YMPÄRISTÖMINISTERIÖ
MILJÖMINISTERIET
MINISTRY OF THE ENVIRONMENT

SVT

Ympäristö ja luonnonvarat 2004:3C
Miljö och naturresurser
Environment and Natural Resources

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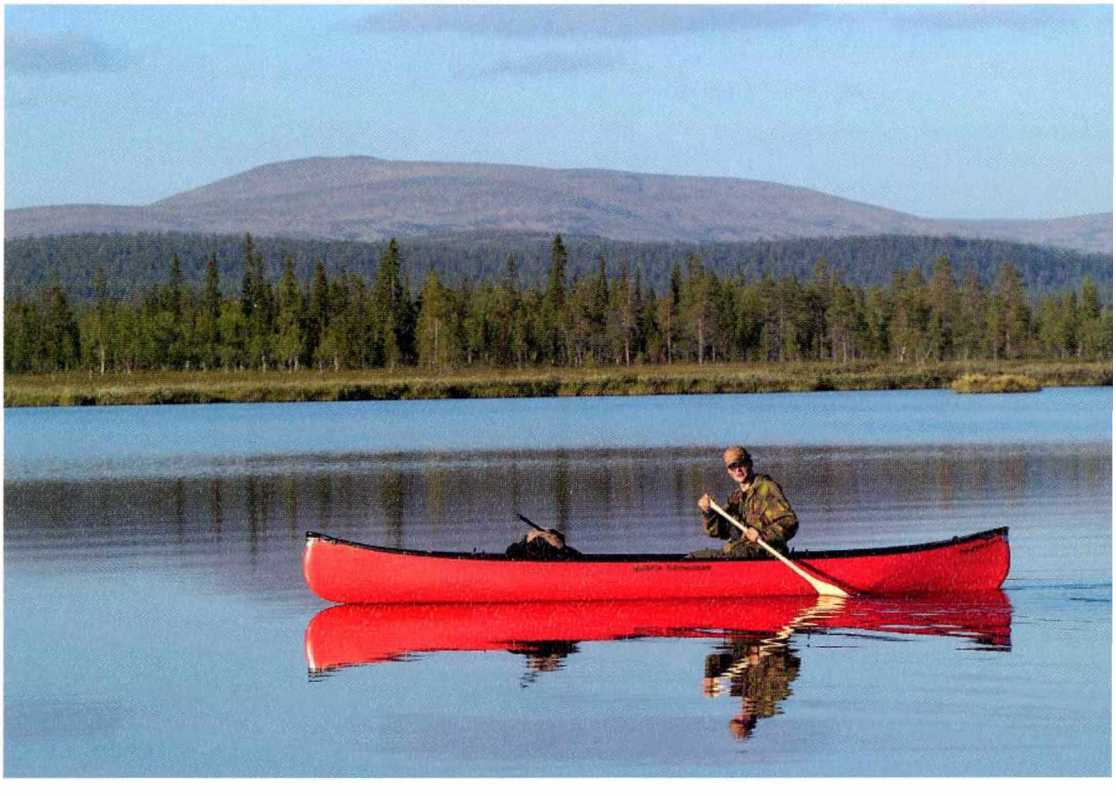
Finland´s Natural Resources and the Environment 2004



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Helsinki – Helsingfors 2004

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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 (WSSD) held in Johannesburg, South Africa, in September 2002. New sustainability objectives were agreed upon, and Agenda 21 of the Rio de Janeiro Environment and Development Conference was accelerated. 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. The European Union has also started preparing a new environmental strategy.

Finland has committed itself to implementing the Johannesburg Plan of Implementation 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 yearly on the national implementation. The Finnish government's 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 commitments that concern the environment and the maintenance of the carrying capacity of ecosystems. In accordance with the Johannesburg action agenda and the Government's programme for sustainable development, this review is published together with the Government's 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 Päivi Valkama, Budget Secretary 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, Tiia Yrjölä, Researcher at the Ministry of Agriculture and Forestry, Raija Merivirta, Senior Adviser at the Ministry of Transport and Communications, Jarmo Muurman, Senior Adviser at the Ministry of the Environment, and Juha-Pekka Maijala, Senior Adviser 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 Stella From, Senior Planning Officer at the Finnish Environment Institute.

Helsinki, September 2004

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

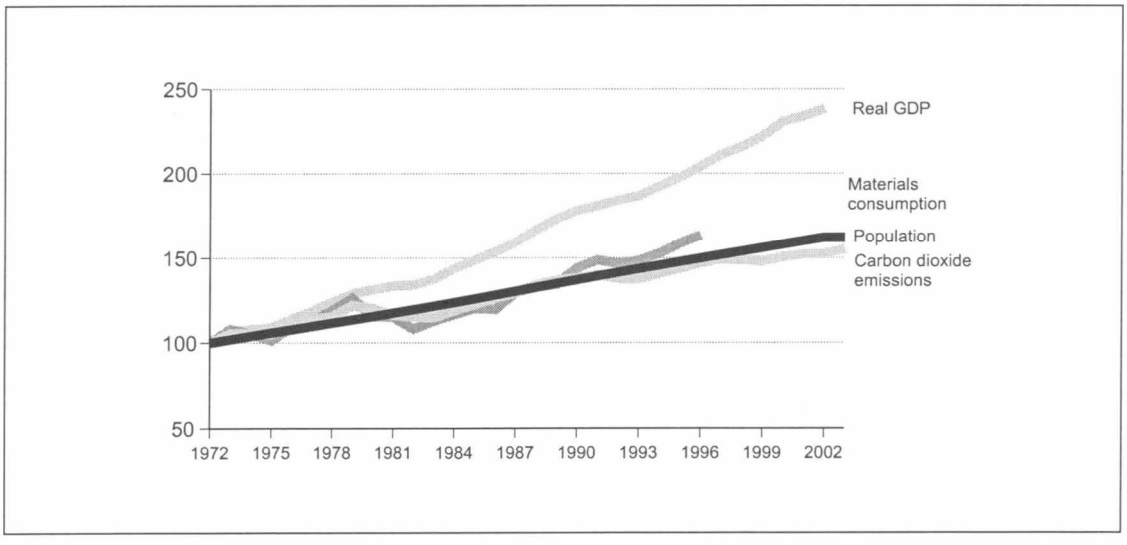
International environmental policy

The growing world population and reigning production and consumption trends are the main reasons for the increase in environmental problems. The world population was 6.2 billion in 2002, and the figure is increasing by 200,000 people every day, or 74 million every year. The population increase has slowed though, with the annual world population increase from 1989-1990 standing at 87 million. According to an estimate by the Population Research Institute of the United States, world mortality will exceed the birth rate by 2050. By this time the world's population will be between 7.9 and 10.9 billion people. A point of great concern is how natural resources will be sufficient for all the world's inhabitants given current production and consumption trends.

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 patterns, environmental health, ecosystems and environmental 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. During the first stage of the Johannesburg Plan of Implementation in the twelfth and thirteenth sessions of the UN Commission on Sustainable Development (2004–2005), emphasis is placed on improving people's access to water, and on developing sanitation and human settlements in the poorest countries. These objectives also form part of the Millennium Development Goals.

Progress in sustainable development has been slower than anticipated, and there have proved to be many political hurdles in the process. Numerous agreements and mea-

Figure 1. World development trends (1972=100)



sures are now perceived to be insufficient in the face of ever-worsening problems. On the other hand, the political advances achieved thus far can be viewed as significant progress towards sustainable development.

One of the biggest concerns of 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. At the beginning of summer 2004, the Kyoto Protocol had been ratified by 122 countries, including all the EU member states, Japan, and Canada. The United States and Australia, on the other hand, have left themselves outside the Protocol. The Protocol's coming into force depends on Russia's ratification.

The EU strategy for sustainable development contains objectives and measures to tackle the challenges of climate change, traffic congestion, threats to public health and the depletion of natural resources. The EU's Environmental Action Programme will promote sustainable development and contribute to the implementation of a European sustainable development strategy. The key challenges are climate change, health, environment and quality of life, nature and biodiversity, the sustainable use of natural resources, and waste management. Concerning the use of natural resources, the emphasis is on sustainability and waste reduction. In addition, steps are being taken to guide the consumption habits of citizens in more sustainable directions, with measures such as integrated product policy aimed at improving the ecological sustainability of products and encouraging consumers to make environmentally responsible choices.

A great challenge for EU environmental policy is to raise the level of environmental protection in the ten new member states that joined in May 2004 to the level of the rest of the Union. Already before their membership, over 300

Figure 2. Population development globally, in EU15 countries and in the new EU member countries (1950=100)

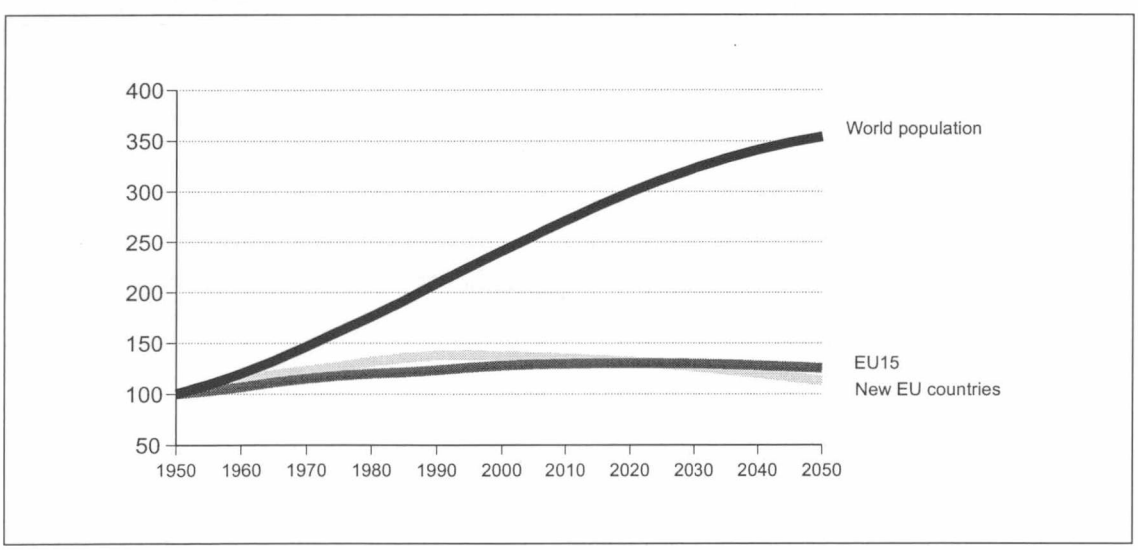
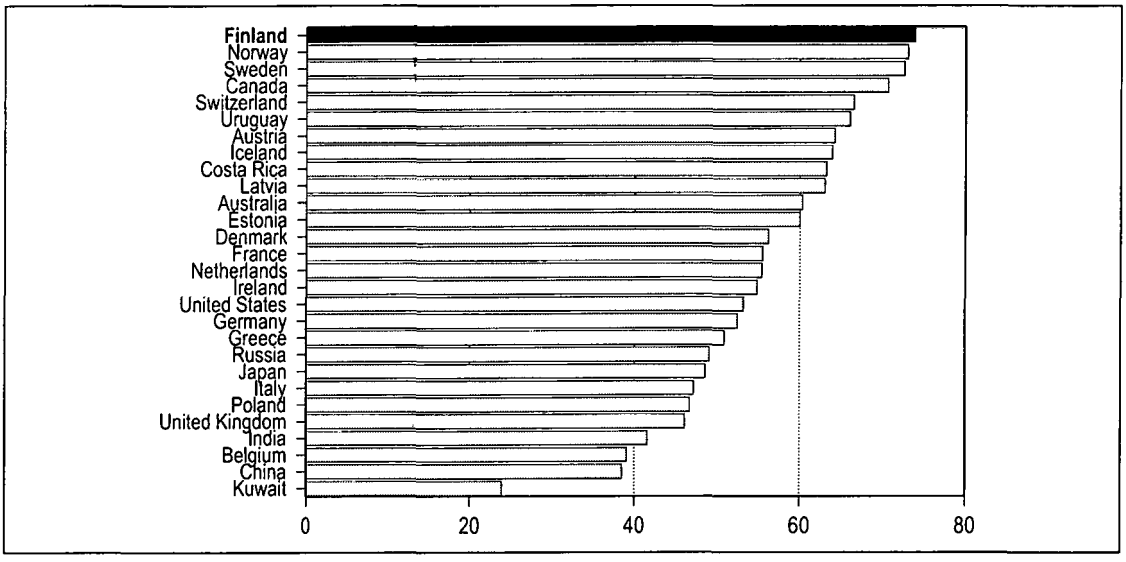


Figure 3. Environmental sustainability index (ESI) for designated countries, 2002



environmental norms of EU countries were transferred to the new member states' national legislation. The implementation of the laws requires sizeable financial input and good administrative work. An estimated EUR 140 billion must be invested in environmental protection by the new member states in the next ten years, i.e. 2-3 per cent of their gross national product, in order for them to achieve the 1997 level of the old member states.

The chemicals legislation under preparation in the EU aims for chemical use to be safe throughout the production chain, and for products to be safe for the consumer and the environment. The central element of the chemicals legislation, REACH (Registration Evaluation and Authorisation of Chemicals), includes the wide-scale testing and registration of all chemicals that have not yet been studied, according to a schedule in the order of quantities of substances. This would be followed by an evaluation by the authorities, who would then issue requirements for further testing. Permit requirements are being planned for certain substances. End users of chemicals would have new responsibilities, such as assessing the risks of their own activity, and getting relevant information and passing it on. The proposal is intended to improve the protection of human health and the environment. It is estimated that 4,500 deaths would be avoided every year in the EU with the new legislation. According to the estimate, the new procedure would cause extra work and expenditure to the chemicals industry. The REACH obligations are due to be put into effect in 2006.

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 its private sector, the standard of science and technology, participation in

international activities, air quality, environmental administration 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 its ecological footprint and in its amounts of nuclear waste, greenhouse gases and emitted transboundary pollutants.

The Finnish Government accepted the Finnish sustainable development programme in the summer of 1998. Finland's Government programme also aims to further the practical implementation of the actions decided on at the Johannesburg summit. The goal is increased efficiency in the use of materials and energy at all stages of the product life cycle. As part of this aim, the Government has decided to draw up a national programme for advancing sustainable consumption and production. In November 2003 a broadly based committee was established to prepare a proposal for a national sustainable consumption and production programme. The proposal contains an analysis of what additional aims and environmental policy measures are needed to turn Finland into an eco-efficient society. The programme is due for completion in May 2005.

A proposal for a national noise abatement programme lasting up to 2010 was completed in April 2004. The objective of the programme is for special attention to be paid in the future planning and placement of noise abatement measures for preventing new noisy areas from forming, to noise abatement in the noisiest areas, and to preserving quiet areas. In Finland, noise is a considerable environmental problem that diminishes the quality of the living environment and makes it less inviting. Human health, well-being, and contentment at home are adversely affected by noise in many ways. In Finland, around one million people live in areas where the environmental noise exceeds the 55dB level. The number of people exposed to high levels of noise is expected to rise to 1.2 million inhabitants.

The parliament accepted the Government's proposal to ratify the Aarhus Convention in June 2004. The goal of the agreement is to advance the right of the current generation and upcoming generations to live in an environment that is favourable to their health

Figure 4. Trends in real GDP and the consumption of energy and materials in Finland (1990=100)

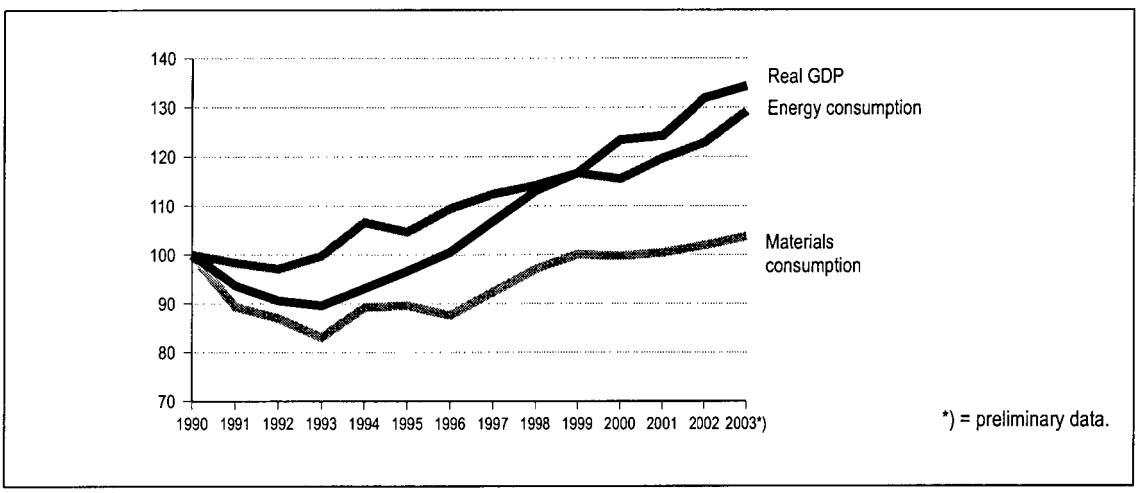
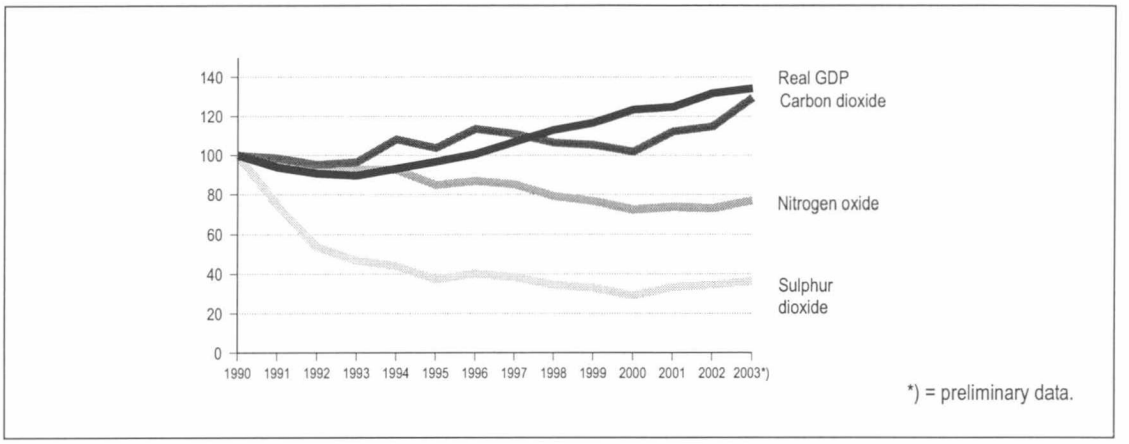


Figure 5. Trends in real GDP and atmospheric emissions in Finland (1990=100)



and well-being. The Convention includes detailed obligations on the right of the public to access information, participate in decision-making, and to use their right to appeal against decisions and initiate legal proceedings in environmental issues. The Convention came into force internationally in October 2001, when it was signed by 39 states and the EU. So far, the Convention has been ratified by 27 countries.

Instruments of environmental protection

Government intervention in the realm of sustainable development has been stepped up in recent years. The current legislation on environmental protection came into force in March 2000, updating and harmonising existing legislation and authorisation procedures. The environmental protection legislation aims to bring uniformity to the process of restricting and managing emissions.

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

	2001 A	2002 A	2003 A	2004 B	2005 BP
Alcoholic beverage surtax*)	13	20	20	20	–
Soft drink surtax*)	1	2	2	2	–
Beverage Container Tax	–	–	–	–	13
Pesticide fee	2	2	2	2	2
Energy taxes	2 652	2 756	2 900	2 990	3 010
Oil waste tax	3	4	3	3	3
Motor car tax	922	1 023	1 207	1 020	1 294
Oil pollution control fee	5	6	9	9	9
Vehicle tax	435	446	473	513	536
Waste tax	31	32	41	49	53
Total	**4 064**	**4 291**	**4 657**	**4 608**	**4 920**

A = Final Accounts. B = Budget. BP = Budget Proposal. *) = packaging tax. – = not in use.

Special emphasis is placed on applying the best available technology (BAT), risk management, and efficient energy use. A new Land Use and Building Act supporting sustainable development came into force at the beginning of 2000 and was reviewed in the beginning of 2001. Its key objectives include creating preconditions for a favourable living environment, increasing the sustainable development of communities, and increasing citizen involvement and influence at a grassroots level.

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. 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 aims to cut down on the use of non-renewable energy sources, reduce environmental impacts, encourage recycling, and improve the eco-efficiency of products, of product consumption, and of energy supply.

2. Environmental tax accumulation in EU15 countries in 2001 (per cent of total accumulation of taxes and social security payments)

Netherlands	9.4
Denmark	9.4
Portugal	8.4
Ireland	7.6
United Kingdom	7.6
Greece	7.5
Italy	7.1
Luxembourg	6.9
Germany	6.2
Spain	6.2
Finland	**6.6**
Austria	5.7
Belgium	5.5
Sweden	5.4
France	4.4
EU15	**6.5**

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

	ISO14001*)	EMAS**)
Spain	4 860	314
Germany	4 150	2 104
Italy	3 121	176
United Kingdom	2 917	76
France	2 344	23
Sweden	2 310	115
Netherlands	1 162	29
Finland	**1 059**	**39**
Hungary	637	6
Denmark	711	124
Czech Republic	605	10
Austria	500	286
Poland	434	0
Norway	350	42
Belgium	303	25
Portugal	248	13
Slovenia	205	0
Ireland	170	7
Greece	90	10
Estonia	74	0
Slovakia	73	1
Lithuania	72	0
Luxembourg	32	1
Cyprus	21	0
Latvia	20	0
Liechtenstein	20	0
Malta	4	1
Iceland	3	0
Total	**26 495**	**3 398**

*) = status on 31.12.2003. **) = status on 9.2.2004.

The European Union and the ISO (International Organisation for Standardisation) have created operating models for the systematic management and development of the environmental issues of companies and other organisations. The EMAS (Eco-Management and Audit Scheme), based on an EU Regulation, and the ISO 14001 environmental management systems standard are in use in Finland. The EMAS scope of application includes organisations from all sectors, not just industries, and an environmental management system meeting the ISO 14001 standard is a requirement of EMAS. It is possible to register several units working together as one organisation. At the end of May 2004 there were 38 registered organisations in Finland, with a total of 46

4. Government environmental expenditure (EUR million)

	2001 A	2002 A	2003 A	2004 B	2005 BP
Environmental administration	98	102	110	112	114
Central administration	*41*	*42*	*47*	*48*	*48*
Regional administration	*57*	*60*	*62*	*64*	*66*
Development co-operation	95	116	106	117	117**)
Co-operation with neighbouring regions	10	13	10	10	2
Nordic Environment Finance Corporation	1	1	1	1	1
Research and development	156	175	176	180	183
Environmental protection and management 1)	*15*	*17*	*17*	*17*	*18*
LUse and management of natural resources 2)	*29*	*40*	*38*	*41*	*41*
*Universities**)	*54*	*57*	*56*	*58*	*60*
Development of environmental technology 3)	*45*	*45*	*49*	*48*	*48*
Other environmental research 4)	*13*	*16*	*16*	*16*	*16*
Environmental NGOs	1	1	1	1	1
Environmental protection	37	40	54	59	37
Clean air and waste management	*10*	*11*	*8*	*18*	*11*
Water protection	*4*	*6*	*8*	*8*	*6*
Environmental management and decontamination	*23*	*23*	*38*	*33*	*20*
Nature conservation	63	59	57	69	86
Promotion of energy saving	6	6	7	10	10
Renewable energy investment support	19	28	27	24	24
Energy repairs for dwellings	–	–	15	17	17
Environmental protection of road traffic*)	39	26	12	12	11
Manure pit investment support	*5*	*2*	*2*	3	3
Agri-environmental support	281	284	306	312	322
Basic support	*248*	*252*	*254*	..	..
Special support	*32*	*31*	*34*	..	..
Others	*2*	*1*	*0*	..	..
Environmental support for forest management	4	4	4	6	6
Total	**816**	**857**	**886**	**932**	**934**

A = Final Accounts. B = Budget. BP = Budget Proposal. – = not in use. .. = data not available. *) = estimate. **) =forecast.

1) = Environmental Administration and the Academy of Finland. 2) = Agriculture and Forestry Administration.

3) = Technical research. 4) = Other administrative branches.

sites. Joining EMAS is possible in all EU countries and in Norway, Iceland and Liechtenstein.

In EMAS, openness and the necessity to inform stakeholders are given special attention. Organisations registered under EMAS regularly publish an environmental report on their activity that has been confirmed by a third party. The external inspection that is a part of the environmental management systems allows them to be taken into account in permit and supervision procedures. Companies have been granted reductions on permit and supervision costs, reductions have been made to the number of supervision visits, or the term of permits has been lengthened. In Finland, the fee for processing an environmental permit can be reduced if an environmental management system shortens the processing time, for example. Environmental management systems can be used as proof that environmental requirements in tender offers of public contracts will be met. Revision of the ISO 14001 standard is currently under way, with improvements in the standard's compatibility with the ISO 9000 quality standard, for example. The new standard is due for approval at the end of 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 beneficial for sustainable development. The idea is that local and central government organisations involved in environmentally responsible purchasing projects will learn from each other in developing best practices.

Funding for environmental protection paid through the Government budget that is not part of the environmental administration's operational expenditure is mostly directed at the environmental protection activities of industry and municipalities. Nature conservation appropriations are used for acquiring and managing nature conservation areas. As a sponsor of environmental research and development, the Government has an important role through various ministries, the Academy of Finland, and the National Technology Agency of Finland (TEKES). The Government also plays its part in carrying out the different EU programmes. The importance of agri-environmental support, which is partly financed by the EU, will be increasing further in the forthcoming programming period.

Development co-operation

Finland is committed to helping developing countries attain 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. Some of the ways in which Finland's development co-operation work aims to prevent environmental problems include providing support for the development of environmental legislation and management, transferring environmental protection technology, the sustainable use of natural resources and equitable division of the benefits obtainable from them, ecologically sustainable ways of making a living from the land, environmental research, training and education, giving citizens opportunities to participate, and preparing for the growing environmental requirements of trading.

The most important environmental projects for development co-operation are the conventions on the prevention of climate change and desertification, the conventions on the protection of biodiversity, and the operations of the UN Forest Forum (UNFF). Also important are the conventions that regulate the protection of the ozone layer in the upper atmosphere and the treatment of problematic waste and environmentally hazardous chemicals. The Global Environment Facility (GEF) financing, which supports the implementation of environmental agreements, has been increased to EUR 7.5 million per year since 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.

At the Johannesburg summit on sustainable development Finland announced its own partnership initiative on 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 project comprises experimental activity in the wind, solar, small hydroelectric and bio-energy sectors, energy resources surveys and feasibility studies, utilisation of the Kyoto Protocol's clean development mechanism, the 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. So far, 22 projects have been accorded EUR 1.3 million in funding. Finland's partnership initiative is one of the most developed, and has gained attention around the world. The partnership initiative was presented as an example to other countries at the Johannesburg follow-up conference in Bonn in 2004.

Co-operation with neighbouring areas

As stated in Finland's neighbouring area strategy and plan of action, the ability of countries to solve their environmental problems on their own and to prevent them from occurring has been developed through co-operation work. Finland's environmental co-operation work with northwestern Russia, Estonia, Latvia, Lithuania and Poland began in 1991. Finland is currently supporting environmental projects primarily in northwestern Russia. In addition, technical assistance co-operation with the Baltic

5. Environmental aid in Finnish development co-operation 1998–2003 (EUR million)

	2001	2002	2003	2004*)	2005**)
Bilateral development co-operation					
Environmental aid as main aim	22	27	25	30	30
Environmental aid as significant secondary aim	72	85	74	80	80
Multilateral development co-operation					
Support to GEF	0	3	6	6	6
Support to multilateral ozone fund	1	1	1	1	1
Total	**95**	**116**	**106**	**117**	**117**

*) = preliminary data. **) = estimate.

countries is being continued for the duration of the transition period. The main objective of the co-operation is to achieve reductions in those emissions from the neighbouring areas that have an impact on Finnish areas and especially the Baltic Sea. The projects are prepared in co-operation with the target countries. The co-operation also has the objective of improving maritime safety on the Gulf of Finland, and to combat the risks posed by dangerous substances. Other central areas of co-operation are nature conservation, protecting the air, and waste management. Alongside subsidies for investments, the Ministry of the Environment also supports training and research in environmental protection, and projects that aim to preserve biodiversity and advance the sustainable use of forests. The scope of the support also includes co-operation on small projects on land use, housing and construction. The projects of the Clean Production programme also advance sustainable, environmentally friendly and economical industrial production, and improve the level of environmental protection in industrial establishments.

Advancing environmental protection in Russia continues to be a tough challenge from Finland's point of view, as it is not a priority nationally, locally, or even for its citizens. Commitment to projects has also been a point of difficulty in the co-operation. Nevertheless, in recent years there have been many positive developments. The need for Russian companies with exports to the west to recognise the environmental aspects of their activity has increased their interest in environmental protection. Finland is placing particular emphasis on projects with a direct effect on the Gulf of Finland. In the co-operation work with northwestern Russia, activity has focused on the treatment of wastewater in the St. Petersburg region. Finland has helped fund the building of the southwestern wastewater purification plant in

6. Finland's contribution to environmental projects in neighbouring areas 1991–2003 (EUR million)

	Investment projects	Technical assistance
Estonia	28	6
Latvia	12	2
Lithuania	98	3
Russia	35	14
Ukraine	1	0
Poland	16	0
Others*)	0	8
Total	**99**	**34**

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

St. Petersburg with a total of EUR 10 million. The total cost of the project is almost EUR 190 million. The new purification plant in St. Petersburg will be a modern biological establishment, where the wastewater of 715,000 inhabitants will be treated. It will achieve nitrogen load reductions of 1,800 tonnes, and phosphorus load reductions of 260 tonnes per year. The construction of the purification plant will be completed in 2005. Co-operation between the Ministry of the Environment and the St. Petersburg water plant will also continue during 2004-2007. Co-operation work has also been carried out elsewhere in northwestern Russia in water protection and nature conservation, and in emissions measurements.

Environmental protection by municipalities

The environmental protection work of municipalities consists mostly of administrative tasks relating to permits and monitoring. There are over 30,000 establishments with environmental permits in Finland. The activity of 80-85 per cent of these belongs to the scope of monitoring by

municipalities. The establishments monitored by municipalities are small and have fewer environmental impacts. 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 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 444) with ongoing projects related to Local Agenda 21, covering over 80 per cent of the population. Started in 1997, the campaign for reducing greenhouse gases in municipalities is being continued. There are 48 municipalities in the campaign, accounting for 47 per cent of Finns.

According to the environmental barometer completed in June 2004 by the Association of Finnish Local and Regional Authorities, the most progress in environmental policy compared with the Finnish municipality average was made by the Hattula municipality. Second place in the environmental barometer of municipalities was accorded to Iniö, third place was shared by Imatra and Parainen. The rest of the top ten in environmental policy progress were Muonio, Naantali, Oulu, Kalvola, Karttula, and Inari. The environmental barometer of municipalities measures the progress that municipalities make in environmental policy in relation to the average of all the municipalities. The indicators in the study describe the state of the environment, environmental changes caused by humans, and activity by the municipality. Environmental policy activity by municipalities includes waste management, water and energy services, transportation, land use and nature conservation.

As part of the national climate strategy, the Ministry of Trade and Industry and the Association of Local and Regional Authorities drew up a municipal energy and climate agreement in 2002 that will remain in force until 2005. Alongside the heating of buildings and the consumption of electricity and water, energy can also be saved in purchases and in the fuel consumption of work machines. The scope of the agreement also includes the use of renewable energy sources and an increase in combined heat and power production. Municipalities, joint municipal boards and other municipal actors have made 84 co-operation agreements covering around 75 per cent of the municipalities' public housing. On the basis of these agreements, municipalities will gain government grants for energy reviews, energy savings investments, and training in efficient energy use.

The model Finnish municipalities for sustainable transportation - Jyväskylä, Kerava and Lempäälä - are trying new ways to promote more environmentally friendly and human-friendly transportation, and are considering ways of circulating these

7. Environmental protection by municipalities (EUR million)

	2001	2002	2003*)
Waste management			
Investments	17	19	21
Operating costs	129	126	129
Waste water treatment			
Investments	44	40	47
Operating costs	116	121	126
Sewerage			
Investments	106	97	113
Operating costs	135	141	147
Environmental management			
Investments	11	7	6
Operating costs	52	58	57
Total	**610**	**609**	**646**
Investments	178	163	187
Operating costs	432	446	459

*) = preliminary data.

principles to new localities with the help of the learning by example method. The projects are intended to encourage municipalities to improve the conditions and popularity especially of light transport, to develop public transport and to rationalise car traffic. Measures are founded on the action plans of each municipality and 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).

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 money for investments in these projects comes from Government funding. Expenditure on environmental management is financed by municipalities' own funding and through Government 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, developments are still needed 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 there is a lot of deviation in the proposed figures. 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 high 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 are also caused by drops in productivity, cigarette smoke, asbestos and radon.

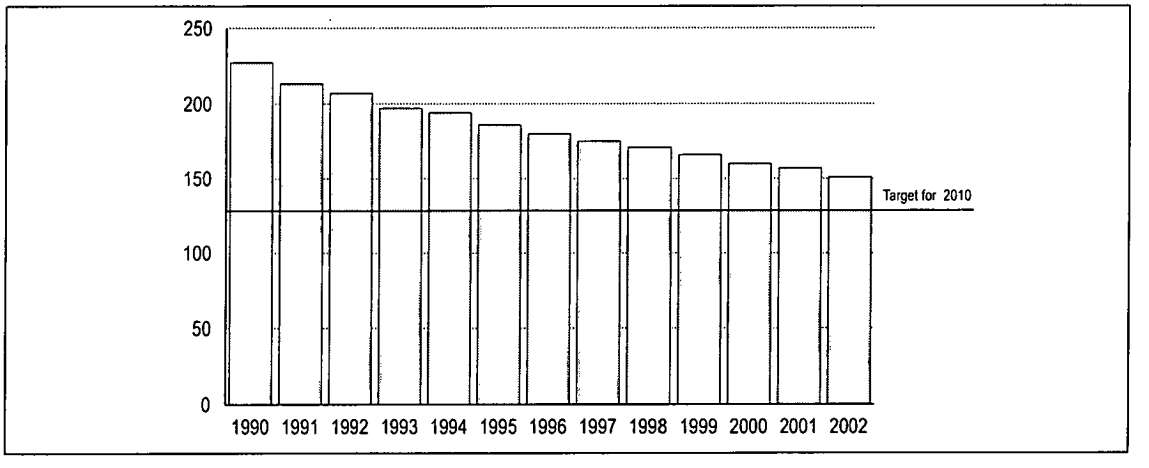
Attempts have been made to limit the problem of suspended dust in the outdoor air by reducing street sanding in the winter, by improving the quality of the sand, and by more efficient street cleaning, especially during the spring. Despite preventive measures, the amounts of the most dangerous particles, those under 2.5 micrometers in diameter, have not been significantly reduced. These particles are so small that they can enter the air sacks 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 nitrogen oxides, especially in the centres of built-up areas and alongside busy traffic routes.

In addition, the ozone concentrations measured in the lower atmosphere have

repeatedly exceeded WHO guidelines. Ozone concentrations 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 the 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's restrictions are ahead of almost all the corresponding requirements set out in the Montreal Protocol.

Figure 6. Finland's NMVOC (Non-Methane Volatile Organic Compounds) emissions and target for 2010 (tonnes)



2 Natural Resources

Sustainable use of natural resources

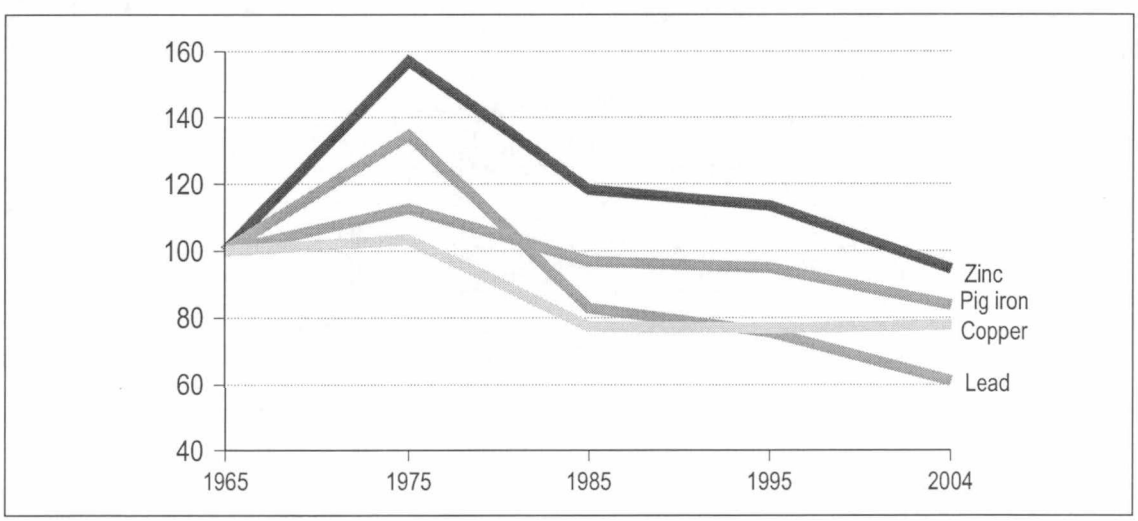
The growth of the world's population and improvement in standards of living are leading to increases in material consumption. Environmental impacts from the accelerating use of fossil fuels and natural resources are seriously jeopardising the renewal and tolerance of the natural environment. Indeed, one of the greatest challenges for sustainable development is 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 30 years. In the light of what we know today there is no threat of the non-renewable natural resources being exhausted over the next few decades.

According to the Government's sustainable development programme, the sustainable use of natural resources entails that non-renewable natural resources are used sparingly and efficiently, while at the same time the aim is to

8. 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 7. Trends in world market prices of selected metals (1965=100)



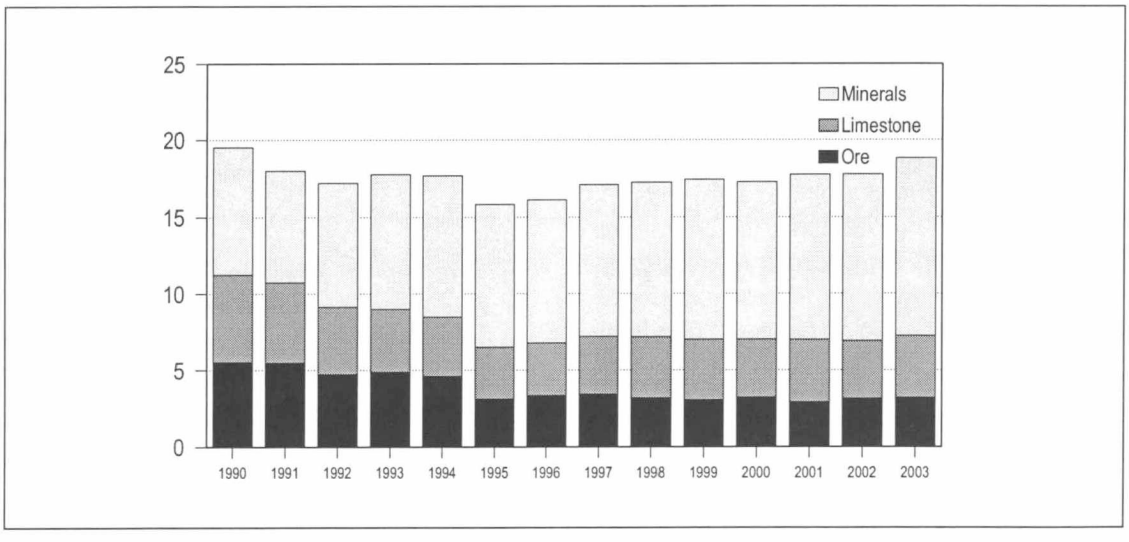
switch from using non-renewable natural resources to using renewable natural resources. Non-renewable natural resources that are in use must be kept within the sphere of commercial activity for as long as possible. This can be achieved by aiming to reduce the amount of waste generated, re-using materials, and recycling. Renewable natural resources are utilised within the limits of their renewability and production capacity.

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 2003, over 218 million tonnes of primary materials were consumed in Finland. Of this, 148 million tonnes were non-renewable and 70 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 rapidly becoming 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.

Figure 8. Mining of ores and industrial minerals and quarrying of limestone in Finland 1990–2003 (million tonnes)



Ore production in domestic mines declined quite considerably in the 1990s, while metal imports increased very sharply. In 2003, ore production in Finland amounted to 3.2 million tonnes, up by nearly 60 thousand tonnes from the previous year. In the same year, 6.3 million tonnes of metallic minerals were imported, limestone production was four million tonnes and domestic industrial mineral production was 11.5 million tonnes. The most important ores are chromium, zinc, nickel, copper and gold. The main industrial minerals are limestone, granite and talc.

The 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 extracted. In recent years the use of natural rock as a substitute for gravel has sharply increased as gravel resources near 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 (i.e. productive forests) amounts to 20 million hectares. Altogether 53 per cent of forestry land is in private ownership, 34 per cent is owned by the state, 8 per cent by companies and 5 per cent by others. The figure for state-owned forestry land also comprises areas reserved for conservation. The total volume of growing stock is over two billion cubic metres. Some 68 per cent of this is owned privately, 18 per cent by the state, 9 per cent by companies and 5 per cent by others. The total annual increment of 81 million cubic metres exceeds the total drain. In 2003, 61 million cubic metres were felled for industrial and other uses. Allowing for waste and natural losses, the total drain was 70 million cubic metres. Timber imports to Finland in 2003 totalled 16.6 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 their exploitation. The goal stated 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.

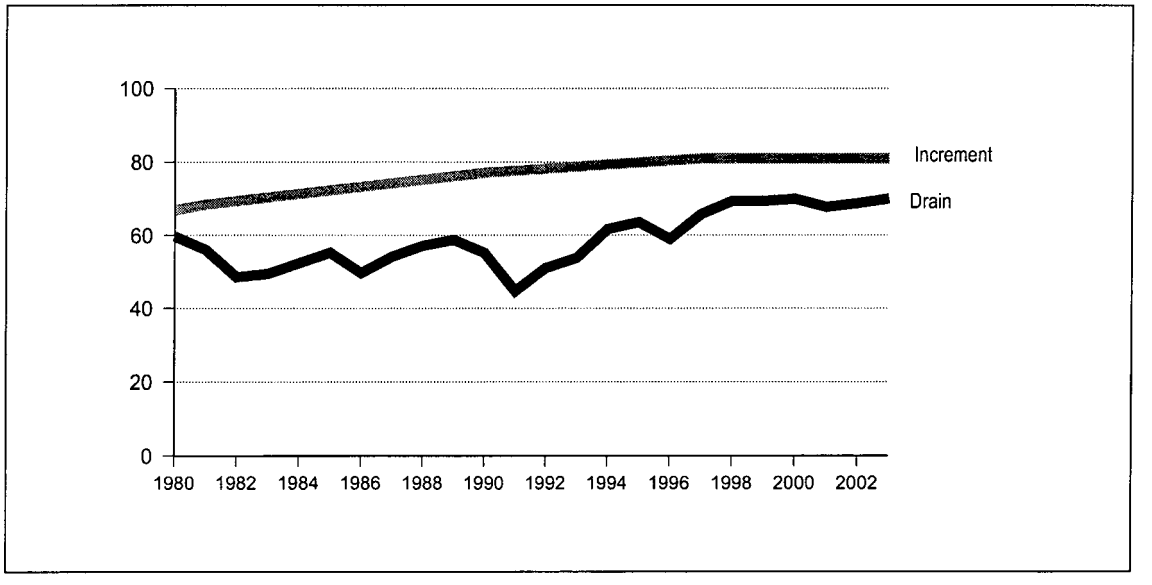
The way that Finland's commercial forests are managed is of key significance to preserving biodiversity in Finnish nature. Intensive silviculture has had negative effects on the diversity of forests, for instance regarding the reduction in the amount of old-growth forests and the amount of rotting wood. However, the new silviculture recommendations for private forests also include biodiversity considerations. An important way to support the diversity of commercial forests is to preserve in their natural state the key natural habitats identified in the Forest Act, as well as other valuable nature sites as defined by silviculture recommendations and certification. Environmental support for forest management is paid to private landowners for losses caused by preservation of important

natural habitats. The support has become more sought after every year.

The Government approved an action plan in autumn 2002 for the protection of the forests of southern Finland, the Oulu province, and southwestern Lapland. It was named the Forest Biodiversity Programme in Southern Finland (METSO). The programme contains many 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 certain core areas that are particularly important for biodiversity. These are national parks, government camping areas and local recreation areas. The available appropriations were used to sign 38 natural asset trading contracts for 10 years. The total area of these sites is 228 hectares. The trial has stirred up widespread interest among forest owners. In 2003, the Finnish Forest and Park Service started restoration work on 60 sites, and restoration and nature management work was done over 2700 hectares. The Finnish Forest and Parks Service has also started collecting general information on nature conservation areas. In 2003, 134,000 hectares were surveyed.

21.9 million hectares of Finland's forests are certified by the FFCS (Finnish Forest Certification System), which is part of the PEFC (Pan European Forest Certification) system. The FFCS contains requirements that are in accordance with laws and international agreements for the management and use of forests, certification of the origin of wood, and the execution of external auditing. The nationally implemented "Survey of Habitats of Special Importance under the Forest Act", or METE project was completed in spring 2004. In the survey, 95,000 especially important natural habitats as intended in the Forest Act were found with an area of around 60,000 hectares. On the basis of the quality assessment of the survey it is estimated that, on average, 80

Figure 9. Growing stock increment and drain (million solid cubic metres)



per cent of these key natural habitats were found.

The statutory regional target programmes for forestry 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. Revision of the regional target programmes for forestry started in 2004.

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 to 2 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 entities. Regional landscape ecological planning, which reconciles the different uses of forests, is aimed at securing biodiversity and the diverse utilisation of commercial forests. For example, rotting wood is left in forests and buffer zones are established. Valuable forest sites are left intact and, where necessary, ecological corridors are established to connect these areas.

Cultivated resources

Some eight per cent of Finland's land area is in agricultural use. There is a total of some 2,235,601 hectares of farmland, i.e. fields and gardens, of which 1,991,684 hectares were being cultivated and 220,331 hectares were lying fallow in 2003. 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 is used for grazing. In 2003 there were a total of 73,714 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 30.5 hectares. The mean cultivated area has increased by 45 per cent since Finland joined the EU. In 2002–2003, 1,760 farms ceased to operate, and the number of farms is estimated to be decreasing further. In 2003 the total agricultural turnover in Finland was EUR four billion. In 2003, fully or partly EU-funded subsidies were given out to a total of EUR 1.157 billion. In 2003, national agricultural subsidies funded by Finland totalled EUR 594 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 pollution include natural leaching, settlements in sparsely populated areas and holiday homes. An estimated 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 support programme in use, in 1995–1999, was estimated to reduce the amount of total

phosphorus originating from agriculture and ending up in the watercourses by 40 percent, and total nitrogen by 30 percent. However, the reduction in nitrogen was only 4–15 per cent and that of phosphorus 5–13 per cent.

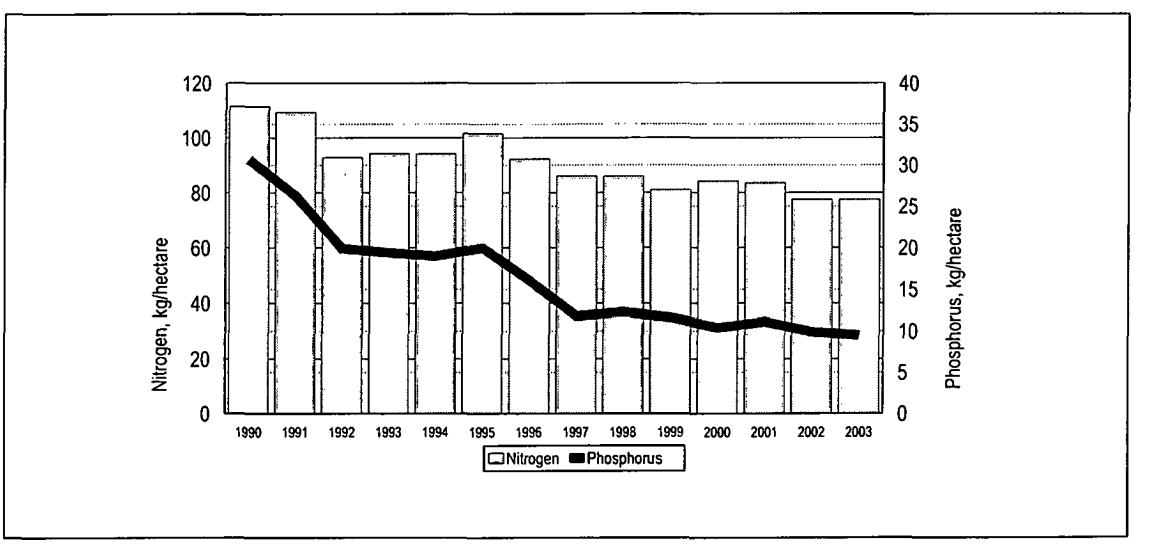
Pesticide use has been increasing recently in Finland. The main reason for the increase is direct sowing having become increasingly popular. Moreover, there has been a change from using low volume substances to using pesticides that require greater volumes, and the cultivated area has increased at the expense of grassed areas.

The Government Decree on nitrates passed in 2000 is used to reach the objectives of the European Council Directive on the protection of watercourses 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 contains regulations 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.

EU agricultural policy was renewed in 2003. As a result of the renewal, issues related to the safety of foodstuffs and the environment, and animal health and wellbeing are now topical. The horizontal plan for the development of rural areas accepted by the European Commission in 2000 also includes an agri-environmental support system for the 2000–2006 period. Around 93 per cent of farmers are committed to the agri-environmental scheme and its coverage is 98 per cent of arable land. The scheme is more flexible with regard to the differences in environmental management between individual farms.

Organic farming is one of the areas of agriculture receiving the special support of agri-environmental support. The support encourages people to produce organically. Organic farming methods imitate and make use of nature's own processes by means of diverse crop rotation. The use of artificial fertilisers and synthetically manufactured

Figure 10. Fertiliser use in agriculture



pesticides is forbidden on organic farms. The authorities inspect the operations of organic farms at least once during the growing season. In 2003 a total of 159,987 hectares were organically farmed in Finland.

9. Organic farming and transition phase area in EU member states in 2002

	Hectares	Percent of arable land
Austria	297 000	11.6
Italy	1 168 212	8.0
Finland	**156 692**	**7.0**
Denmark	178 360	6.7
Sweden	187 000	6.1
United Kingdom	724 523	4.2
Germany	696 978	4.1
Spain	665 055	2.3
Netherlands	42 610	2.2
Portugal	85 912	2.2
Luxembourg	2 004	2.0
France	509 000	1.7
Belgium	20 241	1.5
Greece	28 944	0.9
Ireland	29 850	0.7
EU15	**4 792 381**	**3.5**

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 percent of the country's total area, i.e. 33,500 square kilometres, and territorial waters extend over 36,000 square kilometres. There are an estimated 56,000 lakes in Finland 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 percent of the water suitable for water supply purposes is utilised yearly. The annual rate of usage for usable water is 15 per cent.

10. Agri-environmental support (EUR million)

	2001 A	2002 A	2003 A	2004 B	2005 BP
1. Basic and additional measures	248	252	254	..	..
2. Special support	32	31	34	..	..
2.1 Organic production	16	17	17	..	..
2.2 Buffer zones	2	2	2	..	..
2.3 Treatment of runoff	6	4	4	..	..
2.4 More efficient use of manure	2	3	3	..	..
2.5 Landscape management and biodiversity	6	5	7	..	..
2.6 Cultivation in groundwater areas	0	0	0	..	..
2.7 Native breeds	0	0	1	..	..
3. Training and advisory services	2	1	0	..	..
4. Experimental projects	–	–	–	..	..
5. Other environmental management programmes	–	–	–	..	..
Total	**282**	**284**	**306**	**312**	**322**

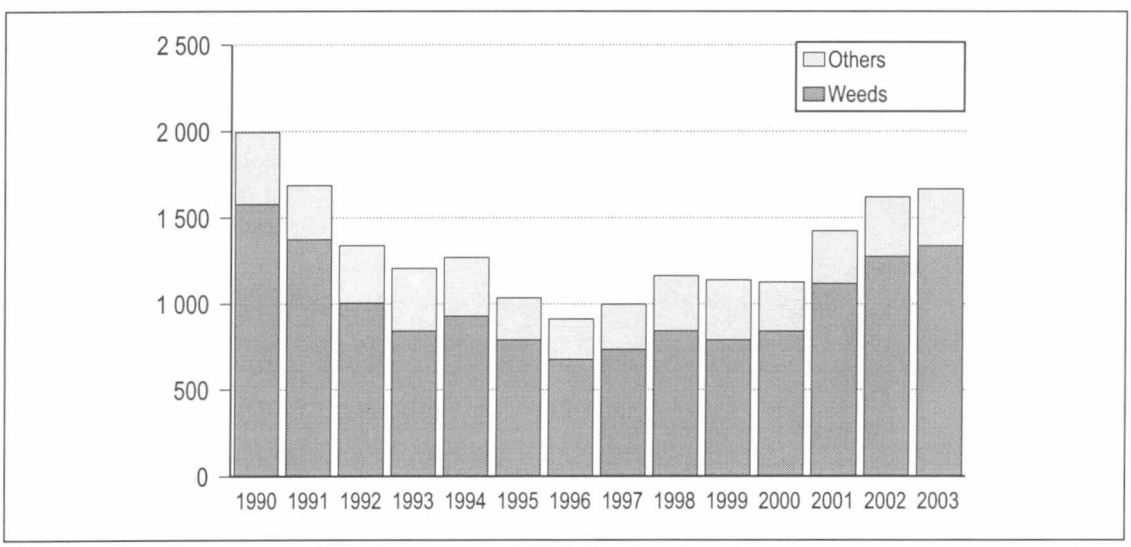
A = Final Accounts. B = Budget. BP = Budget Proposal. – = not in use. .. = data not available.

The quality of Finnish watercourses has been developing positively in recent decades. The positive course of development is owing to water protection measures having been undertaken, e.g. efficient wastewater treatment, which started on a wide scale in the 1970s. Now, urban and industrial wastewater is thoroughly purified. Water quality is still threatened by eutrophication. Many of our originally nutrient-poor watercourses have become eutrophic. The nutrient content of watercourses has risen, oxygen levels have decreased, and through eutrophication, blooming of algae has become more common. Diffuse pollution is still a major cause of water pollution, for which reduction efforts have not been as successful as for point source pollution. Sources of diffuse pollution include agriculture and forestry, and sparsely populated areas beyond the sewer network; water pollution originating from these must be further reduced.

The use and management 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. In order to fulfil the requirements of the EU Water Framework Directive, the necessary changes are being prepared to the ordinances mentioned above.

Public waterwork 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

Figure 11. Use of pesticides in agriculture (1000 kg of active ingredient)



industrial water catchments. About 3.5 million inhabitants use groundwater.

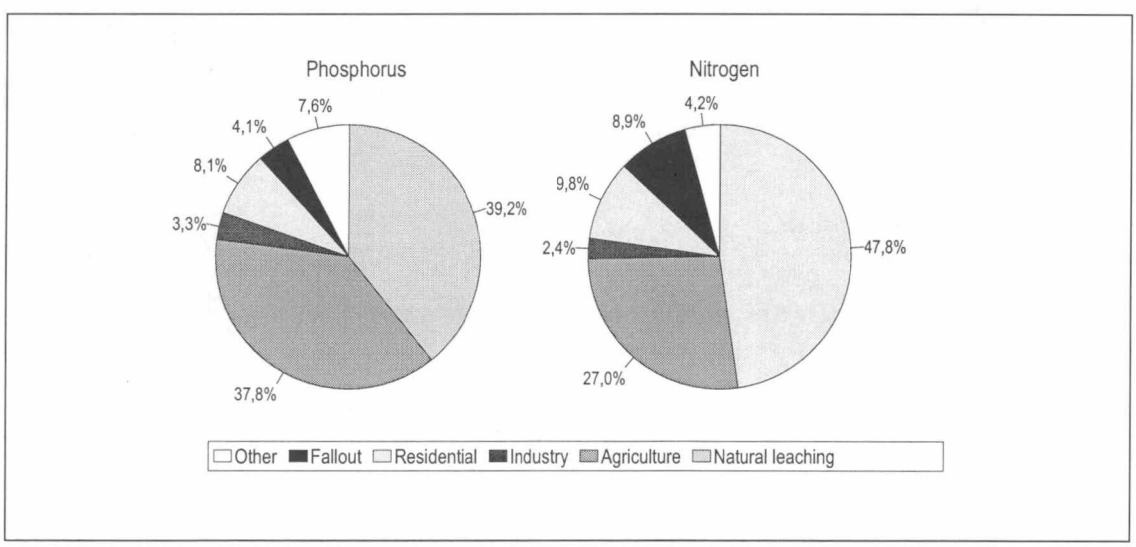
Around 4.1 million inhabitants are served by a sewerage system and there are some 560 sewage treatment plants in population centres of over 50 inhabitants. The treatment plants remove 94 per cent of the organic matter in wastewater, 93 per cent of the phosphorus, and 44 per cent of the nitrogen. One of the great challenges for the near future is to decrease the nitrogen content of wastewater. The target for wastewater 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 the phosphorus level by 30 per cent (to 300 tonnes).

11. Water resource usage in European countries in 2001 (billion cubic metres per year)

	Renewable water resources	Water usage	Intensity of water usage (%)
Belgium	12.0	9.0	75
Spain	111.2	35.5	32
Italy	182.5	57.5	32
Denmark	6.0	0.9	15
Greece	58.0	7.0	13
United Kingdom	145.0	9.3	6
Switzerland	40.4	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

A Decree for improving wastewater treatment in sparsely populated areas came into force in the beginning of 2004. According to the Decree, the wastewater of properties not connected to water companies must be treated adequately. The requirements concern both permanent dwellings and holiday dwellings. The requirements are applied immediately to new buildings, but existing properties normally have a ten-year transition period. During the transition period, 200,000–250,000 properties will have to improve their wastewater treatment. At present, the phosphorus load on watercourses from sparsely populated areas is greater than the

Figure 12. Phosphorus and nitrogen sources of the Finnish watercourses



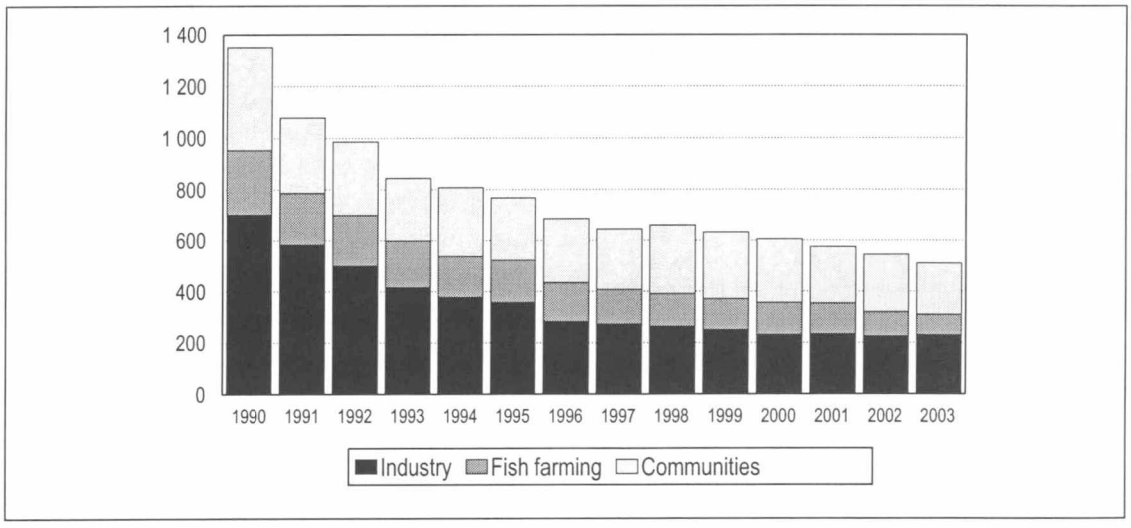
phosphorus load from communities or industry. According to estimates, the measures required by the Decree will result in the phosphorus load caused by sparsely populated areas to drop to less than half of the present level, and the total phosphorus load caused by humans to decrease by 6–7 percent in the next 10–15 years.

The vast majority, or 88 per cent, of the total surface area of Finland's coastal waters is classified as good or excellent in terms of water quality. The eutrophication levels in Finnish coastal waters increase from the Gulf of Bothnia south to the Archipelago and to the Gulf of Finland. The biggest sources of pollution of the Gulf are the agriculture, urban areas and 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 4,200 tonnes of phosphorus and 58,000 tonnes of 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 the 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 40 per cent reductions in nitrogen loads and 45 per cent reductions in phosphorus by 2005, compared to the levels of the early 1990s. Domestic investment is estimated at EUR 300–370 million. Other important projects include improving wastewater 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.

A new, serious threat to the environment is posed by the harbours built on the shores of the Russian side of the Gulf of Finland, which have in recent years multiplied the amount of oil transports in the Gulf of Finland. Oil and

Figure 13. Finland's phosphorus discharge from industry, communities and fish farming sources into watercourses (tonnes)



materials shipments are expected to increase further. In 1997, 35 million tonnes of oil were transported on the Gulf of Finland by sea, and in 2002 69 million tonnes were transported. By 2010, transport is expected to rise to 130 million tonnes. Advancing the safety of maritime traffic and improving open sea oil spill prevention and response are indeed the main aims of Finland's neighbouring area co-operation. The Finnish Maritime Administration and the Finnish Environment Institute were authorised in the state budget for 2005 to begin acquisition of a multipurpose icebreaker equipped with oil destruction facilities. The price of the vessel is EUR 134 million.

In the Baltic Sea, marine protection co-operation is founded on the so-called 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 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 annexes. 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 major sources of pollution (hot spots) in the Environmental Action Programme, 55 have so far been crossed off the list. The Baltic Sea was given PSSA (Particularly Sensitive Sea Area) status in April 2004.

EU environment ministers agreed in June 2004 to regulate the sulphur emissions of maritime traffic in the Baltic Sea, the North Sea and the English Channel. From May 2006, the sulphur content of fuel in ships in the Baltic Sea cannot exceed 1.5 percent. The upper sulphur content limit of maritime fuel in inland water traffic was agreed at 0.2 percent and from 2010 onwards, 0.1 percent.

The EU Water Framework Directive that came into force in 2000 is implemented in Finland mainly with the Act on Organising River Basin Management. It is a framework law that is used to create a planning system for river basin management and for establishing the functions of the authorities required for the implemention of the plans. The planning of river basin management is implemented in eight river basin management areas that consist of watercourse areas, of which two are international river basin management areas. Regional environment centres are in charge of the planning. The main aim of the new river basin management planning system is to achieve an ecologically and chemically good state for surface water and a quantitatively and chemically good state for groundwater. For river basin management, surface waters are divided according to their key characteristics into natural types, and according to chemical and ecological state into a class that represents the state of the water in relation to the natural state. The effects of loads caused by humans, water extraction and structural and hydrological changes on surface and groundwaters will be determined in 2004, and an economic analysis of the use of watercourses will be made. New monitoring programmes are due for completion in 2006, and action plans and river basin management plans in 2009.

Other natural resources

There are 61 species of fish in Finland. Important fish species in terms of quantity for recreational fishing are perch, pike, roach, whitefish, pike-perch, vendace, bream, trout, and rainbow trout. The total catch of recreational fishermen in 2002 was 38.5 million kg, of which 73 percent were fished from inland waters. The total value of the recreational fishing catch was EUR 47.5 million. The most important catches for professional fishing are the Baltic herring, whitefish, sprat, pike-perch, cod, and salmon. The financially most significant catch in inland waters was vendace. In 2003, the value of the professional fishing catch was EUR 19.5 million in the sea area, and in 2002 it was EUR 6.7 million in the inland water area.

Reindeer husbandry forms a quantitatively very small part of agriculture and the national economy. However, reindeer herding has a great economic, ecological and cultural significance in the northern reindeer herding areas. Reindeer population density by lichen grazing area is the least in northern regions, although by summer grazing area and by total land area, the density is greater there than in southern reindeer husbandry discricts. The highest accepted amount of reindeer after autumn slaughter in all reindeer grazing areas for 2000–2010 is 203,700 reindeer. In recent years, reindeer populations have been reduced successfully to the required level.

In Finland, the hunting right is reserved for landowners. There are 300,000 registered hunters. The most common game animals are deer animals, hares, waterfowl, and grouses. The delimiting measures of hunting to comply with sustainable use are based on data from the voluntary monitoring of game species carried out by hunters. Monitoring and studies have shown that the vitality and productivity of animals other than elk are not dependent on hunting, but rather on the quality and quantity of habitats for the animals. The catch of the economically most significant game animal, the elk, was 85,000 elk, and the calculated value was EUR 57 million. The value of the total game catch was around EUR 73 million. The catch is used primarily in hunters' own households.

Waste management

Some 127 million tonnes of waste and waste-like materials were generated in Finland in 2000. Around 530 kg of urban waste was collected per year per person. By comparison, the figure elsewhere in Europe varies between 300 and 650 kg. 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. Agricultural waste mainly consists of manure and straw, 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

12. Values of products from nature in 2002 (EUR million)

Fish catch	78.1
Game catch	73.0
Reindeer herding	14.3
Berries*)	5.5
Christmas trees	7.0
Mushrooms*)	0.7
Lichen**)	1.5

*) = amount entered in trade. **) = value of exports.

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 energy production. In 2000, 70 per cent of industrial waste was utilised; 5.2 million tonnes were reused 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, under which the manufacturer or the importer is to take an active role in organising the disposal and treatment of waste products. The principle has already been applied to used car tyres, waste paper and packaging materials. Regulations on product responsibility for disposal of end-of-life vehicles and electrical and electronics junk came into force on September 1, 2004. The modification of the Waste Act and the regulations on end-of-life vehicles and support for vehicle scrapping will serve to put into force the EU End-of-Life Vehicles Directive in Finland.

In Finland, nearly 100,000 end-of-life vehicles are accumulated yearly, and in the coming years the figure will reach 150,000. Currently, around 90 percent of end-of-life vehicles are recovered. Crushing plants are able to recover around 75 percent of the weight of the metal content of vehicles. In Finland, the 80 percent target for re-use and recycling has not yet been attained, nor has the target of recycling and recovering as energy 85 percent of the weight of vehicles. As stated in the End-of-Life Vehicles Directive, these targets should be attained by the beginning of 2006. The EU End-of-Life Vehicles Directive requires that the producer, i.e. the vehicle-maker and the professional importer, be responsible for costs arising from the disposal of vehicles sold after 1.7.2002, such that the last owner of the vehicle may deposit it without cost at an approved dispatch point. Producers will also be responsible for covering the costs of scrapping vehicles sold before July 2002 no later than from the beginning of 2007 onwards. An individual member state can decide that the producer's financial responsibility for end-of-life vehicles can start sooner. Finland has decided to incorporate the system from September 1, 2004. According to a decree in support of vehicle scrapping, producers will be reimbursed part of the cost arising from the disposal of end-of-life vehicles during the transition period 2004–2006. In practice, the funds are directed to companies that take care of disposing end-of-life vehicles. In 2004, a maximum of 80 percent of the net costs of vehicle disposal are reimbursed, but no more than EUR 80 per vehicle. The support for scrapping is for a fixed period, and decreases yearly. In the Government Budget, EUR 10 million has been reserved for this cause in 2004, EUR 6 million in 2005, and EUR 4 million in 2006.

The National Waste Plan based on the Waste Act and the EU's Waste Directive presents the

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	..

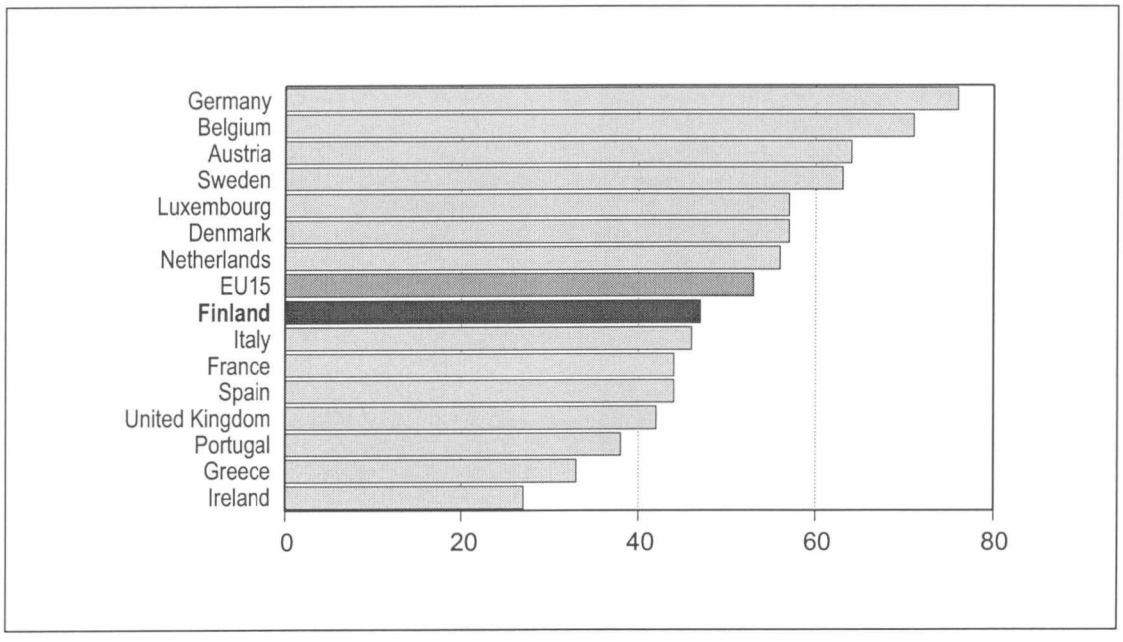
.. = data not available.

current status of the waste sector and sets targets for the development of the sector up to 2005. The Government approved the revised Waste Plan in August 2002. The Ministry of the Environment is currently preparing a National Biological Waste Strategy, which is aimed at reducing the amount of biodegradable waste being taken to landfills, and preventing the climate warming methane emissions that are formed in landfills.

Finland had 248 operational landfills in 2003, of which 91 were landfills for community waste. Today there are fewer landfills for community use, but those currently 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 ground water protection regulations. From that time onwards, landfill sites must be leak-proof pools so that landfill water and gases can be controlled. The target is for a maximum of 30 per cent of waste material to end up in landfills in 2005. The remaining 70 per cent will be utilised as secondary raw materials, energy, soil or in landscaping. As a result of the tightened requirements, the number of landfills will reduce to 60–70 in 2005, and the costs of waste management will grow by 50 per cent to an estimated EUR 1.6 billion.

The EU Directive on the incineration of waste was brought into effect in Finland with a Government Decree in May 2003. It clarifies and standardises the requirements for waste incineration. As a result of the decision, the 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 waste 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.

Figure 14. Recycling of packaging waste in EU15 countries in 2001 (percent)



3 Nature conservation and the built environment

Nature conservation

One of the aims of nature conservation is to preserve biodiversity. 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 monitored. While the most important habitat for endangered species is the forest, the threat of extinction has increased most amongst species living in traditional agricultural landscape habitats.

Ways of striving to maintain biodiversity include setting up conservation areas to protect unspoilt environments, protecting endangered species, and integrating the interests of nature conservation with the demands of land use planning. Strictly protected areas amount to 1,665,000 hectares, or 7.2 per cent of Finland's total forest and scrublands. There are also 97,000 hectares (0.4 per cent of total forest) of areas in which careful tree harvesting is permitted. Of actual productive forestland, 4.1 per cent is protected, or 834,000 hectares. According to the nature conservation financing package that extends to 2007, EUR 31 million is spent every year on acquiring nature conservation areas. Land exchanges made in 2004 total EUR 10 million.

The nature conservation area network in Finland has been developed with the help of various conservation programmes. A financing package for nature conservation programmes was started in 1996. The aim is to have all the programmes in place by 2004, with funding extending to 2007 due to the accrual of purchase prices. In 2003 nature conservation programmes were implemented for a total of 30,113 hectares. The Government acquired 12,996 hectares of land covered by approved nature conservation programmes, and 17,117 hectares of privately protected forest were established. All in all, nature conservation areas have been established on 1.6 million hectares of government and privately owned property. An additional 1.5 million hectares of wilderness area are protected by law.

In southern Finland, 1.0 per cent of productive forestland is strictly protected while 2.2 per cent is less strictly protected. In addition to commercial forests and strictly protected

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

	2001	2002	2003	2004	2005
	A	A	A	B	BP
Purchase of areas	32	23	22	29	42
Purchases of private land	*17*	*13*	*7*	*14*	*27*
Land exchanges	*15*	*10*	*15*	*15*	*15*
Management of conservation areas	14	16	23	21	24
Compensation payments	12	16	9	16	17
Life (Natura)	2	2	2	2	2
Employment promotion scheme	3	2	1	1	1
Total	**63**	**59**	**57**	**69**	**86**

A = Final Accounts. B = Budget. BP = Budget Proposal.

forests, it is necessary to have commercial forests that are managed with the goals of nature conservation in mind. For example, camping and hiking areas, recreational forests and parks would be such partially commercially utilised areas.

In order to fulfil the requirements of the European Commission's Habitats and Birds Directives, a common network of areas to be protected is being created: Natura 2000. In the Natura areas, conservation can be carried out in many ways depending on the protection needs of habitat types and species. Protection areas from both the Habitats Directive and the Birds Directive are included in Natura areas. Each member state compiles a list of Natura areas belonging in the Habitats Directive (SCI areas), after which the EU Commission will evaluate the list with the European Environmental Agency (EEA) Topic Centre for Nature and the member states. The evaluation is carried out separately by individual biogeographical regions. The majority of Finland's areas belong in the Boreal region; the northernmost parts of Lapland belong in the Alpine region. The network also includes special protection areas (SPA areas). These are part of the Birds Directive; the member states select the areas themselves and inform the European Commission. In practice, there is overlap between SCI and SPA areas.

The Government decided on the areas in the Finnish Natura proposal in 1998 and added to this in 1999. Upon request by the European Commission, the proposal was also updated in 2002. The areas that the Government was asked to reconsider by the Supreme Administrative Court were decided on in January 2004. After the January 2004 decision, Finland's Natura 2000 proposal (SCI) and notification (SPA) contained 1,806 sites, of which 87 are in the Åland province. The area of the Natura network is around 4.90 million hectares. Of this, around three-fourths, or 3.59 million hectares, is land area. The most expansive Natura areas are in northern Lapland, classified as an Alpine region. Their combined surface area is around 1.79 million hectares, which accounts for 38 per cent of the surface area of Finnish proposals under the Habitats Directive. The majority (97 per cent) of Finland's Natura 2000 areas are already established conservation areas, or belong in national conservation programmes or areas protected by other means. Further additions to the Natura network will be considered by the Government later in 2004.

The LIFE fund set up by the European Union in 1992 subsidises nature conservation and environmental projects that advance EU environmental policy and legislation. The programme's budget covering 2000–2004 is

15. Natura barometer in EU15 countries 12 May, 2004

	Number of SCI areas	Total area (km^2)	Proportion of total land area (%)	Hectares per capita
Denmark	194	10 259	23.8	0.19
Spain	1 276	118 496	23.5	0.30
Greece	239	27 641	20.9	0.27
Netherlands	141	7 505	18.1	0.05
Portugal	94	16 500	17.9	0.17
Luxembourg	47	383	14.9	0.09
Italy	2 330	44 237	14.7	0.07
Ireland	381	10 000	14.2	0.27
Finland	**1 665**	**47 932**	**14.2**	**0.91**
Sweden	3 420	60 372	13.4	0.67
Austria	160	8 896	10.6	0.11
Belgium	271	3 184	10.4	0.03
United Kingdom	601	24 721	10.1	0.04
Germany	3 5356	32 151	9.0	0.04
France	1 202	41 300	7.45	0.07
Total	**15 557**	**453 577**	**14.3**	**0.12**

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 to protect the species and habitat types listed under the Habitats directive and in particular to implement the Natura 2000 network.

In 2003, Finland received a total of EUR 4.5 million in financing for four projects. Since the beginning of Finland's EU membership in 1995, EUR 37 million in LIFE Nature financing has been received by Finland for 40 different projects. Money has also been directed from other Community funds to help attain the Natura 2000 goals. Currently, the principles for financing the implementation of the Natura 2000 network are being decided on for the period beginning in 2006.

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 a way that creates a basis for a good living environment, promoting 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 increased utilisation of existing infrastructure and building stock and the continuous, schematic 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, the relative location, intervening distance and traffic between residences, work places, services and other businesses is important. In zoning, a certain area is treated as a whole by co-ordinating measures targeted at different sectors. Zoning can influence environmental quality and prevent environmental damage. In drafting zoning plans, the effects of their implementation on the environment must be sufficiently investigated.

In 2002, the Ministry of the Environment issued Decrees concerning energy consumption requirements in buildings. The ordinances and instructions concern the heat insulation, indoor air quality, and ventilation of new buildings. The ordinances aim to reduce the energy consumption of buildings by 25–30 per cent. Improvements in energy efficiency are demanded by both the Kyoto Protocol and the Finnish Climate Strategy. The Climate Strategy is also being implemented with energy grants for repairs that improve the energy efficiency of properties in blocks of flats and row houses. Improvements in the energy efficiency of housing are being advanced with a voluntary energy saving agreement signed at the end of 2002 by the Ministry of the Environment, the Ministry of Trade and Industry, and the Federation of Housing Property Owners and Developers ASRA.

In the European Union, building stock is estimated to account for over 40 per cent of energy consumption. According to a Commission projection, it would be possible to achieve a 22 per cent saving on consumption by 2010. In January 2003, the Directive on the energy performance of buildings came into force, for which the national implementation is under way. In accordance with the Directive, a methodology for calculating the integrated

energy performance of buildings is prepared, minimum standards on the energy performance of new buildings are set, and legislation is passed for the establishment of energy certification systems, and for regular inspections of boilers and air conditioning systems. Energy performance requirements are also set for existing buildings, which will be followed in conjunction with major renovation work. The requirements apply either to the entire building or to the parts of the building being renovated. The ordinances implementing the Directive must be in force at the beginning of 2006. However, there is extra time until the beginning of 2009 for establishing full use of the energy certification procedure and inspection measures.

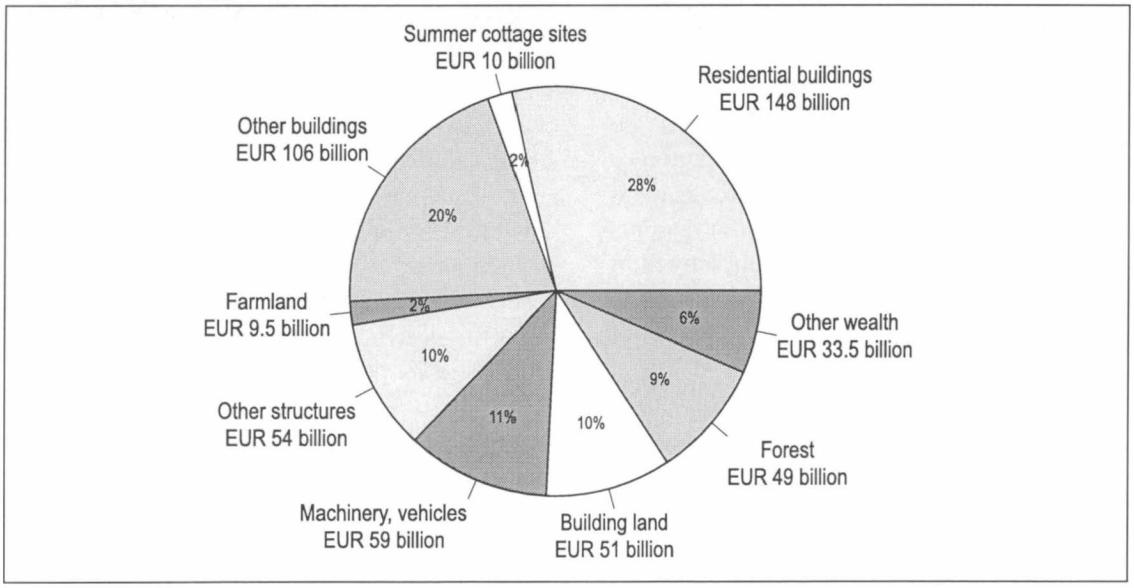
The national construction policy agenda compiled at the beginning of 2003 outlines the Government's approach for developing the properties and construction sector. The agenda improves the Government's ability to take into account the goals of the properties and construction sector when making decisions on long-term actions and developing the facilities of the sector. The properties and construction sector is also expected to answer to the challenges of the industry through its own

16. Population density and housing structure in the EU

	Population density in 2000 (resident per km^2)	Detached houses in 2001 (%)	One-person house holds in2002 (%)	Proportion of people living in cities (%)
Netherlands	387	70.9	14	89.7
Belgium	340	80.0	9	97.5
United Kingdom	244	..	13	89.4
Germany	231	45.6	17	87.9
Italy	191	30.3	10	67.2
Denmark	124	58.5	26	85.1
Portugal	109	56.8	5	67.1
France	109	55.9	13	75.7
Austria	97	65.8	14	67.7
Greece	83	57.8	9	60.6
Spain	81	37.7	5	78.1
Ireland	56	92.4	8	59.5
Sweden	20	45.7	42	83.8
Finland	**15**	**40.3**	**40**	**57.6**

.. = data not available.

Figure 15. Breakdown of Finland's national wealth in 2001 (EUR billion)



development efforts. According to the construction policy agenda, development work in the properties and construction industry must aim for more flexible area planning and more efficient infrastructure, increased expertise in lifecycle thinking and environmental issues, and better competition and productivity. Other goals include building on the inhabitant's terms, more efficient management and wider scope of co-operation.

The development of the built environment is strongly affected by the concentration of work places and subsequent migration. The longstanding migration to cities and suburbs is quickly emptying the countryside. Differentiation is also going on inside cities. In areas of population growth new residences are situated on the outskirts. Due to work places being 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, 28 per cent, or nearly one-third, of national wealth is composed of apartments and 30 per cent composed of other buildings and structures. Finland has around 2.6 million buildings that need building permits. There are fewer than 2.5 million dwellings and 450,000 holiday homes. Even though the traditional Finnish residence has been a house or farmhouse, the numbers of these have decreased due to urbanisation, with the proportion of blocks of flats and row houses growing correspondingly.

17. Different types of residences and holiday homes in Finland (1000s of residences)

	Houses	Row houses	Flats	Others	Holiday homes
1980	774	126	766	116	252
1995	898	291	928	64	416
1998	991	311	1 070	77	435
1999	1 010	312	1 080	76	444
2000	1 014	338	1 094	67	451
2001	1 026	344	1 115	58	457
2002	1 031	349	1 133	62	461

A programme for promoting wood building was launched for the period 2004–2010. Promoting wood use in construction has been set as a goal in the Government programme. The Government's aim of increasing the construction of city-like areas of small houses has been taken into account especially in developing the programme. Both the public and private sectors are represented in the working group. Aims of the programme for the promotion of wood building include increasing wood use in housing developments in Finland and nearby areas, clearing obstacles to wood building, and making necessary development recommendations. Aims also include advancing the quality of wood building and housing through research and product development work, and employing top Finnish knowledge in indoor air matters. In construction industry training, more emphasis is now placed on the importance of wood as a building material.

4 Industry

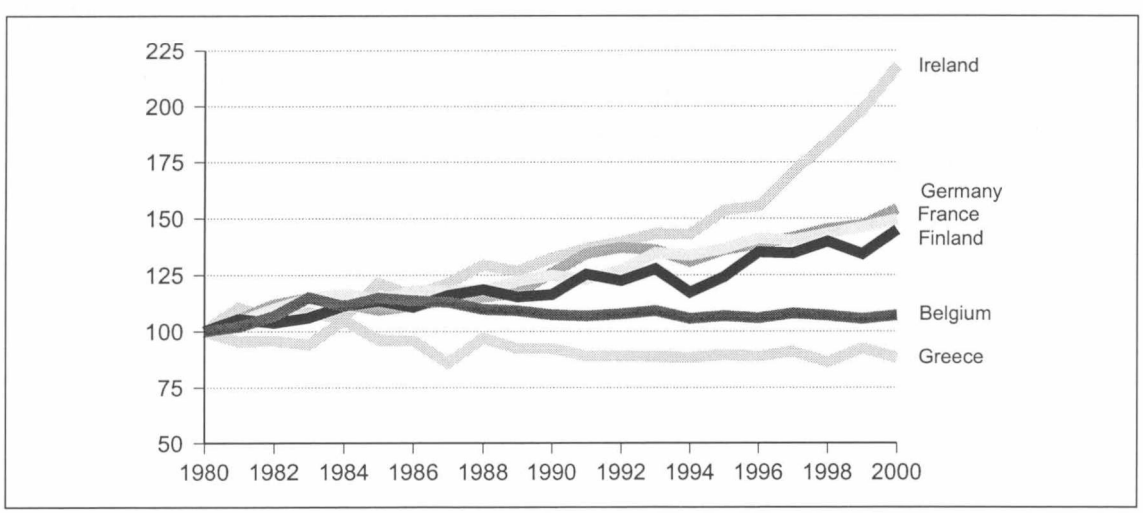
Progress in environmental protection

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 in decline. Growth was fastest in the electronics industry, which showed a sevenfold increase in production in the wake of soaring sales. In 2003, the metal and electronics industry accounted for 43.7, the forest industry for 17.3, and the chemical industry for 10.5 per cent of total industrial output in terms of value added. In 2003, the value of Finnish exports totalled EUR 46.2 billion, of which the electronics and electrical industry generated 26 per cent, the metallurgical industry 28 per cent, the forest industry 25 and the chemical industry 11 per cent.

Finland's industrial sector has invested more and more in environmental protection in recent years, with the emphasis starting 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 emissions by 50 per cent compared to 1995, and chemical oxygen demand by 45 per cent. Targets of a 55–90 per cent reduction in chromium, oil, nickel, copper and zinc emissions have also been established. According to an interim estimate of the

Figure 16. Trends in eco-efficiency in some EU countries (1980 = 100)



programme carried out in 2002, phosphorus emissions 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, all metal and oil emissions had been cut down to the 2005 target level. According to the interim estimate, nitrogen discharges from the forest industry and metallurgical industry discharges should be reduced more vigorously.

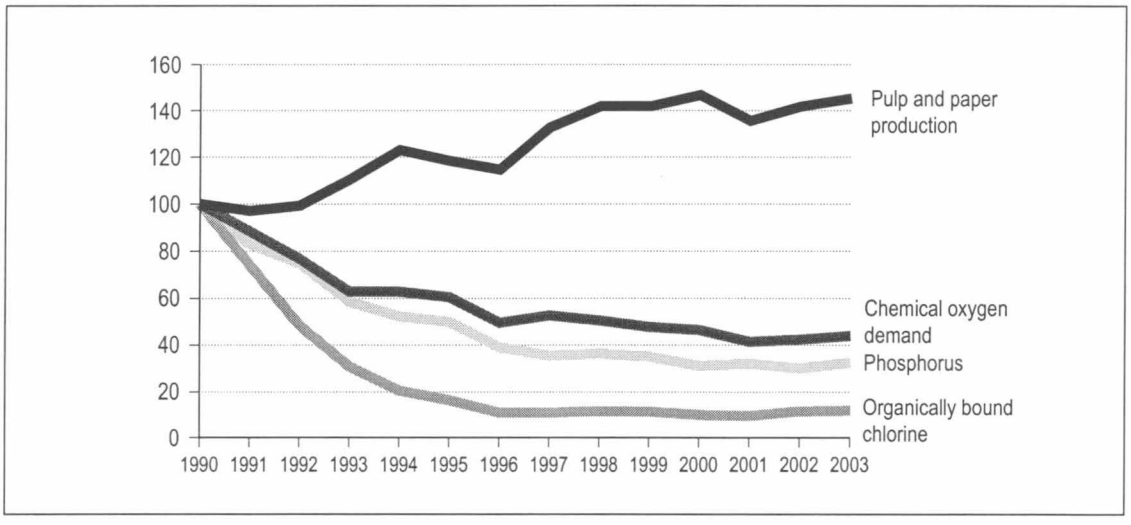
Industrial companies have been actively involved in the energy conservation agreement between the Ministry of Trade and Industry and the Confederation of Finnish Industry and Employers. The agreement is in effect until 2005. The annual report on the industrial energy conservation agreement published at the end of 2003 stated that by the end of 2002 the agreement covered 78 per cent of electricity used by Finnish industries, and 90 per cent of the energy usage in companies in the forest industry and metal production. By the end of 2002, the annual energy savings derived from measures reported within the scope of the agreement system aiming to increase the efficiency of energy usage totalled 3.0 TWh for heat and fuels, and 0.6 TWh for electricity.

Forest industry

Finland accounts for five per cent of the world's forest industry production and 10 per cent of its exports. Of the 10.4 million tonnes of paper produced in Finland in 2003, 91 per cent was exported. Of the 2.7 million tonnes of board produced, 84 per cent was exported. In recent years the forest industry has been producing record quantities of paper and other wood products. In 2003, forest industry production increased by over 2 per cent from the previous year. The paper industry's average capacity utilisation in 2003 was 89 per cent.

Virtually all forest industry companies now have an environmental management system in place and publish environmental reports in conjunction with their annual reports. The forest industry's continued efforts to raise the standards of environmental protection and minimise discharges call for good control of the entire production process. The key concern

Figure 17. Pulp and paper industry production and effluent load on the rivers and lakes (1990=100)



in the improvements to production processes in the pulp and paper industry is to minimise raw material consumption: wood, water, chemicals and pigments. In 2003, the forest industry used a total of 71.3 million solid cubic metres of wood, of which 54.7 million were of domestic origin and 16.5 million imported. Wood consumption for the previous year was at a similar level. Imported timber for the Finnish forest industry is covered by ISO quality and environment certification.

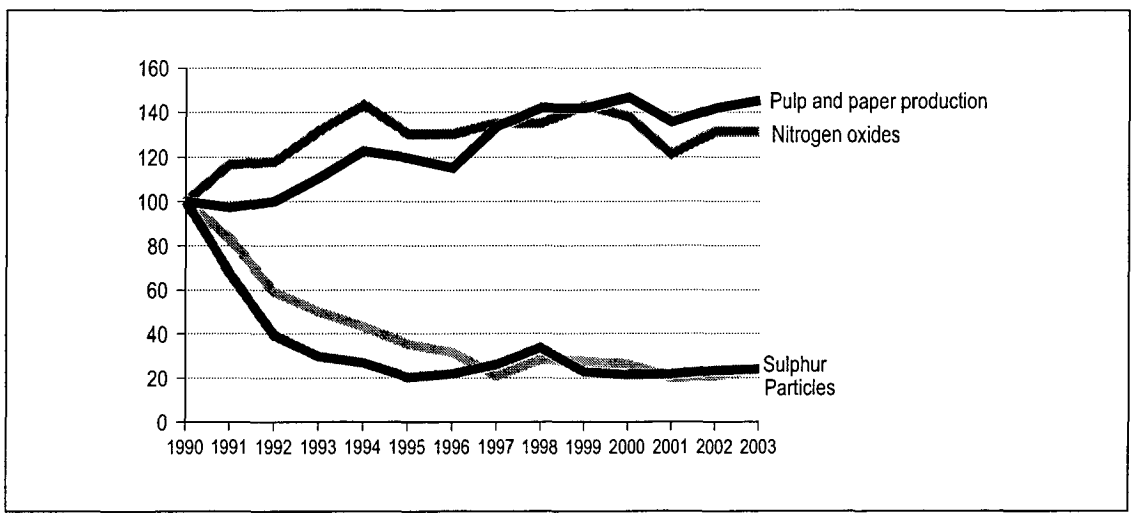
In 2003, the electricity consumption of Finnish pulp and paper mills totalled 273 terajoules. The most important fuel was wood, used in the form of bark, wood chips and black liquor in the pulp industry. In 2003, wood accounted for over 72.8 per cent of total fuel consumption by forest industry power plants, with natural gas accounting for 15.9, peat 6.4, heavy fuel oil 4.6, and coal 0.3 per cent. The forest industry is the largest consumer of biomass fuel in Finland.

In 2003, the pulp and paper industry's environmental investments totalled EUR 49 million, representing an eight per cent reduction on the previous year. Of the completed environmental investments, most were concerned with water protection.

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 the raw materials used in paper production. According to a 1998 decision in principle by the Finnish Government, 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. 749,000 tonnes of paper and board were recovered in Finland in 2003, which represents 73 per cent of all paper used. The volume of recovered waste paper decreased by two per cent from the previous year despite a one per cent increase in the recovery rate. This was due to a decrease in paper consumption of nearly 4 per cent.

The average global recovery rate of waste paper stands at around 40 per cent. Since only approximately 10 per cent of the Finnish paper and board industry's production is consumed domestically, the potential for increasing the share of recycled fibre is limited. In 2003, over

Figure 18. Pulp and paper industry production and emissions into the atmosphere (1990=100)



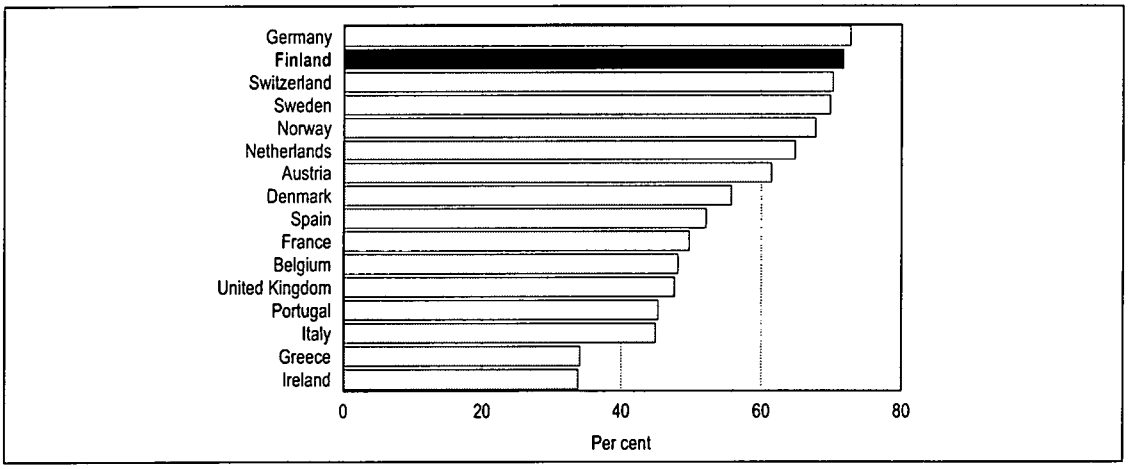
83,000 tonnes of waste paper were imported to Finland to be used in the production of recycled fibre. All in all, Finnish industry used 668,000 tonnes of recovered paper as raw material. 97 per cent of this was used by the paper and board industry, while the rest was used by companies producing heat insulation solutions. Recycled fibre accounted for 5.6 per cent of the paper and board industry's raw materials, used primarily in the production of different types of board, newsprint and tissue.

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, underlining the need for reliable and comprehensive environmental protection. Most investments in environmental protection made by the chemical industry consist of conventional external measures to purify emissions, whereas investments in process technology are less significant. The chemical industry has, however, succeeded in significantly reducing some of its effluents and emissions into water and the atmosphere, and the volume of waste has been declining since 1994.

The chemical industry has taken voluntary steps to raise the standard of its environmental protection and industrial safety in the context of the international Responsible Care programme. In 2003, the programme covered over 80 per cent of Finland's chemical industry production and more than 60 per cent of the industry's employees, totalling 23,200 people. Production increased by 3 per cent from the previous year, while personnel decreased by 4 per cent. Of the companies committed to the Responsible Care programme, more than 85 per cent employed the use of some quality management or environmental management system. 90 per cent of these systems had been certified by an outside authority. Of the various systems, 42 per cent complied with ISO quality standards, 34 per cent with ISO environmental standards, 3 per cent with EMAS, 15 per cent with OHSAS standards, and 7 per cent with other systems. The biggest

Figure 19. Recovery of waste paper in the EU15 countries in 2002



increase has been in management systems that comply with the ISO standards, and in industrial health and safety management systems.

In 2003, companies taking part in the Responsible Care programme invested EUR 57 million (a decrease of 27 per cent on the previous year) in improving environmental, health and safety matters. Most of these investments dealt with energy efficiency, industrial safety, water conservation and other unspecified matters. The companies involved in the programme reported that the operating costs of their environmental, health, and safety systems totalled EUR 100 million in 2003, which represents a decrease of 0.6 per cent on the previous year. The costs were mainly derived from water conservation, waste management and air pollution control.

The most noteworthy emissions reductions under the Responsible Care programme were made in the early 1990s. According to water discharge indices, by 2003 eutrophication discharges had decreased by 40 per cent from 1988, while potentially ecotoxic discharges had decreased by more than 90 per cent. Thanks to the measures taken to reduce discharges that cause eutrophication, these do not currently pose a serious problem in Finland. In 2003, nitrogen discharges into water in proportion to production volumes decreased by 17 per cent compared to the previous year, while chemical oxygen demand in wastewater increased by 15 per cent.

Since 1988, the companies involved in the Responsible Care programme have reduced their acidifying emissions into the atmosphere by 80 per cent and their VOC emissions by more than 60 per cent. Their greenhouse gas emissions have returned to the level of 1999. Nitrogen compound emissions in 2003 were 4 per cent lower than in 2002, while nitrogen oxide emissions in proportion to production volumes decreased by nearly 7 per cent. Although sulphur dioxide emissions increased

18. Chemical industry effluents emitted into the watercourses (tonnes)

	1999	2000	2001	2002	2003
Production volume (1999=100)	**100.0**	**107.6**	**109.0**	**107.9**	**108.1**
Sulphate	61 742	62 529	64 550	64 500	77 550
Phosphorus	13	15	13	11	11
Nitrogen	391	461	465	438	326
Mercury *)	7	8	7	6	14
Cadmium *)	1	0	0	0	2
Lead*)	5	3	3	2	2

*) = kg.

19. Emissions and discharges from oil refining (tonnes)

	1999	2000	2001	2002	2003
Production volume (1999=100)	**100.0**	**97.8**	**91.0**	**97.8**	**98.5**
Volatile hydrocarbons	4 873	4 748	4 590	4 085	4 379
Nitrogen oxides	3 053	2 877	2 915	3 203	3 179
Sulphur dioxide	3 188	3 266	3 383	3 199	3 340
Oil spills into water	4	5	9	3	2

by 2 per cent from the previous year, sulphur dioxide emissions into the atmosphere have decreased by 70 per cent from 1988. Emissions of volatile organic compounds (VOC) in proportion to production volumes decreased by more than 9 per cent from the previous year, taking the total decrease of emissions of such compounds since 1988 to over 60 per cent. The chemical industry's energy consumption, proportioned to production volumes, remained on the same level in 2003 as the year before.

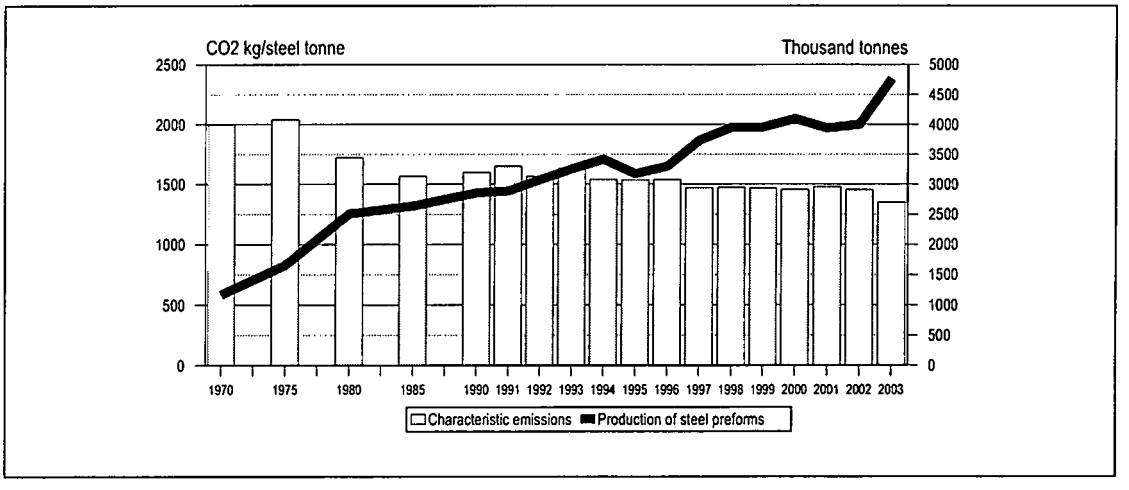
In 2003, the companies taking part in the Responsible Care programme produced 526,000 tonnes of waste for disposal, which is approximately 12 per cent more than the previous year. The amount of waste directed for recycling in 2003 totalled approximately 145,000 tonnes, an increase of 16 per cent on the previous year, while hazardous waste for disposal amounted to some 114,000 tonnes, an increase of about five per cent on the previous year.

Metallurgical and electronics industries

Metal refining production has been growing steadily, doubling over the past ten years. During the same period, production in the electronics and electrical industry has grown almost five-fold. Of total sales in the metal and electronics industries in 2003, 45 per cent were from the electronics and electrical industry, 42 from the machine and metalworking industry, and 13 from metals refining. Most of the environmental impacts in the metallurgical industry arise from metals refining, where raw materials are produced for use by other industries.

Extensive recycling of metals reduces the demand 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 that for all other materials combined. In 2001 some 400 million tonnes of scrap iron was used in the world out of 847 million tonnes of steel produced - making almost half of all steel 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 the use of virgin raw materials. The recycling of aluminium also saves significant amounts of energy; smelting recycled aluminium only

Figure 20. Steel industry characteristic emissions of carbon dioxide in Finland in 1970–2003



requires five per cent of the energy that is needed to produce the same amount of aluminium from bauxite. Furthermore, 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 metal refining industry has worked on improving its production processes, significantly raising the efficiency of its raw materials and energy use and reducing its emissions. Half of the world's copper and 30 per cent of its nickel are produced by the Finnish flash smelting method, which has a low external energy demand and effectively recovers sulphurous gases.

Reducing carbon dioxide emissions is a great challenge for the metal refining industry. Coal is an indispensable deoxidiser in the production 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, furnace efficiency is world-class, with carbon dioxide emissions per unit produced among the lowest in the world. Modern technology can do little more to help reduce emissions.

Investments in environmentally acceptable process technology in the metallurgical industry exceeded the costs arising from the purchase of traditional emission control technologies as early on as 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 through the development of 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 metal refining, investments have focused on the introduction of environmental management systems and related lifecycle analyses. The electrical and electronics industry has focused on reducing the use of CFC compounds and improving the recovery and utilisation of scrap.

20. Emissions and discharges from metal refining

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Production volume (1995=100)	**100.0**	**103.9**	**110.1**	**116.2**	**119.9**	**126.3**	**123.2**	**123.2**	**125.5**
Emissions into the atmosphere (thousand tonnes)									
Sulphur dioxide	8.1	8.1	7.5	7.6	8.1	7.8	8.4	7.6	8.4
Nitrogen oxides	3.2	3.1	3.5	3.5	4.1	4.1	4.0	4.0	4.7
Effluents into water (tonnes)									
Nitrogen	420.6	449.3	421.6	526.0	490.0	520.5	351.4	307.5	399.3
Chromium	3.5	2.3	3.9	4.2	5.8	3.0	1.4	1.1	1.1
Nickel	12.4	6.0	10.3	6.8	9.3	7.2	5.6	3.8	3.4
Copper	8.2	8.7	8.9	6.8	7.1	9.7	7.9	3.3	6.0
Zink	10.7	9.9	9.4	6.9	7.6	7.3	4.0	3.2	2.6

5 Energy supplies

Energy production

In 2003 Finland's total energy consumption was estimated to total 35 million oil equivalent tonnes. The consumption increased by 5 per cent from the previous year. The greatest increase was in the use of coal, which increased by 43 per cent. Oil accounts for 25 per cent of energy consumption, coal for 17 per cent, natural gas for 11 per cent, nuclear power for 16 per cent and peat for 7 per cent. The share of fossil fuels was 60 per cent, 29 per cent originated from domestic energy sources, and 19 per cent 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.

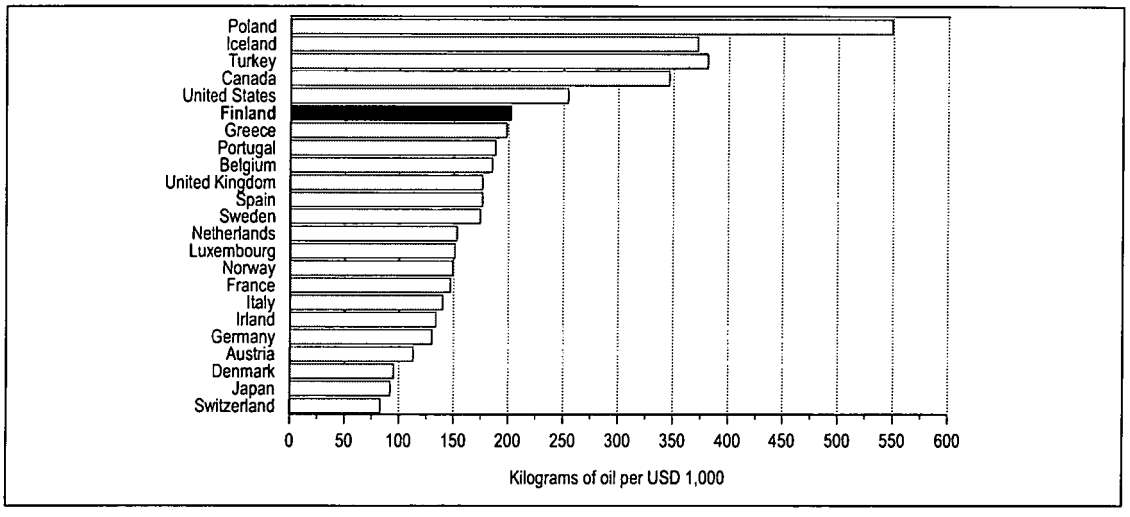
Electricity consumption in Finland amounted to 84.7 TWh in 2003, up by one per cent from 2002. The peak in electricity output of 14,040 megawatts was reached in winter 2002–2003. The availability of hydroelectricity decreased by over one-third in 2003 because of the poor water resource situation in the Nordic countries. Electricity importing from Russia also grew by 43 per cent. The proportion of net imported electricity from total electricity use fell from 14 per cent to under 6 per cent, though. The use of electricity in the home and in agriculture increased by 2.5 per cent, and in industry it grew by 1.5 per cent. Industry and construction accounted for 53 per cent of the electricity demand or 45.2 TWh, and homes and agriculture accounted for 25 per cent or 21.3 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 coal, to

21. End-use of energy by sector in 2003

	Petajoules (PJ)	Per cent
Industry	536	49
Heating	240	22
Transport	179	16
Other	141	13
Total	**1 096**	**100**

Figure 21. Total energy consumption in selected countries by GDP unit in 2001



speed up the implementation of the country's energy saving programme and regulations, and to promote the research, development and introduction of renewable energy sources. A report will be presented to parliament concerning these actions.

Use of fossil fuels

Much of the environmental damage caused by energy production is caused by the use of fossil fuels. The environmental impacts resulting from their use are considerable, and in many places they are now seriously jeopardising the renewal and tolerance of nature. In light of what we know today, there is no threat of fossil energy resources being exhausted 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 57 years and those of coal for 200 years.

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 in 1998, it was in real terms below the price level preceding the first oil crisis in 1973. In 2003 global oil production totalled 4,109 million tonnes.

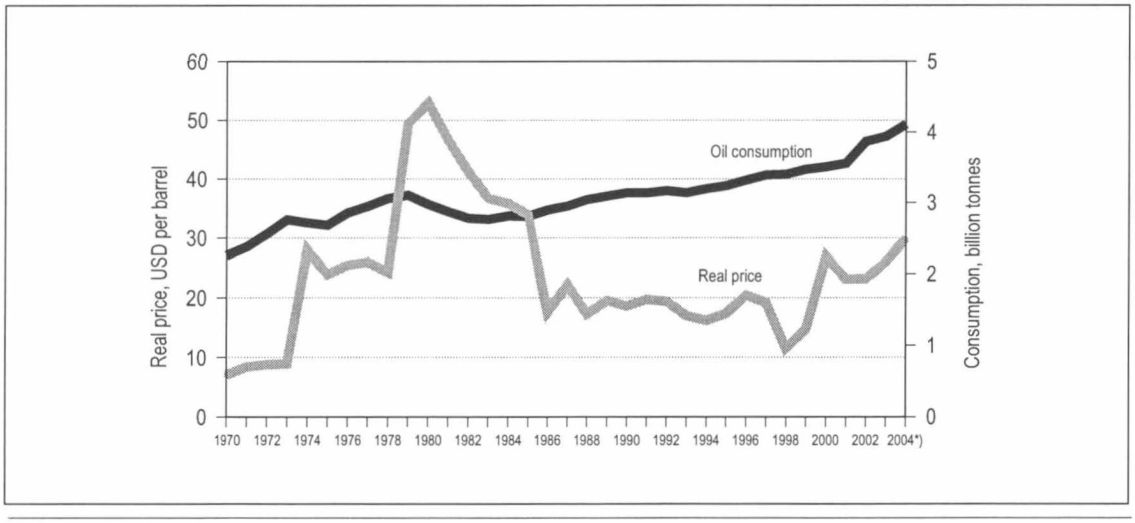
In Finland, oil consumption peaked in the 1970s at about 10 to 12 million tonnes a year. Consumption declined sharply in the 1980s, and during the 1990s annual consumption fell

22. 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	6.6	4.3
2002	8.7	7.3	4.2
2003	8.9	9.6	4.7

– = not in use.

Figure 22. World oil consumption and real world market price



to less than 9 million tonnes. In 2001, however, the consumption of oil products increased. In 2003-2004, consumption of fossil fuels continued to rise in Finland. In 2003, petrol consumption increased by one per cent and diesel fuel by over 3 per cent. The consumption of light fuel oil and heavy fuel oil both increased by 3 per cent, and coal by 43 per cent.

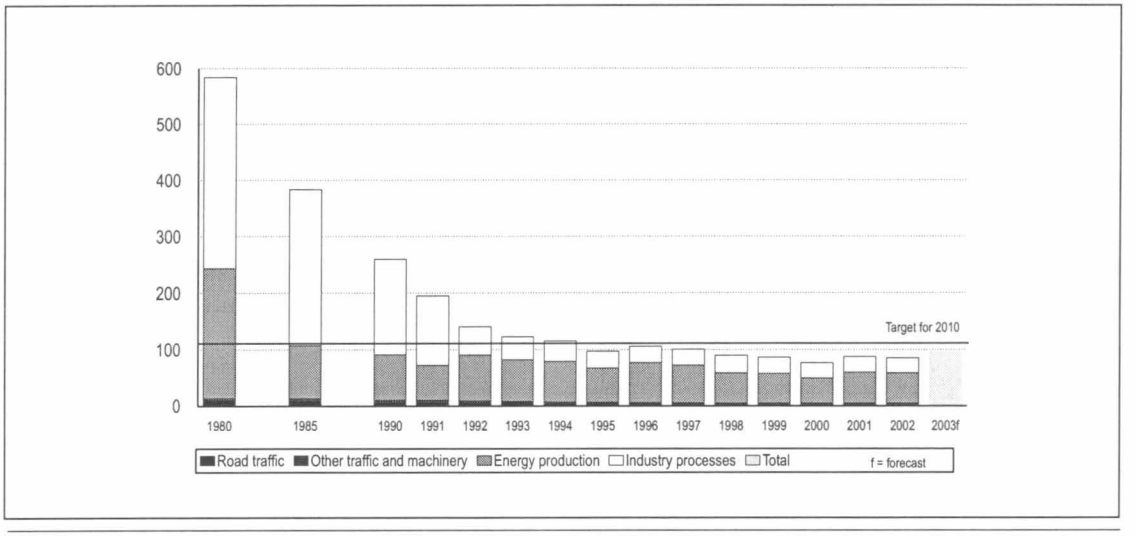
Air pollution and acid deposition

Acidification affects the soil and water in those areas of Finland that are the most sensitive and under the greatest pollutant load. The primary sources of acid deposition are emissions of sulphur dioxides and nitrogen oxides, largely from long-range transboundary pollution and somewhat less from domestic energy production and road traffic. In 2003 Finland's sulphur dioxide emissions totalled, according to estimates, 95,000 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, less use of heavy fuel oil, decreased sulphur content in 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.

According to estimates, in 2003 there were around 218,000 tonnes of nitrogen oxides emissions in Finland, almost 25 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, nitrogen oxides emissions are comparatively high in Finland, about 70 per cent higher than in European OECD countries on average.

Acid deposition has caused damage to a number of fish stocks in Finland, and evidence of damage has been observed in some 2000 lakes in southern and central Finland. It seems that the acidification of groundwaters in Finland has halted, and

Figure 23. Finland's sulphur emissions and reduction targets for 2010 (thousand tonnes of sulphur dioxide)



23. The sulphur dioxide, nitrogen oxides and ammonia emissions of 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	Emissions ceiling	Emissions	Emissions ceiling	Emissions	Emissions 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

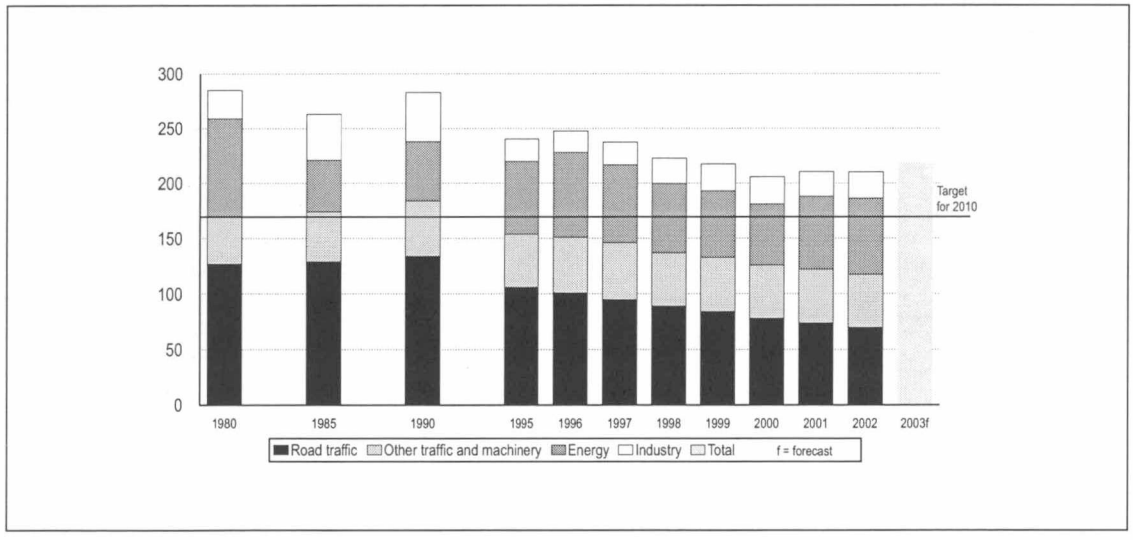
*) = emissions data from 1999. **) = emissions data from 1998. ***) = emissions data from 1996.

neither does the acidification pose a severe threat to the well-being of forests, at least not in the nearby future. The situation may well change in the long term unless deposition levels can be reduced below critical loads in the whole country.

Climate change

One of the foremost concerns of sustainable development is to prevent the acceleration of the greenhouse effect. At the UN Climate Summit in Kyoto in 1997 a

Figure 24. Finland's nitrogen oxides emissions and reduction target for 2010 (thousand tonnes)



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 from 1990 levels during 2008–2012. For the United States the reduction target is 7 per cent, for EU countries it is 8 per cent, and for Japan it is 6 per cent. The Kyoto Protocol is the first step towards lowering the volumes of greenhouse gases to a safe level, although this will not yet have a major effect on slowing down climate change. According to the IPCC (Intergovernmental Panel on Climate Change), the emissions reduction requirement in the long term is to the order of 50–90 per cent world-wide, for atmospheric carbon dioxide content to be kept at no more than double pre-industrial levels.

The IPCC estimates that global temperatures could rise by 1.4–5.8 degrees Celsius by 2100. According to IPCC calculations, the carbon dioxide content in the atmosphere will rise by more than 50 per cent by 2050, from 365 ppm to at least 550 ppm.

In many contexts the EU has set a long-term guiding goal for climate policy: that the rise in world temperature should not rise by more than two degrees compared with pre-industrial times. The EU estimates that a 70 per cent global reduction in the use of greenhouse gases compared to the 1990 level would be required to fulfil this objective.

Some of the countries will voluntarily reduce their emissions by more than the agreed amount. 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 per cent stated in the EU burden sharing agreement. In the EU, the United Kingdom and Sweden have announced that they will strive for reductions of 60 per cent by 2050. The German goal is a reduction of 25 per cent by 2005, when according to burden sharing the target is to reduce greenhouse gas emissions by 21 per cent by 2012. In spring 2005 the European Council will consider the EU's medium to long term climate strategies and goals.

The requirements directed to the EU by the Kyoto Protocol in 1997 have been distributed among the 15 old 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 obligations to the agreement by implementing measures domestically, complemented by measures on a Community level. All the EU member states have made or are in the process of making national implementation strategies to meet the requirements of the Kyoto Protocol. The member states' climate 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. According to a Commission follow-up report, measures taken by the EU member states thus far are not sufficient to reduce greenhouse gas emissions to the degree specified in the Kyoto protocol. With the existing measures for emissions reductions, it will be possible to reduce emissions by 0.5 per cent by 2010, leaving 7.5 per cent of the targeted reductions unattained. With the planned additional measures, the EU could get closer to its target, although 0.8 per cent of the reductions would still remain unattained.

The implementation of a common greenhouse gas emissions trading scheme in the EU is regarded as an essential instrument for attaining the greenhouse gas reduction targets. The emissions trading system is aimed at reducing greenhouse gas emissions as cheaply

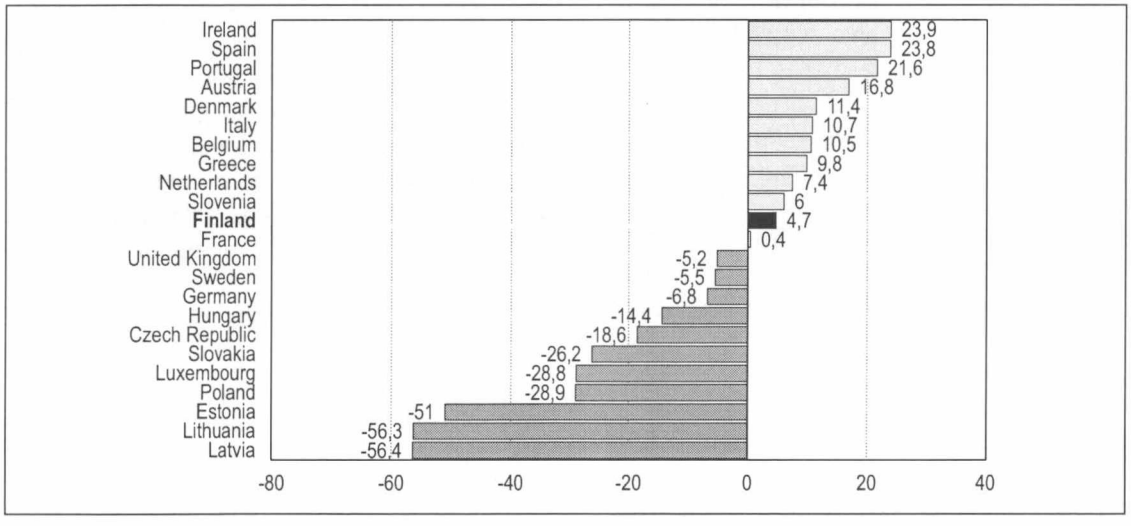
as possible, and in an environmentally efficient way. Emissions trading within the European Community takes place with each member state allocating the emissions allowances site by site to installations covered by the emissions trading scheme, after which the emissions allowances can be traded within the Community. Those for whom it is more cost-effective to reduce emissions can sell their allowances to those for whom the reductions would be more costly.

The EU Emissions Trading Directive came into force on 25 October 2003: it states that emissions trading will commence at the beginning of 2005. At least 95 per cent of the emissions allowances for the initial period 2005–2007 are allocated to the installations free of charge. For the period 2008 to 2012, member states must allocate 90 per cent of the allowances free of charge. Member states must elaborate national allocation plans containing details of the total amount of emissions rights the state will grant during the period specified in the Directive, and how it will allocate the emissions rights to different installations. When writing up the allocation plan, objective and frank justifications must be used, and the plan must respect the criteria contained in the Directive. These criteria include involvement of the public, the potential (including technical capability) of installations to reduce

24. EU greenhouse gas emissions (carbon dioxide equivalents) 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**	**+ 1 %**	**- 8.0 %**

Figure 25. EU member states in relation to Kyoto target levels in 2001 (per cent)



emissions, participation of new entrants, and taking into account early actions.

The EU-wide emissions trading scheme has a considerable effect on Finnish climate policy. Within the EU burden sharing agreement, Finland is committed to cutting its greenhouse gas emissions to the 1990 level by 2008–2012. Since the cost of reducing emissions is comparatively high in Finland, Finnish companies would primarily be purchasers of emission allowances. However, this largely depends on the amount of emissions allowances the member states will allocate in their initial allocation plans, and the consequent market price of emissions allowances. In August 2004, Finland submitted to the European Commission a national allocation plan containing emissions rights by installation for the first period of emissions trading 2005-2007. The plan was based on the Emissions Trading Act that entered into force on 4 August 2004. According to the plan, Finland will allocate emissions allowances equivalent to 136.5 million tonnes of carbon dioxide for 2005–2007. This is 3 per cent fewer emissions allowances than establishments are expected to need during this period. New installations being completed during the emissions trading period have been reserved a 2.5 million tonne carbon dioxide allowance. Emissions allowances are allocated to establishments free of charge. The 150 companies taking part in emissions trading produce half of Finland's greenhouse gas emissions, and 59 per cent of Finland's carbon dioxide emissions. The Government will grant the emissions rights in the autumn after the Commission has approved Finland's proposal for an allocation plan.

As part of the Finsken project, the Finnish Meteorological Institute has produced a series of scenarios for the future climate in Finland and the composition of the atmosphere. The projections based on models estimate that the Finnish climate will become warmer and rain volumes will increase in all the development scenarios. The exposure of forests to low-level ozone will exceed the critical level in southernmost Finland in all the scenarios. The situation looks the least promising under the development scenarios that aim for economic growth, in other words, the scenario in which energy production relies mostly on fossil fuels. According to this scenario the average temperature in Finland will rise by 6-7 degrees halfway through the century, and the ozone exposure of forests will also reach critical levels in northern Finland. In the low emissions development scenarios, in which environmental values are given priority rather than economic development, or in which economic growth is achieved with the help of new, environmentally friendly technology, the ozone exposure of forests will begin to decrease half way through the century. The increase in pollution from traffic and energy production that causes ozone to form in the lower atmosphere will be so immense globally that the measures for reducing air pollution agreed upon in Europe will not suffice to prevent increases in ozone levels. Also within these scenarios the climate in Finland and around the world will become warmer, but at a slower rate than in the higher emissions scenarios. The slower global warming occurs, the better the chances of people, animals and plants adapting to the temperature change. Similarly, the risks of global changes occurring will decrease in the coming centuries.

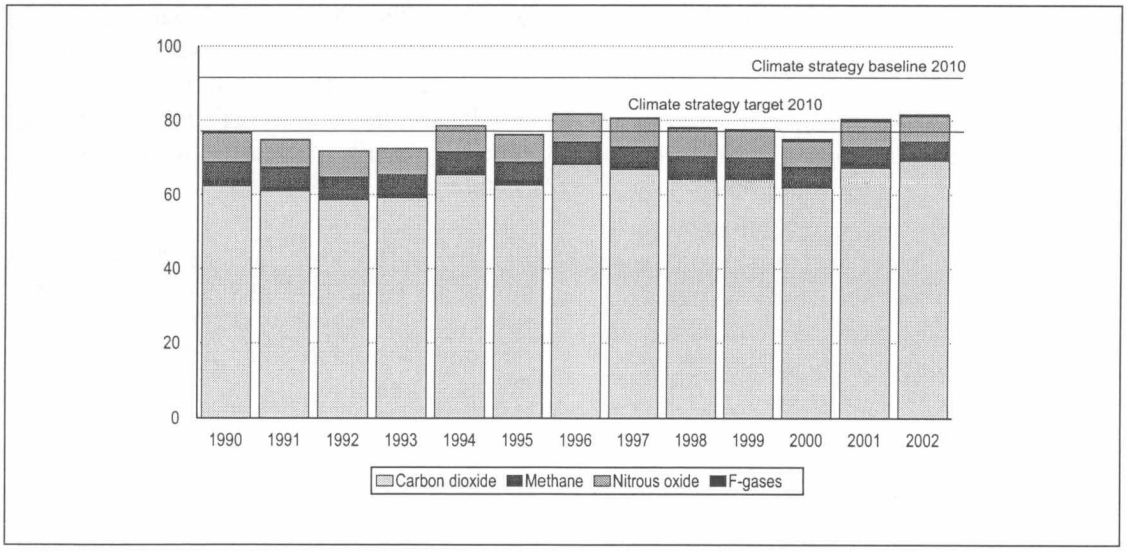
In 2002 Finland's net greenhouse gas emissions were the equivalent of 82 million tonnes of carbon dioxide. This is nearly 5 million tonnes more than in 1990, the Kyoto Protocol benchmark year, when emissions were 77 million carbon dioxide equivalent tonnes. The figures do not include carbon dioxide emissions from wood-based fuels, as these are considered to be reabsorbed by

forests. Carbon dioxide is the major greenhouse gas, accounting for 85 per cent of the total. The main source of carbon dioxide is fuel use for the production of electricity and heat, and fuel use in transport. These account for 78 per cent of total greenhouse gas emissions and 89 per cent of carbon dioxide emissions. In 2003, Finnish carbon dioxide emissions from fossil fuels and peat rose to a new high, 70 million tonnes, exceeding 1990 levels by nearly 30 per cent. The peak was caused by the cold winter, an increase in energy consumption, a reduction in hydroelectricity production in the Nordic countries, and having to satisfy the electricity demand with coal and peat.

The National Climate Strategy report presented to the Finnish parliament in 2001 charts the measures in use for decreasing Finland's greenhouse gas emissions. According to the strategy, Finland's greenhouse gas emissions will exceed the Kyoto targets unless determined efforts are made to combat present trends. Action is needed in energy production and consumption, road traffic, construction, community planning, the control of emissions, and waste management.

Projections have shown that in Finland more efficient use of energy and increased use of renewable energy sources could cover half of the required reductions in greenhouse emissions. According to the national climate strategy, the use of coal should not be increased any further. The Finnish national climate policy is being implemented through wide-scale co-operation. The review of the national climate strategy will be complete in 2004. The new strategy will take into account the Parliament's new stance on nuclear power, the use of the Kyoto flexible mechanisms, the starting of EU-wide carbon dioxide emissions trading in 2005–2007, and Parliament's requirement (in a statement concerning the previous climate strategy) to draw up a programme for adjusting to climate change. The International Conference for Renewable Energies in Bonn on 1–4 April 2004 concluded that renewable energy sources (together with energy efficiency) will grow and form into the most important and very

Figure 26. Finland's greenhouse gas emissions 1990–2003 (million carbon dioxide equivalent tonnes)



widely available sources of energy. Funding for research and development into renewable energy should be increased, and economic instruments should be used to support the increase in renewable energy use.

The UN Framework Convention on Climate Change requires signatories to monitor their greenhouse gas emissions closely. It binds its signatories to submit an annual inventory report on their anthropogenic greenhouse emissions for the last but one year. The European Commission also compiles an inventory covering the EU member states. In Finland, a greenhouse gas inventory establishment as required by the Kyoto Protocol will be established at Statistics Finland by the end of 2004.

A test programme led by the Ministry for Foreign Affairs was started in 1999 to gain experience on the project-based Kyoto mechanisms: Joint Implementation and the Clean Development Mechanism (JI/CDM). The test programme has a total of EUR 20 million in appropriations for its operations. Some EUR 11 million has been invested in the World Bank's Prototype Carbon Fund (PCF) and the Baltic Sea Region Energy Co-operation Testing Ground Facility (TGF). The rest is used in bilateral JI and CDM projects and in the administration of the programme. Bilateral agreements are expected to produce reductions in CO_2 emissions of over 1.5 million tonnes during the first Kyoto Protocol commitment period. The PCF investment is expected to produce a similar reduction in emissions.

Sustainable energy supply

The promotion of renewable energy sources and increased efficiency in energy use are key conditions for sustainable development. The

25. Finland's greenhouse gas emissions by sectors and sources in 2002

	Million CO_2 equivalent tonnes
Energy	68.0
Energy production	*29.5*
Industrial production	*13.6*
Road traffic	*13.4*
House heating, etc.)*	*7.8*
Emissions from peat lands, etc	*3.6*
Industrial processes	2.8
Solvents, etc.	0.04
Emissions from agriculture	7.5
Waste	2.9
Other	0.7
Total emissions	**82.0**

*) = Households and services.

EU's multi-annual support programme for the energy sector's operations, Intelligent Energy - Europe (2003-2006), will continue along the central lines of the framework programme for action in the energy sector that expired at the end of 2002. The programme is 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 efficiency, STEER is concerned with energy conservation in transport and fuels, and COOPENER supports co-operation in energy initiatives 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 the topic of sustainable development and global change.

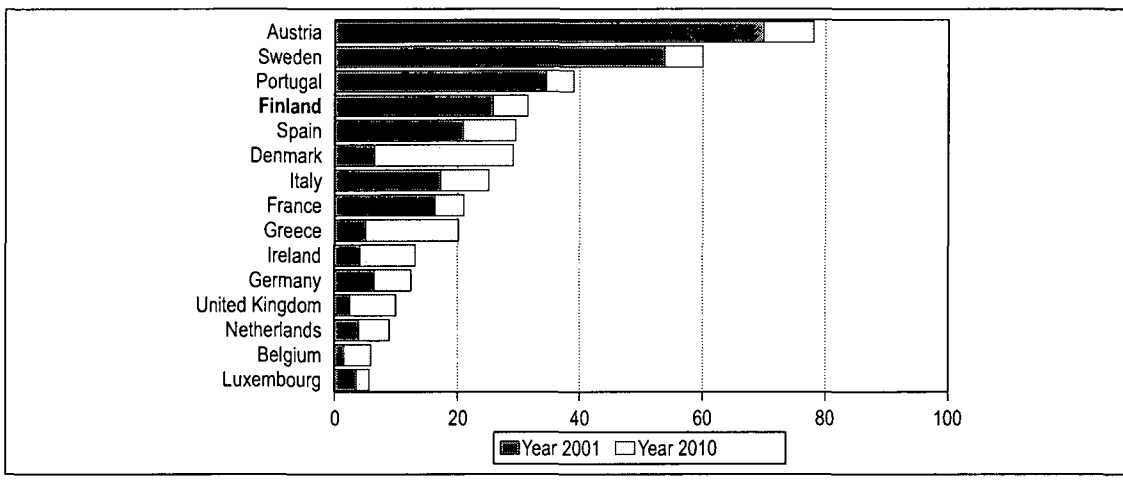
The European Commission aims to double the percentage of renewable energy sources in use from the current figure of six per cent by 2010. In the Directive promoting the use of

electricity produced from renewable energy sources, each member state is given 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 of the EU to double the share of CHP by 2010. To achieve this target (among others), a Directive for promoting combined heat and power production was drafted, which came into force in February 2004.

The programme for the promotion of renewable energy sources, prepared in 1999, is being implemented as part of the National Climate Strategy. In 2002 a proposal was made for revising that programme. The proposed programme aims to increase the use of renewable energy sources by 30 per cent from the 2001 level by 2010. Most of the increase, nearly 90 per cent, would come from bioenergy - mainly from wood. An additional goal in the promotion programme is to increase wind power use by 2010 to 16 times the amount used in 2001. The goal for 2025 is to increase the use of renewable energy by 60–70 per cent compared with current use.

One of the goals of the National Forest Programme and the Action Plan for Renewable Energy Sources is to increase wood fuel use. In 2003, 13.4 million solid cubic metres of wood fuel was used in heat and power plants to produce over 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 2003. 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 2003, wind power capacity was 52 megawatts in 74 plants. In 2003 Finland produced 93 GWh of energy by wind power, which is 47 per cent more than in 2002. The goal is to

Figure 27. Renewable energy sources as a proportion of electricity consumption in 2001, and the target for 2010 (per cent)



increase Finland's wind power capacity to 500 MW by 2010. The construction of more wind power sites has been hampered by the low price of electricity. The EU's wind power capacity was 23,384 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 to provide holiday homes and remote regions with electricity. 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. Around half of the output goes into industry, and half goes into the needs of communities. Co-generation uses only two-thirds of the amount of fuel required in the separate generation of power and heat. In 2003, 75 per cent of district heating and 34 per cent of all electricity was produced through combined heat and power production. All in all, the consumption of district heating in 2003 amounted to 29.9 TWh. Some 46 per cent of the population live in housing connected to a district heating system. In larger cities, the figure is around 90 per cent.

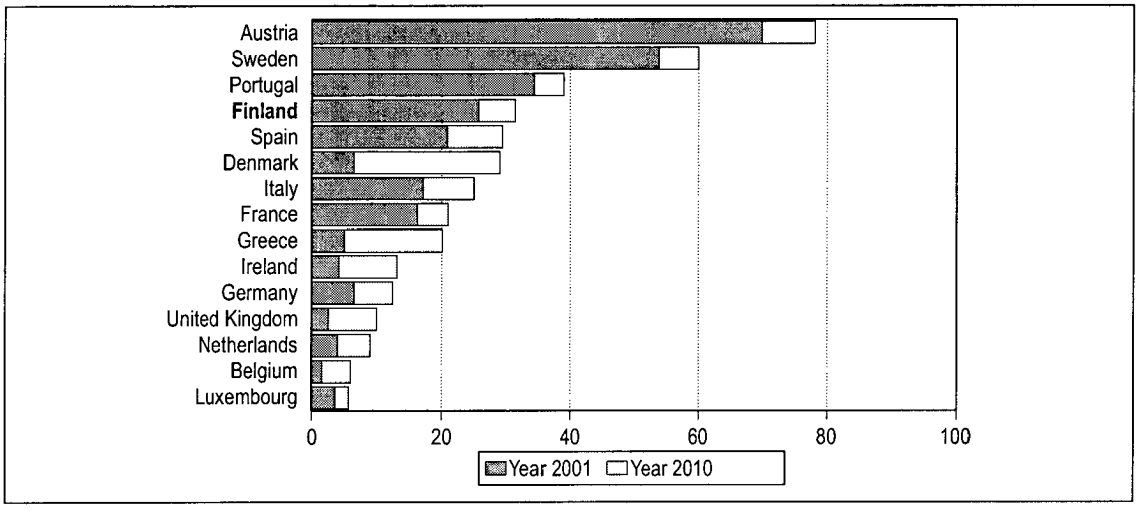
27. EU wind power capacity December 31, 2003 and increase during 2003 (megawatts)

	Capacity	Increase
Germany	14 609	2 645
Spain	6 202	1 377
Denmark	3 110	243
Netherlands	912	226
Italy	904	116
United Kingdom	649	103
Austria	415	276
Sweden	399	54
Greece	375	78
Portugal	299	107
France	239	91
Ireland	186	49
Belgium	68	33
Poland	57	30
Finland	**51**	**8**
Latvia	24	0
Luxembourg	22	5
Czech Republic	10	7
Estonia	3	1
Slovakia	3	3
Hungary	3	0
Cyprus	2	0
Lithuania	0	0
Slovenia	16	10
Malta	0	0
EU15 total	**28 440**	**5 411**
EU25 total	**28 542**	**5 452**

26. Total consumption of forest chips in Finland 2001-2003

	2001 GWh	2001 1000 k-m^3	2002 GWh	2002 1000 k-m^3	2003 GWh	2003 1000 k-m^3
Heat and power production	1 852	960	2 525	1 282	3 439	1 722
Combined heat and power production	*1 044*	*547*	*1 571*	*788*	*2 238*	*1 106*
Heat production	*808*	*413*	*954*	*494*	*1 201*	*616*
Small properties	763	381	774	387	774	387
Total	**2 615**	**1 341**	**3 299**	**1 669**	**3 276**	**2 109**

Figure 28. Percentage of combined heat and power production in EU countries in 2000



Energy taxes

From the beginning of 2004, all principal energy sources with the exception of wood, heat, and peat, have been covered by EU tax harmonisation. This means that at a Community level, the structure of the taxation, the products to be taxed, and the minimum levels of product taxation (that can nevertheless be exceeded by the member states if they so wish) have been laid down. Energy taxation is a major source of income for the national economy, but it also has important goals for energy policy and environmental policy. These are not only national objectives: reducing emissions and promoting renewable energy use and combined production are targets for the EU, and Finland has committed herself to attaining them.

Energy taxation is a way to condition energy use and production to facilitate reaching the above goals. To help reach the goals, the excise duty on energy products is divided into a basic tax and a surtax. The basic tax is a fiscal tax, and is levied on liquid fuels such as petrol, diesel, and light fuel oil. The surtax is levied according to carbon content, and it currently stands at EUR 18.05 per carbon dioxide tonne. The surtax is levied on the liquid fuels mentioned above and heavy fuel oil, coal, fuel peat, natural gas and electricity. Wood and heat are not taxed.

There are some exceptions in the surtax based on carbon content, and measures that resemble subsidies have been incorporated in the structure of the taxation. For example, tax rates for energy products have been allotted so that the taxation promotes the use of energy sources with low emissions, and supports the use of domestic fuels, important for the surety of supply. There is a 50 per cent tax relief on natural gas, and a tax relief has also been accepted for fuel peat. The surtax on fuel peat is around one-fourth of what it would normally be according to its carbon content. In the production of combined heat and power, the calculation method for fuel use in heat production encourages exploiting the competitiveness of the energy-efficiency of the combined production method. The tax distribution has also served to promote the

entry of sulphur-free products onto the transport fuels market.

Electricity taxes are currently levied on all electricity regardless of production method, and the surtax on electricity is not based on the carbon content of the fuels used to produce the electricity. Electricity taxes are split into two brackets. The lower tax rate applies to industry and gardeners using greenhouses. A partial tax rebate has been accorded to energy-intensive industry. To increase the proportion of energy being produced with renewable energy sources, and to otherwise promote small-scale and environmentally friendly electricity production, these were accorded energy tax subsidies, amounting to around EUR 45 million in 2002.

According to the Government programme, energy taxation and environmental taxation are being developed to improve the state of the environment and to improve the chances of income taxes reductions. When developing the taxation of energy and electricity, solutions to be found within the scope of the EU are taken into account, as well as the international competition interests of companies. Fuel taxation supports reaching the reduction targets of fossil fuel use, nevertheless keeping in mind the particular traffic conditions in Finland. For energy and fuel taxation, this involves keeping the tax base as broad as possible. The structure and level of taxation must be developed so that tax income can be ensured while maintaining our competitiveness. This also involves developing and allocating tax subsidies in the most cost-effective way possible. At the same time, improvements are needed in the energy tax system's capability to affect environmental changes, and in the attainment of energy policy goals.

The operating environment around energy products will undergo a fundamental change at the beginning of 2005, when EU-wide emissions trading will begin. The Ministry of Trade and Industry has set up a working group to investigate issues related to the integration of emissions trading and energy taxation. The working group is due to finish its work during the autumn of 2004. The results of the study will be used in the review of the national climate strategy. In the climate strategy, mechanisms for reducing emissions such as emissions trading and energy taxation will be examined.

28. Finland's energy tax revenue in 2003 (EUR million)

Petrol	1 454
Diesel	729
Light fuel oil	185
Heavy fuel oil	56
Coal	37
Fuel peat	9
Electricity	387
Natural gas	8
Total	**2 865**

6 Transport

Environmental impact from transport

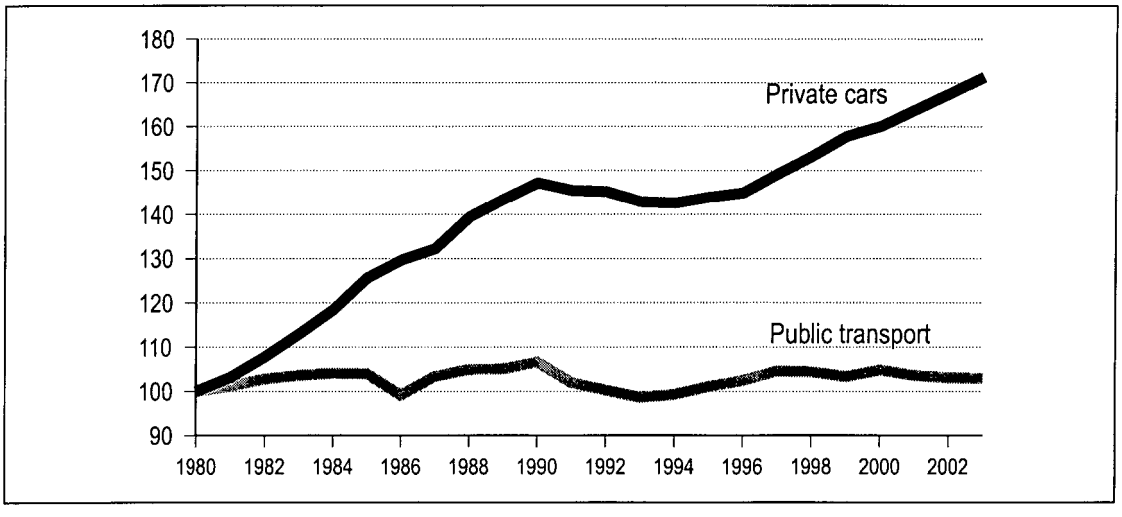
In many countries, traffic increases have been firmly connected to economic growth. In Finland, traffic increase during the first years of the new millennium was slightly slower than economic growth, whereas in EU countries on average, growth in traffic outstripped that of the economy. During the 12-month period beginning in the summer of 2003, traffic on Finland's main roads was up nearly four per cent on the previous 12-month period. Passenger traffic, light commercial vehicle traffic, and heavy vehicle traffic all saw a rise, mainly due to the rapid growth in traffic to and from Russia, which rose last year by approximately eight per cent. Traffic volumes have risen despite economic fluctuations and changes in fuel prices. One reason for this is vastly improved motor car sales.

Road traffic has the following environmental impacts:

- greenhouse gas emissions (carbon dioxide, methane and nitrous oxide emissions)
- other exhaust gas emissions detrimental to the environment or human health (nitrogen oxides, sulphur dioxide, hydrocarbons, carbon monoxide and particles)
- noise
- impacts on ground and surface water, soil, natural resources and/or biodiversity
- impacts on the social environment (e.g. on well-being).

Finland is attempting to reduce the environmental impact of road traffic through use of an ISO 14001 compliant environmental system. The environmental programme of the organisations of the Finnish Ministry of Transport and Communications is currently being audited. The evaluation will be completed in the autumn of 2004 and is part of the reshaping of the Ministry's environmental programme for 2005–2010. Administrative

Figure 29. Trends in the use of public transport and private cars (1980=100)



institutions and companies will complement the programme with their own programmes. Implementation of the programmes will be monitored annually.

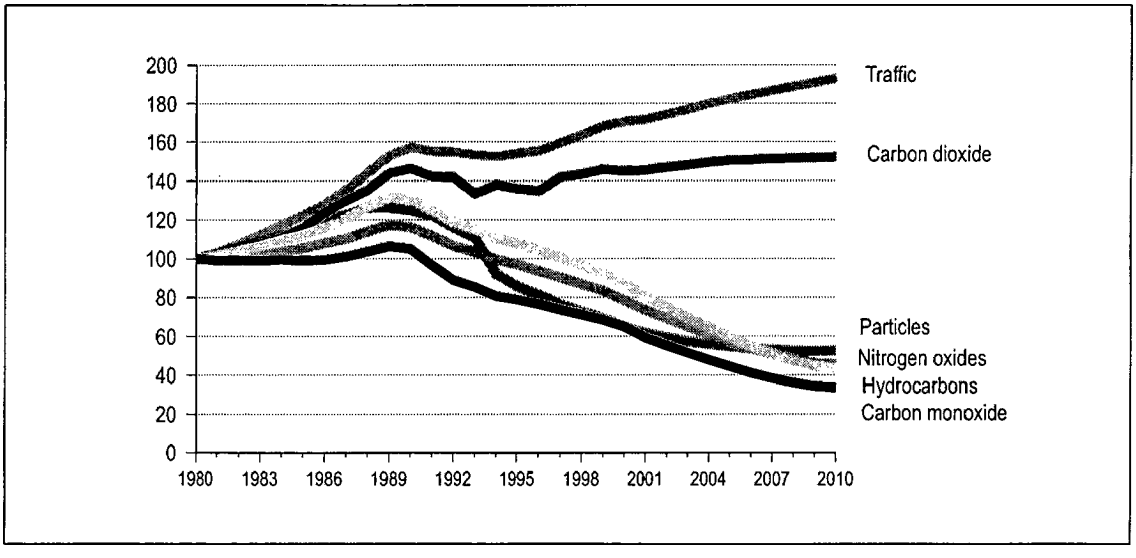
Attempts are being made to reduce greenhouse gas emissions through the climate strategy of the transportation sector. Measures proposed in the strategy have been grouped into nine types of action designed to enable levels to drop to those of 1990 by 2010. The measures aim to reduce the need for transportation (most importantly by condensing and integrating the social structure) and to affect the modal split. Goods transport, international transport, driving habits and solutions provided by information technology have also received attention.

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 average carbon dioxide emissions to 140 grams per km by 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 respectively.

Motor vehicle emissions limits have been significantly tightened over the last few decades and continue to be revised. In 2000 a change in the heavy vehicle emissions directive was put into force in Finland, which aims to cut particle emissions by 80 per cent compared to current levels by 2006, and nitrogen oxide emissions 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 were tightened in 2003 and will tighten further in 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

Figure 30. Trends in emissions from road traffic (1980=100)



29. Emissions from transport in Finland 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 %

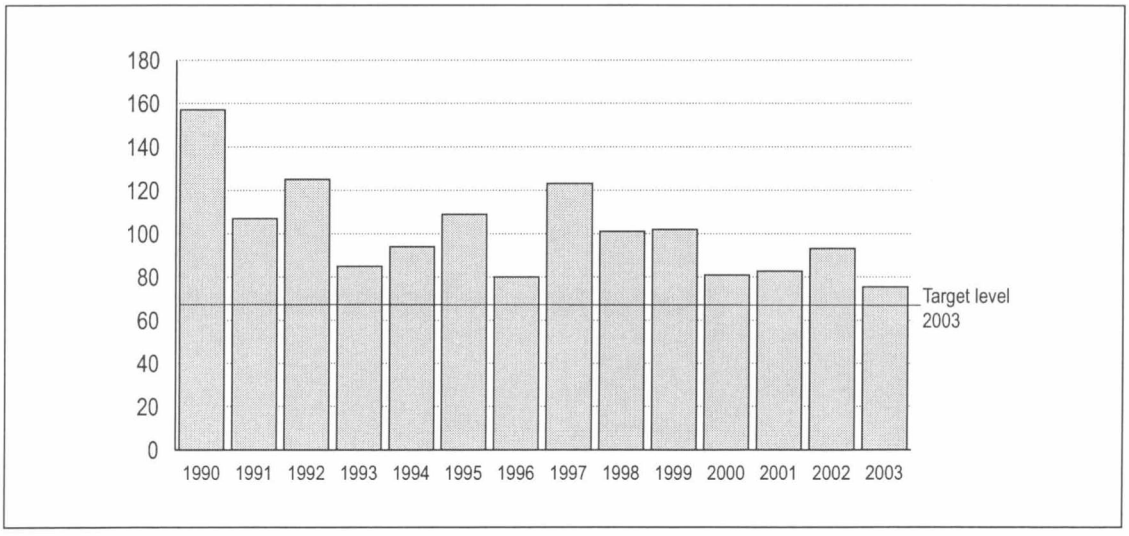
NB. The figures include power plant emissions caused by electric train transportation, and the emissions of internationally-bound water and air transportation in the Finnish economic zone.

number of people and vehicles in 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 highways, around 35,000 in the proximity of a railway, and around 30,000 in a flight traffic noise area. So far, the noise problem has mainly been tackled through technical improvements to vehicles and with noise barriers, but in future, zoning and regulating 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, 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 the traffic sector, the protection of groundwater and soil is already taken into account in the planning phase of projects. The

Figure 31. Use of road salt and target level in 2003 (tonnes)



30. Material flows in road maintenance (thousand tonnes)

	1998	1999	2000	2001	2002	2003
Construction						
Aggregates from outside	7703	5466	3368	3670	2860	1620
Road network maintenance						
Salt	102	103	82	83	93	75
Grit	610	560	570	524	680	520
Waste collected	10	13	12	11	11	9

environmental impact assessment (EIA) scheme is designed to prevent problems from taking shape. As for existing road traffic routes, a groundwater protection programme has been put into effect that protects the most critical sites, which together total approximately 120 kilometres. The aim is to have all critical sites protected by 2010, which means that 15 extra kilometres of road must be protected each year. Approximately six kilometres of groundwater protection was put in place in 2003. The poor funding of road maintenance will result in less new groundwater protection being implemented in upcoming years. The use of road salt to prevent roads from freezing was reduced especially in groundwater areas. In airports, there has been an almost complete change to using chemicals that consume less oxygen for preventing slippery conditions.

Over the last decade, the use of natural resources and waste generation have decreased somewhat in the traffic sector. 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 increasingly to use soil material recoverable from near the site itself, thereby decreasing the amount of soil material transported to and from the construction site.

Transport costs and taxation

The pricing of traffic through various taxes and fees is an important means of steering consumption in an environmentally friend 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 fuel tax. As fuel tax on road traffic is partly based on environmental impacts, the levy on sulphur-free and lead-free fuel is lower. Moreover, the surtax is based on

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

	2001 A	2002 A	2003 A	2004 B	2005 BP
Vehicle tax	227	237	243	513	536
Motor vehicle tax	208	209	230	–	–
Motor car tax	922	1 023	1 207	1 250	1 294
VAT on motor car tax	138	163	192	199	206
Fuel tax	1 960	1 971	2 183	2 229	2 269
VAT on fuel tax	202	209	218	222	224
Total	**3 657**	**3 812**	**4 273**	**4 413**	**4 529**

A = Final Accounts. B = Budget. BP = Budget Proposal. – = not in use.

the carbon content, being EUR 18.05 per tonne of carbon dioxide. Financial instruments have 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 external costs caused by traffic volume. In 2003, EUR 45 million was collected in rail fees. The tax on fuel is the main source of revenue from the special taxes levied on road traffic. Taxes currently make up 71 per cent of the price of unleaded petrol in Finland, and 58 per cent of the price of diesel.

In 2003, EUR 626 million of net appropriations in the Government budget was used for basic road maintenance, with around EUR 138 million used for road traffic development projects. EUR 332 million was used for basic rail maintenance and EUR 139 million for rail traffic development projects.

Figure 32. Retail prices of motor fuel (95E) on 15 August 2004

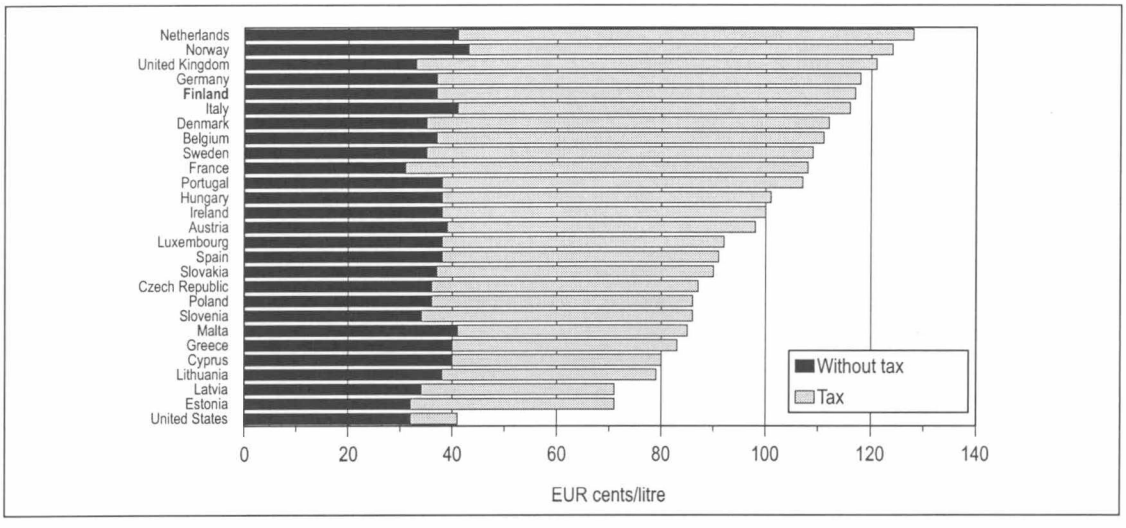
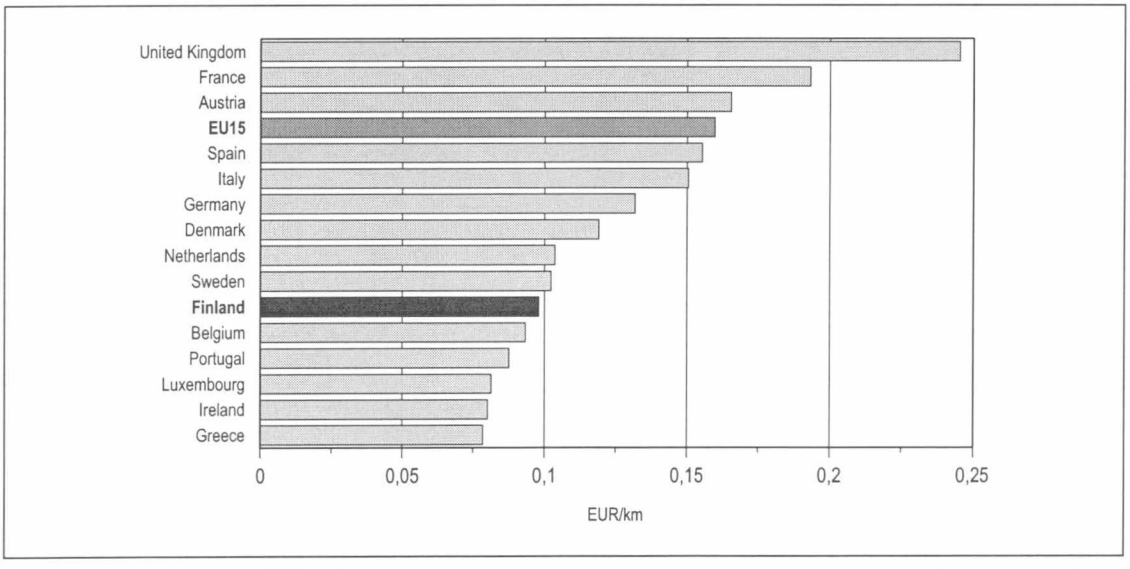


Figure 33. The changing costs of heavy road traffic in 2001



7 Towards sustainable development

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 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. Primary aims in sustainable development currently include sustainable production and consumption, eradication of poverty and the preservation and sustainable use of natural resources. One of the major achievements of the summit was a plan of action to halve the relative number of people living in poverty, part of the UN Millennium Declaration. Among the most important commitments agreed upon at Johannesburg are the decision on the ten-year framework programme on sustainable production and consumption, and the scheduled goals concerning biodiversity, chemicals and fish stocks. Following the Johannesburg summit, important steps forward include the Bonn International Conference for Renewable Energies held in June 2004, and the Finnish partnership initiative with South American nations.

Over the last decade, the European Union has taken a leading role in promoting the policies and actions of sustainable development. Sustainable development in the EU closely integrates the policies of economically, socially and ecologically sustainable development. In addition, the EU ratified the Kyoto protocol before the Johannesburg summit. One of the most important methods for reducing greenhouse gas emissions will be the EU-wide emissions trading, which is due to begin in 2005. The EU chemicals legislation is also expected to enter into force during 2006. A great challenge for EU environmental policy is posed by ten central and eastern European countries joining the Union in May 2004.

The Finnish Government is committed to implementing the Johannesburg Plan of Implementation (JPoI) of the UN World Summit on Sustainable Development. In addition, a national programme for ecologically, socially and economically sustainable production and consumption habits is being prepared. Now at the beginning of the new millennium, the level of environmental protection in Finland is high by international comparison. The "disconnecting" of economic growth, material input and emissions has been successful in Finland over recent decades. In recent years, securing the economy's greenhouse gas emissions at the 1990 level, which was agreed within the EU as part of the burden sharing in the Kyoto Protocol, seems to have become a problem for Finland. The reason for this is partly the increase of the energy-intensiveness of the economy. The problem for Finland is that already in the 1980s and 1990s, measures to reduce emissions were carried out extensively, and few other methods of reducing emissions are available for use.

One of the most important tasks that lies ahead in the near future, both in Finland and internationally, is to form 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 most dramatic damage. Climate changes can also be observed 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 developments exhibit contradictory trends. The Johannesburg follow-up summit on sustainable development was 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. The UN, the World Bank, the OECD and Eurostat are revising guidelines for the calculation of an environmentally adjusted green GDP.

Principal international environment agreements and their objectives and implementation

Agreement	Objectives	Implementation
Climate change • UN Framework Agreement on Climate Change, Rio de Janeiro, 1992. • Kyoto Protocol, 1997.	To stabilise greenhouse gas concentration in the atmosphere at a safe level.Kyoto Protocol industrial countries committed themselves to reducing their greenhouse gas emissions by a total of 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 120 countries and the EU. The EU and its member states ratified the protocol on 31.5.2002. In 2002 Finland's emissions were 5 million tonnes higher than the Kyoto requirements.
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 has been restricted by EU Regulation 2037/2000 and a Government decision (262/1998).
Wild flora and fauna • 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 agreement has been signed by 164 countries and ratified by 161 countries including the EU countries. The Agreement will be implemented through corresponding EU Regulations.
Biological diversity • Convention on Biological 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 Cartegena Protocol came into force on 11 Sept. 2003. It has been signed by 102 countries (incl. Finland) and ratified by 86 countries. The preparation of Finland's ratification started in spring 2002, and is expected to be completed in 2004.
Hazardous waste Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989. • Protocol on liability/compensation for damage, 1999.	Environmental viewpoints to be considered in the 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 10 pesticides and industrial chemicals, to regulate dioxin and furan emissions.	The Agreement entered into force on 17 May 2004. The Agreement has been signed by 151 countries, and ratified by 50. Finland ratified the Agreement 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 for five industrial chemicals and 22 pesticides.	The Agreement entered into force on 24 Feb. 2004. The Agreement has been ratified by 41 countries. In Finland, the ratification is pending. The EU ratified the Agreement on 22 Dec. 2002.

Agreement	Objectives	Implementation
Convention on Long-range Transboundary Air Pollution,1979.		The Protocol has been signed by 32 countries and the EU. The Protocol has been ratified by 48 countries and the EU. Finland ratified the Protocol on 11 Jan 1994.
• Volatile organic compounds (VOCs) (Geneva, 1991).	To cut emissions of VOCs by 30% from the 1988 level by 1999.	Finland's emissions in 2002 were 33% lower than in 1988.
• 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 2002 were 85% lower than in 1980.
• Nitrogen oxides (Sofia, 1988).	Finland committed itself to freezing its emissions of nitrogen oxides at the 1987 level by the end of 1994.	Finland's emissions in 2002 were 27% lower than in 1987.
• Heavy metals (Aarhus, 1998).	To reduce emissions of mercury, lead and cadmium below the 1990 level.	The Protocol entered into force on 29 Dec 2003. It has been signed by 35 countries and the EU. The Protocol has been ratified by 20 countries and the EU. Finland ratified the Protocol on 20 June 2000.
• Persistent organic pollutants (POP's) (Aarhus,1998).	To restrict or discontinue the use of persistent organic pollutants.	The Protocol entered into force on 23 Oct. 2003. It has been signed by 35 countries and the EU. The Protocol has been ratified by 19 countries. Finland ratified the Protocol on 3 Sep 2002.
• The abatement of acidification, eutrophication and ground-level ozone, Gothenburg, 1999.	To cut emissions of sulphur, nitrogen oxides, ammonia and volatile organic compounds (VOCs). Finland's emission ceilings as from 2010 are 116,000 tonnes of sulphur, 170,000 tonnes of nitrogen oxides, 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 7 countries including the EU countries. Finland ratified the Protocol on 23 Dec. 2003.

Agreement	Objectives	Implementation
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; the revisions to the appendices III and IV on the prevention of pollution from agriculture and on organising the reception of ship-originated waste came into force on 31 Dec 2000.
• Baltic Environmental Programme, 1992.	To eliminate the Baltic Sea's worst point source and diffuse pollution inputs.	Will be implemented through national permits and bilateral and multilateral co-operation, especially in neighbouring areas.
• HELCOM Recommendations and Ministerial Statements, 1988 and1998.	To reduce emissions of nutrients, heavy metals and persistent or toxic organic pollutants into the Baltic Sea by 50 % from the 1987 level by 2005.	The targets will be implemented through the "Water Protection Targets to 2005" Decision-in-Principle accepted by the Government and the "Operational Programme for Water Protection Until 2005" accepted by the Ministry of the Environment, and through the Finnish Baltic Environmental Protection Programme and EU regulations.
Environmental impact assessment • Convention on Environmental Impact Assessment in a Transboundary Context, Espoo,1991.	To assess the environmental effects and prevent and limit the harm caused by projects that cause significant transboundary environmental damage, before making decisions related to them.	The Convention came into force in 1997. By the end of 2003 it had been ratified by 40 states and the EU. Finland has applied the Convention to 7 projects and has been the recipient 7 times.
• Protocol on Strategic Environmental Assessment, Cavtat, 2003.	Assessment of plans with likely significant environmental effects and, where applicable, the environmental assessment of operating principles and ordinances, and public participation in the preparations.	The Protocol was written on 21 May 2003. At the end of 2003 it had been signed by 36 countries and the EU. The Government proposal for the ratification is under preparation, and should be presented to the Parliament in 2004.
Access to information and participation • Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, Aarhus,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 27. The Government made a proposal (165/2003) to the Parliament concerning the ratification of the Aarhus Convention in Dec. 2003. The ratification proposal is currently being processed by Parliament.

Statistical appendix

1. World development trends 1970–2003

	Population Billion	GDP USD 1995 rp	Carbon dioxide emissions Billion tonnes	Total materials use Billion tonnes
1970	3.69	1.35	4.08	..
1971	3.77	1.40	4.23	..
1972	3.84	1.48	4.39	6.02
1973	3.92	1.58	4.63	6.50
1974	3.99	1.60	4.64	6.32
1975	4.07	1.61	4.61	6.10
1976	4.14	1.69	4.88	6.58
1977	4.21	1.76	5.02	6.76
1978	4.29	1.83	5.08	7.15
1979	4.36	1.91	5.37	7.60
1980	4.43	1.94	5.30	6.94
1981	4.51	1.98	5.13	6.92
1982	4.59	1.98	5.08	6.50
1983	4.67	2.04	5.07	6.78
1984	4.75	2.13	5.24	7.01
1985	4.83	2.20	5.41	7.22
1986	4.92	2.27	5.57	7.19
1987	5.00	2.36	5.70	7.79
1988	5.09	2.47	5.93	7.97
1989	5.18	2.56	6.04	8.08
1990	5.26	2.64	6.13	8.66
1991	5.35	2.68	6.21	8.95
1992	5.43	2.73	6.09	8.82
1993	5.51	2.77	6.09	8.92
1994	5.59	2.85	6.25	9.19
1995	5.67	2.93	6.40	9.54
1996	5.75	3.03	6.55	9.84
1997	5.83	3.13	6.65	..
1998	5.91	3.20	6.65	..
1999	5.99	3.29	6.49	..
2000	6.07	3.42	6.61	..
2001	6.15	3.47	..	..
2002	6.22	3.53	..	..
2003	6.22	..	..	..

Sources: World Population Profile: 1996 (1960), World Bank, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory and Ayres R., Ayres L. 2002. A handbook of industrial ecology. rp = real price. .. = data not available.

2. Population development globally, in EU15 countries and in the new EU member countries (1950=100)

	World	EU15	New EU-countries
1950	100	100	100
1955	109	103	107
1960	120	107	114
1965	132	111	119
1970	147	115	123
1975	162	118	127
1980	176	120	132
1985	192	121	135
1990	209	123	138
1995	225	126	138
2000	241	128	137
2005	256	129	136
2010	271	130	135
2015	286	130	133
2020	299	130	132
2025	312	130	129
2030	323	130	127
2035	333	129	124
2040	341	128	120

Source: European Environment Agency. EEA Signals 2004.

3. Environmental sustainability index (ESI) of certain countries, 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

3. Environmental sustainability index (ESI) of certain countries. 2002 (continues...)

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
Marocco	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 Iniatiative of the Global Leaders of Tomorrow . World Economic Forum.

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

	GDP at 1995 prices (EUR billion)	Consumption of materials (million tonnes)	Total consumption of energy 1000 Mtoe
1980	72.3	163.6	22606
1981	73.9	158.2	22404
1982	76.2	164.1	22005
1983	78.3	179.4	22463
1984	81.0	181.1	23369
1985	83.5	188.1	24946
1986	85.6	183.3	24748
1987	89.2	194.5	26218
1988	93.4	194.8	26517
1989	98.2	218.6	26679
1990	98.2	210.1	27264
1991	92.1	187.8	26775
1992	89.0	182.8	26436
1993	88.0	174.5	27149
1994	91.5	187.4	29014
1995	95.0	188.2	28478
1996	98.8	184.0	29766
1997	105.0	194.2	30587
1998	111.0	204.0	31133
1999	114.6	210.3	31806
2000	121.2	209.5	31488
2001	122.6	211.0	32631
2002	125.2	214.1	33496
2003*)	127.6	217.1	35233

Source: Statistics Finland. *) = preliminary data.

5. 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	125.2	62	85	210
2003*)	127.6	70	95	218

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

6. Finland's NMVOC (Non-Methane Volatile Organic Compounds) emissions and target for 2010

1990	218	1994	189	1998	169	2002	151
1991	205	1995	184	1999	164	2010*)	130
1992	198	1996	179	2000	160		
1993	191	1997	173	2001	157		

Source: Finnish Environment Institute. *) = target.

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

	Pig iron	Copper	Lead	Zink
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
2004*)	73.0	75.9	51.7	91.5

*) = I-VII/04. Source: United Nations, United Nations Conference on Trade and Development - UNCTAD, Monthly Commodity Price Bulletins. http://www.worldbank.org/prospects/pinksheets/

8. Mining of ores and industrial minerals and quarrying of limestone in Finland in 1980–2003 (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
1990	5.5	5.7	8.3	2002	3.2	3.7	10.8
1991	5.5	5.3	7.2	2003	3.2	4.1	11.5

Source: Mining Industry Association.

9. Growing stock increment and total drain in 1980–2003 (million solid cubic metres)

	Increment	Total drain
1981	72.0	56.0
1990	79.4	55.1
1997	79.4	65.8
2003	81.0*)	70.0

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

10. Fertiliser use in agriculture (kilograms per arable hectare)

Year of fertilisation 1 July - 1 June	Nitrogen	Phosphorus	Year of fertilisation 1 July - 1 June	Nitrogen	Phosphorus	Year of fertilisation 1 July - 1 June	Nitrogen	Phosphorus
1979/80	83.3	27.9	1988/89	100.3	29.7	1997/98	85.0	11.4
1980/81	82.4	27.8	1989/90	111.5	30.7	1998/99	81.0	11.0
1981/82	78.7	26.8	1990/91	109.4	26.3	1999/00	84.2	10.4
1982/83	91.4	29.9	1991/92	92.8	19.9	2000/01	83.2	10.8
1983/84	90.7	30.9	1992/93	94.3	19.4	2001/02	80.5	10.1
1984/85	88.9	30.8	1993/94	94.1	19.0	2002/03	80.3	9.9
1985/86	90.0	30.2	1994/95	101.6	20.0			
1986/87	94.4	31.0	1995/96	92.3	16.1			
1987/88	98.2	32.0	1996/97	86.0	11.8			

Source: Information Centre of the Ministry of Agriculture and Forestry.

11.Use of pesticides in agriculture 1990–2003 (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
2003	1 339.4	327.2	1 666.6

Source: Plant Production Inspection Centre.

12. 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
Deposition*)	390	16 000
Industry****)	220	3 515
Total	**7 003**	**149 643**

*) = Projection from 2002.

**) = Projection from 1997.

***) = Preliminary data from 2002.

****) = Preliminary data from 2003.

*****) = Information from 2000–2003.

Source: Finnish Environment Institute.

13. Finland's phosphorus discharge from industry, communities and fish farming sources into watercourses (tonnes)

	Industry	Fish farming	Communities
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	225	95	224
2003	230	80	200

Source: Finnish Environment Institute.

14. Recycling of packaging waste in EU15 countries in 2001 (per cent)

Germany	76
Belgium	71
Austria	64
Sweden	63
Luxembourg	57
Denmark	57
Netherlands	56
EU15	53
Finland	**47**
Italy	46
France	44
Spain	44
United Kingdom	42
Portugal	38
Greece	33
Ireland	27

Source: European Environment Agency. EEA Signals 2004.

15. Breakdown 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.

16. Direct Material consumption in some EU-countries 1980–2000 (Million tonnes)

	Belgium	Ireland	Austria	Greece	France	Sweden	Germany	EU15
1980	263	77	158	125	1072	231	1763	6009
1981	257	72	156	129	1040	228	1672	5811
1982	247	77	154	127	1012	229	1565	5721
1983	230	75	148	128	986	223	1550	5669
1984	244	80	155	117	984	233	1627	5729
1985	240	72	155	131	1022	221	1707	5985
1986	247	75	154	132	1011	226	1721	6001
1987	254	75	155	144	1035	226	1698	6042
1988	274	74	158	133	1084	227	1747	6222
1989	285	80	164	145	1090	242	1790	6355
1990	299	83	167	145	1097	243	1759	6326
1991	306	82	166	155	1124	227	1730	6167
1992	308	83	169	156	1104	220	1734	6130
1993	301	83	169	154	1032	227	1730	5994
1994	321	88	180	158	1061	231	1839	6240
1995	325	90	177	159	1056	246	1799	6154
1996	332	96	179	164	1033	225	1780	6108
1997	337	97	185	166	1060	225	1768	6195
1998	347	98	177	181	1073	236	1756	6184
1999	363	101	180	175	1086	228	1771	6286
2000	371	101	185	191	1101	251	1737	6308

Source: Eurostat. Materials use in the European Union 1980–2000. Indicators and analysis. 2002 edition. Working Papers and Studies. p. 101.

17. Pulp and paper industry production and effluent load on the rivers and lakes (tonnes per year)

	Paper and board production	Pulp production	Chemical oxygen demand	Organically bound chlorine	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
2003	13 073 000	7 405 000	189 095	1 164	209

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

18. Pulp and paper industry production and emissions into 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
2003	13 073 000	7 405 000	5 791	21 257	5309

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

19. Recovery of waste paper in selected countries 2002 (per cent)

Country	Recovery rate (%)
Germany	72.7
Finland	**71.7**
Switzerland	70.2
Sweden	69.8
Norway	67.7
Netherlands	64.8
Austria	61.4
Denmark	55.7
Spain	52.1
France	49.7
Belgium	48.1
United Kingdom	47.6
Portugal	45.3
Italy	44.9
Greece	34.1
Ireland	33.8

Source: CEPI. Annual statistics 2003.
http://www.cepi-eurokraft.org/
http://www.paperinkerays.fi/tietoa/tietopankki/tilastot

20. Steel industry characteristic emissions of carbon dioxide in Finland in 1970–2003

	Characteristic emissions CO_2 kilos/tonne	Production of steel preforms 1000 tonnes
1970	2001	1169
1975	2041	1656
1980	1724	2508
1985	1568	2639
1990	1602	2860
1991	1652	2890
1992	1566	3076
1993	1634	3256
1994	1542	3420
1995	1535	3176
1996	1538	3301
1997	1472	3734
1998	1475	3952
1999	1470	3956
2000	1457	4096
2001	1481	3938
2002	1456	4003
2003	1350	4766

Source: Federation of Finnish Metal, Engineering and Electrotechnical Industries

21. Total energy consumption in selected countries by GDP unit in 2001

	Total energy consumption kilograms of oil/ USD 1000
Poland	549
Iceland	372
Turkey	381
Canada	346
United States	254
Finland	**202**
Greece	198
Portugal	188
Belgium	185
United Kingdom	176
Spain	176
Sweden	174

	Total energy consumption kilograms of oil/ USD 1000
Netherlands	153
Luxembourg	151
Norway	149
France	147
Italy	140
Ireland	134
Germany	130
Austria	113
Denmark	95
Japan	92
Switzerland	83

Source: IEA/OECD; Energy Balances of OECD Countries.

22. World oil consumption and real market price (USD per barrel)

	Current prices	Real (1996) prices	Billion tonnes		Current prices	Real (1996) prices	Billion tonnes		Current prices	Real (1996) prices	Billion tonnes
1970	2.1	7.0	2254	1982	31.4	41.2	2776	1994	15.5	16.2	3192
1971	2.6	8.4	2377	1983	28.4	36.7	2761	1995	16.9	17.4	3235
1972	2.8	8.8	2556	1984	28.3	35.8	2809	1996	20.4	20.4	3316
1973	3.1	8.9	2754	1985	27.0	33.8	2801	1997	19.2	19.2	3388
1974	11.2	27.9	2710	1986	13.8	17.5	2893	1998	13.1	11.5	3398
1975	10.6	23.9	2678	1987	17.8	22.2	2949	1999	18.1	14.7	3469
1976	11.8	25.5	2852	1988	14.2	17.3	3039	2000	28.2	26.8	3504
1977	12.8	26.0	2944	1989	16.9	19.5	3088	2001	24.5	23.1	3554
1978	12.9	24.3	3055	1990	17.6	19.6	3136	2002	25.0	23.2	3855
1979	29.2	49.4	3103	1991	18.3	19.7	3134	2003	28.9	26.0	3935
1980	35.5	52.9	2972	1992	18.2	19.4	3165	2004*)	33.7	29.9	4109
1981	34.1	46.6	2868	1993	16.1	17.0	3135				

*) = I – VII/04. NB. Crude petroleum/Dubai, UK Brent and Alaska Average/W.Texas Average, spot, F.O.B.
Source : United Nations, United Nations Conference on Trade and Development - UNCTAD, Monthly Commodity Price Bulletins.

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

	Road traffic	Work machines	Energy production	Industrial processes	Total
1980	9.0	5.0	230.0	340.0	584.0
1981	9.0	5.0	180.0	341.0	534.0
1982	8.0	5.0	90.0	380.0	484.0
1983	8.0	5.0	58.0	301.0	372.0
1984	8.0	5.0	76.0	279.0	368.0
1985	8.0	5.0	94.0	276.0	383.0
1986	7.0	5.0	72.0	247.0	331.0
1987	7.0	5.0	78.0	238.0	327.0
1988	6.0	5.0	67.0	224.0	303.0
1989	7.0	4.0	68.0	165.0	242.0
1990	5.0	5.0	81.0	169.0	260.0
1991	5.0	5.0	62.0	123.0	195.0
1992	4.7	4.3	81.6	49.8	140.4
1993	3.8	4.4	73.6	40.6	122.4
1994	2.2	4.7	72.1	36.4	115.4
1995	1.8	4.4	60.8	29.8	96.8
1996	1.2	4.3	71.3	28.6	105.4
1997	0.4	4.6	67.0	28.3	100.3
1998	0.3	4.2	53.9	31.2	89.6
1999	0.3	4.4	52.6	28.4	85.7
2000	0.2	4.3	44.7	26.7	75.9
2001	0.2	4.1	55.3	27.5	87.1
2002	0.2	4.3	54.0	26.3	84.8
2003*)	..	..	..	..	95.0
2010**)	..	..	..	..	117.0

Source: Statistics Finland. .. = data not available. *) = preliminary data. **) = target.

24. Finland's nitrogen oxides emissions and reduction target for 2010 (thousand tonnes)

Year	Road traffic	Work machines	Energy	Industry	Total
1980	127.0	42.0	77.0	39.0	285.0
1981	127.0	43.0	75.0	42.0	287.0
1982	127.0	46.0	32.0	59.0	264.0
1983	128.0	45.0	26.0	54.0	253.0
1984	128.0	44.0	25.0	50.0	247.0
1985	129.0	45.0	38.0	51.0	263.0
1986	132.0	45.0	37.0	51.0	265.0
1987	133.0	48.0	43.0	53.0	277.0
1988	135.0	50.0	44.0	51.0	280.0
1989	138.0	47.0	46.0	53.0	284.0
1990	134.0	50.0	47.0	52.0	283.0
1991	124.0	50.0	47.0	48.0	269.0
1992	119.0	49.0	74.8	19.7	262.5
1993	116.0	49.0	78.3	19.9	263.2
1994	111.0	50.0	81.1	21.2	263.3
1995	106.0	48.0	66.0	20.4	240.4
1996	101.0	50.0	77.0	19.6	247.6
1997	95.0	51.0	70.6	20.9	237.5
1998	89.0	48.0	62.8	22.9	222.7
1999	84.0	49.0	59.9	24.7	217.6
2000	78.0	48.0	55.2	24.7	205.9
2001	74.0	48.0	66.2	22.3	210.5
2002	69.8	47.6	69.0	23.9	210.3
2003*)	..	..	..	..	218.0
2010**)	..	..	..	..	277.0

.. = data not available. *) = preliminary data. **) = target.
Source: Statistics Finland.

25. EU member states in relation to Kyoto target levels in 2001 (per cent)

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

Source: European Environment Agency. Greenhouse gas emission trends and projections in Europe 2003. Environmental issue report No 36. p. 11.

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

	Carbon dioxide	Methane	Nitrous oxide	F gases	Total	Climate strategy target	Climate strategy trend
1990	62.4	6.3	7.9	0.1	76.7	–	–
1991	61.0	6.3	7.4	0.1	74.8	–	–
1992	58.6	6.2	6.9	0.0	71.7	–	–
1993	59.2	6.2	7.0	0.0	72.4	–	–
1994	65.4	6.1	7.1	0.0	78.6	–	–
1995	62.6	6.1	7.4	0.0	76.2	–	–
1996	68.1	6.1	7.4	0.1	81.8	–	–
1997	66.9	6.0	7.6	0.2	80.7	–	–
1998	64.5	5.8	7.5	0.3	78.1	–	–
1999	64.2	5.7	7.3	0.4	77.6	–	–
2000	62.3	5.4	6.8	0.5	75.1	–	–
2001	67.6	5.4	6.8	0.7	80.5	–	–
2002	69.3	5.1	6.8	0.5	81.7	–	–
2010	–	–	–	–		77.0	90.0

– = not in use.

Source: Statistics Finland and the Ministry of Trade and Industry.

27. Renewable sources of energy as a proportion of total energy consumption in 1999

	2001	2010
Denmark	6.5	22.5
Greece	5.1	15.0
Ireland	4.2	9.0
Spain	20.9	8.5
Austria	69.9	8.2
Italy	17.2	7.8
United Kingdom	2.6.0	7.4
Sweden	53.8	6.2
Germany	6.5	6.0
Finland	**25.7**	**5.8**
Netherlands	4.0	5.0
France	16.3	4.7
Portugal	34.5	4.5
Belgium	1.6	4.4
Luxembourg	3.6	2.1

Source: European Environment Agency (EEA) and Eurostat.

28. 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**
Austria	10.4
Luxembourg	17.7
Italy	6.8
Spain	9.2
Portugal	10.0
Germany	10.6
Sweden	6.2
United Kingdom	6.1
Belgium	6.5
France	3.0
Greece	2.1
Ireland	2.4
EU15	**9.8**
EU target in 2010	18.0

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

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

	Total	Private cars	Motorcycles	Public transport
1980	47 900	34 800	800	12 300
1981	49 100	35 900	800	12 500
1982	50 800	37 500	800	12 500
1983	52 700	39 300	800	12 600
1984	54 600	41 200	800	12 700
1985	57 100	43 700	800	12 600
1986	57 900	45 100	800	12 000
1987	59 400	46 000	800	12 600
1988	62 100	48 500	800	12 800
1989	63 400	49 900	800	12 700
1990	64 900	51 200	800	12 900
1991	63 900	50 600	900	12 300
1992	63 500	50 500	900	12 100
1993	62 500	49 700	900	11 900
1994	62 100	49 600	900	11 900
1995	63 100	50 060	900	12 200
1996	63 700	50 400	900	12 400
1997	65 400	51 900	900	12 600
1998	66 700	53 830	900	12 500
1999	68 200	54 900	900	12 400
2000	69 200	55 700	900	12 600
2001	70 400	57 000	900	12 500
2002	71 600	58 300	900	12 400
2003	72 500	59 600	900	12 300

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

30. 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	74 000
1981	489.9	65.0	127.3	7.4	75 000
1982	492.0	65.6	127.4	7.6	77 000
1983	496.6	66.2	127.6	7.8	80 000
1984	497.9	67.0	128.2	8.0	82 000
1985	491.5	66.7	129.4	8.2	86 000
1986	485.7	67.0	131.6	8.4	92 000
1987	485.7	67.8	132.5	8.3	97 000
1988	485.4	69.0	135.3	8.3	101 000
1989	485.6	70.2	137.7	8.1	107 000
1990	469.1	68.0	134.3	7.9	109 000
1991	446.0	64.2	123.8	7.4	106 000
1992	432.5	62.0	119.0	7.1	105 000
1993	414.0	59.4	115.5	7.0	101 000
1994	399.6	57.0	110.7	6.7	104 000
1995	391.0	55.2	106.3	6.4	102 000
1996	378.9	52.6	100.7	6.0	102 000
1997	370.2	50.4	95.2	5.6	107 000
1998	360.4	48.0	89.3	5.1	108 000
1999	349.3	45.5	84.3	4.7	109 000
2000	332.8	42.5	78.4	4.2	108 000
2001	320.3	40.1	73.8	3.9	110 000
2002	304.7	37.5	69.7	3.6	113 000
2003*)	273.3	33.5	64.5	3.3	113 000
2004*)	244.3	29.8	59.5	3.0	113 000
2005*)	219.6	26.3	54.8	2.8	114 000
2006*)	194.0	23.1	50.1	2.6	114 000
2007*)	170.3	20.0	45.4	2.4	114 000
2008*)	151.2	17.6	41.1	2.2	114 000
2009*)	135.2	15.6	37.1	2.0	115 000
2010*)	124,7	14,4	34,0	1,9	114 000

*) = projection.

Source: Technical Research Centre of Finland; LIISA calculation model.

31. Use of de-icing salt 1990-2003 (tonnes)

1990	157.0
1991	107.0
1992	125.0
1993	85.0
1994	94.0
1995	109.0
1996	80.0
1997	123.0
1998	101.0
1999	102.0
2000	81.0
2001	82.8
2002	93.2
2003	75.5

Source: Finnish Road Administration.

33. Costs of heavy road traffic in 2001 (EUR/kilometre)

United Kingdom	0.25
France	0.19
Austria	0.17
EU15	0.16
Spain	0.16
Italy	0.15
Germany	0.13
Denmark	0.12
Netherlands	0.10
Sweden	0.10
Finland	**0.10**
Belgium	0.09
Portugal	0.09
Luxembourg	0.08
Ireland	0.08
Greece	0.08

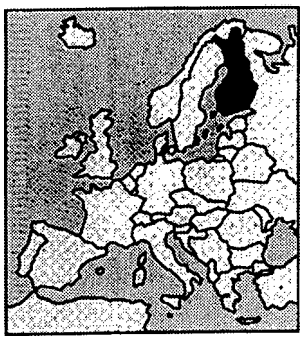
Source: European Environment Agency. EEA Signals 2004.

32. Retail prices of motor fuel (95E) on 15 August 2004 (euro cents per litre)

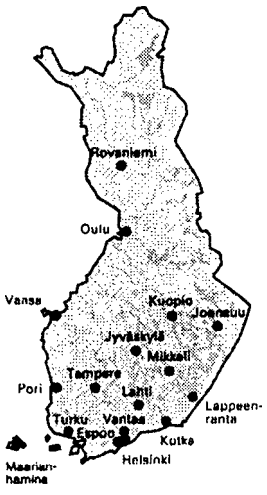
	Refinery price	Consu-mer price	Taxes	Proportion of tax, %
Netherlands	41	128	87	68.0
Norway	43	124	81	65.3
United Kingdom	33	121	88	72.7
Germany	37	118	81	68.6
Finland	**37**	**117**	**80**	**68.4**
Italy	41	116	75	64.7
Denmark	35	112	77	68.8
Belgium	37	111	74	66.7
Sweden	35	109	74	67.9
France	31	108	77	71.3
Portugal	38	107	69	64.5
Hungary	38	101	63	62.4
Ireland	38	100	62	62.0
Austria	39	98	59	60.2
Luxembourg	38	92	54	58.7
Spain	38	91	53	58.2
Slovakia	37	90	53	58.9
Czech Republic	36	87	51	58.6
Poland	36	86	50	58.1
Slovenia	34	86	52	60.5
Malta	41	85	44	51.8
Greece	40	83	43	51.8
Cyprus	40	80	40	50.0
Lithuania	38	79	41	51.9
Latvia	34	71	37	52.1
Estonia	32	71	39	54.9
United States	32	41	9	22.0

Source: EU countries: EU/Oil Petrolier and Oil Industry Service Centre; USA: Energy Information Agency.

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, 79 per cent are urban dwellers, with 1.0 million living in the capital city of Helsinki and its surrounding area. Ninety-two per cent of the population speak Finnish and six per cent speak Swedish. Eighty-four per cent are Evangelic-Lutheran and one per cent are Greek Orthodox. Seventy-two per cent of the population aged 25 to 64 have completed post-comprehensive education and 32 per cent have a university degree or equivalent. Fifty-nine per cent of Finnish households own a personal computer and 46 per cent have an Internet connection. Ninety-four per cent of households have a mobile phone.

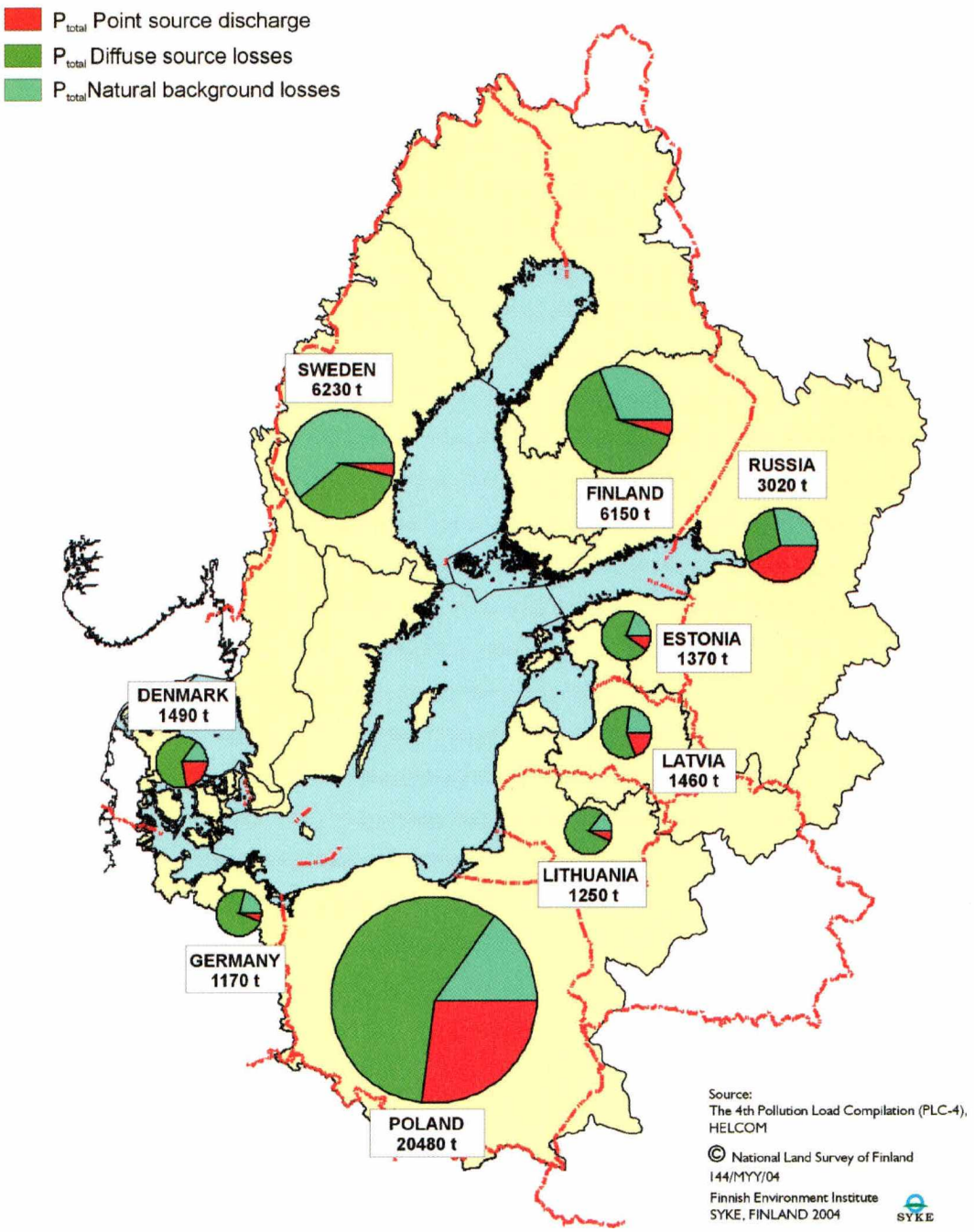
Area: Situated in northern Europe with an area of 338,145 square kilometres of which 304,530 square kilometres is land. Finland shares land boundaries with three countries: 586 kilometres with Sweden, 727 kilometres with Norway and 1,269 kilometres with Russia. The Finnish coastline is approximately 1,100 kilometres. The greatest land length is 1,157 kilometres, from Hanko to Utsjoki, and the highest point, Halti, is 1,328 metres above sea level. 10 per cent of the total area of Finland is covered by water. There are 188,000 fresh water lakes. Forests, mainly pine and spruce, cover 68 per cent of the country while 6 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 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. Finland has been a member of the European Union since January 1995.

Economy: GDP in 2003 totalled EUR 143 billion (USD 140 billion), which constitutes EUR 24,800 per capita when adjusted for purchasing power parity. Finland has one of the highest standards of living in the world. Of the total labour force, 19 per cent are employed in industry, 34 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. The unemployment rate, calculated according to EU standards, was 8.9 per cent in 2003.

Foreign trade: Main trading partners are Germany, Sweden, United Kingdom, USA and Russia. In 2003, the value of imports totalled EUR 36 billion and that of exports EUR 46 billion. Of the imports, 38 per cent was attributed to raw materials and 28 per cent to consumer goods. Main exports are electrical equipment, pulp and paper products, machinery, and metal and chemical products.

Phosphorus discharges in the catchment area of the Baltic Sea



Source:
The 4th Pollution Load Compilation (PLC-4), HELCOM

Finnish Environment Institute
SYKE, FINLAND 2004

SYKE

Finland's Natural Resources and the Environment 2004 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 commited.

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