mmm.fi

State of Finland´s Forests 2007

Based on the Criteria and Indicators of Sustainable Forest Management

7a 2007

State of Finland´s Forests 2007

Based on the Criteria and Indicators of Sustainable Forest Management

Ministry of Agriculture and Forestry 7a/2007

Title of publication:
State of Finland´s Forests 2007
Based on the Criteria and Indicators of Sustainable Forest Management

Final report of the expert group appointed by the Ministry of Agriculture and Forestry

Publisher:
Ministry of Agriculture and Forestry

Writers and Editors:
Jari Parviainen, Sinikka Västilä and Silja Suominen

Expert Group:
Jari Parviainen (chair), Finnish Forest Research Institute (Metla)
Leena Karjalainen-Balk, Ministry of the Environment
Sakari Lepola, Wood and Allied Workers' Union
Timo Nyrhinen, Central Union of Agricultural Producers and Forest Owners (MTK)
Suvi Raivio, Finnish Forest Industries Federation
Reima Sutinen, Ministry of Trade and Industry
Taina Veltheim, Ministry of Agriculture and Forestry
Kati Vierikko, Finnish Association for Nature Conservation
Sinikka Västilä (secretary), Finnish Forest Research Institute (Metla)

Photos:
Metla/Erkki Oksanen

Graphs:
Metla/Sari Elomaa, Anna-Kaisu Korhonen and Markus Lier

ISBN 978-952-453-347-8
ISSN 1238-2531

Translation: Tomi Snellman

Graphic design and layout:
Metla/Markus Lier

Printed by
Vammalan Kirjapaino Oy, 2007

Table of Contents

Foreword

Criteria and indicators have become an established instrument for assessing and monitoring sustainable forest management. Ever since the Second Ministerial Conference on the Protection of Forests in Europe (MCPFE) in Helsinki in 1993, Finland has made an active contribution to the development of the criteria and indicators. The first set of Pan-European Criteria and Indicators for Sustainable Forest Management was produced in 1993–1995 under the leadership of Finland and Portugal.

Based on the pan-European criteria, the first set of national indicators was developed for Finnish conditions in 1996. The revised set of national criteria and indicators was completed in 2000. Both sets have also been used to describe the state of forests and forestry in Finland at the time. The indicators have been used in Finland particularly in the presentation of and reporting on forestry as well as in the monitoring and preparation of the National Forest Programme and the Regional Forest Programmes. The indicators have also been used to steer practical silviculture and forest certification.

The present, third set of indicators was developed by taking into account earlier national experiences and the Pan-European indicators adopted at the MCPFE 2003 in Vienna and revised since then. International debates on the evaluation of sustainable forest management have also contributed to the revision process.

The criteria and indicators have been revised in the same spirit of open co-operation as the National Forest Programme. Appointed by the Ministry of Agriculture and Forestry, the group of experts representing key actors and interest groups in forestry has met 14 times and has reached an agreement on the indicators to be used in Finland and on the presentation of the results obtained thereby. The collation of data and the production of texts concerning the indicators were done at the Finnish Forest Research Institute, which, being in charge of compiling forest statistics in Finland, has the necessary resources for the task. The finished report is a presentation of the status of forests in Finland approved unanimously by the group of experts.

The revised set of Finnish indicators emphasises long-term development series and the clarity of definitions and interpretations. Because the indicators are also used for presentation of and reporting on Finnish forests and forestry internationally, the present report also includes a short description of the development and diversity of Finnish forests and forest management and their significance to Finnish society.

I wish to thank warmly the members of the expert group and others who have participated in the project for a valuable job well done.

Helsinki, 12 June 2007

Sirkka-Liisa Anttila
Minister of Agriculture and Forestry

State of Finland´s Forests 2007 – Summary

This report on forests in Finland is the third publication in which the state of the forests has been assessed using the criteria and indicators for sustainable forest management. The application of the indicators has produced a time series spanning 10 years. Although changes in forests are slow, the indicators enable us to distinguish certain trends and to make comparisons, especially on the impacts of forest policy.

In the context of the topical resolutions adopted by the Fourth Ministerial Conference on the Protection of Forests in Europe (MCPFE) 2003 in Vienna concerning national forest programmes, the economic viability and social and cultural dimensions of sustainable forest management, forest biodiversity and climate change, we can say that in Finland the focus in recent years has been especially on the protection of the biological diversity of forests. In connection with discussions on climate change, forest energy in particular has gained prominence as a dimension of forest policy. Social and cultural dimensions have also gained in prominence, especially because of increased information on the issues. By contrast, the economic viability of forest management has not improved, although the volume and annual increment of growing stock have increased continually.

The main conclusions, presented by criteria, are as follows:

Criterion 1 Forest Resources

Three fourths of the land area in Finland is under forest. Forest area has remained almost unchanged over the last 40 years, whereas the volume of growing stock has increased more than 40% in the same period. The age structure of forests has become more even due to cuttings and systematic forest planning aiming at the sustainability of wood production.

Carbon stocks in forests and the soil are extensive, and are constantly growing due to the increasing volume of growing stock. Carbon balance is currently positive in Finnish forests, with an annual net sequestration of 22 million tonnes of CO_2. The share of wood-based fuels of overall energy consumption in Finland is about 20%, which enables a significant reduction of CO_2 emissions.

Criterion 2 Health and Vitality

The greater part of the deposition of atmospheric pollutants in Finland – 71% of the nitrogen deposition and 83% of the sulphur deposition – comes from abroad. The deposition load has decreased considerably compared to the 1980s. Measurements of the nitrogen and sulphur content in soil water show no significant changes in the acidity of forest land to date.

Based on defoliation measurements, the health status of Finnish forests is satisfactory and has remained stable. There have been no major forest damages in the past 20 years, not even damages caused by air pollutants. In economic terms, the greatest causes of occasional local forest damage have been fungi and insects, storms and damages to saplings caused by moose. Thanks to efficient monitoring, forest fires have remained extremely small in area, although there are several hundred fires each year.

Criterion 3 Productive Functions

The annual increment of growing stock has since the mid-1970s exceeded the total drain by 20–30%. Sustainability of wood production is promoted systematically both by Government measures and the active participation of private forest owners, and through forest planning. The average removal of roundwood in 1997–2006 was 60 million m^3 annually, and the gross stumpage earnings about 1,800 million euros (89 euros per hectare of forest land annually).

Forest-related services and the use and maintenance of non-wood products are a natural component of forest management in Finland. Everyman's Right gives universal right and opportunity to use forests for recreation, outdoor activities and collecting berries and mushrooms, insofar as this causes no damage or disturbance. Non-wood forest products can have considerable importance locally and for individual households, although the value of forest services and non-wood products is slight compared to the sales value of timber nationally. Economically the most important non-wood products of forests are game, mostly moose, and environmental tourism.

Criterion 4 Biological Diversity

In the Forest Act of 1997 the maintenance of the biological diversity of forests was adopted as a parallel goal with roundwood production. Finnish forests have been managed ecologically under the statutory requirement to maintain biodiversity for more than 10 years, but this approach had actually been the practice for decades before the Act. At the same time, the production of information about biodiversity and related research, discussion and consultation have been an important key area, with broad participation by forest owners and other actors and interest groups in forest management.

New management methods and efforts to safeguard biodiversity in commercial forests have slowed down the endangerment of certain forest species since the 1990s. The main methods for maintaining biological diversity in commercial forests are the protection of valuable habitats and biotopes, favouring of mixed tree stands in the management, and increasing the amount of decayed wood. One half of the area of regenerated forest land (150,000 ha) is planted with seedlings and one half either regenerated naturally or by direct seeding.

The protection programmes and decisions have contributed to the increase in the area of protected forests three-fold in the last 30 years. The share of strictly protected forests (924,000 ha, 4.6% of forest land) in Finland is the highest in Europe. In southern Finland, where the relative area of strictly protected forests varies between 0.7 and 4.3%, forest biodiversity is improved by developing better silvicultural methods, as well as by voluntary measures by private forest owners to protect biodiversity, and by the restoration management of protected areas in State ownership.

Criterion 5 Protective Forests

The land surface is fairly flat in Finland, and there are hardly any problems caused by soil erosion, avalanches or shifting of the ground. Protective functions therefore mostly focus on protective forests in the timberline area in Lapland.

The total area of protective forests in the northernmost part of Finland is 3.3 million hectares. In these areas, fellings are restricted by law to prevent the timberline from receding further south. Forest regeneration is monitored constantly in these areas. No discernible change has yet been observed to indicate any shifting of the timberline.

Because of the great number of lakes, rivers, small water systems and peatland forests in Finland, issues relating to water systems receive special attention in forest management. Monitoring of the effects of silviculture on water systems over a period of ten years indicates that the level of water protection has improved continuously at felling sites. Natural peatlands are no longer drained in Finland, but the condition of already drained peatland forests that have growth potential is improved in ditch cleaning and supplementary ditching projects. Protective zones with trees are established alongside water systems in harvesting, sludge sumps are dug during drainage reconditioning, and waters from the area are passed to open waters through an infiltration area. Measures are designed so as prevent nutrient and sludge washout.

Criterion 6 Socio-Economic Functions

The forest sector remains important for the Finnish national economy. The share of the forest sector in GDP is about six per cent. Regionally, the importance of the forest sector is greatest in south-eastern and eastern Finland and in the Kainuu region.

The net result of private forests had decreased until 2007 over the past 10 years, varying from €85 to 117/hectare/year. Domestic consumption of sawn wood is about one square metre per capita, that of paper and paperboard about 230 kg annually. The consumption of wood-based products per capita in Finland is one of the highest in Europe.

The forest sector provided jobs to about 89 000 persons, which is 4.0% of all employed persons in 2006. Occupational safety and health of employees in the forest sector are well taken care of. Social security of employees in the forest sector is equal to that in other sectors of the economy.

Citizens have a great many opportunities for participating in the various aspects of forestry. Methods of participatory planning have been developed especially in the case of State forests.

Forests play a vital role in the development of Finnish national identity and relationship to nature. The cultural and spiritual functions of forests have therefore been taken into account increasingly in, for example, the preservation of forest traditions, silvicultural operations, timber construction, art, communications and landscape protection.

Basic Concepts

Forest

Forest in this report denotes forest land and low productive forest land. As per the Finnish definition, there are 22.9 million hectares of forest in Finland. This classification has been in use in Finland since the 1950s, for over 50 years.

Finnish classification based on site productivity:

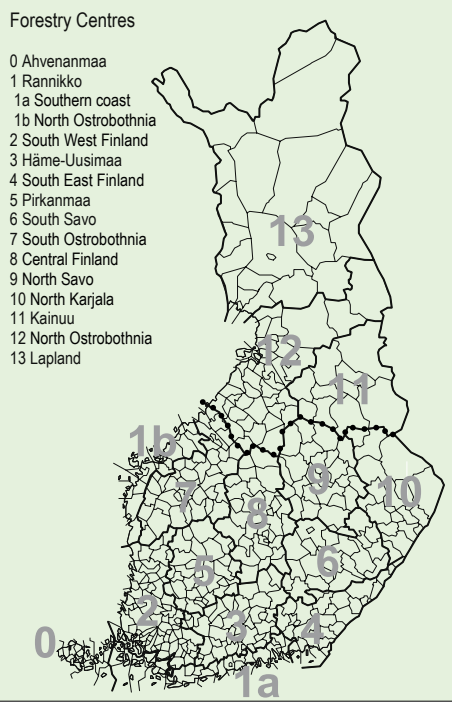
- On **forest land** the potential annual increment for the rotation period is at least 1 m^3/ha/year (20.1 million hectares).
- **Low productive forest land** (scrub land) is mainly exposed bedrock, scree or mires, where the annual increment is less than one but more than 0.1 m^3/ha/year during the rotation period (2.8 million hectares).
- **Other land areas for forestry** (wasteland) consist of completely or almost treeless areas with a growth potential of less than 0.1 m^3/ha/year during the rotation period (3.1 million hectares).
- **Forestry land** (26.3 million hectares) includes, in addition to the above areas, also forest roads, permanent storage areas and plots reserved for the use of forest management, etc.

The definition of forest used by the UN Food and Agriculture Organisation (FAO) in its forest statistics, based on crown density:

- **Forests** are land areas with a tree crown cover of more than 10% and area of more than 0.5 ha. The trees should be able to reach a minimum height of 5 metres at maturity (22.5 million hectares).
- **Other wooded land** are lands either with a tree crown cover (or equivalent stocking level) of 5–10% of trees able to reach a height of 5 metres at maturity; or with a crown cover (or equivalent stocking level) of more than 10% of trees not able to reach a height of 5 metres at maturity.

The Finnish National Forest Inventories have applied the above-mentioned international classification (FAO) parallel with the national classification scheme since the 9th inventory (1996–2003). The international classification is necessary for the preparation of international statistics and for international debate on forests.

Districts of the Forestry Centres



In this report, results are presented by the districts of the Forestry Centres. Southern Finland comprises the province of Åland and the Forestry Centre districts 1a–10. Northern Finland comprises the Forestry Centre districts 11–13 in the regions of Kainuu, northern Ostrobothnia and Lapland.

The districts of the Forestry Centres function as the administrative division of forestry in Finland. Most of the information concerning forest resources, such as the data from forest inventories, is presented both as national averages and as averages for the individual Forestry Centres.
Source: Finnish Statistical Yearbook of Forestry 2006.

Criteria and indicators for Sustainable Forest Management (for a more detailed list, see Chapter 4, pp. 24–26)

The implementation of sustainable forest management is assessed and measured with criteria and indicators. The indicators can be qualitative or quantitative, and their purpose is to gauge the fulfilment of the criteria. Data for the indicators can be obtained from surveys, inventories, statistics, monitoring systems and reports. Qualitative indicators can be steering instruments, measures or agreements for the promotion of sustainable development. They are used to describe a specific phenomenon and its status. Quantitative indicators, on the other hand, represent numerically measurable parameters. Often a certain aspect includes both a qualitative and a quantitative indicator. Generally no target (performance) levels for the indicators - standards - have been set.

Pan-European criteria for sustainable forest management (MCPFE) are:

- Maintenance and appropriate enhancement of forest resources and their contribution to global carbon cycles
- Maintenance of forest ecosystem health and vitality
- Maintenance and encouragement of productive functions of forests (wood and non-wood)
- Maintenance, conservation and appropriate enhancement of biological diversity in forest ecosystems
- Maintenance and appropriate enhancement of protective functions in forest management
- Maintenance of other socio-economic and cultural functions and conditions

The indicators of sustainable forest management can be qualitative or quantitative.

- *Qualitative indicators include:*
  - Regulatory instruments – Forest Act, Nature Conservation Act, Land Use and Building Act, Act on Reindeer Husbandry, etc.
  - Institutional arrangements – monitoring of compliance with the law, forest policy measures and forest programmes, international agreements, organisations, etc.
  - Economic instruments – funding and subsidies, forest taxation, etc.
  - Informational instruments – systems for information gathering, training and consulting, guidelines, inter-organisational co-operation, etc.

The number of pan-European qualitative indicators for sustainable forestry is currently 5 + 12 (MCPFE Conference, Vienna 2003).

Qualitative indicators also include the description of other aspects of forest management which cannot be evaluated or measured numerically.

- *Quantitative indicators include* parameters that can be measured or evaluated numerically, such as the area of land under forest, the volume of stock or the number of employees.

The number of pan-European quantitative indicators for sustainable forestry is currently 35 (MCPFE Conference, Vienna 2003).

1. Finnish Forests and Forest Management in a Nutshell

The most extensive forest cover in Europe

Forests are part of the Finnish cultural heritage. The economic livelihood and material, cultural and spiritual progress of Finns has been dependent on forests. People have lived in forests, using forests in many ways. Wood has been used for construction, for making tools, utility articles, heating, cooking – practically every aspect and function of living. Game, berries and mushrooms used to provide an important source of food. The pelts of animals were used for trading. Manifold and biologically diverse forests constitute an important landscape element, an environment for recreation, and a habitat for flora and fauna.

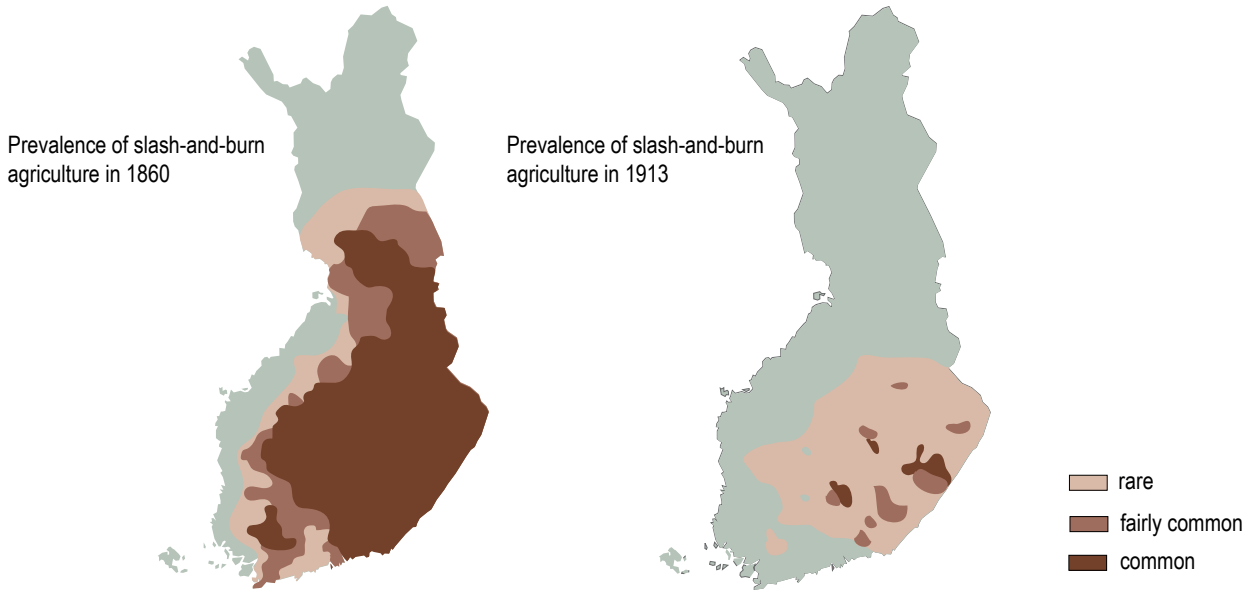
The forest cover in Finland is more extensive than in any other European country. Three fourths of the land area, some 23 million hectares, is under forests. In addition, there are land areas under management where there are only few trees, such as open peatland and areas of exposed bedrock, over 3 million hectares altogether.

Owing to conditions in the north, forest management in Finland takes place in climatically exceptional conditions. Geographically Finland lies in an intermediate zone between maritime and continental climates, belonging for the most part to the boreal vegetation zone.

Because of the warming effect of the Gulf Stream, however, the climate of Finland is in many respects more favourable than in corresponding areas in Russia and Canada. Because Finland is over 1,100 km long on the north-south axis, conditions for growth vary considerably between the southern and northern parts of the country. Towards the north, the climate gets increasingly colder and more humid (=precipitation exceeds evaporation). The growth period in southern Finland is about five months, and in the north it is three months. The average increment of growing stock in southern Finland, 6.1 m^3/ha/year, is twice as much as in northern Finland.

The number of plant species in Finnish forests is small compared to the boreal zone in North America, for example, or the temperate zone in Central Europe. This is because of the high European mountain ranges running east-west, which prevented the return of plants to the north after the last Ice Age. There are only four coniferous tree species native to Finland, and fewer than 30 deciduous trees and arborescent shrubs. The majority of forests in Finland are predominantly coniferous, with broadleaves often growing in mixed stands.

Forest cover in Europe, as percentage of land area.
Source: Schuck, A., Van Brusselen, J., Päivinen, R., Häme, T., Kennedy, P. and Folving, S. 2002. Compilation of a calibrated European forest map derived from NOAA-AVHRR data. European Forest Institute. EFI Internal Report 13, 44 p. plus Annexes



Areas in slash-and-burn agriculture in Finland in 1860 and 1913.
Source: Heikinheimo 1915. Acta Forestalia Fennica 4. 264 p. + Annex 149 p.

The timberline in northern Lapland is a hemiboreal zone often several dozen kilometres wide. To the north of the timberline, the land is a mosaic of exposed ground, shrub and struggling trees or trees less than two metres tall. On the southern edge of the zone, the timberline is reached, where the height of trees exceeds two metres. To prevent the timberline from receding further south, an Act on Protective Forests was adopted as far back as 1922 to prevent unplanned use of forests and consequent shifting of the timberline. Now these provisions are incorporated in the Forest Act.

History of forest management

The human influence on forests in Finland has been extensive and it has a long history. Here the livelihood and cultural development of humans has been more dependent on forests than anywhere else in Europe: on hunting culture, slash-and-burn agriculture, tar burning, forestry, forest industries and today on the so-called forest cluster.

Hunting and the barter of furs were the main livelihoods in the area for thousands of years. Agriculture was first introduced in the form of slash-and-burn cultivation 4,000 years ago, and developed into permanent agriculture 3,500 years ago. Along with the spread of slash-and-burn cultivation, human settlements spread to central and eastern Finland, especially from the 16th century onwards. In the 18th and 19th centuries, forests in Finland were also used for tar production, the needs of the mining and shipbuilding industries, for home use and construction, as well as for agriculture and grazing within the slash-and-burn culture.

Depending on the area, 50–75% of forests in southern Finland had been treated for slash-and-burn cultivation by the beginning of the 20th century. Since then, the greatest factor affecting the structure of forests has been the use of wood as raw material for the forest industry.

Owing to the various uses of forests, there are no completely untouched natural forests in Finland. Remnants of natural forests are only encountered in certain protected areas in Lapland and eastern Finland. However, there are no intensively managed tree plantations, because forest management in commercial forests makes use only of native tree species, and the development of mixed stands is actively promoted in management and harvesting.

Long-term forestry

The long-term sustainability of forest management has been actively promoted in Finland ever since the end of the 1940s. Government actions, legislation, national and regional forest programmes as well as the actions of and co-operation amongst private forest owners have all supported the attainment of the goal of sustainability. The annual increment of growing stock has over the last 30 years exceeded the drain by about one quarter. The standing timber stock in Finland today is greater than it has ever been during the time Finland has been an independent country, i.e. since 1917.

As in other countries in Western Europe, forests in Finland are mainly owned by private people and families.

In the principal growth area, southern and central Finland, about 3/4 of all forests are in private ownership. In some areas, the share is over 90%. State forests

Forest ownership category	Share (%)			
	Area of forestry land %	Growing stock volume %	Annual increment %	Commercial harvesting %
Private	60	64	69	86
State	26	20	14	8
Companies	9	10	11	6
Other (municipalities, parishes, associations and societies)	5	6	6	(share included in the private owners)

Table 1
Forestry land, growing stock, annual increment and commercial harvesting by forest ownership category.
Source: Statistical Yearbook of Forestry 2006

are for the most part situated in northern and eastern Finland. The percentage of growing stock volume, annual increment and fellings in private forests accounts for between 64 and 86% of the total. Private forests produce over 80% of roundwood purchased annually by the forest industry in Finland. Private forestry is a key issue for the entire forest sector in Finland.

Long-term sustainable wood production in private forests has been secured by forest legislation since 1886. The obligation to regenerate the forest after final fellings has been and remains to this day the basic principle of the law. This principle – in practice an injunction against the destruction of forests – has remained in place, even though forest legislation has been revised to accommodate new needs of society. The Government encourages forest owners to use good silvicultural practices in the management of their forests. State subsidies are available for safeguarding sustainable wood production, maintenance of forest biodiversity and improvement of the health of forests.

Within the limits permitted by the law, forest owners make decisions regarding all measures undertaken in their forests. Many forest owners or their family members engage in practical silvicultural work themselves, and some owners also harvest their own trees. The majority of fellings are carried out by the procurement companies under felling contracts between the forest owner and forest industry corporations (standing sales). In Finland the industry corporations usually buy the felling and transportation services from the procurement companies (forest machinery entrepreneurs and timber transportation companies), which for the most part are family enterprises.

Co-operation among forest owners also aims at long-term sustainable forest management. The first associations of forest owners were established in Finland in the early 1900s. The number of forest management associations at the start of 2007 was 151. The basic function of the associations is to promote the profitability of forest management undertaken by private forest owners and the attainment of other goals they have set for their forests. The associations also provide advisory services and education for the forest owners.

The operations of the forest management associations are financed by service fees and statutory forest management fees paid by the forest owners. Forest management fees account for an average of 10% of the associations' income.

Private forest owners – family forests predominate

In Finland private forest holdings are mostly in the hands of families. The holdings are quite small. There are only about 17,000 private forest holdings of over 100 hectares. The number of farms whose forest holdings are less than two hectares is 443,000. The average size of holdings is 36 hectares.

There are more forest owners than there are holdings, because spouses often have joint ownership of the holding. As estates and pools have an average of four stakeholders, the number of people owning at least two hectares of forest is estimated to be about 920,000.

The majority of forests in Finland are owned by families and private people.

The fact that forests remain in the hands of families, passed on in inheritance from one generation to the next, is an indication of the predominance of rural habitation. With sweeping structural changes in society, however, the composition of forest owners is also changing. The number of forest owners grows when holdings are split up in conjunction with the distribution of estates. About 63% of forest owners live in areas of scattered settlement, 18% in built-up areas and small towns, and 19% in towns with more than 20,000

Natural regeneration is most successful in sites where a layer of humus over a mineral soil and surface vegetation do not prevent germination and later development of saplings.

inhabitants. Today the largest single socio-economic group among private forest owners are pensioners, who account for 37% of all private forest owners.

Main lines of stand management

The aim of forest management is to safeguard the production of high-quality roundwood, the biodiversity of forests and the preconditions for the multiple functions of forests.

Forestry in Finland is based on the management of even-aged stands. Management is clearly divided into two phases, growth and regeneration. Depending on the tree species, geographical location and site characteristics, the recommended growth period varies from 50 to 120 years. In special sites, such as landscape areas and forest parks, cultural sites or forests dedicated for recreational use, uneven-aged management systems can also be used. In an uneven-aged system of management, different growth stages are concurrent, and stands are managed with single-tree selection.

Forest stands in Finland are classified according to their naturally occurring plant communities, based on a forest site type classification developed by A.K. Cajander in the early 20th century. The surface vegetation at each individual site indicates the properties of the site and also the growth potential of trees. There are six main site types in southern Finland, and management and fellings are directed according to their properties. The average size of managed stands in southern Finland is about 1.2 hectares, which is about the same as the average in Germany, Austria and France.

In silvicultural management the young and seedling stands are managed by cleaning and thinning. Young and advanced thinning stands are managed by intermediate fellings, which are carried out 1–3 times during the growth cycle of the stand. Each time 25–30% of the trees in the stand are removed. The purpose of intermediate fellings is to direct the growth of the stand in favour of the best trees, to encourage their growth and thereby produce harvesting income already prior to regeneration felling.

By natural regeneration, seed or shelterwood trees are left standing to seed the site. Sometimes natural seeding may take place by trees on the forest edge surrounding the regeneration area. Artificial regeneration by seeding or planting is preceded by final felling. The success of regeneration is ensured by clearing the site and exposing mineral soil with mechanical soil preparation prior to regeneration, and ensuring that grasses will not endanger the early development of seedlings.

The goal is to create a fully productive stand with a suitable species composition in a reasonable period of time. The majority of forests in Finland are regenerated naturally, with about 30% planted or artificially seeded. However, even such artificially regenerated stands have great numbers of naturally regenerated trees as well.

Biodiversity is promoted in fellings and other silvicultural measures by leaving dead, decayed and living valuable tall trees in the forest and by managing valuable habitats in a way to preserve their natural characteristics.

Trees are for the most part harvested using the Nordic cut-to-length system (CTL): logs are debranched and cut to appropriate length according to their use on site. Branches and crowns are left in the forest to

maintain an even nutrient cycle. There is a new trend to harvest branches and crowns in spruce stands to be used as fuel. The CTL system of cutting is particularly suited to conditions in Finland as the land is fairly level. Cuttings are carried out mostly in winter, when the ground is frozen and covered by snow to minimise any detrimental effects of cutting on the soil and trees left standing.

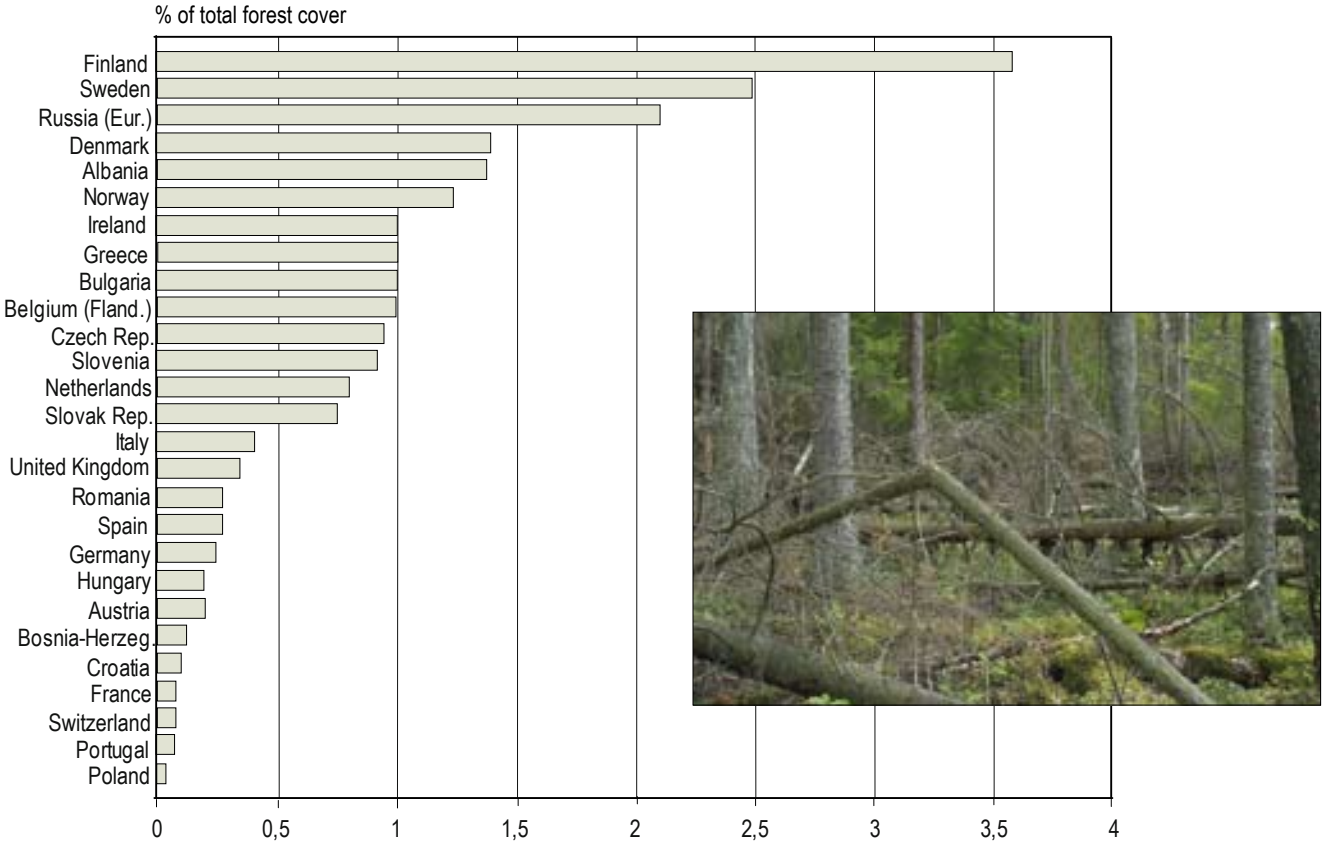
Safeguarding and protecting forest biodiversity

The protection of most valuable forests and ensuring the biological diversity in commercial forests are issues which have attracted special attention in recent decades. Owing to many protection programmes and decisions, the area of protected forests has increased three-fold in Finland over the past 30 years. The total area of protected forests is currently 2.1 million hectares, or 9.0% of all forest land (2005). The total area of protected forests and forests under restricted use is 2.9 million hectares, or 12.6% of all forest land.

The share of strictly protected forests in Finland is among the largest in Europe. Most of the protected areas are in northern Finland. The status of voluntary protection measures in forests was surveyed in the Forest Biodiversity Programme for Southern Finland (METSO) in 2002–2007. The goal of the programme was to discover new and cost-effective alternatives for safeguarding the biodiversity of forests. Such alternative measures include co-operation networks of forest owners, natural values trading in and competitive tendering for ecologically valuable features in forests. Results of the pilot schemes will be used to decide about more extended use of the alternative methods in 2007. The METSO programme also incorporates the restoration management measures in already established conservation areas to enhance their biodiversity.

The Natura 2000 network in Finland comprises 1,860 protected sites whose total area is 4.9 million hectares, of which 3.6 million hectares, or three fourths, are land areas. The European Commission approved the Natura 2000 areas of Finland in 2003 (alpine zone) and in 2005 (boreal zone).

Biological diversity in commercial forests is promoted by means of forest legislation, recommendations and instructions for best practices in forest management, as well as conservation agreements and forest certification. The Nature Conservation Act lists nine protected habitat types, three of which are found in forests. The Forest Act contains definitions of habitats of special importance (key biotopes) whose natural features must be conserved. According to surveys conducted by the Forestry Centres, key biotopes account for 77,000 hectares, or 0.5%, of forestry land in private forests.



The share of strictly protected forests of all forest land in certain European countries.
Source: EU/COST Action: Forest Reserve Research Network, EUR 19550, Luxembourg, 2000.

In commercial forests owned by the forest industries, such habitats account for 0.7% of the area; the percentage in State-owned forests administered by Metsähallitus is 1.0%.

Following recommendations, old broadleaved trees are left standing in the forest in fellings, and decayed trees or other trees that have special biological value are also preserved. Following forest certification requirements, a certified site must have an average of 5–10 such trees per hectare. Certification also involves many other measures designed to increase biodiversity, such as increasing prescribed burnings and maintaining water systems.

About one half of the approximately 43,000 species known in Finland live in forests. The occurrence of endangered species is monitored regularly. According to the most recent survey (2000), there are 1,505 endangered plant and animal species in Finland, of which 37% are forest species. While the majority of forest species remain viable also in commercial forests, some species depend on natural habitats or decayed or burnt wood for their survival.

Cultural and multiple use of forests

Access to and recreational use of forests is free for all in Finland. The so-called Everyman's Right (right of public access) bestows on all people a free right to use land owned by others to travel on foot, skis, bicycle or horseback, provided that they do not cause any damage. Other activities freely permitted on other people's land are temporary camping as well as picking wild non-protected flowers, berries and mushrooms. The use of motor vehicles and making fire in forests, however, always require permission from the landowner. Everyman's Right may not be exercised in such a way as to cause any disturbance or damage to the landowner.

Forests are an important environment for recreation in Finland, especially as the population increasingly moves into population centres or towns. The most common forms of recreation in forests are hiking, camping, orienteering and cross-country skiing. Forests also provide a setting for relaxation, meditation and communing with nature.

The most important non-wood products which have an economic value are game, berries, mushrooms and lichen. The greatest value in economic terms is game, particularly moose. Collecting fresh products of the forest also gives a chance to hiking and enjoying nature. The volume of nature tourism has increased in recent years. Particularly in Lapland, nature tourism has a great economic impact. On the national scale, however, the economic value of non-wood products and services is small compared to the income from the sale of wood products. Instead, income from non-wood products and recreational services in forests may have a crucial impact locally and for individuals.

Forest industries

The industrial use of forests for sawn timber and paper products began in the late 19th century. Nowadays forestry and forest industries account for approximately 6% of the GDP. Relative to its size, Finland is more dependent on forests and the forest industry than any other country in the world. As a consequence, Finland has accumulated an expertise in forestry and industrial manufacturing of forest products that is unique in Europe. For instance, 80% of paper industry engineers in Europe are trained in Finland, as are a considerable number of harvester drivers proficient in the Nordic CTL harvesting system.

A couple of decades ago the number of forest industry companies was still fairly large in Finland. The pressures of internationalisation, a reorientation of production in paper industry and extensive need for new investments triggered an intense process of change in the field of forest industry in the early 1980s. Through acquisitions and mergers, this has led to the creation of international forest industry corporations, some of these among the largest in the world. The three largest corporations account for more than 90% of all production in the paper and pulp industry, while the corresponding figure two decades ago was about 30%.

Most of the products of the Finnish forest industries are exported. The most important market is the European Union. Exports there account for nearly 70% of the total exports of the sector. The major export countries are Germany, Great Britain, the United States, France and Spain.

Modern paper and pulp factories operate on the principle of closed loop water recycling, where waste water used in production is thoroughly cleaned and reused.

Berry collecting in Finland is allowed under the principle of Everyman's Right. Collecting berries is also an important bond to forests and nature, particularly for people living in population centres.

A hundred years ago, the share of forest industry products in the value of all Finnish export of goods was as high as 80%. Today that figure is slightly over 20%. Products of the pulp and paper industry account for about three fourths of the exports of all products of the forest industry, and the share of paperboard and sawn timber is about 25%.

Environmental impacts of the forest industry

Owing to new technology and advanced production processes, emissions of the forest industry to both water and air have been reduced considerably in the last 20 years, even though the volume of production has increased many times over during this period. Although the reduction of emissions into water systems continues to be important, the emphasis on environmental factors has gradually shifted towards the lifecycle of products, efficient use of natural resources, recycling and use of renewable energy.

70% of paper used in Finland is recycled, which is a considerable achievement considering the low population density in the country. Globally, the recycling percentage for paper is an average of 40%.

The forest industry is energy intensive. It uses about one third of all electricity produced in Finland. The main source of energy for the forest industry is bark and sawdust, and black liquor produced in the pulp industry. Of the total consumption of energy by the forest industries, 73% comes from wood-based fuels.

Workforce in forestry and forest industry

The importance of forestry and forest industry as a source of employment continues to be an important factor in maintaining the vitality of rural areas and regional economy, although the number of jobs provided by the forest sector has diminished in the past few decades.

Forestry and forest industry employ about 4 per cent of all employed people in the Finnish national economy, or about 89,000 persons, three fourths of whom work for the forest industry. Forestry provides jobs for about 23,000 people, in addition to which a considerable part of silvicultural work in particular is done by private forest owners and their families. The forest sector continues to be a male-dominated area, where the share of women of all employees is about 18%.

Energy from wood

In addition to reducing greenhouse gas emissions, the use of wood for energy has the effect of increasing self-sufficiency in energy production, promoting good silvicultural practices, and improving the employment situation. The share of wood-based fuels of the total consumption of energy in Finland is about 20%. The use of wood-based fuels has increased in Finland since the 1990s. The majority of forest industry companies produce their own energy using bark, sawdust and chippings as well as logging residue from thinning and regeneration fellings and waste liquors from industrial processes, which makes them energy self-sufficient. Wood is also used increasingly in rural areas and population centres, especially for heating. There has been a marked increase in recent years in research on the energy uses of wood for heating, electricity and biofuel production.

2. Criteria and Indicators for Sustainable Forest Management

International commitments to the promotion of sustainable forest management

Rapid internationalisation, the crucial importance of forests for the livelihood of people living in rural areas and for global environmental processes, as well as concern over the disappearance of tropical forests, all these have during the past 20 years led to international negotiations and treaties on the environment and forests.

The Framework Convention on Climate Change and the Convention on Biological Diversity (CBD) were concluded in 1992 at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, which also adopted principles for the management, use and sustainable development of forests, the so-called Forest Principles. Global discussion on forests has since then continued under the aegis of the Intergovernmental Panel on Forests (IPF) and the Intergovernmental Forum on Forests (IFF), and from 2001 at the United Nations Forum on Forests (UNFF).

The Ministerial Conference on the Protection of Forests in Europe (MCPFE) plays an important role in international co-operation on forests in Europe. At the initiative of France and Finland, the first conference was organised in Strasbourg in 1990. Since then there have been three conferences: in Helsinki in 1993, Lisbon in 1998 and Vienna in 2003. The fifth MCPFE is held in Warsaw in November 2007.

Resolutions adopted by the Ministerial Conferences have been used to call attention to important and topical issues in forest policy. At the fourth conference in Vienna, five resolutions were prepared, covering, respectively, national forest programmes, economic viability of forests, social and cultural dimensions, forest biological diversity, and climate change and sustainable forest management.

One of the main achievements of the Ministerial Conferences has been to define sustainable management of forests, and the related criteria and indicators. The first criteria and indicators (C&I) for sustainable forest management were developed in the beginning of the 1990s (ITTO 1992, the Montreal Process 1993, the Helsinki Process 1993–1995). To date, a total of nine intergovernmental regional sets of criteria and indicators for various forest zones have been developed. Collaboration between the regional indicator processes aims to reach an agreement on the basic requirements for measuring sustainability and, above all, to harmonise the concepts, methods of measurement, preparation of statistics and reporting on the indicators

Finland has taken an active role in the international development of C&I. The first global meeting between the regional processes was organised in Helsinki in 1996 (Intergovernmental Seminar on Criteria and Indicators for Sustainable Forest Management, ISCI). Finland has served as organiser or initiator also in later conferences (Guatemala, CICI 2003, the Philippines, ECCI 2004, and Poland, Bialowieza 2006).

The international commitments mentioned above are part of Finland's national forest policy. The accession of Finland to the European Union in 1995 also entailed the incorporation of forest related regulations of the EU into national legislation.

Although the EU does not have a similar uniform policy for forests as it has for agriculture, forest-related issues are incorporated in the functions of the various sectors of the Union, such as agriculture, rural development, the environment, trade, internal market, research, industry and energy, and development co-operation. In agricultural and environmental policy in particular there are several regulations and directives which also have a direct or indirect effect on forestry and the forest industry.

The Forest Strategy of the EU was adopted in 1998. It provides directions for the development of sustainable forestry and the co-ordination of forest issues in the EU. On the basis of the Forest Strategy, a Forest Action

Plan was prepared for forests in the EU. The Action Plan was adopted in 2006. The EU Biodiversity Strategy for 2010 also includes aims concerning forests, such as the development of indicators to support the monitoring of forest biodiversity. Forest protection and biodiversity issues are also addressed by the Natura 2000 directives.

Pan-European and Finnish work for criteria and indicators

Criteria and indicators have become an established instrument for assessing and monitoring sustainable forest management. They are used in the preparation and monitoring of forest policies and strategies, reporting on the condition of forests, setting the direction of forest management, publishing information about forests and forestry to political decision makers and other interested parties, making initiatives for research, and forest certification.

At the Second Ministerial Conference on the Protection of Forests in Europe (Helsinki 1993) Resolutions H1 and H2 were adopted where the concept of sustainable forest management was defined for the first time (Resolution H1, Article D). On the basis of the definition, the European C&I for sustainable forest management were developed in 1993—-1995, and were later ratified in the Third Ministerial Conference in Lisbon (1998).

The pan-European indicators were reviewed in 2002–2003. Qualitative indicators in particular were improved, and their number was reduced by focusing on greater wholes than before. The concepts, coverage and guidelines for reporting on quantitative indicators were also improved. The set of indicators adopted at the Fourth Ministerial Conference (Vienna 2003) includes five qualitative indicators on policies, institutions and instruments for sustainable forest management. There are 35 quantitative indicators, and 12 policy areas describing the principles for the implementation of the indicators.

The Finnish criteria and indicators for sustainable forest management are based on the pan-European C&I. Finland and France were the first countries in Europe to start implementing the pan-European indicators in the 1990s. The first set of national indicators was developed in Finland in 1996. The set included over 160 indicators, of which 64 were quantitative. The report, Suomen kestävän metsätalouden kriteerit ja indikaattorit metsätalouden tilan kuvaajina (Criteria and Indicators for Sustainable Forest Management in Finland as Descriptors of the State of Forestry), was published in 1997.

The second Finnish set of indicators was completed in 2000 and published under the title The State of Forestry in Finland 2000. Criteria and Indicators for Sustainable Forest Management in Finland. The set comprised 47 indicators, of which 35 were quantitative. At the time, the number of qualitative indicators in particular was reduced. In anticipation of the future development of the C&I, however, the representation of indicators for the multiple use of forests and social and economic factors was increased.

The set of indicators has been used especially in the reporting on Finnish forestry and in the preparation of regional target programmes for forest management. The indicators have also been used for directing silvicultural operations and in the Finnish Forest Certification System (FFCS). The Finnish set of indicators was also used as an example in a project for comparing the indicators of five countries conducted in 1998–2001, funded by EU/Life.

The current, third consecutive set of indicators takes into account the improved pan-European indicators from 2003, experiences of the development of earlier sets of indicators, and international discussions on measuring sustainable forest management. Work for the improvement of the pan-European set of indicators in 2002–2003 shifted more than before towards description of the state of forests and forest management in Central Europe. Consequently, the use of certain indicators is not considered appropriate in the current national adaptation of the indicators for Finland.

Sources:

- ECE Timber Committee, www.unece.org/trade/timber
- Ministerial Conference on the Protection of Forests in Europe, www.mcpfe.org
- European Union, www.europa.eu.int
- United Nations Framework Convention on Climate Change, www.unfccc.int
- Montreal Process, www.mpci.org
- ITTO, www.itto.or.jp/live/index.jsp
- United Nations, www.un.org
- Food and Agriculture Organization of the United Nations, www.fao.org
- Eeronheimo, O., Ahti, A. & Sahlberg, S. 1997. Suomen kestävän metsätalouden kriteerit ja indikaattorit metsätalouden tilan kuvaajina [Finnish criteria and indicators for sustainable forest management as descriptors of the state of forestry]. Finnish Ministry of Agriculture and Forestry
- Expert Consultation on Criteria and Indicators for Sustainable Forest Management, 2–4 March 2004, Cebu City, Philippines. FAO
- The Fourth Ministerial Conference on the Protection of Forests in Europe, Vienna 28–30 April 2003. Resolutions. Ministry of Agriculture and Forestry, publications of the Ministry 12/2004. Vammalan kirjapaino. 45 p. www.mmm.fi/julkaisut/julkaisusarja

Regional process	Participating countries
MCPFE (Ministerial Conference on the Protection of Forests in Europe)	44[1]
Montreal Process	12[2]
ITTO (International Tropical Timber Organisation)	31[3]
Tarapoto Proposal	8[4]
ATO (African Timber Organisation)	14[5]
Dry Zone Africa Process	30[6]
Near East Process	30[7]
Dry Forest Asia Initiative	9[8]
Lepaterique Process	7[9]

Table 2
Regional C&I Processes in the World
Source: Expert Consultation on Criteria and Indicators for Sustainable Forest Management, 2–4 March 2004, Cebu City, Philippines. FAO

- Parviainen, J & Lier, M. 2006. The use and audiences of national and international forest sustainability reports. Inter-C&I Process Harmonization Workshop in Bialowieza National Park, Poland, June 8–10, 2006.19 p. www.mcpfe.org/
- The State of Forestry in Finland 2000. Criteria and Indicators for Sustainable Forest Management in Finland. Ministry of Agriculture and Forestry, publications of the Ministry 5/2000. Printed by PrintLink Oy Ab, Helsinki.104 p.

1 Albania, Austria, Belarus, Belgium, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, EU, Finland, France, Georgia, Germany, Great Britain, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, Norway, Poland, Portugal, Rumania, Russia, San Marino, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, Yugoslavia

2 Argentine, Australia, Canada, Chile, China, Japan, Mexico, New Zealand, Republic of Korea, Russia, Uruguay, USA

3 Bolivia, Brazil, Cambodia, Cameroon, Central African Republic, Colombia, Congo, Democratic Republic of the Congo, Ecuador, Fiji, Gabon, Ghana, Guatemala, Guyana, Honduras, India, Indonesia, Ivory Coast, Liberia, Malesia, Myanmar, Nigeria, Panama, Papua New Guinea, Peru, Philippines, Suriname, Thailand, Togo, Trinidad and Tobago, Vanuatu, Venezuela

4 Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Surinam, Venezuela

5 Angola, Cameroon, Central African Republic, Congo, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Ghana, Ivory Coast, Liberia, Nigeria, Sao Tome and Principe, Tanzania, Togo

6 Angola, Botswana, Burkina Faso, Cape Verde, Chad, Democratic Republic of the Congo, Djibouti, Eritrea, Ethiopia, Gambia, Guinea Bissau, Kenya, Lesotho, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Senegal, Seychelles, Somalia, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia, Zimbabwe

7 Afghanistan, Algeria, Azerbaijan, Bahrain, Cyprus, Djibouti, Egypt, Iraq, Jordan, Kuwait, Kyrgyzstan, Lebanon, Libya, Malta, Mauritania, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Somalia, Sudan, United Arab Emirates, Yemen Syria, Tajikistan, Tunisia, Turkey, Turkmenistan

8 Bangladesh, Bhutan, China, India, Iran, Mongolia, Myanmar, Nepal, Sri Lanka, Thailand

9 Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama

3. Overall Policy and Instruments for the Sustainable Forest Management in Finland

National forest programmes and other forest-related programmes

Forest programmes have played an important role in Finland both as an instrument of forest policy and in the provision of funding for forestry. Increasing prosperity of the forest industry after the Second World War was based on long-term and systematic forest programmes. The first actual forest programme was prepared in 1961, known by the initials of its authors HKNL (Heikurainen-Kuusela-Linnamies-Nyyssönen). It was followed by Teho programmes (1962 and 1964), the Mera programmes (1964, 1966, 1969), the Forest 2000 programme (1985) and the New environmental programme for forestry in Finland (1994). With their focus on wood production, the Mera programmes resulted in a doubling of investments in silviculture and improvement of wood production, leading thereby to an increase in stock increment and harvesting opportunities. Subsequent programmes have shifted the main focus of forest policy from increasing the production of timber towards enhancing the use of all forest resources and taking into account the multiple use of forests.

The latest forest programme is *the National Forest Programme 2010 (NFP)*, adopted by the Government in 1999. Its aim is to secure employment and livelihoods based on the use of forests, the biological diversity and vitality of forests, as well as their recreational benefits. Although the programme represents a continuation of previous forest programmes, it is clearly more extensive in scope in that it takes into account the economic, ecological, social and cultural sustainability of forests and their management. *The Future Review for the Forest Sector*, prepared by the national Forest Council in 2006, serves as the background for the NFP, which ccame under review in 2007.

In 2002, the Government adopted *the Forest Biodiversity Programme for Southern Finland (METSO)* as a supplement to the National Forest Programme. The aim of the METSO programme is to improve the maintenance of habitats and structural features of forests vital to the survival of endangered species. New areas and networks of areas that support forest biodiversity are created, and the biodiversity of existing conservation areas is improved. The principles of new protection methods are voluntary participation by forest owners, preservation of ownership and full compensation of economic losses. The METSO programme will end in 2007, and based on the functionality and economic viability of the conservation measures tested in the programme, a proposal will be prepared for an action plan for the protection of forest biodiversity in southern Finland for 2008–2016.

The *first regional target programmes for forest management (regional forest programmes)* to comply with the revised Forest Act of 1997 were completed in 1998. The programmes were reviewed in 2000 and 2005. They provide an overall view of the status and development needs of forests and forest management in the domain of each Forestry Centre. The programmes are prepared and reviewed by the Forestry Centres in co-operation with the forest owners and other interest groups in the region.

A broad-based National Commission on Sustainable Development, chaired by the Prime Minister, was appointed in 1993 to promote sustainable development in Finland. *Finland's National Strategy for Sustainable Development* was adopted by the Government in 2006.

The National Strategy for the Conservation and Sustainable Use of Biodiversity in Finland 2006–2016 was adopted by the Government in 2006. The aim of the strategy is to halt the decline of biodiversity in Finland by the year 2010, and also to establish a favourable development of biodiversity in the long term.

Under the Kyoto Protocol of 1997 and the burden-sharing agreement of the EU, Finland is committed to keep the average level of greenhouse gas emissions in

2008–2012 on the level of emissions in 1990. To ensure that Finland is able to attain the target for emission reduction, a *National Climate Strategy* was prepared in 1999–2001. The new *Energy and Climate Strategy for Finland* was submitted as a Government report to the Parliament in November 2005.

The Government Programme (2003–2007) included two programmes that concerned forests. The aim of *the Industrial Policy Programme for Forest Products 2004–2010* is to create preconditions for ensuring the success and growth of internationally competitive forest product industry in Finland. *The Wood Construction Development Programme 2004–2010* aims to increase the use of wood in the construction of urban small-house residential areas in Finland and in its neighbouring regions. The programme also aims to safeguard the preconditions for industrial, efficient timber construction, and to promote networking among small and medium-sized enterprises.

Forestry and environmental organisations

The organisation of the Finnish forest sector began in the mid-19th century. The aim was to regulate the use of forest resources, because there was fear that forests would run out of wood. In 1851 a temporary Board of Land Survey and Forestry was established, the precursor of current Metsähallitus, which used to be a State authority and now it is a State enterprise that administers State-owned land and water areas. The year 1862 saw the establishment of the Evo Forest Institute, the first college of foresters in Finland, and in 1887 the Finnish Forest Association was established. Organisations of private forest owners were established in the early 20th century, when the Finnish Forest Research Institute (Metla) was also set up.

The highest forest authority in Finland is *the Ministry of Agriculture and Forestry*, whose mandate is to create conditions for the sustainable and diversified use of renewable natural resources and to secure the quality of the commodities obtained from them. The Department of Forestry in the Ministry is charged with directing and developing forest policy in Finland. *Metsähallitus, Finnish Forest Research Institute, Forestry Development Centre Tapio* and *the regional Forestry Centres* are all under the performance guidance of the Ministry.

The 13 Forestry Centres and *Forestry Development Centre Tapio* are responsible for promoting the sustainable management of forests, protecting their biodiversity and other activities within the forest sector. The Forestry Centres also monitor compliance with forest legislation and carry out other administrative tasks. The Forestry Development Centre Tapio has no administrative functions.

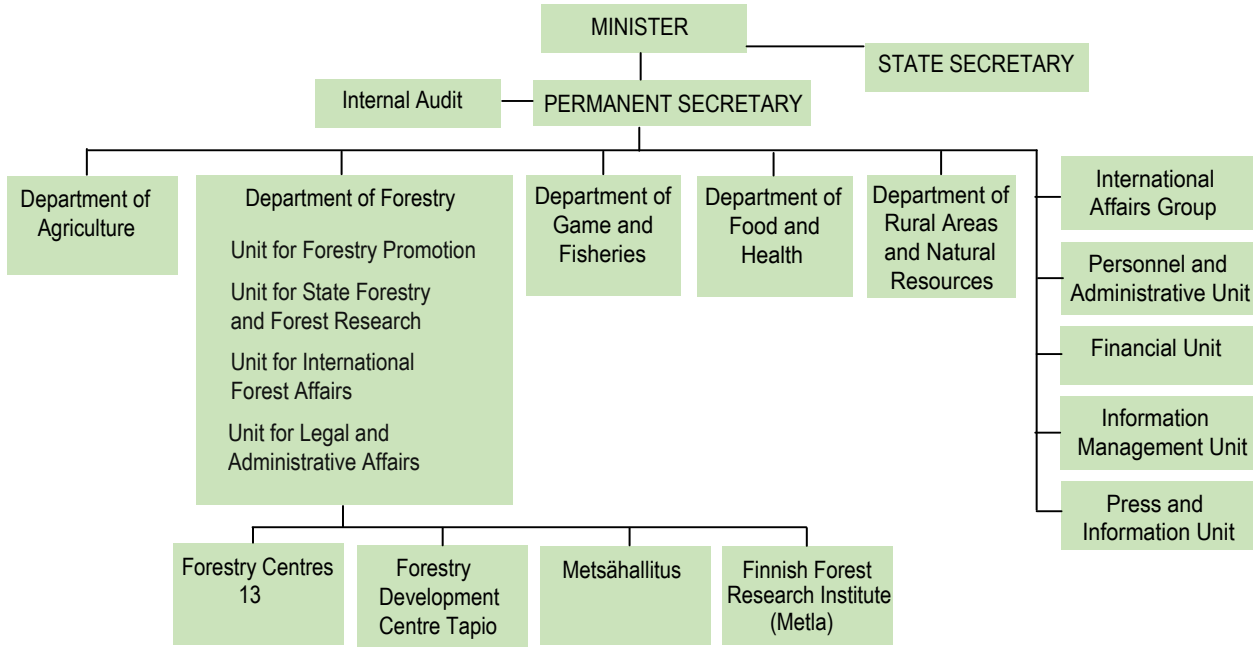
Metsähallitus manages, uses and protects the natural resources and other property on State lands under its administration. It is required to work efficiently and to follow the principle of sustainability. The business operations are governed by social obligations ascribed to Metsähallitus in the relevant Act. Metsähallitus also has public administrative duties.

Forests and forestry are studied in Finnish universities and research institutions by about 650 researchers. Nearly one half of them work in *the Finnish Forest Research Institute*. Matters involving forests and the use of wood are also studied in the universities of Helsinki, Joensuu, Turku, Oulu, Kuopio and Jyväskylä, the private R&D company Metsäteho, TTS (Work Efficiency Institute), Finnish Environment Institute, Finnish Game and Fisheries Research Institute, Oy Keskuslaboratorio Centrallaboratorium Ab (KCL) private research company, and VTT Technical Research Centre of Finland. The forest industry companies also conduct research and development. The European Forest Institute located in Finland also includes Finnish forest issues in its work agenda.

The function of the 151 *Forest Management Associations in Finland* (figure as of January 1, 2007) is to promote the profitability of forestry practised by forest owners and to support the attainment of objectives they set to their operations. The associations are funded and operated by the forest owners. The associations provide expert assistance in silviculture, timber trade and forest planning. The Forest Management Associations are organised geographically into Unions of *Forest Management Associations* (10 unions as of January 1, 2007). The Unions in turn are members of the national interest group, *the Central Union of Agricultural Producers and Forest Owners (MTK)*.

There are also a number of organised interest groups, professional associations and NGOs active in the field of silviculture and forest industry.

The environmental administration promotes sustainable development, the sustainable use of natural resources, environmental protection, conservation of the diversity and vitality of nature, and the maintenance of the aesthetic and cultural values of the environment. It develops our living environment and social structures and monitors the use and maintenance of water resources. The mandate of the *Ministry of the Environment* also covers tasks involving forests. These include the maintenance of biodiversity, prevention of environmental pollution and detrimental changes in



The organisation for the management and development of Finnish forest policy at the Ministry of Agriculture and Forestry.
Source: www.mmm.fi

the atmosphere, and management and funding of nature conservation areas.

The Ministry of the Environment has jurisdiction over the *Finnish Environment Institute (SYKE)*, which studies environmental phenomena and develops solutions to manage changes, and the 13 *regional Environment Centres*, operating on the same regional areas as Forestry Centres. The Environment Centres are charged with implementing the functions of the environmental administration in their own districts, thereby promoting the improvement of the environment and the sustainable use of natural resources.

Legislation

Since the first Forest Act of 1886, the basic principle of Finnish forest legislation has been the prevention of forest destruction. This basic objective still remains in legislation, although the aims of forest policy have changed and legislation has been reformed. The latest extensive reform of forest legislation made in the 1990s was put into motion by a Government decision-in-principle, made in 1994, and by the National Environment Programme for Forestry ratified the same year. Practically all *legislation on forests and nature conservation* was reformed in the mid-1990s.

In the *Forest Act* (1997), the requirement of maintaining forest biodiversity has emerged alongside wood production as an important aim of forest management. The earlier Forest Improvement Act was revised and replaced by the *Act on the Financing of Sustainable Forestry*. As a result of the reformation of forest legislation, legislation was also amended concerning Metsähallitus, the Forestry Centres and the Forest Management Associations.

Instruments affecting forest management also include *the Act on Trade in Forest Reproductive Materials, the Forest Insect and Fungi Damage Prevention Act*, and *the Act on Environmental Impact Assessment Procedure*. Such matters as zoning are governed by the Land Use and Building Act. Water protection in the EU is harmonised by the Water Framework Directive (2000). The water policy provisions required by the Framework Directive are incorporated in Finnish legislation in the Act on the Organisation of Water Management, adopted in 2004, and three other statutes concerning the waters.

Employment relations and occupational safety and health are covered extensively by legislation. Forestry is also covered by a special piece of legislation which applies to harvesting, for instance.

Financial instruments

Financial instruments comprise subsidies for silvicultural and environmental works in the form of either State subsidies or loans, as well as tax policies.

Since silviculture is a sustained long-term process, many measures that are vital for the production of wood or the safeguarding of biodiversity have poor profitability from the viewpoint of private forest owners, and are therefore subsidised from State funds. The first Forest Improvement Act was adopted as far back as 1928. The latest change was in early 1997, when

the *Act on the Financing of Sustainable Forestry* was adopted. In addition to traditional silvicultural works, it is today possible to receive Government funding also for the maintenance of biodiversity and natural features, and for harvesting energy wood.

The Forest Biodiversity Programme (METSO) for southern Finland, the western part of the Province of Oulu and south-western part of the Province of Lapland included many pilot projects to find economic incentives for increasing conservation projects undertaken by forest owners. Since 2003 new funding instruments concerning natural values trading and *establishment of co-operation networks* have been included in *the Act on the Financing of Sustainable Forestry*. The instruments are used as incentives for private forest owners to safeguard biological diversity in their forests.

After a transition period of 13 years, taxation of forestry income has from the start of 2006 been based on stumpage revenues. Taxation is calculated on the basis of real income and expenses. Forest income taxation was previously calculated on the basis of annual increment of growing stock, taking into consideration the average price of roundwood and average expenses (so-called "site productivity forest taxation").

Information

Along with conducting regular research, forest research organisations have created *systems for monitoring* the state of forests and forest management, including the National Forest Inventories (NFI), forest statistics, forest condition monitoring programme (Forest Focus), the Finnish biodiversity information system (Lumonet), and the evaluation of nature management in commercial forests. The majority of these monitoring systems are the responsibility of the Finnish Forest Research Institute.

Forest education is provided in the universities of Helsinki and Joensuu and at technical and vocational level in several institutes and colleges around the country. *Training* for private forest owners is provided by private forestry organisations, forest polytechnics and colleges, as well as various further training centres.

Forest Management Associations and Forestry Centres provide *advisory services for forest owners*. Advisory services may take the form of personal or group consultation, or consultation provided in conjunction with exhibitions, competitions or field trips. Group consultation services are also provided by forest polytechnics. Forest industry companies organise excursions and meetings for their forest owner customers.

There are several *journals in Finland dealing with forestry*. They publish information about forests primarily for interested parties, forest owners and forest professionals. Those with the widest circulation are Maaseudun Tulevaisuus and Metsälehti.

Forest management plans for individual holdings are an important instrument for systematic long-term forest management. Management plans for individual forest holdings are mostly prepared by the Forestry Centres and the Forest Management Associations. Metsähallitus, forest industry companies and other bodies that own large forest areas have drawn up corresponding plans for the forests administered or owned by them, plans that reflect their own needs.

Forest certification is a voluntary instrument for market actors. It serves as an adjunct to the implementation of sustainable forest management, ensuring the commitment by the actors to silvicultural instructions and standards. The major international certification systems are PEFC (*Programme for the Endorsement of Forest Certification Schemes*) and FSC (*Forest Stewardship Council*). Finland has its own national certification system, FFCS (*Finnish Forest Certification System*), which is adapted to family forestry. The system was approved in 2000 as part of the PEFC. 95% (22 mill. ha) of Finnish forests are covered by FFCS.

Sources:

- Finland's National Forest Programme, www.mmm.fi
- Future Review for the Forest Sector, www.mmm.fi
- Forest Biodiversity Programme for Southern Finland (METSO), www.mmm.fi/metso
- The National Strategy for the Conservation and Sustainable Use of Biodiversity in Finland 2006–2016, www.ymparisto.fi
- Finland's National Climate Strategy, www.ktm.fi
- Ministry of Agriculture and Forestry, www.mmm.fi/en/index/frontpage.html
- Ministry of the Environment, www.ymparisto.fi
- Metsähallitus, www.metsa.fi
- Finnish Forest Research Institute, www.metla.fi
- Forestry Development Centre Tapio, www.tapio.fi
- Forestry Centres, www.metsakeskus.fi/web/eng
- Central Union of Agricultural Producers and Forest Owners (MTK), www.mtk.fi/en_GB/
- Forest Management Associations, www.mhy.fi
- Regional Environment Centres, www.ymparisto.fi/default.asp?node=4661&lan=en
- Finnish Environment Institute (SYKE), www.ymparisto.fi
- Finnish legislation, www.finlex.fi/en/
- Maaseudun Tulevaisuus, www.maaseuduntulevaisuus.fi
- Metsälehti, www.metsalehti.fi
- FFCS (Finnish Forest Certification System), www.ffcs-finland.org/
- PEFC (Programme for the Endorsement of Forest Certification Schemes), www.pefc.org/
- FSC (Forest Stewardship Council), www.fsc.org

4. National and Pan-European Criteria and Indicators for Sustainable Forest Management

Overall policies (5), qualitative indicators (12) and quantitative indicators (35)

The order of indicators in the national set of indicators departs in some respects from the order of the pan-European indicators. For instance, the indicator "Energy from wood resources" (6.9) is presented in conjunction with the indicators of Criterion 1 in the national set of indicators. The reason for the rearrangement is that the use of wood-based fuels fits in naturally with the account of the carbon stock.

Water issues in forest management are addressed in conjunction with Criterion 5, even though they do not as such concern protective forests mentioned in this criterion. The pan-European indicator "Protective forests – soil, water and other ecosystem functions" (5.1) is in the national set interpreted as applying to timberline forests in northern Finland.

Qualitative indicators (5) concerning the overall policies, institutions and instruments for sustainable forest management (overall policies)	
National	*Pan-European*
Overall policies and instruments for the sustainable forest management in Finland (Chapter 3)	A. Overall policies, institutions and instruments for sustainable forest management
National forest programmes and other forest-related programmes	A.1 National forest programmes or similar
Forestry and environmental organisations	A.2 Institutional frameworks
Legislation	A.3 Legal/regulatory frameworks and international commitments
Financial instruments	A.4 Financial instruments/economic policy
Information	A.5 Informational means

Indicators on the policies, institutions and instruments and their implementation (B indicators, 12 in all) are presented in the following list along with the quantitative indicators.

Qualitative (12) and quantitative indicators (35)

Criterion 1: Maintenance and Appropriate Enhancement of Forest Resources and their Contribution to Global Carbon Cycles (Forest Resources)	
National	*Pan-European*
B.1 Preservation and increase of forest land	B.1 Land use and forest area and other wooded land
Forest area (1.1)	1.1 Forest area
Growing stock (1.2)	1.2 Growing stock
Age structure of forests (1.3)	1.3 Age structure and/or diameter distribution
B.2 Maintenance of carbon balance in forests	B.2 Carbon balance
Carbon stock (1.4)	1.4 Carbon stock
Use of wood-based fuels (6.9)	6.9 Energy from wood resources

Criterion 2: Maintenance of Forest Ecosystem Health and Vitality (Health and Vitality)	
National	*Pan-European*
B.3: Maintenance of health and vitality of forests	B.3 Health and vitality
Deposition of air pollutants (2.1)	2.1 Deposition of air pollutants
Chemical soil condition (2.2)	2.2 Soil condition
Defoliation (2.3)	2.3 Defoliation
Forest damage (2.4)	2.4 Forest damage

Criterion 3: Maintenance and Encouragement of Productive Functions of Forests (Wood and Non-Wood) (Productive Functions)	
National	*Pan-European*
B.4 Safeguarding wood production	B.4 Production and use of wood
Increment and drain (3.1)	3.1 Increment and fellings
Quantity and value of annual fellings (3.2)	3.2 Roundwood
Coverage of forest planning (3.5)	3.5 Forests under management plans
B.5 Safeguarding and increasing services and non-wood products	B.5 Production and use of non-wood goods and services, provision of especially recreation
Non-wood goods (3.3)	3.3 Non-wood goods
Services, particularly of recreation (3.4 and 6.10)	3.4 Services + 6.10 Accessibility for recreation

Criterion 4: Maintenance, Conservation and Appropriate Enhancement of Biological Diversity in Forest Ecosystems (Biological Diversity)	
National	*Pan-European*
B.6 Safeguarding and protecting biodiversity of forests	B.6 Biodiversity
Tree species composition (4.1)	4.1 Tree species composition
Forest regeneration (4.2)	4.2 Regeneration
Natural forests (4.3)	4.3 Naturalness
Introduced tree species (4.4)	4.4 Introduced tree species
Deadwood (4.5)	4.5 Deadwood
Genetic resources (4.6)	4.6 Genetic resources
Forest cover in landscapes (4.7)	4.7 Landscape pattern
Threatened forest species (4.8)	4.8 Threatened forest species
Protected forests (4.9)	4.9 Protected Forests

Criterion 5: Maintenance and Appropriate Enhancement of Protective Functions in Forest Management (notably soil and water) (Protective Forests)	
National	*Pan-European*
B.7 Maintenance and increasing of the protective functions of forests	B.7 Protective forests and other wooded land
Timberline forests (5.1)	5.1 Protective forests– soil, water and other ecosystem functions
Protective forests – infrastructure and managed natural resources (5.2)	5.2 Protective forests – infrastructure and managed natural resources
Impacts of forest management on waters	

Criterion 6: Maintenance of Other Socio-Economic Functions and Conditions (Socio-Economic Functions)	
National	*Pan-European*
B.8 Maintenance of the economic viability of forestry	B.8 Economic viability
Forest holdings (6.1)	6.1 Forest holdings
Contribution of forest sector to GDP (6.2)	6.2 Contribution of forest sector to GDP
Net revenue from wood production in private forests (6.3)	6.3 Net revenue
Public commodities of forests (6.4)	6.4 Expenditures for services
Consumption of products of the forest industries (6.7)	6.7 Wood consumption
Exports of the forest sector (6.8)	6.8 Trade in wood
B.9 Improvement of employment and occupational safety in the forest sector	B.9 Employment (incl. safety and health)
Forest sector workforce (6.5)	6.5 Forest sector workforce
Occupational safety and health (6.6)	6.6 Occupational safety and health
B.10 Safeguarding the opportunities of the public for participation	B.10 Public awareness and participation
B.11 Research, training and education in forestry	B.11 Research, training and education
B.12 Maintenance of cultural and spiritual values	B.12 Cultural and spiritual values
Cultural and spiritual values (6.11)	6.11 Cultural and spiritual values

Criterion 1 Forest Resources

Three fourths of the land area in Finland is under forest. Forest area has remained almost unchanged over the last 40 years, whereas the volume of growing stock has increased more than 40% in the same period. The age structure of forests has become more even due to cuttings and systematic forest planning aiming at the sustainability of wood production.

Carbon stocks in forests and the soil are extensive, and are constantly growing due to the increasing volume of growing stock. Carbon balance is currently positive in Finnish forests, with an annual net sequestration of 22 million tonnes of CO_2. The share of wood-based fuels of overall energy consumption in Finland is about 20%, which enables a significant reduction of CO_2 emissions.

B.1 Preservation and increase of forest land

The use of forestry land is subject to a variety of widely different and simultaneous aims, needs and wishes. Forest land can be used for wood production, recreation, nature protection, tourism or landscape management. Other simultaneous aims include the use of forestry land for the construction of housing or traffic routes, or as peripheral areas of settlement.

There are no legal restrictions concerning changes in land use in Finland. Forestry land may be converted to other use, and treeless areas may be afforested.

The relative share of different forms of land use has changed very little. The area of forestry land has decreased slightly owing to the construction of houses and roads and clearing of fields, whereas the afforestation of former agricultural land and areas which used to be utilised for peat production have increased the area available for forestry purposes.

One way of monitoring changes in the area of forestry land are *National Forest Inventories* (NFI), which provide information about the development of forest resources and the state of forests. The first systematic inventory of forests was conducted as far back as in 1921–1924, and as a result Finland has long time series on the development of forest resources. The NFI forest resources report is published as a supplement to *Metsätieteen aikakauskirja* [forest science journal]. Key figures are also published annually in the Finnish Statistical Yearbook of Forestry and on the Internet in the Metinfo forest information service maintained by the Finnish Forest Research Institute[10].

National programmes and legislation

One of the aims of *the National Forest Programme 2010* is to increase forest resources in Finland. *The Natural Resources Strategy* which steers the operations of the agriculture and forestry administration was revised in 2002 and extends now to 2010. In accordance with the aims of the strategy, renewable natural resources are used sustainably and within their production capacity.

Land use planning in Finland is governed by the *Land Use and Building Act*. When necessary, areas of agriculture or forestry are marked in regional land use plans and local master plans with attributes indicating recreational use or environmental values.

Under the Forest Act, sites where regeneration felling has been carried out must be reforested to create a new forest. The basic principle of preventing forest destruction was included already in the Forest Act of 1886. The same principle has been retained in the new Forest Act of 1997, which requires that, after regeneration felling, a commercially viable stand must be created on the site within a reasonable time. The Act applies to all forests in commercial use. Compliance with the Act is monitored by *the Forestry Centres*. The main instrument for monitoring is the Forest Use Declaration, which must be completed prior to all fellings and contains information about the planned cuttings.

The Forest Act also contains provisions on protection zones where forests must be managed and utilised with special care to prevent the timberline from receding further south.

Under *the Act on the Financing of Sustainable Forestry*, private forest owners are eligible for a State subsidy. The Act promotes the increase and maintenance of the forest area, because funding is granted for the afforestation of previously treeless sites and sites where natural catastrophes have destroyed the growing stock.

Sources:

Programmes
- National Forest Programme 2010, www.mmm.fi/attachments/5fLUy9oi5/5gpA9OecX/Files/CurrentFile/The_programme_2010en.pdf
- Strategy for Renewable Natural Resources, www.mmm.fi/attachments/5gA9ccoKa/5jzS6g4vF/Files/CurrentFile/julkaisu_Luonnonvara_Englanti.pdf

Finnish legislation, www.finlex.fi/en/
- Land use and Building Act (132/1999)
- Forest Act (1093/1996)
- Act on the Financing of Sustainable Forestry (1094/1996)

Organisations, monitoring, etc.
- Ministry of Agriculture and Forestry, www.mmm.fi/en/index/frontpage.html
- Forestry Centres, www.metsakeskus.fi/web/eng
- Finnish Forest Research Institute, www.metla.fi/index-en.html
- National Forest Inventory, www.metla.fi/ohjelma/vmi/info-en.htm

10 National Forest Inventory, statistics on forest resources www.metla.fi/metinfo/vmi

Forest area[11] (1.1)

Forest area indicates changes in the land area covered by forests as well as in the proportion of forests compared to other uses of the land.

Three fourths of the land area of Finland, 22.9 million ha, is covered by forests (forest land and low productive forest). In addition, there are 3 million ha of treeless or sparsely stocked other land areas (open mires, rocky grounds, etc.) as well as 0.2 million ha of other forestry land (forest roads, storage sites, etc.). In total, forestry land covers 86% of the land area of Finland. Nature conservation areas are also included in this figure.

After the Second World War, Finland ceded about 12% of its land area to the Soviet Union. Since then, there have been slight changes in forest area due to afforestation and clearing of agricultural land, drainage works, the construction of communities, and other land use measures. Some of the increase in forest area after the 1950s is due to changes in the classification of forest land.

There are 18.1 million ha (90%) of predominantly coniferous forest land in Finland and 1.9 million ha (9%) of predominantly broadleaved forests. The rest of forest land is temporarily open areas in between regeneration fellings and subsequent afforestation.

As a result of a preference for pine in forest regeneration and of peatland drainage projects, the share of forests dominated by pine has increased. Correspondingly, the area of predominantly broadleaved forests has decreased. However, the total volume of broadleaved stock in Finnish forests has increased at the same time (Figure 1.2) as mixed stands have become more common.

National Forest Inventories conducted by the Finnish Forest Research Institute produce information about the development of forest resources. The inventories' forest resources reports are published as a supplement to Metsätieteen aikakauskirja. Key figures are also published annually in the Finnish Statistical Yearbook of Forestry.

Sources:

- Finnish Forest Research Institute, www.metla.fi/index-en.html
- National Forest Inventory, www.metla.fi/ohjelma/vmi/info-en.htm
- Metsätieteen aikakauskirja, www.metla.fi/aikakauskirja/ (in Finnish only)
- Statistical Yearbook of Forestry, www.metla.fi/julkaisut/metsatilastollinenvsk/index-en.htm
- Korhonen, K.T., Heikkinen, J., Henttonen, H., Ihalainen, A., Pitkänen, J. & Tuomainen, T. 2006. Forest Resources in Finland 2004–2005. Metsätieteen aikakauskirja 1B/2006: pp. 183–221

11 The long time series in the NFIs on the development of forest resources use the Finnish classification based on site productivity (definition see page 8). The data on forest area in this report are therefore presented using this classification. The NFIs have employed the international classification (FAO) parallel with the national classification scheme since the 9th inventory (1996–2003).

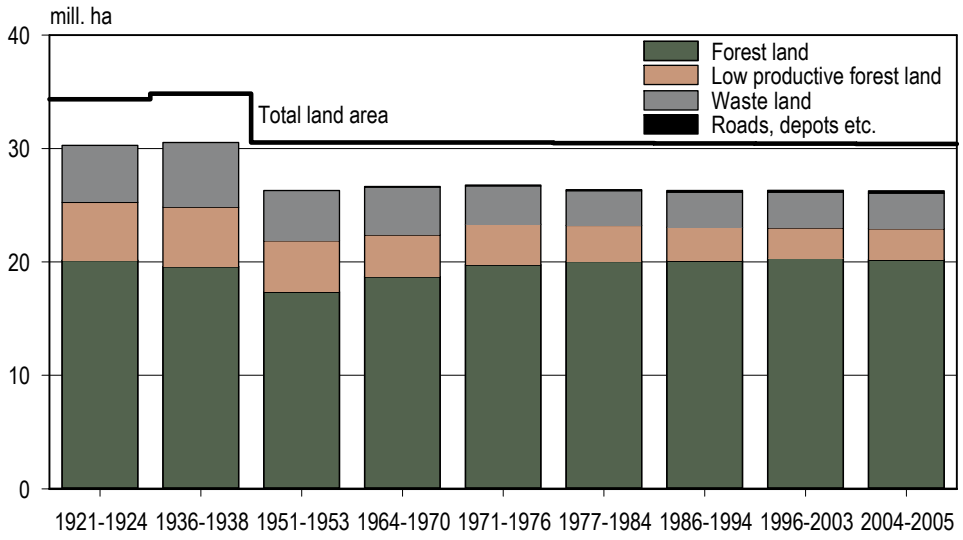


Figure 1.1a
Forest area 1921–2005
Areas ceded to the Soviet Union in 1944
The classification of forest land and low productive forest land in 1921–1953 does not correspond fully with the current classification.
Source: Finnish Forest Research Institute, National Forest Inventory

Growing stock (1.2)

The volume of growing stock indicates the opportunities for the utilisation of wood and harvesting.

In 2006, the growing stock volume was 2,190 million solid cubic metres over bark. The figure includes trees in low productive forest lands (64 million m^3) as well as trees on lands outside regular wood production[12] (135.2 million m^3).

The total volume of growing stock in Finnish forests has increased since the 1960s. This is due to the creation of new productive forest land by drainage and by afforestation of agricultural land, increased growth, a decrease in the number of low-yield stands, changes in the age structure of forests, and above all the fact that the increment has exceeded harvesting drain.

National Forest Inventories conducted by the Finnish Forest Research Institute produce information on the development of forest resources. The inventories' forest resource reports are published as a supplement to Metsätieteen aikakauskirja. Key figures are also published annually in the Finnish Statistical Yearbook of Forestry.

Sources:

- Finnish Forest Research Institute, www.metla.fi/index-en.html
- National Forest Inventory, www.metla.fi/ohjelma/vmi/info-en.htm
- Metsätieteen aikakauskirja, www.metla.fi/aikakauskirja/ (in Finnish only)
- Statistical Yearbook of Forestry, www.metla.fi/julkaisut/metsatilastollinenvsk/index-en.htm
- Korhonen, K.T., Heikkinen, J., Henttonen, H., Ihalainen, A., Pitkänen, J. & Tuomainen, T. 2006. Forest Resources inFinland 2004–2005. Metsätieteen aikakauskirja 1B/2006: pp. 183–221

12 In the NFIs, this category includes conservation areas based on the Nature Conservation Act and on other legislation, natural forests, recreation forests, park forests, recreational areas for short-range outdoor activities, training areas of the Defence Forces and other special areas where clear cuttings and other silvicultural measures are restricted.

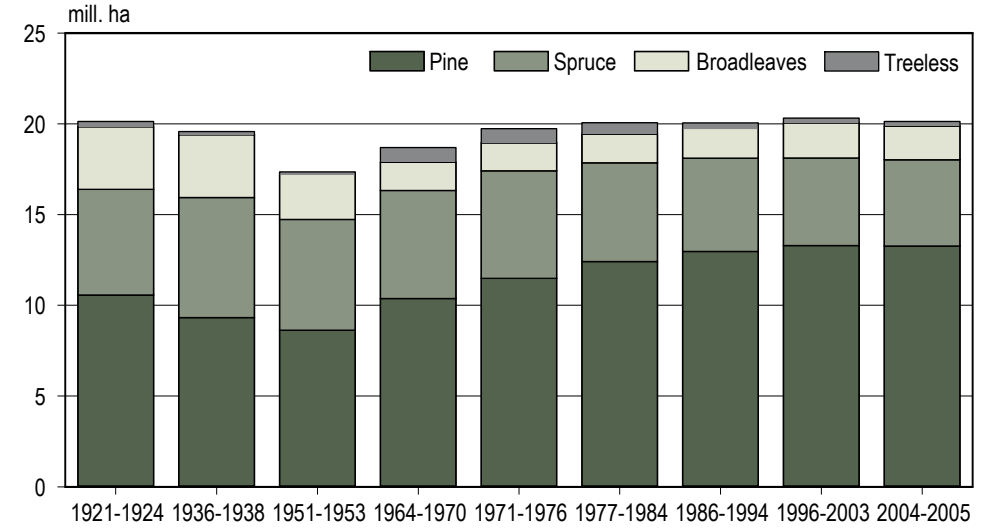


Figure 1.1b entire country
Predominance of tree species on forest land 1921–2005
Areas ceded to the Soviet Union in 1944
Source: Finnish Forest Research Institute, National Forest Inventory

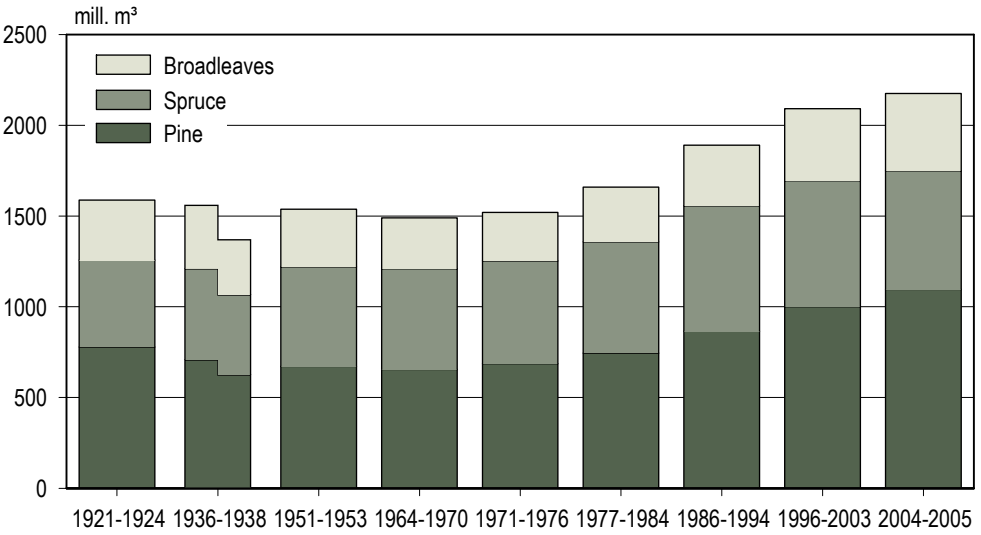


Figure 1.2
Growing stock volume on forest and low productive forest land 1921–2005
Areas ceded to the Soviet Union in 1944
Source: Finnish Forest Research Institute, National Forest Inventory

Age structure of forests (1.3)

The age structure of forests is an indication of the history of the development and use of forests, and of the structure of growing stock. The development of stand attributes is generally presented relative to stand age. Stand age is also an important factor in forest management planning. The aim in wood production is an age structure which maintains a high, even and sustainable yield. This aim can be attained with an even age structure, where the age of the oldest stands corresponds to the recommended rotation length. The recommended rotation length varies geographically from 50 years to 120 years depending on the species and the site.

The age structure of Finnish forests is nowadays fairly even. Looking at the situation by tree species, however, the age structure deviates from the recommended structure for wood production. Stands dominated by Scots pine or broadleaves are young, whereas those dominated by spruce are usually older.

The age structure of forests has changed radically since the 1920s. The proportion of middle-aged forests has decreased especially in southern Finland, and that of old forests in northern Finland. Owing to large nature conservation areas, however, in the north of Finland there are still a great many forests that are over 140 years old. In the beginning of the 20th century, the effects of slash-and-burn agriculture and selection logging as well as the great proportion of forests outside commercial management in Lapland were still clearly discernible. The current age structure is the result of the rise of forest industry and its increased need for raw materials, systematic silviculture and changes in harvesting methods.

National Forest Inventories conducted by the Finnish Forest Research Institute produce information on the development of forest resources. The inventories' forest resource reports are published as a supplement to Metsätieteen aikakauskirja. Key figures are also published annually in the Finnish Statistical Yearbook of Forestry.

Sources:

- Finnish Forest Research Institute, www.metla.fi/index-en.html
- National Forest Inventory, www.metla.fi/ohjelma/vmi/info-en.htm
- Metsätieteen aikakauskirja, www.metla.fi/aikakauskirja/ (in Finnish only)
- Statistical Yearbook of Forestry, www.metla.fi/julkaisut/metsatilastollinenvsk/index-en.htm
- Korhonen, K.T., Heikkinen, J., Henttonen, H., Ihalainen, A., Pitkänen, J. & Tuomainen, T. 2006. Forest Resources in Finland 2004–2005. Metsätieteen aikakauskirja 1B/2006: pp. 183–221

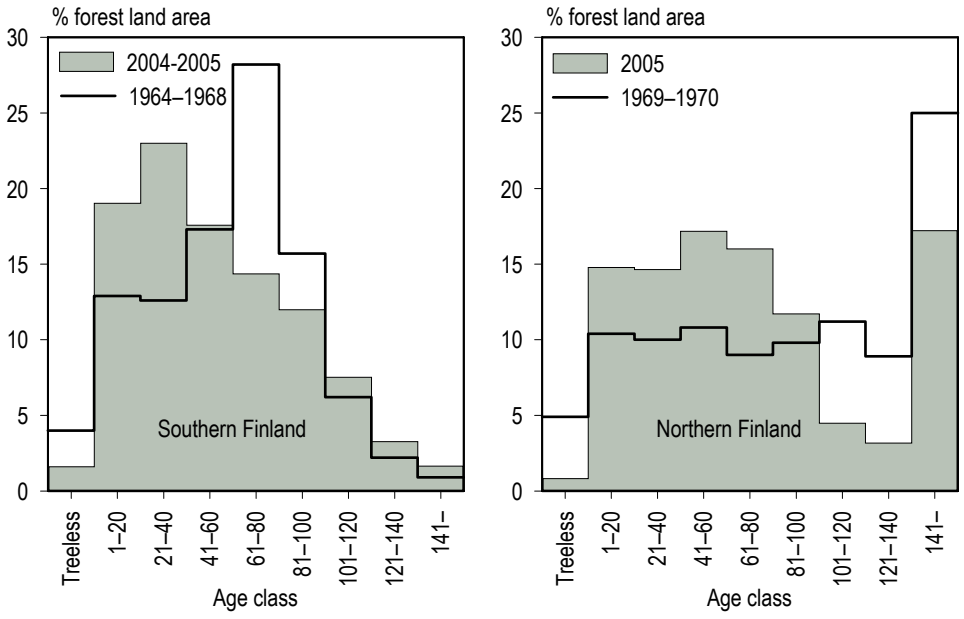


Figure 1.3a
Age structure of forests in the 1960s and the 2000s
Source: Finnish Forest Research Institute, National Forest Inventory

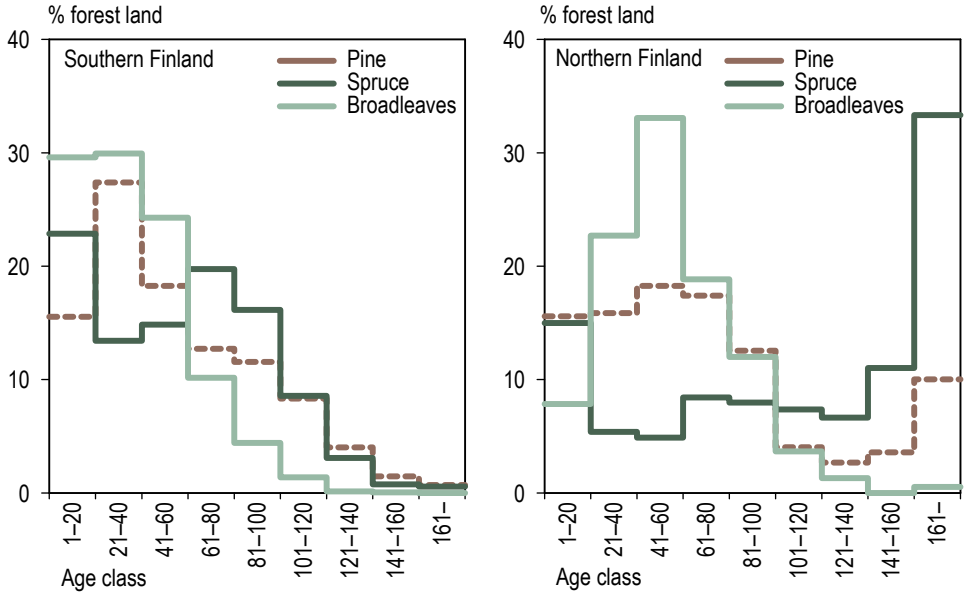


Figure 1.3b
Age structure of stands by predominant tree species 2004–2005
Source: Finnish Forest Research Institute, National Forest Inventory

B.2 Maintenance of carbon balance in forests

The concentrations of greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and halogenated hydrocarbons (F gases) in the atmosphere have increased over the last hundred years. Greenhouse gases prevent heat from radiating back into space, as a consequence of which they warm up the climate.

The amount of carbon dioxide emitted into the atmosphere can be reduced by maintaining and increasing the area of forests and the volume of growing stock, as well as by ensuring the preservation of carbon stocks in the soil. The carbon pool increases when the annual increment of growing stock exceeds the drain, and more carbon is sequestered in trees than is released in harvests. The trees function as a carbon sink.

The maintenance and increase of the capacity of the soil and trees to sequester carbon is only one factor in climate change. The main objectives in mitigating climate change are the reduction of greenhouse gas emissions and the substitution of non-renewable raw materials and energy sources with renewable biomass, such as wood based products and energy.

Policy instruments for the prevention of climate change

The Kyoto Protocol, which builds upon the UN Framework Convention on Climate Change (UNFCCC), commits industrial economies and economies in transition to reduce their collective emissions in 2008–2012 to five percent below the levels of 1990. Under the Burden-Sharing Agreement of the European Union, Finland must reduce its average emissions during the commitment period to the same level as they were in 1990, that is, to 71.1 million tonnes of carbon dioxide equivalents per year.

Under *the National Energy and Climate Strategy* approved by the Government and submitted to the Parliament as a Government report, Finland invests in the introduction of renewable energy sources, energy saving and the reduction of greenhouse gas emissions. Using the mechanisms for carbon trading, the State will also acquire Assigned Amount Units (AAU) as permitted by the Kyoto Protocol.

Finland's National Strategy for Adaptation to Climate Change was completed in 2005. The Strategy describes the impacts of climate change on forestry, among other things, and outlines measures needed in forest management. On the basis of the Strategy, a research programme was launched in 2006 on adaptation to climate change.

Emissions Trading Act

The Emissions Trading Act and Decree apply to carbon dioxide emissions of combustion installations with a rated thermal input of more than 20MW and of certain installations and processes in the steel, mineral and forest industries. The emissions trading system in Finland covers about 550 installations and 150 companies. Under the Emissions Trading Act, the Government has allocated installation-specific emission allowances for the period 2005–2007. As set out in *the Emissions Trading Act*, the national authority in emissions trading in Finland is the Energy Market Authority, which operates under the jurisdiction of the Ministry of Trade and Industry. The Authority is charged with issuing emission permits and monitoring compliance, maintaining an emissions trading registry, monitoring compliance with obligations resulting from emissions trading, and accepting ETS verifiers.

The use of wood chips is on the increase. Wood is an important raw material for producing energy for heating, especially in population centres in rural areas. The photo shows a local heating plant using wood chips in Punkaharju.

Promoting the use of renewable energy

Carbon dioxide emissions are also reduced by substituting non-renewable raw materials and energy sources with renewable biomass. The promotion of renewable energy sources is based on *the Programme for Promoting Renewable Energy* for the period 2003–2006. The aim is to make energy produced from renewable sources competitive on the open market. The programme aims at increasing the use of renewable energy to 413 petajoule (PJ) by the year 2010, an increase of about 28% compared to the level of 2002. Goals for the use of renewable energy have also been set in other programmes. *The National Forest Programme 2010* set an additional target of harvesting five million m^3 of energy wood annually by the year 2010. In *the Future Review for the Forest Sector* prepared by the national Forest Council in 2006, the target was raised to eight million m^3 by 2015. Under *the Act on the Financing of Sustainable Forestry*, the harvesting and chipping of energy wood from thinning stands is subsidised by the State.

Financial instruments are also used to direct the choice of different forms of energy. *The excise duty* on traffic and heating fuels in Finland is based on their CO_2 content. Wood and wood-based fuels and peat are exempt from the duty, and an *electricity production subsidy* is paid for electricity produced with wood and peat. In autumn 2006 the Government passed a bill to promote *the use of biofuels in traffic*. The bill proposes that, in accordance with the decision of the European Union, at least 5.75% of the fuel supply would be biofuels by the year 2010.

Reporting on greenhouse gas emissions

The parties to the UN Climate Convention are required to submit to the UNFCCC Secretariat *a national greenhouse gas inventory*, assessing and reporting on anthropogenic greenhouse gas emissions to and removals from the atmosphere. In addition to data on emissions, the report includes accounts of the methods used in emission calculations and any changes made to them.

The Finnish national inventory is prepared by *Statistics Finland*, which also participates in the preparation of the greenhouse gas inventory for the European Union. In addition to Statistics Finland, inventory calculations are made by the Finnish Environment Institute, Agrifood Research Finland and the Finnish Forest Research Institute. The Finnish Forest Research Institute calculates the carbon balance of forest land woody biomass, the change in carbon dioxide sequestered in trees. Since 2005 also changes in the volume of dead wood and carbon stocks in soil have been reported.

Sources:

Treaties and programmes

- United Nations Framework Convention on Climate Change, unfccc.int/
- Kyoto Protocol, unfccc.int/kyoto_protocol/items/2830.php
- National Energy and Climate Strategy of Finland, www.ktm.fi/index.phtml?l=en&s=164
- Finland's National Strategy for Adaptation to Climate Change, www.mmm.fi/attachments/5enfdAPe1/5kghLfz0d/Files/CurrentFile/MMMjulkaisu2005_1a.pdf
- Programme for Promoting Renewable Energy, www.ktm.fi/index.phtml?l=en&s=180 (English summary)

- National Forest Programme 2010, www.mmm.fi/attachments/5fLUy9oi5/5gpA9OecX/Files/CurrentFile/The_programme_2010en.pdf
- Future Review for the Forest Sector, www.mmm.fi/attachments/5enfdAPe1/5m6LgokFX/Files/CurrentFile/MMMjulkaisu2006_11b.pdf

Finnish legislation, www.finlex.fi/en/

- Emissions Trading Act (683/2004)
- Government Decree on Emissions Trading (730/2004)
- Environmental Protection Act (86/2000)
- Act on Excise Duty on Electricity and Certain Fuels (1260/1996)
- Act on the Financing of Sustainable Forestry (1094/1996)

Organisations, monitoring, etc.

- Ministry of Trade and Industry, www.ktm.fi/?l=en&s=1
- Energy policy, www.ktm.fi/?l=en&s=7
- Energy Market Authority, www.energiamarkkinavirasto.fi/index.asp?start=1&languageid=826
- Statistics Finland, www.stat.fi/index_en.html
- National Greenhouse Gas Inventory, http://www.stat.fi/tup/khkinv/index.html (in Finnish only)

Carbon stock (1.4)

The main greenhouse gas, carbon dioxide, is absorbed and stored (sequestered) into vegetation and the soil by forests.

The amount of CO_2 sequestered in the soil in Finnish forests is currently estimated to be about 23,500 million tonnes, of which about 3,500 tonnes are in the soil of upland forests and about 20,000 tonnes in the soil of peatlands. The amount of carbon sequestered in woody biomass is about 2,780 million tonnes of carbon dioxide.

The carbon stock in trees increases when the annual increment of growing stock exceeds the drain. The amount of the carbon stock in soil varies with changes in forest litter production, weather conditions and fellings. The carbon stocks sequestered in forest vegetation and soil in Finland have increased – the forests have functioned as a carbon sink.

The Finnish national inventory is prepared by Statistics Finland, which also participates in the preparation of the greenhouse gas inventory of the European Union. The Finnish Forest Research Institute calculates the carbon balance of woody biomass, the change in carbon dioxide sequestered in trees. Since 2005 also changes in the volume of dead wood and carbon stocks in soil have been reported.

Sources:

- Statistics Finland, www.stat.fi/index_en.html
- National Greenhouse Gas Inventory, http://www.stat.fi/tup/khkinv/index.html (in Finnish only)
- Greenhouse Gas Emissions in Finland 1990–2005. National Inventory Report to the UNFCCC. 15 April 2007. Statistics Finland. 292 p.
- Liski, J. et al. 2006. Carbon accumulation in Finland's forests 1922–2004 - an estimate obtained by combination of forest inventory data with modelling of biomass, litter and soil. Ann. For. Sci. 63 (2006): pp. 687–697
- Minkkinen, K. et al. 2002. Carbon balance and radiative forcing of Finnish peatlands in 1900–2100 - impacts of drainage for forestry. Global Change Biology 8: pp. 785–799

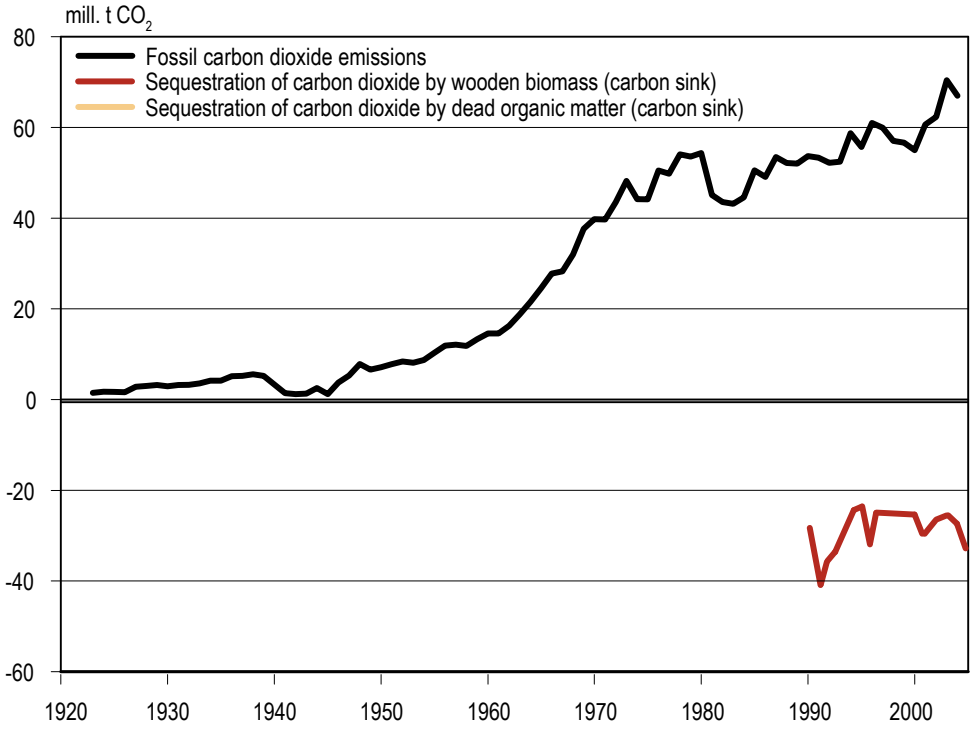


Figure 1.4
Carbon balance between emissions of fossil carbon dioxide (1923–2004) and net changes in sequestration of carbon dioxide by wooden biomass, dead organic matter and soil organic matter (1990–2005) in Finland
Sources: European Forest Institute, Finnish Forest Research Institute, VTT Technical Research Centre of Finland

Table 1.4
Carbon pool on forest land in Finland as net sequestration of CO2 by wooden biomass, dead organic matter and soil organic matter. "–" sequestration (sinks), "+" emissions , 1990–2005
Sources: Finnish Forest Research Institute, Statistics Finland

year	mill. tonnes CO_2 /year					
	CO_2 sequestered through the increment	CO_2 released through removals	Sequestration of CO_2 by wooden biomass	Dead organic matter	Soil organic matter	Total
1990	-100,7	72,1	-28,6	-6,9	7,7	-27,8
1991	-100,7	58,6	-42,1	-7,1	7,5	-41,7
1992	-101,2	66,7	-34,5	-8,1	6,9	-35,7
1993	-102,1	70,4	-31,7	-8,4	6,2	-33,9
1994	-101,7	80,6	-21,1	-9,2	6,0	-24,3
1995	-103,0	83,1	-19,9	-10,0	5,9	-24,0
1996	-103,0	77,0	-26,1	-10,7	5,4	-31,4
1997	-107,4	85,9	-21,5	-10,5	6,7	-25,3
1998	-111,8	90,4	-21,3	-10,2	6,8	-24,7
1999	-112,2	90,4	-21,8	-10,2	6,1	-25,9
2000	-112,2	91,1	-21,1	-9,6	5,5	-25,2
2001	-112,2	88,2	-24,0	-8,9	4,9	-28,0
2002	-112,2	89,5	-22,8	-8,4	4,2	-27,0
2003	-112,2	90,9	-21,3	-8,0	3,6	-25,7
2004	-112,2	91,0	-21,2	-8,0	3,0	-26,2
2005	-124,9	87,8	-37,2	-3,4	2,9	-37,7

Use of wood-based fuels (6.9)

Carbon dioxide emissions and the threat of subsequent climate warming can be mitigated by substituting fossil fuels with renewable energy sources[13]. In Finnish forest industry, waste liquors as well as bark, chips and sawdust provide a source of renewable energy. The same applies to logging residue, the branches and crowns of trees left in forests in regeneration fellings and thinnings. In addition to reducing greenhouse gas emissions, the use of wood for energy has the effect of increasing self-sufficiency in energy production, promoting good silvicultural practices, and improving the employment situation.

In 2006, wood-based fuels[14] accounted for 300 petajoule (PJ) of energy production in Finland. Their share of the total consumption of energy in Finland was 20%. Most forest industry installations are self-sufficient in terms of energy as they can utilise all woody waste and waste liquors for energy production. The use of wood-based fuels has increased in Finland since the 1990s.

Annual statistics on the overall consumption of energy are compiled by Statistics Finland. The amount of wood-based fuels used by the forest industry and by heating and power plants is calculated annually by the Finnish Forest Research Institute, which also calculates the amount of fuelwood used by detached houses every 5–10 years.

Sources:

- Statistics Finland, www.stat.fi/index_en.html
- Energy statistics, yearbook 2006. Official energy statistics for 2006. Statistics Finland. 152 p. (in Finnish only)
- Finnish Forest Research Institute, www.metla.fi/index-en.html
- Metinfo statistics, www.metla.fi/metinfo/tilasto/ (in Finnish)
- Metsätilastotiedote 867. Puun energiakäyttö 2006 [Use of wood for energy 2006]. Finnish Forest Research Institute, Forest Statistics Service. 9 p.
- Sevola, Y., Peltola, A. & Moilanen, J. 2003. Polttopuun käyttö pientaloissa 2000/2001 [Use of fuelwood in detached houses]. Notifications of the Finnish Forest Research Institute 894. 30 p.

13 Renewable energy sources are solar, wind and bioenergy, geothermal energy and energy from the motion of waves and tides. Bioenergy is energy from the combustion of biological fuels. Biofuels are made from biomass growing in forests, peatlands and fields, and from suitable organic waste produced by communities, agriculture and industry. Bioenergy accounts for 90% of all renewable energy sources.

14 Wood-based fuels are waste liquors and other byproducts of the forest industry (tall oil and birch oil, soft soap, methanol, biosludge, paper), forest chips, industrial chips, sawdust, bark, recycled wood, pellets, briquettes and fuelwood.

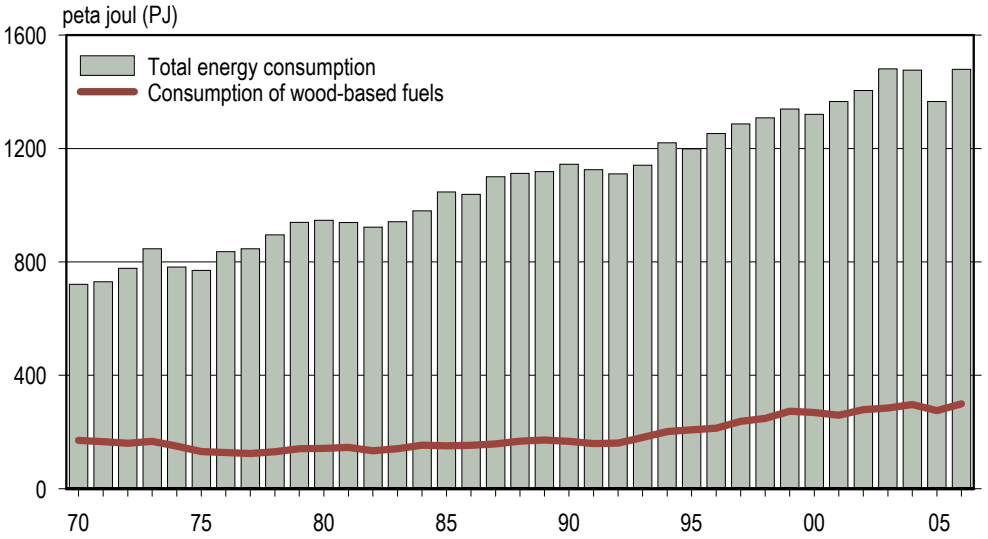


Figure 6.9a
Total energy consumption and consumption of wood-based fuels, 1970–2006
Source: Statistics Finland

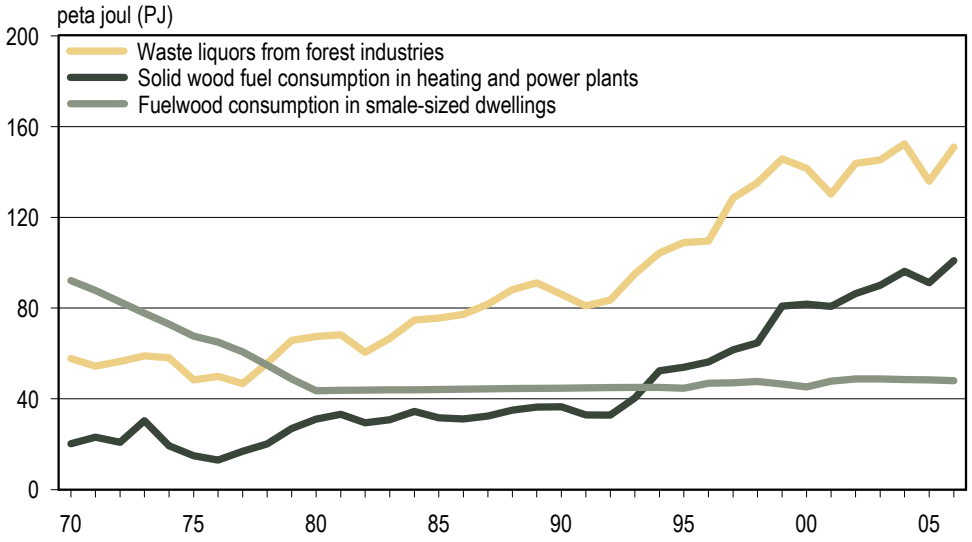


Figure 6.9b
Consumption of wood-based fuels, 1970–2006
Source: Statistics Finland

Criterion 2 Health and Vitality

The greater part of the deposition of atmospheric pollutants in Finland – 71% of the nitrogen deposition and 83% of the sulphur deposition – comes from abroad. The deposition load has decreased considerably compared to the 1980s. Measurements of the nitrogen and sulphur content in soil water show no significant changes in the acidity of forest land to date.

Based on defoliation measurements, the health status of Finnish forests is satisfactory and has remained stable. There have been no major forest damages in the past 20 years, not even damages caused by air pollutants. In economic terms, the greatest causes of occasional local forest damage have been fungi and insects, storms and damages to saplings caused by moose. Thanks to efficient monitoring, forest fires have remained extremely small in area, although there are several hundred fires each year.

B.3 Maintenance of health and vitality of forests

Forest health can decline due to abiotic agents such as atmospheric pollutants, exceptional weather conditions or careless harvesting or timber storage. Deteriorating health can also be due to biotic agents such as diseases caused by fungi and insects. Climate change is expected to increase the risk of local damages caused by snow, storms and insects.

International treaties for reducing atmospheric pollutants

Atmospheric pollutants present a global problem, because they are transported far and wide across borders and have a detrimental effect on many things, including the vitality of forests. *The Convention on Long-Range Transboundary Air Pollution (CLRTAP)* entered into force in 1983. It seeks to reduce the emissions of substances that have deleterious effects, such as sulphur, nitrogen, heavy metals, volatile organic compounds and persistent organic pollutants, or to restrict their use. At *the Earth Summit in Kyoto in 1997*, an agreement was reached on the reduction of greenhouse gas emissions. Finland also participates in the work of the Intergovernmental Panel on Climate Change (IPCC), the body of climate experts established in 1988. To implement the EU Directive on National Emission Ceilings (2001/81/EC), the Finnish Government has adopted *the Air Pollution Control Programme 2010*.

Legislation, national programmes and other instruments for the protection of forests

The Act on Protecting Plant Health governs measures that are used to control pests and prevent their spreading. The Act contains provisions on the importation, exportation and marketing of plant products.

The Forest Insect and Fungi Damage Prevention Act restricts the storage of coniferous timber in forests and other permanent outdoor storage areas in the summer. It also stipulates that damaged coniferous trees must be removed from the forest whenever their amount exceeds a certain minimum, and it provides for the possibility to control damage caused by insects and fungi in conjunction with fellings and the tending of seedling stands.

The Act on Trade in Forest Reproductive Material applies to the production, sale, import and export of seedlings and seeds of forest tree species. Seeds and planting stock must be suitable for the intended site in terms of their species and origin, as well as viable and otherwise suited to the purpose.

The importance of using indigenous tree species in forest regeneration after harvesting is stressed in *the Forest Act*.

Under *the Act on the Financing of Sustainable Forestry*, funding can be granted for forest remedial fertilisation, afforestation of areas suffering from natural catastrophes, and for the control and prevention of root-rot fungus in risk areas.

Under *a decision of the EU Commission*, efforts are made to prevent *the spread of pine wood nematode (PWN)* from outside the EU along with imports of coniferous wood products, sawn wood or coniferous packing material. Under the decision, all coniferous goods imported into the territory of the EU are inspected by the plant inspection authorities of the Member States. Finland has been granted an exception concerning the inspection of coniferous wood coming from the European part of Russia. Coniferous wood coming from that area is inspected by taking samples from 1% of the goods.

The National Plant Protection Strategy 2004–2013 includes an estimate of the current status of plant protection as well as changes and development needs in the operating environment. The Strategy provides the basis for the setting of protection goals for forest trees as well as determining actions for their attainment.

The moose population is regulated regionally under a system of hunting permits. Under *the Hunting Act*, moose populations must be kept at a level where the damages caused by the animals to traffic, agriculture and forestry remain moderate. The income from game management and hunting permits is used by the Ministry of Agriculture and Forestry to compensate damages to traffic, agriculture and forestry.

Monitoring systems

The Finnish Meteorological Institute has 14 stations that monitor long-term changes in air quality, and *the Finnish Environment Institute* has 29 stations for observing the quality of precipitation and depositions. The Finnish Environment Institute has published summaries in 2003 and 2006 on the environmental monitoring of natural resources, the state of the environment, water, health, land use, environmental policy, and the management and utilisation of monitoring information. The *volume of emissions in Finland* is calculated by *Statistics Finland*.

Since 1985, Finland has participated in the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests). In the EU countries, monitoring is based on EU regula-

Crown defoliation (needle loss in conifers) indicates reduced tree vitality.

tions *(Forest Focus programme)*. In 2007, Forest Focus is being converted into a monitoring programme, which in addition to forest health also monitors biodiversity indicators and is eligible for Life+ funding.

The Finnish Forest Research Institute conducts *annual inventories* of the health of individual trees in about 600 permanent sample plots following internationally agreed methods. The effects on forest health of atmospheric pollutants as well as other stressors are studied in detail in 31 stands across Finland.

Forest health is also monitored in the National Forest Inventories. The Forest Research Institute prepares annual forecasts on changes in the populations of certain insect pests and voles, and provides expert assistance in matters involving forest damage.

Sources:

Treaties and programmes

- United Nations Framework Convention on Climate Change, unfccc.int
- The Convention on Long-Range Trans-Boundary Air Pollution (CLRTAP) (15/1983), www.finlex.fi (Finnish version)
- Kyoto Protocol, unfccc.int/kyoto_protocol/items/2830.php
- Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants, www.europa.eu/scadplus/leg/en/lvb/l28095.htm
- Commission Decision (2006/133/EC) requiring Member States temporarily to take additional measures against the dissemination of Bursaphelenchus xylophilus (the pine wood nematode), eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:052:0034:0038:EN:PDF
- Forest Focus programme, europa.eu/scadplus/leg/en/lvb/l28125.htm
- Regulation (EC) No 2152/2003 of the European Parliament and of the Council of 17 November 2003 concerning monitoring of forests and environmental interactions in the Community (Forest Focus)
- Intergovernmental Panel on Climate Change (IPCC), www.ipcc.ch/
- Finnish Air Pollution Control Programme 2010, www.ymparisto.fi/default.asp?node=6041&lan=en (English summary)
- National Plant Protection Strategy 2004–2013, www.mmm.fi/julkaisut/tyoryhmamuistiot/2003/tr2003_25.pdf (in Finnish only)

Finnish legislation, www.finlex.fi/en/

- Act on Protecting Plant Health (1203/1994)
- Forest Insect and Fungi Damage Prevention Act (263/1991)
- Act on Trade in Forest Reproductive Material (241/2002)
- Forest Act (1093/1996)
- Hunting Act (615/1993)
- Act on the Financing of Sustainable Forestry (1094/1996)

Organisations, monitoring, etc.

- Finnish Meteorological Institute, www.fmi.fi/en/index.html
- Statistics Finland, www.stat.fi/index_en.html
- Ympäristötilasto (Environmental statistics) 2006. 2006. Statistics Finland. 208 p. (Finnish)
- Finnish Forest Research Institute, www.metla.fi/index-en.html
- National Forest Inventory, www.metla.fi/ohjelma/vmi/info-en.htm
- Damage reports and forecasts, Metinfo service, www.metla.fi/metinfo/metsienterveys/ (in Finnish only)
- Finnish Environment Institute, www.ymparisto.fi/default.asp?node=5297&lan=en
- Niemi, J. (ed.). 2006. Ympäristön seuranta Suomessa [Environmental monitoring in Finland] 2006–2008. Suomen ympäristö 24. Finnish Environment Institute. 151 p.

Deposition of air pollutants (2.1)

Atmospheric pollutants impair the vitality of forests by affecting trees and other organisms both directly and indirectly, as well as through soil. Trees suffering from pollutants are also susceptible to damage from extreme weather conditions and to destruction.

Gases resulting from the combustion of fossil fuels contain sulphur and nitrogen oxides which react chemically in the atmosphere and fall to the earth as acid deposition. A considerable part of acid deposition comes with long-range pollution transport. 71% of the nitrogen deposition and 83% of the sulphur deposition measured in Finland originates abroad.

There is as yet no information on the long-term cumulative effects of acid deposition on soils, and the capacity of forest soils to neutralise acid is not completely known.

The observation stations of the Finnish Environment Institute monitor bulk deposition, which mostly consists of wet deposition from rain. Regional deposition

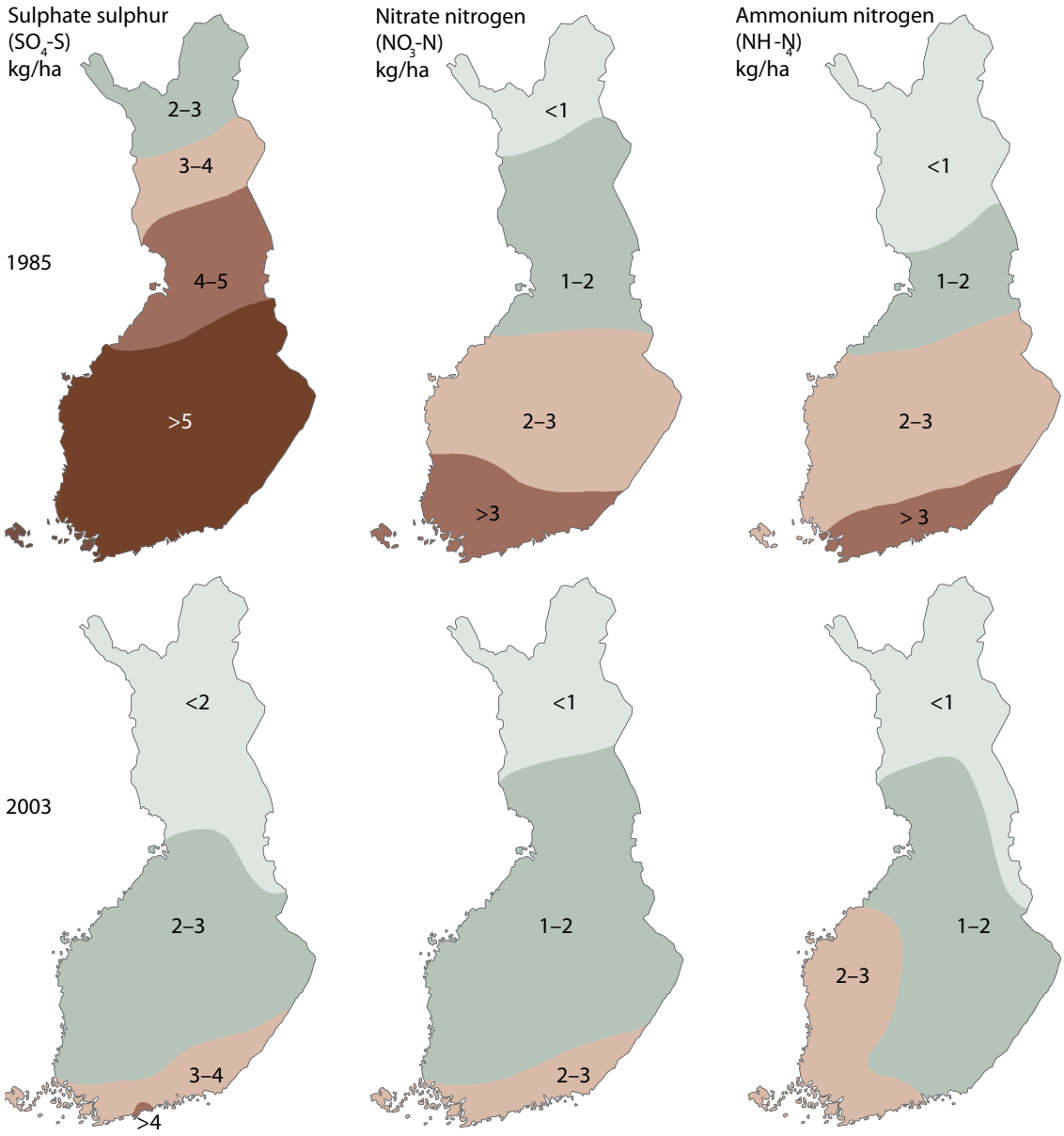


Figure 2.1
Total deposition of sulphate sulphur and nitrogen (nitrate nitrogen and ammonium nitrogen) in 1985 and 2003
Source: Finnish Environment Institute

values are based on the results of the Environment Institute's network of observation stations which covers the entire country. In 2003 the sulphur deposition was 2–4 kg/ha and nitrogen deposition 2–6 kg/ha. At the Environment Institute's observation stations, sulphur deposition has decreased 50–60% and nitrogen deposition 20–40% since 1985. A decrease in sulphur deposition was observed also in some sample plots of the Forest Focus programme in the period 1996–2003, but no clear change in the amount of nitrogen deposition was found.

The decrease in sulphur deposition is the result of reductions of emissions from energy production, reduced use of industrial fuel oil, the introduction of new alternative energy sources, and improvements in the production methods of pulp and paper plants and metal and chemical industries.

Under the Forest Focus programme, the Finnish Forest Research Institute monitors the effects on forest health of atmospheric pollutants as well as other stressors on 31 forest stands in various parts of the country.

Sources:

- Finnish Environment Institute, www.ymparisto/default.asp?node=5297&lan=en
- Finnish Forest Research Institute, www.metla.fi/index-en.html
- Finnish Statistical Yearbook of Forestry 2006. Skogsstatistisk årsbok. Finnish Statistical Yearbook of Forestry. SVT Agriculture, forestry and fishery 2006. 438 p.

Chemical soil condition (2.2)

Changes in the chemical composition of the soil, such as acidification[15] and eutrophication[16], affect trees either directly or indirectly, through the process of decomposition of organic matter by organisms in the soil.

The soil in coniferous forests is acid by nature. The most favourable pH range for conifers is 4.7–5.5. If the soil is any more acid, the rate of growth of trees slows down as their nutrient uptake becomes more difficult. When soil pH falls below 4, the leaching of nutrients vital to trees increases.

The decomposition of organic matter also slows down in acid soils, reducing the nitrogen supply of plants. Increased soil acidity destroys many easily decomposing plants which produce nitrogen-rich litter in the forest. However, acidification reduces the productivity of forest land only very slowly.

The eutrophication of forests is not a problem for the health of trees and vegetation in the short term. If eutrophication is widespread and prolonged, the biological diversity and species composition of forests change as a result of a reduction in the area of nutrient poor sites and their species.

The deposition of acidifying and eutrophying compounds has been monitored since 1996 on sample sites for intensive monitoring under the Forest Focus programme. No changes in the concentrations of sulphur or nitrogen in soil water have been observed during the monitoring period. In other studies conducted by the Finnish Forest Research Institute, only weak signs of acidification in forest soils have been observed. The decrease of sulphur concentrations in the organic layer of soils is linked to the decrease in sulphur deposition that started in the 1980s. The stability of nitrogen concentrations in the soil or their decrease over the monitoring period implies that the current nitrogen deposition will not constitute a health risk for forests in southern Finland in the near future.

15 Acidification = In acidification, the capacity of the soil to resist, or neutralise, acid deposition deteriorates. Acidifying compounds can be deposited in the soil with rain (wet deposition) or as particles or gases (dry deposition).

16 Eutrophication = Eutrophication means the increase of primary productivity caused by increased amounts of nutrients. In a soil ecosystem, eutrophication can manifest as increased growth of standing stock, for example. Increased growth is caused especially by nitrogen deposition, but increased concentrations of CO2 in the atmosphere also increase the growth of trees.

Current depositions of nitrogen and sulphur do not lead to acidification of forest land, and have not changed the nutrient cycle of different soil layers.

Under the Forest Focus programme, the Finnish Forest Research Institute monitors the effects on forest health of atmospheric pollutants as well as other stressors in 31 forest stands in various parts of the country.

Source:

- Tamminen, P. & Derome, J. 2005. Temporal trends in chemical parameters of upland forest soils in southern Finland. Silva Fennica 39(3): pp. 313–330

Defoliation (2.3)

Defoliation[17] – the loss of needles/leaves relative to a crown with 0% defoliation – is an indication of the general condition of trees. A decrease in the biomass of photosynthesising needles or leaves affects the vital functions of trees and reduces their growth.

Defoliation is assessed visually. In upland forests, 3% of pine, 22% of spruce and 7% of broadleaves were classified as damaged[18] in 2005.

The proportion of undefoliated pines (defoliation less than 10%) had decreased and the proportion of slightly defoliated pines (10–25%) had grown slightly during the monitoring period 1986–2005. However, the proportion of damaged trees in all tree species had remained nearly unchanged over the past few years.

In Finland, defoliation is primarily caused by ageing, unfavourable weather and climate conditions and damage due to fungi and insects. In the vicinity of local emission sources, in built-up areas and along roads, defoliation is also caused by atmospheric pollutants. Under the Forest Focus health monitoring programme,

17 Defoliation, the loss of needles or leaves, is an indicator of vitality. The degree of defoliation is classified as slight when it is 10–25%, moderate >25–60%, severe >60–99%, and dead 100%.

18 A tree is classified as damaged when defoliation is greater than 25%.

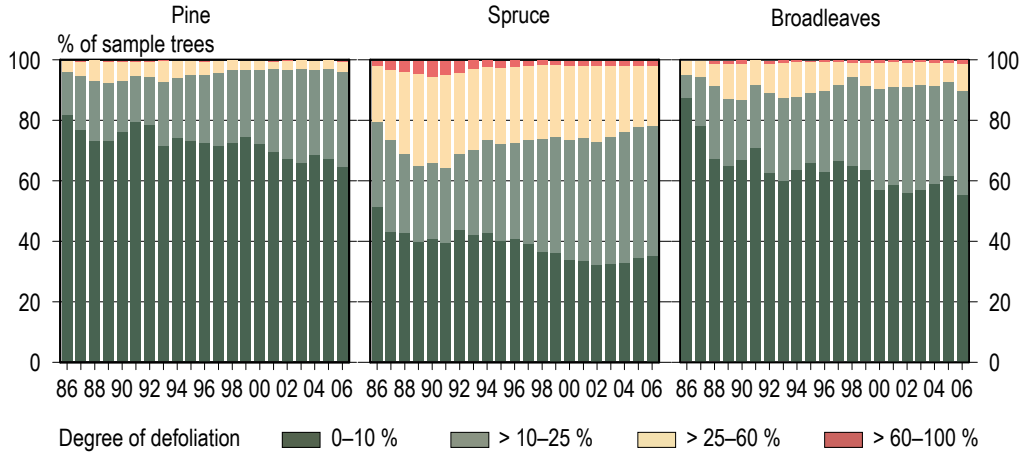


Figure 2.3
Defoliation frequency distribution for pine, spruce and broadleaves in mineral-soil sites, 1986–2006 (from 2004 the figures also include reference trees on peatland)
Source: Finnish Forest Research Institute, annual monitoring of forest vitality

the Finnish Forest Research Institute inventories the health of individual trees annually from about 600 permanent sample plots under internationally agreed methods.

Source:

- Finnish Statistical Yearbook of Forestry 2006. Skogsstatistisk årsbok. Finnish Statistical Yearbook of Forestry. SVT Agriculture, forestry and fishery 2006. 438 p.

Forest damage (2.4)

Forest damage can be caused by various abiotic[19] and biotic[20] agents. Damage caused by diseases or other damaging agents to individual trees is normal in forests, but if biotic agents succeed in spreading over large areas forest damage is considered to have occurred. The prevalence of damaging agents and the resultant damages vary depending on pest populations and weather conditions.

Damages requiring immediate regeneration occurred in 2004 and 2005 in a total of 31,000 hectares. Lesser damages occurred in larger areas. Damages necessitating regeneration were caused above all by snow and moose, as well as Scleroderris canker and resintop disease. Most of the causal agents remain unidentified, however.

No extensive forest damage has occurred in Finland in the last few decades. Continuous damage is, however, caused in southern and central Finland by Annosus root-rot, which primarily attacks conifers. The increased moose population causes damage to seedling stands of pine and birch in particular, but also of spruce. There are also local epidemics of Scleroderris canker, Pine sawfly, autumnal moth and voles. Wind and snow can also cause significant damages locally.

In addition to parameters of growing stock, forest damages and their effects on stock are also assessed in the sample plots of the National Forest Inventories conduced by the Finnish Forest Research Institute. The inventory reports are published as a supplement of Metsätieteen aikakauskirja. Key figures are published annually in the Finnish Statistical Yearbook of Forestry.

Root-rot *(Heterobasidion parviporum)* is the most destructive fungus of conifers in southern Finland.

The forest damage diagnostic service of the Finnish Forest Research Institute compiles an annual report for the Ministry of Agriculture and Forestry on damages observed in forests during the preceding year. Forest fires are entered in the Pronto database maintained by the Department for Rescue Services of the Ministry of the Interior.

The size of the moose population is assessed by the Finnish Game and Fisheries Research Institute. The Ministry of Agriculture and Forestry gathers information on damage to private forests caused by moose for which compensation is paid.

19 Abiotic agents are wind, snow, sub-zero temperatures, other climate and weather conditions, forest fires, soil-related factors, logging, atmospheric pollutants, and other human activities.

20 Biotic agents are fungi, insects and vertebrates.

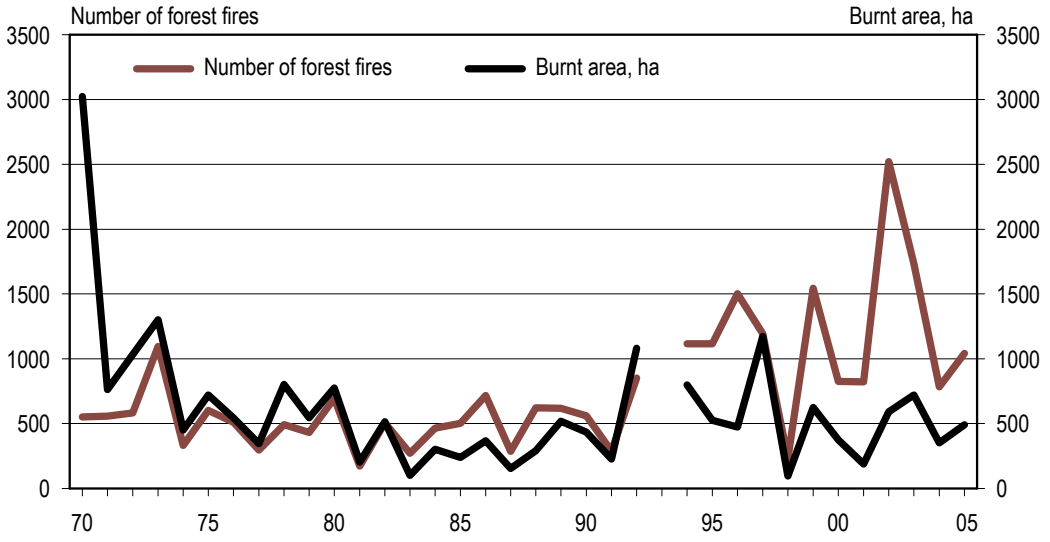


Figure 2.4b
Forest fires 1970–2005
Source: Ministry of the Interior, Department for Rescue Services, Pronto database

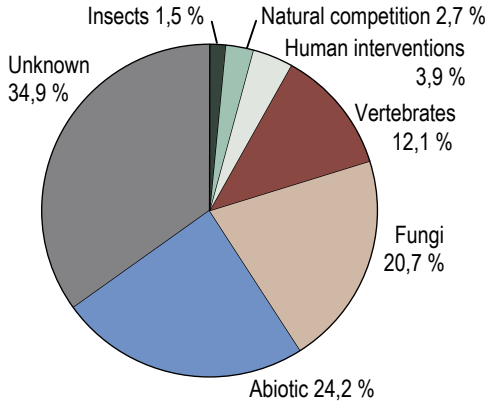


Figure 2.4a
Occurrence of damaging agents reducing stand quality in timber production, 2004 and 2005
Source: Finnish Forest Research Institute, National Forest Inventory

Sources:

- Ministry of the Interior, www.intermin.fi/intermin/home.nsf/pages/index_eng
- Statistics (PRONTO), www.pelastustoimi.fi/en/statistics/
- Ministry of Agriculture and Forestry, www.mmm.fi/en/index/frontpage.html
- Finnish Game and Fisheries Research Institute, www.rktl.fi/english/
- Finnish Forest Research Institute, www.metla.fi/index-en.html
- National Forest Inventory, www.metla.fi/ohjelma/vmi/info-en.htm
- Metsätieteen aikakauskirja, www.metla.fi/aikakauskirja/ (in Finnish only)
- Statistical Yearbook of Forestry, www.metla.fi/julkaisut/metsatilastollinenvsk/index-en.htm
- Forest damage diagnostic service, www.metla.fi/metinfo/metsienterveys (in Finnish)
- Korhonen, K.T., Heikkinen, J., Henttonen, H., Ihalainen, A., Pitkänen, J. & Tuomainen, T. 2006. Forest Resources in Finland 2004–2005. Metsätieteen aikakauskirja 1B/2006: pp. 183–221

Moose *(Alces alces)* is an important game species in Finland, but it also causes considerable damage to seedling stands. Moose populations are therefore regulated systematically.

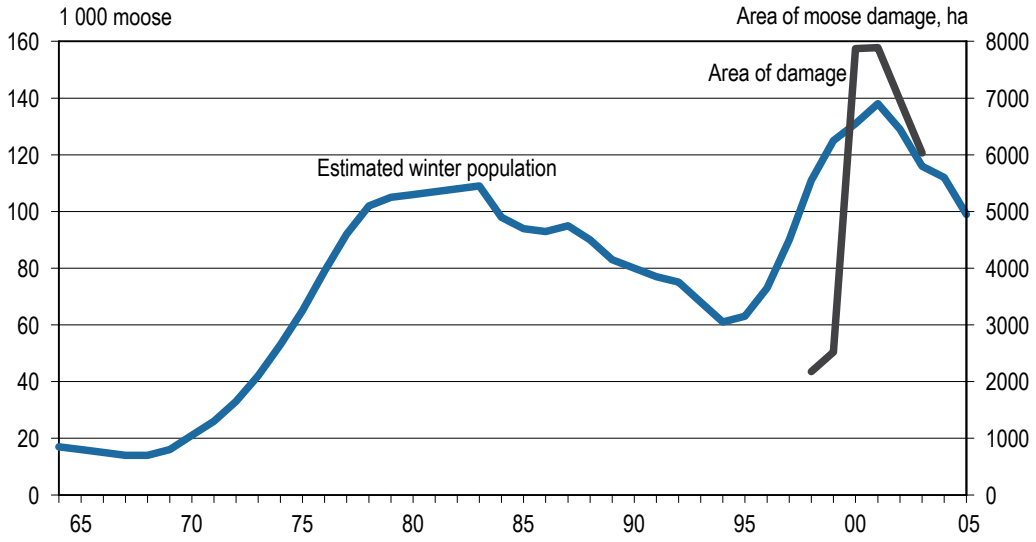


Figure 2.4c
Moose winter population and area of damages caused by moose, 1964–2005
Source: Finnish Game and Fisheries Research Institute

Criterion 3 Productive Functions

The annual increment of growing stock has since the mid-1970s exceeded the total drain by 20–30%. Sustainability of wood production is promoted systematically both by Government measures and the active participation of private forest owners, and through forest planning. The average removal of roundwood in 1997–2006 was 60 million m^3 annually, and the gross stumpage earnings about 1,800 million euros (89 euros per hectare of forest land annually).

Forest-related services and the use and maintenance of non-wood products are a natural component of forest management in Finland. Everyman's Right gives universal right and opportunity to use forests for recreation, outdoor activities and collecting berries and mushrooms, insofar as this causes no damage or disturbance. Non-wood forest products can have considerable importance locally and for individual households, although the value of forest services and non-wood products is slight compared to the sales value of timber nationally. Economically the most important non-wood products of forests are game, mostly moose, and environmental tourism.

B.4 Safeguarding wood production

The basic requirement of sustainable forest management is to safeguard the continuity and profitability of wood production while taking into account the biological diversity of forests as well as other forest products and services. Regeneration and the tending of seedling and thinning stands are crucial for the maintenance of the productive capacity of forests.

It is also important to safeguard the health and growth potential of forests as well as the infrastructure required for harvesting and management, such as the network of forest roads and their condition.

Forest programmes

Forest programmes have played an important role in Finland both as an instrument of forest policy and in the provision of funding for forestry. The latest forest programme is *the National Forest Programme 2010 (NFP)*, adopted by the Government in 1999, and it sets out the main guidelines for forest policy. The central aim of the programme is to increase the annual production of industrial roundwood to 63–68 million m^3 per year. This calls for an increase in the annual investment to silviculture and forest improvement to a level of about 250 million euros. Another aim of the NFP is to increase the use of wood for energy by five million m^3.

The Future Review for the Forest Sector was approved in 2006 by the national Forest Council to serve as the foundation for the National Forest Programme, which came under review in 2007. According to the Future Review, the use of domestic wood can be increased provided that further allocations for silviculture and forest improvement are included in the State budget.

The Regional Forest Programme is a *development plan for forestry* within the district of a particular Forestry Centre. It sets out the needs and aims for forest management, forest-based business operations, and multiple use and protection of forests. It also presents the measures and funding to attain the goals. Forestry Centres are required to review the programme at least once every five years. The current programmes cover the period 2006–2010.

Legislation

Roundwood production in Finland is regulated by the Forest Act, the Act on the Financing of Sustainable Forestry, and the Act on Trade in Forest Reproductive Materials. Under *the Forest Act*, thinnings must be made in such a way that a sufficient number of trees is left to the harvesting area to guarantee satisfactory growth potential. After regeneration felling, a new economically viable seedling stand must be established in the area within a reasonable period of time. *The Act on Trade in Forest Reproductive Materials* ensures that reproductive material used for artificial regeneration is suitable for the various parts of the country.

State funding for roundwood production

Private forest owners are eligible for public funding for some silvicultural and forest improvement measures. The funding is justified by the social benefits gained from supporting the least profitable investments in private forestry, investments which will only yield earnings in the next generations. Silvicultural works covering large areas which are carried out jointly by forest owners are also supported. State funding has been granted for the management of private forests ever since the adoption of the first Forest Improvement Act in 1928. Public funding for forestry is today based on the *Act on the Financing of Sustainable Forestry*. The average sum of subsidies paid for safeguarding wood production in the 2000s has been 55 million euros per year.

In the first decades, the focus of State funding was on drainage projects. The range of works eligible for funding has been extended gradually and the focus changed depending on the goals which at any given time have been considered vital for the favourable development of forests. In addition to silvicultural aims, other factors affecting funding include employment and environmental issues. New measures eligible for funding are harvesting and chipping of wood for energy purposes. Other measures supported under the Act on the Financing of Sustainable Forestry include the maintenance of forest biodiversity and the management of forest ecosystems.

Forest taxation

Since the beginning of 2006, all forest owners have been *taxed on the basis of their stumpage revenues*. Taxation is calculated on the basis of real income and expenses. The difference between earnings and expenses is treated as capital income, and is taxed at the general rate for capital income, 28% in 2007.

Work performed for the delivery sales of timber by the forest owner or his/her family is regarded taxable earned income insofar as the volume of wood gathered from the forest exceeds 125 m^3 per year.

Forest planning

Forest planning is the main practical instrument for specifying the implementation of sustainability in for-

Forest planning

Management plans for individual forest holdings help and guide private forest owners in management and use of their forest holdings. The plans are always based on the forest owner's objectives and the characteristics of the stands in question. The owner's goals related to wood production as well as multiple use of forests are both taken into consideration. Management plans for individual holdings are usually prepared for a period of 10–15 years and they are updated after the silvicultural works have been performed in the forest. Individual forest management plans include data on the current status of the forest, opportunities for harvesting, silvicultural needs and their economic effects, as well as forecasts on the development of growing stock and comprehensive maps.

Forests owned by the State and by forest industry companies are all covered by planning which corresponds to individual forest management plans.

Regional forest management plans are prepared for uniform areas of 2,000–5,000 hectares which consist of several individual private forest holdings, for example, forests within the area of a rural village. Comprehensive data are gathered covering the individual stands. In conjunction with the regional plan, individual management plans are also prepared for all forest owners who are willing to have one. Regional management plans for private forests are usually drawn up by the Forestry Centres.

Regional management plans contain cumulative information on individual forest management plans and intermediate areas. They do not include data on individual forest holdings. The goal of regional forest management planning is to regulate the planning of silvicultural and economic activities of the Forestry Centres and the Forest Management Associations, and to produce data for the monitoring and planning of the forest resources within the area of the Forestry Centre in question.

Regional forest programmes are development plans for forestry within the district of a particular Forestry Centre. The programme sets out the needs and aims for wood production and forest management, forest-based business operations, multiple use of forests and protection of forest biodiversity. It also sets out the measures and funding to attain the goals. The programme is prepared by the Forestry Centre in broad-based co-operation with regional actors and interest groups within the forest sector. The programme is reviewed at least once every five years. The current programmes cover the period 2006–2010. The implementation of regional forest programmes is monitored annually in the forest and environmental reports prepared by the Forestry Centres.

Natural resources and landscape ecological planning

There are various expectations regarding the lands and waters administered by Metsähallitus, which places great demands on planning in these areas. The most extensive plan made by Metsähallitus is the natural resources plan. It sets out the general principles and goals for land use for the next ten-year period for the seven forestry regions which correspond to the regional division of Metsähallitus. The planning process is used to review the general operative guidelines of Metsähallitus and to make regional decisions concerning such matters as the extent of forestry and the key areas of forest protection and recreational use.

The natural resources plan is further specified by the so-called landscape ecological review, in which areas demanding special ecological attention and measures to be undertaken are determined. The first landscape ecological plan for commercially utilised State forests was completed in 2000.

In addition to all the above information, the geographical information system (GIS) of Metsähallitus also includes normal forestry data on stands. The GIS is constantly updated with information about silvicultural works performed in the stands. Forest resource planning is a participatory process, allowing local inhabitants and interest groups to have a say in its content.

National and regional forecasts for the development of forest resources are based on assessments of the current state of forests produced in the National Forest Inventories by the Finnish Forest Research Institute, and on alternative scenarios on how forest resources, increment of growing stock and potential for wood production may develop, given various options in the management of forests and their protection programmes. Scenarios on the development of national forest resources have been calculated with the MELA software developed by the Finnish Forest Research Institute. The software was also used in the preparation of the National Forest Programme 2010.

The forest management plan for an individual holding is an important document for the determination of the forest owner's goals, especially in terms of silviculture and fellings.

est management nationally, regionally, locally and per holdings.

Production of information

In a forest management regime based on private forests, it is important that forest owners have access to sufficient information about methods and practices for safeguarding the welfare of their forests. *Forest advisory services* and information are important factors in ensuring that the changing group of forest owners have sufficient information about the significance and potential of their forests.

Private forestry organisations and research institutions producing information have in recent years increased their efforts to provide advisory services for private forest owners and to publish information about forest management. Issues which affect the safeguarding of wood production are also key research topics for all forest research organisations. *Recommendations and manuals* for practical silviculture have been produced.

Environmental and quality assurance systems are used to improve the quality of silvicultural works and to mitigate negative environmental impacts. Forest industry corporations and Metsähallitus have adopted a certified environmental management system based on the international ISO 14001 standard.

Forest certification systems promote sustainable forest management by committing actors in forestry to act in compliance with requirements. Certification criteria include several requirements that promote wood production.

The National Forest Inventories conducted by the Finnish Forest Research Institute produce information on the development of forest resources and the state of forests. *The Forest Statistics Service* produces extensive, up-to-date statistics on forest management and the activities of the forest sector as a whole. Key statistics are published annually in the Statistical Yearbook of Forestry.

Sources:

Programmes

- National Forest Programme 2010, www.mmm.fi/attachments/5fLUy9oi5/5gpA9OecX/Files/CurrentFile/The_programme_2010en.pdf
- Future Review for the Forest Sector, www.mmm.fi/attachments/5enfdAPe1/5m6LgokFX/Files/CurrentFile/MMMjulkaisu2006_11b.pdf
- Regional target programmes for forestry (Regional Forest Programmes), www.mmm.fi/en/index/frontpage/forests/forest_policy/regional_forest_programmes.html

Finnish legislation, www.finlex.fi/en/

- Forest Act (1093/1996)
- Act on Trade in Forest Reproductive Materials 241/2002)
- Act on the Financing of Sustainable Forestry (1094/1996)
- Income Tax Act (1535/1992)

Organisaatiot, seuranta ym.

- Ministry of Agriculture and Forestry, www.mmm.fi/en/index/frontpage.html
- Forestry Centres, www.metsakeskus.fi/web/eng
- Finnish Forest Research Institute, www.metla.fi/index-en.html
- National Forest Inventory, www.metla.fi/ohjelma/vmi/info-en.htm
- Forest Statistics Service, www.metla.fi/hanke/3006/index-en.htm
- Metsähallitus, www.metsa.fi/default.asp?Section=1176
- Forestry Development Centre Tapio, www.tapio.fi/good_forest_for_all
- Finnish Forest Certification System (FFCS), www.ffcs-finland.org/

Increment and drain (3.1)

The balance between annual increment and drain[21] of growing stock is an indicator of the sustainability of wood production. The total drain may not exceed the increment in the long term.

21 The total drain consists of roundwood removals (=commercial roundwood felled for industry and exports, firewood used by small residential houses, and wood for contract sawing), logging residue left in the forest (slash) and the residue of naturally died trees (natural drain). The natural drain is 2–4 million m^3 or 3–5% of the total drain.

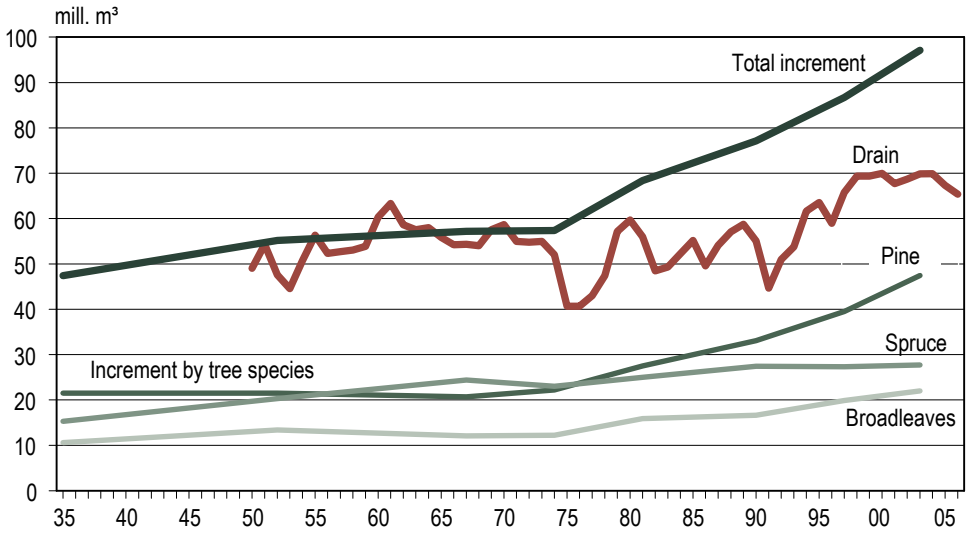


Figure 3.1
Increment of growing stock (1935–2005) and drain (1949–2006)
Source: Finnish Forest Research Institute, National Forest Inventory and Forest Statistics Information Service

In the National Forest Inventories, the increment of stock is measured for increment estimation periods, which comprise the preceding five growing seasons. One of the reasons for using 5-year periods is to reduce the effect of annual variation on the estimation due to such factors as weather, for instance. The drain, however, is estimated annually. There is, therefore, a temporal difference between figures for increment and drain.

The annual increment of growing stock has since the mid-1970s exceeded removals by 20–30%. The balance between increment and drain varies between tree species. According to the latest forest inventory (NFI 10), the annual increment in 2005 and 2006 was 98.5 million m³, of which 95 million m³ came from commercial forests. The annual drain has been less than 70 million m³ in the 2000s.

National Forest Inventories conducted by the Finnish Forest Research Institute produce information on the development of forest resources. The forest resource reports of the inventories are published as a supplement to Metsätieteen aikakauskirja. The key figures are published annually in the Finnish Statistical Yearbook of Forestry. The drain is calculated annually by Forest Statistics Service of the Finnish Forest Research Institute.

Sources:

- Finnish Forest Research Institute, www.metla.fi/index-en.html
- Statistical Yearbook of Forestry, www.metla.fi/julkaisut/metsatilastollinenvsk/index-en.htm
- Fellings and drain by Forestry Centre 2006. Metsätilastotiedote 857. Finnish Forest Research Institute, Forest Statistics Service. 12 p.
- Korhonen, K.T., Heikkinen, J., Henttonen, H., Ihalainen, A., Pitkänen, J. & Tuomainen, T. 2006. Forest Resources in Finland 2004–2005. Metsätieteen aikakauskirja 1B/2006: pp. 183–221

Quantity and value of annual fellings (3.2)

The structure of roundwood removals[22] and the earnings of forest owners depend on the structure of forests and the volume of thinnings and regeneration cuttings. Apart from the volume of cuttings, earnings are also dependent on the price of timber.

The mean annual gross stumpage earnings[23] for 1996–2005 were 1,800 million euros (89 euros/ha/year). The share of logs of total earnings from the sale of wood has been 70%.

Forest harvesting machines utilising state-of-the-art computer technology are efficient yet agile. They are gentle on the environment and can also be used for thinning. The trees can be cut to desired length already in the forest.

22 Roundwood removals is the sum total of wood felled in forests during the year in question. It comprises wood felled for industry and for exports, firewood for small residential houses, and wood for contract sawing.
23 Gross stumpage earnings is the sum of the value of stumpage earnings and of wood felled by forest owners for their own use. The majority of earnings come from wood felled for industry and for exports.

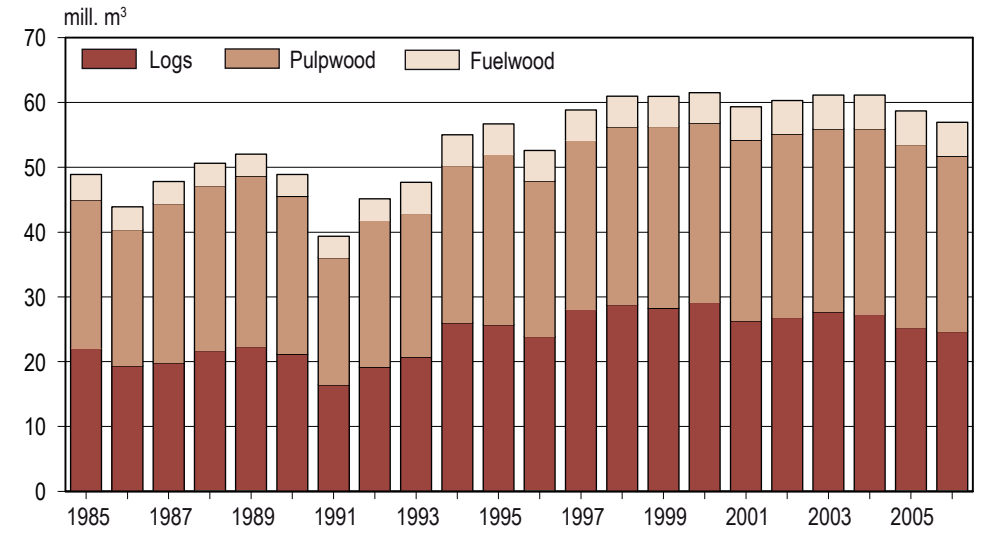


Figure 3.2a
Total roundwood removals, 1985–2006
Source: Finnish Forest Research Institute, Forest Statistics Information Service

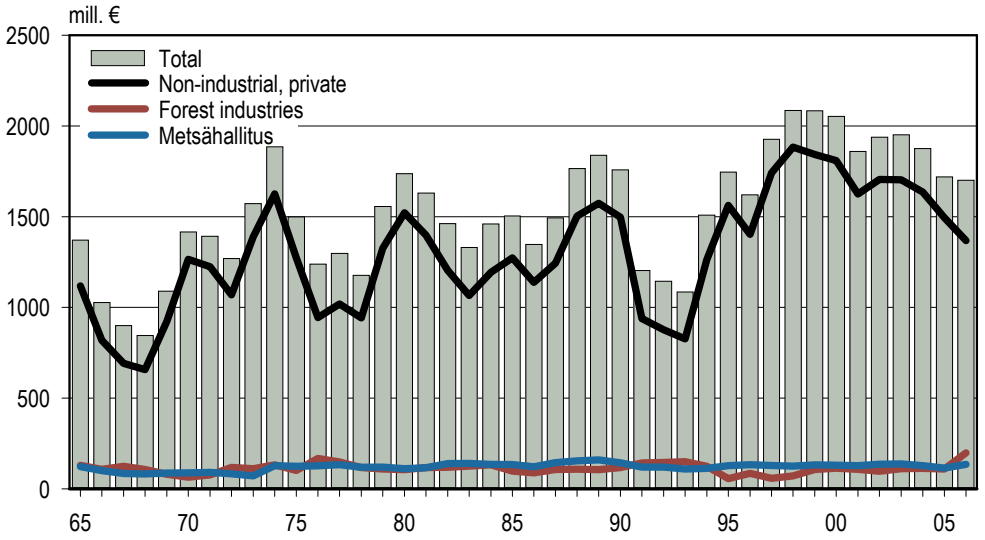


Figure 3.2b
Gross stumpage earnings 1965–2006 adjusted for the value of money in 2006
Source: Finnish Forest Research Institute, Forest Statistics Information Service

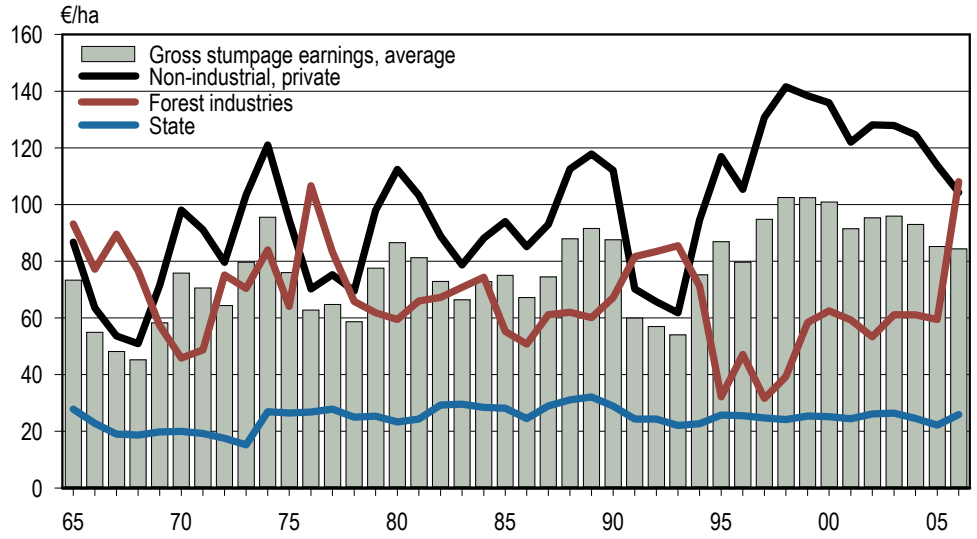


Figure 3.2c
Gross stumpage earnings per ha of forest land, 1965–2006 inflation adjusted to 2006
Source: Finnish Forest Research Institute, Forest Statistics Information Service

The mean annual volume of fellings in 1996–2005 was 60 million m^3. The share of both logs and pulpwood has been 46% and that of fuelwood 8% of the total.

Total removals and gross stumpage earnings are calculated annually by the Forest Statistics Service of the Finnish Forest Research Institute.

Sources:

- Finnish Forest Research Institute, www.metla.fi/index-en.html
- Metinfo statistics, http://www.metla.fi/metinfo/tilasto/index.htm (in Finnish)
- Fellings and drain by Forestry Centre 2006. Metsätilastotiedote 857. Finnish Forest Research Institute, Forest Statistics Service. 12 p.
- Gross stumpage earnings by Forestry Centre 2006. Metsätilastotiedote 861. Finnish Forest Research Institute, Forest Statistics Service. 14 p.

Coverage of forest planning (3.5)

Forest planning is used to ensure the sustainability of forestry nationally, regionally and locally. Plans for individual holdings give the forest owner information about the status of their forest, potential for harvesting, and needs for management.

Forest plans for individual holdings cover silvicultural measures and other management aspects. The plan is based on the owner's management objectives and the characteristics of the forest in question. Individual plans are more common on large holdings than small ones, where there is often no need for an extensive forest plan. Regional plans for private forests cover areas extending beyond individual holdings. Regional forest plans are prepared for areas of 2,000–5,000 ha in size, such as the forests of a village, for example.

The coverage of forest planning varies from one owner group to the next. Forests owned by the State, corporations and other legal bodies are nearly all covered by forest planning.

Regional forest planning in 2005 covered 9.0 million hectares in private forests, or 60% of the area of forestry land in private ownership. The 104,000 plans for individual forest holdings covered a total of about 6.1 million hectares of forestry land (40%).

Data on forest planning and existing plans are gathered by the Forestry Centres and Forest Management Associations for the statistics of their annual reports. The data are published by the Forestry Development Centre Tapio in its annual statistics.

Sources:

- Forestry Development Centre Tapio, www.tapio.fi/good_forest_for_all
- Annual statistics of Forestry Development Centre Tapio 2006. www.metsavastaa.net/tiedostot/dokumentit/8621/Vuositilastot%202006_web.pdf (in Finnish and Swedish only)
- Forestry Centres, www.metsakeskukset.fi/web/eng

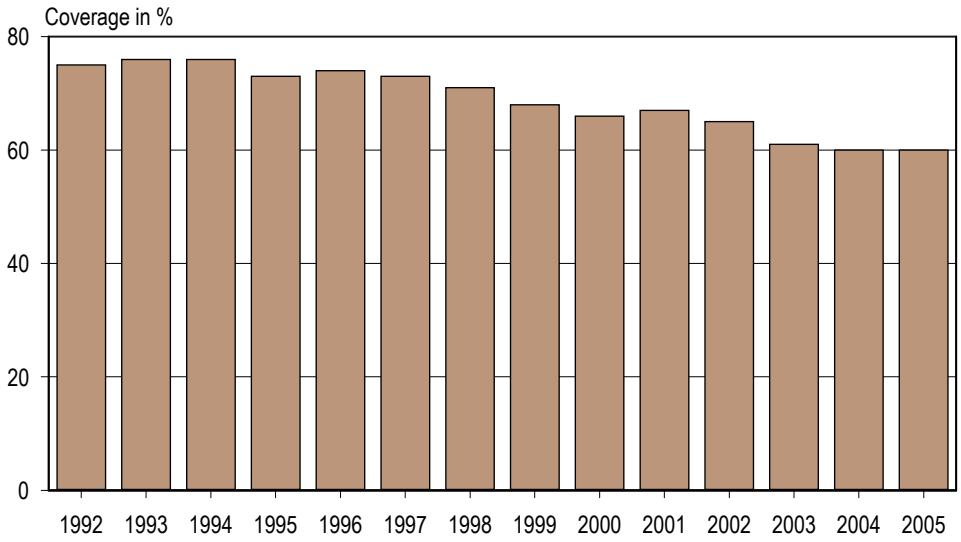


Figure 3.5
Coverage of forest planning in private forests, 1992–2005
Source: Annual statistics, Forestry Development Centre Tapio

B.5 Safeguarding and increasing services and non-wood products

Forests are also used in many ways for recreation and as a source of many products. Non-wood forest products and forest-related services offer opportunities for additional income. Forests are also a source of products collected on the basis of the Everyman's Right.

Forest products that can be collected on the basis of Everyman's Right include wild berries and mushrooms. By contrast, collecting lichen, hunting, cultivating Christmas trees and burning tar are all activities based on land ownership.

Trees and wild plants are also a source of raw materials for the food, medicine and cosmetics industries. Forest-related marketable services include hunting, the maintenance of recreational areas and related services, and nature tourism. Forest-related public goods include scenery and recreation benefits.

National programmes

The Natural Resources Strategy of the Ministry of Agriculture and Forestry includes objectives pertaining to the utilisation of game animal populations, products collected from forests and forest scenery in the development of business activities and by households. The Natural Resources Strategy supports the objectives of the National Strategy for Sustainable Development. Indicators have been developed for the monitoring of the implementation of both strategies.

Non-wood forest products are also taken into account in *the National Forest Programme 2010* and *the Future Review for the Forest Sector*. They envisage growing opportunities for economic activity in nature tourism, further refinement and processing of natural products, as well as entrepreneurial activities based on the health effects of forest products and services. These issues are also promoted in *the Regional Development Strategy 2005–2008* of the Ministry of Agriculture and Forestry.

The Rural Policy Programme 2005–2008 rests on the diverse utilisation of natural resources in the development of rural areas, placing a special emphasis on the networking of different actors, such as natural resources entrepreneurs. Under *the Rural Policy Committee* composed of representatives of the various administrative sectors, there are several theme groups which also promote the multiple use of forests.

In *the programme for recreational use of nature and environmental tourism (VILMAT)* several measures were proposed to promote environmental tourism and the recreational use of nature. The aim is to increase environmental tourism at an annual rate of 8% so as to double the employment opportunities in the field between 2003 and 2010.

Legislation

The freedom to move in forests and to collects berries and mushrooms are in Finland based on the so-called *Everyman's Right*. Everyman's Right is an established practice, even though it is not enshrined in legislation as such. *The Off-Road Traffic Act* governs motorised vehicle traffic in forests.

Under *the Forest Act*, forests that are valuable in terms of scenery, multiple use or scientific research can be managed in a way that suits the particular characteristics of the site. The various uses of forests are reconciled in zoning based on *the Land Use and Building Act*. Recreational areas as well as primarily agricultural and forestry areas in need of recreational supervision are indicated in the land use plans, as well as the needs for transportation between areas.

The Hunting Act specifies the times for the hunting seasons for game animals and the procedure for granting hunting permits. Hunters are required to pass a hunting examination. Hunting rights belong to the landowner. However, inhabitants in the Lapland region and in certain municipalities in the Province of Oulu have a free hunting right on State land within their municipality of residence. Under the Hunting Act, moose populations must be kept at a level where damages caused by the animals remain moderate.

With certain restrictions, reindeer herding in the reindeer herding area defined in *the Reindeer Husbandry Act* is permitted on all land regardless of the ownership of the land. The Act also includes provisions on the prevention of and compensation for damage done by reindeer, and on the maximum permitted number of reindeer. Rights relating to reindeer husbandry are also addressed in the *Skolt Act*.

Economic incentives

The collecting of wild berries and mushrooms is encouraged by exempting income from their sales from tax. The further processing of products collected from forests is supported through many funding channels.

Agri-environmental support can be used to finance measures designed to create biologically diverse forest edges and wetlands, or to leave fields uncultivated. Agri-environmental support can also be granted for the construction of paths and bird observations towers.

In granting the aid, setting up enterprises based on natural produce and ecotourism, related investments and product development are considered on a par with other small and medium enterprises. Various funding channels are available for educational and network development projects, as well as village development projects. Funding is granted primarily by the regional Employment and Economic Development Centres (T&E Centres). Other major funding bodies include the National Technology Agency of Finland TEKES, Regional Councils, which have an interest in emphasising regional development, and the Rural Policy Committee.

Forest planning

Non-wood products and services are covered in all national and regional programmes and action plans on forests (see Indicator B.4). The multiple uses of forests are coordinated not only in forest planning but also in zoning.

For State lands, the main guidelines for recreational use of forests are included in the natural resources plans made by Metsähallitus. The landscape ecological plans of Metsähallitus aim to prevent the fragmentation of forests.

The non-wood products of the forest are taken into account in the management and harvesting plans for individual forest holdings, subject to the aims of the landowner. The certification criteria for forests also promote the multiple use of forests.

In forest planning for individual holdings, the objectives are determined by the owner of the forest, and the goals aligned in the calculations.

Monitoring, research and advisory services in several organisations

Non-wood products and their place in forest management are studied in many research projects of *the Finnish Forest Research Institute*. Regional forecasts for berry and mushroom harvests are prepared by the Finnish Forest Research Institute in cooperation with 4-H organisations and trained berry and mushroom consultants. The Institute also monitors the supply and demand of recreational use and environmental tourism. An extensive inventory, *the National Outdoor Recreation Demand and Supply Assessment (LVVI)*, was conducted in 1998–2002. Metsähallitus monitors the recreational use of State lands and keeps relevant statistics.

The Finnish Game and Fisheries Research Institute and *the Finnish Museum of Natural History* study questions relating to game management, gather nationwide statistics on the game bag, and evaluate the development of game populations together with *the Hunters' Central Organisation*. Moose and reindeer husbandry are studied at *the Finnish Game and Fisheries Research Institute* and *the Finnish Forest Research Institute*.

Sustainable management of game in Finland is the responsibility of *the Ministry of Agriculture and Forestry*. Hunting licences are granted by forest owners and on State land by *Mestähallitus*. Hunting is monitored by *the Police* and on State lands by Metsähallitus. Other public bodies and organisations with statutory duties related to game management are the Hunters' Central Organisation, *the Game Management Districts* (15 districts) and *the Game Management Associations* (298 associations), whose tasks include training and consultation in matters involving hunting and game management. Operations of these organisations are funded by the game management fees paid by hunters. Matters relating to hunting and game management are also dealt with in *hunting associations* and *national hunting organisations*, whose membership is voluntary.

Many education institutions and voluntary organisations promote the use of natural produce and game management by organising training events and courses and by producing educational material. Increasing nature tourism has also increased training in this area. There are numerous trained wilderness guides who work as private entrepreneurs and in the growing tourism businesses.

Sources:

Programmes

- Natural Resources Strategy of the Ministry of Agriculture and Forestry, www.mmm.fi/attachments/5gA9ccoKa/5jzS6g4vF/Files/CurrentFile/julkaisu_Luonnonvara_Englanti.pdf
- Finland's National Strategy for Sustainable Development, www.ymparisto.fi/default.asp?node=8607&lan=en
- National Forest Programme 2010, www.mmm.fi/attachments/5fLUy9oi5/5gpA9OecX/Files/CurrentFile/The_programme_2010en.pdf
- Future Review for the Forest Sector, www.mmm.fi/attachments/5enfdAPe1/5m6LgokFX/Files/CurrentFile/MMMjulkaisu2006_11b.pdf

- Rural Policy Programme 2005–2008, www.intermin.fi/intermin/home.nsf/pages/9855A653D91836CCC2256FB9007076C3?opendocument (English summary)
- Programme for recreational use of nature and environmental tourism (VILMAT) (Gvmt decision 2003), www.ymparisto.fi/download.asp?contentid=1318&lan=fi (in Finnish only)

Finnish legislation, www.finlex.fi/en/
- Off-Road Traffic Act (1710/1995)
- Forest Act (1093/1996)
- Land use and Building Act (132/1999)
- Reindeer Husbandry Act (848/1990)
- Skolt Act (253/1995)
- Finnish Constitution (731/1999)

Organisations, monitoring, etc.
- Rural Policy Committee, http://www.ruralpolicy.fi/
- Nature and Landscape Services Theme Group, www.maaseutupolitiikka.fi/index.phtml?s=65 (in Finnish only)
- Ministry of the Environment, www.ymparisto.fi/default.asp?node=4032&lan=en
- Everyman's Right, http://www.ymparisto.fi/default.asp?contentid=240888&lan=FI&clan=en
- Employment and Economic Development Centres (T&E Centres), www.update.te-keskus.fi
- National Technology Agency of Finland (TEKES), www.tekes.fi (Finnish), www.tekes.fi/eng
- Finnish Forest Research Institute, Metinfo Multiple Use of Forests, www.metla.fi/metinfo/monikäyttö (Finnish) www.metla.fi/metinfo/monikaytto/index-en.htm
- Finnish Game and Fisheries Research Institute, www.rktl.fi/english/
- Finnish Museum of Natural History, www.fmnh.helsinki.fi/english/
- Hunters' Central Organisation, www.riista.fi (in Finnish only)
- Metsähallitus, www.metsa.fi/default.asp?Section=1176
- Recreation services website, www.luontoon.fi
- Suomen luontoyrittäjyysverkosto ry [Finnish nature entrepreneurs' network]. www.luontoyrittaja.net (in Finnish only)
- Programme for recreational use of nature and environmental tourism. Ministry of the Environment 2002. Suomen ympäristö. 47 p.

Non-wood goods (3.3)

Apart from wood, forests also yield other products such as berries, mushrooms, lichen, game, reindeer meat and skins, and Christmas trees. Picking berries and mushrooms and hunting are classified as recreational uses of forests. Commercial health products derived from forests include xylitol, oils and sap juice. Important non-wood forest products used to include tar and birch bark, although these have lost their economic significance today. The economic significance of non-wood products is small compared to the income from sale of wood products. Income from non-wood products can, however, be significant for private households.

Game species in Finland include 34 species of mammals and 26 species of birds, most of which have their habitats in forests. Economically the most important game species is moose. The moose population in Finland began to grow in the 1990s. The annual bag of moose and other cervids is about 95,000. Other important game species are grouse and hare. As only a small part of the bag of game is sold, its monetary value, 68 million euros on average annually in the 2000s, is rather theoretic. The number of registered hunters has increased three-fold since the 1930s, and is currently about 300,000. The expenditure on hunting equipment and the value of time used for hunting are therefore much greater than the value of the bag.

About 50–60% of Finns gather wild berries or mushrooms every year. There are 37 species of edible wild berries in Finland. The most important ones are bilberry *(Vaccinium myrtillus)*, cowberry *(Vaccinium vitis-idaea)* and cloudberry *(Rubus chamaemorus)*. The total annual harvest of wild berries is estimated to be 500–1,000 million kg. Only a small part of the crop is

		Value, mill. €
Roundwood	(stumpage price)	1 568
Fuelwood	(stumpage price)	55
Forest chips	(value on site of use)	67
Christmas trees	(growers' income)	10
Game	(calculatory value)	71
Reindeer husbandry	(slaughter income)	13
Wild berries	(sales to retailers)	12
Mushrooms	(sales to retailers)	1
Herbs	(collected for retail and household use, figure for 2000)	5
Lichen	(export income)	1

Table 3.3a
Value of forest products, 2005
Some of the figures are estimates, and are not completely commensurate.

Collecting mushrooms and berries for private consumption is common in Finland, but in good years it can also provide significant earnings locally.

collected, most of it for private consumption. In a good year, the bilberry harvest is about 40 million kg and that of other berries 10 million kg.

There are about 200 species of edible mushroom in Finland, of which 22 are accepted as marketable. The crop of marketable mushrooms in good years is about 1,200 million kg, of which about one fourth are fit for collecting. Only a couple of per cent of the overall annual mushroom crop is used. The harvest of edible mushrooms is a little less than 10 million kg, but in the best years it can reach almost 15 million.

There are 27 wild herbs in Finland which are collected commercially. They are used for food products, herbal remedies and cosmetics. Decorative lichen has considerable economic value in the Oulu region.

The reindeer herding area in northern Finland covers 36% of the total land area of the country. The area is divided among 56 reindeer herding cooperatives, which carry out all works related to reindeer husbandry. There are 1,250 households whose winter herd is 50 or more reindeer. Under a decision by the Ministry of Agriculture and Forestry, the maximum allowable size of the winter herd is today 203,700 reindeer. Approximately 100,000 reindeer are culled annually, most of them calves. The main products of reindeer husbandry are meat and meat products. By-products are skins, horn and bone. Reindeer are also used in tourism.

The value of direct sales and outdoor market sales of wild berries and mushrooms and of their private consumption is several times the value of produce purchased by retail stores.

Official statistics on game populations and the game bag are compiled by *the Finnish Game and Fisheries Research Institute*. Statistics on the supply of wild berries and mushrooms and picking incomes are compiled by TNS Gallup Ltd. Food and Farm Facts. The figures for the export of lichen are based on *customs statistics*. Reindeer statistics are compiled by *the Reindeer Herders' Association*.

Sources:

- National Board of Customs, Statistical Service, www.tulli.fi
- Finnish Game and Fisheries Research Institute, www.rktl.fi/english/
- Hunters' Central Organisation, www.riista.fi (in Finnish only)
- Reindeer Herders' Association, www.paliskunnat.fi
- Joulupuuseura ry. [Christmas Tree Society], www.joulupuuseura.fi
- Market supply of wild berries and mushrooms, 2005. MARSI 2005. 2006. Information Centre of the Ministry of Agriculture and Forestry. TNS Gallup Ltd. Food and Farm Facts. 46 p.
- Bags of game 2005. 2006. SVT Agriculture, forestry and fishery 2006. Finnish Game and Fisheries Research Institute 26 p.

Services, particularly of recreation (3.4 and 6.10)

Hiking and other outdoor activities in the forest are part of the Finnish way of life and leisure time. The number, location and quality of recreational areas can be used as indicators for assessing how forests are used for recreation. Visitor monitoring and surveys are used to monitor the adequacy of recreation areas and the satisfaction of visitors.

Outdoor life in Finland

The traditional Everyman's Right[24], areas designated for outdoor activities as well as extensive conservation areas provide excellent opportunities for outdoor recreation in Finland. Free public access to forests and the right to collect natural produce are both Everyman's Rights. Hiking in forests is only restricted in strictly protected nature reserves, where access requires a permit. Restrictions to free access apply to less than 0.2% of the area of forestry land in Finland.

Apart from the location of recreational areas, factors affecting the recreational use of forests include the

24 Everyman's Rights refers to the right of everyone staying in Finland, foreign nationals included, to roam freely in the countryside and in forests regardless of who owns the land. Everyman's Right bestows the right to move freely on land by foot, ski or bicycle, stay temporarily in areas where roaming is allowed, pick wild berries, mushrooms and flowers, fish with a rod and line or a jig, travel on water, swim or wash in inland waters and the sea, and move on ice. Despite Everyman's Right one may not cause disturbance or damage to the land or landowner.

Table 3.4a
Ecotourism by owner and location of site.
Opportunities for outdoor recreation in municipal recreational forests. Other outdoor activities include camping, caravan and motorhome tours, swimming, and picking wild berries and mushrooms Nature trips involve participating in outdoor activities and staying overnight in the nature. The data relate to the respondents' most recent nature tourism experience in the past 12 months.
Source: Finnish Forest Research Institute, national inventory of recreational use of nature, 1997–2000

Main purpose of nature trip	Owner of site					Distance from residence, km				
	Municipality	State	Private land		Total	<= 50 km	51–200 km	201–500 km	> 500 km	Total
			or water area	holiday residence						
	% of nature trips									
Leisure home stays	4	7	9	79	100	23	41	29	7	100
Cross-country skiing	34	30	22	13	100	12	11	18	59	100
Hiking	13	65	16	6	100	21	20	17	42	100
Fishing	6	31	26	37	100	21	30	31	19	100
Hunting	3	28	40	29	100	20	34	21	24	100
Picking berries	3	8	60	29	100	22	29	35	15	100
Downhill skiing	33	22	29	16	100	16	7	26	50	100
Boating	12	21	51	16	100	36	42	21	2	100
Nature excursions	11	38	26	25	100	11	34	25	31	100
Forestry work	..	..	15	85	100	30	51	15	5	100
Other	23	20	34	23	100	27	32	29	11	100

Year	National parks		Hiking areas		Nature centres and other service points	
	Pcs	Visitors	Pcs	Visitors	Pcs	Visitors
2000	30	83 300	7	350 000	20	492 000
2001	30	851 800	7	355 000	21	563 800
2002	32	1 012 000	7	346 500	22	671 600
2003	34	1 123 200	7	353 000	23	687 700
2004	34	1 153 900	7	350 500	26	769 600
2005	34	1 410 000	7	360 100	26	787 400

Table 3.4b
Visitors to national parks, recreation areas, nature centres and other Metsähallitus customer service points, 2000–2005
Source: Metsähallitus
The statistic does not include data on the Koli national park, which draws about 100 000 visitors annually.

age structure of the population, level of education and income, and available leisure time. Although the need to establish recreational areas becomes more pressing due to urbanisation, thanks to Everyman's Right the need for forests designated specifically for recreational use[25] is not as great as in countries with far greater population density, such as those in central or southern Europe.

Finns use forests for recreation in many ways: hiking is something nearly all Finns do, and one person in two bicycles or skis regularly, and often these activities take place in a forest environment. Over one half of working-age Finns collect berries and nearly 40% collect mushrooms. The majority of the population live close to areas suitable for outdoor recreation: half of the people live 300 metres or less from a park, forest or outdoor recreation area, and areas suitable for skiing are no more than 500 metres away.

Many municipalities have areas and routes reserved for recreation on their own lands. Recreation area associations formed by some municipalities (7 associations in 2007) have acquired dozens of recreational areas. The services as well as hiking and snowmobile routes in the areas are maintained by the associations. The Ministry of the Environment supports the associations in the acquisition of recreation areas. Municipalities and the State maintain regional and national hiking routes, altogether tens of thousands of kilometres of trail.

25 Recreational use comprises all outdoor leisure activities undertaken in forests.

Cross-country skiing is a popular winter sport in Finland. It also provides an opportunity to develop environmental tourism, especially in Lapland.

Opportunities for outdoor activities and related services in State recreation areas

Under the Outdoor Recreation Act, seven recreation areas comprising a total of 355,000 ha were established in various parts of Finland between 1979 and 1994. The areas have good hiking and ski routes and other services, and they are intended primarily for recreational use by the public. There are also 94 recreation forests[26] (158,000 ha) established by Metsähallitus. The largest recreation areas are in northern Finland.

National parks (35), wilderness areas (12) and other conservation areas are also accessible for recreational use. Guidance and advisory services are provided at Nature Centres and other information points.

The number of visitors to conservation and recreation areas has been monitored for about ten years. Use of the areas has grown every year. Currently national parks draw about 1.5 million visitors every year.

Additionally, the Koli National Park administered by the Finnish Forest Research Institute has about 100,000 visitors annually.

26 Recreation forests are forests where nature management methods are used, or other special forests administered by Metsähallitus. They are designated primarily for recreational use, even though they are also commercially managed.

The principles and key areas of the utilisation of natural resources on State lands are gathered in the natural resources plans of Metsähallitus. Conservation areas and State recreation areas are covered by management plans, in which recreational services are also dealt with.

The recreational services include the establishment of routes, campfire sites, lean-to shelters and cabins, as well as firewood and waste disposal services. In the archipelago, Metsähallitus has established 1,478 landing areas, 106 anchoring sites and 184 marinas.

Customer satisfaction at the Nature Centres and service points of Metsähallitus is monitored by conducting customer satisfaction studies and by customer surveys at a few years' intervals. Customer satisfaction has been good, regardless of the method of assessment.

The latest service launched by Metsähallitus is the luontoon.fi website, which presents over a hundred sites in Finnish, Swedish, English and Sami. The website had 1.6 million visitors in 2006.

Services subject to charge

As Everyman's Right gives everyone the right to move in forests, no charge can be levied for using nature for recreation on that basis. The commercial organisation of excursions and other services by entrepreneurs requires permission from the landowner.

Hunting, fishing and the use of off-road vehicles on State land are subject to a fee. Open wilderness huts on State land may be used free of charge, while a fee is payable for reservable huts. There is no admission charge to nature centres, but guided tours are only provided for a fee.

Monitoring

The National Outdoor Recreation Demand and Supply Assessment (LVVI) co-ordinated by the Finnish Forest Research Institute gathered information in 1997–2000 on the supply of recreation opportunities, their quantity and quality, and the needs of Finns for outdoor recreation.

Studies are conducted regularly by the organisations which maintain nature trails and recreation areas, as well as by Metsähallitus and municipalities, to discover the number, structure and wishes of visitors. Metsähallitus maintains a database of recreation areas, trails and facilities on State lands (REISKA), and a visitor information database (ASTA).

The Finnish Environment Institute maintains a database on outdoor recreation opportunities (VIRGIS), which holds information about recreation areas, nature trails and recreation services. The Environment Institute also maintains other information systems that can be used to study development opportunities of recreation services. These include the Land Use Geographic Information System (GISALU), the Information System for Monitoring Land Use Planning (KATSE), the Maintenance System for the Implementation of Nature Conservation Areas (LUOTO), as well as the Environmental Information System (HERTTA).

The University of Jyväskylä also maintains a national database on the supply of recreation services.

Sources:

- Programme for the Development of Recreational Use of Nature and Ecotourism (VILMAT) (Gvmt decision 2003), www.ymparisto.fi/download.asp?contentid=1318&lan=fi (in Finnish only)
- Outdoor Recreation Act (606/1973), www.finlex.fi
- Ministry of the Environment, www.ymparisto.fi/default.asp?node=4032&lan=en
- Finnish Environment Institute, www.ymparisto.fi/default.asp?node=5297&lan=en
- Everyman's Rights, http://www.ymparisto.fi/default.asp?contentid=246267&lan=EN
- Recreation areas and nature trails, www.ymparisto.fi/default.asp?node=699&lan=fi (in Finnish only)
- Finnish Forest Research Institute, www.metla.fi/index-en.html
- National Outdoor Recreation Demand and Supply Assessment (LVVI), www.metla.fi/metinfo/monikaytto/index-en.htm
- University of Jyväskylä, database of recreational opportunities, www.sport.jyu.fi (Finnish and English)
- Metsähallitus, www.metsa.fi/default.asp?Section=1176
- Recreational use website, www.luontoon.fi/default.asp?Section=4973
- Suomen Latu ry., www.suomenlatu.fi (in Finnish only)
- Ulkoilijan portaali [outdoor recreation portal], www.ulos.fi (in Finnish)
- Sievänen, T. 2005 Luonnon virkistyskäytön ja luontomatkailun tulevaisuudenkuvia [future scenarios for recreational use of nature and ecotourism]. In: Koivula, E ja Saastamoinen O. (ed.) 2005. Näkökulmia luontomatkailuun ja sen tulevaisuuteen [perspectives on ecotourism and its future]. University of Joensuu, Faculty of Forest Science. Tiedonantoja [bulletins] 165. pp.62–80
- Sievänen, T. (ed.). 2001. Luonnon virkistyskäyttö [Recreational use of nature] 2000. Bulletins of Finnish Forest Research Institute 802. 336 p.
- Sievänen, T., Pouta E., & Neuvonen M. 2002. Luonnon virkistyskäyttö maakunnittain [Recreational use of nature by regions]. Bulletins of Finnish Forest Research Institute 885. 32 p.
- Programme for the Development of Recreational Use of Nature and Ecotourism. Ministry of the Environment 2002. Suomen ympäristö. 47 p.

Criterion 4 Biological Diversity

In the Forest Act of 1997 the maintenance of the biological diversity of forests was adopted as a parallel goal with roundwood production. Finnish forests have been managed ecologically under the statutory requirement to maintain biodiversity for more than 10 years, but this approach had actually been the practice for decades before the Act. At the same time, the production of information about biodiversity and related research, discussion and consultation have been an important key area, with broad participation by forest owners and other actors and interest groups in forest management.

New management methods and efforts to safeguard biodiversity in commercial forests have slowed down the endangerment of certain forest species since the 1990s. The main methods for maintaining biological diversity in commercial forests are the protection of valuable habitats and biotopes, favouring of mixed tree stands in the management, and increasing the amount of decayed wood. One half of the area of regenerated forest land (150,000 ha) is planted with seedlings and one half either regenerated naturally or by direct seeding.

The protection programmes and decisions have contributed to the increase in the area of protected forests three-fold in the last 30 years. The share of strictly protected forests (924,000 ha, 4.6% of forest land) in Finland is the highest in Europe. In southern Finland, where the relative area of strictly protected forests varies between 0.7 and 4.3%, forest biodiversity is improved by developing better silvicultural methods, as well as by voluntary measures by private forest owners to protect biodiversity, and by the restoration management of protected areas in State ownership.

B.6 Safeguarding and protecting biodiversity of forests

The biological diversity of forest ecosystems encompasses 1) the abundance and diversity of different forest habitats, communities of organisms, and ecosystems; 2) the abundance and diversity of forest organisms; and 3) the diversity within the genotype of each organism.

The principal instruments for safeguarding biodiversity are protection of the most valuable forest ecosystems through the establishment of protected areas and the management of stands in a way that takes biological diversity into account.

International and national agreements and programmes

Finland has ratified several international conventions whose signatories are committed to promoting the protection of biological diversity and sustainable management. These conventions include *the Convention on the Conservation of European Wildlife and Natural Habitats* (Bern Convention 1979), *the United Nations Convention on Biological Diversity* (CBD 1992), *the Pan-European Biological and Landscape Diversity Strategy* (PEBLDS, 1995) *of the European environmental ministries' co-operation process* and *the resolutions of the Ministerial Conferences on the Protection of Forests in Europe* (MCPFE, Helsinki 1993, Lisbon 1998 and Vienna 2003).

The Fourth Ministerial Conference in Vienna (2003) adopted Resolution V4 on Conserving and Enhancing Forest Biological Diversity in Europe. The resolution stressed the importance of biodiversity in all types of forests and presented ways to maintain, conserve, restore and, as appropriate, enhance forest biological diversity.

The first extensive national programme addressing biological diversity was *the National Action Plan for Biodiversity in Finland, 1997–2005*, which took into account the obligations of the UN Convention on Biological Diversity. *The National Strategy for the Conservation and Sustainable Use of Biodiversity in Finland 2006–2016* was adopted by the Government in December 2006. The aim of the strategy is to halt the decline of biodiversity in Finland by 2010. The strategy also aims to establish a favourable development of biodiversity in the long term.

Altogether, the Government of Finland has adopted seven *programmes for the conservation of nature* covering national parks and strict nature reserves, mires, waterfowl habitats, eskers, herb-rich forests, shorelines and old-growth forests. The programmes set out the objectives for the establishment of conservation areas. The degree of implementation of the programmes varies: the programme for national parks and nature reserves is almost completed, while there is still work to be done on the old-growth forest conservation programme. At the end of 2006, there were still about 60,000 ha of private land awaiting acquisition by the State. The aim is to complete the conservation programmes, covering a total of about 3.6 million ha of land, by the end of 2009.

The Natura 2000 network safeguards the biotopes and habitats of species defined in the Habitats and Birds Directives of the EU. The European Commission has accepted the Natura 2000 areas of Finland: the alpine zone areas in 2003 and those of the boreal zone in 2005. With the exception of the northernmost parts of Lapland, the majority of areas in Finland belong to the boreal zone. The majority of the Natura 2000 areas, 97 percent, are nature conservation areas established under national decisions, or they are part of national conservation programmes or areas protected in some other way.

In 2002, the Government passed a decision in principle on *the Forest Biodiversity Programme for Southern Finland (METSO)*, which complements the National Forest Programme 2010. The aim of the METSO programme is to improve the protection of habitats and structural features of forests vital to forest biotopes and endangered species. To attain this goal, new areas and networks that support forest biodiversity are created, and existing conservation areas are restored. The principles in the development of new protection measures are the maintenance of private ownership of forests, voluntary measures in the safeguarding of biodiversity, and compensation of any economic losses.

Legislation

The supreme administrative and executive powers in the safeguarding of biological diversity belong to *the Ministry of the Environment* and in part also to *the Ministry of Agriculture and Forestry*. The practical execution is the responsibility of *regional Environment Centres* and *Forestry Centres*, which all come under the *jurisdiction of the two Ministries*.

The central legal instruments safeguarding forest biodiversity are the Nature Conservation Act, the Act on Wilderness Reserves, and the Forest Act. The Act on the Financing of Sustainable Forestry gives the State a financial instrument for safeguarding forest biodiversity.

The natural characteristics of habitats of special importance, such as this spring, must be preserved during silvicultural works and fellings.

The Nature Conservation Act aims to achieve and maintain a favourable level of protection for habitats and wild species. To achieve this aim, nature reserves can be established to conserve protected habitats, three of which are forests: wild woods rich in noble broadleaves, hazel woods and common alder woods. The Act also includes provisions on endangered species, their protection and international trade in them.

Under the *Act on Wilderness Reserves*, 12 wilderness reserves have been established in northern Finland. Some of the reserves are under a total felling ban, in others forests can be managed to a certain degree.

The Forest Act defines habitats of special importance to forest biodiversity, areas whose natural features must be conserved. These habitats are clearly delimited and generally fairly small areas in natural or semi-natural state, including 1) the immediate surroundings of springs, brooks, rivulets constituting a permanent water flow channel, and small ponds; 2) herb-rich and grassy hardwood-spruce swamps, ferny hardwood-spruce swamps, eutrophic paludal hardwood-spruce swamps, and eutrophic fens located to the south of the Province of Lapland; 3) fertile patches of herb-rich forest; 4) heathland forest islets in undrained peatlands; 5) gorges and ravines; 6) steep bluffs and the underlying forest; and 7) sandy soils, exposed bedrock, boulder fields, peatlands with sparse tree stand and flood meadows which are less productive than nutrient-poor heathland forests.

One of the aims of *the Land Use and Building Act* is to promote ecologically sustainable development. According to the national land use guidelines adopted by *the Government under the Land Use and Building Act*, land use planning is used to promote the conservation of the biodiversity in areas which are important for nature and susceptible to damage. Another aim is to preserve ecological corridors between conservation areas. One particular aim is to prevent the fragmentation of large forest areas with other land use without special reason.

Under *the Act on Environmental Impact Assessment Procedure* and *the Act on the Assessment of the Impacts of the Authorities' Plans*, *Programmes and Policies on the Environment*, the impacts of certain plans, programmes and policies on biological diversity must be assessed.

Financial instruments

Financial support granted under the Act on the Financing of Sustainable Forestry and agri-environmental support give forest owners an opportunity to receive funding for silvicultural measures that maintain and promote biological diversity. The METSO programme (2000–2007) includes pilot projects to find economic incentives to encourage forest owners to voluntarily safeguard biodiversity in their forests.

The Act on the Financing of Sustainable Forestry promotes sustainable forest management by granting State support for private forestry measures which aim at the maintenance of forest biodiversity and ecosystems. Agri-environmental support for the maintenance of biodiversity is granted in situations where the preservation of some particularly valuable habitat causes more than slight economic losses to the forest owner. The aid is also used to support projects for the management of forest ecosystems. These include ecosystem surveys, management and restoration of habitats extending over the area of several forest holdings, and landscape management projects.

Support under the special agri-environmental measures for sites other than agricultural land is available for farmers who undertake to maintain heritage biotopes, wetlands or forest edges bordering on fields.

Under the Nature Conservation Act, landowners are compensated for the establishment of conservation areas on their lands. A conservation area can be established in three ways: 1) by establishing a private conservation area under the Nature Conservation Act, in which case the area remains property of the landowner, who receives compensation which corresponds to the economic loss caused by conservation; 2) by purchasing the area to the State; or 3) by exchanging the area for an area owned by the State.

Active information services

The maintenance of forest biodiversity receives special emphasis in all forest management *recommendations and guidelines* prepared for the various actors in forestry.

Along with wood production, the maintenance and safeguarding of biodiversity is an integral part of *forest planning* undertaken on different levels and in different ways. Planning systems are described in more detail in conjunction with Indicator B4 of Criterion 3. The requirements regarding voluntary *forest certification* also contain several measures designed to safeguard biodiversity, such as increasing the number of prescribed burnings, leaving retention trees in forests, and safeguarding the characteristic features of valuable habitats.

Assessments of endangered species have been conducted three times by the Ministry of the Environment, in 1983–85, 1987–91 and 1997–2000. The assessments have produced information about the number of endangered species, the causes of endangerment and risks, as well as proposals for improving their protection.

One key way of safeguarding forest biodiversity outside conservation areas is to maintain the natural characteristics of habitats of special importance. *Habitats protected under the Nature Conservation Act* have been mapped by the regional Environment Centres. Surveys of *habitats of special importance mentioned in the Forest Act and of other forest habitats* are conducted by the Forestry Development Centre Tapio, the Forestry Centres, Metsähallitus and the forest industry companies. A nationwide report was completed in 2005.

The preservation of biological diversity in private forests, forests owned by corporations and those administered by Metsähallitus has been monitored regularly since 1995 in conjunction with the *monitoring of the quality of nature management in commercial forests*. *The National Forest Inventories* also produce data on forest biodiversity.

In addition to universities providing instruction in biological subjects, forest biodiversity is also studied in research institutes operating under the Ministry of the Environment and the Ministry of Agriculture and Forestry. The principal research organisations are *the Finnish Forest Research Institute* (Metla) and *the Finnish Environment Institute (SYKE)*.

In the beginning of 2003, the Ministry of Agriculture and Forestry launched a broad-based *biodiversity and monitoring programme called MOSSE*, finalised in 2006. One of the main focal areas of the programme was research on the maintenance of biodiversity in forest ecosystems. The programme was a contribution to the informational needs of the METSO biodiversity programme (2002–2007). The aim is to produce applicable information to support practical conservation and management of biodiversity, and to develop related monitoring projects. Ongoing research programmes include *PUTTE (Deficiently known and endangered forest species in Finland, 2003–2007)* co-ordinated by the Ministry of the Environment, and *TUK (Safeguarding forest biodiversity, 2005–1020)* conducted by the Finnish Forest Research Institute.

Lumonet, the Finnish Clearing-House Mechanism of the Convention on Biological Diversity, is a national system for collecting and publishing information as required by the CBD. Lumonet is maintained by the Finnish Environment Institute.

Sources:

Treaties and programmes

- Convention on Biological Diversity, http://www.cbd.int/convention/convention.shtml
- Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention), conventions.coe.int/Treaty/EN/Treaties/Html/104.htm (English text)
- Pan-European Biological and Landscape Strategy, www.pebldsorg/
- Resolutions of the Ministerial Conference on the Protection of Forests in Europe, www.mcpfe.org/mcpfe/resolutions
- Government Resolution on the National Strategy for the Conservation and Sustainable Use of Biodiversity in Finland 2006–2016, www.ymparisto.fi
- Forest Biodiversity Programme for Southern Finland (METSO), www.mmm.fi/metso
- National Land Use Guidelines (Gvmt decision 2001), http://www.ymparisto.fi/default.asp?contentid=242187&lan=fi&clan=en

Finnish legislation, www.finlex.fi/en/

- Finnish legislation, www.finlex.fi/en/
- Nature Conservation Act (1096/1996).
- Nature Conservation Decree (160/1997).
- Act on Wilderness Reserves (62/1991)
- Land Use and Building Act (132/1999)
- Forest Act (1093/1996)
- Act on the Financing of Sustainable Forestry (1094/1996)
- Act on Environmental Impact Assessment Procedure (468/1994)
- Act on the Assessment of the Impacts of the Authorities' Plans, Programmes and Policies on the Environment (2000/2005)

Research programmes

- Biodiversity and monitoring programme (MOSSE) (2003–2006), http://wwwb.mmm.fi/metso/international/research/index.html (English summary)
- Research programme on deficiently known and endangered forest species in Finland (PUTTE) (2003–2007), http://www.ymparisto.fi/default.asp?contentid=228996&lan=fi&clan=en
- Safeguarding forest biodiversity – policy instruments and socio-economic impacts (TUK), http://www.metla.fi/ohjelma/tuk/index-en.htm

Organisations, monitoring, etc.

- Ministry of the Environment, www.ymparisto.fi
- Finnish Environment Institute (SYKE), www.ymparisto.fi/default.asp?node=5297&lan=en

- Protected habitats under the Nature Conservation Act, http://www.ymparisto.fi/default.asp?contentid=240954&lan=fi&clan=en
- Habitats and Bird Directives, ec.europa.eu/environment/nature/nature_conservation/eu_nature_legislation
- Lumonet, Finnish Clearing-House Mechanism of the Convention on Biological Diversity, www.ymparisto.fi/default.asp?contentid=248346&lan=FI&clan=en
- Forestry Development Centre Tapio, www.tapio.fi/good_forest_for_all
- Habitats of special importance as defined in the Forest Act, www.metsavastaa.net/index.cfm?docID=280 (in Finnish only)
- Finnish Forest Research Institute, www.metla.fi
- National Forest Inventory, www.metla.fi/ohjelma/vmi/info-en.htm
- Horne, P. et al. (ed.) 2006. METSON jäljillä, Etelä-Suomen monimuotoisuusohjelman tutkimusraportti [Research Report on the Forest Biodiversity Programme Metso]. 2006. Ministry of Agriculture and Forestry, Ministry of the Environment, Finnish Forest Research Institute and the Finnish Environment Institute. 397 p.
- Working group for the harmonisation of the classifications and statistics on forest protection. 2002. Working group report MMM 2002:15. 51 p. + Annexes.

Tree species composition (4.1)

The number of indigenous tree species in Finland is small: four conifers and 27 broadleaved species of trees, bushes or small trees. Some of the broadleaves have a very narrow area of distribution. Many sites are dominated by just one species, such as pine in upland forests. Mixed stands and predominance of broadleaves are common in fresh mineral soil sites and upland forests with grass-herb vegetation. The most common species growing in mixed stands is downy birch.

Pine predominates on 66% of forest land, spruce on 24% and broadleaves on 9%. Broadleaves, which are important to forest biodiversity and the soil and grow mostly in mixed stands, account for 20% of the total volume of growing stock, which is clearly more than the total area of predominantly deciduous stands.

Tree species composition changes slowly. Since the beginning of the 1950s, the share of pine dominated stands has increased as a result of regeneration with pine. The most significant change is the reduction of the area of predominantly deciduous stands by a half in southern Finland. The species composition has changed less in terms of growing stock volume than in terms of species predominance.

Pure stands[27] account for 38%, stands with some mixing[28] account for 31% and actual mixed stands for 29% of all forest land.

National Forest Inventories conducted by the Finnish Forest Research Institute provide information on the development of forest resources and the state of forests. The forest resource reports of the inventories are published as a supplement to Metsätieteen

27 Pure stand: the proportional share of the dominant species of the volume (in seedling stands, the proportional share of the number of viable seedlings) is over 95%.

28 Stand with some mixing: the proportional share of the dominant species of the volume (in seedling stands, the proportional share of the number of viable seedlings) is between 75–95%. Mixed stand: the proportional share of the dominant species of the volume (in seedling stands, the proportional share of the number of viable seedlings) is below 75%.

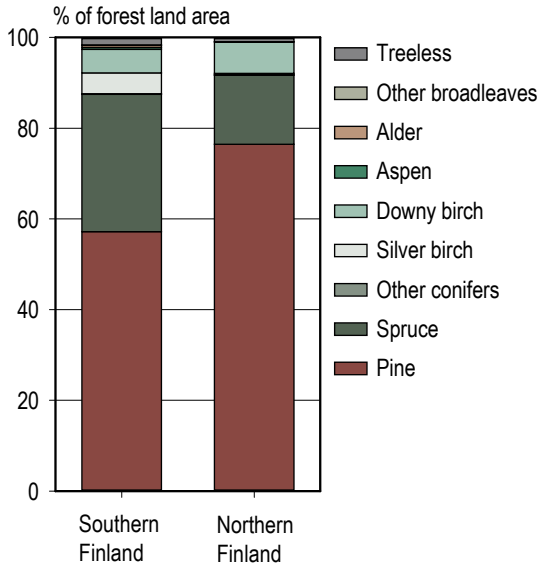


Figure 4.1a
Tree species dominance, 2004–2005
Source: Finnish Forest Research Institute, National Forest Inventory

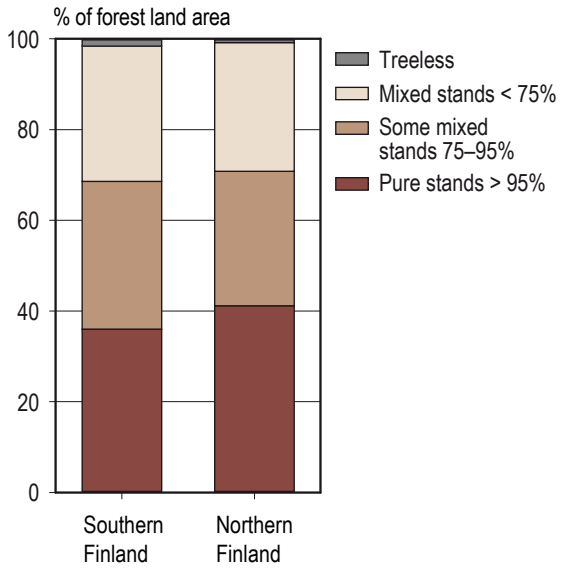


Figure 4.1b
Pure and mixed forest stands, 2004–2005
Source: Finnish Forest Research Institute, National Forest Inventory

Indigenous tree species in Finland

Conifers (4)	
- Scots pine	*Pinus sylvestris*
- Norway spruce	*Picea abies*
- Common juniper	*Juniperus communis*
- European yew	*Taxus baccata*
Broadleaves (27)	
- Silver birch	*Betula pendula*
- Downy birch	*Betula pubescens*
- Common alder	*Alnus glutinosa*
- Speckled alder	*Alnus incana*
- Aspen	*Populus tremula*
- European rowan	*Sorbus aucuparia*
- Oakleaf mountain ash	*Sorbus hybrida*
- Swedish mountain ash	*Sorbus intermedia*
- Swedish rowan	*Sorbus teodori*
- Bird cherry	*Prunus padus*
- Littleleaf linden	*Tilia cordata*
- Norway maple	*Acer platanoides*
- Common oak	*Quercus robur*
- European ash	*Fraxinus excelsior*
- Wych elm	*Ulmus glabra*
- European white elm	*Ulmus laevis*
- Crab apple	*Malus sylvestris*
- Buckthorn	*Rhamnus catharticus*
- Glossy buckthorn	*Rhamnus frangula*
- Hawthorn	*Crataegus monogyna*
- Spetshagtorn	*Crataegus rhipidophylla*
- Goat willow	*Salix caprea*
- Bay-leaf willow	*Salix pentandra*
- Black maul	*Salix triandra*
- Dark-leaved willow	*Salix myrsinifolia*
- Boreal willow	*Salix borealis*
- Pyrolavide	*Salix pyrolifolia*

Source: Hämet-Ahti, L. et al. 1992. Suomen puu- ja pensaskasvio. Finnish Dendrological Society.

aikakauskirja. Key figures are published annually in the Finnish Statistical Yearbook of Forestry.

Source:

- Korhonen, K.T., Heikkinen, J., Henttonen, H., Ihalainen, A., Pitkänen, J. & Tuomainen, T. 2006. Finnish Forest Resources 2004–2005. Metsätieteen aikakauskirja 1B/2006: pp. 183–221

Forest regeneration (4.2)

Under the Forest Act, after regeneration felling a new economically viable seedling stand whose development is not directly threatened by other vegetation must be established in the area within a reasonable period of time. Reproduction takes the form of natural regeneration[29], provided that, judged on the basis of growing stock, soil and other vegetation, the site has the potential for the production of natural seedlings. Otherwise clear felling is used, removing all trees and seeding or planting the site with reproductive material of local origin.

Mixed stands are preferred especially in more productive sites where the natural characteristics of the site provide favourable conditions for growth. The share of broadleaves is often 10–30% of the volume of the stock.

In 2005, some 145,000 ha of forest were regenerated. Fellings aiming at natural regeneration were carried out on 26,000 ha, with 88,000 ha planted and 31,000 ha seeded. In the period 1996–2005, the total area of forest regeneration varied from 145,000 to 178,000 ha annually. The proportional share of natural regeneration of all forest regeneration was about one fourth, that of seeding one fifth, and planting more than a half.

Altogether about 30% of Finnish commercial forests are regenerated by seeding or planting. The rest are established either by natural regeneration or assisted natural regeneration. Even in artificially regenerated stands there are lots of naturally grown trees, giving rise to a mixed species composition.

Data on forest regeneration are included in the statistics on silviculture and forest improvement, which are based on information collected from all forest owner groups by the Forest Statistics Information Service of the Finnish Forest Research Institute.

Sources:

- Metinfo statistics, www.metla.fi/metinfo/tilasto (in Finnish)
- Metsänhoito- ja perusparannustyöt 2005 [Forest management and improvement works 2005]. 2006. Metsätilastotiedote 838. 35 p.

29 Forms of regeneration: In natural regeneration, the new generation of trees is established naturally from the seeds of seed trees or shelterwood left standing in the felling site, or from seed in the woods adjacent to the felling area. In artificial regeneration, the new tree generation is established by seeding or planting. Even in artificially regenerated stands there are lots of naturally grown trees.

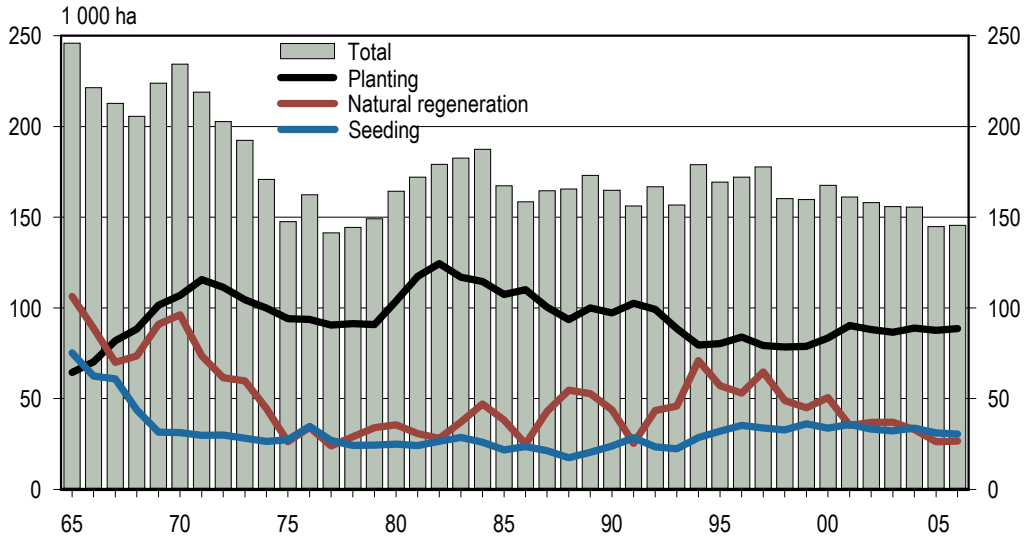


Figure 4.2
Natural and artificial regeneration, 1965–2006
Source: Finnish Forest Research Institute, Forest Statistics Information Service

Natural forests (4.3)

In the last five years, naturalness has developed into an international indicator of forest biodiversity. The naturalness of forests is assessed on a continuous ratio scale, where the existing vegetation in a stand is compared to naturally occurring vegetation. Naturalness is an indication of human impact in forests and of earlier, historical use of forests. Under the data collection guidelines of the Fourth Ministerial Conference (Vienna 2003), forests fall roughly into three classes on the basis of their naturalness: 1) undisturbed by man[30], 2) semi-natural forests[31], and 3) plantations[32].

Human activities change the structure and species composition of forests. Left unmanaged, forests grow into stands whose structure resembles forests in their natural state. Unmanaged, strictly protected conservation areas can be used to gain information about the natural development of forests.

Owing to long-term human intervention, no extensive natural forests have survived in Finland, except for some small stands in certain conservation areas. The structure of vegetation in managed forests in Finland has nevertheless remained largely similar to natural forests, thanks to forest management based on the natural site type classification and the use of indigenous species in regeneration.

According to the 9th National Forest Inventory, there were a total of 170,000 ha of old forests resembling natural forests (forests of over 140 years with observed indicators suggesting naturalness) in the hemiboreal, southern and middle boreal zones. Of these, 40% were in conservation areas. In the northern boreal zone there were 716,000 ha of such forests, 56% of them in conservation areas.

Indigenous tree species are used almost exclusively in forest management in Finland. Introduced species are planted only experimentally. Forests are regenerated on the basis of site type classification, which means that both natural and artificial regeneration is carried out with species that are best suited for the site in question.

Monocultures are established only in the afforestation of fields (approximately one per cent of all forests), but in them, too, the species and their origin are Finnish.

The naturalness of forest sites has been altered by peatland drainage. In wooded drained mires, however, the original tree species composition generally remains unaltered. Altogether 55% of all mires, or some five million ha, have been drained. In the last 10 years, practically no new drainage projects have been carried out. A significant share of the drained mires revert to natural development, as it is not justifiable economically to maintain the network of drains.

30 Undisturbed forests contain features belonging to the natural growth cycle of forests. Such features include natural species composition, deadwood, natural age structure and natural regeneration. The site is large enough to maintain natural succession. There are no recognisable signs of human activity in the area, or a sufficiently long time has passed from human intervention to allow the re-emergence of natural tree species composition and its development dynamics.

31 A semi-natural forest displays all those characteristics which are not included in forests undisturbed by man and plantations.

32 Plantations are forest stands established by planting introduced species or intensively managed stands of indigenous species which meet the following criteria: one or two species at plantation, even age class, and regular spacing. The exception is stands which were established as plantations, but which have been without intensive management for a long time, allowing the stand to develop naturally. In Finland, only afforested fields are classified as plantations. Sites of normal forest regeneration are established at irregular intervals and, because of supplementary natural regeneration and thinnings, they usually develop into mixed stands containing a great number of naturally established trees.

A typical northern natural coniferous forest at the end of its rotation in southern Finland (Vesijako nature reserve).

An increasing number of stands in southern Finland remain uncut. The number of forests exceeding 140 years of age where no fellings have been done in the last 40 years has grown continuously.

As yet there is no common, functioning European classification and measurement system for naturalness. With the exception of Austria, no country-specific assessments have been made that would correspond to the system of national forest inventories.

Source:

- National Forest Inventory, www.metla.fi/ohjelma/vmi/info-en.htm

Introduced tree species (4.4)

Introduced tree species[33] change forests, their mix of species, structure and diversity. Introduced species have been planted in Finland only for research and experimental purposes, or as decorative trees and stands in arboretums, for example.

There are about 9,500 ha of forests in Finland composed of introduced species. Of these, 9,000 ha are stands of lodgepole pine.

The number of stands with introduced species is not growing as the Forest Act and forest certification both require that, apart from special cases, only indigenous tree species must be used in regeneration. Siberian spruce is considered an indigenous species. The special cases mentioned in the forest certification standard where introduced species may be used include the establishment of park forest stands, the production of Christmas trees and conifer twigs, stands and trees planted for landscape management, and the cultivation of hybrid aspens. Hybrid aspen is a crossbreed between Finnish and North American aspen, which has been cultivated in Finland already since the 1950s.

National Forest Inventories conducted by the Finnish Forest Research Institute produce information about the development of forest resources and the state of forests. The forest resource reports of the inventories are published as a supplement to Metsätieteen aikakauskirja. Key figures are published annually in the Finnish Statistical Yearbook of Forestry.

Sources:

- Forest Act (1093/1996), www.finlex.fi
- Finnish Forest Certification System, www.ffcs-finland.org
- Korhonen, K.T., Heikkinen, J., Henttonen, H., Ihalainen, A., Pitkänen, J. & Tuomainen, T. 2006. Finnish Forest Resources 2004–2005. Metsätieteen aikakauskirja 1B/2006: pp. 183–221

Deadwood (4.5)

Certain forest organisms rely on dead or decaying wood for their survival. Many of these species are endangered. According to the latest report on endangered species, published in 2000, the decrease in the amount of deadwood is the main factor threatening the survival of 164 species, representing 11% of all endangered species.

33 Introduced tree species are other than indigenous species occurring naturally in Finland. The Siberian larch and the hybrid aspen are treated as indigenous species.

Table 4.5
Volume of deadwood in forest and low productive forest, 1996–2003
Source: Finnish Forest Research Institute, National Forest Inventory

	m³/ha		
	Snag	Log	Total
Southern Finland	0,8	2,0	2,7
Northern Finland	1,8	6,4	8,3
Entire country	1,3	4,2	5,5

In forests in southern Finland (commercial forests and nature conservation areas) there is on average 2.8 m^3 of dead and decaying wood per hectare, and 8.2 m^3/ha in northern Finland. Old-growth forests in natural state may have 20–120 m^3 of dead and decaying wood per hectare, but the amount varies a great deal depending on the fertility of the site, the development state of the forest, and natural disturbances.

The amount of deadwood in forests will increase as retention trees are left standing in regeneration sites to maintain biodiversity and the amount of decayed wood in the forest. In 1995–2006, an average of 5 m^3/ha green trees were left standing in regeneration fellings in private forests and the forests of the industry companies. About 60% of the volume consisted of retention trees, and 40% of important habitats and natural sites in or bordering the felling area. The volume of deadwood in felling sites was 1–1.5 m^3/ha. An average of 12 green retention trees were left standing in each felling site. Their value was 78 euros/ha. Under forest certification criteria, at least 5–10 dead or live retention trees with a breast height diameter of over 10 centimetres must be left standing in certified regeneration sites. Also individual fallen trees are nowadays often left in the forest. Broadleaves of slight economic value are left uncut in all fellings.

National Forest Inventories conducted by the Finnish Forest Research Institute produce information about the development of forest resources and the state of forests. The forest resource reports of the inventories are published as a supplement to Metsätieteen aikakauskirja. Key figures are published annually in the Finnish Statistical Yearbook of Forestry.

The maintenance of biological diversity, including the number of retention trees, has been monitored in private forests, forests owned by corporations and those administered by Metsähallitus regularly since 1995 in conjunction with the monitoring of the quality of nature management in commercial forests.

Sources:

- Evaluations of the monitoring of the quality of nature management in commercial forests, www.metsavastaa.net/index.cfm?docID=345 (in Finnish only)

Nowadays snags and logs that turn into deadwood are left in the forests in fellings. Deadwood helps the survival of certain species on the site across tree generations.

- Finnish Forest Certification System, www.ffcs-finland.org
- National Forest Inventory, www.metla.fi/ohjelma/vmi/info-en.htm
- Korhonen, K.T., Heikkinen, J., Henttonen, H., Ihalainen, A., Pitkänen, J. & Tuomainen, T. 2006. Finnish Forest Resources 2004–2005. Metsätieteen aikakauskirja 1B/2006: pp. 183–221

Genetic resources (4.6)

The purpose of protecting the genetic resources of forest trees[34] is to safeguard the capacity of the species and stands to adapt to changes in the environment. Genetic diversity is taken into consideration in forest management in the regulations on forest reproduction material and in seedling production. No forests are established in Finland of clones from a single individual tree, as the reduction of genetic variability would weaken the survival of tree species.

The natural genetic resources of the main tree species in Finland – pine, spruce, silver birch and downy birch – are maintained in gene reserve forests[35], which have been selected to represent the variability of the species within their distribution area. The network of gene reserve forests is almost completed. The genetic resources of rare species are protected in gene banks

34 The genetic resources of forest trees comprise their genetic variability, the various species and varieties, and intra-species variation.

35 A gene reserve forest (in situ conservation) is a living gene bank, which is allowed to develop under evolutionary pressure. Gene reserve forests are usually regenerated naturally and are managed following the regular good silvicultural practices.

established specifically for the purpose[36]. Nature conservation areas also contribute to the safeguarding of the genetic diversity of forest trees.

Genetically improved seed produced in seed orchards[37] are still used primarily in forest tree nurseries for seedling production.

Table 4.6a
Gene reserve forests, 2005. There are several tree species living in some gene reserve forests.
Source: Finnish Forest Research Institute, register on forest genetics

Species	Number	Area, ha
Pine	22	5 129
Spruce	10	1 809
Birch	6	643
Others	6	75
Total	43*	7 656

Table 4.6b
Gene resource archives, 2002
Source: Finnish Forest Research Institute, register on forest genetics

Species	Number	Area, ha
Maple	2	1,03
Eur. ash	3	0,74
Oak	1	0,22
Littleleaf linden	2	1,29
European white elm	1	0,42
Wych elm	2	1,79
Total	11	5,49

Table 4.6c
Seed orchards, 2004
Source: Finnish Food Safety Authority (Evira)

Species	Number	Area, ha
Pine	150	2 419,85
Spruce	26	298,08
Silver birch	7	0,86
Downy birch	1	0,07
Curly birch	1	0,04
Larch	10	68,50
Elms	2	2,50
Littleleaf linden	2	2,30
Rowan	1	1,80
Oak	1	0,70
Ash	1	0,60
Total	202	2 795,02

Table 4.6d
Seed collection areas, 2002
Source: Finnish Forest Research Institute

Species	Number	Area, ha
Pine	566	3 536,9
Spruce	204	1 170,7
Silver birch	60	135,3
Downy birch	46	109,0
Aspen	2	3,0
Siberian larch	2	6,5
Speckled alder	7	13,0
Common alder	9	7,2
Ash	2	2,3
Oak	3	2,0
Wych elm	1	0,5
Total	902	4 986,4

Pine seed from seed collection areas[38] is used primarily for stand seeding, while some spruce seed is still used in nurseries for seedling production.

Forest tree breeding and the management of the genetic resources of forest trees are the responsibility of the Finnish Forest Research Institute. The Institute maintains a register on forest genetics which covers information about selected trees and plus trees, experimental plantations, gene reserve forests and gene resource archives.

Compliance with the Act on Trade in Forest Reproductive Material is monitored by the subsection for forest reproductive material of the Finnish Food Safety Authority to ensure that the basic genetic material used to produce reproductive material for forests is of a high quality.

Sources:

- Finnish Forest Research Institute, www.metla.fi/index-en.html
- Finnish Food Safety Authority, www.evira.fi
- Forest tree breeding, www.evira.fi/portal/fi/kasvintuotanto_ja_rehut/metsanviljely/.kttk.fi
- Metsäpuiden siemenhuoltotyöryhmän muistio [Report of seed supply working group]. 2004. Working group report 2004:12. Ministry of Agriculture and Forestry.
- Yrjänä, L. & Karvinen, K. 2002. Suomen metsänjalostuksen yleistilasto [general statistics on forest breeding in Finland]. Bulletins of Finnish Forest Research Institute 854.

36 Genetic resource archives (ex situ conservation) contain genetic material from several different stands. The archive is tended with intense management.

37 Seed orchards are tree plantations established specifically for the production of seed. The trees in a seed orchard are plus trees, the best individuals selected from natural populations using the methods of tree breeding.

38 Seed collection areas are natural stands which have been selected for the purpose of collecting seeds. The stands are of high-quality growing stock and suitable for seed production both in terms of the age and management history of the stand.

Forest cover in landscapes (4.7)

In the long term, the development of forest species depends on the forest cover, i.e. whether it is preserved or whether unbroken cover is fragmented permanently as a result of other land use. Observation of land use on the landscape level produces information on the integrity of forests, their size, form and location. Landscape-level observation also enables us to assess what kinds of habitats are available for forest species.

The dominant landscape element in Finland is forest. About 75% of the land area is under forest cover. The second most dominant landscape element is lakes and other small water bodies. There are more than 180,000 lakes or ponds that are at least 500 square metres in area. Their total area is 3.4 million ha, which is 10% of the total area of the country. The rest consists of agricultural land, constructed areas or open land.

No major changes have taken place in the relative share of forest cover in Finland over the past few decades. Changes in forest cover on the landscape level have mainly been caused by construction and changes in agriculture, such as the afforestation of abandoned meadows and fields or the conversion of drained peatlands into wooded land. Because of dispersed settlement patterns, the permanent road network in Finland is rather dense. The majority of roads are narrow, however, and do not pose much of an obstacle to the spreading of species.

There are as yet no indicators in Finland to monitor changes in the landscape level.

Source:

- Statistical Yearbook of Finland 2005. Statistics Finland, 702 p.

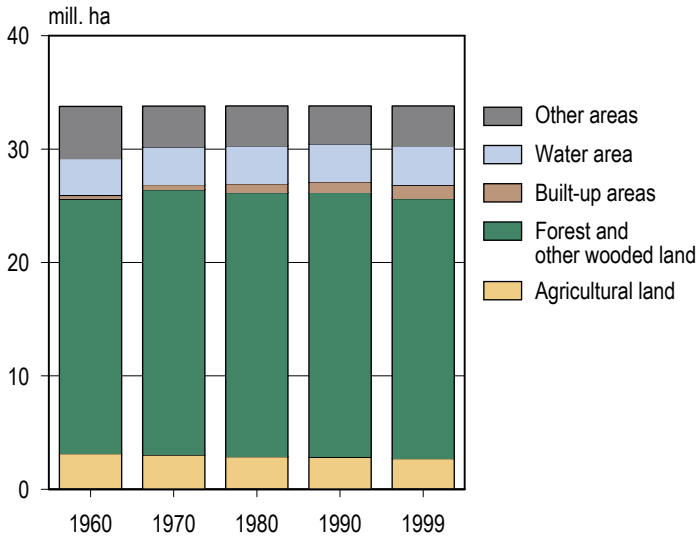


Figure 4.7
Land use in Finland, 1960–1999
Source: Statistical Yearbook of Finland 2005

Threatened forest species (4.8)

Monitoring of threatened species[39] yields information about changes in forest ecosystems. It is estimated that there are about 43,000 species living in Finland, about half of which have their habitat in the forest. Potential endangerment has been assessed for 15,000 species. In the latest study from 2000, 1,505 species were classified as endangered. Of these, 564 species had their primary habitat in the forest and 67 in mires.

Of the endangered forest species, 82% live in herb-rich forests and old-growth upland forests. The taxonomic groups with the greatest number of endangered forest species are invertebrates and fungi.

The inventory of 2000 made use of the new international classification of threatened species, the IUCN classification. The assessment was also carried out using the old set of criteria so as to allow comparison with the two preceding reports. The endangerment of forest species seems to have slowed down in the 1990s, although the likelihood of extinction of species living in old-growth forests in southern Finland is still clearly on the increase. The number of endangered species is growing the fastest in heritage habitats created by human activity such as semi-natural wooded pastures and meadows.

The list of endangered species was updated in 2006. The list, annexed to the new Nature Conservation Decree, contains 1,410 endangered species. Data on the distribution of threatened species is entered in the database of threatened species maintained by the Finnish Environment Institute.

Sources:

- Finnish Environment Institute, www.ymparisto.fi/default.asp?node=5297&lan=en
- Database of threatened species, www.ymparisto.fi/default.asp?contentid=173556&lan=fi&clan=en
- Species protection, www.ymparisto.fi/default.asp?node=475&lan=fi (Finnish), www.ymparisto.fi/default.asp?contentid=244753&lan=fi&clan=en
- Research programme on deficiently known and endangered forest species in Finland (PUTTE) (2003–2007), http://www.ymparisto.fi/default.asp?contentid=228996&lan=fi&clan=en
- Rassi, P., Alanen, A., Kanerva, T. & Mannerkoski, I. (ed.) 2001. Suomen lajien uhanalaisuus 2000 [Endangered species in Finland 2000].
- The World Conservation Union IUCN classification of threatened species, www.iucn.org/themes/ssc/redlist2006/categories.htm

39 Endangerment refers to the probability of the species becoming extinct. Anthropogenic and non-anthropogenic causes of endangerment are not distinguished in the assessment of endangerment. All threatened species are classified as critically endangered, vulnerable and endangered.

Table 4.8
Number of threatened forest and mire species
Source: Rassi, P., Alanen, A., Kanerva, T. & Mannerkoski, I. 2001: Suomen lajien uhanalaisuus 2000 [Endangered species in Finland 2000].

	Vertebrates	Invertebrates	Vascular plants	Cryptograms	Fungi and lichens	Total
Forest type	**12**	**252**	**35**	**15**	**250**	**564**
Old heathland forests	4	69		1	70	144
Other heathland forests	3	8	3	1	24	39
Old herb-rich forests	1	58		7	32	98
Other herb-rich forests	2	66	26	5	120	219
Esker forests		15	6			21
Forest fire areas		29				29
Other forests	2	7		1	4	14
Peatlands	**1**	**14**	**18**	**25**	**9**	**67**
Fens		3	17	13	4	37
Bogs	1	2	1	1	2	7
Pine mires		5			1	6
Spruce mires		2		9	2	13
Other peatlands		2		2		4

Protected forests (4.9)

Conservation areas are in most cases established through legislation. They are areas where forests are allowed to develop naturally, or where fellings are severely restricted. Most nature conservation areas are on forestry land and are owned by the State.

Grey snail *(Bulgarica cana)* is an extremely endangered species in Finland.

The area of protected forests (forest and low productive forest) is currently 2.1 million ha (9% of the total area of forests). In addition there are 0.8 million ha of forests under restricted forestry use. The majority of protected forests are in northern Finland. Statistics on protected forests are prepared on the basis of the national classification. MCPFE Assessment Guidelines (2003) are used in the classifications and statistics on forest protection in Europe.

Extensive statutory conservation areas

The area of protected forests in Finland has tripled since the 1970s. The establishment of statutory conservation areas has been based on conservation programmes for national parks, strict nature reserves, mires, waterfowl habitats, eskers, herb-rich forests, shorelines and old-growth forests adopted by the Government in the 1970s–1990s. The first national parks and nature reserves in Finland were established in 1938. There are currently 35 national parks with a total land area of 799,000 ha. Many national parks have been extended in recent years. There are 19 nature reserves with a total area of 151,000 ha. Wilderness reserves (12 areas, total 1.4 million ha) were established in Lapland in 1991. The Natura 2000 network in Finland is almost complete.

Other statutory forest protection areas

The Forest Act lists habitats of special importance for forest biodiversity, whose natural features must be preserved in the management. A total of 120,000 of such small sites have been found in surveys of private forests. Their total area is about 75,000 ha, or 0.5% of

the area of private forestry land. In their surveys, the forest industry companies have found about 11,000 ha of habitats of special importance listed in the Forest Act, and Metsähallitus has found about 43,000 ha of such habitats.

A preliminary survey suggests that there is a total of 674 hectares of protected wooded biotopes listed in the Nature Conservation Act (wild woods rich in noble broadleaves, hazel woods and common alder woods). The Forest Biodiversity Programme for Southern Finland (METSO) adopted by the Government in 2002 lists several new, voluntary measures for the conservation of forest biodiversity in private forests. These measures are being tested in certain areas. In the period 2003–2006, a total of 121 agreements were made with private landowners on natural values covering altogether 1,216 ha of land. On the basis of competitive tendering, about 310 ha were placed under protection for 20 years or permanently.

Management of conservation areas

Under funding from the METSO programme, Metsähallitus will restore by 2012 a total of 33,000 ha of upland forests and drained peatlands in the State conservation areas under its administration. About two-thirds of the targets set in the programme were realised by the end of 2006.

An international team of experts carried out an assessment of the management of Finnish nature conservation areas in 2004. The assessment suggests that the current level of management of Finnish conservation areas is good, and apart from a few exceptions, the aims of safeguarding biodiversity have been achieved.

Table 4.9
Protected forests and forests in restricted forestry use, 1 January 2005
Source: Finnish Forest Research Institute, Forest Statistics Information Service

Classification	Forest land		Low productive forest land		Forest and low productive forest land		Total land area	
	% of forest land		% of low productive forest land		% of forest and low productive forest land		% of total land area	
	1,000 ha	%	1,000 ha	%	1,000 ha	%	1,000 ha	%
1. Strictly protected forests [A]	**924**	**4,6**	**961**	**34,7**	**1 885**	**8,2**	**3 412**	**13,0**
2a. Protected areas where restricted forest management is possible [B]	115	0,6	58	2,1	173	0,8	246	0,9
1+2a. Protected forests	**1 039**	**5,2**	**1 019**	**36,8**	**2 058**	**9,0**	**3 658**	**13,9**
2b. Forests with felling restrictions [C]	550	2,7	273	9,9	823	3,6	1 115	4,2
1+2a+2b. Protected forests and forests with felling restrictions, total	**1 589**	**7,9**	**1 292**	**46,7**	**2 881**	**12,6**	**4 773**	**18,2**

[A] National parks and strict nature reserves, mires, herb-rich forests and old-growth forest conservation areas, other conservation areas on State and private land, strictly protected zones in wilderness reserves, areas covered in nature conservation programmes, sites of the Natura 2000 network established under the Nature Conservation Act, habitats of species under special protection, and sites covered by environmental support under the Act on the Financing of Sustainable Forestry.

[B] Managed zones in wilderness reserves, biotopes protected under the Nature Conservation Act whose boundaries have been determined, habitats of special importance as listed in the Forest Act, strictly protected zones in State recreation areas, areas protected by the member organisations of the Finnish Forest Industries Federation under their own decisions, statutory species protection and areas covered by the METSO Forest Biodiversity Programme.

[C] Other nature conservation areas on private land belonging to the shoreline conservation programme, sites of the Natura 2000 network established under the Forest Act, valuable forest ecosystems, the following areas of Metsähallitus: protected forests, ecological corridors, other natural sites in landscape-ecological plans, capercaillie lek sites, forestry areas containing special environmental or recreational values, landscape sites, contract research forests, recreation forests and areas, other than strictly protected zones in State recreation areas, cultural, recreational, landscape and game management areas owned by forest industry companies, and the nesting and resting sites of the flying squirrel.

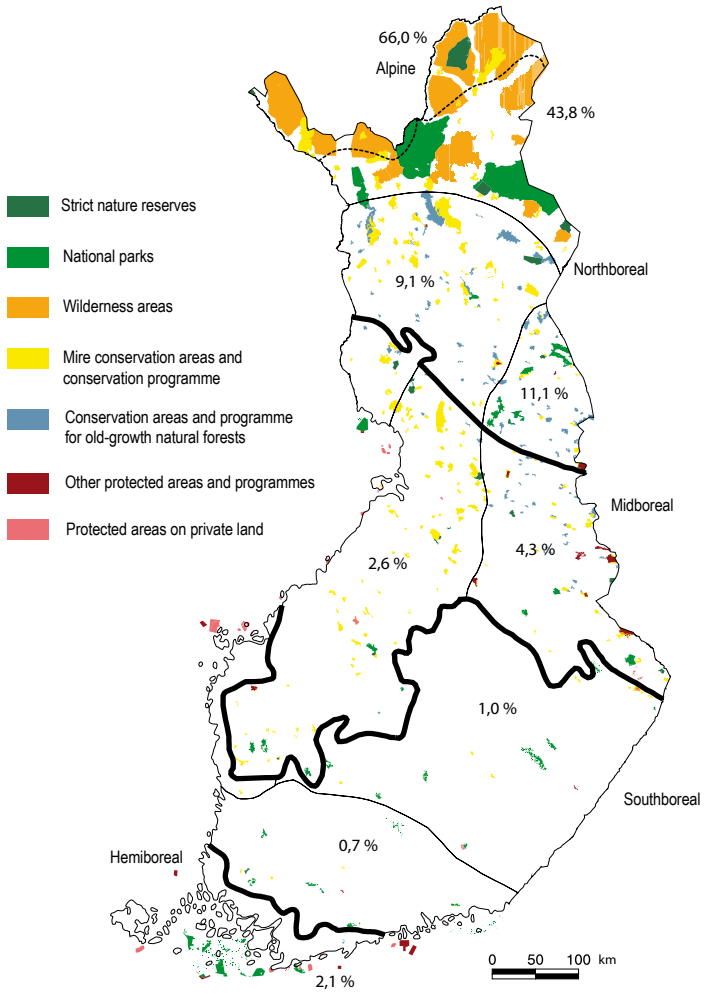


Figure 4.9
Nature conservation areas by forest vegetation zone, 2000.
Percentage shares indicated by results of NFI8.
Sources: Finnish Environment Institute, Metsähallitus

Sources:

- Ministry of the Environment, www.ymparisto.fi/default.asp?node=4032&lan=en
- Finnish Environment Institute, www.ymparisto.fi/default.asp?node=5297&lan=en
- Nature conservation, www.ymparisto.fi/default.asp?contentid=246822&lan=fi&clan=en
- Finnish Forest Research Institute, www.metla.fi/index-en.html
- Statistics on protected forests, Metinfo Forest Statistics Information Service, www.metla.fi/metinfo/suti/
- Metsähallitus, www.metsa.fi/default.asp?Section=1176
- Nature conservation, www.ymparisto.fi/default.asp?contentid=246822&lan=fi&clan=en
- MCPFE classification, www.mcpfe.org/system/files/u1/vienna_resolution_v4.pdf
- Working group for the harmonisation of the classifications and statistics on forest protection. 2002. Working group report MMM 2002:15. 51 p. + annexes.
- Action plan for the protection of forest biodiversity in southern Finland, western part of the Province of Oulu and south-western part of Lapland. 2002. Suomen ympäristö 583. Ministry of the Environment.56 p.
- Horne, P (ed.) 2006. METSON jäljillä, Etelä-Suomen monimuotoisuusohjelman tutkimusraportti [Research Report on the Forest Biodiversity Programme Metso]. Ministry of Agriculture and Forestry, Ministry of the Environment, Finnish Forest Research Institute and Finnish Environment Institute. 397 p.
- Gilligan,B., Dudley, N., Fernandez de Tejada, A. and Toivonen, H. 2005: Management Effectiveness Evaluation of Finland's Protected Areas. Nature Protection Publications of Metsähallitus. Series A 147.
- COST E4, 2000: COST Action E4: Forest reserves research network. EUR 19550. European Commission. Luxembourg 2000. 377 p.
- Parviainen, J., Kassioumis, K., Bücking, W., Hochbichler, E., Päivinen, R., Little, D., 2000.: COST Action E4: Forest Reserves Research Network. Missions, Goals, Linkages, Recommendations and Partners. Final Report. Joensuu, Finland. In: European Commission (ed.): COST Action E4. Forest Reserves Research Network. 377 p. Luxembourg. ISBN 92-894-0155-9.

Criterion 5 Protective Forests

The land surface is fairly flat in Finland, and there are hardly any problems caused by soil erosion, avalanches or shifting of the ground. Protective functions therefore mostly focus on protective forests in the timberline area in Lapland.

The total area of protective forests in the northernmost part of Finland is 3.3 million hectares. In these areas, fellings are restricted by law to prevent the timberline from receding further south. Forest regeneration is monitored constantly in these areas. No discernible change has yet been observed to indicate any shifting of the timberline.

Because of the great number of lakes, rivers, small water systems and peatland forests in Finland, issues relating to water systems receive special attention in forest management. Monitoring of the effects of silviculture on water systems over a period of ten years indicates that the level of water protection has improved continuously at felling sites. Natural peatlands are no longer drained in Finland, but the condition of already drained peatland forests that have growth potential is improved in ditch cleaning and supplementary ditching projects. Protective zones with trees are established alongside water systems in harvesting, sludge sumps are dug during ditch cleaning and supplementary ditching, and waters from the area are passed to open waters through an infiltration area. Measures are designed so as prevent nutrient and sludge washout.

B.7 Maintenance and increasing of the protective functions of forests

Owing to the flatness of the topography and the lack of mountainous areas, forests in Finland do not have the same kind of protective function against erosion and avalanches as they do in many other European countries. Protective functions mostly focus on protective forests in the timberline area in Lapland. In the protective forest zone[41] the special aim of forest management is to prevent the retreat of the timberline and to maintain the vitality of forests in the area.

Under the Forest Act, forests in the protection zones must be managed with special care to prevent the timberline from retreating further south.

Under the Government Decision on Protective Forests, the Finnish Forest Research Institute is required to monitor the regeneration of forests in the protective zone and in the high-altitude areas in the Provinces of Lapland and Oulu.

The supreme administrative and executive powers in matters pertaining to protective forests belong to the Ministry of the Environment. Policies are implemented by Metsähallitus and the Forestry Centres. The Finnish Forest Research Institute monitors the *regeneration of the protective forest zone* and *the high-altitude forests* in the Provinces of Lapland and Oulu, and prepares a report on these every ten years for the Ministry of Agriculture and Forestry.

Environmental protection is taken into account when *planning the management of protective forests*. This includes forest planning for commercial forests, management plans for protective forests, as well as management plans for wilderness reserves. In the protective zone, cuttings for any other purposes than household consumption of fuelwood are only permitted if covered by harvesting and regeneration plans specifically approved by the relevant Forestry Centre.

Sources:

Finnish legislation, www.finlex.fi/en/

- Forest Act (1093/1996)
- Government Decision on Protective Forests (844/1998)

Monitoring

- Hyppönen, M. et al. 2003. Metsien uudistuminen suojametsäalueella [Forest regeneration in the protective forest zone]. Metsätieteen aikakauskirja 1/2003: pp. 31–45

41 The protective forest zone consists of the municipalities of Enontekiö and Utsjoki in their entirety, and areas in the municipalities of Inari, Kittilä, Kolari, Muonio, Salla, Savukoski and Sodankylä whose boundaries are marked in the terrain in the land survey operation.

Timberline forests (5.1)

Protective functions mostly focus on protective forests in the timberline area. In the protective forest zone in northern Finland, forest management is restricted and regulated in order to prevent the retreat of the timberline and to maintain the vitality of the forests in the area.

Table 5.1
State forestry lands in the protective forest zone
Source: Metsähallitus

	1,000 ha		
	In forestry use	Other areas [A]	Total
Forest land	211	382	593
Low productive forest land	79	896	975
Waste land	90	1 143	1 233
Total	380	2 421	2 801

[A] Wilderness reserves (over 800,000 ha), statutory conservation areas (over 200,000 ha), areas under protection programmes, protected forests and recreational forests.
About 170,000 ha of the Pallas-Ounastunturi national park are missing from the figures.

The total area of the protective forest zone in the north is about 3.3 million ha, of which State forests administered by Metsähallitus account for 2.8 million ha. 380,000 ha of the State forests are under commercial management without any felling restrictions.

The Finnish Forest Research Institute is required to monitor the regeneration of forests in the protective zone and the high-altitude forests in the Provinces of Lapland and Oulu, and to prepare a report on these for the Ministry of Agriculture and Forestry every ten years. According to the last report, published in 2003, the regeneration of forests in the protective zone has been fairly successful in recent years. Unless the climate changes suddenly, no changes are expected in forest regeneration.

Protective forests - infrastructure and managed natural resources (5.2)

As regards topography, Finland is a level country. Agricultural land only covers 8.9% of the total area and field parcels are small and surrounded by forests, which is why there is hardly any need to establish hedges or wooded zones on fields as windbreaks.

Forests have local significance in mitigating the damages caused by traffic. Major arteries are generally routed through forests far away from population centres, and even in built-up areas residential districts are set off from traffic routes with wooded buffers as wide as possible. Trees are efficient in capturing dust and

exhaust fumes. For a noise barrier, a wooded band several dozen metres wide is needed, depending on the structure of the wood. The visual barrier trees present has also been observed to reduce the subjective experience of noise disturbance.

Wooded protective areas in communities are planned in conjunction with land use planning. For example, green belts along busy roads which shelter adjacent areas from the damaging effects of traffic and which because of their location cannot be used for recreation are marked as such in local and master plans.

Source:

- Land use planning, Land Use and Building Act 2000 series, www.ymparisto.fi/default.asp?node=1410&lan=fi (in Finnish only)

Water issues in forest management are addressed in conjunction with protective forests, even though they do not as such concern protective forests as referred to in this criterion.

Impacts of forest management on waters

Because of the great number of lakes, rivers, small water systems and peatland forests in Finland, issues relating to water systems receive special attention in forest management.

The greatest impacts of forest management on waters are caused by ditch cleaning and supplementary ditching, regeneration fellings and related soil preparation, as well as fertilisation. The environmental load from forest management weakens the condition of otherwise clean headwaters, brooks and other small water bodies. Important groundwater areas are taken into consideration in forest management and fellings, and the quality of groundwater is not compromised.

The phosphorus load from forest management accounted for about 8% of the total anthropogenic nutrient load in 2004, and the nitrogen load for about 5%. The nitrogen load from forestry has decreased as a consequence of the decrease in drainage projects. The fertilisation of peatlands has increased the phosphorus load caused by drained mires.

In the national water protection programme *Guidelines for water protection to 2015* targets are set for the reduction of the environmental load on waters from forestry. The guidelines support the planning of water management in compliance with t*he Act on the Organisation of Water Management*, in which the problems and needs of water protection are addressed by drainage areas. The measures for the implementation of the policy guidelines for water protection will be defined and targeted in detail in water management plans drawn up in compliance with the EU Water Framework Directive by the end of 2009.

In the National Forest Programme 2010, the goal was set of reducing the phosphorus and nitrogen load from forest management by at least 50% from the estimated level of 1993 by 2005. The same target was also included in the Government's decision in principle on *the targets of water protection to 2005*. Under *the Act on Environmental Impact Assessment Procedure*, the environmental impacts of large-scale peat production and drainage projects must be assessed.

Knowledge about the environmental impacts of forest management and ways for reducing it has increased substantially in the last 30 years, and new information has been applied on a broad scale.

The quality of water protection in harvesting and soil preparation works in private forests and forests of the forest industry companies and Metsähallitus is monitored in conjunction with the *assessment of the quality of nature management in commercial forests*. The quality of waters is monitored by the environmental administration. Statistics on *the nutrient load, runoff into waters*, etc. are compiled by the Finnish Environment Institute.

According to the Act on the Financing of Sustainable Forestry, measures for water management which receive funding must be based on a duly prepared plan. A water protection plan must always be included in plans concerning ditch cleaning and supplementary ditching.

Guidelines and recommendations on water and soil protection in forest management have been prepared by private forestry organisations, Metsähallitus and forest industry companies in co-operation with environmental authorities.

Water protection is also addressed in the *forest certification* standard: an unbroken riparian zone must be retained along waterways and small bodies of water, natural mires are not drained, a water protection plan is drawn up in conjunction with ditch cleaning and supplementary ditching, no chemical pesticides or fertilisers are used in groundwater areas, and the use of chemical pesticides is avoided in general.

In harvesting and silvicultural works, riparian zones with an unbroken forest cover are left along waters, digging breaks and sludge sumps are established in soil preparation, and felling residue is handled so that no nutrients are washed into ditches or waters. Log-

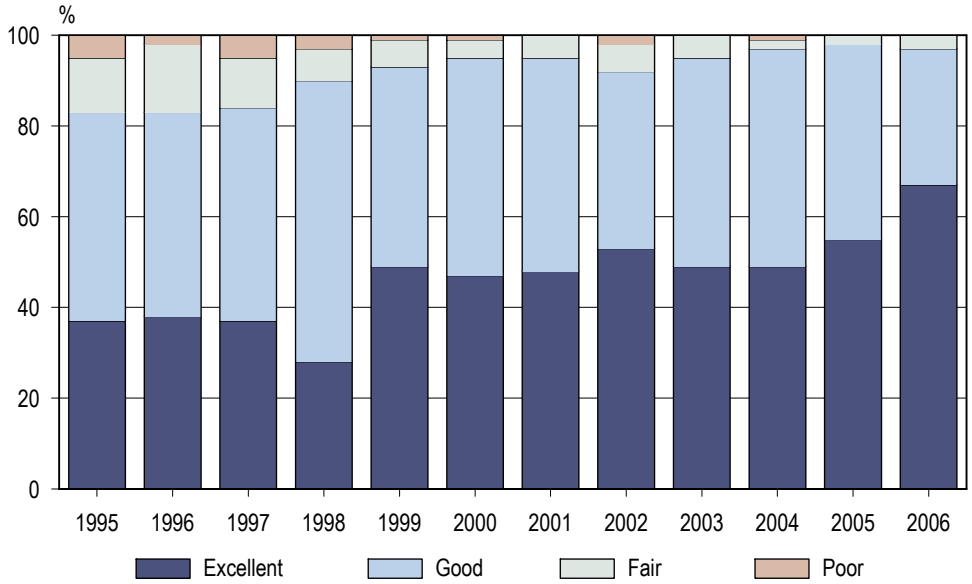


Figure 5a
The quality of water protection in harvesting, 1995–2006
Source: Assessment of the quality of nature management in commercial forests

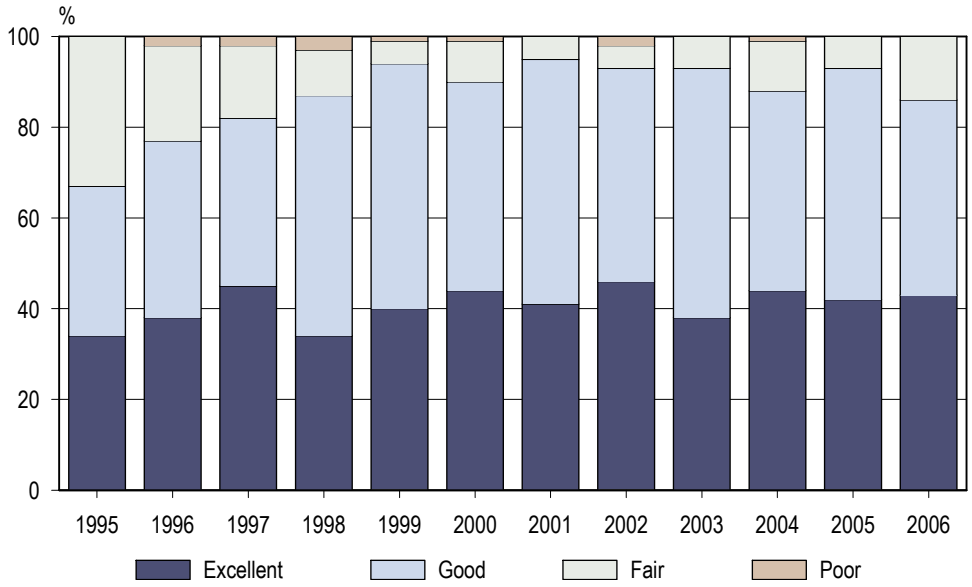


Figure 5b
Quality of water protection in soil preparation, 1995–2006
Source: Assessment of the quality of nature management in commercial forests

ging roads are planned so as to ensure that no channels for water are created between ditches and small water bodies. Water protection in conjunction with harvesting and soil preparation improved during the monitoring period 1995–2005.

Sources:

Programmes
- Guidelines for water protection to 2015 (2006, www.ymparisto.fi/download.asp?contentid=59652&lan=fi (in Finnish)
- Water protection targets to 2005 (1998), www.ymparisto.fi/download.asp?contentid=5197&lan=fi (in Finnish)
- National Forest Programme 2010 (2001), www.mmm.fi/attachments/5fLUy9oi5/5gpA9OecX/Files/CurrentFile/The_programme_2010en.pdf

Finnish legislation, www.finlex.fi/en/
- Forest Act (1093/1996)
- Water Act (264/1961)
- Act of the Organisation of Water Management (1299/2004)
- Act on Environmental Impact Assessment Procedure (468/1994)
- Act on Compensation for Environmental Damage (737/1994)

Organisations, monitoring, etc.
- Finnish Environment Institute, www.ymparisto.fi/default.asp?node=5297&lan=en
- Nutrient load and natural runoff, www.ymparisto.fi/default.asp?node=8568&lan=fi (in Finnish)
- Forestry Development Centre Tapio, www.tapio.fi/good_forest_for_all
- Water protection in forest management, www.metsavastaa.net/index.cfm?docID=4568 (in Finnish)

Criterion 6 Socio-Economic Functions

The forest sector remains important for the Finnish national economy. The share of the forest sector in GDP is about six per cent. Regionally, the importance of the forest sector is greatest in south-eastern and eastern Finland and in the Kainuu region.

The net result of private forests had decreased untill 2007 over the past 10 years, varying from €85 to 117/hectare/year. Domestic consumption of sawn wood is about one square metre per capita, that of paper and paperboard about 230 kg annually. The consumption of wood-based products per capita in Finland is one of the highest in Europe.

The forest sector provided jobs to about 89,000 persons, which is 4.0% of all employed persons in 2006. Occupational safety and health of employees in the forest sector are well taken care of. Social security of employees in the forest sector is equal to that in other sectors of the economy.

Citizens have a great many opportunities for participating in the various aspects of forestry. Methods of participatory planning have been developed especially in the case of State forests.

Forests play a vital role in the development of Finnish national identity and relationship to nature. The cultural and spiritual functions of forests have therefore been taken into account increasingly in, for example, the preservation of forest traditions, silvicultural operations, timber construction, art, communications and landscape protection

B.8 Maintenance of the economic viability of forestry

Economic viability is a basic requirement of sustainable forest management. Without an economically viable forest economy, there can be no ecologically or socially sustainable forest management, either. Unlike in many other European countries, in Finland the non-wood forest products have only seldom any greater effect on the economic viability of forestry.

The principal factors affecting the economic viability of forestry are the price of timber, the volume of sales, the cost of forest management and harvesting, taxation and Government subsidies. Economic viability also depends on the general economic climate, which affects matters such as interest rates and the value of forest land. Economic viability can be improved by developing the methods of forest management and harvesting, and by increasing cost-efficiency and improving the quality of silvicultural works.

The economic viability of private forestry has deteriorated in Finland in recent years as the volume of fellings and the price of timber have fallen (as an exception, in 2007 the price of timber rose quite unexpectedly by 40%). At the same time, the costs of forestry, transportation in particular, have gone up. There are regional differences in the economic viability of wood production: in southern Finland it is clearly more viable than in the north.

The price of timber depends mostly on the price of forest industry products on the world market and on related economic trends. As most of the production of the Finnish forest industry is exported, the domestic market for roundwood is dependent on the international demand for the exported products.

Because the forest industry has reinvested its profits in Finland, its raw material supply continues to be dependent on the domestic roundwood market. In the last 10 years, an increasing volume of roundwood is imported to Finland, mostly from Russia, which has an effect on the domestic market as well.

Programmes

The economic viability of sustainable forest management (SFM) was adopted as the theme of one of the Resolutions (V2) by *the Fourth MCPFE Conference in Vienna in 2003*. The Resolution emphasised factors which can be used to safeguard the economic viability of forest management, especially in rural areas.

The promotion of economically viable forestry is one of the main aims of *the Finnish National Forest Programme 2010* and of *the Future Review for the Forest Sector*. The goal is to secure and maintain the economic viability of forestry in Finland.

Since the economic viability of forestry is vital to the maintenance of habitation, employment and entrepreneurship in rural areas, it is supported by several measures in regional policy. Entrepreneurial operations are encouraged by taxation and by granting start-up subsidies to new businesses. Regional activities in forestry and the wood sector are also supported through the structural funds of the European Union and by the Centre of Expertise Programme.

Legislation

Policy instruments for wood production and non-wood products are also discussed in conjunction with indicators B.4 and B.5 of Criterion 3.

The Act on the Financing of Sustainable Forestry provides means for improving the economic viability of investments in private forestry. Private forest owners are eligible for public funding for certain silvicultural and forest improvement works. The funding is justified by the social benefits gained from supporting the least profitable long-term investments of private forestry and from joint projects of forest owners, such as peatland drainage and forest road construction. Subject to a set of stringent criteria, the measures eligible for support are afforestation of previously treeless areas and the regeneration of land of low forest cover, prescribed burnings, management of young stands, harvesting and chipping of energy wood, remedial fertilisation, ditch cleaning and supplementary ditching, establishment and reconditioning of forest roads, and prevention of the spread of root-rot disease.

Taxation

Taxation can be used to steer wood production and to improve its economic viability. Until 1993, the *taxation of forest income* in Finland was based on site productivity, the mean price of timber and expenses. Forest taxation was reformed in 1993, and forest owners were given the choice whether to pay taxes according to the old system or the new one based on net stumpage earnings. The two systems were in force simultaneously in 1993–2005.

Starting in 2006, all forest owners pay tax calculated on the basis of real income and expenses. The net difference between income and expenses is pure capital income from forestry, which is taxed at the rate of 28%.

Work performed for the delivery sales of timber by the forest owner or his/her family is regarded as taxable earned income insofar as the volume of wood produced or transported by the forest owner exceeds 125 m^3 per year.

Advisory services

In improving the economic viability of forest management, timing of management works and correct sequencing are vital. Forest *advisory services* aim to ensure that this is the case. The recommendations for commercial forest management have been reviewed and rotation recommendations have been revised to improve economic viability. Local forest management associations offer practical advice on how to improve profitability.

Sources:

Treaties and programmes

- Resolutions of the Ministerial Conference on the Protection of Forests in Europe, www.mcpfe.org/mcpfe/resolutions
- Resolution V4 on Conserving and Enhancing Forest Biological Diversity in Europe adopted by the Fourth Ministerial Conference (Vienna 2003), www.mcpfe.org/system/files/u1/vienna_resolution_v4.pdf
- National Forest Programme 2010, www.mmm.fi/attachments/5fLUy9oi5/5gpA9OecX/Files/CurrentFile/The_programme_2010en.pdf
- Future Review for the Forest Sector, www.mmm.fi/attachments/5enfdAPe1/5m6LgokFX/Files/CurrentFile/MMMjulkaisu2006_11b.pdf

Finnish legislation, www.finlex.fi/en/

- Act on the Taxation of Farm Income (543/1967)
- Forest Tax Decree (1208/1991)
- Income Tax Act (1535/1992)
- Forest Act (1093/1996)

Organisations, monitoring, etc.

- Forestry Centres, www.metsäkeskukset.fi/web/eng
- Central Union of Agricultural Producers and Forest Owners (MTK), www.mtk.fi/en_GB/ (English in brief)
- Hyvän metsänhoidon suositukset [Recommendations for good forest management]. 2006. Forestry Development Centre Tapio. 95 p.

Forest holdings (6.1)

Private forest owners (individuals, estates and partnerships) own 12 million hectares of forest land, the State 5 million, companies 2 million and corporate bodies (municipalities, parishes, partners to jointly-owned forests, etc.) one million hectares of forest land. The majority of forests owned by the State are in eastern and northern Finland.

Finnish forestry is mainly in the hands of families. Private forest holdings are rather small[42]. The average size of holdings required to pay the statutory forest management fee stipulated in *the Forest Management Association Act* is 31 hectares. The average size of holdings which are not required to pay the fee because of their small size is 2.4 hectares.

The number of private forest holdings whose size is over 2 hectares is 443,300. There are more forest owners than there are holdings, however, because spouses often own a holding jointly. On average, estates and partnerships have four partners. The number of persons who own forest in Finland is estimated to be 920,000.

Two kinds of structural changes take place in forest ownership: changes amongst owner groups and internal changes within a group. Changes among owner groups have been very small, and have generally involved the purchase of holdings. Some forests change hands through the exchange of land or, in the acquisition of conservation areas, also by expropriation by the State.

42 The owners of small forest holdings are not required to pay the management fee. A small holding is one which has less than four hectare of forest land; in the Province of Oulu seven hectares, and in Lapland 12 hectares.

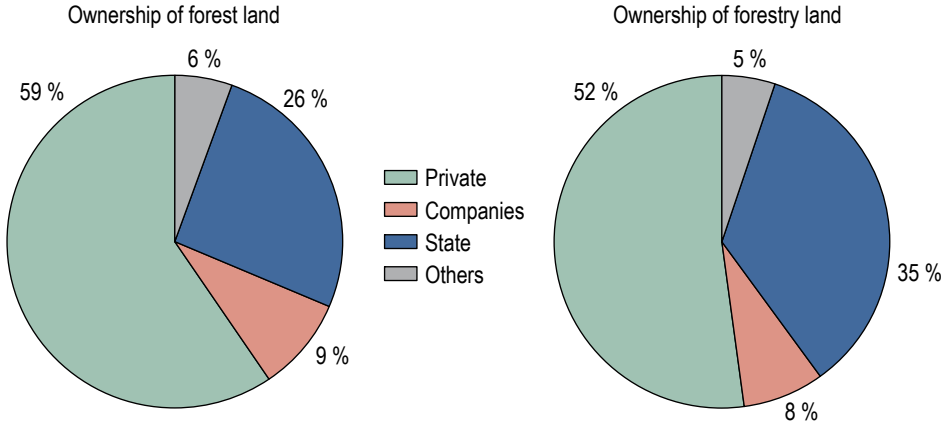


Figure 6.1a
Ownership of forest land and forestry land, 2004–2005
Source: Finnish Forest Research Institute, National Forest Inventory

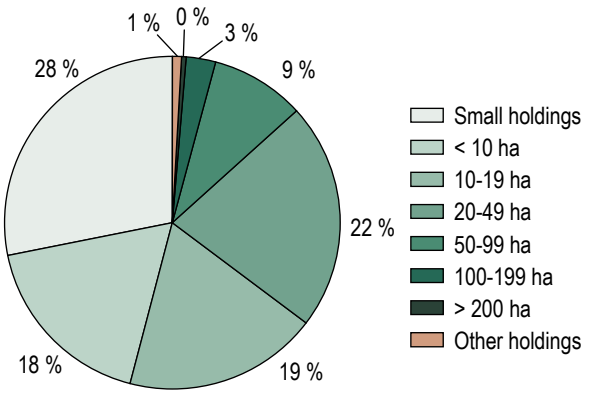


Figure 6.1B
Number of private forest holdings (over 2 ha), 2005. A holding consists of one or more forest parcels owned by the same owner.
Source: Finnish Tax Administration, Farm Register

Changes within a group of forest owners mainly happen in the private forestry sector. Forest owners with a traditional social and professional background are being replaced by owners whose background is different. This takes place through inheritance and increasingly also through real estate deals. As the average period of ownership for forest holdings is about 30 years, the owner changes annually on more than 10,000 private holdings. Forest owners are fairly old; their average age has increased and is now almost 60 years. As a result, pensioners today make up the largest single group of forest owners. The share of persons among forest owners whose main source of income is agriculture has decreased in ten years from one third to one fifth. One half of forest owners live permanently on their farm. In spite of the general urbanisation trend, about 60% of all forest owners still live in rural areas.

National Forest Inventories conducted by the Finnish Forest Research Institute produce information about the development of forest resources, including forest ownership and the state of forests. The forest resource reports of the inventories are published as a supplement to Metsätieteen aikakauskirja. Key figures are published annually in the Finnish Statistical Yearbook of Forestry.

Sources:

- Tax administration, http://vero.fi/default.asp?language=ENG&domain=VERO_ENGLISH
- Farm Register, www.vero.fi/default.asp?article=1152&domain=VERO_MAIN&path=5,39,46,59&language=FIN
- Finnish Forest Research Institute, www.metla.fi/index-en.html
- Statistical Yearbook of Forestry, www.metla.fi/julkaisut/metsatilastollinenvsk/index-en.htm
- Karppinen, H., Hänninen, H. & Ripatti, P. 2002. Suomalainen metsänomistaja 2000 [Finnish forest owners 2000]. Bulletins of Finnish Forest Research Institute 852. 83 p.
- Korhonen, K.T., Heikkinen, J., Henttonen, H., Ihalainen, A., Pitkänen, J. & Tuomainen, T. 2006. Finnish Forest Resources 2004–2005. Metsätieteen aikakauskirja 1B/2006: pp. 183–221
- Ripatti, P. 2002. Metsien omistus [Ownership of forests]. In: Tapion taskukirja. 24th edition. Metsälehti Kustannus and Tapio. pp. 24–34

Contribution of forest sector to the GDP (6.2)

The contribution of the forest sector to the GDP[43] describes the economic weight of the sector. The contribution can be used in regional analysis to evaluate the significance of the forest sector as a source of employment and a factor in economic development.

In 2005, the Finnish gross domestic product (GDP) at market prices was 157 billion euros, of which forestry accounted for 1.7%, the wood product industry for 1.0% and pulp and paper industry for 2.7%. The importance of forestry has decreased with the diversification of the economy. In the 1960s, the average contribution of forestry to the GDP was 7.3%, that of wood product industry 2.2% and the pulp and paper industry 3.3%.

The share of the forest sector of the GDP varies geographically. Regions with a high concentration of forest industry are south-eastern Finland (forest sector contribution to GDP 21%), central Finland (14%) and Kainuu and South Savo (13%). The contribution of forestry to the economy is the greatest in South Savo (9%), Kainuu (7%) and North Karelia (6%).

GDP statistics are compiled mostly from the register data of Statistics Finland, such as annual national accounts, business register and structural statistics.

Sources:

- Statistics Finland, www.stat.fi/index_en.html
- Regional national accounts 1995–2004. 30.5.2006. Statistics Finland.
- Annual national accounts 1995–2005. Revised time series. SVT National accounts 2006. Statistics Finland, 34 p.

Net revenue from wood production in private forests (6.3)

The net revenue from wood production in private forests is an indicator of the sustained income flow from forestry.

43 Gross Domestic Product (GDP) is the sum of the added value of the goods and services produced in the national economy. In addition to production for the market, GDP also includes products and services which are not valued on the market (e.g. services produces by the State, municipalities and the Social Insurance Institution). GDP is presented by industry sectors (Statistics Finland classification standard 2002).

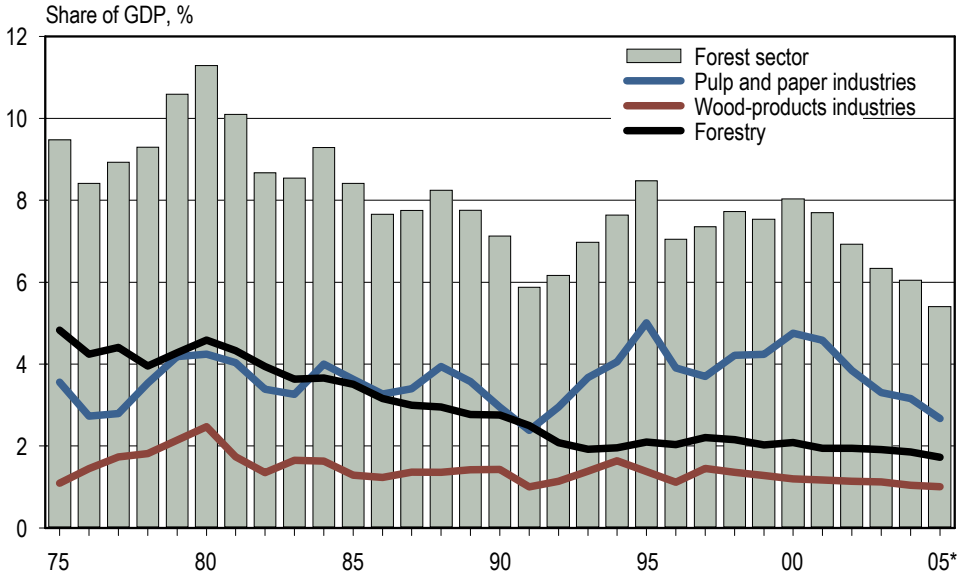


Figure 6.2a
Contribution of forest sector to GDP, 1975–2005
* Preliminary data
Source: Statistics Finland

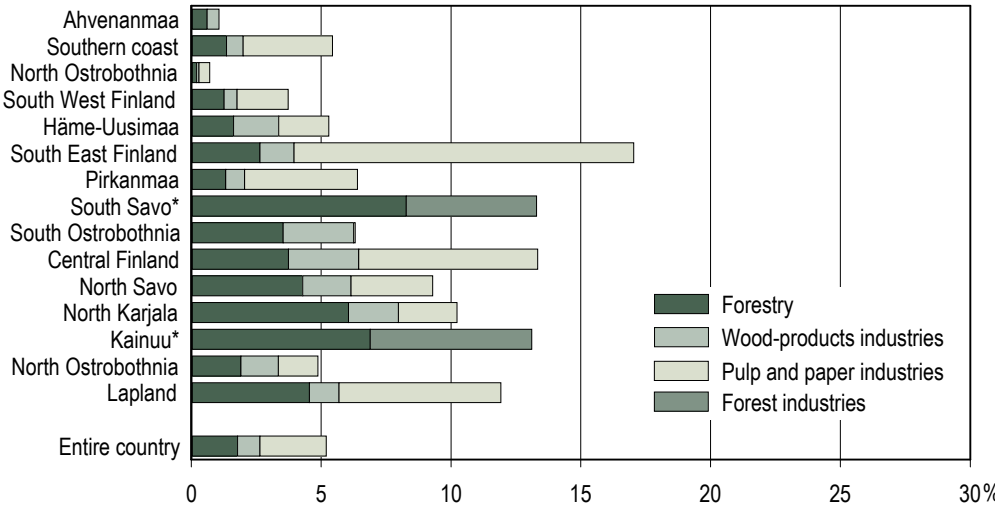


Figure 6.2b
Contribution of forest sector to GDP in Ahvenanmaa and by Forestry Centre, 2005
* Data are not available because of data confidentiality
Source: Statistics Finland

The net revenue from wood production (before taxes) is calculated by subtracting the total cost of wood production from the sum of gross stumpage earnings and support paid by the State to forest owners. Income from delivery sales is not included in the revenue. Net revenue is disposable income which is available to the forest owner for consumption, investment and taxes. The result depends primarily on the volume of harvest and the price of timber. To ensure regional comparability of data, the net revenue is often reported relative to the area of forest land.

The net result alone is not a sufficient indicator of sustainable forest management, but it needs to be supplemented with data on the sustainability of the amount of felling.

The average net revenue from wood production in 1997–2006 was 103 euros/ha/year, varying between 85–117euros/ha. Preliminary data suggests that the net revenue for the entire country in 2006 was 85 euros/ha, but regional differences were considerable. The net result in eastern Finland was 116 euros/ha, in western Finland 108 euros/ha, and northern Finland only 28 euros/ha.

The calculations are based on data on gross stumpage earnings calculated by the Finnish Forest Research Institute and on forest land areas, the cost of forest management and improvement, and administrative cost of tree breeding reported by the Finnish Forest Research Institute.

Sources:

- Finnish Forest Research Institute, www.metla.fi
- Forest Statistics Service, www.metla.fi/hanke/3006/index-en.htm
- Gross stumpage earnings by Forestry Centre, 2006. Bulletin of forest statistics 861. Finnish Forest Research Institute, Forest Statistics Information Service. 14 p.
- Economic viability of private forest enterprises. Business and income statistics for agriculture 2003, regional coverage calculations 2004 and preliminary data for 2005. Bulletin of forest statistics 809. Finnish Forest Research Institute, Forest Statistics Information Service. 14 p.

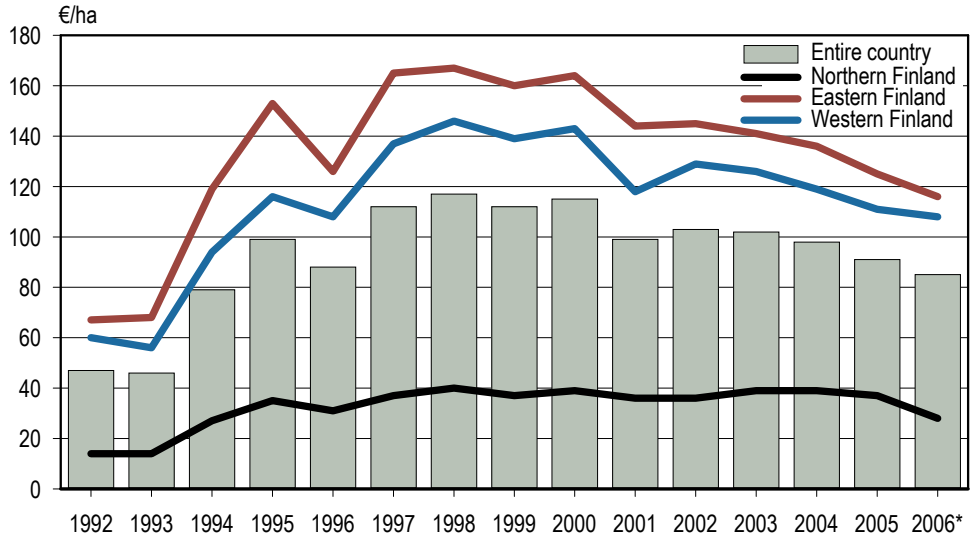


Figure 6.3
Net earnings in private forestry 1992–2006 inflation adjusted for 2006 (living cost index)
* Preliminary data
Source: Finnish Forest Research Institute, Forest Statistics Information Service

Public commodities of forests (6.4)

Forest owners produce many immaterial services in their forests for free, for the benefit all citizens alike. Such services include the protective functions and biodiversity of forests, forests as a mitigating factor in climate change, and landscape and recreational opportunities offered by forests. These are all important contributions to the quality of life.

Under the Act on the Financing of Sustainable Forestry, forest owners are eligible for a subsidy to offset greater than slight economic losses incurred from the preservation of ecological values, and a subsidy for the management of forest ecosystems. An annual appropriation is reserved in the State budget for 2003–2007 to cover the cost of pilot projects in the trade in natural values, competitive tendering and co-operation networks undertaken under the Forest Biodiversity Programme for Southern Finland (METSO).

The total amount of environmental support for forest management granted in 1997–2005 was 12.5 million euros, covering 14,500 hectares. Nature management projects, the great majority of which are surveys of habitats of special importance for forest biodiversity (METE surveys), have received 22.3 million euros and the pilot projects in the METSO programme 0.9 million euros.

Sources:

- Ministry of Agriculture and Forestry, monitoring of the use of funds granted under the Act on the Financing of Sustainable Forestry, www.mmm.fi

Consumption of products of the forest industries (6.7)

The per capita consumption of products of the forest industries gives an idea of the economic significance of wood and forest industry products, but it is also an indication of the status and appreciation of wood in society at large. Because wood is a renewable natural raw material, its use is considered to be preferable ecologically as opposed to non-renewable raw materials such as plastic, metal, concrete, etc. The use of wood is also spoken for by its capacity to sequester carbon and the good eco-balance of its procurement and production chains, especially wood production, as well as life cycle issues.

The consumption of sawn goods in Finland is the highest in the world, about one cubic metre per capita. The calculated consumption[44] of sawn goods in the territory of the EU is 0.2 m^3 per capita, and 0.06 m^3 globally. The domestic consumption of sawn goods has almost doubled in the past ten years. The consumption of sawn goods is connected especially to the use of timber in housing construction and in the repair of old residential buildings.

Domestic consumption of paper and paperboard was 230 kg per capita in 2006. Domestic consumption has remained around 200 kg per capita for the last decade.

Figures on the production of the forest industry are mainly based on information supplied by the member organisations of the Finnish Forest Industries Federation. Small sawmills remain outside the statistic. Their contribution to the production of sawn goods is slight, however. The figures for the domestic consumption of

44 Calculated consumption = production + imports - exports

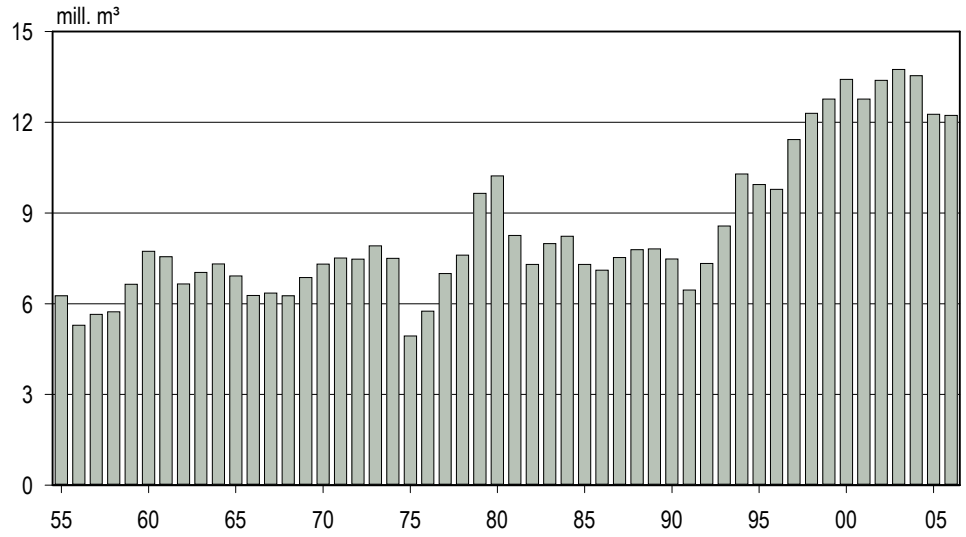


Figure 6.7a
Production of sawn goods, 1955–2006
Sources: Finnish Forest Industries Federation, Finnish Forest Research Institute

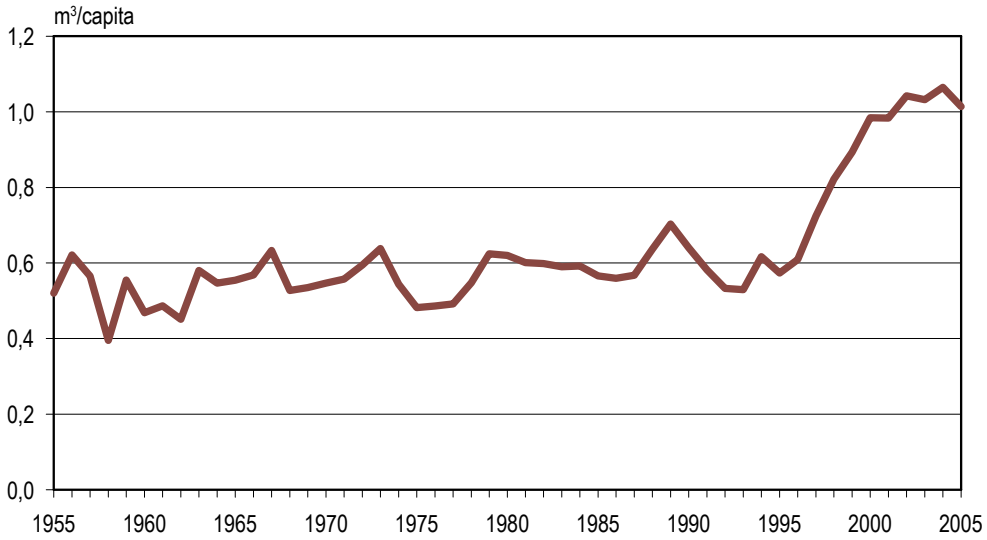


Figure 6.7b
Domestic consumption of sawn goods per capita, 1955–2005
Sources: Finnish Forest Industries Federation, Finnish Forest Research Institute

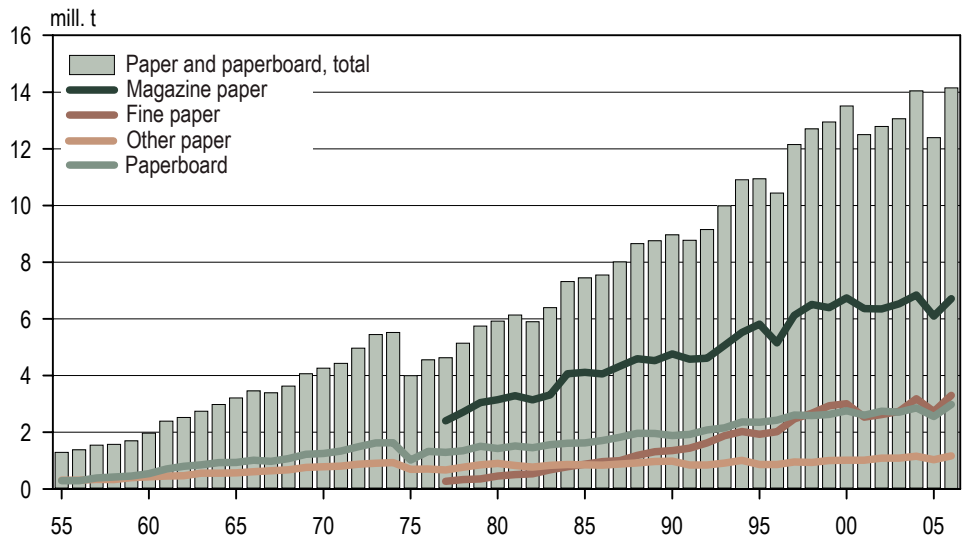


Figure 6.7c
Production of paper and paperboard, 1955–2006
Source: Finnish Forest Industries Federation

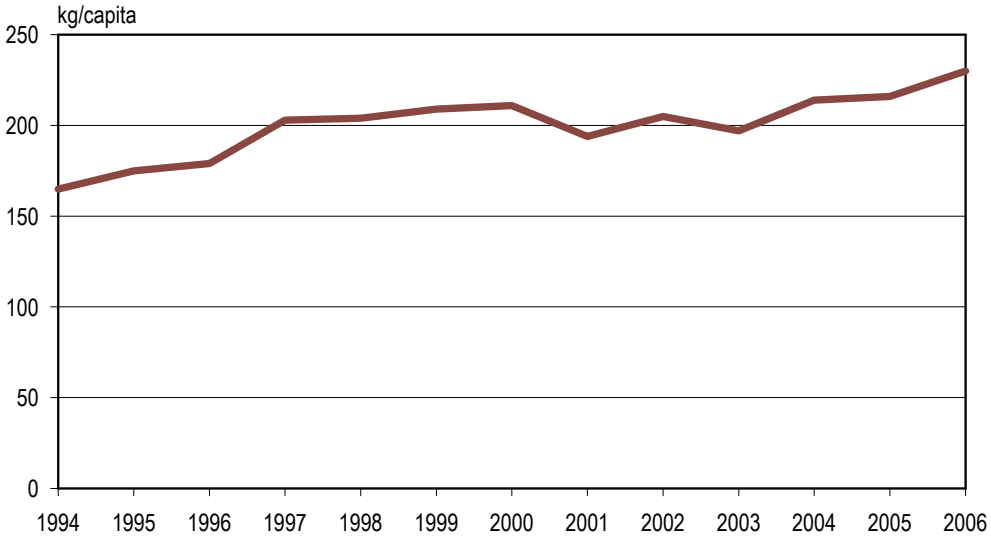


Figure 6.7d
Domestic consumption of paper and paperboard per capita, 1994–2006
Domestic consumption = supply of paper and paperboard to Finland and imports minus the exports of processed goods and printed matter.
Sources: Finnish Forest Industries Federation, Finnish Forest Research Institute

coniferous sawn goods and of paper and paperboard are based on estimates made by the Finnish Forest Industries Federation.

Sources:

- Finnish Forest Research Institute, www.metla.fi/index-en.html
- Metinfo statistics, www.metla.fi/metinfo/tilasto/
- Finnish Forest Industries Federation, www.forestindustries.fi/
- Paperia ja puuta [Paper and wood]. Statistical yearbook of the forest industry 2006. Data for 2005. Finnish Forest Industries Federation. 40 p.

Exports of the forest sector (6.8)

The export and import of wood and wood-based products gives an idea of the contribution of the forest industry to the national economy. It is also an indication of the degree of domestic origin of wood as raw material and of the products of the forest industries. Most of the production of the forest industry in Finland is exported. Domestic consumption of products of the paper industry is about 10% and of those of the wood products industries about 30% of all domestic production. Foreign trade with wood-based products is crucial for the Finnish economy. Wood processing is therefore an important economic indicator, particularly in rural areas.

The total value of the exports of wood and forest industry products was 10.9 billion euros in 2005. This was about one fifth of the total value of Finnish exports of goods. Of the export income of the forest industry, 75% was from products of the pulp and paper industry, 24% from the wood products industries, and 1% from the export of roundwood. The value of wood and forest industry products imported to Finland in 2005 was 2.0 billion euros – four percentage points of the total value of imports of goods. Of the total value of the imports of the forest industry, 36% was from the import of wood, 36% from products of the pulp and paper industry, and 28% from products of the wood products industries.

In 2005, a record 21.5 million m^3 of roundwood was imported to Finland (value 0.7 million euros), whereas the volume of exports of roundwood was 1.5 million m^3 (0.1 million euros).

Although the total value of forest industry products has increased, its proportional share of the value of Finnish exports has gradually diminished, while that of electronic and communication technology in particular has grown. The export volume of paper and paperboard products has grown fairly consistently over the last 30 years. The volume of exports of sawn goods and plywood turned back up after the early years of the 1990s. The export volume of sawn goods has in recent years stabilised at the level of 8 million cubic metres per year. The volume of imported roundwood has grown every year over the last ten year period, while the export volume has remained on the current level since the 1960s.

Information about foreign trade is gathered by the National Board of Customs. Statistics on foreign trade in forest industry products are compiled by the Finnish Forest Research Institute from data supplied by the National Board of Customs.

Sources:

- National Board of Customs, www.tulli.fi/en/
- Statistics on foreign trade, http://www.tulli.fi/en/03_Foreign_trade_statistics/index.jsp
- Finnish Forest Research Institute, www.metla.fi
- Foreign trade of the forest industry, monthly statistics. Bulletins on forest statistics. Finnish Forest Research Institute, Forest Statistics Information Service.
- Foreign trade of the forest industry by country, 2005. Bulletin of forest statistics 829. Finnish Forest Research Institute, Forest Statistics Information Service. 27 p.

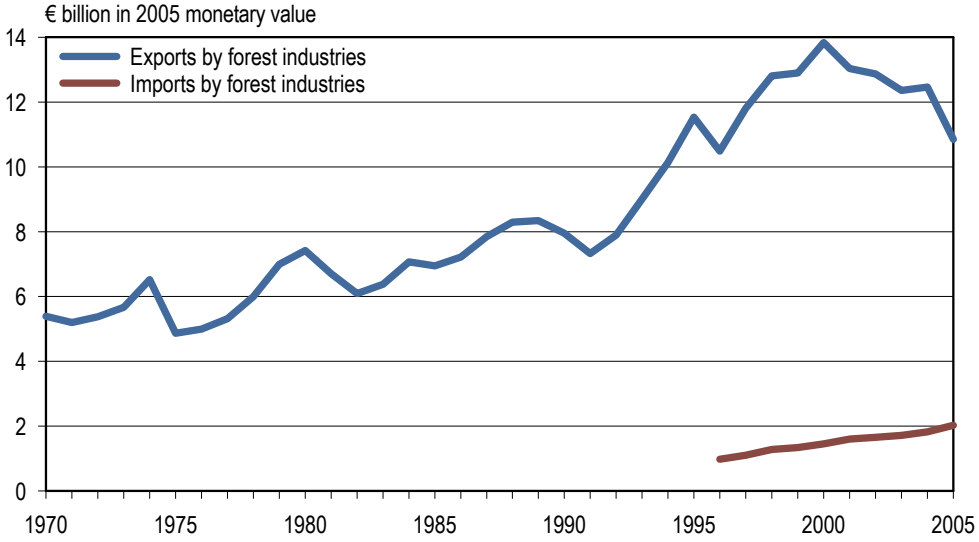


Figure 6.8a
The value of the forest industry exports 1970–2005 and imports 1996–2005 also includes foreign trade in roundwood and forest industry products
Sources: National Board of Customs, Finnish Forest Research Institute

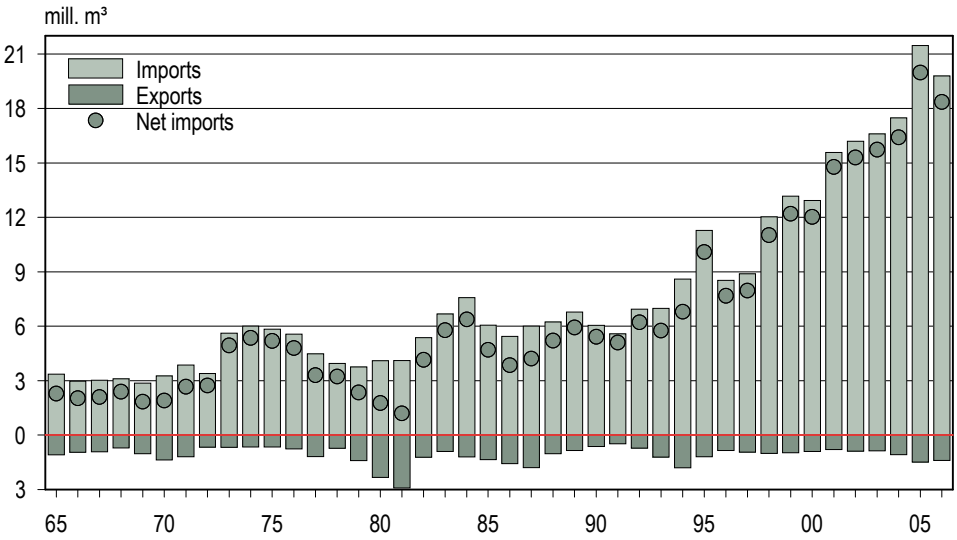


Figure 6.8b
Foreign trade in roundwood, 1965–2006, mill. m^3/year
Sources: National Board of Customs, Finnish Forest Research Institute

B.9 Improvement of employment and occupational safety in the forest sector

Improvement of employment

The importance of forestry and the forest industry to the vitality of rural areas and for regional economy continues to be great, although the number of jobs provided by the forest sector has diminished. Efforts to improve the productivity of work and technological development have led to the mechanisation of forest management, especially harvesting and the processes of the forest industry, which has diminished the need for labour.

Intense mechanisation of harvesting took place in the 1980s and 1990s. It is no longer possible to improve on the degree of mechanisation in harvesting, but the functionality of wood harvesting chains and the fleet of harvesting machines are continuously being improved and renewed. At the same time, the conditions of forestry work have improved substantially and e.g. the number of occupational accidents has fallen.

Forest management still requires a great deal of human labour. Efforts are made to increase employment in forestry by increasing the use of wood and especially the number of silvicultural works. A considerable part of forestry work is currently performed by forest owners themselves.

The general operational conditions and employment situation in the forest sector depend on decisions made by the Government and other actors. These include decisions concerning taxation, interest rates and currency rates, which have an impact on foreign trade, support and funding arrangements, and measures involving education and training.

In addition to the major forest companies, there are a great many small and medium-sized enterprises in the forest sector, which engage in forest machinery and transportation, sawmills, manufacture of wood products, and other forest-related activities. Efforts have been made to improve the operative conditions of SMEs in particular through research programmes in wood products and national and regional expert networks in the field of wood products. Networking among SMEs has increased, which has also had positive repercussions on employment.

The supply of labour in the forest sector, occupational safety and protection are the competence of several different ministries. The Ministry of Agriculture and Forestry participates in maintaining and steering the social and regional-economic operating conditions of forest management. The Ministry of Social Affairs and Health administers and monitors issues involving occupational safety, the Ministry of Labour is responsible for the implementation of labour legislation and the coordination of employment programmes, and the Ministry of Education is responsible for ensuring that education and training correspond to the needs of the labour and business sectors.

Programmes promoting employment and employment legislation

One of the primary aims of employment policy is to improve the match between supply and demand on labour markets both locally and regionally. Functions relating to the supply and sufficiency of labour include employment exchange services, career guidance and the provision of labour market training for adults.

The National Forest Programme 2010 and *the Future Review for the Forest Sector* both aim at increasing the annual harvesting of roundwood and silvicultural works as well as the use of wood for energy. When achieved, these goals will generate job opportunities in the forest sector.

The supply of labour in the long term is secured by ensuring that education and training meet the needs of employment. The public image of forestry and forest industry as a sector of the economy is improved. By improving working conditions, young people are attracted to continue running forest farms and work in forestry.

The general obligations of employees and employers, the commencement and termination of employment, terms and conditions of employment, payment of salaries, the rights and obligations of the parties to employment contracts, temporary dismissal and termination of employment are all regulated by *the Employment Contracts Act*.

Collective labour agreements concluded within the individual sectors of the economy regulate the wages and other terms and conditions of employment in the sector. In the forest sector, the parties to the collective labour agreement are the employer and employee organisations in forestry and the forest industries.

Cooperation in the workplace between employer and employees is regulated by *the Act on Cooperation within Undertakings*. The Act obligates the employer to inform employees about major events and changes involving the company.

Improving safety at work

The main goal of occupational safety is to maintain and promote the health, safety and working capacity

Using the correct equipment and accessories for the job is one of the most important things in preventing accidents and damage at work. Planting tube for planting containerised seedlings is an ergonomical way of sparing the back.

of employees and to prevent accidents and occupational diseases. Special goals for improvement include the prevention of work-related musculoskeletal diseases and the promotion of mental health and coping at work among employees. To improve occupational safety and health, an *Occupational Safety and Health Strategy* was drawn up in 1998, with monitoring reports prepared at three-year intervals. The goal of *the National Occupational Accident Prevention Programme 2001–2005* was to reduce the number and seriousness of accidents at work.

Safety at work in forestry has been continuously developed along with the mechanisation of harvesting. The safety of silvicultural work carried out by forest owners is also improved by providing education and guidance. Each workplace has an action plan for occupational safety prepared jointly by the employer and employees, and it is monitored and updated when necessary. Employees in the forest sector are encouraged to take the Occupational Safety Card course.

Compliance with the legislation on occupational safety and health is monitored by occupational safety and health inspectorates operating under the Ministry of Social Affairs and Health. The inspectorates also support measures to ensure occupational safety in the workplace.

The Centre for Occupational Safety produces training, publications and development services for the improvement of working conditions and health and safety at work. The Centre publishes manuals and instructions on occupational safety, also for the forestry sector.

The Finnish Institute of Occupational Health is a multidisciplinary research and expert organisation dedicated to improving occupational safety and health and the welfare of employees.

Legislation on occupational safety and labour protection

General provisions concerning occupational safety and health and labour protection also apply in the forest sector.

The purpose of *the Occupational Health and Safety Act* is to improve work environments and working conditions in order to safeguard and maintain employee's capacity for work and to prevent occupational accidents and diseases and other damage to the physical and mental health of employees resulting from work and the work environment.

The Act on Occupational Safety and Health Enforcement and Cooperation on Occupational Safety and Health at Workplaces provides for a procedure to be followed by occupational safety and health authorities in monitoring compliance with provisions on occupational safety and health and for cooperation on occupational safety and health between employers and employees at workplaces.

The Occupational Health Care Act lays down provisions on the duty of employers to arrange occupational health care and on the content and organisation of the occupational health care provided.

The Employment Accidents Act provides for the right of employees to receive compensation for accidents occurring at work.

The Working Hours Act contains provisions on regular working hours, overtime, rest periods and the registration of working hours.

There are legislative instruments specifically for the forest sector, such as *the Government Decree on Safety of Harvesting in Forest Management*. Collective wage agreements also include provisions on occupational safety and safety equipment.

Sources:

Programmes

- Labour Policy Strategy, www.mol.fi/mol/en/99_pdf/en/92_brochures/strategy_poster2003_2010.pdf
- Occupational Safety and Health Strategy, fi.osha.europa.eu./systems/strategies/stm/ts_strategia.stm
- National Forest Programme 2010, www.mmm.fi/attachments/5fLUy9oi5/5gpA9OecX/Files/CurrentFile/The_programme_2010en.pdf
- Future Review for the Forest Sector, www.mmm.fi/attachments/5enfdAPe1/5m6LgokFX/Files/CurrentFile/MMMjulkaisu2006_11b.pdf

Finnish legislation, www.finlex.fi/en/

- Finnish Constitution (731/1999)
- Employment Contracts Act (55/2001)
- Act on Cooperation within Undertakings (725/1978)
- Occupational Health and Safety Act (738/2002)
- Act on Occupational Safety and Health Enforcement and Cooperation on Occupational Safety and Health at Workplaces (44/2006)
- Government Decree on Safety of Harvesting in Forest Management (Gvmt Decree 749/2001)
- Employment Accidents Act (608/1948)
- Occupational Health Care Act (1383/2001)
- Working Hours Act (605/1999)
- Government Decree on medical examinations in work that presents a special risk of illness (Gvmt Decree 1485/2001)
- Collective labour agreements, www.finlex.fi

Organisations, monitoring, etc.

- Ministry of Social Affairs and Health, www.stm.fi
- The Centre for Occupational Safety, www.tyoturva.fi
- Finnish Institute of Occupational Health, www.ttl.fi

Forest sector workforce (6.5)

The number of people employed in the forest sector is an indication of the social impacts and benefits of forest economy. The employment contribution of the forest sector is an important indicator, especially in assessing economic and social development in rural areas.

In 2006, there were 89,000 people employed in the forest sector, of whom 23,000 were in forestry, 32,000 in wood products industries, and 34,000 in pulp and paper industry. The forest sector employed about 4% of all people employed in Finland. As a result of the mechanisation of harvesting and automation of the production processes of the forest industry as well as outsourcing, the number of people employed in the forest sector has decreased rapidly since the early 1980s, when the sector still employed about 8% of total workforce. The number of people employed in the wood products industries has remained the same for the past 10 years.

The average unemployment rate in the forest sector in 2005 was 4.6%, in forestry 6.0% and in the forest industry 4.1%. The overall unemployment rate in Finland was considerably higher than in the forest sector, 8.4%. The unemployment rate in forest economy has decreased owing to the increasing number of silvicultural works and volume of harvesting of wood for energy. In 2006, the number of jobs in the forest industry fell by a couple of thousand because of the closing down of a factory and production lines.

In 2005, there were 17,000 women employed in the forest sector, of whom 2,000 worked in forestry (12% of the employed in the sector), 7,000 (41%) in wood products industry, and 8,000 (47%) in the pulp and paper industry. Women's share of the workforce in Finland is very high internationally, 48% of all employed people in all sectors of the economy. The forest sector remains clearly a male-dominated sector, however.

The number of people working in forestry in 2006 was about 23,000. Of these, 15,000 were salaried employees and 8,000 entrepreneurs. In addition to them, a considerable number of forest owners worked in their forests, mainly in silvicultural works.

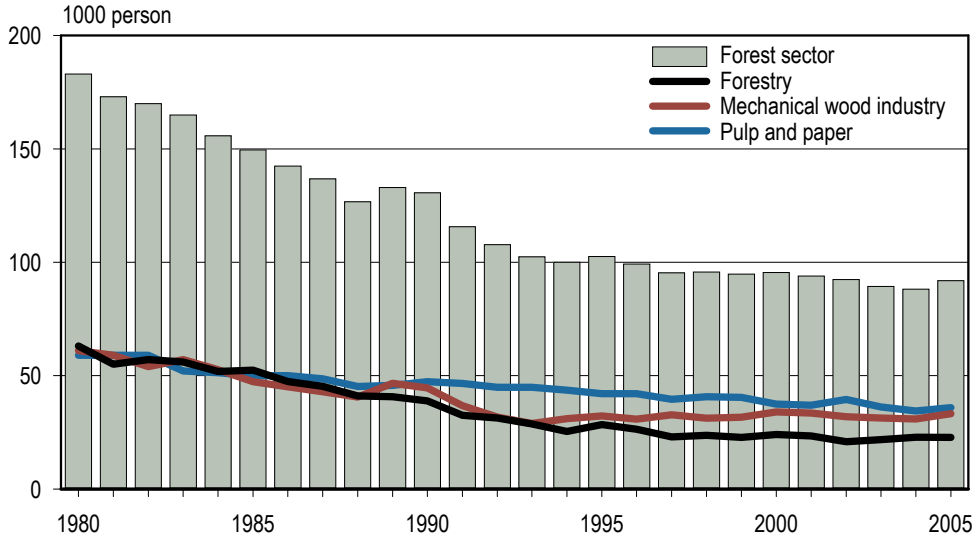


Figure 6.5a
Employment in the forest sector, 1980–2006
Source: Statistics Finland, employment research

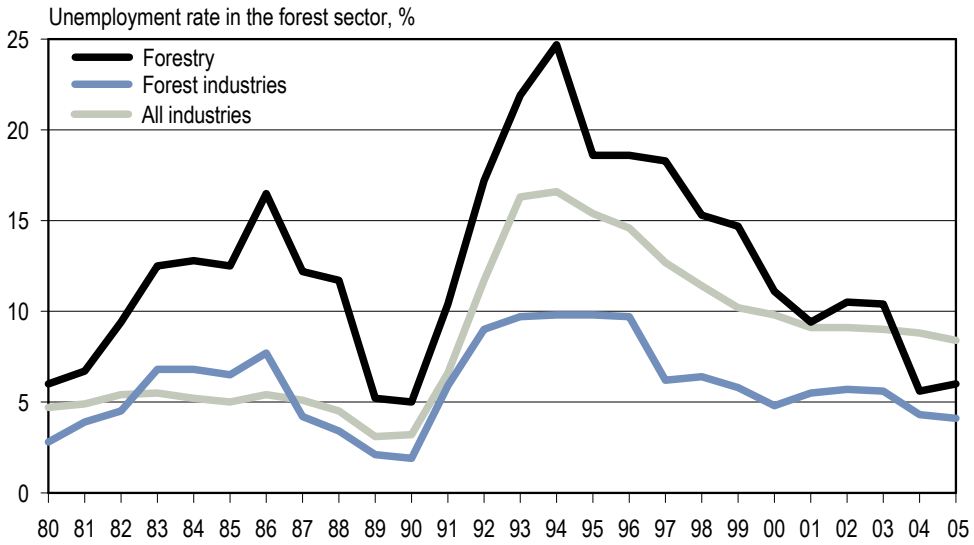


Figure 6.5b
Unemployment rate in forest sector, 1980–2005
Source: Statistics Finland, employment research

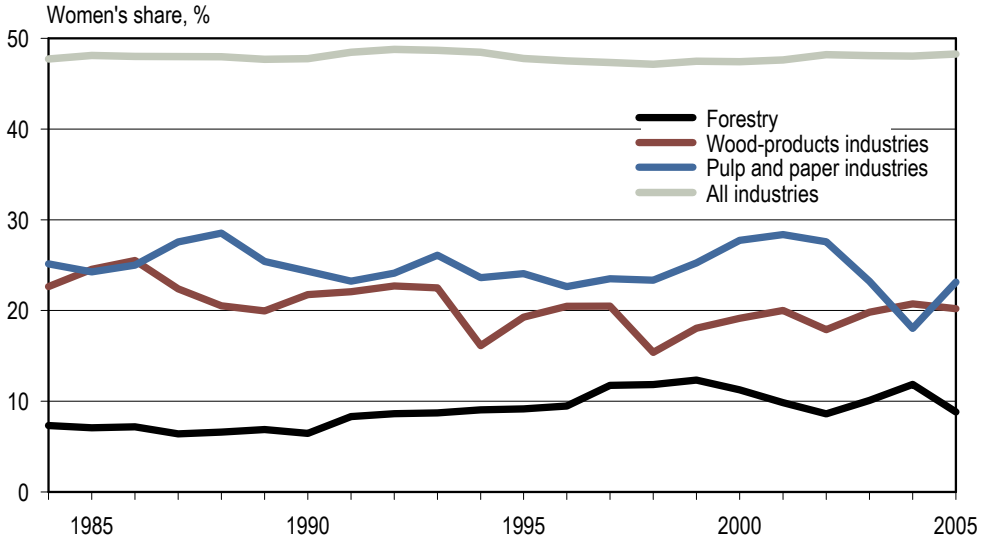


Figure 6.5c
Women's share of employed people in the forest sector, 1984–2005
Statistics Finland, employment research

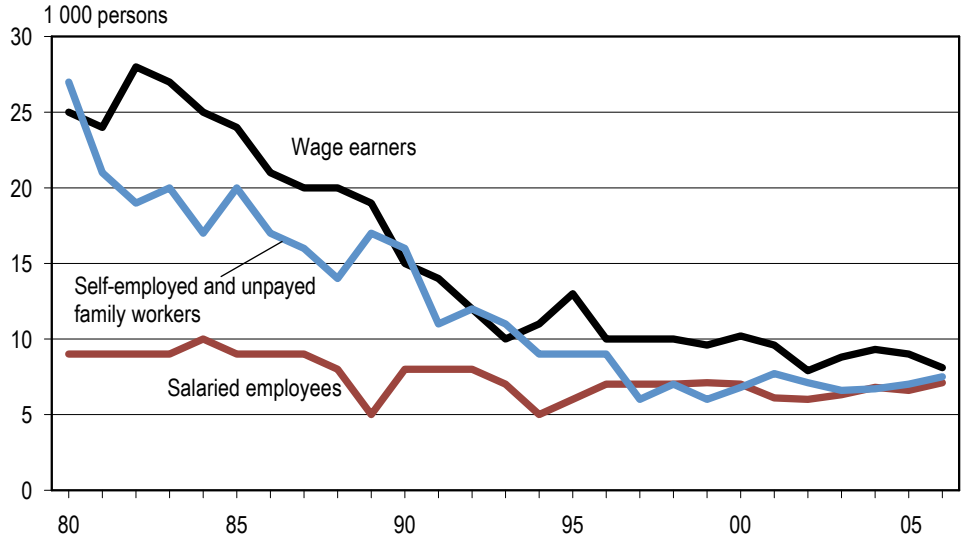


Figure 6.5d
People employed in forestry 1980–2006 by professional status
Statistics Finland, employment research

Information about employment in the forest sector is based primarily on the labour force survey conducted by Statistics Finland. The monthly survey sample is about 12,000 people. Data are collected on participation in work, working hours, unemployment and the structure of the workforce among the population aged between 15 and 74. The primary classification is based on position in the labour market: employed, unemployed and outside the labour force. Labour force comprises the employed and the unemployed. On the basis of employment status, the employed are divided into wage and salary earners (sub-classification into workers and salary earners) and entrepreneurs and family workers. Unemployed persons' status in employment is determined on the basis of their last job.

Sources:

- Statistics Finland, www.stat.fi/index_en.html
- Labour force survey, www.stat.fi/til/tyti/index_en.html
- Finnish Forest Research Institute, www.metla.fi
- Statistics on fellings and employment in commercial roundwood production. Bulletins on forest statistics. Forest Statistics Service, www.metla.fi/hanke/3006/index-en.htm
- Finnish Forest Sector Economic Outlook 2006–2007. 2006. Finnish Forest Research Institute. 54 p.
- Employment statistics 2005. Results of the labour force survey, 1996–2005. SVT Labour Market 2006. Statistics Finland. 144 p. + Annexes.

Occupational safety and health (6.6)

Forestry work is hard and dangerous. Risks can be mitigated by developing work methods, adopting preventive measures and mechanising the work. The recognition and monitoring of occupational accidents and diseases helps developing better working methods and improving safety.

In 2005, there were 868 accidents at work in forestry, 361 of which occurred to salaried employees and 507 to forest owners working in their own forest. Accidents among salaried employees in the forest economy have decreased markedly during the last 20 years. This is mainly because of the mechanisation of harvesting, but also because of better education and training and advances in protective equipment. There were 3,383 accidents at work in the forest industry in 2004, two thirds of them in the wood products industry.

In 2004, there were an average of 22 accidents per 1,000 man-years among employees in forestry and 76 accidents among forest owners. The accident susceptibility[45] of employees in forestry has decreased substantially since the 1980s.

The prevention of occupational diseases and promotion of occupational health and welfare are also taken into account in the development of working methods and conditions. Occupational health care and rehabilitation are used to maintain the working capacity of the workforce.

An increasing proportion of employees in forestry are salaried workers. Silvicultural work is increasingly subject to profit targets and schedules. This has the effect of increasing the psychological stress of work and the consequent susceptibility to disease. The maintenance of welfare at work is becoming more and more diverse.

Information about accidents at work is available in the statistics on occupational accidents of Statistics Finland, who gather the data from the Federation of Accident Insurance Institutions (FAII). The data on ac-

45 Accident susceptibility = accidents/1000 man-years

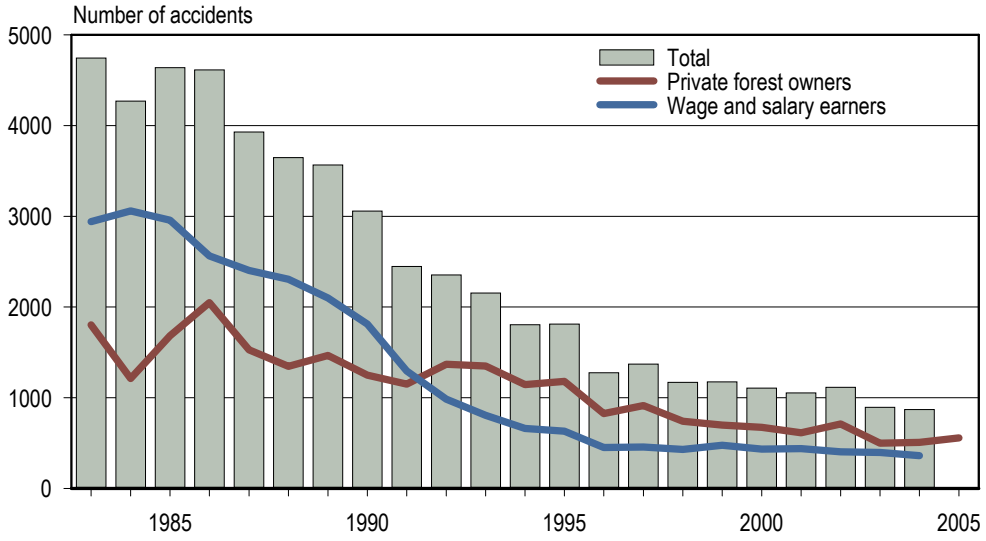


Figure 6.6a
Occupational accidents in the forest sector, 1983–2005
Sources: Statistics Finland, Farmers' Social Insurance Institution Mela

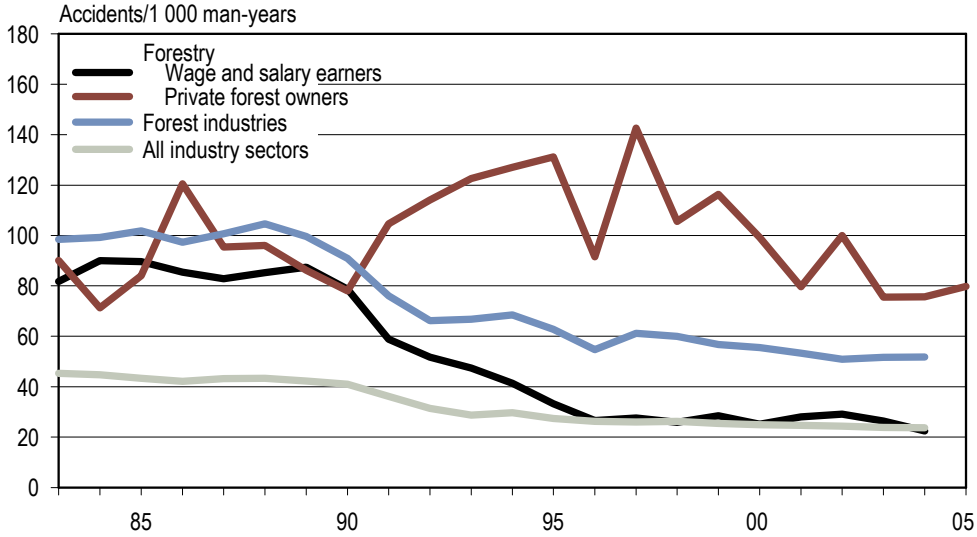


Figure 6.6b
Accident susceptibility in the forest sector, 1983-2005
Sources: Statistics Finland, Farmers' Social Insurance Institution Mela

cidents at work among forest owners working in their own forests can be obtained from the Farmers' Social Insurance Institution Mela.

Sources:

- Statistics Finland, www.stat.fi/index_en.html
- Occupational accidents 2004. SVT Labour Market 2006. Statistics Finland. 128 p.
- Farmers' Social Insurance Institution Mela, www.mela.fi
- Statistics, http://asp.hci.fi/mela/tilastot.nsf/Ohje/$First?OpenDocument

B.10 Safeguarding the opportunities of the public for participation

One commonly recognised aspect of social sustainability is the opportunity of stakeholders and the public to participate in decision making. Experience shows that transparency and co-operation between different stakeholders already in the planning stage is an efficient way of preventing conflicts.

In Finland extensive forest programmes and projects are usually prepared in working groups with representation from various interest groups, including forest owners, forest industry, trade unions, tourism and nature conservation organisations, youth organisations, hunters, reindeer herding associations and public authorities. Typical forms of participation include stakeholder hearings and requesting statements from interest groups in the planning stage of projects and programmes.

International conventions and commitments

The international instrument safeguarding opportunities for public participation is *the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters,* known as the Aarhus Convention (1998). Issues concerning public participation are also addressed in the UN Conferences on Environment and Development, the Ministerial Conferences on the Protection of Forests in Europe, and the Indigenous and Tribal Peoples Convention of the International Labour Organisation, ILO.

National programmes and legislation

The established practice of governance includes the provision of opportunities for public participation. *The Administrative Procedure Act and the Act on the Openness of Government Activities* set down the general provisions governing public administration. They are applied to promote the opportunities of citizens to receive information about matters that involve them and to participate in decision making. Equal treatment of the sexes is set down by *the Equality Act*.

The special rights of local inhabitants in Lapland and the archipelago to traditional livelihoods, hunting and berry collecting are enshrined in *the Act for Traditional Means of Livelihood, the Hunting Act and the Off-Road Traffic Act*. The preservation of the cultural heritage and livelihoods of the Sami is addressed in *the Act on Wilderness Reserves* and *the Skolt Act*.

The right of public participation and associated procedures have been reinforced in recent comprehensive reforms of *legislation on environmental management*. Extensive opportunities for public participation are ensured especially in land use planning, nature conservation and the procedure for environmental impact assessment and permits.

Information dissemination and interaction

The democratic system of decision making in Finland supports public participation. The key development goals are to increase opportunities for interaction and

Forest excursions are a popular and efficient way of disseminating information and participating in the management of common forest issues.

enhance the use of information networks. Attitude surveys and opinion polls are used to find out about popular attitudes towards and views on forest management and forests. The activities of NGOs are supported by granting funds for their operation from State funds.

Forest owners' and civic organisations participate in many preparatory and decision making processes. Direct channels of participation have also been provided, for example, in the preparation of the National Forest Programme 2010 when regional hearings were arranged that were open to all interested parties and individuals. Regional forest programmes are drawn up by the Forestry Centres in cooperation with the stakeholders of forestry in their area. The regional natural resources programmes and landscape-ecological plans of Metsähallitus are drawn up in a participatory process where local inhabitants and stakeholders have an opportunity to take part in the preparation of the plans.

Local inhabitants have the opportunity to influence the management of forests and woods in built-up areas through participatory processes incorporated in land use planning procedures. Many municipalities use surveys and questionnaires to monitor outdoor activities and the wishes of the public, organise public discussions on the management plans for municipal forests, and publish information about harvesting.

Because of the great importance of forests for Finnish society, discussion about them is lively and very broad. Forest issues are also dealt with in Government programmes. Because forest ownership is broad-based, approximately 920,000 Finns have a direct contact with forests as forest owners. The protection of forests and the interests of forest-dependent industries in northern Lapland have necessitated the greatest efforts to reconcile the different views.

Sources:

Treaties and programmes

- Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (1998). (Sops 122/2004) www.finlex.fi/fi/sopimukset/sopsteksti/2004/20040122
- European Landscape Convention (2000), (Sops 14/2006) www.coe.int/t/e/Cultural_Co-operation/Environment/Landscape/
- Resolutions of the Ministerial Conference on the Protection of Forests in Europe, www.mcpfe.org/mcpfe/resolutions
- UN Conferences on Environment and Development, www.unep.org/Documents.Multilingual/Default.asp?DocumentID=303
- Convention (No. 169) concerning Indigenous and Tribal Peoples in Independent Countries (1989) by the General Conference of the International Labour Organisation (Finland has not ratified)
- Finland's National Strategy for Sustainable Development. (2006) Prime Minister's Office Publications 5/2006, www.vnk.fi/julkaisukansio/2006/j07-towards-sustainable-choices/pdf/en.pdf

Finnish legislation, www.finlex.fi/en/

- Administrative Procedure Act (432/2003)
- Act on the Openness of Government Activities (621/1999)
- Equality Act (1146/1999)
- Land Use and Building Act (132/1999)
- Nature Conservation Act (1096/1996).
- Act on Environmental Impact Assessment Procedure (468/1994)
- Act on the Assessment of the Impacts of the Authorities' Plans, Programmes and Policies on the Environment (200/2005)
- Hunting Act (615/1993)
- Off-Road Traffic Act (1710/1995)
- Act on Wilderness Reserves (62/1991)
- Skolt Act (253/1995)

B.11 Research, training and education in forestry

Because of the great importance of forests for Finnish society, Finland has invested heavily in forest research, forest education and training. The forest cluster is one of the most important national clusters of expertise. Finland also aims at becoming an international cluster of excellence with a significant role in the EU Forest-Based Sector Technology Platform as well as in other international forest research cooperation.

Research

There are about 650 researchers in Finland working on subjects involving forests. About 300 of them work in the Finnish Forest Research Institute (Metla) in nine units in different locations in Finland. Forestry research is also conducted in the Universities of Joensuu and Helsinki, which have about 100 forest researchers. Research teams working on subjects closely related to forestry are also found in the Universities of Kuopio, Jyväskylä, Turku and Oulu. There are also a number of small research units in forest issues in e.g. the Work Efficiency Institute (TTS), the Pellervo Economic Research Institute (PTT) and Metsäteho Oy.

The strongest concentrations of research in forestry and its environmental impacts are in the Helsinki region and Joensuu.

Mechanical processing of wood and paper and pulp manufacture are studied at Keskuslaboratorio Oy (KCL) and Technical Research Centre of Finland (VTT) and in several Technical Universities. The Finnish Environment Institute (SYKE) and the Regional Environment Centres operating under the Ministry of the Environment also conduct surveys and studies on forests and research serving the administration.

The international European Forest Institute (EFI) is based in Joensuu, Finland. EFI is a network organisation with seven project centres in different parts of Europe. Its mission is to gather information for decision making on forest policy and forest management in Europe.

Research funding

The principal source of funding for forest research in Finland has for decades been the annual appropriations in the State budget. In the last ten years, however, the share of other funding has grown to about 30% of all research funding today.

Increasing numbers of Finnish forest researchers participate in research projects funded by the European Union, as well as in network cooperation, such as COST (Cooperation in the Fields of Scientific and Technical Research in Europe). EU-funded research projects focus on themes important from a European perspective, but they often have a great significance nationally as well.

Key areas of research

The focus of forest research in Finland is reviewed constantly to reflect topical issues. Particular focal areas in the last few years have been changes in the operating environment of the forestry and research involving forecasting. Work in these areas has been done at the Future Forum on Forests, in the preparation of the Future Review for the Forest Sector laying the background for the review of the National Forest Programme, and in the Research Strategy of the Finnish Forest Cluster. The structural aspects of forest research have been studied in a working group on sectoral research. The goal is to establish internationally competitive clusters of excellence in Finland. The Research Strategy of the Finnish Forest Research Institute was revised in 2005–2006 and its key areas have been redefined.

Forest research is moving away from forest ecosystem-based research with main focus on growing tree stands and forest management towards a more customer-oriented research approach that serves the policy and economic sectors. Above all, research needs to be developed in chemical forest industry, wood products industry, recreation and ecotourism, and natural products industries.

Major research institutions and universities conducting research in wood, forests and paper manufacturing and actors benefiting from the research founded in 2007 an innovation company called Metsäklusteri Oy. The mission of the new company representing expertise in forestry and forest industry is to initiate extensive research programmes to promote the innovation of new wood and paper products and the use of wood-based energy.

A new national Centre of Expertise Programme 2007–2013 was also launched in the beginning of 2007. Among the programme's 13 fields of expertise there are three in which forest research plays an important role. These fields of expertise are *Energy Technology, Forest Industry Future* and *Living Cluster Programme*.

The successful functioning of the system of expertise clusters means that practical research needs are communicated to research without delay, and that the new information and expertise produced by research is put to use efficiently. The interaction between researchers

Forest research places an increasing emphasis on customer-orientation and product chain thinking, from the forest to the finished product. The Metla House of the Finnish Forest Research Institute built in Joensuu in 2004 is an outstanding example of timber construction in Finland, and also a showcase of the potential of research in promoting building in wood.

and actors in the field is enhanced, above all, by improving procedures and structures and increasing the usability of information services.

Education and training

Competent workforce is a central vector for success in the forest sector. The integration of the qualitative and quantitative goals and future needs of education calls for continuous interaction between forestry and forest industry businesses and those making plans for education.

Education in forestry and silviculture in Finland is provided on three levels: universities, polytechnics and vocational colleges.

A diploma of Master of Forest Science (M.Sc) can be earned in the Universities of Helsinki and Joensuu.

There are eight polytechnics providing education in forestry. The degree in forestry which may be earned in polytechnics is Forest Engineer. In the labour market, Forest Engineers work within the forest sector and related organisations in positions that involve planning, consultation, management, education, training, marketing and research, and as private entrepreneurs.

The three-year vocational degree in the forest sector includes a wide range of fields for specialisation. The students can earn the qualifications of a forestry worker, forest machine operator or forest ecosystem worker.

About 1,500 people study subjects in the field of forest industry annually. The majority take an upper-secondary degree, leading to a career in mechanical wood products industry and the pulp and paper industry. A university-level degree in wood processing technology is completed annually by about 60 students.

Further and specialist qualifications based on skills testing focus on the student's actual competence in mastering the special tasks of the profession. Further qualifications are available in the fields of multiple use of forests, forest work, forestry entrepreneurship, operating forest machines, timber lorry transport and peat utilisation. Special vocational degrees are available in nature surveying, multiple-use of forests, operating forest machines and forest advice.

Some further professional training is provided by employers, the rest is supplied by education institutions and universities providing education in forest issues.

The need for further education has grown constantly along with changes in the operating environment and priority areas in the work.

Sources:

- Forests and Forestry in European Union Countries. 2006. State Forest Information Centre and Forest Research Institute, Poland, Warsaw.
- Statistical Yearbook of Forestry 2006. Finnish Forest Research Institute, Vammala Printers.
- COST, www.cost.esf.org

- EU Research, www.cordis.europa.eu
- European Forest Institute, www.efi.int
- Forest-Based Technology Platform, www.forestplatform.org
- University of Helsinki, www.helsinki.fi
- University of Joensuu, www.joensuu.fi
- University of Jyväskylä, www.jyu.fi
- Keskuslaboratorio Oy, www.kcl.fi
- University of Kuopio, www.uku.fi
- Education and training supply in the forest sector, www.metsalehti.fi/fi-FI/koulutus/koulutustarjonta
- Metsämiesten säätiö [Society of Forestry Professionals], www.mmsaatio.fi
- Finnish Forest Research Institute, www.metla.fi
- Metsäteho [private R&D company], www.metsateho.fi
- University of Oulu, www.oulu.fi
- Pellervo Economic Research Institute (PTT), www.ptt.fi
- Academy of Finland, www.aka.fi
- Finnish Cultural Foundation, www.skr.fi
- Foundation for Research of Natural Resources in Finland, www.luovasaa.saunalahti.fi
- Finnish Environment Institute, www.ymparisto.fi
- National Technology Agency of Finland TEKES, www.tekes.fi
- University of Turku, www.utu.fi
- TTS (Work Efficiency Institute), www.tts.fi
- VTT Technical Research Centre of Finland, www.vtt.fi

B.12 Maintenance of cultural and spiritual values

Forests play an important part in the construction of the Finnish identity. The settlement of Finland and the emergence of Finnish culture were based on forests. The identification of the cultural heritage[46] and landscape values of forests and their preservation are therefore important for future generations. By taking cultural values into account it is possible to ensure that the traditional ways of using and tending forests are passed on to future generations. Forest culture can also be used in commercial operations and leisure activities.

International conventions and commitments

The relationship between man and forests and the cultural values of forests were addressed by *the Fourth Ministerial Conference MCPFE in Vienna* (2003), which adopted Resolution V3 on the social and cultural dimensions of sustainable forest management. These dimensions receive increasing attention in national forest programmes and other plans and policies concerning forests. The signatory states and the European Community made a commitment concerning several measures for the preservation and enhancement of the social and cultural dimensions of sustainable forest management in Europe.

The sustainable management of natural resources and the preservation of cultural and landscape values are also included in the aims of t*he UN Convention on Biological Diversity* (CBD 1992), *the Pan-European Biological and Landscape Diversity Strategy* (PEBLDS 1995) and *the European Landscape Convention* (2000). *The Convention Concerning the Protection of the World Cultural and Natural Heritage* (World Heritage Convention) is an international convention adopted by UNESCO in 1972. Seven sites in Finland are inscribed on the World Heritage list.

National programmes and legislation

The aims of *the National Forest Programme 2010* also take into account traditional ways of using and managing forests, their cultural history and landscapes.

In its *Future Review for the Forest Sector* of 2006, the Forest Council saw growing economic potential in nature tourism. The Council also stressed the importance of defining the non-marketable values of forests and assessing their value.

Cultural and landscape functions of forests are also covered in the Natural Resources Strategy of the Ministry of Agriculture and Forestry, in agricultural policy programmes and sectoral programmes for agriculture, as well as in various regional and local development and environmental programmes.

In addition to forestry and regional policy programmes, the main strategic instruments governing the management of forest landscapes and land use changes are *the Government resolution on national land use guidelines* (VAT 2000) and *the Government resolution on nationally valuable landscape areas and development of landscape management* (1995). In 2006, Metsähallitus prepared a Cultural Heritage Strategy for the management of State lands.

Cultural heritage, landscapes and the associated values are recognised extensively in Finnish legislation as functions that need to be taken into consideration. According to *the Forest Act*, forests must be managed in an economically, ecologically and socially sustainable way. The Act provides for the opportunity to manage forests in a way which takes into account the special characteristics of sites in terms of landscape, multiple use and research.

Under *the Antiquities Act*, antiquities are automatically protected. Prehistoric and historic relicts must be taken into account in all land use. This requirement is also incorporated in forest certification. The National Board of Antiquities has, together with organisations

46 Cultural heritage consists of the immaterial and material heritage created by human activity. Material cultural heritage can be movable (e.g. books and objects) or fixed.

in the forest sector, produced guidelines for forest management in areas containing antiquities.

Zoning based on *the Land Use and Building Act* can be used to issue instructions for planning, protection and construction that take cultural, historical and landscape values into account. In land use planning, the cultural impacts of the plan must be assessed. According to the Land Use and Building Act, actions altering the landscape may not be taken without a permit. Trees in areas covered by a detailed land use plan may not be felled without a permit. A landscape work permit may be required in master plans instead of the Forest Use Declaration set down in the Forest Act.

The Nature Conservation Act allows the establishment of landscape conservation areas for the conservation and management of the natural or cultural beauty of the area, its historical characteristics or other special values.

Other statutes linked to cultural and landscape values of forests are: *the Act on Wilderness Reserves, Land Extraction Act, Act on Environmental Impact Assessment Procedure, Act on the Assessment of the Impacts of the Authorities' Plans, Programmes and Policies on the Environment, Act on the Financing of Sustainable Forestry, and decrees on agricultural support systems*.

Other steering instruments

The management plans for national parks, wilderness reserves and nature conservation areas promote, not only nature conservation, but also the management of landscapes and cultural heritage in these areas. Many nationally valuable landscape conservation areas are covered by management plans. Regional management plans for traditional landscapes will soon be completed, and supplementary and monitoring surveys have already been initiated. Regional programmes on the cultural environment basically govern the planning, protection and management of the built environment and landscape, but they can also include aims that involve forests.

Agricultural and forest areas of special environmental value are designated as such in land use plans. Scenically valuable fields should not be afforested or allowed to grow over. Nationally and regionally valuable cultural landscape areas and sites are also marked in land use plans. Only recommendations on forest management may be given in the plans.

Forests near settlements, cultivated areas and shorelines are taken into account in management plans if the forest owner so wishes.

The Act on the Financing of Sustainable Forestry can be applied to finance nature management plans for several private holdings which take landscape values into consideration. Under the Rural Development Programme farmers are eligible for special support to offset the cost of managing wooded heritage landscapes or loss of income caused by such management.

Management recommendations for forest landscapes are issued in the Metsämaiseman hoito (Forest Landscape Management) manual published by Tapio and Metsäteho Oy.

Sources:

Treaties and programmes

- Convention Concerning the Protection of the World Cultural and Natural Heritage (UNESCO World Heritage Convention) (Sops 19/1987) http://www.finlex.fi/fi/sopimukset/sopsteksti/1987/19870019/19870019_2
- European Landscape Convention (2000), (Sops 14/2006) www.coe.int/t/e/Cultural_Co-operation/Environment/Landscape/
- Convention on Biological Diversity (1992), http://www.cbd.int/convention/convention.shtml
- Pan-European Biological and Landscape Diversity Strategy (1994), www.ec.europa.eu/environment/docum/pdf/9842fi.pdf
- Resolutions of the Ministerial Conference on the Protection of Forests in Europe, www.mcpfe.org/mcpfe/resolutions
- National Forest Programme 2010 (1999), www.mmm.fi/attachments/5fLUy9oi5/5gpA9OecX/Files/CurrentFile/The_programme_2010en.pdf
- Future Review for the Forest Sector (2006), www.mmm.fi/attachments/5enfdAPe1/5m6LgokFX/Files/CurrentFile/MMMjulkaisu2006_11b.pdf
- Government resolution on national land use guidelines (VAT 2000), www.ymparisto.fi/default.asp?contentid=242187&lan=fi&clan=en
- Government resolution on nationally valuable landscape areas and development of landscape management (1995), www.ymparisto.fi/download.asp?contentid=28080&lan=fi

Finnish legislation, www.finlex.fi:/en/:

- Antiquities Act (295/1963)
- Land Use and Building Act (132/1999)
- Nature Conservation Act (1096/1996).
- Act on Environmental Impact Assessment Procedure (468/1994)
- Act on the Assessment of the Impacts of the Authorities' Plans, Programmes and Policies on the Environment (200/2005)
- Forest Act (1093/1996)
- Act on the Financing of Sustainable Forestry (1094/1996)
- Act on Wilderness Reserves (62/1991)
- Land Extraction Act (555/1981)

Organisations, monitoring, etc.

- Ministry of the Environment, www.ymparisto.fi
- Built heritage and cultural environments, www.ymparisto.fi/default.asp?contentid=241954&lan=fi&clan=en
- Land use planning, www.ymparisto.fi/default.asp?contentid=242814&lan=fi&clan=en
- Metsähallitus, www.metsa.fi/default.asp?Section=1176
- Cultural heritage, www.metsa.fi/page.asp?Section=2037
- National Board of Antiquities, www.nba.fi
- Archaeology, www.nba.fi/en/archaeology

- Maintenance of heritage sites, www.nba.fi/en/metsanhoitoeng
- Hänninen E., Oulasmaa K. & Salpakivi-Salomaa P. 1997. Metsämaiseman hoito. Forestry Development Centre Tapio. English edition: Forest Landscape Management. 1998. 25 p.

Cultural and spiritual values (6.11)

Importance of forests for Finnish culture and spiritual well-being

Forests are the most characteristic feature of the Finnish landscape and the origin of our culture. Every era and every generation have left their mark in the forests. Forests are an integral part of our cultural environment[47]. Forests have also provided artistic stimulus and themes for the visual arts, music and literature.

Forests occupied an important place in ancient religions. There were sacrificial trees in the forest, magical places and sacrificial groves, where gods were worshipped in ancient times. Rowan, in particular, was considered a sacred tree. It remains popular to this day to have a rowan growing in the yard. Another tree which is often left standing near the house is spruce, to protect the house and its occupants. Famous historical trees under which some notable persons once rested have been preserved as monuments.

Ancient monuments[48] are constantly being discovered in forests, dating from a time when forest was home, source of food and a place of worship. Many areas associated with forestry and agriculture, other livelihoods and also military history are discovered in forests, areas with ancient structures and mounds of stone. Sites of cultural and historical significance also include old logging cabins, foresters' dwellings and structures for log floating. Old watermill and sawmill sites are part of the history of forests. The wood processing industry has given rise to many buildings and environments with great cultural and historical value.

Nearly all buildings in rural areas are still constructed of timber. Efforts are made to maintain the tradition of timber construction also in population centres. Wooden furniture, vessels, tools, utensils and decorative objects are part of both everyday life and the valuable handicrafts traditions.

Museums have been founded for the preservation and restoration of forest and hunting culture. Various kinds of events are organised for the same purpose, including competitions in traditional skills in forestry, hunting and log floating. Performances for displaying traditional logging methods and timber construction are also arranged.

Forests and trees contribute to the spiritual welfare and health of Finns in many ways. Studies suggest that merely by looking at pictures of nature people recover more quickly from stress and illnesses. The favourite place of Finns is often outdoors in nature, where they can calm down, relax, enjoy their surroundings and forget their problems for a while.

An ancient monument in the forest. Särkisalo, Puosinkallio.

47 Cultural environment is an umbrella concept. It refers to environments whose characteristics betray the past history of culture and the interaction between nature and man. A cultural environment embodies the relationship of man to his environment now and in the past, including the meanings, interpretations and names ascribed to it. On a more detailed level, cultural environment can be described using the concepts of cultural landscape and built cultural environment. Ancient monuments and traditional semi-natural habitats are also part of the cultural environment.

48 Ancient monuments are structures or formations in the landscape or soil which are the result of human activity in ancient times. Ancient monuments are often clearly observable formations, such as cairns, sacrificial stones, mounds, circles or labyrinths of stones, and defence devices. Another group are underground monuments such as dwellings and places of work, and graves. Ancient monuments are protected under the Antiquities Act.

Lönnrot Pine in Kesälahti is a famous historical tree in Finland. According to legend, Elias Lönnrot wrote down oral poems under this tree when collecting folklore material for Finland's National Epic, the Kalevala.

Cultural and landscape sites

There are seven sites in Finland that have been inscribed on the UNESCO World Heritage list. One of them, the Bronze Age burial site of Sammallahdenmäki in the municipality of Lappi is situated in a forest. The environs of the Verla Groundwood and Board Mill are a magnificent milieu from the early days of Finnish forest industry. Old Rauma city and the Petäjävesi Old Church represent old timber architecture.

There are 35 national parks in Finland. One aspect of the maintenance of the parks is the promotion of the preservation of cultural heritage and landscape values. The Seitseminen and Liesjärvi national parks both include an old, traditional farmstead, where the buildings, fields and environs are managed with traditional methods.

The grounds for the protection of the Punkaharju and Aulanko nature conservation areas as well as their management goals cover the conservation of not only natural features but also of cultural values and the landscape.

The Kuivajärvi-Hietajärvi area is the only landscape conservation area established under the Nature Conservation Act (2001). It includes large tracts of forest, which are an integral part of the White Karelian culture of the area. National urban parks were established in Hämeenlinna, Heinola and Pori in 2000–2005.

Natural monuments[49] protected under the Nature Conservation Act number in the hundreds. Most of them are located in forests; alternatively the monuments are trees or groups of trees growing in built-up cultural environments. The Finnish Dendrological Society has identified over 1,200 large or otherwise exceptional trees. The many arboretums (over 80 in Finland) are part of the cultural history of forest research.

Prehistoric monuments are found in cultural environments, but also far away from current settlement areas, in the middle of commercial forests. The Register of Ancient Monuments kept by the National Board of Antiquities is being constantly updated. There are currently about 18,000 sites listed in the register. Antiquities are protected under the Antiquities Act, even if they are not entered in the register.

A survey of the most representative rural cultural landscapes was completed in 1992. 156 of the landscape areas in the study were identified as being important nationally. Most of them are located in agricultural regions in southern and western Finland, but even here the margin forests along fields and waters and the general landscape provide an important framework for the site.

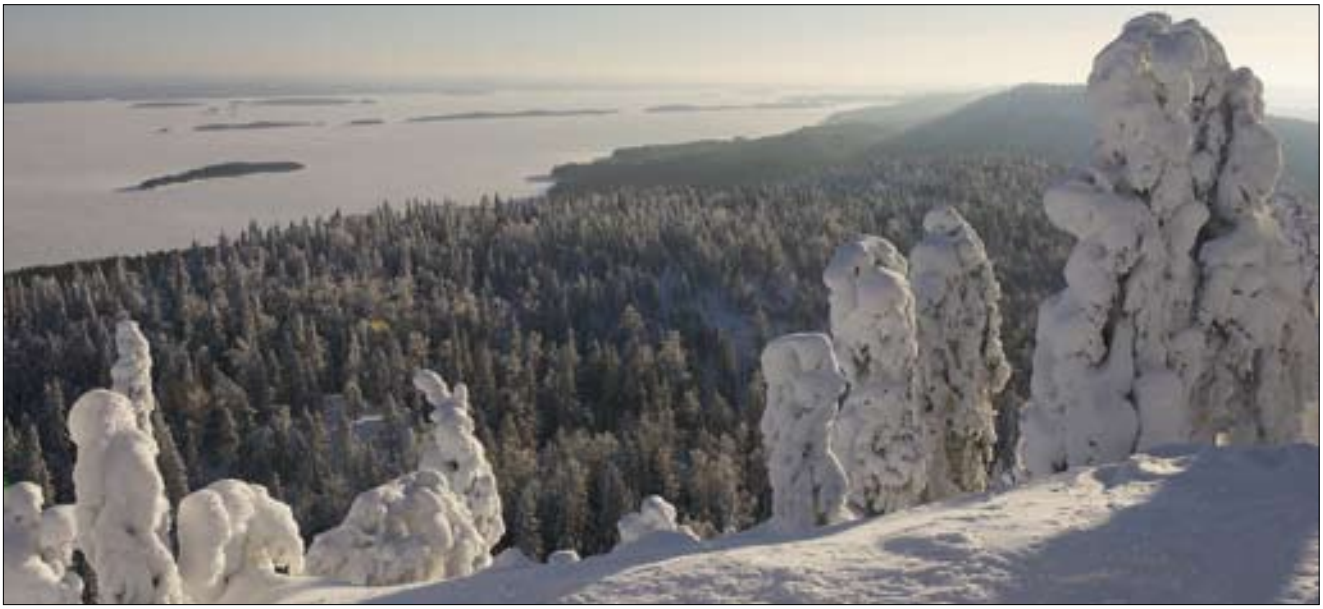
A survey of built cultural heritage completed in 1993 covered 1,772 valuable sites and areas whose value stems from architectural heritage. The environments of these areas also include trees and margin forests. The National Board of Antiquities has launched a project for revising the list of cultural heritage sites, to be completed in the near future.

To commemorate the 75th Independence Day in 1992, 27 areas were designated national landscapes[50].

A national inventory of heritage landscapes was conducted in 1992–1998. The inventory identified 3,700

49 Natural monument = Under the Nature Conservation Act, trees, groups of trees, boulders or other natural formations can be protected as natural monuments. Natural formations can be protected because of their beauty, rarity, scenic importance or scientific value.

50 National landscape = The term national landscape is often used to describe famous landscapes of a high symbolic value. Areas considered national landscapes are nationally valuable landscape areas and/or nationally significant constructed cultural environments.



The landscape of rocky hills and lakes at the Koli National Park is one of the most famous of national landscapes in Finland.

valuable heritage landscapes[51], which had developed as a result of traditional agricultural practices. Wooded semi-natural environments are wooded pastures and meadows and old burnt-over woodlands. Such sites are often part of a larger whole, which also includes traditional farmhouses or other structures.

The Finnish Road Administration has conducted surveys of historical roads and roadside landscapes. The most striking roads have been designated scenic routes, and the woods and cultural sites along the routes are managed under a special management plan.

A total of 12 museums have been founded to preserve and make known traditional silvicultural practices. The largest of these is the Finnish Forest Museum Lusto founded in 1994 in Punkaharju as a national museum and science centre. Events presenting forest culture are organised in Lusto. The Sami Museum, today named Siida, was founded in Inari in 1959 to present Sami culture and Lapland nature.

Monitoring systems

Information on landscape and cultural heritage sites is maintained by the regional Environment Centres, the Finnish Environment Institute and the National Board of Antiquities. The National Board of Antiquities also maintains the Register of Ancient Monuments.

Landscapes and cultural heritage sites are covered in the environmental monitoring programmes of the Agri-Environmental Programme 2000–2006 and the Finnish Road Administration. Monitoring data on the implementation of land use plans is available from the relevant municipalities as well as from the Regional Councils and the Finnish Environment Institute

Sources:

- Ministry of the Environment, www.minedu.fi/default.asp?node=4032&lan=en
- World Heritage sites in Finland, www.minedu.fi/OPM/Kansainvaeliset_asiat/kansainvaeliset_jaerjestoet/unesco/maailmanperinto/
- National Board of Antiquities, www.nba.fi
- Concepts on cultural environments and remedial construction, www.rakennusperinto.fi/muuta_sisaltoa/kasitteisto/fi_FI/Kasitteisto/
- Maintenance of heritage sites, www.nba.fi/en/mjhoito-eng
- Ministry of the Environment, www.ymparisto.fi/default.asp?node=4032&lan=en
- Landscape protection and management, www.ymparisto.fi/default.asp?contentid=239508&lan=fi&clan=en
- Built heritage and cultural environments, www.ymparisto.fi/default.asp?contentid=241954&lan=fi&clan=en
- Biosphere reserves, www.ymparisto.fi/default.asp?contentid=152153&lan=fi&clan=en
- Metsähallitus, www.metsa.fi/default.asp?Section=1176
- Cultural heritage, www.metsa.fi/page.asp?Section=2037
- Finnish Road Administration, www.tiehallinto.fi
- Scenic routes, http://www.tiehallinto.fi/servlet/page?_pageid=68&_dad=julia&_schema=PORTAL30&kieli=en&menu=4908&_pageid=71&kieli=en&linkki=7714&julkaisu=3118
- Finnish Dendrological Society, www.dendrologianseura.fi
- Finnish Forest Museum Lusto, www.lusto.fi
- Sami Museum and Northern Lapland Nature Centre, www.siida.fi

51 Heritage landscape and traditional (semi-natural) habitat These are areas or sites moulded by traditional livelihoods and land use patterns where the historical traces are preserved. Heritage landscapes include, for example, meadows and pastures and the structures and methods of utilisation associated with them. The concepts of cultural landscape and heritage landscape are partly overlapping; a heritage landscape is usually small in area, and forms part of a larger cultural landscape. Traditional habitats are semi-natural habitats such as dry and damp meadows, pastures and wooded meadows with a rich mix of species thanks to mowing or grazing.