre)

	Consumer price	Refinery price	Taxes	Proportion of tax, %
United Kingdom	108	28	80	74.1
Norway	102	38	64	62.6
Germany	88	29	59	67.5
Italy	86	31	55	63.8
Sweden	80	29	51	63.4
Ireland	78	32	46	59.3
Netherlands	78	30	48	61.8
Finland	**78**	**32**	**46**	**58.7**
Denmark	77	25	53	67.8
France	76	24	52	68.0
Austria	70	30	41	57.9
Belgium	70	27	43	60.9
Portugal	70	28	42	60.1
Spain	67	28	39	57.8
Greece	61	28	34	55.2
Luxembourg	61	28	33	54.5

Source : EU/Oil Petrolier and the Finnish Petroleum Association.

Finland in Figures





Suomi
Finland

***Population**: 5.2 million, with average density of only 17 persons per square kilometre; annual growth 0.2 per cent. Average household size is 2.2 persons. Of the total population, 77 per cent are urban dwellers, with 1.0 million living in the capital city of Helsinki and its surrounds. Ninety-two per cent speak Finnish and six per cent Swedish. Eighty-five per cent are Evangelic-Lutheran and one per cent Greek Orthodox. Seventy per cent of the population aged 25 to 64 have completed post-comprehensive education and 30 per cent have university degree or equivalent. Fifty-five per cent of Finnish households own a personal computer and 41 per cent have an Internet connection. Ninety-two per cent of households have a mobile phone.*

***Area:** Situated in northern Europe with an area of 338,145 square kilometres of which 304,530 square kilometres is land area. Land boundary 586 kilometres with Sweden, 727 kilometres with Norway and 1,269 kilometres with Russia. Coastline approximately 1,100 kilometres. The greatest length is 1,157 kilometres, from Hanko to Utsjoki, and the highest point, Halti, 1,328 metres above sea level. Of the total area 10 per cent is covered by water. There are 188,000 fresh water lakes in Finland. Forests, mainly pine and spruce, cover 72 per cent of the country while 7 per cent of the land area is under cultivation, with barley and oats as the main crops.*

***Government:** Finland has been a sovereign parliamentary republic since 1917. The head of the state is the president, elected every six years. The post has been held by Ms Tarja Halonen since 1 March 2000. The Parliament comprises 200 members, elected for a four-year term. The country is divided into 5 provinces and the Autonomous Territory of the Åland Islands. Member of the European Union since January 1995.*

***Economy**: GDP in 2002 totalled EUR 140 billion (USD 140 billion), i.e. EUR 26,097 per capita when adjusted for purchasing power parity. One of the highest standards of living in the world. Of the total labour force 20 per cent are employed in industry, 33 in services, 15 per cent in trade, 14 per cent in financial and business services, 7 per cent in transport and communications, 5 per cent in agriculture and forestry and 6 per cent in construction. Unemployment rate, calculated according to EU standards, was 9.1 per cent in 2002.*

***Foreign trade**: Main trading partners are Germany, Sweden, United Kingdom, USA and Russia. The value of imports totalled EUR 36 billion and that of exports EUR 48 billion in 2002. Of the imports 39.4 per cent were raw materials and 26.8 per cent consumer goods. Main exports are electrical equipment, pulp and paper products, machinery, and metal and chemical products.*

The catchment area of the Baltic Sea

Finland's Natural Resources and the Environment 2003 is a review of the state of Finland's natural resources and the environment. It presents the main principles of interaction between the national economy and the environment and describes the extent to which the objectives of sustainable development have been realised in Finland. It also reviews trends in the main sectors of the economy as they affect the environment. These sectors include natural resources and environmental protection, industry, energy and transport. Finally, the publication contains a presentation of the principal agreements on the natural resources and the conservation of environment to which Finland is committed.

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