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4th MINISTERIAL CONFERENCE ON THE PROTECTION OF FORESTS IN EUROPE

State of Europe's Forests 2003

The MCPFE Report on Sustainable Forest Management in Europe

Jointly prepared by the MCPFE Liaison Unit Vienna and UNECE/FAO

United Nations
Economic Commission for Europe

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PREFACE

Did you know that the area of Europe's forests is constantly increasing? Perhaps you did, but this still comes as a surprise to most Europeans. This along with many other interesting facts about Europe's forests can be found in this report.

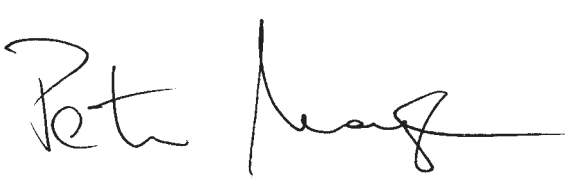
Forests have always been an essential component in the lives of Europeans. To get a better picture of the situation regarding forests all over Europe, the UNECE/FAO had already started to gather detailed information about Europe's forests during the middle of the last century. Based on the expert knowledge of country correspondents in all European countries, a first picture was drawn of the state of forests in the region.

Based on these efforts, the Ministerial Conference on the Protection of Forests in Europe (MCPFE) and UNECE/FAO have joined forces to develope a comprehensive report about the state of sustainable forest management in Europe over the last ten years. A special effort has been made to cover all aspects of the forest, not only those which are easily quantified.

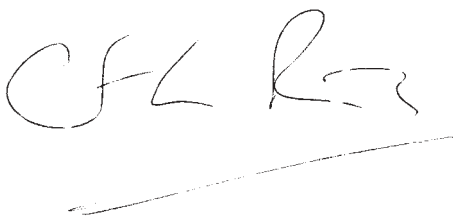
This report, prepared for the 'Living Forest Summit', the Fourth Ministerial Conference on the Protection of Forests in Europe, in Vienna in April 2003, contains the most up-to-date information about the state of sustainable forest management in Europe. The report aims to give key facts and figures about Europe's forests for policy and decision makers at the "Living Forest Summit" and to inform a wider public in a comprehensive and easy-to-read form.

The report would not have been possible without true pan-European co-operation. First of all, our special thanks go to the correspondents in the MCPFE countries for their valuable efforts to provide information on the state of forests in their respective countries. Furthermore, our special thanks go to Stefanie Linser, Ewald Rametsteiner and Christoph Wildburger of the MCPFE Liaison Unit Vienna, Alexander Korotkov of the secretariat of the Timber Section of UNECE/FAO, Aleksi Lehtonen of Finland/FAO and Stein Tomter of Norway, who have been the main contributors in completing this important report. Finally, our thanks go to all others who contributed to this task.

All in all, this report is not only an important reference source on the state of Europe's forests, it is also a visible product of mutually beneficial co-operation between MCPFE and UNECE/FAO. It is this and many other efforts that ultimately contribute to the further understanding and improvement of sustainable forest management in Europe to the benefit of society.



Peter Mayer
Head of the Liaison Unit Vienna, MCPFE



Kit Prins
Chief Timber Branch, UNECE

EXECUTIVE SUMMARY

The report 'The State of Europe's Forests 2003' gives an overview of the latest facts and figures on forests and paints a picture of the status of sustainable forest management in Europe. It is structured according to the six Pan-European Criteria for Sustainable Forest Management, which define the goals of sustainable forest management.

In this report Europe comprises the 44 countries of the MCPFE listed in Annex II.

Forest resources in Europe are increasing

Forests and other wooded land cover about 1 000 million ha in Europe and are therefore a characteristic element of the natural landscape. Presently the share of forest and other wooded land of the total land area in Europe is 47%, ranging from 1% in Malta to 68% in Finland and Sweden. In general, there are about two football grounds of forest area per capita in Europe, however, large variations occur at country level. The development of forest area in Europe is positive, increasing annually by about 0.1%, which e.g. also means that forests are sequestrating more carbon.

Forest health and vitality are still critical

Figures on depositions of air pollutants show that nitrogen and sulphur depositions continue to have serious impacts on Europe's forests. Currently, one-fifth of all trees in Europe are rated as 'damaged' by defoliation. Following an increase in damage levels from 1990 to 1994, a stabilisation at a high level of damage can be observed afterwards. The crown condition varies between climatic regions and species due to temporally and spatially changing natural and anthropogenic stress factors. Soil condition as an important factor for ecosystem health and vitality is also affected by depleted soil buffers and changes in soil properties. Further important factors causing damage to Europe's forests are storm and insect calamities.

Productive functions are maintained

In all European countries there is considerably more increment than fellings. Since the start of international data collection in 1947, the annual increment has never been as high as presently, amounting to 2 287 million m^3. Of this increment only about one quarter is annually felled in Europe, while excluding the Russian Federation it is more than half.

Non-wood forest products are economically important in many European countries. Game has the highest value in this respect, but Christmas trees, mushrooms, berries and cork are also an important source of income in some countries. Marketed services, such as hunting licences, also constitute an important additional income of forest owners.

Forest biodiversity is a focus

More than two-thirds of Europe's forests are semi-natural. In addition, more than one quarter of forests are undisturbed by man, mainly in Eastern and Northern Europe, whereas plantations play only a minor role in

Europe, covering 3% of the forest area. The diversity of tree species is highest in the southern and eastern parts of Europe. Almost half of the total forest area is covered by mixed forests. The type of regeneration varies considerably in European forests. Natural regeneration is applied on two-thirds of the regeneration area in forests. Twelve per cent of the forest area is protected for biodiversity reasons or for the protection of landscapes and specific natural elements. While there are large areas in Northern and Eastern Europe with little human intervention, most of the protected forests are actively managed for the conservation of biological diversity.

Protective forests play important roles in Europe

Also about 12% of the forest area are designated as protective forests. On about 80% of these areas, the management is directed to protect soil, water or other ecosystem functions, while the remaining areas are mainly managed to protect infrastructure.

Other socio-economic functions are important

Public bodies own a larger area of forests in Europe than is in private ownership. Public holdings predominate in Eastern European countries particularly, while in other European countries private ownership ranges up to 92%. In the whole of Europe, there are more than 90 000 forest holdings in public ownership and 9 million in private ownership. Nevertheless, in most European countries forests are generally open to public access, offering the public a variety of recreational possibilities.

The contribution of the forest sector to national gross domestic product is quite high in several countries. While employment in European forestry has been decreasing by 22% over the last decade, it still provides employment to 1.36 million persons.

INTRODUCTION

The report 'The State of Europe's Forests 2003' provides an overview of the status and development of sustainable forest management in Europe on the occasion of the Fourth Ministerial Conference on the Protection of Forests in Europe, the 'Living Forest Summit'.

The purpose of this report, jointly prepared by the MCPFE Liaison Unit Vienna and UNECE/FAO, is to provide the most recent, objective, quantified and comparable data about sustainable forest management in Europe. It should also provide an updated information source for decision makers and other stakeholders and should serve as a background document for new commitments.

This report is mainly based on forest resource assessment data of UNECE/FAO (2000)[1], FAO (2001)[2], some additional information of other approved sources and updates of the forest resource assessment data, which were conducted by UNECE/FAO and MCPFE in 2002. Additionally, new data on protected and protective forest areas were collected by UNECE and MCPFE in 2002 according to the 'MCPFE Assessment Guidelines for Protected and Protective Forest and Other Wooded Land in Europe'.

A special focus of this report is on changes that occurred in European forests between former forest resource assessments and the recent updates provided specifically for this report. Studying these changes provides an insight into the development of Europe's forests. It reveals the current status and achievements in sustainable forest management in Europe.

The report is structured according to the Pan-European Criteria and Indicators for Sustainable Forest Management, which were developed to show to what extent the goal of sustainable forest management is fulfilled in individual European countries. The related pan-European indicators show changes over time for each criterion and demonstrate the progress made towards its specified objective (MCPFE, 1998).

Efforts have been made to provide data for every indicator, although data quality and the comprehensiveness of the information vary significantly, depending on the specific variable and the country conditions. It should be noted that although some of the pan-European indicators for sustainable forest management are not exactly equivalent to variables reported in the forest resource assessment process, those variables provide the best approximation for these indicators. More information on data reliability is given in Annex I: Material and Methods.

In this report Europe comprises the 44 MCPFE countries listed in Annex II, including the Russian Federation. Data were provided by 40 countries. No data were available for Andorra, the Holy See, Monaco and Serbia & Montenegro.

All tables with statistics, including country comments, can be found in Annex IV. The updates provided by countries in 2002 are highlighted in grey in the tables.

[1] Forest Resources of Europe, CIS, North America, Australia, Japan and New Zealand (TBFRA 2000).

[2] Global Forest Resource Assessment 2000 (FRA 2000).

CRITERION 1: FOREST RESOURCES AND THEIR CONTRIBUTION TO GLOBAL CARBON CYCLES

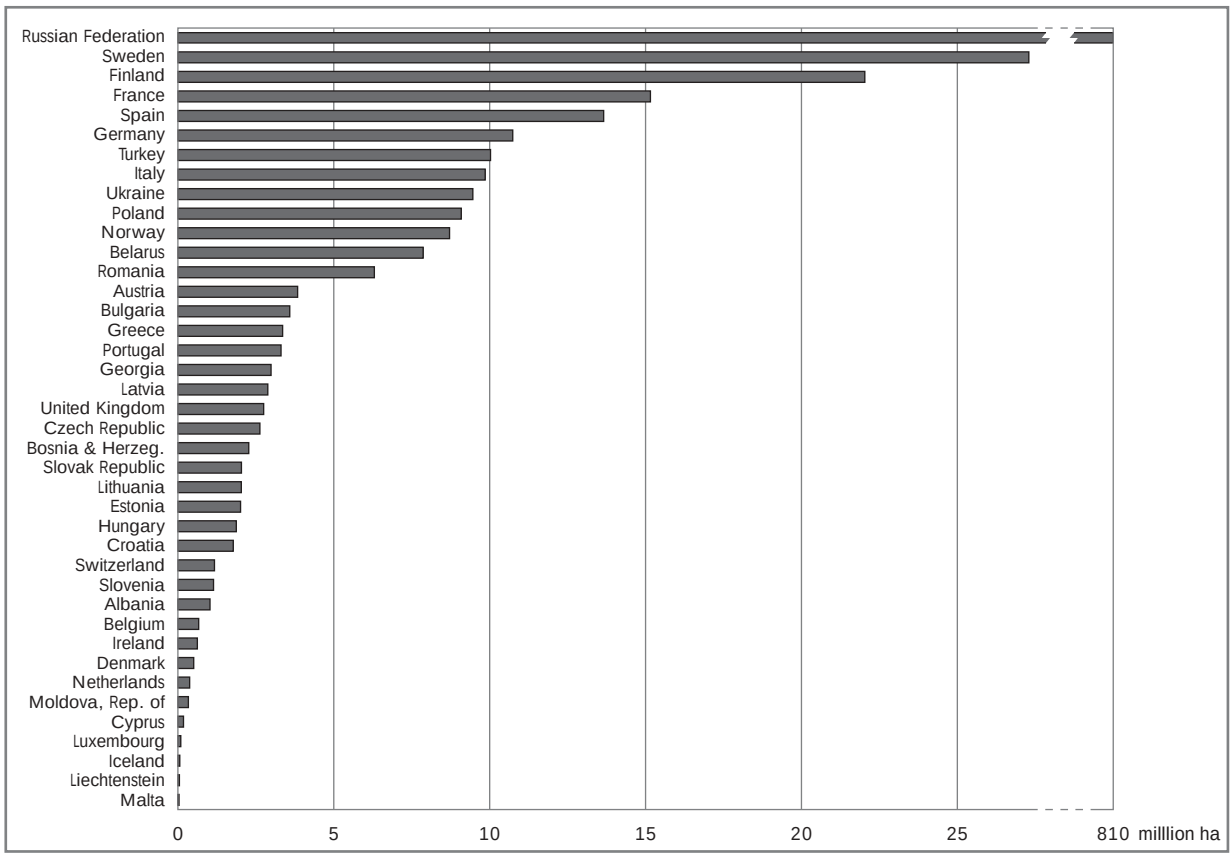
1.1 Forest areas in Europe are increasing

Forest area is, in general, land with tree crown cover of more than 10% and area of more than 0.5 ha[3]. Information on forest area is relevant to several other chapters describing further aspects of sustainable forest management.

1.1.1 Forest areas in Europe are vast

The total forest area in Europe amounts to 1 004 million ha, of which more than 800 million ha grow in the Russian Federation (Annex IV, Table 1.2.a). About half of the remaining forest areas can be found in Sweden, Finland, France, Spain, Germany and Turkey (Figure 1.1). All other European countries together comprise 95 million ha of forest.

Figure 1.1: Forest area in European countries. Source: UNECE/FAO (2000) and updates.

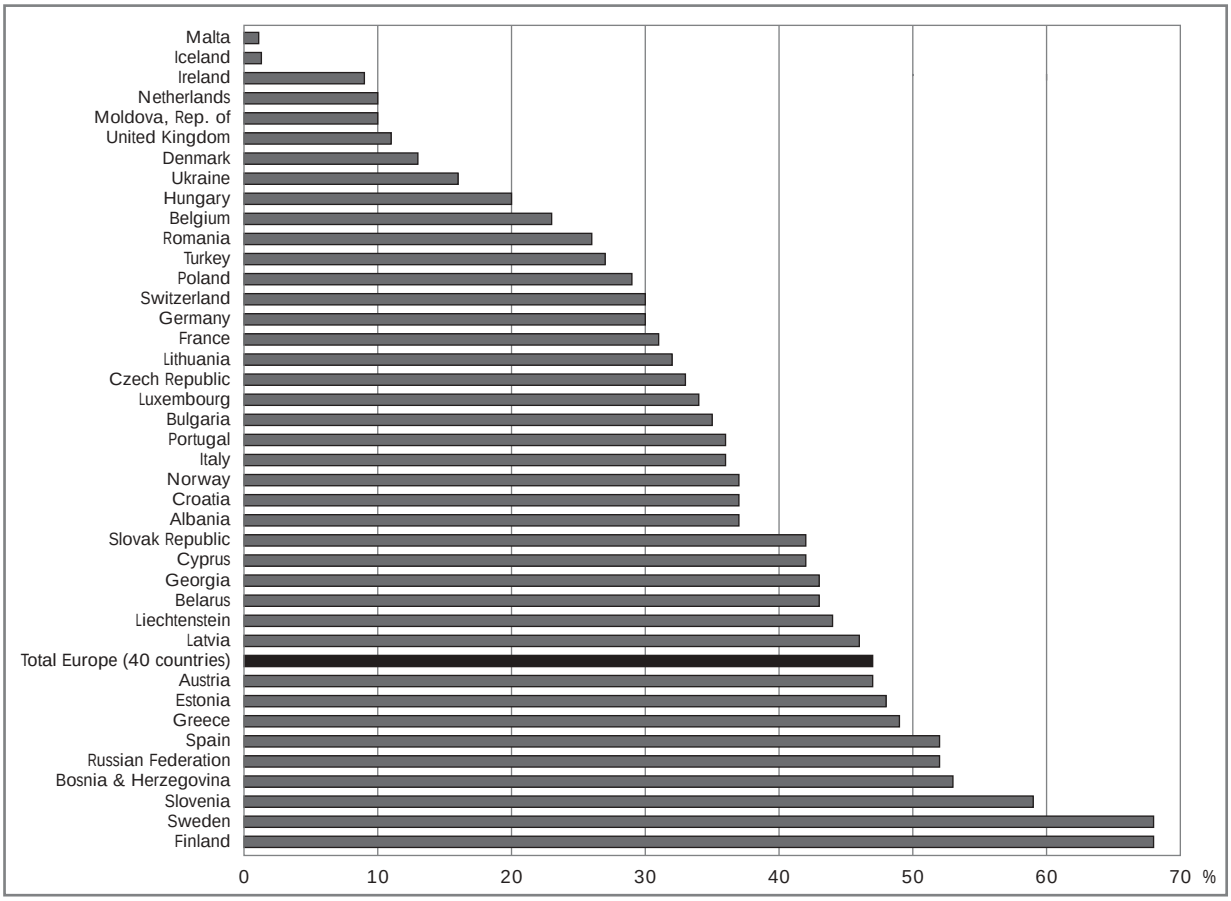


[3] For the full definition, please see Annex V: Terms and Definitions.

Additionally, there is other wooded land that is land either with a very low crown cover or with shrubs and bushes, like the Mediterranean macchia areas or the Nordic peat lands. The total area of other wooded land in Europe amounts to 111 647 ha mainly located in Southern and Northern European countries (Annex IV, Table 1.2.a). Other wooded land was slightly decreasing during the last decade.

The share of forest and other wooded land of the total land area in Europe is 47% (Annex IV, Table 1.1). This share varies considerably between countries, ranging from 68% in Finland and Sweden to 1% in Iceland and Malta (Figure 1.2).

Table 1.2: Share of forest and other wooded land in total area in European countries. Source: UNECE/FAO (2000) and updates.



There are 1.42 ha forest and other wooded land per capita in Europe. This is about the size of two football grounds. At country level, the range of forest and other wooded land per capita is very wide, from 6 ha in the Russian Federation and 4.4 ha in Sweden to 0.001 ha in Malta (Annex IV, Table 1.1).

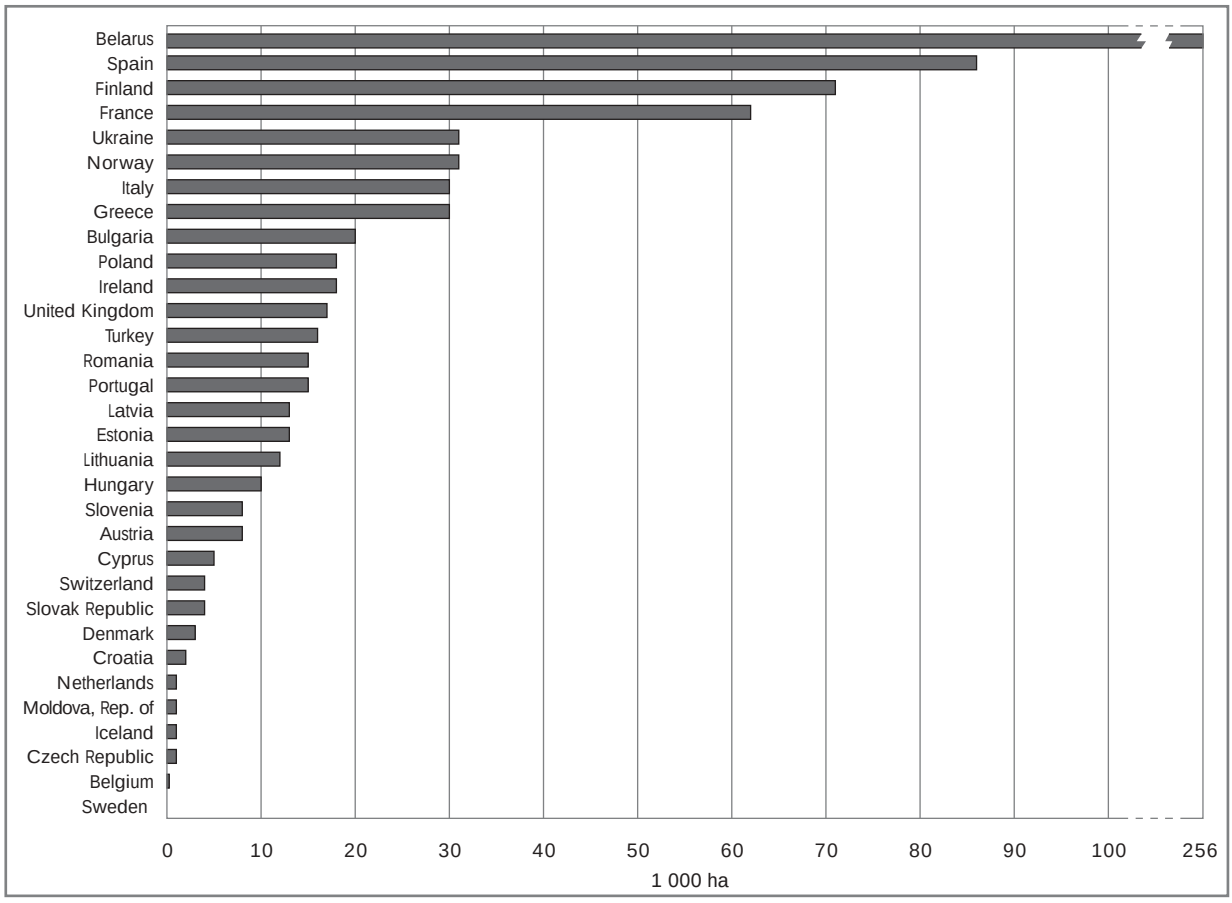
1.1.2 Forest area continues to increase

The forest area is increasing in all European countries with the exception of the Russian Federation[4] (Figure

[4] In the Russian Federation annual loss was reported to be around one million hectares or 0.15% of the total forest area of the country, but this is apparently due to definitional changes such as the reclassification of forest and other wooded land to other land uses (see also Annex I: Material and Methods).

1.3). During the last reference period, forest area increased annually in Europe, without the Russian Federation, by 802 000 ha or 0.08% of the total forest area (Annex IV, Table 1.2.a). This is about the area of Cyprus.

Figure 1.3: Annual increase of forest area in European countries where data were available. Source: UNECE/FAO (2000) and updates.



The highest annual increase of forest area occurred in Belarus, Spain, Finland and France (Figure 1.2). In the past few years the forest area increased particularly in the United Kingdom and in Denmark (Annex IV, Table 1.2.b). According to UNECE (2002a), changes in forest area are mainly caused by afforestation of former agricultural lands aiming to increase long-term timber supply, to increase the level of non-wood goods and services, and to provide alternatives for agricultural use of land. In general, afforestation activities have slowed down considerably since 1980. It is becoming harder to find land suitable for afforestation, and the costs of additional afforestation are increasing.

In Europe about 85% of the forests are available for wood supply. A long-term analysis based on data published by UNECE/FAO indicates that, in general, the forest area available for wood supply in Europe has increased moderately since 1950. During the last few years this area has been more or less constant. UNECE (2002a) explains the discrepancy between the increased forest area and constant forest area available for wood supply by the establishment of protection areas in forests that were formerly available for wood supply.

According to the data available, other wooded land is decreasing in some countries due to the conversion of other wooded land to forest land, mainly in the Mediterranean countries. In the past few years a large decline in other wooded land also occurred in Slovenia and a smaller decline in Finland (see Annex IV, Table 1.2.b).

1.2 More young than old forests were reported

Age and diameter distributions of forests give information about the structure and future development of forests. In combination with figures on current state and changes of growing stock, the evaluation of future potential growth and sustainable timber supply is also possible.

High forests in which the predominant proportion of trees falls in the same age class as well as coppice are called even-aged forests. Their age structure was, for the first time, reported in 2002 in detail by 10 countries, that is Belgium, Finland, France, Germany, Hungary, Lithuania, the Netherlands, Slovakia, Slovenia and Sweden (Annex IV, Tables 1.5.a-d). Past forest resource assessments only asked for the differentiation of three instead of nine age classes.

The largest forest areas in these countries can be found in the age class 21-40 years, followed by the age classes 41-60 and 61-80 years. According to UNECE (2002a), this peak is likely to have its origin in the huge afforestations which were carried out in Central Europe after the Second World War and the subsequent policy of subsidies for afforestation. In Finland, however, more than one-third and in Slovenia more than half of the forests are older than 80 years. In coniferous forests in these countries, most trees grow in the age class 61-80 years. The largest broadleaved and mixed forest areas grow in the age class 21-40 years (Annex IV, Tables 1.5.a-d).

Coppice is even-aged forest composed of stool-shoots or root suckers with a short cutting cycle. Data on the area of coppice are not available by TBFRA or the update 2002. According to UNECE (2001) considerable coppice areas can be found especially in Southern and South-eastern Europe. In total, coppice covers about 21 million ha or 2% of the forest area. The coppice area in France alone is almost 7 million ha, followed by Italy (3.5 million ha) and Greece (2 million ha).

In uneven-aged forests, several age classes, crown layers and development stages commonly occur at the same time. For technical and cost reasons, data on diameter distribution are collected for uneven-aged stands instead of age data, but are so far not available for most European countries. As forest management is changing towards more uneven-aged stands, the data on diameter distribution might gain importance in the future.

Nine countries provided updated data on uneven-aged forests, in total nearly 13 million ha. The share of uneven-aged mixed forests is quite low (17%). The shares of uneven-aged coniferous (42%) and broadleaved (41%) forests are about the same (Annex IV, Table 1.5.a-d).

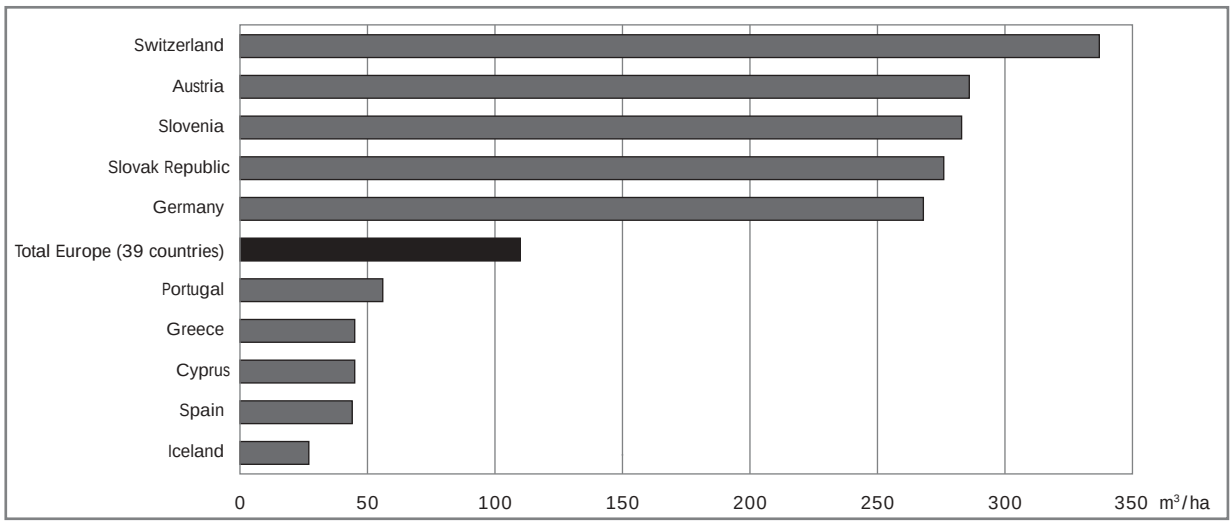
1.3 Growing stock continues to increase

Information on the growing stock, that is the living tree component of the standing volume, is crucial for several data users like foresters, timber companies, climate researchers and others.

1.3.1 Wood resources per hectare are different from region to region

The average stem volume in Europe is 110 m^3/ha, which is the volume of a cube with a side length of almost 5 m. However, there is large regional variety from 27 m^3/ha in Iceland to 337 m^3/ha in Switzerland, depending on growth conditions and intensity of management (Figure 1.4 and Annex IV, Table 1.7).

Figure 1.4: Average stem volumes – including 10 countries with the highest and lowest values and the total for Europe. Source: UNECE/FAO (2000) and updates.



The share of growing stock which is available for wood supply varies. Excluding the European CIS countries[5], 83% of growing stock is available for wood supply, in the European CIS countries only around two-thirds (UNECE/FAO, 2000). The remaining growing stock mainly grows on areas that are under some kind of protection or on areas which are difficult to access.

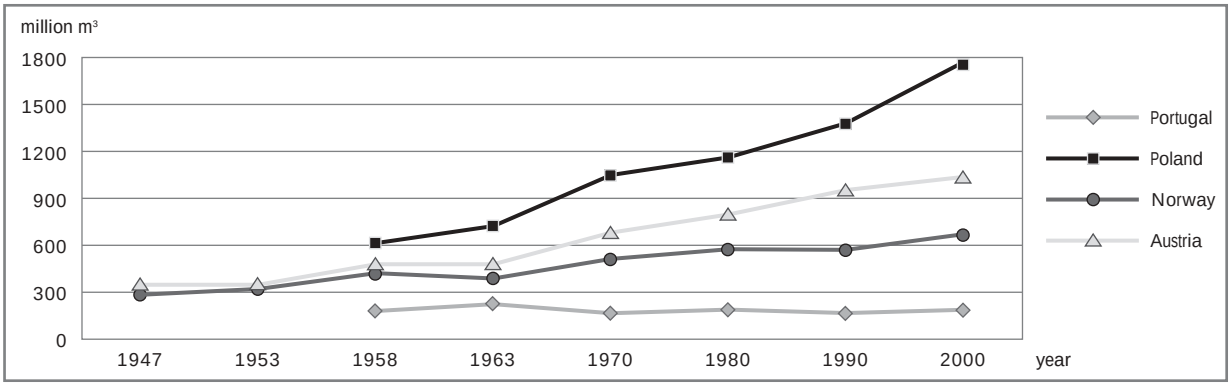
1.3.2 Growing stock is increasing steadily

A result of the increasing forest area is an increasing total growing stock. The average annual increase of the growing stock in Europe amounts to nearly 620 million m^3/year (Annex IV, Table 1.7).

In general, the growing stock of European forests has been increasing throughout the last assessment periods. The average annual change is positive for all countries (Annex IV, Table 1.7), indicating that forests are not harvested as intensively as would be possible. This less-intensive management could also be an indication of a change in the priorities of the benefits that forests provide. Also, improved growing conditions and advanced silvicultural methods and better planting material can help to explain some of this positive change, as well as low removals and postponed thinnings. However, the high average annual change in growing stock over the assessment periods is possibly also related to methodical changes. Unfortunately, reliability estimates for growing stock and its change are often lacking.

[5] Belarus, Georgia, Republic of Moldova, Russian Federation and Ukraine.

Figure 1.5: Long-term change in growing stock on forest available for wood supply in the GCC countries Austria, Norway, Poland and Portugal. Source: UNECE/FAO database.



Austria, Norway, Poland and Portugal form the General Co-ordinating Committee (GCC) of the MCPFE, representing different European regions. The difference between development trends of growing stock in these countries can be seen in Figure 1.5. Substantial changes in the growing stock were measured especially in Poland, Austria and Norway in 1970, and in 2000 again in Poland. One partial reason for these exceptionally steep rises could be a change in the inventory methods. Such large increases in growing stock during a decade are unlikely to be explained fully by, for instance, improved forest management or fertilising nitrogen deposition.

1.3.3 Stem volume depends on latitudes

The latitude has a significant influence on the average stem volume. Table 1.6 (Annex IV) shows that there is a gradient in the average stem volume according to the latitude. For example, forests in Finland and Sweden have less volume per area unit than in Belgium, France or Germany. In comparing forest resources of different European countries it needs to be taken into account that the same species may have a totally different stocking in a stand in Scandinavia than in the Mediterranean region.

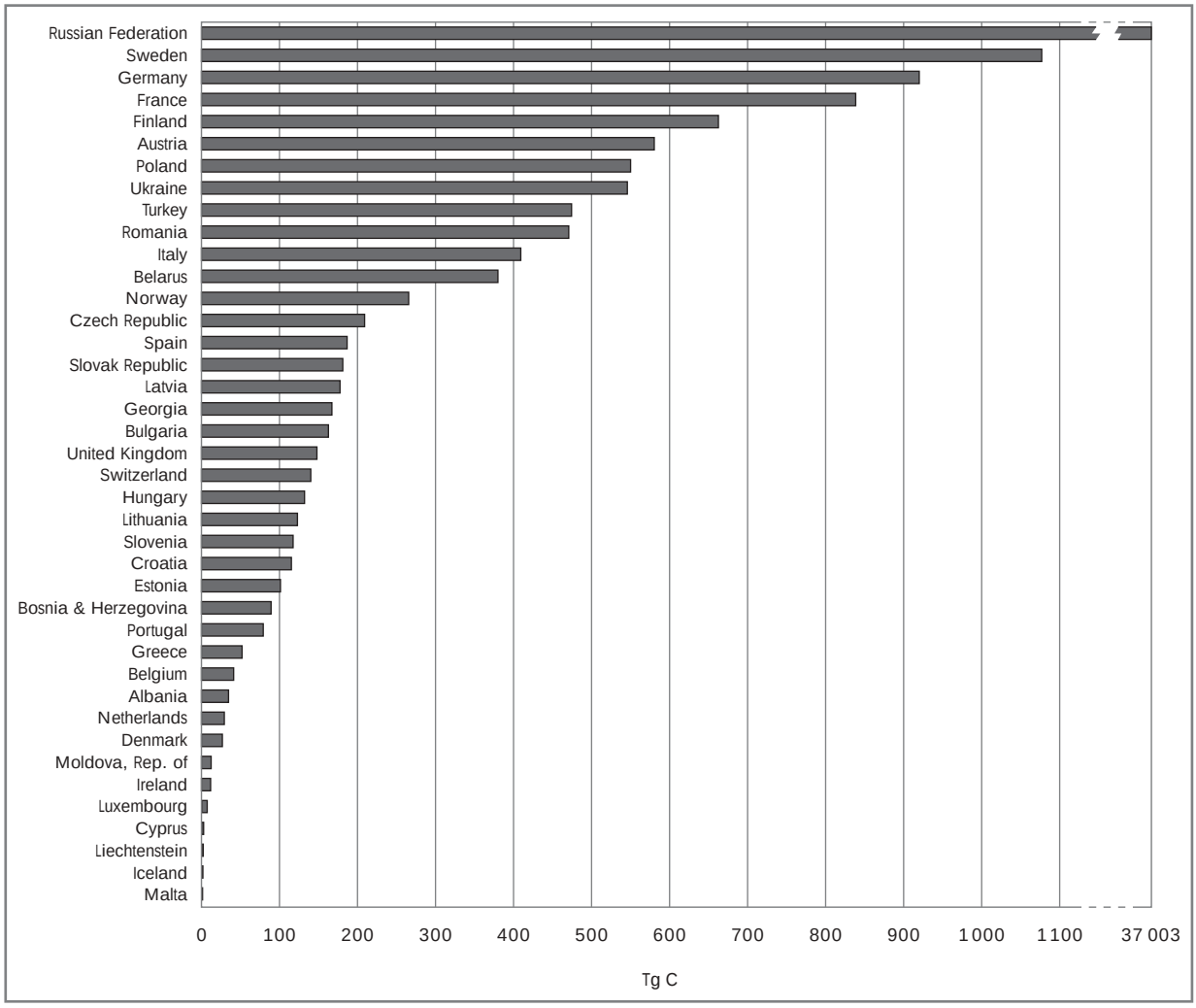
1.3 Forests and carbon

The Kyoto Protocol recognises that carbon sequestration in forest ecosystems can contribute to a reduction in the concentration of greenhouse gases in the atmosphere as a growing tree is using CO_2 from the atmosphere. Carbon can be retained for long periods in the forest biomass and soils, and later in wood products. However, the main goal of climate policies is and should be to reduce emissions of greenhouse gases.

The total carbon sequestered in woody biomass of the European forests, as reported by 40 countries, amounts to 46 526 Tg or 46 526 million tonnes of carbon. Nearly 80% of this total stock is in the Russian Federation. Excluding the Russian Federation, 9 522 Tg or 9 522 million tonnes of carbon are stored in the woody biomass in forests in the remaining European countries (Annex IV, Table 1.8)[6]. The absolute carbon stock varies considerably between countries, depending on the extent of forest areas and the growing stocks (Figure 1.6).

[6] The evaluation of carbon stock and changes was done during the previous forest resource assess-ment. Estimates of carbon stock were based on biomass, net annual increment, annual fellings and natural losses information published in UNECE/FAO (2000) (TBFRA 2000, Chapter III, Annex 3b.3).

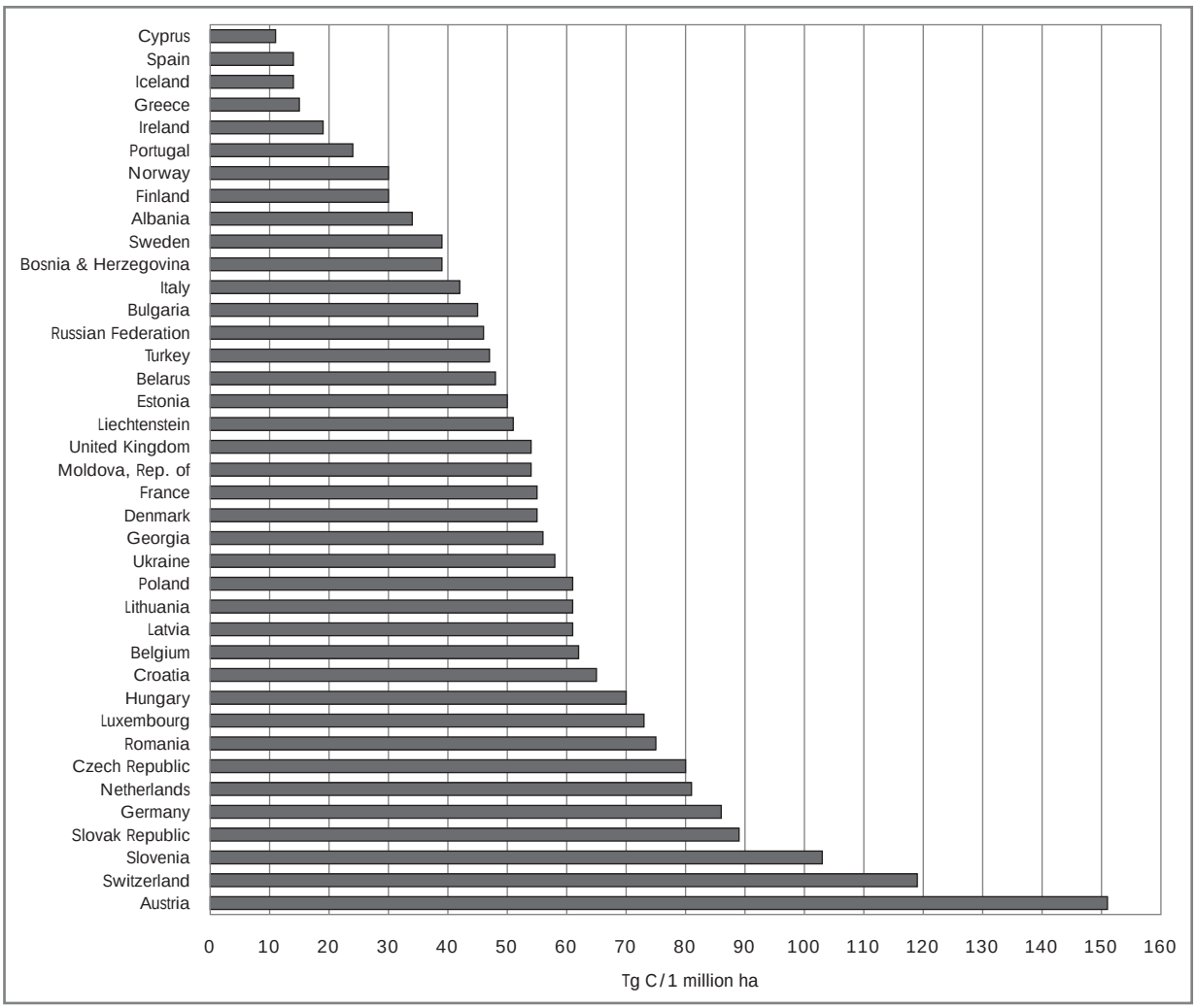
Figure 1.6: Carbon stock of woody biomass in Europe. Source: UNECE/FAO (2000) and updates.



The change of carbon stock in woody biomass is positive or zero in all countries, resulting in a total of 556 Tg or 556 million tonnes of carbon per year (Annex IV, Table 1.8). Since in all countries for which data were available, the annual increment was larger than the annual fellings (Annex IV, Table 3.1.a), consequently the carbon stock of woody biomass increased in Europe. Its average annual increase is 1.2% in Europe (Annex IV, Table 1.8). The joint EU/ICP Forests Programme (2002), analysing results of 37 European countries, found that carbon sequestration is mainly due to a net increase in forest growth, while the information about further sequestration in the soil is limited.

It should be noted that the biomass estimates are so far based on often-rough conversion factors. Therefore, the corresponding data should be interpreted with caution. The information on carbon stock is furthermore not comparable with data included in greenhouse gas inventories under UNFCCC and the Kyoto Protocol, due to differences in terms, definitions and methodologies.

Figure 1.7: Carbon stock in woody biomass per 1 million ha forest land in European countries. Source: UNECE/FAO (2000) and updates.



Most of the calculated carbon storage takes place in Central Europe, in particular in Austria, Switzerland, Slovenia, the Slovak Republic, Germany and the Czech Republic (Figure 1.7). One factor could be the silvicultural tradition in this region, which has tended to build up growing stock per hectare. The climatically extreme edges in Europe, like Scandinavia and the Mediterranean areas, seem to sequester less, which is due to limiting factors for growth that appear.

CRITERION 2: FOREST ECOSYSTEM HEALTH AND VITALITY

2.1 Depositions of air pollutants still threaten European forests

Deposition of air pollutants on forests is a major stress factor that has been shown to damage leaves and needles or to change soil and water condition and thus affect forest tree health, ground vegetation composition and ecosystem stability. Air pollution may also predispose trees to the effects of drought and attack by fungi or insects.

Depositions are continuously monitored under the UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP) by the UNECE International Co-operative Programme on the Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests) in 30 European countries. Data for all MCPFE countries are so far not available. The following information is based on the report 'The Condition of Forests in Europe' by UNECE/EC (2002).

2.1.1 High acid loads all across Europe

The average nitrogen deposition from 1995 to 1999 was 19 kg/ha/yr. Relatively high nitrogen inputs above 22 kg/ha/yr or 1 600 mol_c/ha/yr occur in Western and Central Europe. Total nitrogen input is generally found to be much lower in Northern and Southern European countries. UNECE/EC (2002) found that the correlations between nitrogen inputs and forest condition are not significant. On the one hand, nitrogen inputs fertilise forest ecosystems, but on the other hand, they may also have acidifying effects.

The average acid load, which comprises nitrogen as well as sulphate deposition, is about 2100 mol_c/ha/yr. Relatively high acid inputs can be found all across Europe, except in central and northern parts of Scandinavia. However, most sites with the highest acid depositions of up to 3 000 mol_c/ha/yr are situated in Central European forests. In general, nitrogen deposition is higher than sulphur deposition in most countries. Analyses show that there is a small but statistically significant relationship between sulphur deposition and defoliation. High defoliation levels are found in areas with high sulphur deposition, and a reduction in defoliation is observed in areas where successful abatement strategies have reduced sulphur deposition.

2.1.2 Depositions of air pollutants on forests decreased slightly in the last decade

Efforts to reduce emissions led to reductions in depositions of sulphur (SOx), nitrogen oxides (NOx) and ammonia (NH3) in most European countries between 1991 and 1998. However, the present loads are still high, particularly in Western and Central Europe, in spite of the reductions achieved. In some regions, particularly where the recipient soil is especially sensitive, depositions still exceed critical loads (UBA, 2002).

2.2 One-fifth of all trees in Europe are affected by defoliation

The most important measure used to assess forest condition or health is crown density or defoliation, a measurement of the amount of foliage that a tree carries. However, the causes of observed defoliation like

deposition of air pollutants, acidification, drought, biotic factors, etc. are non-specific and are often not quantifiable. By definition, a tree with defoliation greater than 25% is classified as 'damaged'. This comprises the defoliation classes 'moderately damaged', 'severely damaged' and 'dead'.

The data presented in this report were compiled by ICP Forests.

2.2.1 Overall, broadleaves are more affected by defoliation than conifers

Defoliation of trees is observed in all parts of Europe. In 2001, 22.4% of all trees assessed by ICP Forests were classified as moderately or severely defoliated or dead. (Annex IV, Table 2.1.a). However, this share varies greatly among regions and tree species. Lowest rates of defoliation are to be found in Denmark, Estonia, Cyprus and Austria. The highest rates of defoliation are to be found in the Czech Republic and Ukraine. Areas with high defoliation are mainly located in countries of Central and Eastern Europe. In the national inventories conducted in 2001, Bulgaria, the Czech Republic, Italy, Moldova, Poland, the Slovak Republic and Ukraine assigned more than 30% of all assessed trees to the defoliation classes moderately damaged, severely damaged and dead (Annex IV, Table 2.1.a).

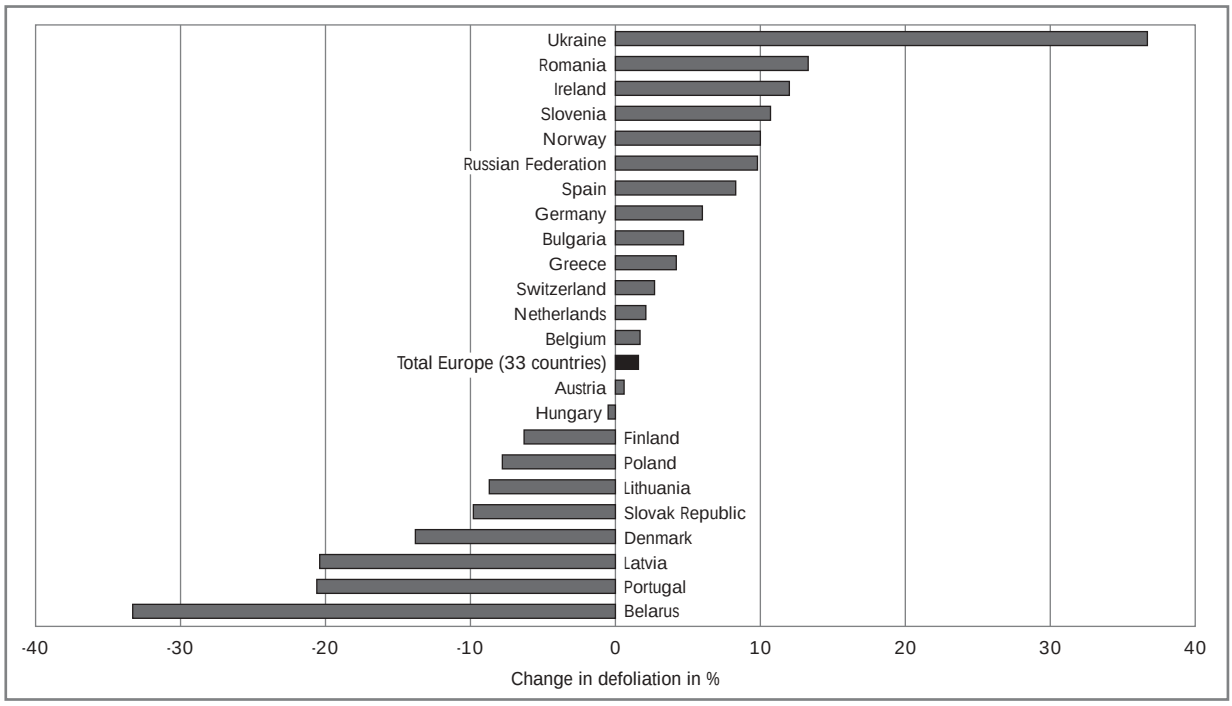
In the transnational assessment of ICP Forests in 2001, the proportion of damaged broadleaves was higher (24.4%) than the proportion of damaged conifers (21.0%) (Annex IV, Tables 2.1.b-c). Of the four tree species Norway spruce, Scots pine, common beech and deciduous oaks, which are most frequently occurring on the European sample plots of ICP Forests, the oak species were the most severely defoliated and also showed the highest proportion of dead trees. Particularly in the Atlantic south and north, Mountainous north, Continental, Mediterranean higher and Mediterranean lower region, broadleaved trees outnumber coniferous trees. There the broadleaved trees have mostly higher defoliation. The Sub-Atlantic, Mountainous and Boreal regions comprise about three-fourths of all coniferous sample trees. In these regions, the coniferous trees have mostly slightly higher defoliation levels than the broadleaves. This is due to the large areas with severe defoliation of Scots pine and Norway spruce in the Czech Republic, Slovak Republic and Poland (UNECE/EC, 2002).

2.2.2 Since 1990, diverging trends in defoliation

A comparison of individual years is just an approximation for accurately judging the situation of defoliation. However, a simple comparison of defoliation between the First Ministerial Conference of the MCPFE in 1990 and 2001 shows that defoliation has increased in most countries rather than decreased.

Figure 2.1 presents the change in defoliation from 1990 to 2001 in those 23 European countries where data were available for both years. Due to changes in methodology, including sample sizes, means for 1990 and 2001 are not comparable in Italy, France and United Kingdom and therefore not presented. Also, annual fluctuations between 1990 and 2001 are not presented. In Belarus a very high decrease in defoliation took place during the last decade. Also, conditions in Portugal, Latvia and Denmark improved considerably. Defoliation increased considerably within the last decade in Ukraine, Romania and Ireland. All country figures are based on national assessments. The reference for total Europe with a change in defoliation of 1.6% from 1990 to 2001 is based on transnational assessments of ICP Forests in 33 European countries.

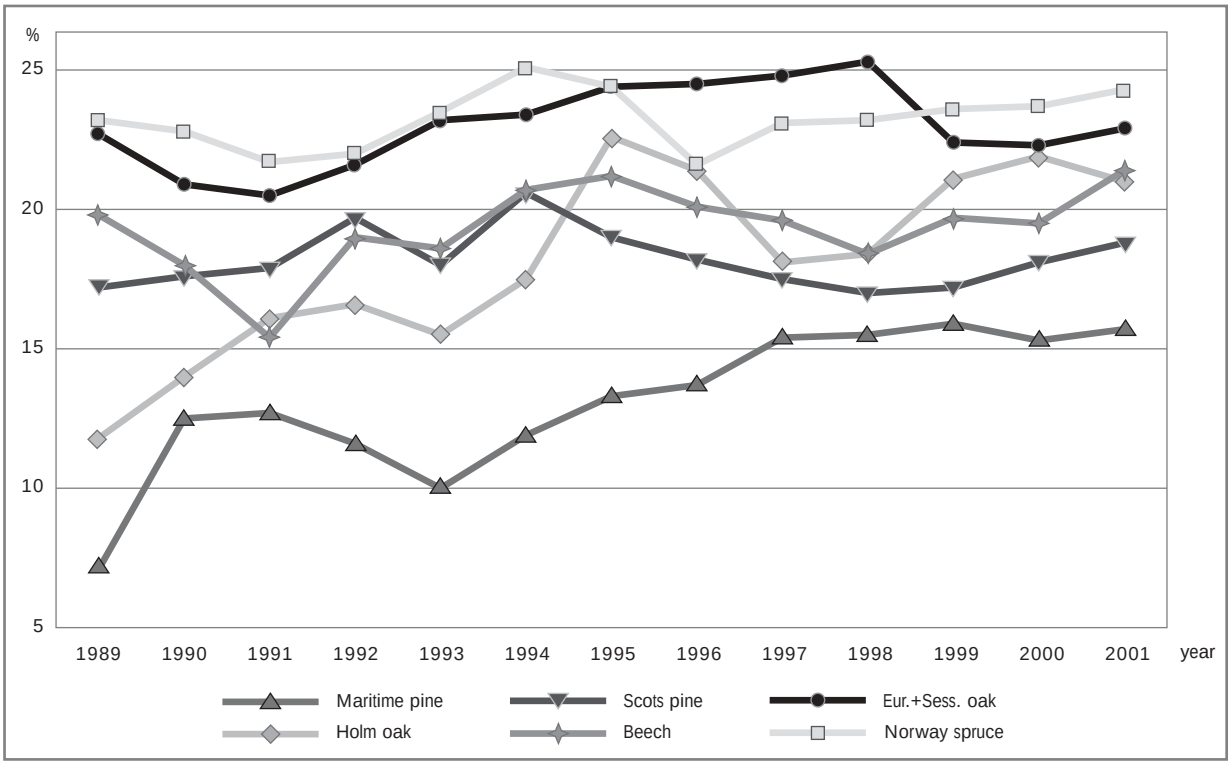
Figure 2.1: Change in defoliation from 1990 to 2001 in countries where data were available for both years. Source: UNECE/FAO (2000) and updates.



The large-scale survey of forest condition in Europe of ICP Forests started in 1986 with the first crown condition assessment. Table 2.1.a (Annex IV) shows that in about one-third of the European countries defoliation in 2001 was clearly higher than in 1990. In about half of the countries the defoliation in 2001 was approximately as high as in 1990. Defoliation was lower in 2001 than in 1990 in only one fifth of the countries. Overall and based on transnational surveys, the level of damaged and dead trees of all species was highest in 1994 (26.4%) and slightly decreased in the following years.

In Figure 2.2, trends of defoliation over time for the main European tree species indicate that for some, e.g. Maritime pine, there has been a progressive deterioration, mainly in the Atlantic south region. Common beech, European oak and Sessile oak show considerable annual fluctuations as a result of weather extremes, seeding years and insect attacks (UNECE/EC, 2002).

Figure 2.2: Development of mean defoliation for main tree species in Europe, calculated for continuously monitored trees. (Sample sizes vary between 1 215 trees for European and Sessile oak and 3 012 for Norway spruce). Source: UNECE/EC (2002).

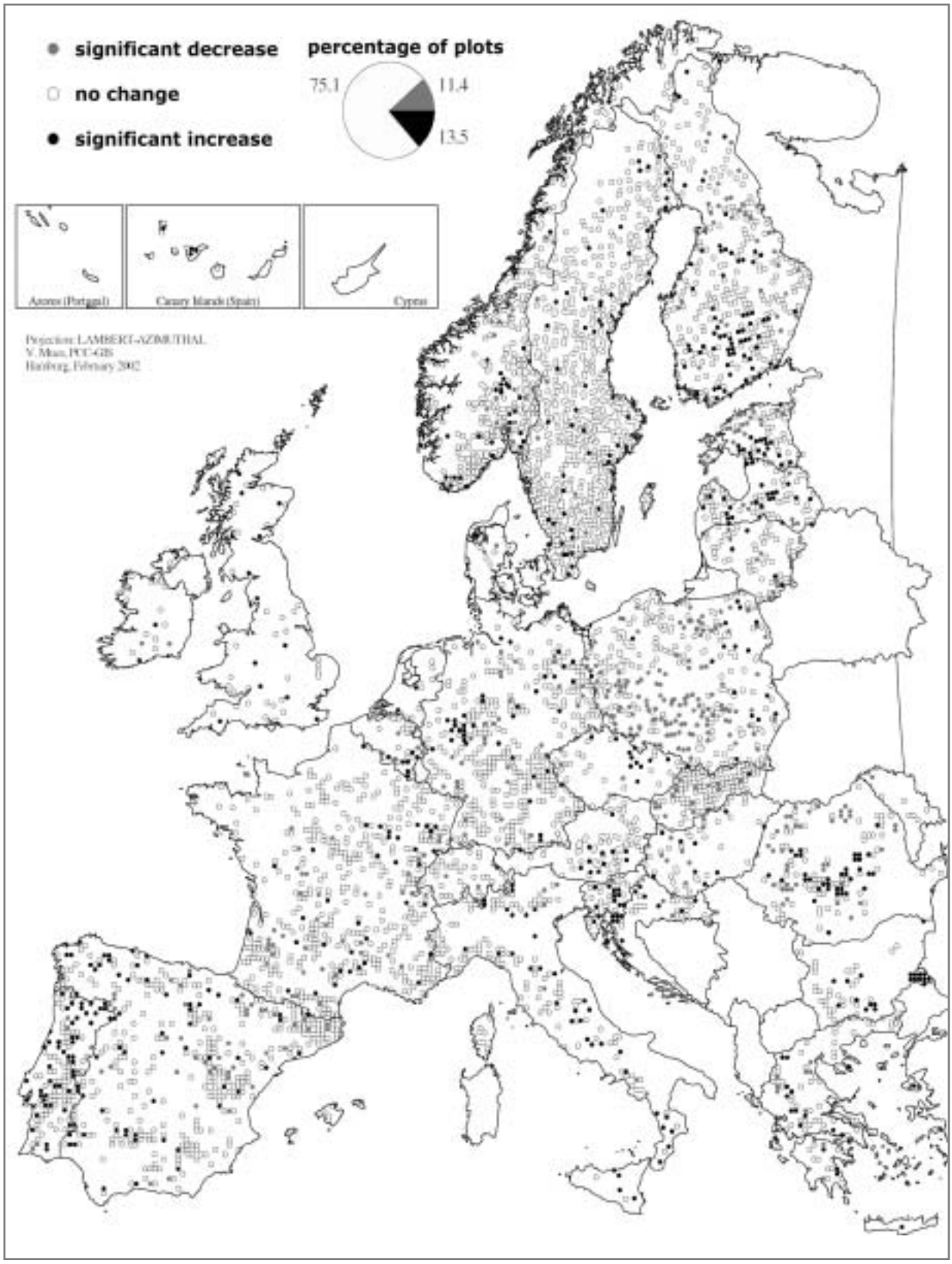


2.2.3 Crown condition depends on latitude, biotic and abiotic factors

The development of defoliation not only varies among tree species but also within different European regions. Figure 2.3 shows that in the past few years the number of plots with a significant increase (565) is slightly higher than the number of plots with a decrease in mean defoliation (500). For example, in southern Poland and in the Slovak Republic crown condition has improved. In Eastern Bulgaria and Southern Italy a noticeable deterioration has occurred.

Statistical analysis of UNECE/EC (2002) shows that climate, soil condition, atmospheric pollution and forest pathogens all have a synergistic effect on forest condition. The importance of each factor can vary, depending on climatic regions and species, and from year to year.

Figure 2.3: Development of defoliation for all tree species, 1994-2001. (Plot-wise linear trends were tested for significance. The evaluation period for France, Italy and Sweden is 1997-2001). Source: UNECE/EC (2002).



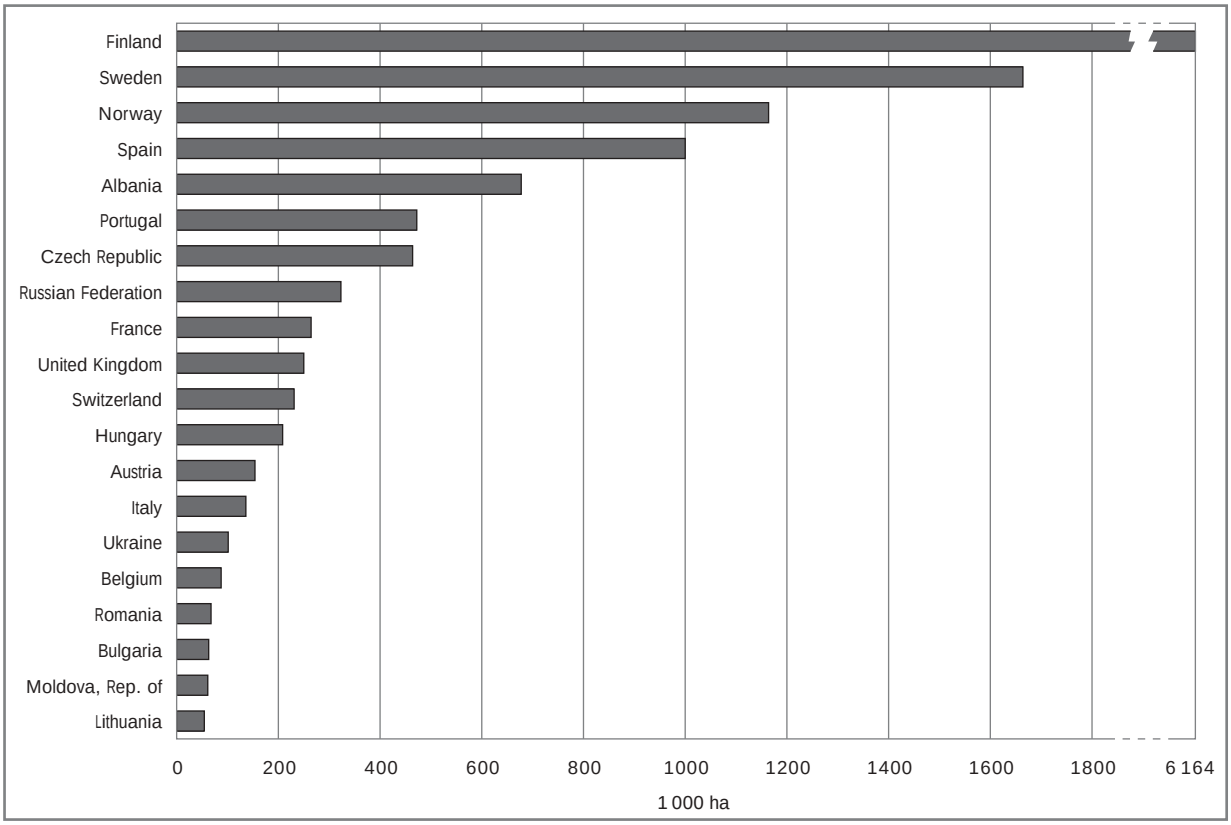
2.3 Forests in Europe are also affected by several damaging agents

Several damaging agents affect forests in Europe. Biotic damaging agents include, for instance, insects and diseases, wildlife and cattle grazing in forests. Abiotic damaging agents comprise fire, storm, wind, snow, drought, mudflow and avalanche. Direct human-induced damage factors include, for instance, harvesting damage.

2.3.1 One per cent of all forests in Europe are damaged

In total, nearly 10.8 million ha or 1% of forest and other wooded land were reported to be damaged by known causes. However, only some of the 36 reporting countries were able to provide updated information on damage in forest and other wooded land after the year 1999 (Annex IV, Table 2.2). According to Figure 2.4, it seems that most of the damage occurred in Northern Europe, but the data presented here do not yet include the recent storm damage in Central Europe, which could change the graph considerably. The storms in December 1999 caused the highest damage ever reported in Europe, amounting to nearly 200 million m^3 of merchantable timber. This is almost half of the annual wood production in Europe.

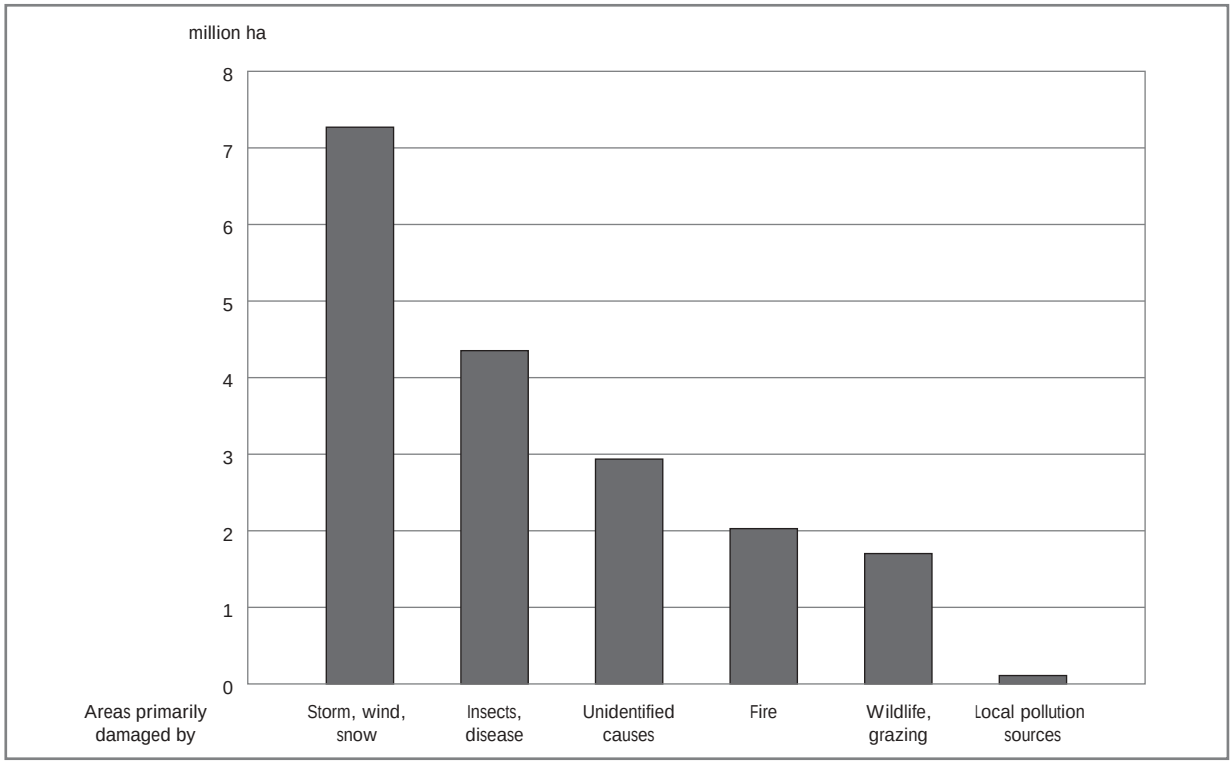
Figure 2.4: Countries with more than 50 000 ha total area of forest and other wooded land with damage by known and unidentified causes. Source: UNECE/FAO (2000) and updates.



2.3.2 Most important causes of damage are storms and insects

Forests are damaged by various damaging agents. Figure 2.5 shows the extent of damage to forest and other wooded land primarily damaged by six different agents (Annex IV, Table 2.2).

Figure 2.5: Area of damage to forest and other wooded land by different damaging agents. Source: UNECE/FAO (2000) and updates.



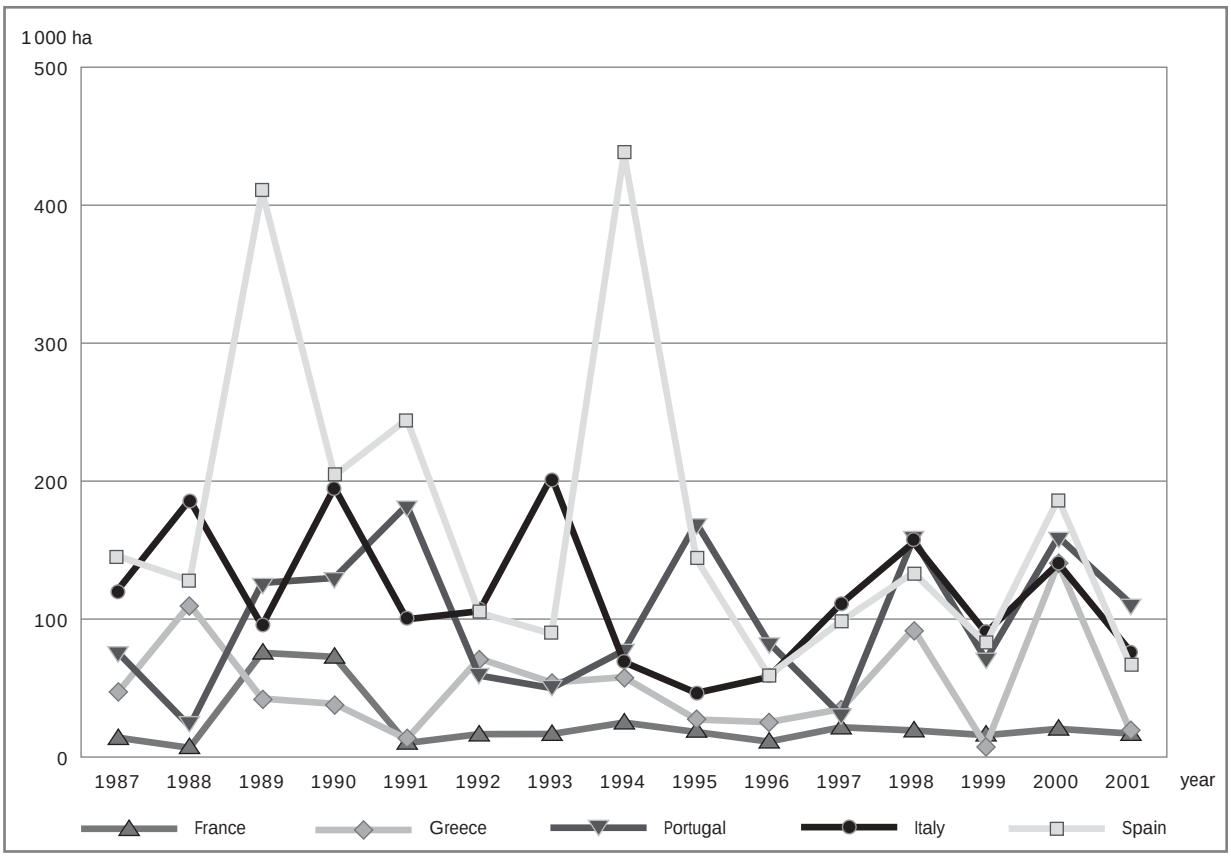
Even though not all affected countries reported so far on the 1999 storm event in Central Europe, storm, wind, snow or other identifiable abiotic actors represent the most important causes of damage in many countries. Over the past decades damage severity has increased with extensive storm events, for instance, in 1967, 1990 (cyclones 'Vivian' and 'Wiebke') and 1999 (cyclone 'Lothar').

Insects and diseases represent the second most important causes of damage. Insects and fungi play an important role, especially in the defoliation of oak species. Bark beetles cause the most important damage to conifers. In general, insect calamities are triggered by weather conditions, environmental factors and related population dynamics of insects.

Damage by unidentified causes was reported by 15 countries. Often the damage is caused by a number of factors resulting in defoliation. Assigning such damage to any one damaging agent is therefore not possible.

Fire is the most important damaging agent in the Mediterranean countries (Figure 2.6). However, the largest area damaged by forest fires was reported by the Russian Federation (Annex IV, Table 2.3). With the increase of forest fire prevention, most fires are controlled at an early stage and a small number of fires are responsible for more than half of the area burned. With the exception of France, the number of fires and the area damaged by forest fires fluctuated heavily from 1987 to 2001, depending on yearly weather conditions. The effect of preventive measures and improved management is difficult to detect within a decade.

Figure 2.6: Area of forest fires in the Mediterranean region. Source: UNECE/FAO (2000) and updates; UNECE (2002b).



Serious damage by wildlife and grazing occurred in Iceland (17%). Between 6% and 2% of forest and other wooded land are damaged by wildlife and grazing in Belgium, Liechtenstein, Poland, Norway, Austria, Sweden and the United Kingdom. This is due to many factors, including hunting practices and the absence of predators. Game populations are at the highest levels in several countries. As a consequence, extensive preventive measures have often to be taken for the protection of regeneration areas.

Known local pollution sources were identified as a direct cause of damage, for instance, in Albania, the Czech Republic, Romania and the Slovak Republic.

Human-induced damage is relatively minor in comparison with damage by other damaging agents. However, adequate data are not available in most countries.

In general, data quality on areas damaged by different damaging agents varies due to different assessment criteria. Previous evaluations of UNECE/EC (1997) show that different thresholds are applied, above which, for instance, insect attack is rated as damage.

2.4 Soil buffers are often depleted

Soil is essentially a non-renewable resource with potentially rapid degradation rates and extremely slow formation and regeneration processes. Where degradation of soil occurs, the overall potential to perform its functions is reduced.

In Europe's forests a broad range of different soil types occur depending, on latitude, altitude, climate, forest type and grade of decomposition. Threats and external influences may affect different soil types in different ways. The existing tendency to acidification and eutrophication of soils and the associated changes in foliar chemistry in many parts in Europe is a potential area of concern.

Several indices are needed to monitor the quality of soil. The base saturation indicates the reserves left in the soil to buffer against further additions of, for instance, acidifying substances. The C/N ration, the Cation Exchange Capacity (CEC) as well as the pH and organic carbon are important key indicators to describe soil acidity and eutrophication.

Data related to soil condition are costly to collect and cannot yet be compiled during the forest resource assessment process. Some relevant information was, however, given by UNECE/EC (2001). According to this source, results show that depleted soil buffers and changes in physical and chemical soil properties originate, at least in part, from atmospheric deposition. It has been detected that acidification, which comprises low pH, low concentrations of calcium and/or manganese, low base saturation and high concentrations of aluminium, coincided with high defoliation values in fir, Scots pine and partly also in common beech. Soil acidity also has a negative influence on ground vegetation diversity in forests. Soil moisture deficit (drought) has been found to have a negative influence on crown condition, especially in firs and common beech and to a lesser extent in Scots pine.

CRITERION 3: PRODUCTIVE FUNCTIONS OF FORESTS

3.1 Considerably more increment than fellings in Europe

The balance of annual increment and annual felling highlights the sustainability of timber production over time. It also indicates the current and future availability of timber. For long-term sustainability annual felling must not exceed the annual increment.

3.1.1 Increment is at highest level since the beginning of international data collection

The annual increment on forest and other wooded land amounts to 2 287 million m^3. Of this, 98% occurs on forest land, the remainder on other wooded land and trees outside forests (Annex IV, Table 3.1.a). The highest absolute increment can be found in the Russian Federation. The increment per hectare decreases towards Northern and Southern Europe because of more unfavourable climatic conditions. Compared with former assessments of UNECE/FAO, the absolute increment as well as the increment per hectare is steadily increasing due to improved growth conditions.

3.1.2 Fellings are lower than increment

In Europe, the total annual fellings are 627 million m^3. The country with the largest quantity of annual fellings is the Russian Federation (130 million m^3), followed by Sweden (73 million m^3), Finland (68 million m^3) and France (65 million m^3).

Figures 3.1 and 3.2 show the level of harvest compared with the annual increment. The low levels of utilisation of some countries might be a consequence of management objectives like biodiversity conservation or recreation areas as well as ownership structures; i.e. in general, small private holdings are not intensively managed. The data on annual increment refer to the total forest and other wooded land area, whereas data on felling relate only to the forest area available for wood supply, which in some countries may be considerably smaller. Therefore, not all annual increment is available for fellings. It should also be kept in mind that the current increment depends on the age structure of a forest. In countries where young age classes predominate (e.g. in Iceland) or in countries where the share of older age classes increases due to other than production services of forests, a simple comparison between annual increment and felling may lead to misleading judgements about sustainability.

Figure 3.1: Annual fellings and annual increment in European countries where data were available. Source: UNECE/FAO (2000) and updates.

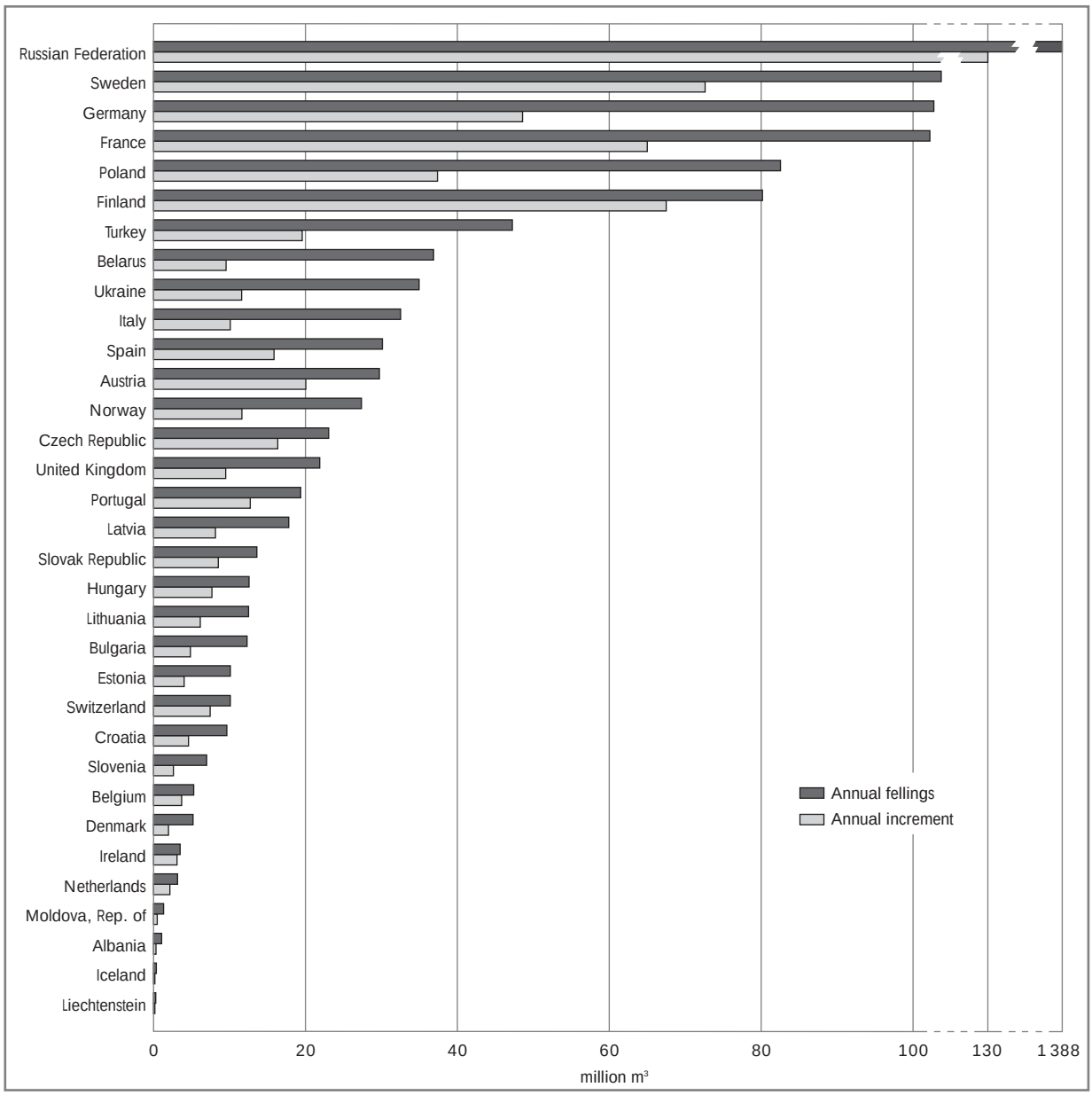
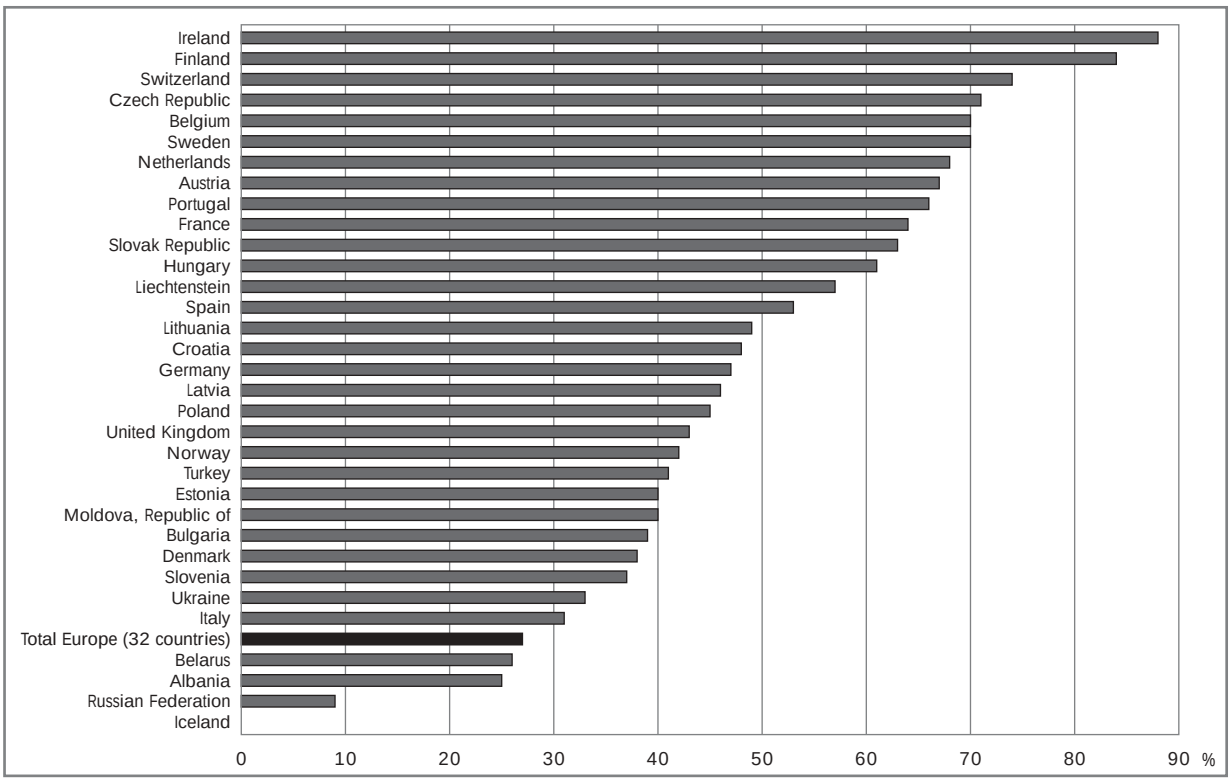


Figure 3.2: Utilisation rate (annual felling expressed as a percentage of the annual increment) in European countries where data were available. Source: UNECE/FAO (2000) and updates.



In Europe, excluding the Russian Federation, annual felling amounts to 55% of the annual increment. In the whole of Europe, the utilisation rate is only 27% (Figure 3.2). Most countries lie above this average. The Russian Federation, which contributes 61% of Europe's annual increment, accounts for only 21% of Europe's fellings (Annex IV, Table 3.1.a). The ratio of annual felling to annual increment in the Russian Federation is not even 10%. The main causes of this contrast between growth and harvest might still be economic, social and infrastructure related issues.

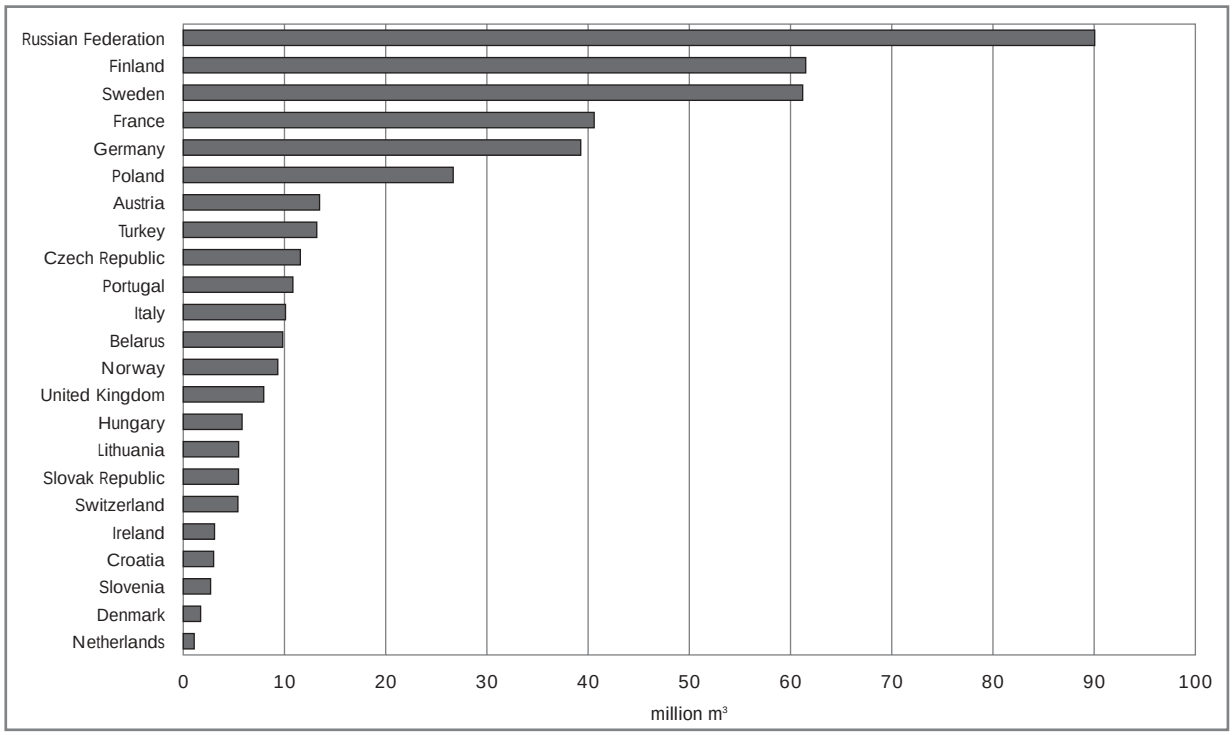
Compared with former forest resource assessments, both increment and felling show a gradually increasing trend for most countries (UNECE, 2002a). The increasing fellings in most countries might be a result of the increasing forest area and increasing annual increment. However, it is noticeable that the time series do not show an explicit and continuous upward trend. In some countries the level of felling in 2002 is lower than reported in 2000 for UNECE/FAO (2000) (Annex IV, Table 3.1.b). One explanation could be that the level of felling is not just driven by supply factors, but also by markets and other factors such as storms.

3.1.3 Total wood produced in Europe amounts to nearly half a billion m^3

Countries with active afforestation programmes or increasing plantations, which include Ireland and the United Kingdom, expect increasing supply in the future. Increases in growing stock are expected to increase wood supply also in Finland and Poland. However, measures such as the increased protection of undisturbed forests and the conservation of rare biotopes may influence the level of wood supply. Some of the European countries in transition mentioned that much of the merchantable wood in the country cannot be harvested for economic or protection reasons (FAO, 2003).

The total wood produced in Europe comprises logs, fuelwood and pulpwood and adds up to 444 million m^3. (Annex IV, Table 3.2). This is 13% of the world total (FAO, 2002). The Russian Federation is the country with the highest production (90 million m^3), followed by Finland (62 million m^3) and Sweden (61 million m^3) (Figure 3.3).

Figure 3.3: Total wood produced in countries with a production of more than 1 million m^3. Source: UNECE/FAO (2000) and updates.



Compared with the data provided in TBFRA 2000 (UNECE/FAO, 2000), the amount of wood produced clearly increased in the past few years in Finland, Portugal and Poland, and slightly increased in Hungary, Ireland, Slovenia and Sweden. The total wood produced decreased in Albania, Austria, Belgium, Cyprus, Denmark, Lithuania, the Russian Federation and Turkey. The total value of wood produced in Europe is 14,885 million € (Annex IV, Table 3.2).

3.2 A high percentage of forests are under management plans

The existence of forest management plans or management guidelines indicates an approach towards pre-set goals and their targeted implementation. In general, plans or guidelines contribute to sustainable forest management but cannot guarantee it. Sustainable forest management can also be carried out without a written management plan or guideline.

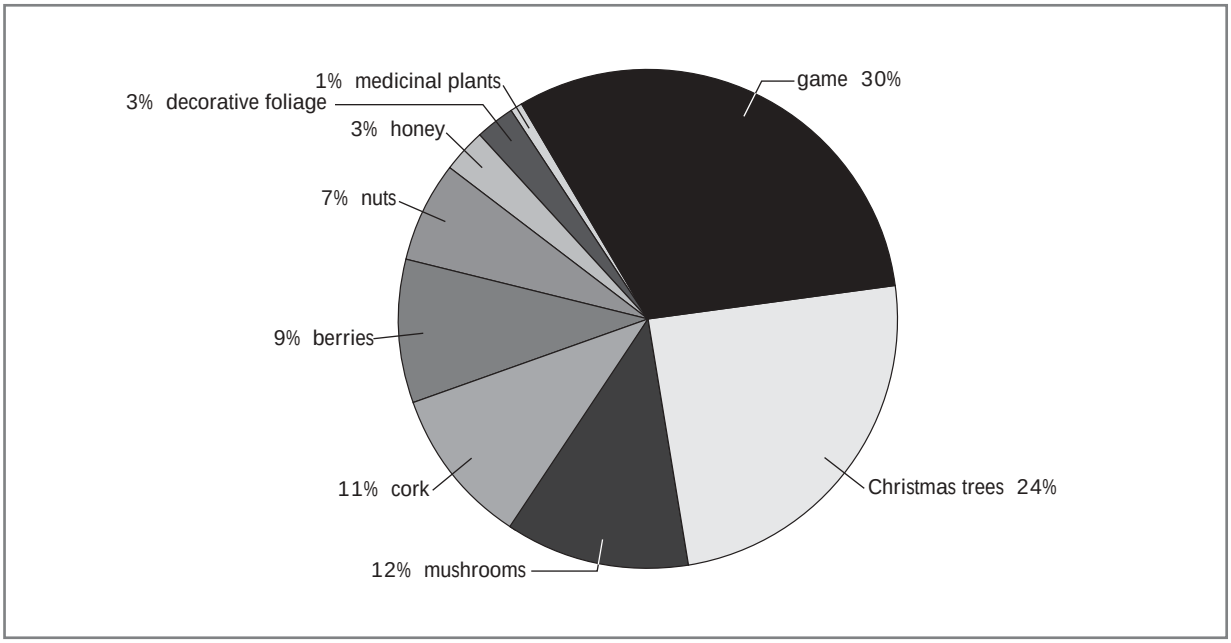
The past forest resource assessment asked for information on the existence of management plans or guidelines. It showed that in Europe as a whole the forest and other wooded land in public and private ownership under management plans and guidelines is more than 80% (Annex IV, Table 3.3). However, the existence of management plans and guidelines does not give information about their quality or their implementation.

3.3 Non-wood forest products are economically important

Forests provide a variety of products other than wood. Non-wood forest products (NWFPs) are, for instance, Christmas trees, cork, mushrooms, berries, medicinal plants, decorative foliage, game meat, pelts, honey, nuts, barks for tannin extraction, birch sap, seeds, resin and tar (Figure 3.4). Non-wood forest products often have an important economic value. However, the income of e.g. berry picking does not necessarily go to the forest owner.

Data on the quantity and value of marketed non-wood forest products were provided by 27 countries, despite the fact that comprehensive data are limited in most countries (Annex IV, Table 3.4). At best, some countries collect data on the most important products or have data on commercial production or exports. Personal use often accounts for the largest share of use. Non-wood forest products are not seen as economically important in many countries, and due to the difficulties and costs of collecting accurate data, many countries do not collect and report data on non-wood forest products. At the same time, it can be seen from the values of non-wood forest products that they can be an important source of income, especially in rural areas. Even where data were available for production, the estimates are seldom based on recurring inventories.

Figure 3.4: Non-wood forest products from forest and other wooded land in Europe. Share of total value in 27 countries. Source: UNECE/FAO (2000) and updates.



3.3.1 Game and Christmas trees are the non-wood forest products with the highest value

Game comprises all hunted birds and mammals, such as partridge, pheasant, hare, deer, wild pigs or chamois. Data on game meat and its value were reported by 21 countries. In some countries the commercial sale of game meat is an important economic activity.

Sixteen mainly Northern and Eastern European countries reported data on Christmas tree production and its value. Christmas tree production includes mainly fir, spruce or pine trees from Christmas tree plantations as well as the harvest of individual trees from other forest areas. In many countries Christmas tree plantations

are not included as part of the forest area but are classified as agricultural land. The information on Christmas trees in Table 3.4 (Annex IV) relates only to Christmas trees from forest and other wooded land.

3.3.2 Mushrooms, berries and other non-wood forest products are also an important source of income for some countries

Mushrooms and truffles were reported by eighteen countries. This category covers a wide variety of species. The most often named mushrooms are chanterelles, boletus, matsutake, and morels. Quantitative estimates for fruits and berries were mentioned by 17 countries. Species like bilberry, lingonberry, cranberry, blueberries, ashberries, juniper berries and strawberries were specified.

Few countries noted a decline in traditional collection of mushrooms and berries. Some countries indicated stable or increasing demand, particularly close to urban areas. Harvest of mushrooms and berries appears to be dominated by personal use. In some European countries its collection is often common for subsistence purposes. Commercial demand appears to be increasing throughout Europe. Supplies well in excess of current demand were reported especially by Northern and Eastern European countries (UNECE/FAO, 2000).

The below-mentioned non-wood forest products are important in only a few countries (see also Annex IV, Table 3.4).

Data on cork production were reported by four countries. Cork oaks for professional cork production grow only in the Mediterranean region. Portugal is the main producer.

Data on production and value of nuts are available for nine countries. Various species of nuts like chestnuts, acorns, hazelnuts, and pinions (pine nuts) are harvested from forest and other wooded land for domestic use, production of tannins or export. Most often the stands are originally managed only for wood production, and the various nuts are a side product. Exceptions are stands of stone pine for pinions in Portugal and hazelnuts in Turkey.

Honey production was mentioned by 11 countries. Some of them reported that the full potential of honey from forest and other wooded land is not being exploited.

Data on decorative foliage were provided by seven countries. The data include information on decorative evergreen branches and boughs, willows, mosses, lichens, leaves, flowers and pine cones used primarily in the floral industry. Ornamental branches are usually taken during thinning operations and during intermediate and final cutting. According to UNECE/FAO (2000) the supply is expected to increase in the future as more wood is produced on special plantations.

Data on medicinal plants were reported by nine countries. Collecting medicinal plants for traditional remedies remains an important use in some regions. Collection for personal use appears to be the dominant use of these plants, but commercial exploitation is growing in response to growing markets.

3.4 Marketed forest services gain importance

Marketed services have gained importance in recent years. They include, for instance, hunting licences, fishing licences, private contracts for conservation, managed outdoor recreation areas or trails for mountain biking, horse riding, skiing and other recreational activities. These marketed services may contribute directly to the income of forest owners and thus contribute to the economic viability of sustainable forest management.

Data on marketed services were not collected during the forest resource assessment process and, with the exception of hunting licences, are not available. Several countries have data on hunting, a traditional service and one of the most important. According to UNECE/FAO (2000), trends vary in hunting across countries: Austria, Croatia, Lithuania, and Portugal reported an increasing amount and value of hunting. Part of the increased demand in Lithuania is from foreign hunters, most often from Central Europe. Stable demand was reported in Finland. The amount and value of hunting were reported as declining in the Netherlands as a result of anti-hunting sentiment. Some reasons for declining hunting participation include an increasingly urban population and time constraints.

Hunting licences can be a source of significant income to private and public landowners. For instance, forest owners in Denmark earned 22 million € in 1996, in Hungary 18 million €. Some countries also provided information on the rates for hunting leases, e.g. the Netherlands, which charged 11-19 €/ha/yr, Germany 5-31 €/ha/yr and Finland 0.19-0.39 €/ha/yr (UNECE/FAO, 2000). The rates vary considerably across Europe and depend also on the location and attractiveness of the hunting ground.

CRITERION 4: BIOLOGICAL DIVERSITY IN FOREST ECOSYSTEMS

4.1 Most forests in Europe are semi-natural

The degree of naturalness of forest ecosystems shows the intensity of human intervention. Different levels of utilisation intensity are characterised not only by changing structures but also by different species communities and thus influence the biological diversity of an area.

In general, forests are only moderately disturbed compared with other land-use patterns such as agricultural land. The degrees of naturalness are described in this report by the categories 'forest area undisturbed by man', 'semi-natural forests' and 'plantations'. Forests undisturbed by man are forests where processes, composition of species and structure remain natural or have been restored. Plantations usually represent ecosystems on their own, with artificial dynamics establishing species communities distinct from the original ecosystem. Semi-natural forests are neither undisturbed by man nor plantations and display certain characteristics of the natural ecosystem.

4.1.1 More than two-thirds of all forests in Europe are semi-natural

Most forests in Europe (70%) are classified as 'semi-natural' (Annex IV, Table 4.1). Due to the above definition, semi-natural forests include a broad range of ecosystems showing different levels of naturalness and biodiversity. They have in common that their ecological dynamics are influenced by human interventions but keep their natural characteristics to a certain extent.

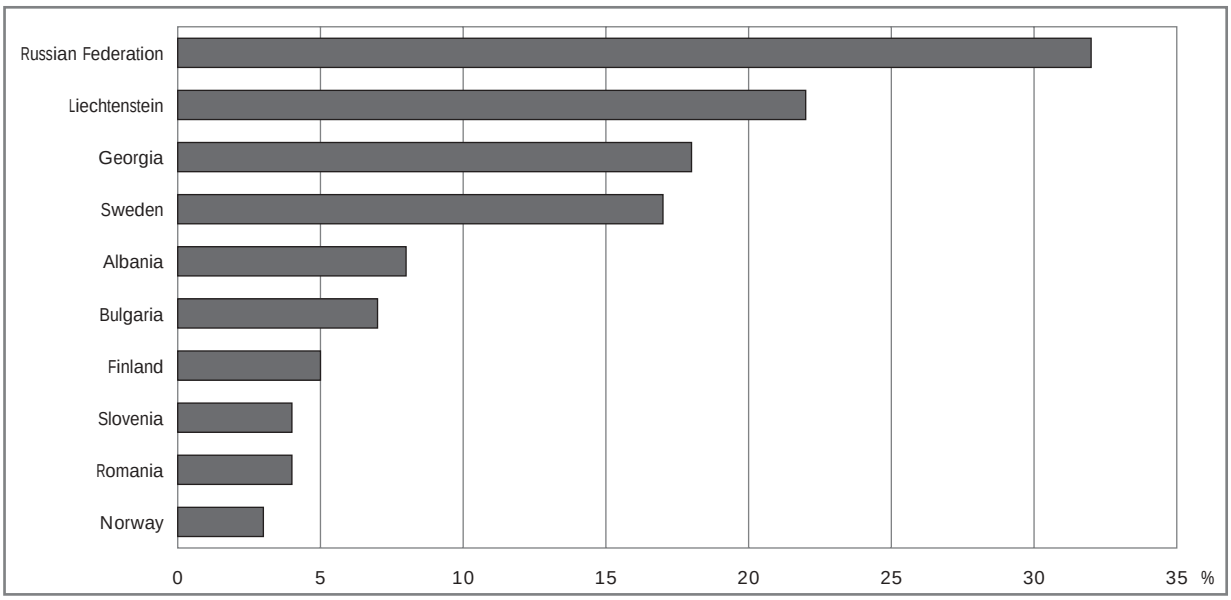
Other wooded land is most often also characterised as 'semi-natural' (Annex IV, Table 4.1). Only in Sweden and in the Russian Federation sizeable shares of other wooded land are classified as 'undisturbed by man'.

4.1.2 Large forest areas in Eastern and Northern Europe are undisturbed by man

Forests undisturbed by man have a high conservation value, especially also for understanding ecological principles, and for reference when setting up management priorities, plans and models for silvicultural planning. In Europe the share of forests undisturbed by man is 27%.

The Russian Federation has with 32% by far the highest share of forests undisturbed by man (Figure 4.1). Nonetheless, more than 8 million ha or of 1% forests defined as undisturbed by man exist in Europe, not including the Russian Federation. More than half of this area is in Sweden, and most of the remaining areas are in Norway and Finland. In addition, Georgia, Bulgaria, Romania, Liechtenstein, Albania and Slovenia also have larger areas of forests undisturbed by man (Annex IV, Table 4.1). In most other European countries the share of forests undisturbed by man ranges from zero to less than one per cent. In general, forests undisturbed by man seem to be located mostly in remote or inaccessible areas or areas where extreme climatic or topographic conditions prevail.

Figure 4.1: Countries with the highest share of forest area undisturbed by man of the total forest area. Source: UNECE/FAO (2000) and updates.



4.1.3 Plantations cover only a small area in Europe

Only 3% of the forest area in Europe are plantations. Nevertheless, Ireland and Malta indicated that all their forests are plantations. Plantations also dominate in Denmark and the United Kingdom. More than one-fourth of the forest area are plantations in Belgium, Bulgaria, Iceland, the Netherlands, Portugal and Ukraine (Annex IV, Table 4.1). However, these relatively high numbers might be a result of different interpretation of the definitions.

4.2 Tree species composition differs all over throughout Europe

Species diversity and dynamics of forest ecosystems differ throughout Europe and also depend considerably on the composition of tree species. Multi-species forest and other wooded land are usually richer in biodiversity than mono-species forest and other wooded land. However, it has to be considered that some natural forest ecosystems have only one or two tree species, e.g. natural sub-alpine spruce stands.

4.2.1 Tree diversity is higher in Southern and Eastern Europe

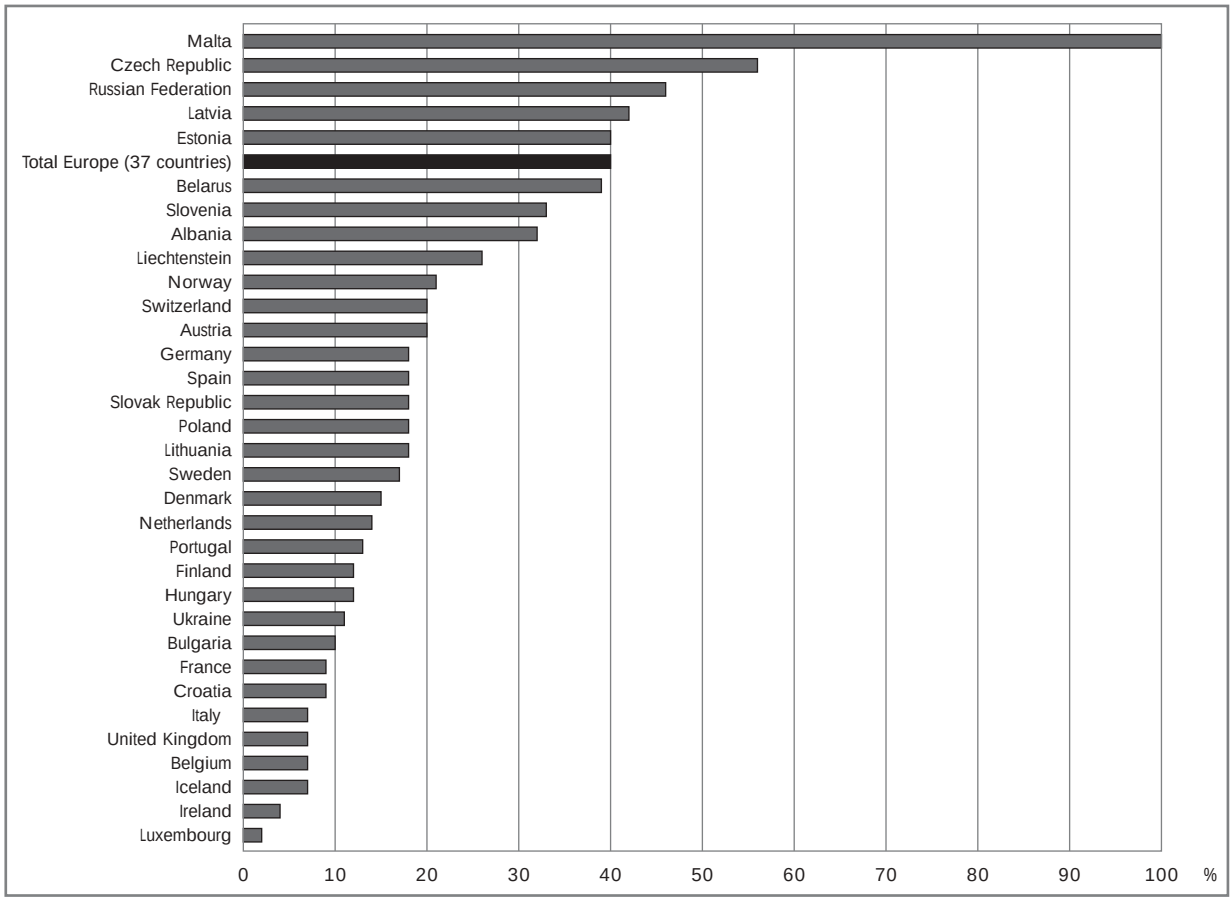
Most forest-occurring tree species are found in the Czech Republic (277), followed by Bulgaria (210); the fewest occur in Malta (2). In general, fewer tree species grow in Northern European forest ecosystems, and tree diversity increases towards Southern and Eastern Europe (Annex IV, Table 4.2). It has to be taken into account that data collection methods vary considerably in the countries. Therefore, the comparability of the data is limited.

The categories for forest types used for this report are ‘broadleaved forests’, ‘coniferous forests’ as well as ‘mixed’ broadleaved and coniferous forests.

4.2.2 In Europe almost half of the forest area is covered by mixed forests

The total share of 42% coniferous forests in Europe is mainly located in the Scandinavian countries. In addition, Austria, Germany, Poland and Turkey have a high share of coniferous forests. Of the European forests 18% are broadleaved. Broadleaved forests predominate in the countries of the Balkan region, in France, Hungary, Italy, Moldova, Portugal and Romania. Mixed forests occur on 40% of the total forest area in Europe. However, they predominate only in the forests of the Czech Republic and Malta (Annex IV, Table 1.3 and 4.4). Figure 4.2 shows that in five countries the percentage of mixed forests is larger than the European share of 40% of the total forest area.

Figure 4.2: Share of mixed forest of the total forest area in European countries where data were available. Source: UNECE/FAO (2000) and updates.



The variety and distribution of forest types have changed in some countries during the last decade. Table 1.2.b (Annex IV) shows that for the Nordic countries, such as Sweden and Finland, the relative share of coniferous forests has been reduced, and that the share of mixed and broadleaved forests increased. In Ireland the share of mixed forest areas has increased in the last years by 180%. In Denmark the coniferous forest area has increased nearly 60% in the past few years, most probably due to the conversion of agricultural and other wooded land into forest area. Significant changes were noticed in the Russian Federation: according to national reporting, about 90 million ha less coniferous forests were assessed in 1998 compared to the 1993 assessment (Annex IV, Table 1.3).

4.3 Some forest species are still threatened

The most recognisable form of depletion of biodiversity lies in the loss of plant and animal species. Slowing down the rate of species extinction due to anthropogenic factors is a key objective of the conservation of biodiversity. Many threatened species are limited in their geographical distribution to single countries. Therefore, this information is of high importance for the implementation of sustainable forest management at the national level.

The enquiry for this report requested data for the total of forest-occurring tree and vascular plant species that are endangered (Annex IV, Table 4.2). As most of the data in Table 4.2 (Annex IV) were not updated in comparison with the data published in the TBFRA 2000 report (UNECE/FAO, 2000), trends concerning the amount of endangered species could not be analysed.

The accuracy of the provided information depends on the quality and coverage of data as well as on the way in which risk is assessed. While some European countries have detailed inventories of forest species as well as threatened species data (Red Lists), other countries provided only very fragmentary information.

4.3.1 More than a quarter of forest-occurring plant species are endangered in some European countries

In the majority of European countries there are fewer than 150 different forest-occurring tree species. Most forest-occurring tree species are endangered in the Netherlands (27) and in Albania (21) (Annex IV, Table 4.2).

The total number of forest-occurring vascular plant species, including tree species and herbal plants, ranges from six in Malta to 1500 in Cyprus and the Slovak Republic. Central and Eastern European countries, in particular, reported a high share of endangered vascular plant species occurring in forests. The largest numbers are found in the Slovak Republic (360), Austria (271) and Ukraine (200). More than one-fourth of the total number of forest-occurring vascular plant species are endangered in Belgium, Estonia, Sweden, Switzerland and Ukraine. Malta does not have any and Iceland only one endangered forest-occurring vascular plant species (Annex IV, Table 4.2).

4.3.2 Large forest animals are more endangered than smaller ones

Data concerning forest-occurring animal species were not updated during the last forest resource assessment. However, there is some information from other sources.

According to TBFRA 2000 (UNECE/FAO, 2000), there seems to be a tendency that larger animals, particularly mammals and birds, are proportionally more endangered than the smaller animals in Europe. According to UNEP (1999), 50 mammal species are endangered in Western European and 35 in Eastern European forests. In individual countries the results vary.

The largest numbers of endangered forest-occurring bird species (more than 20 endangered species) are reported in TBFRA 2000 (UNECE/FAO, 2000) for Sweden, the Baltic countries and some countries in Central and Eastern Europe. These results should be interpreted very carefully, as it seems that the figures contain only bird species breeding in the country.

4.4 Genetic resources

Genetic diversity is the ultimate source of biodiversity at all levels. Genetic resources of species should be conserved for the future, both to secure the width of genetic pools and to allow use of best origins. A loss of variation may have negative consequences for fitness and production and may prevent adaptive change in populations in response to climate change.

Data related to the genetic resources in Europe were not yet collected during the forest resource assessment process. Information on the area managed for ex situ gene conservation was provided by the International Plant Genetic Resources Institute (IPGRI). Ex situ conservation is the conservation of genetic resources outside their site of natural occurrence, for instance in tree nurseries. Adequate data on the area managed for in situ gene conservation and the area managed for seed production are so far not available.

Based on information from 28 countries 47,443 ha are dedicated to the ex situ conservation of genetic resources in Europe (Annex IV, Table 4.3). The largest areas managed for ex situ gene conservation are in France (16,115 ha), followed by the Russian Federation (7659 ha) and Norway (6310). This partly reflects the higher share of the regeneration type planting or seeding in these countries (cf. Annex IV, Table 4.5).

4.5 Two-thirds of Europe's forests are regenerated naturally

Natural regeneration contributes to conserving the diversity of the genotype and to maintaining the natural species composition, structure and ecological dynamics. However, natural regeneration may not always be adequate to achieve biodiversity conservation goals.

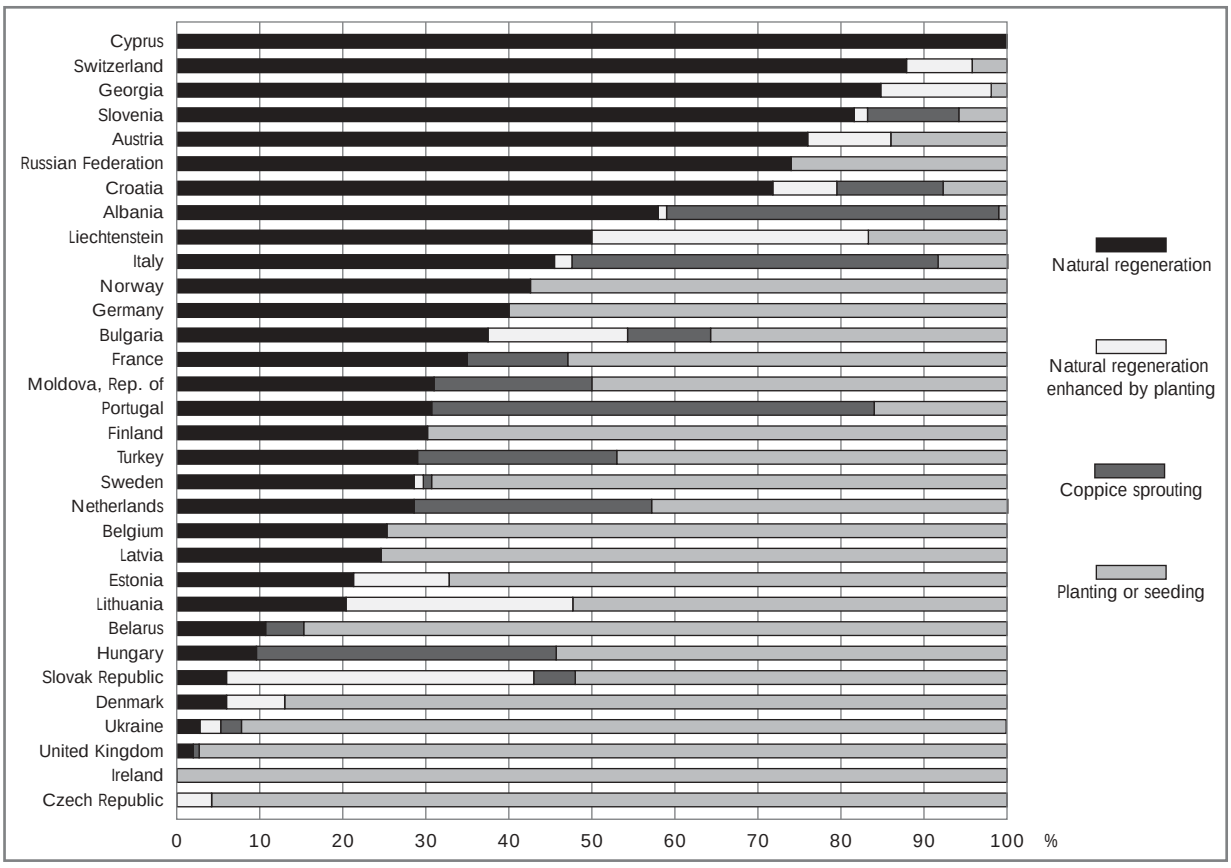
According to Table 4.5 (Annex IV), the type of regeneration varies considerably in Europe[7]. Two-thirds of the forests are regenerated naturally; 0.5% are regenerated naturally enhanced by planting. Coppice sprouting is applied in 1.4% of the forests; planting and seeding predominate on about one-third of the regeneration area.

Forests are mainly regenerated naturally in Austria, Croatia, Cyprus, Georgia, Slovenia and Switzerland (see also Figure 4.3). The area regenerated naturally in the Russian Federation is significantly higher than in all other European countries. However, also more than one-fourth of the forest area is regenerated by planting or seeding in the Russian Federation.

The share of naturally regenerated forest areas and the share of afforestation by planting or seeding are almost equal in Bulgaria, Germany and Norway. Planting or seeding predominates especially in Belarus, the Czech Republic, Denmark, Ireland, Poland, Ukraine and the United Kingdom. Coppice sprouting is of importance mainly in Southern and South-eastern European countries such as Albania, Italy, Portugal and France.

[7] The figures refer to the percentage of the area regenerated in the reference year in the countries. The area of regeneration under continuous forest cover management is not included.

Figure 4.3: Regeneration by different regeneration types in European countries where data were available. Source: UNECE/FAO (2000) and updates.



In most European countries, forest cover is currently expanding (cf. Annex IV, Table 1.2.a). The type of expansion differs from one country to another and can vary from the establishment of plantations of introduced species to natural recolonisation of abandoned agricultural land (UNECE/FAO, 2000).

4.5.1 Introduced tree species are used in some afforestation

Non-indigenous tree species have been introduced for various reasons such as forestry or gardening. Introduced tree species make a significant contribution to wood supply in some countries, however, their ecological characteristics, e.g. competitiveness, may change the dynamics of forest ecosystems and may influence sites, species composition, structure and functional diversity. Some introduced species have become invasive.

Introduced tree species are often used in Europe to transform former agricultural land into forests (UNECE, 2001). There are no reliable data, however, about the extent to which introduced species are used in replacing forests of native species nor of the extent of the current area of stands and of other wooded land dominated by introduced tree species, and about which are invasive. In total, around 200 000 ha of forest and other wooded land are planted annually with introduced species in Europe. This corresponds roughly to 20% of the total area afforested. Introduced species play a role in afforestation in the United Kingdom, Ireland, Hungary and Sweden. Other countries where at least 20% of forests are planted annually using introduced species are Belgium, Denmark, France, Iceland, Moldova and Portugal (UNECE/FAO, 2000). So far, data on invasive tree species, according to the CBD definition, are not available on a European scale.

4.6 Deadwood

Deadwood in the form of dead standing trees and dead lying trees is a habitat for a wide array of organisms, and after humification it constitutes an important component of forest soil. Many species are dependent, during some part of their life cycle, upon moribund or dead standing and fallen trees or upon wood-inhabiting fungi or other species. Because of lack of deadwood, many of the dependent species are endangered.

Adequate data were not yet collected during the forest resource assessment process. However, some relevant information was given by UNECE/FAO (2000): The volume of standing deadwood in forest available for wood supply amounts to 2 556 million m^3, of which 85% can be found in forests of the Russian Federation. In forest not available for wood supply the volume of standing deadwood totals 1 051 million m^3, 92% of it in the Russian Federation. There are also large amounts of standing deadwood in the Scandinavian countries.

Harmonised data on the volume of lying and standing deadwood is so far not yet available in most European countries, but due to the ecological importance of deadwood, it is expected that appropriate data will be collected soon.

4.7 More than one-tenth of the forest area is protected in Europe

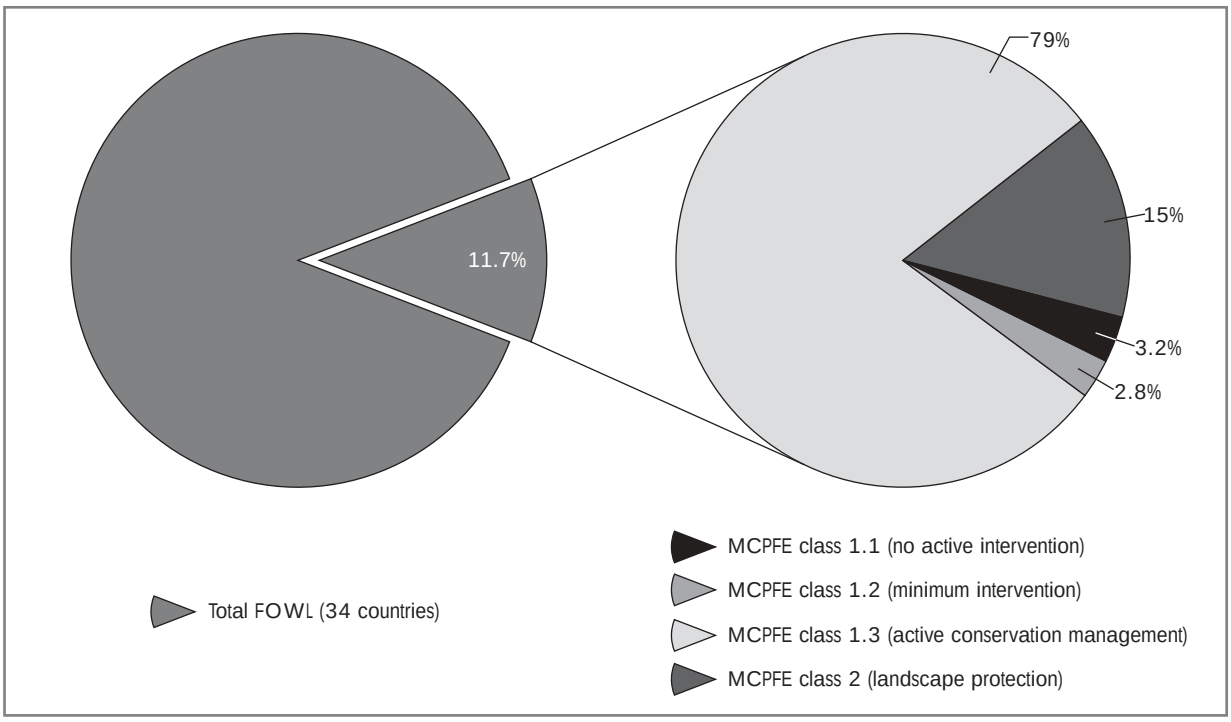
Protected areas per se focus on the conservation of biological diversity and the maintenance of natural ecological processes. Protected areas are included as a main pillar in nature conservation laws in all European countries and represent one of the oldest instruments for protecting nature and natural resources.

In 2002 new Assessment Guidelines for Protected and Protective Forest and Other Wooded Land in Europe were elaborated and adopted by the MCPFE (MCPFE 2002a). These Assessment Guidelines are the basis for this analysis. So far, 34 European countries have provided data according to the detailed guidelines. Some countries provided data on forest but not on other wooded land, while in other cases it was only possible to get information on the sum of forest and other wooded land.

Based on information from 34 countries, 126.6 million ha or 11.7% of the total forest and other wooded land in these countries has the management objective to conserve biodiversity or to protect the landscape and natural monuments (Annex IV, Table 4.6; Figures 4.4 and 4.5).

Of these 11.7% protected forests, 3.2% are areas with no active intervention (MCPFE class 1.1), 2.8% are areas with minimum intervention (MCPFE class1.2), 79% are areas with active conservation management (MCPFE class 1.3), and 15% are landscape protection areas (MCPFE class 2).

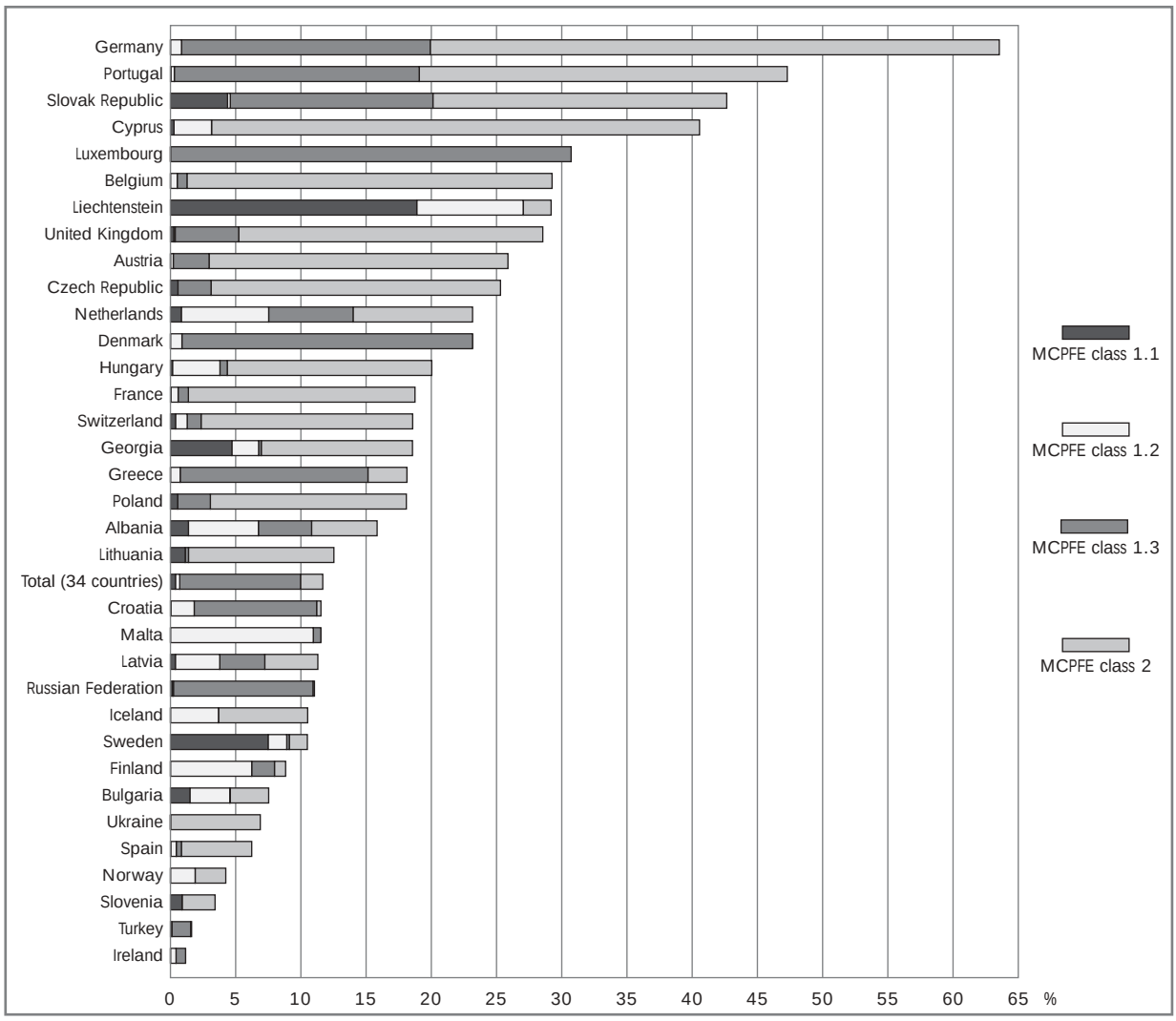
Figure 4.4: Total forest and other wooded land (FOWL) area and share of MCPFE classes 1.1-1.3 and 2 in 34 European countries. Source: MCPFE (2000 and 2002b).



The absolute majority of protected forest and other wooded land, under MCPFE class 1.1-1.3 and 2, can be found in the Russian Federation (97 million ha), accounting for 11% of the forest and other wooded land area in the country. More than one-fourth of the forest and other wooded land is protected in Austria (26%), the United Kingdom (29%), Liechtenstein (29%), Belgium (29%), Luxembourg (31%), Cyprus (41%), the Slovak Republic (43%), Portugal (47%)[8] and Germany (64%)[9] (see Figure 4.5). The size of the protected forest areas varies considerably: The largest single reserves of up to 70 000 ha are located in Finland and Sweden, and the smallest ones may cover only 0.5 ha.

[8/9] This figure includes all Natura 2000 areas according to the Council Directive 92/43/EEC under MCPFE class 1.3.

Figure 4.5: Share of protected forest and other wooded land in 34 European countries. Source: MCPFE (2000 and 2002b).



Note: Ukraine has provided data only on MCPFE class 2; information on MCPFE classes 1.1 to 1.3 is not available. In Germany and Portugal, all Natura 2000 areas are under MCPFE class 1.3.

4.7.1 Large areas with little human intervention exist in Eastern and Northern Europe

On 4.2 million ha or 3.2% of protected forest and other wooded , no active human intervention is taking place according to MCPFE class 1.1 (see Figure 4.4). Protected forest and other wooded land where the management includes only very few direct interventions, such as the control of insect outbreaks or fire interventions, cover 3.6 million ha (2.8%) (MCPFE class 1.2). Countries in Eastern Europe, in particular, have a larger proportion of forests under MCPFE classes 1.1 and 1.2 than Western European countries. Most of the Western European countries have less than 1% of the forest area under strict protection regimes with little human interventions. Liechtenstein, Malta, the Netherlands, Finland, Sweden and Norway are exceptions to this pattern. Especially in the Nordic countries, forest protection has targeted the preservation of old forest remnants.

4.7.2 Most protected forests are actively managed for the conservation of biodiversity

The conservation of biodiversity through active management is the main objective for most of the protected forest areas in Europe. On 100 million ha, which is 79% of the protected forest area, specific interventions to achieve the conservation goal are taking place as defined in MCPFE class 1.3 (see Figure 4.4). More than one-tenth of the forest area is actively managed for the conservation of biodiversity in the Russian Federation, the Slovak Republic, Portugal, Germany, Denmark, Greece and Luxembourg (Figure 4.5).

4.7.3 Landscape protection prevails mainly in some Central and Western European countries

The protection of landscapes and specific natural elements is the main management objective on 18.5 million ha of forest and other wooded land (MCPFE class 2). This is 15% of the protected forest area (see Figure 4.4). Especially in Central and Western European countries such as the Slovak Republic, Czech Republic, Austria, Germany, United Kingdom, Belgium and also in Portugal, large areas of protected forests are mainly designated to achieve landscape diversity and to protect specific natural elements in cultural landscapes (Figure 4.5).

Albania, Bulgaria, Croatia, Finland, Portugal, the Russian Federation, Spain, Sweden and Turkey provided separate data on other protected wooded land. In these countries a total of 1.9 million ha of other wooded land is protected according to MCPFE classes 1.1-1.3 and 2.

CRITERION 5: PROTECTIVE FUNCTIONS IN FOREST MANAGEMENT

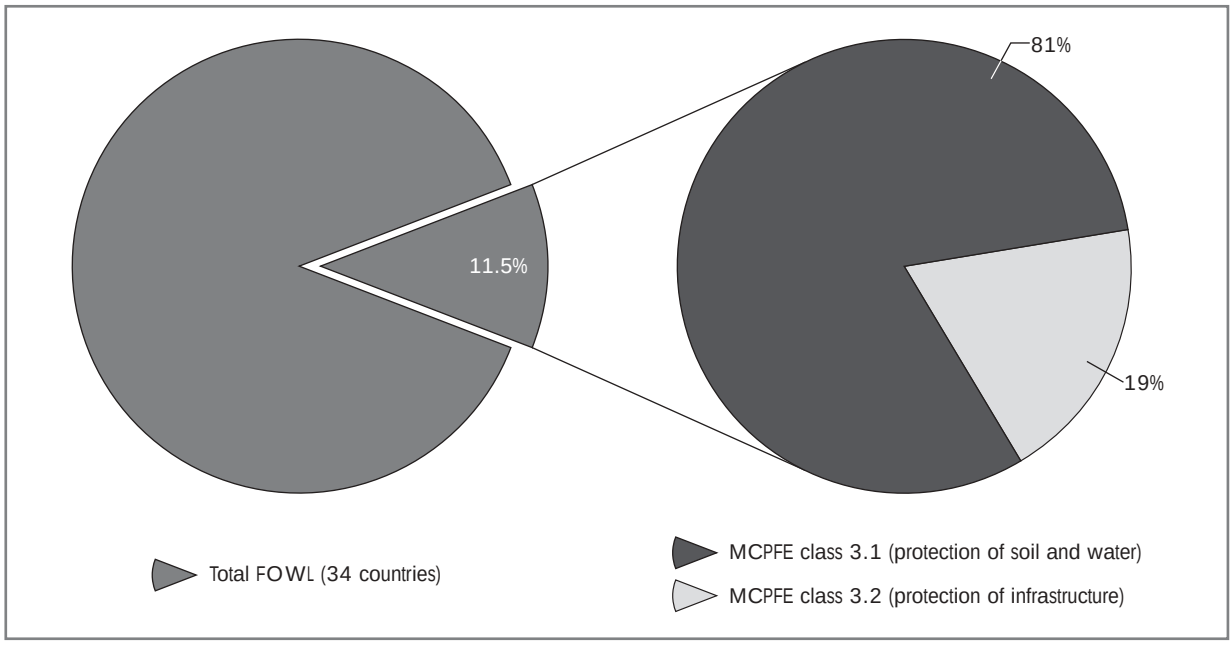
5.1 Protective forests play important roles in Europe

Forests play important roles in the protection of soil or the surface under the forest cover, for instance, for protection against erosion. Forests are also essential for the maintenance of water resources and of water cycles such as the protection of water reservoirs or filtering of water, modification of water cycle and run-off. In addition, protective forests guarantee other important ecosystem functions, like the maintenance of clean air, stabilisation of local climate, securing the timber line in alpine and polar areas, etc. Forests also fulfil important protective functions for infrastructure (e.g. roads, settlements against avalanches), managed natural resources (e.g. vineyards, orchards, meadows) and directly for the protection of humans.

Information on forest and other wooded land where protective functions are the primary management objective is more sparse than on those designated as protected forests. This is mainly based on the fact that an official designation 'protective forest area' does not exist in all countries, and the information itself is less available.

A total of 124 million ha or 11.5% of forest and other wooded land is designated to protect soil, water, ecosystem functions (MCPFE class 3.1) and infrastructure and managed natural resources (MCPFE class 3.2), based on the information of 34 countries (Annex IV, Table 5.1).

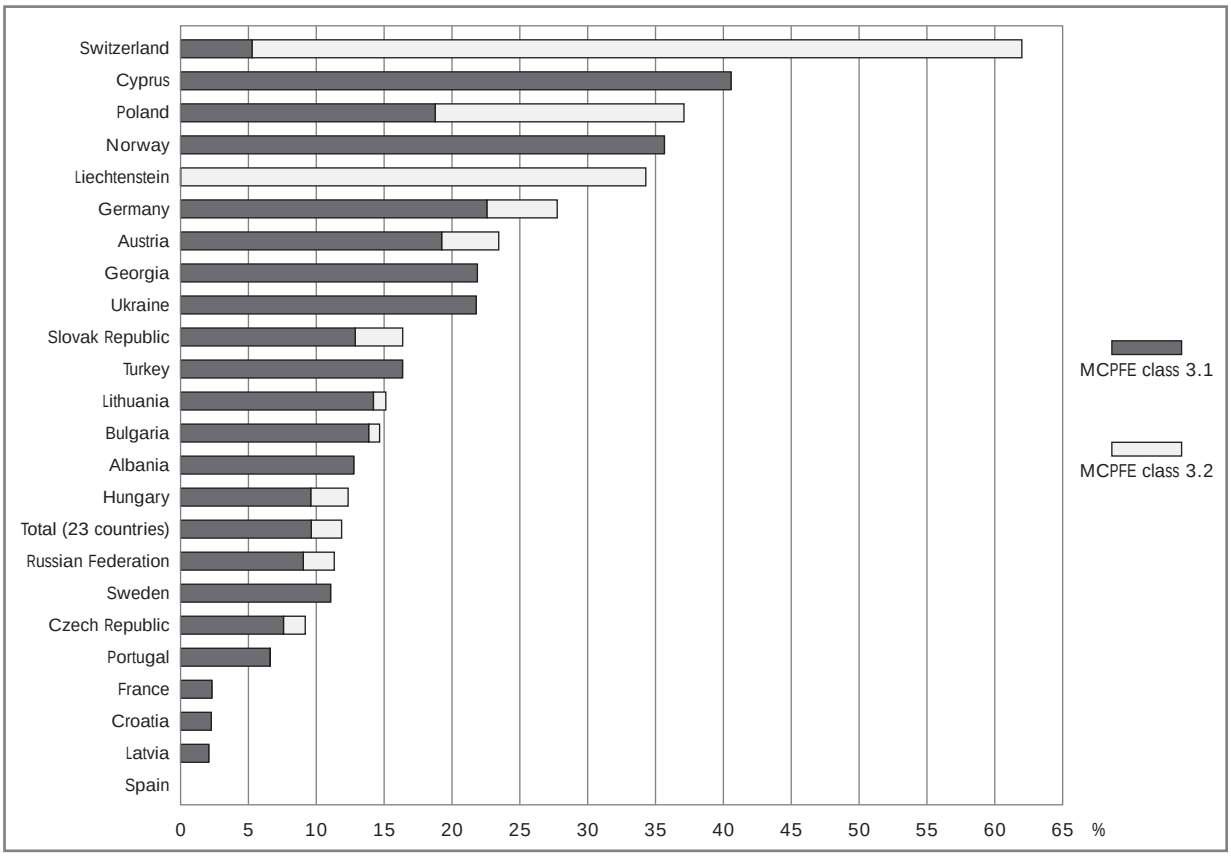
Figure 5.1: Total forest and other wooded land (FOWL) area and share of MCPFE classes 3.1 and 3.2 in 34 European countries. Source: MCPFE (2000 and 2002b).



On 81% of the protective areas the management is directed to protect soil, water or other ecosystem functions. On 19% the management is directed to protect infrastructure and managed natural resources against natural hazards (Figure 5.1).

Sometimes the specific protective function may not be accurately defined in the description of national regimes, thus there may be a risk of wrong assignment of the respective areas under MCPFE class 3.1 and 3.2. Of course, some of these areas also contribute to the protection of biodiversity, and some areas managed for the conservation of biodiversity also have significant protective functions.

Figure 5.2: Share of protective forest and other wooded land in 23 European countries. Source: MCPFE (2000 and 2002b).



5.1.1 Protection of soil, water and other ecosystem functions is crucial

The management of about 101 million ha or 9.3% of forest and other wooded land is directed to protect soil and its properties, water quality and quantity or other forest ecosystem functions (MCPFE class 3.1) based on information of 33 European countries. However, 11 of these countries reported to have no corresponding protective areas. Cyprus, Norway, Georgia, Ukraine, Austria and Poland have a high proportion of forest and other wooded land where the protection of soil, water and other ecosystem functions is the primary management objective (Annex IV, Table 5.1; Figure 5.2).

5.1.2 Infrastructure and managed natural resources are protected in specific areas

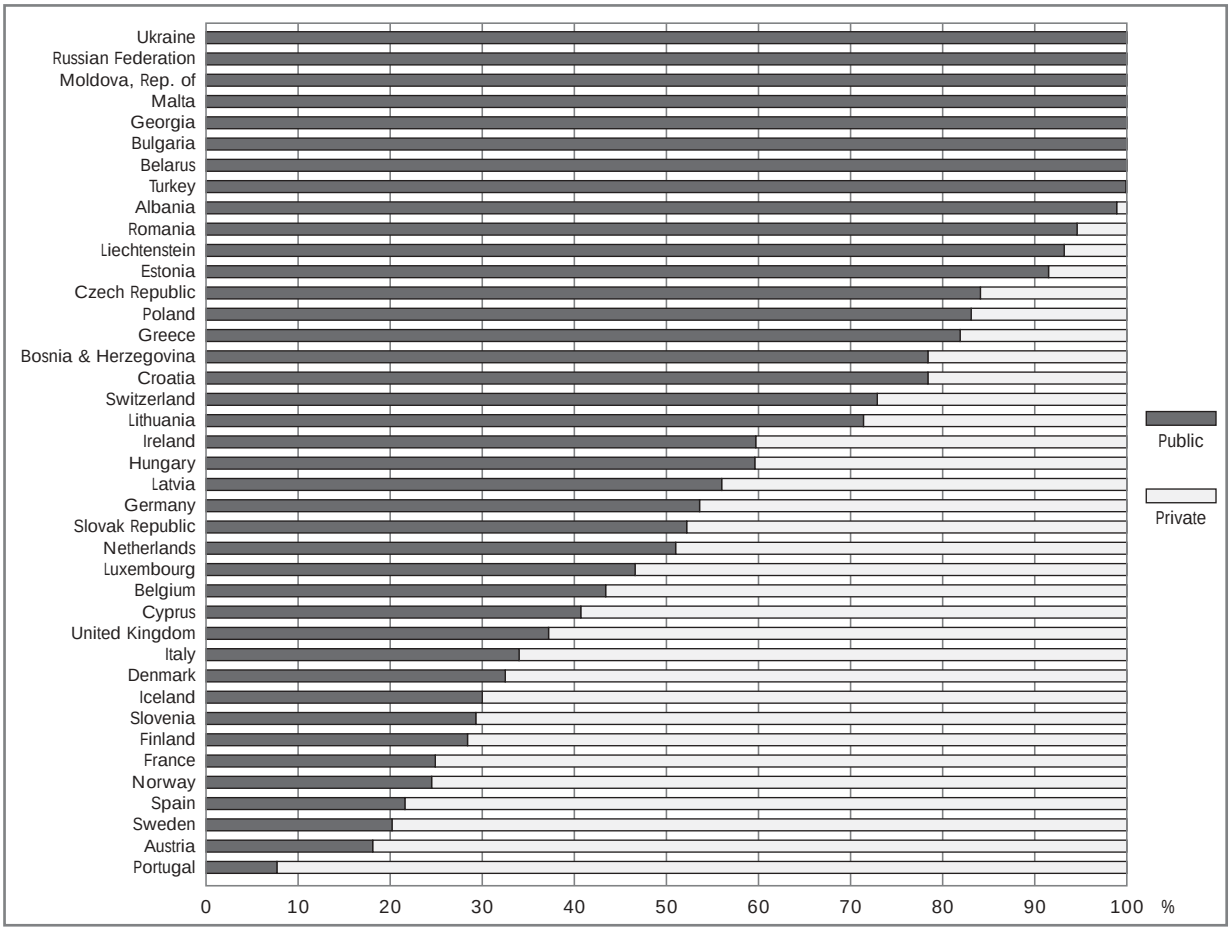
The management of 23 million ha or 2.2% of forest and other wooded land is directed to protect infrastructure and managed natural resources against natural hazards (MCPFE class 3.2) based on the information of 34 European countries. Of these, 22 countries reported that they have no such designations (Annex IV, Table 5.1). In addition to Austria, Liechtenstein, Portugal and Switzerland this protection class can be found only in a number of Eastern European countries (see Figure 5.2). In countries with steep slopes, mountainous terrain and risk of avalanches it is quite obvious that protection of, for instance, roads and settlements plays an important role in the management of forests. The proportion of forests belonging to this class is especially high in Liechtenstein and Switzerland (34% and 57%, respectively). In Eastern Europe the types of regimes assigned to MCPFE class 3.2 are more diverse.

CRITERION 6: OTHER SOCIO-ECONOMIC FUNCTIONS AND CONDITIONS

6.1 Most forests in Europe are in public hands but there are 100 times more private than public forest owners

In Europe, excluding the Russian Federation, about half of the forest and other wooded land is in public (51%) and half in private ownership (49%). Including the Russian Federation, 91% of the forest and other wooded land is in public and only 9% in private ownership. In most of the Central and Eastern European countries the restitution or privatisation process is still ongoing. In Lithuania, for instance, the private forest and other wooded land area increased in recent years by 65% and comprises now about one-third of the forest area (Annex IV, Table 1.4.b). In Ukraine, the Russian Federation, Moldova, Malta, Georgia, Belarus and Bulgaria all areas of forest and other wooded land are in public ownership (Figure 6.1). The highest share of privately owned forest and other wooded land occurs in Portugal (92%), followed by Austria (82%), Sweden (80%) and Spain (78%) (Annex IV, Table 1.4.a).

Figure 6.1: Share of publicly and privately owned forest and other wooded land in Europe. Source: UNECE/FAO (2000) and updates.



According to Table 1.4.a (Annex IV) there are more than 90 000 holdings of forest and other wooded land in public ownership and 8.9 million in private ownership. However, there are no separate data available for the 170 548 Austrian holdings and no data at all for some South-eastern European countries. The Confederation of European Forest Owners (CEPF) refers, for instance, to estimates of up to 15 million private forest owners in Europe.

Compared with former forest resource assessments, the number of holdings decreased. It seems probable that, next to closure of unprofitable holdings and their purchase by other holdings, some countries may have excluded holdings of less than a certain minimum size from the present assessment. This could make a difference of several million in the total number of holdings in Europe. In the near future an increase in the number of private holdings is expected in several Eastern European countries due to the continuing restitution or privatisation process.

The average size of public holdings is about 11 000 ha. Excluding the Russian Federation, the average size is only 1 300 ha. Private holdings have an average size of 13 ha. However, there is considerable variation among countries in the average size of holdings. The vast majority of private owners have holdings of less than 3 ha.

6.2 The contribution of the forest sector to national GDP is considerable in several countries

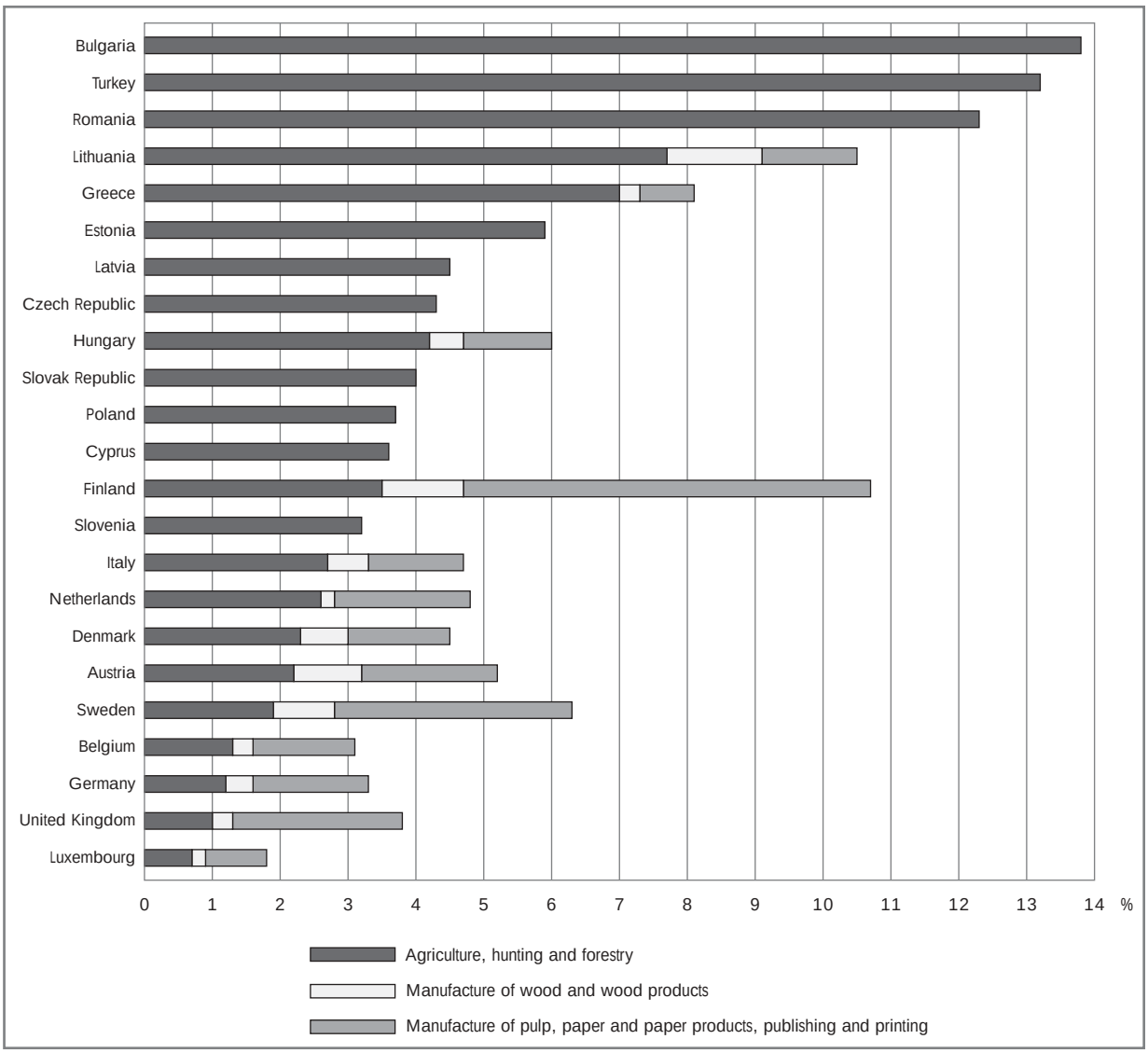
The contribution of forestry and manufacturing of wood and paper products, i.e. the forest sector, to gross domestic product (GDP) indicates its macro-economic importance. It can also indicate the role of the forest sector in rural development.

Data on the contribution of various sectors to the gross domestic product have been collected for decades for nearly all European countries. The European Statistical Office (Eurostat) collects data on GDP by branch of activity, but there are usually no separate data for 'forestry, logging and related services', which belong to the wider class 'agriculture, hunting and forestry'. Data for these forestry activities are only available for seven European countries (Annex IV, Table 6.1). For all other countries the share of forestry activities may vary considerably due to the relative importance of forestry and agriculture in the respective country.

The share of total gross value added at basic prices for the year 2000 is provided for 23 countries (Annex IV, Table 6.2). In Bulgaria, Romania and Turkey the share of the agriculture, hunting and forestry sector (ISIC/NACE 02) is higher than 10%. In all three countries, agriculture plays a mayor role.

The share of the manufacturing sectors 'wood and wood products' (ISIC/NACE 20) and 'pulp, paper and paper products, publishing and printing' (ISIC/NACE 21) is above average, especially in Finland and Sweden (see Figure 6.2).

Figure 6.2: Share of total gross value added (at basic prices) for the year 2000 for European countries where data were available. Source: Eurostat database (2003).

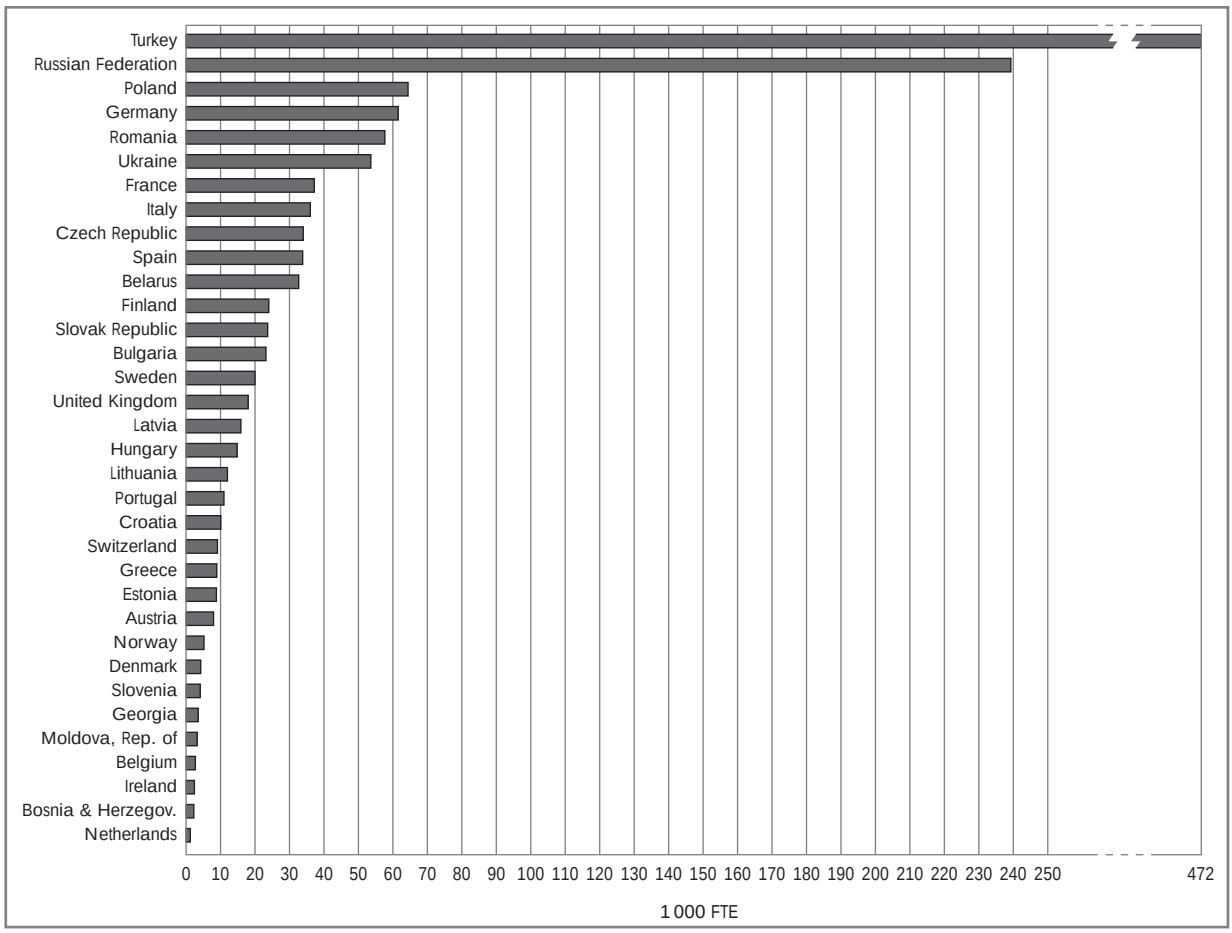


6.3 The forest sector workforce is decreasing

Employment provided by forestry is an important contribution to the socio-economic benefits generated by forests, especially for sustainable rural development. At the same time, an adequate workforce in terms of numbers and qualifications is a critical component to sustainable forest management. Data related to forest sector workforce can be found in a European Forest Sector Outlook Study (UNECE/FAO, 2002), which provides data on full-time equivalents (FTE) employed in the forest sector.

In Europe's forestry (ISIC/NACE 02.0), total employment is 1.36 million persons (FTE) (Annex IV, Table 6.3). Turkey has the highest number of employees (472 408 FTE), followed by the Russian Federation (239 300 FTE), Poland (64 400 FTE) and Germany (61 520 FTE) (see Figure 6.3). In general, employment in the forest sector has been decreasing in many European countries over the last decade, inter alia, due to rapid increases in mechanisation.

Figure 6.3: Employment in forestry in European countries where data were available. Source: UNECE/FAO (2002).



Between 1990 and 2000 the workforce was reduced by more than half in Bosnia & Herzegovina (-91%), the Netherlands (-73%), Georgia (-70%), Poland (-59%) and Germany (-57%). The average change in workforce is -22% in Europe. Only in four countries has the workforce increased during the last decade, that is, in Spain (+28%), Ukraine, (+26%), Latvia (+6%) and in the Russian Federation (+1%) (Annex IV, Table 6.3).

Employment in forestry per 1 000 ha forest area shows that the highest concentration of employees can be found in South-eastern and Eastern European countries, i.e. Turkey (47 FTE/1 000 ha), the Czech Republic (13 FTE/1 000 ha), the Slovak Republic (12 FTE/1 000 ha), Moldova (10 FTE/1 000 ha) and Romania (9 FTE/1 000 ha). In Norway and Sweden less than one person is employed per 1 000 ha forest area. This is a reflection of the high level of mechanisation and good working conditions in the lowland forests. In Switzerland, with its majority of steep mountain forests, about 8 persons are employed per 1 000 ha forest area (Annex IV, Table 6.3).

Qualification requirements for the remaining workforce increased due to the use of advanced equipment and machines. Particularly for work in the forest, many countries have an ageing workforce that is poorly qualified and have difficulties recruiting new qualified personnel (ILO/GTZ, 2000).

Employment in the wood industry also decreased in Europe over the last decade by 16%. Very high decreases occurred particularly in Albania (-98%), Moldova (-87%), and Bosnia & Herzegovina (-86%). By contrast, particularly high increases in employment were noted in Lithuania (75%), Ireland (74%), Estonia (61%) and Latvia (60%), which is an indication of the expanding forest industry in those countries. Employment in the pulp and

paper industry decreased in Europe over the last decade by 8%. Decreases above 50% during the last decade can be found in Albania (-99%), Bosnia & Herzegovina (-76%) and Latvia (-64%). Employment in the pulp and paper industry increased in Greece (751%), Ireland (22%) and Spain (18%) (Annex IV, Table 6.3).

6.3.1 Occupational safety and health is insufficient in many countries

Safety and health are a major concern in forestry, as forestry work continues to be one of the most dangerous of all economic activities in most European countries and is also beset by a large number of health hazards (ILO, 1998). The prevention of occupational accidents and occupational diseases of the forestry workforce is an important social aspect of sustainable forest management.

Data related to occupational safety and health were not yet collected during the forest resource assessment process. Information provided by the International Labour Organization (ILO) claims that satisfactory safety and health levels are not being achieved in most European countries. Groups with above-average accident rates are contractors, the self-employed and forest farmers (ILO, 2000). Occupational diseases in forestry comprise diseases contracted as a result of an exposure to risk factors arising from work activity. Data on these diseases are not yet collected in most countries. Therefore, no comparable data are available so far. Training is regarded as one of the most effective measures for preventing accidents and health problems in forestry.

6.4 Free public access to forests is available in most European countries

Access to forests enables people to benefit from the recreational value of forests, which contributes to quality of life. Ownership patterns and property rights affect public access to forest and other wooded land. The regulation of access is often being understood and implemented in different ways across Europe.

Thirty-eight countries provided data on the area of forest and other wooded land where access to public is legally allowed (Annex IV, Table 6.4). In general, the public has free access to 94% of the total forest and other wooded land in Europe.

6.4.1 Public forest land is generally freely accessible

Thirty-seven countries reported that the public has access to 976 million ha, that is 98% of the forest and other wooded land in public ownership in Europe, for the purposes of recreation and gathering of forest products for personal use.

Some types of public land restrictions occur in all countries, but these normally only affect a small percentage of public lands. The most common restrictions were related to protection of scientific reserves, ecologically sensitive areas, wildlife reserves, water catchment areas, military lands, health and safety concerns as well as to areas under specific management regimes like forest regeneration areas, experimental plots and stands for seed supply. Access limitations may also exist for the collection of forest products, such as mushrooms and berries. In addition, there are also some access restrictions to prevent conflict between uses. For example, access to timber harvest areas is often not allowed for public safety purposes. Some types of recreation use are confined to specific routes to avoid resource damage. These access regulations are often seasonal or temporary to adapt to changing resource conditions and shifts in harvesting activity.

The principles of public access often vary by the type of public ownership. Forest and other wooded lands

in the European countries of the Commonwealth of Independent States (CIS) and Malta are unique in that all forest and other wooded land is owned by the central government (Annex IV, Table 1.4). Other countries have a mix of public ownership, including national and sub-national units such as states, provinces, cantons, counties and local municipalities.

6.4.2 Access to private forests is widespread but not universal

Twenty-four countries indicated that the public has access to 75 million ha, that is, 85% of the forest and other wooded land in private ownership in Europe (Annex IV, Table 6.4).

European countries have different private land access policies. The majority of countries that have private forest land have a policy of open public access for recreation and gathering of forest products for personal use. In these countries there is little difference between access to public and private lands, although the rights of landowners to restrict access varies. In most countries access can be limited for health and safety reasons and during hunting seasons. Several countries, including Denmark and Estonia, allow access to private lands only during the daylight hours. In some cases, use is restricted to paths and roads or traditional routes of access. In a few countries the public is not allowed to collect logging waste, branches or the cones of wind-thrown trees without landowner permission.

In Austria, Denmark, Finland, Greece, Iceland, Lithuania and the Slovak Republic access is free on 94.5 to 99.7%, in the Netherlands on 79% of the privately owned forest area. France reported that the total forest and other wooded land in private ownership is not open to public access. In this context, it should be remembered that 'right of access' is not the same as 'effective access'. In some privately owned forests the public can and does access the land with no objection from the owner, although it has no legal right to do so. On the other hand, in some other countries there are privately owned forests with public access which are hardly ever visited (e.g. in remote boreal areas). Access regulations protect the interests of the owners of the land. Access policies will remain an important factor in addressing an increasing demand for many non-wood forest products.

The restitution process in several Eastern European countries has affected and is still shifting the distribution of land between public and private owners but does not seem to have had major impacts on access. An increased use of legal protection for ecologically sensitive sites has also affected access. Overall, access policies to forest and other wooded land have remained fairly stable (UNECE/FAO, 2000).

6.4.3 Cultural sites gain importance

Forests have many cultural and spiritual values for societies and individuals, notably for historical, aesthetic and religious reasons. Although frequently intangible, these values are often manifested in particular sites which are increasingly being identified, listed and protected. Examples of such sites are, for instance, cultural landscapes, historical sites and monuments related to forests, giant or unusual trees, sites for special ceremonies or customs, etc.

According to UNECE/FAO (2000), most countries reported that the demand for the protection of cultural values is increasing, at least partly in response to increased public knowledge and appreciation of the role which forests play in maintaining or enhancing such values. A number of countries have special legislation or other types of programmes to protect cultural values. Sites within forests designated as having cultural or spiritual values can be found, for instance, in the Czech Republic, Estonia, Finland, Ireland, Norway, Poland, Portugal, Slovenia, Sweden, the Russian Federation, Turkey and the United Kingdom.

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Abbreviations

..	Data not available
0	Data nil or less than half a unit
C	Carbon
CBD	Convention on Biological Diversity
CEC	Cation Exchange Capacity
CIS	Commonwealth of Independent States
CO_2	Carbon dioxide
EC	European Commission
EU	European Union
FAO	Food and Agricultural Organisation of the United Nations
FOWL	Forest and other wooded land
FRA	Forest Resource Assessment
FTE	Full time equivalent
GCC	General Co-ordinating Committee of the MCPFE
GDP	Gross Domestic Product
ha	Hectares
ICP Forests	International Co-operative Programme on Assessment and Monitoring of Air PollutionEffects on Forests
ILO	International Labour Organization
IPCC	Intergovernmental Panel on Climate Change
IPGRI	International Plant Genetic Resources Institute
ISIC	International standard industrial classification of all economic activities
IUCN	The World Conservation Union
MCPFE	Ministerial Conference on the Protection of Forests in Europe
NACE	Nomenclature générale des activités écono-miques dans les communautés Européennes (General industrial classification of economic activities within the European communities)
NFI	National forest inventory
NWFP	Non-wood forest product
OWL	Other wooded land
Pcs	Pieces
pH	Logarithmic measure of hydrogen ion concentration
PPP	Purchasing Power Parity
SFM	Sustainable Forest Management
TBFRA	Temperate and Boreal Forest Resources Assessment
Tg	Tera gram (Tg = 10^{12} g)
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
yr	Year

Annexes

ANNEX I: Material and Methods

The latest international forest resource assessment (FRA) datasets (UNECE/FAO, 2000, FAO, 2001) were used as a background for this report. The UNECE/FAO (2000) forest resources data were mainly based on the countries' information related to the mid-1990s. By now some countries have implemented new rounds of forest inventories or provided fresh accounting of their forest resources. Therefore, there was a need to update the UNECE/FAO (2000) statistics, so that they could be more relevant to early 2003.

The variables that apply to criteria and indicators for sustainable forest management were extracted mainly from the regional forest resource assessment (TBFRA 2000), and also some data are taken from the global forest resource assessment (FRA 2000). It was not possible to repeat the whole forest resource assessment process and to cover all the variables that were assessed some years ago because of the time limits. Also some European countries have not implemented a national assessment after the 2002 forest resource assessment.

This updating of data from TBFRA 2000 (UNECE/FAO, 2000) has given the countries a possibility to provide the latest and best available national forest resource data adjusted to UNECE/FAO terms and definitions. It was also an opportunity to correct and further improve estimates that have been reported earlier.

Therefore, a questionnaire was posted to the FRA national correspondents in spring 2002. Only few countries have repeated forest inventories that give all the basic data required. Of the 44 MCPFE countries, 17 provided comprehensive updated information on their forest resources. Five countries offered partially updated information, and four countries reported no changes since the TBFRA 2000 assessment. In Annex IV all updated information is highlighted in grey. The data were accompanied by comments which are attached under the corresponding tables in Annex IV. The reporting countries classified data from the national definitions into the international UNECE/FAO definitions (see Annex V). National definitions have been taking shape during the previous century, while the international definitions by UNECE/FAO have been developed during the forest resource assessment process to be applicable in all countries.

In six countries a national forest inventory is presently ongoing or planned, and therefore results will be available in future for forest resource assessments. In countries like the Netherlands and Luxembourg, only preliminary data of new national forest inventories are available, which are not approved yet and therefore not available here. For Germany the results of a second national forest inventory will be available in 2004, and data published earlier based on an inventory in 1987 are still valid and presented here. Switzerland is currently preparing the third national inventory, which will take place between 2004 and 2006. The Austrian Forest Inventory 2000-2002 was still ongoing during the data collection.

The MCPFE Liaison Unit Vienna and UNECE/FAO analysed the 2002 replies in close co-operation with the FRA countries' correspondents. It has to be considered that every national estimate has a statistical error (normally), and when these estimates were transformed to the international classification, an extra source of uncertainty and possible bias was introduced. The absence of reliable source data of some countries has an impact on the reliability of this assessment and overview.

The main aim of this data set is to provide information about changes in forest resources that have happened since the MCPFE process started in 1990 and especially changes that have happened since the Third Ministerial Conference in 1998 in Lisbon.

Countries had provided forest resource data during the FRA process by conducting national or regional forest resource inventories, so the FRA data were originally generated from these national estimates done by the countries. Although this FRA dataset is the latest uniform and international forest resource information

for the European countries, it has to be emphasised that the data were harmonised from national estimates to match the international definitions by the countries themselves.

It is necessary to realise that estimates for forest area, area change, growing stock and change in growing stock should be made by methods that allow the evaluation of the statistical precision for the mentioned variables. The values of this information increase highly when statistically sound methods are applied. Several European countries conduct national forest inventories (NFI) that allow estimation of a standard error of forest area, but unfortunately the reliability estimates for growing stock and change in the growing stock are often lacking. Some countries, applying the improved forest inventory methods, have come up with a larger forest area at national level than was assessed before. This has been noticed when national inventories have moved from a compartment inventory approach towards methods based on sampling techniques.

Countries measure the forest area and other relevant variables by their own definitions. For the comparison of the forest resource data at international level it is important that the re-classification from national forest classes to the international UNECE/FAO classes is properly done. The limitations of the re-classified data should be taken into account: over time, terms, definitions and people are changing, and this might lead to some inconsistency in the interpretation and application of the internationally comparable definitions in different countries.

Additionally, the national forest inventories are conducted at different intervals in different countries, ranging from annual inventories to inventories that are done occasionally over several decades. Changes resulting from different silvicultural methods may need some time to be visible; for instance, increasing amounts of deadwood will accumulate slowly at national level, not immediately after changing the silvicultural guidelines.

Methodological Difficulties

In the Russian Federation the annual reduction of forest area was reported to be more than one million hectares. In relative terms this is a rather small change (-0.15%). The causes for the negative forest area change estimate are different and their calculation is quite complex. The Russian experts worked out the methodology of re-accounting national data according to terms, definitions and methodological approaches used in TBFRA 2000 (UNECE/FAO, 2000). Along with the national classification of the ‘forest’ areas as ‘other wooded land’ which had taken place in the 1990s, and transfers of some ‘forest fund’ lands to other users (e.g. establishment of nature reserves, transfer of some forest lands to pasture and hunting lands under jurisdiction of indigenous and tribal peoples or allocation of forest lands for construction and gardening purposes) are the main reasons for the negative change. Actually, the shown change is not exactly a ‘real’ change in the forest area, and this is the reason why the data on forest area change for the Russian Federation are not included in the actual statistics (Annex IV, Table 1.2).

The data on defoliation are not generally directly comparable with those of previous years due to differences in the sample sizes and changes in methods in some countries. The scope for interpretation of the absolute figures with respect to their spatial and temporal trends is limited for the following reasons: despite great efforts to harmonise assessment methods, differences in standards remain among the countries, preventing a comparison of the national results. Moreover, annual changes in the plot and tree samples as well as adjustments or inconsistencies in the standards and methods over time confine the comparability between survey years. In addition, defoliation is the result of a multitude of natural and anthropogenic influences. It provides an obvious and fast-reacting indicator for stress acting upon the trees but, as with most parameters, permits

no conclusions about cause-effect relationships in the absence of additional information. For these reasons, UNECE/EC (ICP-Forests) interprets temporal and spatial variation of defoliation only after several statistical adjustments of the raw data. These include corrections for fluctuations in the tree sample and statistical adjustments for systematic differences in defoliation between countries.

Conversion of Values from US$ into Euros

Most data on economic values have so far been provided in US$. For the purpose of this report, all monetary data are presented in euros. According to UNECE the conversion factor used is 0.881 US$ = 1 €.

ANNEX II: MCPFE Member Countries[10]

1. Albania
2. Andorra
3. Austria
4. Belarus
5. Belgium
6. Bosnia & Herzegovina
7. Bulgaria
8. Croatia
9. Cyprus
10. Czech Republic
11. Denmark
12. Estonia
13. Finland
14. France
15. Georgia
16. Germany
17. Greece
18. Holy See
19. Hungary
20. Iceland
21. Ireland
22. Italy
23. Latvia
24. Liechtenstein
25. Lithuania
26. Luxembourg
27. Malta
28. Moldova, Republic of
29. Monaco
30. Netherlands
31. Norway
32. Poland
33. Portugal
34. Romania
35. Russian Federation
36. Serbia & Montenegro
37. Slovak Republic
38. Slovenia
39. Spain
40. Sweden
41. Switzerland
42. Turkey
43. Ukraine
44. United Kingdom

European Community

[10] In addition to the 44 European countries and the European Community, 13 non-European countries and 28 international organisations participate as observers in the MCPFE.

ANNEX III: Species Referred to in the Text

English term	Latin term
Fir	Abies alba
Chestnut	Castanea sativa
Hazelnut	Corylus colurna
Common beech	Fagus sylvatica
Holm oak	Quercus ilex
Sessile oak	Quercus petraea
European oak	Quercus robur
Red oak	Quercus rubra
Cork oak	Quercus suber
Norway spruce	Picea abies
Aleppo pine	Pinus halepensis
Maritime pine	Pinus pinaster
Stone pine	Pinus pinea
Scots pine	Pinus sylvestris

ANNEX IV: Tables and Statistics

Please note that in this report Europe comprises the 44 MCPFE countries listed in Annex II. However, the data presented in Annex IV comprise only 40 countries. No data were available for Andorra, the Holy See, Monaco and Serbia & Montenegro which are therefore not listed in the tables.

List of Tables

Table 1.1: Background information on MCPFE countries

Country	Reference period	Population*	Total area	Land area	FOWL**	Share of FOWL in total area	FOWL per capita	GDP*** per capita
		(1 000)		(1 000 ha)		%	ha	€
Albania	2001	3 435	2 875	2 759	1 052	37	0.31	3 277
Austria	1994	8 075	8 387	8 252	3 924	47	0.49	24 654
Belarus	1994	9 971	20 760	20 285	8 936	43	0.90	7 370
Belgium	2000	10 264	3 053	3 030	694	23	0.07	23 767
Bosnia & Herzegovina	1995	4 284	5 120	5 073	2 710	53	0.63	2 328
Bulgaria	1995	7 952	11 098	10 895	3 902	35	0.49	5 606
Croatia	1996	4 437	5 654	5 592	2 105	37	0.47	7 149
Cyprus	1999	790	925	916	386	42	0.49	10 164
Czech Republic	1995	10 224	7 887	7 728	2 630	33	0.26	13 287
Denmark	2000	5 333	4 309	4 239	579	13	0.11	26 456
Estonia	1996	1 364	4 523	4 187	2 156	48	1.58	8 849
Finland	1996	5 178	33 814	30 454	22 882	68	4.42	23 035
France	1997	59 453	54 919	54 148	16 989	31	0.29	22 727
Georgia	1995	4 426	6 970	6 831	2 988	43	0.68	3 123
Germany	1987	82 007	35 702	34 613	10 740	30	0.13	23 570
Greece	1992	10 623	13 196	13 076	6 513	49	0.61	15 706
Hungary	2001	10 188	9 303	9 093	1 873	20	0.18	11 210
Iceland	1998	281	10 295	9 024	130	1.3	0.46	26 608
Ireland	2001	3 841	7 029	6 890	665	9	0.17	24 401
Italy	1995	57 503	30 132	29 412	10 842	36	0.19	23 146
Latvia	1997	2 355	6 459	6 222	2 995	46	1.27	6 861
Liechtenstein	1995	33	16	16	7	44	0.21	...
Lithuania	2001	3 481	6 530	6 267	2 119	32	0.61	7 034
Luxembourg	1997	442	259	258	89	34	0.20	42 758
Malta	1996	392	31.6	31.6	0.347	1.1	0.001	8 145
Moldova, Republic of	1997	3 631	3 385	3 309	353	10	0.10	2 031
Netherlands	1994	15 930	3 735	3 388	361	10	0.02	25 603
Norway	1995	4 488	32 376	30 625	12 004	37	2.67	28 287
Poland	2001	38 641	31 268	30 435	9 088	29	0.24	8 674
Portugal	1995	10 033	9 204	9 105	3 349	36	0.33	16 441
Romania	1990	22 408	23 839	22 949	6 301	26	0.28	6 111
Russian Federation	1998	144 870	1 709 800	1 498 700	881 974	52	6.09	7 476
Slovak Republic	2001	5 390	4 903	4 810	2 038	42	0.38	10 822
Slovenia	2001	1 992	2 027	2 016	1 194	59	0.60	15 657
Spain	1990	39 921	50 596	50 055	26 267	52	0.66	18 625
Sweden	1998-01	8 833	45 218	40 843	30 599	68	3.46	22 729
Switzerland	1994	7 170	4 129	3 916	1 234	30	0.17	27 493
Turkey	1999	67 632	77 945	76 729	20 762	27	0.31	5 423
Ukraine	1996	49 092	60 355	57 936	9 496	16	0.19	3 661
United Kingdom	1995-99	59 541	24 291	23 969	2 771	11	0.05	22 552
Total Europe (MCPFE)		785 904	2 372 318	2 138 077	1 115 697	47	1.42	592 816

* Population data for mid-year 2001.

** FOWL is forest and other wooded land.

*** Real GDP (gross domestic product) per capita (year 2001), at current prices and current PPPs.

Source: UNECE Statistical Database (2002); UNECE/FAO (2000) and updates.

Table 1.2.a: Area and change of forest and other wooded land

	Reference period	Forest area	OWL* area	Forest area change per year	OWL area change per year**
		(1 000 ha)			
Albania	2001	1 030	22	..	..
Austria	1994	3 840	84	8	0
Belarus	1994	7 865	1 071	256	36
Belgium	2000	667	27.1	0.1	0.1
Bosnia & Herzegovina	1995	2 273	433	..	0
Bulgaria	1995	3 588	314	20	2
Croatia	1996	1 775	330	2	0
Cyprus	1999	172	214	5	16
Czech Republic	1995	2 630		1	0
Denmark	2000	486	93	3	2
Estonia	1996	2 010	146	13	6
Finland	1996	22 032	850	71	–17
France	1997	15 156	1 833	62	–18
Georgia	1995	2 988	..	..	0
Germany	1987	10 740	..	..	0
Greece	1992	3 359	3 154	30	–29
Hungary	2001	1 873	0	10	0
Iceland	1998	30	100	1	0
Ireland	2001	624	41	18	0
Italy	1995	9 855	985	30	–30
Latvia	1997	2 884	111	13	–3
Liechtenstein	1995	7		..	0
Lithuania	2001	2 034	85	12	3
Luxembourg	1997	86	3	..	0
Malta	1996	0.347	..	..	0
Moldova, Republic of	1997	322	31	1	0
Netherlands	1994	361		1	0
Norway	1995	8 713	3 291	31	15
Poland	2001	9 088	..	18	..
Portugal	1995	3 308	41	15	..
Romania	1990	6 301	..	15	
Russian Federation	1998	810 367	71 607	..***	..
Slovak Republic	2001	2 038	..	4	..
Slovenia	2001	1 143	51	8	0
Spain	1990	13 656	12 611	86	–68
Sweden	1998-2001	27 293	3 266	0	0
Switzerland	1994	1 173	61	4	1
Turkey	1999	10 027	10 735	16	24
Ukraine	1996	9 460	36	31	0
United Kingdom	1995-1999	2 751	20	17	0
Total Europe (MCPFE)		1 004 005	111 647	802	–60

* OWL is other wooded land.

** Change of OWL is derived from the UNECE/FAO (2000) (Table 7) and updates 2002.

*** See also comments under chapter Material and Methods (Annex I) concerning the changes in the forest area of the Russian Federation.

Source: UNECE/FAO (2000) and updates. (Forest area was adjusted according to FAOSTAT land areas).

Comments:
Albania: The other wooded land is area without any forest trees but after our forest law is included in the forest fund.
Belgium: New data do not indicate change between 1997 and 2000, but are more accurate due to inventory scheme.
Finland: FAO definitions for forest and OWL have been assessed in the field since 1998. Models and aerial photo based adjustment have been applied to older data. The middle point of the new period, weighted by land area, is 1995.5, and the previous period is 1993.4.
Hungary: Regarding the definitions applied in TBFRA 2000, app. 4 000 ha would fall into the OWL category, but for consistency reasons it is included here and in the other tables in the area of "Forest".
Portugal: The changes on the area of forest and OWL were calculated based on the difference between the values of the 3rd NFI Revision (1995) and the 2nd NFI Revision (1982), divided by 13 (1995-1982); all data presented here refer to the mainland territory of Portugal.
Russian Federation: Concerning forest and OWL area: 810.367 mill. ha is forest stand areas and 71.607 million ha is shrub and bush areas.
Slovak Republic: Forest is forest land (1.988 million ha in 1996 and 2.006 million ha in 2001) + forest on farmlands (28 000 ha in 1996, 32 000 ha in 2001).
Sweden: Crown cover has been measured with a new method in the latest inventory and therefore change estimate is reported as zero here.
United Kingdom: Reference date changed to achieve consistency with other tables of the update. OWL estimate unchanged from TBFRA.

Table 1.2.b: Changes in forest and other wooded land (OWL) area in countries which provided updated data

FRA Parameters	Belgium	Denmark	Finland	Hungary	Ireland	Lithuania	Poland	Slovak Republic	Slovenia	Sweden	United Kingdom
(1 000 hectares)											
Forest area, updated	667	486	22 032	1 873	624	2 034	9 088	2 038	1 143	27 293	2 751
Forest area UNECE/FAO (2000)	646	445	21 883	1 811	591	1 978	8 942	2 016	1 099	27 264	2 469
Change, forest area	3.3%	9.2%	0.7%	3.4%	5.6%	2.8%	1.6%	1.1%	4.0%	0.1%	11.4%
OWL area updated	27	93	850	0	41	85	..	..	51	3 266	20
OWL area UNECE/FAO (2000)	26	93	885	0	0	72	0	15	67	2 995	20
Change, OWL area	4.2%	0.0%	–4.0%	..	..	18.1%	..	..	–23.9%	9.0%	0.0%
Coniferous forest area, updated	283	268	17 525	189	516	936	6 022	616	344	20 900	..
Coniferous forest area, UNECE/FAO (2000)	273	168	17 596	207	496	914	5 955	621	329	21 452	..
Change in coniferous forest area	3.4%	59.3%	–0.4%	–8.7%	4.0%	2.4%	1.1%	–0.8%	4.6%	–2.6%	..
Broadleaved forest area, updated	339	143	1 773	1 455	80	732	1 392	939	427	1 808	..
Broadleaved forest area, UNECE/FAO (2000)	322	111	1 692	1 416	85	678	1 377	960	413	1 599	..
Change in broad-leaved forest area	5.3	28.3	4.8	2.8	–5.9	8.0	1.1	–2.2	3.4	13.1	..
Mixed forest area, updated	46	75	2 734	229	28	366	1 628	372	372	4 585	..
Mixed forest area, UNECE/FAO (2000)	51	166	2 595	188	10	386	1 610	435	357	4 213	..
Change in mixed forest area	–10	–54.7	5.4	21.8	180	–5.2	1.1	–14.4	4.2	8.8	..

Note: Coniferous forest refers to the predominately coniferous forests and broadleaved forest refers to the predominately broadleaved forests. Relative change here refers to the change between reference periods, which are different for every country.

Source: UNECE/FAO (2000) and updates.

Table 1.3: Forest and other wooded land by forest types (species groups)

	Reference period	Forest (1 000 ha)			Other wooded land (1 000 ha)		
		Predominantly coniferous	Predominantly broadleaved	Mixed	Predominantly coniferous	Predominantly broadleaved	Mixed
Albania	2001	141	560	329	0	0	0
Austria	1992-1996	2 613	470	757	84	0	0
Belarus	1994 -1997	3 046	1 751	3 067	108	854	110
Belgium	2000	283	339	46	0	27	0
Bosnia & Herzegovina	1995	..	..	..	..	..	..
Bulgaria	1995	793	2 421	376	150	163	0
Croatia	1996	168	1 448	159	0	330	0
Cyprus	1999	171	1	0	0	0	214
Czech Republic	1995	820	346	1 464	0	0	0
Denmark	2000	268	143	75	..	..	..
Estonia	1996	788	416	812	29	80	37
Finland	1991-2000	17 525	1 773	2 734	727	122	1
France	1997	4 124	9 667	1 365	92	1 649	92
Georgia	1995	..	..	..	..	..	..
Germany	1997	6 052	2 715	1 973	0	0	0
Greece	1992	1 429	1 930	0	0	3 154	0
Hungary	2001	189	1 455	229	0	0	0
Iceland	1998	10	18	2	0	100	0
Ireland	2001	516	80	28	..	41	..
Italy	1995	2 094	7 071	692	209	707	69
Latvia	1997	1 127	534	1 223	0	111	0
Liechtenstein	1995	3.0	2.10	1.80	0.20	0.20	0.10
Lithuania	2001	936	732	366	7	46	32
Luxembourg	1994	31	53	2	0	3	0
Malta	1996	0	0	0.347	0	0	0
Moldova, Republic of	1997	4	320	0	0	31	0
Netherlands	1992-1996	143	146	50	0	0	0
Norway	1994-1996	4 930	1 962	1 818	702	2 407	181
Poland	1997-2001	6 022	1 392	1 628	0	0	0
Portugal	1995	876	2 002	430	0	41	0
Romania	1990-1997	1 909	4 392	0	0	379	0
Russian Federation	1998	324 147	113 451	372 769	38 014	33 593	0
Slovak Republic	2001	616	939	372	..	..	..
Slovenia	2001	344	427	372	20	22	9
Spain	1990	5 879	5 123	2 507	3 743	7 484	1 248
Sweden	1998-2001	20 900	1 808	4 585	1 973	686	607
Switzerland	1997	671	269	233	15	38	8
Turkey	1999	6 563	3 464	0	4 631	6 104	0
Ukraine	1996	3 711	4 745	1 002	7	29	0
United Kingdom	1995-1999	1 554	1 005	192	0	20	0
Total Europe (MCPFE)		421 397	175 371	401 659	50 511	58 221	2 608

Source: UNECE/FAO (2000) (Table 3) and updates.

Comments:

Belgium: Clear-cut areas are included in this table.

Russian Federation: Expert assessment: conifer – 40%, broadleaved – 14%, mixed forest – 46% and OWL for predominantly coniferous = 38 014 000 ha of dwarf pine area.

Turkey: From forest and other wooded land 11% is mixed forest and other wooded land for 1996 reference period.

United Kingdom: Mixed estimated as 7% of area, as in TBFRA, and subtracted equally from conifers and broadleaves. Felled temp assumed to be all conifers. Open space allocated conifer / broadleaves in proportion to total area.

Table 1.4.a: Ownership and number of holdings of forest and other wooded land

	Reference period	Area of forest and OWL* by ownership (1 000 ha)		Number of holdings	
		Public	Private	Public	Private
Albania	2001	1 019	11	36	..
Austria	1992-1996	712	3212	..	..
Belarus	1997	8 936	0	1 971	0
Belgium	2000	301	393	877	155 110
Bosnia & Herzegovina	1995	2 125	584	..	..
Bulgaria	1995	3 903	..	177	0
Croatia	1996	1 651	454	672	..
Cyprus	1999	157	229	403	..
Czech Republic	1996	2 212	418	4 566	137 260
Denmark	2000	188	391	360	26 246
Estonia	1996	1 978	184	180	17 000
Finland	1991-2000	6 491	16 391	..	447 104
France	1995-1999	4 228	12 761	15 926	3 495 000
Georgia	1995	2 988	0	..	..
Germany	1987	5762	4978	13 040	349 361
Greece	1992	5 331	1 182	2 190	1 265
Hungary	2001	1 116	757	912	53 636
Iceland	1985	39	91	..	..
Ireland	2001	397	268	152	21 386
Italy	1995	3 687	7 155	2 241	815 586
Latvia	1997	1 678	1 317	575	117 645
Liechtenstein	1995	6.9	0.5	15	584
Lithuania	2001	1 513	606	53	164 000
Luxembourg	1997	41	47	295	13 785
Malta	1996	0.35	0	21	0
Moldova, Republic of	1997	355	0	..	..
Netherlands	1995	173	166	2 558	28 870
Norway	1989	2 936	9 064	1 302	171 079
Poland	1997-2001	7 518	1 524	461**	843 802**
Portugal	1995	258	3 091	1 140	409 524
Romania	1997	6 320	360	..	..
Russian Federation	1998	881 974	0	>2000	0
Slovak Republic	2001	1 047	959	578	40 035
Slovenia	2001	350	844	251	300 000
Spain	1985-1995	5 608	20 376	8 718	661 992
Sweden	1998-2001	6 175	24 385	13 557**	260 386**
Switzerland	1996	878	326	3 503	257 700
Turkey	1999	20 745	18	1 623	152
Ukraine	1996	9 494	0	10 515	0
United Kingdom	1995-1999	1 030	1 741	646	106 000
Total Europe (MCPFE)		1 001 321	114 284	>91 514	8 894 508

* OWL is other wooded land.

** Reference period is 1992-1996.

Source: UNECE/FAO (2000) (Table 9 and 18) and updates.

Comments:

Albania: The number of private holdings is not registered.

Austria: The total number of holdings is 170 548 (Source: Agrarstrukturerhebung 1999, Agricultural Structure Survey 1999, Statistics Austria). A differentiation in public and private holdings is not available.

Finland: The number of small private holdings without a forestry fee obligation is included and is 124 939. The number of holdings is not relevant in the case of the public forest.
Hungary: Number of holdings has decreased because of association.
Portugal: The area was calculated with the proportions of public and private area observed in the UNECE/FAO (2000) data. There are no new available data on the number of holdings.
Slovak Republic: Public forests are state-owned and municipal forest holdings.
Sweden: Right now the market objectives of the Sveaskog forest estate are unclear. Sveaskog, which is 100% state-owned, is the biggest forest owner in Sweden. It recently bought the big former private forest company AssiDomän AB, which means that the forest landowner figures for Sweden are under transition. The uncertainties mean that Sweden has no clear policy regarding whether we should consider Sveaskog 'private' or 'state' owned. Until this is resolved, Sveaskog is considered a private landowner in the Swedish figures.
United Kingdom: Data of Forestry Commission and Forest Service area were updated in 1997. The estimate for other publicly owned woodland is now available from NIWT and is 125, replacing the previous estimate of 130. The private area was assessed by subtracting 'public' from the total.

Table 1.4.b: Changes in public and private forest and other wooded land (OWL) area in countries which provided updated data

FRA parameters	Belgium	Denmark	Finland	Hungary	Ireland	Lithuania	Poland	Slovak Republic	Slovenia	Sweden	United Kingdom
(1 000 hectares)											
Public forest + OWL area, updated	301	188	6 491	1 116	397	1 513	7 518	1 047	350	6 175	1 030
Public forest + OWL area, UNECE/FAO (2000)	289	153	6 720	1 169	391	1 683	7 448	1 133	347	6 151	1 072
Change, public forest + OWL area	4.2%	23.0%	–3.4%	–4.5%	1.5%	–10.1%	0.9%	–7.6%	0.9%	0.4%	–3.9%
Private forest + OWL area, updated	393	391	16 391	757	268	606	1 524	959	844	24 385	1 741
Private forest + OWL area, UNECE/FAO (2000)	383	359	15 885	642	200	367	1 493	898	819	24 121	1 417
Change, private forest + OWL area	2.7%	9.1%	3.2%	17.9%	34.0%	65.1%	2.1%	6.8%	3.1%	1.1%	22.9%

Source: UNECE/FAO (2000) and updates.

Table 1.5.a: Age-class distribution – total of all forest types

	Reference period	(1 000 ha)										
		<10	11-20	21-40	41-60	61-80	81-100	101-120	121-140	>140	Uneven-aged	Unspec-ified
Albania		..	..	..	..	..	..	..	..	..	..	..
Austria		..	..	..	..	..	..	..	..	..	..	..
Belarus		..	..	..	..	..	..	..	..	..	..	..
Belgium	2000	42	51	132	77	35	12	2	0.7	0.7	299	..
Bosnia & Herzeg.		..	..	..	..	..	..	..	..	..	..	..
Bulgaria		..	..	..	..	..	..	..	..	..	..	..
Croatia		..	..	..	..	..	..	..	..	..	..	..
Cyprus		..	..	..	..	..	..	..	..	..	..	..
Czech Republic		..	..	..	..	..	..	..	..	..	..	..
Denmark		..	..	..	..	..	..	..	..	..	..	..
Estonia		..	..	..	..	..	..	..	..	..	..	..
Finland	1991-2000	2 028	1 633	3 699	3 425	3 120	2 226	1 380	856	1 756	1 911	..
France	1997	775	899	3 800	1 657	1 134	655	476	389	514	4 907	..
Georgia		..	..	..	..	..	..	..	..	..	..	..
Germany	1987	..	1 429	2 222	1 672	1 635	1 359	814	475	351	..	..
Greece		..	..	..	..	..	..	..	..	..	..	..
Hungary	2001	318	279	405	235	180	107	32	5	3	309	..
Iceland		..	..	..	..	..	..	..	..	..	..	..
Ireland		..	..	..	..	..	..	..	..	..	..	..
Italy		..	..	..	..	..	..	..	..	..	..	..
Latvia		..	..	..	..	..	..	..	..	..	..	..
Liechtenstein		..	..	..	..	..	..	..	..	..	..	..
Lithuania	2001	133	131	399	591	402	186	37	7	4	48	..
Luxembourg		..	..	..	..	..	..	..	..	..	..	..
Malta		..	..	..	..	..	..	..	..	..	..	..
Moldova, Rep. of		..	..	..	..	..	..	..	..	..	..	..
Netherlands	1995-1999	18	22	59	71	47	21	8	3	3	56	..
Norway		..	..	..	..	..	..	..	..	..	..	..
Poland		..	..	..	..	..	..	..	..	..	..	..
Portugal		..	..	..	..	..	..	..	..	..	..	..
Romania		..	..	..	..	..	..	..	..	..	..	..
Russian Federation		..	..	..	..	..	..	..	..	..	..	..
Slovakia	2001	35	39	74	89	99	84	27	14	13	142	..
Slovenia	2000	..	15	53	112	110	123	102	56	24	557	..
Spain		..	..	..	..	..	..	..	..	..	..	..
Sweden	1998-2001	2 820	2 656	4 207	2 554	2 000	1 457	1 167	769	338	4 684	4 641
Switzerland		..	..	..	..	..	..	..	..	..	..	..
Turkey		..	..	..	..	..	..	..	..	..	..	..
Ukraine		..	..	..	..	..	..	..	..	..	..	..
United Kingdom		..	..	..	..	..	..	..	..	..	..	..
Total Europe (MCPFE)		6 169	7 154	15 050	10 483	8 762	6 230	4 045	2 275	3 007	12 913	

Source: UNECE/FAO (2000) and updates.

Table 1.5.b: Age-class distribution of predominantly coniferous forest

	Reference period	(1 000 ha)										
		<10	11-20	21-40	41-60	61-80	81-100	101-120	121-140	>140	Uneven-aged	Unspec-ified
Albania		..	..	..	..	..	..	..	..	..	..	..
Austria		..	..	..	..	..	..	..	..	..	..	..
Belarus		..	..	..	..	..	..	..	..	..	..	..
Belgium	2000	31	24	101	67	31	10	1.3	0.2	0	3	..
Bosnia & Herzeg.		..	..	..	..	..	..	..	..	..	..	..
Bulgaria		..	..	..	..	..	..	..	..	..	..	..
Croatia		..	..	..	..	..	..	..	..	..	..	..
Cyprus		..	..	..	..	..	..	..	..	..	..	..
Czech Rep.		..	..	..	..	..	..	..	..	..	..	..
Denmark		..	..	..	..	..	..	..	..	..	..	..
Estonia		..	..	..	..	..	..	..	..	..	..	..
Finland	1991-2000	1 552	1 231	2 772	2 498	2 544	1 898	1 235	767	1 643	1 386	..
France	1997	382	528	1053	597	352	202	123	85	142	265	..
Georgia		..	..	..	..	..	..	..	..	..	..	..
Germany	1987	..	994	1 647	1 140	1 188	918	449	177	75	..	..
Greece		..	..	..	..	..	..	..	..	..	..	..
Hungary	2001	12	34	90	22	3	1	..	..	..	27	..
Iceland		..	..	..	..	..	..	..	..	..	..	..
Ireland		..	..	..	..	..	..	..	..	..	..	..
Italy		..	..	..	..	..	..	..	..	..	..	..
Latvia		..	..	..	..	..	..	..	..	..	..	..
Liechtenstein		..	..	..	..	..	..	..	..	..	..	..
Lithuania	2001	82	43	136	227	207	139	32	6	3	18	..
Luxembourg		..	..	..	..	..	..	..	..	..	..	..
Malta		..	..	..	..	..	..	..	..	..	..	..
Moldova, Rep. of		..	..	..	..	..	..	..	..	..	..	..
Netherlands	1995-1999	2	6	26	38	27	8	2	0.3	0.5	7	..
Norway		..	..	..	..	..	..	..	..	..	..	..
Poland		..	..	..	..	..	..	..	..	..	..	..
Portugal		..	..	..	..	..	..	..	..	..	..	..
Romania		..	..	..	..	..	..	..	..	..	..	..
Russian Federation		..	..	..	..	..	..	..	..	..	..	..
Slovakia	2001	35	39	74	89	99	84	27	14	13	142	..
Slovenia	2000	..	3	10	35	27	62	27	21	11	143	..
Spain		..	..	..	..	..	..	..	..	..	..	..
Sweden	1998-2001	2 497	2 106	3 137	1 789	1 607	1 287	1 095	737	328	3 438	2 878
Switzerland		..	..	..	..	..	..	..	..	..	..	..
Turkey		..	..	..	..	..	..	..	..	..	..	..
Ukraine		..	..	..	..	..	..	..	..	..	..	..
United Kingdom		..	..	..	..	..	..	..	..	..	..	

Source: UNECE/FAO (2000) and updates.

Table 1.5.c: Age-class distribution of predominantly broadleaved forest

	Reference period	(1 000 ha)										
		<10	11-20	21-40	41-60	61-80	81-100	101-120	121-140	>140	Uneven-aged	Unspec-ified
Albania		..	..	..	..	..	..	..	..	..	..	..
Austria		..	..	..	..	..	..	..	..	..	..	..
Belarus		..	..	..	..	..	..	..	..	..	..	..
Belgium	2000	10	25	27	7	3	2	0.9	0.5	0.6	261	..
Bosnia & Herzeg.		..	..	..	..	..	..	..	..	..	..	..
Bulgaria		..	..	..	..	..	..	..	..	..	..	..
Croatia		..	..	..	..	..	..	..	..	..	..	..
Cyprus		..	..	..	..	..	..	..	..	..	..	..
Czech Republic		..	..	..	..	..	..	..	..	..	..	..
Denmark		..	..	..	..	..	..	..	..	..	..	..
Estonia		..	..	..	..	..	..	..	..	..	..	..
Finland	1991-2000	201	144	378	323	138	60	15	7	9	499	..
France	1997	379	342	938	975	690	394	307	270	332	3 932	..
Georgia		..	..	..	..	..	..	..	..	..	..	..
Germany	1987	..	435	575	532	447	441	365	298	276	..	..
Greece		..	..	..	..	..	..	..	..	..	..	..
Hungary	2001	225	229	285	190	168	98	29	5	3	223	..
Iceland		..	..	..	..	..	..	..	..	..	..	..
Ireland		..	..	..	..	..	..	..	..	..	..	..
Italy		..	..	..	..	..	..	..	..	..	..	..
Latvia		..	..	..	..	..	..	..	..	..	..	..
Liechtenstein		..	..	..	..	..	..	..	..	..	..	..
Lithuania	2001	32	50	203	273	100	17	2	0.7	0.8	17	..
Luxembourg		..	..	..	..	..	..	..	..	..	..	..
Malta		..	..	..	..	..	..	..	..	..	..	..
Moldova, Rep. of		..	..	..	..	..	..	..	..	..	..	..
Netherlands	1995-1999	3	7	15	11	6	5	2	0.9	1.4	22	..
Norway		..	..	..	..	..	..	..	..	..	..	..
Poland		..	..	..	..	..	..	..	..	..	..	..
Portugal		..	..	..	..	..	..	..	..	..	..	..
Romania		..	..	..	..	..	..	..	..	..	..	..
Russian Federation		..	..	..	..	..	..	..	..	..	..	..
Slovakia		..	..	..	..	..	..	..	..	..	..	..
Slovenia	2000	..	5	24	50	54	35	46	13	10	195	..
Spain		..	..	..	..	..	..	..	..	..	..	..
Sweden	1998-2001	109	115	287	255	120	51	24	9	..	142	696
Switzerland		..	..	..	..	..	..	..	..	..	..	..
Turkey		..	..	..	..	..	..	..	..	..	..	..
Ukraine		..	..	..	..	..	..	..	..	..	..	..
United Kingdom		..	..	..	..	..	..	..	..	..	..	..

Source: UNECE/FAO (2000) and updates.

Table 1.5.d: Age-class distribution of mixed forest

	Reference period	(1 000 ha)										
		<10	11-20	21-40	41-60	61-80	81-100	101-120	121-140	>140	Uneven-aged	Unspec-ified
Albania		..	..	..	..	..	..	..	..	..	..	..
Austria		..	..	..	..	..	..	..	..	..	..	..
Belarus		..	..	..	..	..	..	..	..	..	..	..
Belgium	2000	0.5	1.5	4	3	1	0.2	0	0	0.1	35	..
Bosnia & Herzeg.		..	..	..	..	..	..	..	..	..	..	..
Bulgaria		..	..	..	..	..	..	..	..	..	..	..
Croatia		..	..	..	..	..	..	..	..	..	..	..
Cyprus		..	..	..	..	..	..	..	..	..	..	..
Czech Republic		..	..	..	..	..	..	..	..	..	..	..
Denmark		..	..	..	..	..	..	..	..	..	..	..
Estonia		..	..	..	..	..	..	..	..	..	..	..
Finland	1991-2000	275	258	549	604	438	268	130	82	104	26	..
France	1997	14	29	90	85	92	59	46	34	40	710	..
Georgia		..	..	..	..	..	..	..	..	..	..	..
Germany		..	..	..	..	..	..	..	..	..	..	..
Greece		..	..	..	..	..	..	..	..	..	..	..
Hungary	2001	81	16	30	23	9	8	3	..	..	59	..
Iceland		..	..	..	..	..	..	..	..	..	..	..
Ireland		..	..	..	..	..	..	..	..	..	..	..
Italy		..	..	..	..	..	..	..	..	..	..	..
Latvia		..	..	..	..	..	..	..	..	..	..	..
Liechtenstein		..	..	..	..	..	..	..	..	..	..	..
Lithuania	2001	19	38	60	91	95	30	3	0.5	0.2	13	..
Luxembourg		..	..	..	..	..	..	..	..	..	..	..
Malta		..	..	..	..	..	..	..	..	..	..	..
Moldova, Rep. of		..	..	..	..	..	..	..	..	..	..	..
Netherlands	1995-1999	13	9	18	22	14	8	4	1.3	1.2	27	..
Norway		..	..	..	..	..	..	..	..	..	..	..
Poland		..	..	..	..	..	..	..	..	..	..	..
Portugal		..	..	..	..	..	..	..	..	..	..	..
Romania		..	..	..	..	..	..	..	..	..	..	..
Russian Federation		..	..	..	..	..	..	..	..	..	..	..
Slovakia		..	..	..	..	..	..	..	..	..	..	..
Slovenia	2000	..	7	19	27	29	26	29	22	3	219	..
Spain		..	..	..	..	..	..	..	..	..	..	..
Sweden	1998-2001	214	435	783	510	273	119	48	23	10	1 104	1 067
Switzerland		..	..	..	..	..	..	..	..	..	..	..
Turkey		..	..	..	..	..	..	..	..	..	..	..
Ukraine		..	..	..	..	..	..	..	..	..	..	..
United Kingdom		..	..	..	..	..	..	..	..	..	..	..

Source: UNECE/FAO (2000) and updates.

Table 1.6: Average stem volume of corresponding age classes – total of all forest types

	Reference period	(m^3 / ha, overbark)										
		<10	11-20	21-40	41-60	61-80	81-100	101-120	121-140	>140	Uneven-aged	Unspec-ified
Albania		..	..	..	..	..	..	..	..	..	..	..
Austria		..	..	..	..	..	..	..	..	..	..	..
Belarus		..	..	..	..	..	..	..	..	..	..	..
Belgium	2000	..	..	653	743	790	703	472	870	409	589	..
Bosnia & Herzeg.		..	..	..	..	..	..	..	..	..	..	..
Bulgaria		..	..	..	..	..	..	..	..	..	..	..
Croatia		..	..	..	..	..	..	..	..	..	..	..
Cyprus		..	..	..	..	..	..	..	..	..	..	..
Czech Republic		..	..	..	..	..	..	..	..	..	..	..
Denmark		..	..	..	..	..	..	..	..	..	..	..
Estonia		..	..	..	..	..	..	..	..	..	..	..
Finland	1991-2000	23	83	217	309	385	448	430	343	254	108	..
France	1997	64	355	551	676	853	993	1 161	1 183	1 192	635	..
Georgia		..	..	..	..	..	..	..	..	..	..	..
Germany	1987	..	74	334	615	716	844	803	801	803	..	..
Greece		..	..	..	..	..	..	..	..	..	..	..
Hungary	2001	49	232	532	780	885	935	1 099	848	1 326	657	..
Iceland		..	..	..	..	..	..	..	..	..	..	..
Ireland		..	..	..	..	..	..	..	..	..	..	..
Italy		..	..	..	..	..	..	..	..	..	..	..
Latvia		..	..	..	..	..	..	..	..	..	..	..
Liechtenstein		..	..	..	..	..	..	..	..	..	..	..
Lithuania	2001	34	141	424	656	796	806	800	810	850	719	..
Luxembourg		..	..	..	..	..	..	..	..	..	..	..
Malta		..	..	..	..	..	..	..	..	..	..	..
Moldova, Rep. of		..	..	..	..	..	..	..	..	..	..	..
Netherlands	1995-1999	119	269	582	705	698	725	849	951	1 079	388	..
Norway		..	..	..	..	..	..	..	..	..	..	..
Poland		..	..	..	..	..	..	..	..	..	..	..
Portugal		..	..	..	..	..	..	..	..	..	..	..
Romania		..	..	..	..	..	..	..	..	..	..	..
Russian Federation		..	..	..	..	..	..	..	..	..	..	..
Slovakia		..	..	..	..	..	..	..	..	..	..	..
Slovenia	2000	..	106	315	552	842	1 017	1 093	1 246	1 376	832	..
Spain		..	..	..	..	..	..	..	..	..	..	..
Sweden	1998-2001	56	81	276	480	650	709	722	700	422	474	114
Switzerland		..	..	..	..	..	..	..	..	..	..	..
Turkey		..	..	..	..	..	..	..	..	..	..	..
Ukraine		..	..	..	..	..	..	..	..	..	..	..
United Kingdom		..	..	..	..	..	..	..	..	..	..	..

Source: UNECE/FAO (2000) and updates.

Table 1.7: Volume and biomass per ha and changes over time in growing stock

	Forest, total*		Reference period 1	Reference period 2	Growing stock on forest (1 000 m³ overbark)**		
	Stem volume	Woody biomass			Ref. period 1	Ref. period 2	Average annual change
	m³/ha	t/ha					
Albania	82	66	1995	2001	83 435	84 394	160
Austria	286	250	1986-1990	1992-1996	1 080 121	1 097 307	2 864
Belarus	153	80	1988	1994	891 230	1 092 550	33 553
Belgium	213	124	1982	1997	122 047	141 793	1 316
Bosnia & Herzegovina	110	..	1990	1995	..	..	..
Bulgaria	130	76	1985	1995	404 800	467 345	6 255
Croatia	201	107	1986	1996	328 207	356 302	2 809
Cyprus	45	22	1990	2000	4 812	7 714	290
Czech Republic	260	125	1986	1995	639 873	683 806	4 393
Denmark	141	57	1990	2000	64 883	74 281	940
Estonia	156	85	1988	1996	259 680	314 537	6 857
Finland	100	50	1991-1996	1991-2000	1 940 000	1 995 000	20 370
France	202	98	1987	1997	2 538 961	2 891 777	35 282
Georgia	145	97	1990	1995	421 190	434 000	2 562
Germany	268	134	1961	1987	..	2 880 000	35 000
Greece	45	25	..	1992	..	151 788	..
Hungary	174	112	1990	2001	288 004	326 410	3 491
Iceland	27	17	1990-1990	1998-1998	760	800	5
Ireland	74	25	1987	1996	25 000	42 000	1 700
Italy	145	74	1985	1995	712 447	1 428 742	71 630
Latvia	174	93	1988	1997	432 000	502 000	7 000
Liechtenstein	254	119	1975	1995	1 570	1 750	9
Lithuania	186	100	1996	2001	362 637	378 294	3 131
Luxembourg	..	..	1985	1997	20 377	20 217	160
Malta	232	..	..	1996	..	80	..
Moldova, Republic of	128	64	1988	1997	35 290	41 600	631
Netherlands	160	107	1988-1992	1991-1995	52 191	54 209	672
Norway	89	49	1980-1986	1994-1996	621 332	771 448	11 547
Poland	230	101	1992-1996	1997-2001	1 908 019	2 079 444	34 285
Portugal	56	48	1982-1984	1995-1998	182 000	186 839	358
Romania	213	124	..	..	..	..	..
Russian Federation	101	90	1993	1998	80 676 360	81 863 690	237 466
Slovak Republic	276	157	1996	2001	510 948	554 223	8 655
Slovenia	283	178	1996	2000	310 577	320 040	2 365
Spain	44	24	1970	1990	456 721	594 111	6 870
Sweden	110	64	1992-1996	98-01	2 928 117	3 000 950	13 242
Switzerland	337	165	1983-1985	1993-1995	361 286	395 450	3 383
Turkey	136	..	1996	1999	1 349 323	1 366 361	5 679
Ukraine	179	..	1988	1996	1 319 700	1 695 912	47 026
United Kingdom	137	80	1980	1995-1999	241 000	377 000	8 000
Total Europe (MCPFE)	110	87			101 574 898	108 674 164	619 956

Sources: * FAO (2001) (Table 7); ** UNECE/FAO (2000) (Table 37) and updates.

Comments:

Finland: The middle point of the period 1, weighted by volume, is 1993.7 and for period 2 is 1996.4.

France: Total volume and biomass have been assessed on 14 311 thousand ha only: the values/ha have to be consequently corrected.

Hungary: National growing stock definition matches with the definition in TBFRA 2000.

Portugal: The reported value of biomass is calculated as the sum of biomass of living trees in the stand and the biomass of shrubs and bushes at the understorey. Unlike trees biomass, shrubs and bushes biomass does not include stumps and roots. For growing stock, years adopted as a reference were 1983 (average of 1982-1984 period) and 1996.5 (average of 1995-1998 period).

Russian Federation: Volume 101 m³/ha = 81 863.69 million m³ / 810.367 million ha. Biomass 90 t/ha = 101 * 0.89, where 0.89 t/m³ – average conversion factor (expert assessment).

Slovak Republic: Growing stock and growing stock per hectare refer to the living trees over 7 cm at dbh.

United Kingdom: Volume to biomass conversion for conifer/broadleaves using same factors as in TBFRA. Totals divided by total forest area.

Table 1.8: Carbon stock of woody biomass and annual change

(Tg = 10^{12} g)

	Reference period	C stock in woody biomass	Change of C stock in woody biomass	C stock in woody biomass / 1 million ha forest area	Forest area
		Tg C	Tg C / yr	Tg C / 1 million ha	1 million ha
Albania	2001	34.69	0.07	34	1.03
Austria	1992-1996	580.36	5.15	151	3.84
Belarus	1994	380.01	5.65	48	7.87
Belgium	1997	41.27	0.38	62	0.67
Bosnia & Herzegovina	1995	89.26	1.37	39	2.27
Bulgaria	1995	162.75	2.65	45	3.59
Croatia	1996	115.28	1.12	65	1.78
Cyprus	1999	1.80	0.07	11	0.17
Czech Republic	1995	209.11	2.13	80	2.63
Denmark	2000	26.80	1.15	55	0.486
Estonia	1996	101.25	1.23	50	2.01
Finland	1991-2000	662.59	5.77	30	22.03
France	1997	838.55	9.92	55	15.16
Georgia	1995	167.20	1.37	56	2.99
Germany	1987	920.00	14.02	86	10.74
Greece	1992	52.04	0.59	15	3.36
Hungary	2001	132.13	1.65	70	1.88
Iceland	1998	0.42	0.02	14	0.03
Ireland	2000	11.74	0.11	19	0.62
Italy	1995	409.28	6.95	42	9.86
Latvia	1997	177.60	2.52	61	2.89
Liechtenstein	1995	0.51	0.00	51	0.01
Lithuania	1997-2001	123.02	0.94	61	2.03
Luxembourg	1985-1997	6.53	0.09	73	0.09
Malta	1996	0.06	0.00	173	0.000347
Moldova, Republic of	1997	12.42	0.23	54	0.32
Netherlands	1991-1995	29.29	0.40	81	0.361
Norway	1994-1996	265.61	4.56	30	8.71
Poland	1997-2001	550.03	10.70	61	9.09
Portugal	1995-1998	79.21	1.36	24	3.31
Romania	1984	470.78	7.35	75	6.30
Russian Federation	1998	37 003.57	440.00	46	810.37
Slovak Republic	2001	181.16	2.83	89	2.04
Slovenia	2000	117.46	1.89	103	1.14
Spain	1990	186.69	4.49	14	13.66
Sweden	1998-2001	1 077.00	5.60	39	27.29
Switzerland	1993-1995	140.14	0.71	119	1.17
Turkey	1999	474.38	..	47	10.03
Ukraine	1996	545.87	7.36	58	9.46
United Kingdom	1995-1999	148.00	3.43	54	2.75
Total Europe (MCPFE)		46 525.86	555.83		

Note: Estimate is based on same methods as applied in TBFRA 2000 (UNECE/FAO (2000), but with updated data.

Source: UNECE/FAO (2000) (chapter III, annex 3B.2) and updates.

Comments:

Hungary: Biomass values are estimates.

Ireland: Change in C store of woody biomass is net of harvest as is TBRRA assessment datum (0.35 Tg C), Submission to Ireland to UNFCCC for 2000.

Portugal: The values of biomass and carbon were calculated overbark. The change of carbon store in woody biomass only accounts for the trees in the stand. Therefore shrubs and bushes understorey are not considered.

Russian Federation: 90 t/ha * 0.5 * 810.367 million ha = 36 466.52 Tg C (for forest area) 15 t/ha * 0.5 * 71.607 million ha = 537.05 Tg C (for OWL) 36 466.52 + 537.05 = 37 003.57 Tg C (forest area+OWL) 440 Tg/yr = 970.41 million m3/yr * 0.89 t/m3 * 0.5, where: 970.41 million m3/yr – net annual increment for forest stands and 0.5 is the carbon factor.

United Kingdom: Forest above stump revised to be consistent with revised volume. Other biomass figures unchanged from TBFRA. Change based on increment figures. Less fellings and unrecovered natural losses as in TBFRA.

Table 2.1.a: Defoliation, all trees

	All species											
	% of total of sampled trees in defoliation classes 2-4 (moderately or severely defoliated or dead)											
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Albania	..	..	..	..	..	..	..	..	9.8	9.9	10.1	10.2
Austria	9.1	7.5	6.9	8.2	7.8	6.6	7.9	7.1	6.7	6.8	8.9	9.7
Belarus	54.0	..	29.2	29.3	37.4	38.3	39.7	36.3	30.5	26.0	24.0	20.7
Belgium	16.2	17.9	16.9	14.8	16.9	24.5	21.2	17.4	17.0	17.7	19.0	17.9
Bosnia & Herzegovina	..	..	..	..	..	..	..	..	..	..	..	..
Bulgaria	29.1	21.8	23.1	23.2	28.9	38.0	39.2	49.6	60.2	44.2	46.3	33.8
Croatia	..	..	15.6	19.2	28.8	39.8	30.1	33.1	25.6	23.1	23.4	25.0
Cyprus	..	..	..	..	..	..	..	..	..	..	..	8.9
Czech Republic	..	45.3	56.1	51.8	57.7	58.5	71.9	68.6	48.8	50.4	51.7	52.1
Denmark	21.2	29.9	25.9	33.4	36.5	36.6	28.0	20.7	22.0	13.2	11.0	7.4
Estonia*	..	..	..	..	..	..	..	..	8.7	8.7	7.4	8.5
Finland	17.3	16.0	14.5	15.2	13.0	13.3	13.2	12.2	11.8	11.4	11.6	11.0
France	7.3	7.1	8.0	8.3	8.4	12.5	17.8	25.2	23.3	19.7	18.3	20.3
Georgia	..	..	..	..	..	..	..	..	..	..	..	..
Germany	15.9	25.2	26.4	24.2	24.4	22.1	20.3	19.8	21.0	21.7	23.0	21.9
Greece	17.5	16.9	18.1	21.2	23.2	25.1	23.9	23.7	21.7	16.6	18.2	21.7
Hungary	21.7	19.6	21.5	21.0	21.7	20.0	19.2	19.4	19.0	18.2	20.8	21.2
Iceland	..	..	..	..	..	..	..	..	..	..	..	..
Ireland	5.4	15.0	15.7	29.6	19.7	26.3	13.0	13.6	16.1	13.0	14.6	17.4
Italy	16.3	16.4	18.2	17.6	19.5	18.9	29.9	35.8	35.9	35.3	34.4	38.4
Latvia	36.0	..	37.0	35.0	30.0	20.0	21.2	19.2	16.6	18.9	20.7	15.6
Liechtenstein	..	..	16.0	..	..	..	..	..	..	..	..	..
Lithuania	20.4	23.9	17.5	27.4	25.4	24.9	12.6	14.5	15.7	11.6	13.9	11.7
Luxembourg	..	20.8	20.4	23.8	34.8	38.3	37.5	29.9	25.3	..	23.4	..
Malta	..	..	..	..	..	..	..	..	..	..	..	..
Moldova, Rep. of	..	..	..	50.8	..	40.4	41.2	..	..	..	29.1	36.9
Netherlands	17.8	17.2	33.4	25.0	19.4	32.0	34.1	34.6	31.0	..	21.8	19.9
Norway	17.2	19.7	26.2	24.9	27.5	28.8	29.4	30.7	30.6	28.6	24.3	27.2
Poland	38.4	45.0	48.8	50.0	54.9	52.6	39.7	36.6	34.6	30.6	32.0	30.6
Portugal	30.7	29.6	22.5	7.3	5.7	9.1	7.3	8.3	10.2	11.1	10.3	10.1
Romania	..	9.7	16.7	20.5	21.2	21.2	16.9	15.6	12.3	12.7	14.3	13.3
Russian Federation	..	..	..	..	10.7	12.5	..	..	..	..	..	9.8
Slovak Republic	41.5	28.5	36.0	37.6	41.8	42.6	34.0	31.0	32.5	27.8	23.5	31.7
Slovenia	18.2	15.9	..	19.0	16.0	24.7	19.0	25.7	27.6	29.1	24.8	28.9
Spain	4.7	7.4	12.3	13.0	19.4	23.5	19.4	13.7	13.6	12.9	13.8	13.0
Sweden*	..	..	..	..	..	14.2	17.4	14.9	14.2	13.2	13.7	17.5
Switzerland	15.5	16.1	12.8	15.4	18.2	24.6	20.8	16.9	19.1	19.0	29.4	18.2
Turkey	..	..	..	..	..	..	..	..	..	..	..	..
Ukraine	2.9	6.4	16.3	21.5	32.4	29.6	46.0	31.4	51.5	56.2	60.7	39.6
United Kingdom	39.0	56.7	58.3	16.9	13.9	13.6	14.3	19.0	21.1	21.4	21.6	21.1
Total Europe (MCPFE)	20.8	22.2	23.5	22.6	26.4	25.3	25.1	25.6	24.0	22.6	22.8	22.4

* Only coniferous trees are assessed.

Source: ICP Forests database (2002).

Comments:
Czech Republic: Only trees older than 60 years assessed until 1997.
France: Due to methodological changes, only the time series 1990-94 and 1997-2001 are consistent, but not comparable to each other.
Germany: For 1990, only data for former Federal Republic of Germany.
Greece: Excluding maquis.
Italy: Due to methodological changes, only the time series 1989-96 and 1997-2001 are consistent, but not comparable to each other.
Russian Federation: Only Kaliningrad and Leningrad Regions.
United Kingdom: The difference between 1992 and subsequent years is mainly due to a change of assessment method in line with that used in other states.

Table 2.1.b: Defoliation, coniferous trees

	Conifers											
	% of total of sampled trees in defoliation classes 2-4 (moderately or severely defoliated or dead)											
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Albania	..	..	..	..	..	..	..	..	12.0	12.1	12.3	12.4
Austria	8.3	7.0	6.6	8.2	7.9	6.6	7.3	6.3	6.3	6.4	9.1	9.6
Belarus	57.0	..	33.7	33.8	44.0	43.9	43.1	41.2	33.9	28.9	26.1	23.4
Belgium	23.6	23.4	23.0	18.3	21.2	21.0	25.8	19.2	13.5	15.5	19.5	17.5
Bosnia & Herzegovina	..	..	..	..	..	..	..	..	..	..	..	..
Bulgaria	37.4	26.5	25.5	26.9	25.0	41.4	46.5	53.5	69.8	48.9	46.4	39.1
Croatia	..	..	26.2	33.9	39.3	57.5	57.0	68.7	45.8	53.2	53.3	65.1
Cyprus	..	..	..	..	..	..	..	..	..	..	..	8.9
Czech Republic	46.9	46.3	57.9	51.5	59.0	60.7	74.9	71.9	54.6	57.4	58.3	58.1
Denmark	18.8	31.4	28.6	37.0	38.7	34.8	23.2	15.9	17.0	9.9	8.8	6.7
Estonia	20.0	28.0	29.5	21.2	16.0	14.2	14.6	11.4	9.0	9.1	7.5	8.8
Finland	18.0	17.2	15.2	15.6	13.1	13.7	13.7	12.8	12.2	11.9	12.0	11.4
France	6.6	6.7	7.1	8.2	8.2	9.2	13.5	16.2	16.8	14.1	12.0	14.0
Georgia	..	..	..	..	..	..	..	..	..	..	..	..
Germany	15.0	24.8	23.8	21.4	21.6	18.3	16.7	15.4	19.0	19.2	19.6	20.0
Greece	10.0	7.2	12.3	13.9	13.2	13.6	14.4	13.8	12.9	13.5	16.5	17.2
Hungary	23.3	17.8	20.1	20.1	21.2	18.7	17.8	17.4	18.7	17.6	21.5	19.5
Iceland	..	..	..	..	..	..	..	..	..	..	..	..
Ireland	5.4	15.0	15.7	29.6	19.7	26.3	13.0	13.6	16.1	13.0	14.6	17.4
Italy	19.2	13.8	17.2	15.1	15.0	19.4	25.1	28.1	25.5	23.1	19.2	19.1
Latvia	43.0	..	45.0	41.0	34.0	23.0	24.8	21.9	18.9	20.6	20.1	15.8
Liechtenstein	..	..	18.0	..	..	..	..	..	..	..	..	..
Lithuania	22.9	27.8	17.5	29.2	26.3	26.6	12.9	13.9	13.6	11.5	12.0	9.8
Luxembourg	..	7.9	6.3	9.0	12.8	12.9	12.7	8.0	10.5	..	7.0	..
Malta	..	..	..	..	..	..	..	..	..	..	..	..
Moldova, Rep. of	..	..	..	45.2	..	33.3	48.4	..	..	..	..	..
Netherlands	21.4	21.4	34.7	30.6	27.7	45.4	43.5	45.3	43.2	..	23.5	20.7
Norway	17.1	19.0	23.4	20.9	22.4	24.0	25.1	28.5	27.5	24.3	21.8	25.1
Poland	40.7	46.9	50.3	50.8	55.6	54.5	40.5	36.8	34.6	30.6	32.1	30.3
Portugal	25.7	19.8	11.3	7.1	5.4	6.6	5.6	7.8	6.6	6.0	4.3	4.3
Romania	..	6.9	10.9	16.6	15.5	15.2	10.4	10.3	9.0	9.1	9.8	9.6
Russian Federation	6.0	4.2	5.4	4.5	9.4	10.1	9.4	..	..	..	..	9.8
Slovak Republic	55.5	38.5	44.0	49.9	50.3	52.0	41.0	42.2	40.3	40.2	37.9	38.7
Slovenia	34.6	31.3	..	27.0	19.0	33.6	26.0	32.5	36.7	38.0	34.5	32.2
Spain	4.5	7.3	13.5	14.7	19.1	18.1	18.1	11.5	12.9	9.8	12.0	11.6
Sweden	16.1	12.3	16.9	10.6	16.2	14.5	16.9	15.9	15.0	13.6	13.5	18.4
Switzerland	17.9	18.0	14.1	17.4	19.6	23.2	21.4	19.9	19.7	18.3	33.0	19.1
Turkey	..	..	..	..	..	..	..	..	..	..	..	..
Ukraine	3.0	6.4	13.8	21.7	34.8	25.7	45.8	32.7	64.9	50.0	47.3	16.8
United Kingdom	45.0	51.5	52.7	16.8	15.0	13.0	13.9	17.0	19.8	20.1	20.2	20.6
Total Europe (MCPFE)												21.0

Source: ICP Forests database (2002).

Comments:

Czech Republic: Only trees older than 60 years assessed until 1997.

France: Due to methodological changes, only the time series 1990-94 and 1997-2001 are consistent, but not comparable to each other.

Germany: For 1990, only data for former Federal Republic of Germany.

Greece: Excluding maquis.

Italy: Due to methodological changes, only the time series 1989-96 and 1997-2001 are consistent, but not comparable to each other.

Russian Federation: Only Kaliningrad and Leningrad Regions.

United Kingdom: The difference between 1992 and subsequent years is mainly due to a change of assessment method in line with that used in other States.

Table 2.1.c: Defoliation, broadleaved trees

	Broadleaves											
	% of total of sampled trees in defoliation classes 2-4 (moderately or severely defoliated or dead)											
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Albania	..	..	..	..	..	..	..	..	8.0	8.1	8.4	8.4
Austria	14.9	11.1	9.3	7.7	7.4	6.5	11.6	12.2	9.6	9.4	7.6	10.4
Belarus	45.0	..	14.8	16.6	18.6	22.9	29.2	23.0	19.3	17.0	16.9	13.3
Belgium	10.0	13.5	11.8	11.7	12.8	26.6	18.5	16.1	19.2	19.1	18.8	18.3
Bosnia & Herzegovina	..	..	..	..	..	..	..	..	..	..	..	..
Bulgaria	17.3	15.3	18.0	16.6	34.4	32.7	33.0	43.9	48.4	35.9	45.8	26.0
Croatia	..	..	13.6	15.6	26.4	35.2	26.0	27.8	21.9	16.8	18.3	18.7
Cyprus	..	..	..	..	..	..	..	..	..	..	..	..
Czech Republic	..	37.6	29.2	54.4	48.0	30.6	34.0	26.5	13.5	17.1	21.4	21.7
Denmark	25.4	27.3	21.2	27.0	32.4	39.7	36.1	28.4	30.1	18.8	13.9	8.5
Estonia	*	.*	0.0	1.1	2.0	1.1	5.3	7.4	1.0	1.1	9.5	2.1
Finland	11.6	7.7	10.1	12.8	12.0	11.0	10.3	8.4	9.4	8.6	9.9	8.8
France	7.7	7.4	8.5	8.4	8.4	14.3	20.1	29.9	26.9	22.9	21.6	23.6
Georgia	..	..	..	..	..	..	..	..	..	..	..	..
Germany	23.8	26.5	32.0	29.9	30.1	29.9	30.8	28.6	25.2	26.9	29.9	25.4
Greece	26.5	28.5	25.0	29.8	35.0	38.2	34.6	34.9	31.7	20.2	20.2	26.6
Hungary	21.5	19.9	21.8	21.2	21.8	20.2	19.5	19.7	19.0	18.2	20.8	21.5
Iceland	..	..	..	..	..	..	..	..	..	..	..	..
Ireland*	..	..	..	..	..	..	..	..	..	..	..	..
Italy	15.4	17.1	18.5	18.3	20.7	18.5	31.2	38.0	38.9	39.3	40.5	46.3
Latvia	27.0	..	19.0	17.8	15.0	10.0	11.4	11.3	13.6	14.2	22.2	14.8
Liechtenstein	..	..	8.0	..	..	..	..	..	..	..	..	..
Lithuania	15.8	14.9	17.6	23.8	23.3	20.8	12.2	15.9	19.7	11.8	17.7	16.3
Luxembourg	..	33.9	30.5	31.0	46.8	51.4	49.8	41.8	33.3	..	33.5	..
Malta	..	..	..	..	..	..	..	..	..	..	..	..
Moldova, Rep. of	..	..	..	50.9	21.9	40.5	41.1	30.0	..	41.4	29.2	36.9
Netherlands	11.5	9.4	31.1	13.1	5.1	10.8	19.2	17.8	14.0	..	18.8	18.5
Norway	18.2	25.1	38.9	42.1	47.6	47.4	45.0	38.9	42.2	44.8	34.0	33.7
Poland	25.6	34.8	40.4	45.6	51.5	46.7	37.4	35.8	34.8	31.1	32.0	31.4
Portugal	34.1	36.6	29.1	7.5	5.8	10.4	8.3	8.6	12.0	13.7	13.2	12.8
Romania	..	10.4	18.4	21.4	22.9	18.0	18.7	16.9	13.3	14.0	15.8	14.7
Russian Federation	10.2	..	..	..	39.4	34.4	..	..	..	..	..	..
Slovak Republic	31.3	21.1	30.0	29.1	35.6	35.8	28.0	23.3	27.0	19.3	13.9	26.9
Slovenia	4.4	5.8	..	11.0	13.0	19.3	15.0	21.4	21.7	23.2	18.4	26.7
Spain	4.8	7.4	11.2	11.4	19.6	28.7	20.7	15.8	14.4	16.1	15.7	14.4
Sweden	*	*	*	*	*	7.9	20.7	6.1	7.4	8.7	7.5	14.1
Switzerland	12.3	13.3	11.1	12.7	16.2	27.0	19.8	12.5	18.1	20.4	22.1	16.3
Turkey	..	..	..	..	..	..	..	..	..	..	..	..
Ukraine	2.7	6.4	20.2	21.6	29.9	33.0	46.2	30.7	43.2	59.7	69.6	53.3
United Kingdom	28.8	65.6	67.8	17.1	12.4	14.5	15.0	22.0	22.9	23.2	23.8	21.9
Total Europe (MCPFE)												24.4

* Only coniferous trees are assessed.

Source: ICP Forests database (2002).

Comments:

Czech Republic: Only trees older than 60 years assessed until 1997.

France: Due to methodological changes, only the time series 1990-94 and 1997-2001 are consistent, but not comparable to each other.

Germany: For 1990, only data for former Federal Republic of Germany.

Greece: Excluding maquis.

Italy: Due to methodological changes, only the time series 1989-96 and 1997-2001 are consistent, but not comparable to each other.

Russian Federation: Only Kaliningrad and Leningrad Regions.

United Kingdom: The difference between 1992 and subsequent years is mainly due to a change of assessment method in line with that used in other States.

Table 2.2: Area of damage to forest and other wooded land by different damaging agents

	Reference period	Total area with damage by known causes	Primarily damaged by					Total area with damage by unidentified causes
			Storm, wind, snow or other identifiable abiotic factors	Insects and disease	Wildlife and grazing	Known local pollution sources	Fire	
		(1 000 ha)						
Albania	2001	677.6	0.0	135.0	12.7	11.9	518.0	0.0
Austria	1991-00	140.0	13.0	55.0	72.0	0.0	0.0	14.0
Belarus	..	8.9	5.8	0.4	0.1	0.0	2.6	0.6
Belgium	1994-99	87.5	..	45.1	40.5	..	1.9	..
Bosnia & Herzegovina	..	..	..	..	..	..	..	..
Bulgaria	..	63.0	13.8	18.7	23.5	..	7.0	..
Croatia	1986-96	16.0	..	15.0	1.0	..	11.0	..
Cyprus	1990-99	1.2	0.0	0.0	0.0	0.0	1.2	0.0
Czech Republic	1988-97	451.0	44.0	355.0	30.0	18.0	4.0	13.0
Denmark	1990-00	22.7	20.0	0.0	2.5	0.0	0.2	..
Estonia	1996	5.1	0.4	3.5	0.7	..	0.5	..
Finland	1991-00	4 713.0	1 650.0	1 495.0	114.0	1.0	3.0	1 451.0
France	1995-98	264.4	1.8	200.0	45.0	0.0	17.6	0.0
Georgia	..	..	..	..	..	..	..	..
Germany	..	..	..	..	..	..	..	..
Greece	..	..	..	..	..	..	37.2	..
Hungary	2001	205.8	30.1	146.2	27.9	0.0	1.6	2.6
Iceland	..	10.0	2.0	3.0	5.0	0.0	0.0	..
Ireland	2001	..	2 661.0	..	..	..	939.0	..
Italy	1995	129.6	17.5	66.0	6.0	0.1	40.0	6.5
Latvia	1996	1.6	0.2	0.9	0.2	0.0	0.3	0.0
Liechtenstein	..	0.7	..	0.1	0.4	0.3	..	..
Lithuania	2001	54.4	0.6	38.5	15.3	..	0.0	..
Luxembourg	..	..	0.0	0.0	0.0	0.0	0.0	0.0
Malta	..	..	..	..	..	..	..	..
Moldova, Republic of	..	61.2	..	61.2	..	..	0.0	..
Netherlands	1990-95	0.3	0.0	0.0	0.0	0.0	0.3	0.0
Norway	1994-96	1 164.0	832.0	112.0	218.0	2.0	0.0	0.0
Poland	1992-96	..	196.0	309.0	389.0	..	13.0	..
Portugal	2001	437.3	32.6	363.6	0.0	0.0	41.1	34.9
Romania	1993-97	67.6	..	0.0	0.7	66.9	0.0	..
Russian Federation	1998	299.5	20.0	9.6	0.2	0.2	268.4	23.5
Slovak Republic	1997-01	21.2	8.3	11.5	0.8	9.1	0.6	3.2
Slovenia	2001	1.8	0.3	0.7	0.1	0.0	0.3	0.3
Spain	1990	..	1 000.0	500.0	..	..	100.0	1 000.0
Sweden	1998-01	1 518.0	562.7	323.6	629.5	..	2.3	146.1
Switzerland	..	1.0	..	0.7	..	0.1	0.2	230.0
Turkey	1992-96	22.0	5.0	4.0	..	..	13.0	..
Ukraine	1992-96	100.9	18.3	49.0	0.4	..	33.1	0.4
United Kingdom	1995	240.0	135.0	30.0	67.0	0.0	8.0	10.0
Total Europe (MCPFE)		10 787.3	7 270.4	4 352.3	1 702.5	109.6	2 028.2	2 936.1

Source: UNECE/FAO (2000) (Table 70) and updates.

Note: In Croatia, Liechtenstein, the Slovak Republic and Sweden the sum of areas primarily damaged by storm, wind, snow, insects and diseases, wildlife and grazing, known local pollution sources and fire is higher than the figures reported under 'total area with damages by known causes' due to possible double counting of the same areas affected by different causes of damage. In Finland, France, the Russian Federation, Slovenia and Ukraine the total area with damages by known causes is slightly larger than the sum of the areas affected by different causes of damage, possibly due to the fact that other than the listed damaging agents occurred.

Comments:
Belgium: Area was damaged during the reference period; it is not an annual average.
Finland: Damages caused by tree harvesting are included in column 'Storm, wind, etc.'.
Slovak Republic: Pollution damage from known local sources: only the area acutely damaged was included (Pollution Zone C, where the life expectation of forest tree species is less than 40 years).

Table 2.3: Number and area of forest fires

	Number of forest fires					Area of forest fires (ha)				
	1997	1998	1999	2000	Average 97-00	1997	1998	1999	2000	Average 97-00
Albania	735	601	628	915	720	1 847	680	4 761	12 339	4 907
Austria	56	84	33	39	53	22	93	8	42	41
Belarus	1 466	876	3 959	2 569	2 218	965	547	6 261	1 931	2 426
Belgium	35	20	20	4	20	280	30	4	2	79
Bosnia & Herzeg.	139	139	139	139	139	881	881	881	881	881
Bulgaria	200	578	320	1 710	702	595	6 967	8 291	57 406	18 315
Croatia	305	441	223	706	419	6 784	32 055	6 053	68 166	28 265
Cyprus	19	19	20	285	86	167	566	3	8 035	2 193
Czech Republic	1 398	2 563	1 403	1 499	1 716	3 475	1 132	336	375	1 330
Denmark	7	..	0	0	2	10	..	0	0	2
Estonia	359	61	130	158	177	1 114	54	1 103	684	739
Finland	1 192	231	1 543	825	948	1 171	95	623	374	566
France	8 005	6 289	4 952	2 908	5 539	21 581	19 283	15 864	20 459	19 297
Georgia	11	6	6	6	7	98	105	105	105	103
Germany	1 467	1 032	1 178	1 210	1 222	599	397	415	581	498
Greece	2 273	1 842	1 486	2 581	2 046	34 781	92 901	8 289	140 267	69 060
Hungary	393	393	258	696	435	1 349	1 349	754	1 595	1 262
Iceland	..	..	..	..	..	..	..	..	..	..
Ireland	143	143	143	143	143	461	461	461	461	461
Italy	11 612	9 540	6 932	10 038	9 531	111 230	155 553	90 130	140 384	124 324
Latvia	768	357	1 196	915	809	604	211	1 544	1 341	925
Liechtenstein	..	..	..	..	..	..	..	..	..	..
Lithuania	565	231	1 022	606	606	139	93	215	215	165
Luxembourg	1	0	0	0	0	1	0	0	0	0
Malta	..	..	..	..	..	..	..	..	..	..
Moldova, Rep. of	0	2	2	2	2	0	10	10	10	7
Netherlands	68	74	74	74	73	222	207	207	207	211
Norway	108	14	148	97	92	870	300	861	1 713	936
Poland	6 528	5 946	9 405	12 428	8 577	6 598	4 019	8 307	7 013	6 484
Portugal	23 497	34 676	25 477	34 109	29 440	30 534	158 369	70 613	159 605	104 780
Romania	34	181	139	688	261	46	729	381	3 607	1 191
Russian Federation	31 300	28 000	36 600	22 400	29 575	726 700	4 268 800	751 700	1 328 600	1 768 950
Slovak Republic	535	1 056	751	824	792	35	32	96	105	67
Slovenia	59	151	53	98	90	493	1 254	433	265	611
Spain	22 319	22 445	18 237	24 117	21 780	98 503	133 643	82 217	187 026	125 347
Sweden	8 434	5 258	5 258	5 258	6 052	6 386	2 989	2 989	2 989	3 838
Switzerland	77	88	41	53	65	1 932	249	22	66	567
Turkey	1 339	1 932	2 075	2 353	1 925	6 011	6 764	5 804	26 353	11 233
Ukraine	2 309	3 915	6 070	3 696	3 998	1 835	4 706	6 494	1 905	3 735
United Kingdom	375	158	81	47	165	332	54	171	266	206
Total Europe (MCPFE)	1 28131	129 342	130 002	134 196	130 425	1068 651	4 895 578	1 076 406	2 175 373	2 304 002

Sources: UNECE/FAO (2000) (Table 8) and updates; UNECE Forest Fire Statistics (2002).

Comments:
Cyprus: Data for 1998-1999 cover only state forests. Data for 2000 cover both state and private forest and other wooded land. The given area is the total burned area and it includes other land, i.e. agricultural land.
Malta: Area burned is less than 1 ha.
United Kingdom: State forests only.

Table 3.1.a: Gross annual increment and annual fellings

	Gross annual increment (1 000 m³ overbark)					Annual fellings (1 000 m³ overbark)				
	Reference period	Total	Forest	OWL*	Trees outside forest	Reference period	Total	Forest	OWL*	Trees outside forest
Albania	2001	969	969	0	0	2001	245	245	0	0
Austria	1992-96	29 733	29 433	200	100	1992-96	20 041	19 821	150	70
Belarus	1994	36 866	36 866	0	0	1996	9 550	9 550	0	0
Belgium	1994-99	5 289	5 289	0	..	1994-99	3 701	3 701	0	..
Bosnia&Herzeg.	1995	..	..	..	..	1995	..	1 200	..	..
Bulgaria	1995	12 311	12 310	..	1	1995	4 852	4 852	0	0
Croatia	1986-96	9 651	9 651	..	0	1986-96	4 600	4 600	0	0
Cyprus	1990-99	..	109	..	..	1999	35	35	0	0
Czech Republic	1995	23 056	22 915	0	141	1995	16 355	16 345	0	10
Denmark	2000	5 196	4 946	250	..	1999	1 965	1 715	250	..
Estonia	1996	10 110	9 830	160	120	1996	..	4 028	..	..
Finland	1991-00	80 172	79 129	271	772	2000	67 500	67 500	0	0
France	1997	102 215	102 096	0	119	1996	65 006	65 006	..	..
Georgia	1995	..	..	..	..	1995	500	500	0	..
Germany	1995	102 736	100 722	0	2 014	1996	48 584	48 584	0	..
Greece	1992	4 193	4 118	75	..	1992	..	..	..	..
Hungary	2001	12 573	11 973	0	600	2001	7 687	7 287	0	400
Iceland	1998	67	58	9	0	1996	0	0	0	..
Ireland	1996	3 500	3 500	..	..	2001	3 089	3 089	0	..
Italy	1995	32 526	30 822	0	1 704	1995	10 101	8 746	0	1 355
Latvia	1996	17 800	16 500	500	800	1996	8 150	8 010	60	80
Liechtenstein	1995	28	28	..	..	1995	16	16	0	0
Lithuania	2001	12 509	11 904	345	260	1997-01	6 152	5 972	130	50
Luxembourg	1985-97	..	..	..	..	1992-94	..	..	..	..
Malta	1996	..	..	..	..	1996	0	0	..	..
Moldova, Rep. of	1997	1 206	1 140	66	0	1997	483	483	0	0
Netherlands	1991-95	3 158	2 538	0	620	1991-95	2 150	1 561	0	589
Norway	1994-96	27 370	26 209	1 161	0	1994-96	11 632	11 632	0	0
Poland	1997-01	82 544	80 439	0	2 105	1997-01	37 386	36 810	..	576
Portugal	1995-98	19 369	19 054	32	284	1995-98	12 733	12 733	0	0
Romania	1984	..	34 650	..	..	1997-01	8 525	8 525	..	..
Russian Federation	1998	1388 466	1339 166	35 800	13 500	1998	130 179	130 179	0	0
Slovak Republic	2001	13 601	13 601	..	..	1997-01	8 525	8 525	..	..
Slovenia	2001	6 990	6 925	55	10	2001	2 614	2 614	0	0
Spain	1990	30 135	30 120	15	..	1994	15 863	12 639	..	3 224
Sweden	1998-01	103 706	101 598	996	1 112	1998-01	72 621	72 345	0	277
Switzerland	1985-95	10 107	9 831	276	..	1985-95	7 451	7 451	0	..
Turkey	1999	47 242	38 832	3 863	4 547	1999	19 573	15 029	0	4 544
Ukraine	1996	34 960	33 757	10	1 193	1996	11 600	11 300	0	300
United Kingdom	1995-99	21 880	21 300	5	575	1995	9 500	9 500	0	0
Total Europe (MCPFE)		2 287 039	2 247 382	44 089	30 577		626 999	620 413	590	11 475

* OWL is other wooded land.

Source: UNECE/FAO (2000) (Table 42 and Table 47) and updates.

Comments:
France: The amount of fellings has increased from TBFRA due to use of improved branches coefficients.
Hungary: Data for trees outside forest are estimated.
Russian Federation: On forest land 1339,166 million m^3/yr = 970.41 m^3/yr * 1.38, where 1.38 – part of felled and dead trees. On OWL 35.8 million m^3/yr = 71.6 million ha * 0.5 m^3/yrTrees outside forest 13.5 million m^3/yr = 27 million ha * 0.5 m^3/yr.
Slovak Republic: Methodology of calculation of the total annual felling fully compliant with the National FRA-2000. It refers to the volume of all felled trees. Information about fellings on OWL and of trees outside forest is not available.
United Kingdom: Gross annual increment revised to use EFISCEN for forest available for wood supply. Forest not available for wood supply and others unchanged from TBFRA.

Table 3.1.b: Changes of gross annual increment and annual fellings in countries which provided updated data

FRA parameters	Belgium	Denmark	Finland	Hungary	Ireland	Lithuania	Poland	Slovak Republic	Slovenia	Sweden	United Kingdom
(1 000 hectares)											
Gross annual increment, updated	5 289	5 196	80 172	12 573	..	12 509	82 544	13 601	6 990	103 706	21 880
Gross annual increment, TBFRA	5 176	3 770	75 974	12 093	..	12 844	57 984	15 929	7 120	103 415	15 390
Change, gross annual increment	2.2%	37.8%	5.5%	4.0%	..	–2.6%	42.4%	–14.6%	–1.8%	0.3%	42.2%
Annual fellings, updated	3 701	1 965	67 500	7 687	3 089	6 152	37 386	8 525	2 614	72 621	9 500
Annual fellings, TBFRA	4 400	2 444	54 300	6 449	2 330	5 750	32 212	7 400	2 300	67 766	9 500
Change, annual fellings	–15.9%	–19.6%	24.3%	19.2%	32.6%	7.0%	16.1%	15.2%	13.7%	7.2%	0.0%

Source: UNECE/FAO (2000) and updates.

Table 3.2: Quantity and value of wood from forest and other wooded land

	Reference period	Total wood produced (1 000 m^3)	Value of wood produced (million €)
Albania	2001	244.7	0.64
Austria	2001	13 467	821
Belarus	1995	9 830	34.5
Belgium	1994-99	3 701.2	111.4
Bosnia & Herzegovina		..	..
Bulgaria		..	..
Croatia	1996	3 000	126.9
Cyprus	1999	35	0.881
Czech Republic	1993-95	11 568	319.9
Denmark	1999	1 715	63.4
Estonia		..	..
Finland	2000	61 500	1 557.6
France		40 600	1 739.9
Georgia		..	..
Germany		39 272	1 753.2
Greece		..	..
Hungary	2001	5 811	146.9
Iceland	1998	0.15	0.13
Ireland	2001	3 089	..
Italy	1995	10 101	484.8
Latvia		..	..
Liechtenstein		..	..
Lithuania	2001	5 472	92.5
Luxembourg		..	..
Malta		..	..
Moldova, Republic of	1991-96	362	..
Netherlands		1 080	47.7
Norway	1994-96	9 340	425.1
Poland	2001	26 671	1 127.2
Portugal	2000	10 831	276.8
Romania		..	..
Russian Federation	1999	90 054	2 643.0
Slovak Republic		5 459	164.7
Slovenia	2001	2 700	73.1
Spain		..	..
Sweden	..	61 200	1 945.2
Switzerland	1996	5 400	383.7
Turkey	1999	13 191	370.9
Ukraine		..	..
United Kingdom	1995	7 951	272.7
Total Europe (MCPFE)		443 645	14 885

Source: UNECE/FAO (2000) (Chapter VI, Table 6.3) and updates.

Comments:
Belgium: Average for 94-99, but with actual change.
Hungary: Value of wood sold.
Portugal: The reported volumes are overbark. Portugal assumed that all the broadleaved wood removed is from *Eucalyptus globulus* and all the coniferous removed wood is from *Pinus pinaster*. The prices applied are, respectively, the price of eucalyptus and pine wood.

Table 3.3: Management of forest and other wooded land

	Reference period	Managed from total FOWL* (%)
Albania	2001	100.0
Austria	1992-1996	100.0
Belarus	1997	93.6
Belgium	1997	100.0
Bosnia & Herzegovina	1995	74.1
Bulgaria	1995	92.0
Croatia	1996	74.1
Cyprus	1999	41.0
Czech Republic	1996	100.0
Denmark	2000	100.0
Estonia	1996	52.2
Finland	1991-1996	85.6
France	1999	69.2
Georgia	1995	81.6
Germany	1987	100.0
Greece	1992	39.0
Hungary	2001	100.0
Iceland	1985	10.0
Ireland	2001	93.8
Italy	1995	100.0
Latvia	1997	100.0
Liechtenstein	1995	100.0
Lithuania	2001	98.8
Luxembourg	1994-1997	11.6
Malta	1996	100.0
Moldova, Republic of	1997	100.0
Netherlands	1992-1996	100.0
Norway	1989	77.4
Poland	1997-2001	100.0
Portugal	1995	33.8
Romania	1990	100.0
Russian Federation	1998	100.0
Slovak Republic	2001	95.4
Slovenia	2001	100.0
Spain	1985-1995	68.0
Sweden	1998-2001	100.0
Switzerland	1993-1995	93.4
Turkey	1999	100.0
Ukraine	1996	100.0
United Kingdom	1995	93.2

* FOWL is forest and other wooded land.

Sources: FAO (2001) (Table 9), UNECE/FAO (2000) (Table 10) and updates.

Comments:

France: The figure proposed in 1997 is not relevant and may not be compared to the new one. A new survey has been carried out in private forests in 1999: the area of FOWL where private owners are involved in a 'forest development network' may be considered as 'managed' according to the FAO definition. Public FOWL are considered as managed on 100% of area.

Slovak Republic: Non-managed forests is the area of national (strict) nature reserves, nature reserves and nature monuments where neither felling nor other management interventions are allowed following the Act no. 287/1994 Z.z. on Nature and Landscape Protection = 4.59% of the total forest area in the Slovak Republic.

Sweden: Sweden considers all areas in Sweden to have either a formal or an informal management plan (as written in the definitions), and that is the reason why the areas in this column are the same as 'total area'. The formal or informal plan might also mean that no treatments are allowed – which is also a management plan.

Table 3.4: Quantity and value of non-wood forest products from forest and other wooded land

	Reference period	Christmas trees	Value of Christmas trees	Cork	Value of cork	Mushrooms and truffles	Value of mushrooms and truffles	Fruits and berries	Value of fruits and berries	Medicinal plants	Value of medicinal plants	Decorative foliage	Value of decorative foliage
		(1 000 Pcs)	(1 000 €)	(tonnes)	(1 000 €)	(tonnes)	(1 000 €)	(tonnes)	(1 000 €)	(tonnes)	(1 000 €)	(tonnes)	(1 000 €)
Albania	8	0	0	0	0	43	30	33	50	8.8	8 810	0	0
Austria	..	..	..	..	..	..	..	..	..	..	..	..	..
Belarus	****	..	..	..	..	10 100	13 300	8 100	7 100	297	26.4	..	..
Belgium	..	..	..	..	..	..	..	..	..	..	..	..	..
Bosnia & Herzegovina	..	..	..	..	..	..	..	..	..	..	..	..	..
Bulgaria	..	..	..	..	..	..	..	..	..	..	..	..	..
Croatia	..	..	..	..	..	..	..	..	..	..	..	..	..
Cyprus	1996	6.6	50.2	..	..	80	230	..	..	..	..	..	..
Czech Republic	..	..	..	..	..	23 900	34 500	22 700	34 500	..	..	..	..
Denmark	2000	8 105.2	72 242	..	..	..	..	..	..	..	..	32 500	37 700
Estonia	1996	308.4	1 281.9	..	..	4 130	6 100	8 043	7 700	..	..	..	..
Finland	2000	440.5	5 638.4	..	..	9 000	20	40 000	40	..	3 838.5	314	1 100
France	1997-99	..	..	6 950	956.8	9 890	49 300	5 500	..	..	..	..	..
Georgia	..	..	..	..	..	..	..	..	..	..	..	..	..
Germany	..	17 620	207 294	..	..	..	..	..	..	..	..	..	..
Greece	..	..	..	..	..	..	..	..	..	..	..	..	..
Hungary	..	..	..	..	..	..	..	..	..	..	..	..	..
Iceland	1998	7.1	39.6	..	..	..	..	..	..	..	..	..	..
Ireland	1996	105.72	616.7	..	..	..	..	..	..	..	..	..	..
Italy	1995	..	..	10 374	6 343.2	2 413	39 400	496	2 500	..	..	..	..
Latvia	..	..	..	..	..	..	..	..	..	..	..	..	..
Liechtenstein	..	..	..	..	..	..	..	..	..	..	..	..	..
Lithuania	2001	264.3	660.8	..	..	1 316	4 000	4 930	5 900	57	73.1	..	..
Luxembourg	..	..	..	..	..	..	..	..	..	..	..	..	..
Malta	..	..	..	..	..	..	..	..	..	..	..	..	..
Moldova, Republic of	****	..	..	..	..	..	..	351.4	20	15.4	12.9	..	..
Netherlands	1996	185.8	18 767.1	..	..	..	..	..	..	..	..	..	..
Norway	1994-96	881	18 633.2	..	..	1 200	4 800	25 000	39 900	..	..	375	1 100
Poland	2001	142.7	..	..	..	3 276	..	8 745	..	..	..	..	..
Portugal ***	1992-00	..	..	128 733	167 653	760	5 300	40 100	8 800	..	..	..	..
Romania	..	..	..	..	..	..	..	..	..	..	..	..	..
Russian Federation *	****	..	..	..	..	213	..	780	..	510	..	..	..
Slovak Republic	2001	528.6	3 524	..	..	8 750	8 500	15 200	10 100	178	202.6	8 303	1 900
Slovenia	2001	92.5	770.9	0	0	447	4 100	600	1 300	..	..	..	..
Spain	..	..	..	..	..	..	..	..	..	..	..	..	..
Sweden	****	1 762	12 334	..	..	5 000	14 500	26 000	35 100	..	..	..	..
Switzerland	1996	352.4	3 765.4	..	..	735	5 700	..	..	25	2.2	11 750**	..
Turkey	1999	0	0	15	70	21	..	318	..	4 444	..	660	..
Ukraine	..	..	..	..	..	..	..	..	..	..	..	300	..
United Kingdom	1995	2643	58 733.6	..	..	..	..	..	..	..	..	..	..
Total Europe (MCPFE)		33 445.5	404 352.1	146 072	174 953	81 274	189 780	206 896	153 010	5 535	12 965.7		41 800

* For Russian Federation data were derived from Forest and Forest Products Country Profile: Russian Federation, ECE/TIM/SP/18.

** Quantity in cubic metres.

*** The productions and prices have been calculated as the average of the productions and prices of the cork production cycle (nine years), the reference period varies 1992-2000 depending on product, and data refer to mainland territory.

**** Different reference years for various products.

Source: UNECE/FAO (2000) and updates.

Table 3.4: Quantity and value of non-wood forest products from forest and other wooded land (cont.)

	Reference period	Game meat	Game harvest	Value of game	Pelts	Value of pelts	Quantity of honey	Value of honey	Quantity of nuts	Value of nuts
		(tonnes)	(1 000 Pcs)	(1 000 €)	(1 000 Pcs)	(1 000 €)	(tonnes)	(1 000 €)	(tonnes)	(1 000 €)
Albania	2001	..	2 10.1	130	..	..	..	..	..	..
Austria	..	..	..	..	..	..	..	..	..	..
Belarus	1995	2 830	..	4 200	..	13.2	30	96.1	20	26.4
Belgium	1991	..	..	13 900	..	..	..	..	0	0
Bosnia & Herzegovina	..	..	..	..	..	..	..	..	..	..
Bulgaria	..	..	..	..	..	..	..	..	..	..
Croatia	..	..	..	..	..	..	..	..	..	..
Cyprus	..	..	25	410	..	..	..	..	..	..
Czech Republic	1992	6 790	695	..	..	..	..	..	..	..
Denmark	..	..	..	..	..	..	..	..	..	..
Estonia	1996	600	..	1 800	5.8	70.5	..	..	..	..
Finland	1996	10 200	1 449	46 700	275	2 396.3	..	..	..	..
France	***	..	..	92 600	..	..	600	3964.5	..	..
Georgia	..	..	..	..	..	..	..	..	..	..
Germany	1996	..	..	155 100	..	..	..	..	..	..
Greece	..	..	..	..	..	..	..	..	..	..
Hungary	2000	6 604	157.6	7 800	..	..	7 600	18 693.1	..	..
Iceland	..	..	..	..	..	..	..	..	..	..
Ireland	..	..	..	..	..	..	..	..	..	..
Italy	..	..	..	..	..	..	..	..	94 944	83 871.2
Latvia	..	..	..	..	..	..	..	..	..	..
Liechtenstein	..	..	..	..	..	..	..	..	..	..
Lithuania	1996	853	..	900	22	103.1	..	..	..	..
Luxembourg	..	..	..	..	..	..	..	..	..	..
Malta	..	..	..	..	..	..	..	..	..	..
Moldova, Republic of	***	..	..	..	..	..	11	17.6	47.5	17.6
Netherlands	1996	..	1 148	16 900	..	..	..	..	..	..
Norway	1995	6 600	..	58 600	50	555	1 500	..	..	..
Poland	1996	8 153	..	..	..	..	..	..	..	..
Portugal	2000	..	3 304	34 600	..	..	4 461	5 365.3	33 861	23 080.4
Romania	..	..	..	..	..	..	..	..	..	..
Russian Federation *	1998	..	2 730 000	..	20 000	..	107	..	74	..
Slovak Republic **	2001	1 673.1	48.7	2 500	..	..	2 500	2 378.7	200	97.8
Slovenia	2001	1 119	..	6 100	..	..	1 600	5 902.7	..	..
Spain	..	..	..	..	..	..	..	..	..	..
Sweden	***	17 152	556	58 800	103	748.9	700	4 757.4	..	..
Switzerland	1996	1 597	..	9 900	30	211.4	513	5 559.1	12	44.1
Turkey	..	..	..	..	..	..	..	..	907	227.3
Ukraine	..	..	..	..	..	..	..	..	..	..
United Kingdom	..	850	..	4 900	..	..	..	..	..	..
Total Europe (MCPFE)		63 348	2 737 436	515 840	20 486	4 098.4	19 622	46 734.5	130 018	107 364.8

* For the Russian Federation data were derived from Forest and Forest Products Country Profile: Russian Federation, ECE/TIM/SP/18.

** Concerning game, figures refer to the forest-related game species including red dear, roe-dear, wild boar, mouflon and fallow deer.

*** Different reference years for various products.

Source: UNECE/FAO (2000) and updates.

Table 4.1: Forest and other wooded land area by categories of 'naturalness'

		Forest (1 000 ha)			Other wooded land (1 000 ha)	
	Reference period	Undisturbed by man	Semi-natural	Plantations	Undisturbed by man	Semi-natural
Albania	2001	84.8	843.2	102.0	0.0	22.0
Austria	1992-1996	34.0	3 806.0	0.0	84.0	0.0
Belarus	1994-1997	43.5	7 626.5	194.8	0.0	1 071.3
Belgium	2000	0.0	395.8	271.5	1	27.1
Bosnia & Herzegovina	1995	0.0	2 219.3	56.9	0.0	433.6
Bulgaria	1995	256.5	2 364.6	968.5	0.0	313.8
Croatia	1996	2.4	1 725.7	47.0	33.0	297.0
Cyprus	1999	10.6	157.2	3.8	21	193
Czech Republic	1995	0.0	2 630.0	0.0	0.0	0.0
Denmark	2000	0.4	126.1	359.5	10.0	10.0
Estonia	1996	2.0	1 709.0	305.0	0.0	146.0
Finland	1991-2000	1 202.0	20 830.0	0.0	75.0	775.0
France	1997	30.0	13 465.0	1 661.0	..	1 833.0
Georgia	1995	550.0	2 238.4	200.0	0.0	0.0
Germany	1997	0.0	10 740.0	0.0	0.0	0.0
Greece	1992	..	..	120.0	0.0	3 154.0
Hungary	2001	0.1	1 743.2	129.7	0.0	0.0
Iceland	1998	0.0	18.0	12.0	0.0	100.0
Ireland	2001	0.0	0.0	624.0	1.0	40.0
Italy	1995	6.0	9 718.0	133.0	197.0	788.0
Latvia	1997	4.0	2 737.0	143.0	0.0	111.0
Liechtenstein	1995	1.5	5.1	0.3	0.3	0.2
Lithuania	2001	12.0	1 738.0	284.0	0.0	85.0
Luxembourg	1994	0.0	..	..	0.0	2.8
Malta	1996	0.0	0.0	0.3	0.0	0.0
Moldova, Republic of	1997	0.0	322.8	1.3	0.0	30.8
Netherlands	1992-1996	0.0	239.0	100.0	0.0	0.0
Norway	1994-1996	250.0	8 160.0	300.0	329.0	2 961.0
Poland	1992-1996	144.0	8 758.0	39.0	0.0	0.0
Portugal	1995-1998	0.0	2 588.0	719.9	0.0	41.4
Romania	1990-1997	233.2	5 977.4	90.6	..	..
Russian Federation	1998	260 768.7	534 238.3	15 360.0	38 014.0	33 593.0
Slovak Republic	2001	25.0	1 998.0	15.0	0.0	..
Slovenia	2001	50.0	1 092.6	0.3	0.0	51.0
Spain	1990	5.0	11 600.0	1 904.0	3.0	12 472.0
Sweden	1998-2001	4 531.3	22 151.4	610.3	3 180.5	85.5
Switzerland	1997	7.0	1 162.0	4.0	0.0	61.0
Turkey	1999	188.0	7 845.0	1 994.0	148.0	10 584.0
Ukraine	1996	59.0	4 974.0	4 425.0	6.0	30.0
United Kingdom	1995-1999	0	772	1 979.0	0.0	20.0
Total Europe (MCPFE)		268 679	698 537	33 159	42 316	69 118
		27%	70%	3%	38%	62%

Source: UNECE/FAO (2000) (Table 53) and updates.

Comments:

Belgium: Note for Flanders: only the poplar stands are considered plantations: one species, even age class, regular spacing (and great plant distance). The stands of Corsican pine and Scotch pine are considered as semi-natural. These stands were established as so-called plantations (one species, even age, regular spacing), but are not intensively managed, and are (now or in the near future) reformed to mixed stands. Note for Wallonia: the coniferous stands are all considered plantations. Note for Brussels: the whole area is classified as semi-natural broaleaved forest.

France: Using the exact FAO definition of 'plantations' leads to a total area of plantations of 1 661 thousand ha.

Hungary: 'Plantations' includes the total area of genetically improved poplar stands, plus area of stands where regular spacing was applied to enhance wood production.

Portugal: The area reported in TBFRA 2000 under forest 'Undisturbed by man' referred to Madeira and the Azores. The current data only concern the mainland territory.

Russian Federation: On forest land 260.7687 million ha is mature and old-mature stands. On OWL 38.014 million ha is dwarf pine area.

Slovak Republic: Increase in the category of 'forests undisturbed by man' is related to the long-term (>50 years) strict non-intervention regime in non-managed forests.

United Kingdom: Semi-natural unchanged from TBFRA (as it used in recent study, not projection from 1980), so plantations adjusted to agree with new total.

Table 4.2: Reported number of forest-occurring endangered tree and vascular plant species

	Forest-occurring tree species		Forest-occurring vascular plant species	
	Total	of which endangered	Total	of which endangered
Albania	120	21	1 460	38
Austria	58	9	1 049	271
Belarus	33	2	850	107
Belgium	38	3	131	37
Bosnia & Herzegovina	..	..	..	..
Bulgaria	210	..	..	..
Croatia	..	..	..	..
Cyprus	47	1	1 500	22
Czech Republic	277	14	655	83
Denmark	63	7	256	50
Estonia	62	13	240	69
Finland	33	8	213	35
France	104	0	611	11
Georgia	..	..	..	..
Germany	63	0	601	6
Greece	..	..	..	..
Hungary	79	4	..	5
Iceland	27	0	..	1
Ireland	85	0	130	8
Italy	86	1	..	..
Latvia	47	2	480	94
Liechtenstein	..	..	..	..
Lithuania	32	2	713	102
Luxembourg	..	..	..	..
Malta	2	0	6	0
Moldova, Republic of	47	7	130	18
Netherlands	74	27	317	72
Norway	43	2	700	60
Poland	81	1	524	..
Portugal	87	5	490	16
Romania	..	..	..	..
Russian Federation	68	4	90	15
Slovak Republic	57	7	1 500	360
Slovenia	73	5	..	..
Spain	..	..	..	..
Sweden	30	7	360	92
Switzerland	44	4	442	110
Turkey	..	..	..	..
Ukraine	148	14	730	200
United Kingdom	..	..	..	..

Source: UNECE/FAO (2000) (Table 56, 57) and updates.

Table 4.3: Area managed for ex situ gene conservation

	Reference year	Area managed for ex situ gene conservation (ha)
Albania	2002	..
Austria	2002	41
Belarus	2002	..
Belgium	2002	38
Bosnia & Herzegovina	2002	..
Bulgaria	2002	74
Croatia	2002	5
Cyprus	2002	8
Czech Republic	2002	341
Denmark	2002	4
Estonia	2002	224
Finland	2002	325
France	2002	16 115
Georgia	2002	..
Germany	2002	1 026
Greece	2002	..
Hungary	2002	23
Iceland	2002	..
Ireland	2002	18
Italy	2002	102
Latvia	2002	..
Liechtenstein	2002	..
Lithuania	2002	333
Luxembourg	2002	..
Malta	2002	..
Moldova, Republic of	2002	..
Netherlands	2002	8
Norway	2002	6 310
Poland	2002	816
Portugal	2002	..
Romania	2002	366
Russian Federation	2002	7 659
Slovakia	2002	2 197
Slovenia	2002	27
Spain	2002	11
Sweden	2002	304
Switzerland	2002	7
Turkey	2002	1 040
Ukraine	2002	1
United Kingdom	2002	20
Total Europe (MCPFE)	2002	47 443

Source: IPGRI/EUFORGEN database (2003).

Table 4.4: Mixed forest

	Reference period	Mixed forest	Forest area	Share of mixed forest
		(1 000 ha)		(%)
Albania	2001	329	1 030	32
Austria	1992-1996	757	3 840	20
Belarus	1994-1997	3 067	7 865	39
Belgium	2000	46	667	7
Bosnia & Herzegovina	1995		2 273	..
Bulgaria	1995	376	3 588	10
Croatia	1996	159	1 775	9
Cyprus	1996	0	172	0
Czech Republic	1995	1 464	2 630	56
Denmark	2000	75	486	15
Estonia	1996	812	2 010	40
Finland	1991-2000	2 734	22 032	12
France	1997	1 365	15 156	9
Georgia	1995		2 988	..
Germany	1997	1 973	10 740	18
Greece	1992	0	3 359	0
Hungary	2001	229	1 873	12
Iceland	1998	2	30	7
Ireland	2001	28	624	4
Italy	1995	692	9 855	7
Latvia	1997	1 223	2 884	42
Liechtenstein	1995	1.80	7	26
Lithuania	2001	366	2 034	18
Luxembourg	1994	2	86	2
Malta	1996	0.347	0.347	100
Moldova, Republic of	1997	0	322	0
Netherlands	1992-1996	50	361	14
Norway	1994-1996	1 818	8 713	21
Poland	1997-2001	1 628	9 088	18
Portugal	1995	430	3 308	13
Romania	1990-1997	0	6 301	0
Russian Federation	1998	372 769	810 367	46
Slovak Republic	2001	372	2 038	18
Slovenia	2001	372	1 143	33
Spain	1990	2 507	13 656	18
Sweden	1998-2001	4 585	27 293	17
Switzerland	1997	233	1 173	20
Turkey	1996	..	10 027	..
Ukraine	1996	1 002	9 460	11
United Kingdom	1995-1999	192	2 751	7
Total Europe (MCPFE)		401 659	1 004 005	40

Source: UNECE/FAO (2000) (Tables 3 and 4) and updates.

Comments:
Slovak Republic: Information refers to forests on forest land (2 006 000 ha). No information is available for forests on farmland (32 000 ha).

Table 4.5: Share of different types of regeneration*

	Natural regeneration	Natural regeneration enhanced by planting	Coppice sprouting	Planting or seeding
	(%)			
Albania	58.0	1.0	40.0	1.0
Austria	76.0	10.0	0	14.0
Belarus	10.7	0	4.6	84.7
Belgium	25.3	..	..	74.7
Bosnia & Herzegovina	..	..	..	..
Bulgaria	37.5	16.8	10.0	35.7
Croatia	71.8	7.7	12.8	7.7
Cyprus	100.0	0	0	0
Czech Republic	0	4.2	0	95.8
Denmark	6.0	7.0	..	87.0
Estonia	21.3	11.5	0	67.2
Finland	30.2	..	0	69.8
France	35.0	..	12.1	52.9
Georgia	84.8	13.3	..	1.9
Germany	40.0	0	0	60.0
Greece	..	..	..	..
Hungary	9.6	..	36.1	54.3
Iceland	..	..	..	..
Ireland	0	0	0	100.0
Italy	45.5	2.1	44.1	8.3
Latvia	24.6	0	0	75.4
Liechtenstein	50.0	33.3	0	16.7
Lithuania	20.4	27.3	..	52.3
Luxembourg	..	..	..	..
Malta	..	..	..	..
Moldova, Republic of	31.0	0	19.0	50.0
Netherlands	28.6	0	28.6	42.8
Norway	42.6	0	0	57.4
Poland	1.8	7.2	0.0	91.0
Portugal	30.7	0	53.3	16.0
Romania	..	..	..	..
Russian Federation	74.0	0	0	26.0
Slovak Republic	6.0	37.0	5.0	52.0
Slovenia	81.6	1.6	11.0	5.8
Spain	..	..	..	..
Sweden	28.6	1.1	1.0	69.3
Switzerland	87.9	7.9	0	4.2
Turkey	29.0	0	24.0	47.0
Ukraine	2.9	2.5	2.5	92.1
United Kingdom	2.0	0	0.7	97.3
Total Europe (MCPFE)	66.4	0.5	1.4	31.7

* The figure refers to the percentage of the area regenerated in the reference year in the countries. The area of regeneration under continuous forest cover management is not included.

Source: UNECE/FAO (2000) (Table 68) and updates.

Comments:
Belgium: A part of the area with natural regeneration is enhanced by planting, but there are no estimates for this part available.
France: The method used previously was not precise and has overestimated coppice sprouting.
Hungary: Natural regeneration included natural regeneration enhanced by planting.

Table 4.6: Protected forest area and other wooded land, according to the MCPFE Assessment Guidelines (see Annex VI)

	MCPFE class 1.1			MCPFE class 1.2			MCPFE class 1.3			MCPFE class 2		
	Forest	OWL*	FOWL**	Forest	OWL*	FOWL**	Forest	OWL*	FOWL**	Forest	OWL*	FOWL**
	(ha)											
Albania	9 500	5 000	14 500	39 047	17 393	56 440	21 503	21 392	42 895	35 778	17 075	52 853
Austria	1	..	1	8 500	..	8 500	107 700	..	107 700	899 100	..	899 100
Belarus	..	..	..	..	..	..	..	..	..	..	..	..
Belgium	0	0	0	3 600	0	3 600	5 187	0	5 187	194 264	0	194 264
Bosnia & Herzegovina	..	..	..	..	..	..	..	..	..	..	..	..
Bulgaria	45 056	13 121	58 177	99 452	19 774	119 226	912	33	945	99 739	15 775	115 514
Croatia	621	0	621	35 085	2 644	37 729	196 458	1 103	197 561	6 948	18	6 966
Cyprus	1 043	0	1 043	11 103	0	11 103	0	0	0	144 429	0	144 429
Czech Republic	15 056	0	15 056	0	0	0	66 851	0	66 851	583 590	0	583 590
Denmark	0	0	0	5 090	0	5 090	129 000	0	129 000	0	0	0
Estonia	..	..	..	..	..	..	..	..	..	..	..	..
Finland	0	0	0	1 303 329	122 294	1 425 623	358 925	40 584	399 509	186 824	8 701	195 525
France	5 200	..	5 200	94 600	..	94 600	133 600	..	133 600	2 951 800	..	2 951 800
Georgia	..	..	140 684	..	..	61 300	..	..	5 992	..	..	346 500
Germany	0	..	0	90 831	..	90 831	2 047 591	..	2 047 591***	4 686 038	..	4 686 038
Greece	0	0	0	..	..	48 540	..	..	937 661			194 700
Hungary	2 933	0	2 933	68 147	0	68 147	10 489	0	10 489	293 612	0	293 612
Iceland	0	0	0	..	..	4 782	0	0	0	..	..	8 895
Ireland	0	0	0	..	..	2 854	..	..	4 850	0	0	0
Italy	..	..	..	..	..	..	..	..	..	..	..	..
Latvia	11 246	..	11 246	101 976	..	101 976	103 416	..	103 416	121 806	..	121 806
Liechtenstein	1 322	..	1 322	571	..	571	0	0	0	150	..	150
Lithuania	..	..	23 896	0	0	0	..	..	5 399	..	..	236 232
Luxembourg	0	0	0	0	0	0	27 340	0	27 340	..	..	..
Malta	0	0	0	..	..	38	..	..	2	0	0	0
Moldova, Republic of	..	..	..	..	..	..	..	..	..	..	..	..
Netherlands	3 000	0	3 000	24 190	0	24 190	23 351	0	23 351	33 078	0	33 078
Norway	0	0	0	..	..	227 236	0	0	0	..	..	282 000
Poland	50 425	0	50 425	0	0	0	227 679	0	227 679	1 365 543	0	1 365 543
Portugal	897	104	1 001	8 921	0	8 921	605 980	22 866	628 846***	938 390	6 554	944 944
Romania	..	..	..	..	..	..	..	..	..	..	..	..
Russian Federation	1 357 200	35 800	1 393 000	593 800	15 700	609 500	94 301 500	63 600	94 365 100	893 000	117 000	1 010 000
Slovak Republic	89 214	..	89 214	4 264	..	4 264	316 630	..	316 630	459 082	..	459 082
Slovenia	..	..	10 520	..	..	..	..	..	..	..	..	30 320
Spain	4 089	65	4 154	100 007	12 821	112 828	32 324	70 558	102 882	1 205 166	211 611	1 416 777
Sweden	1 635 591	654 447	2 290 038	312 789	125 156	437 945	46 268	14 392	60 660	302 157	120 901	423 058
Switzerland	4 800	..	4 800	11 019	..	11 019	13 144	..	13 144	200 200	..	200 200
Turkey	17 849	4 649	22 498	0	0	0	160 938	137 987	298 925	9 792	5 663	15 455
Ukraine	..	..	..	..	..	..	..	..	..	..	..	654 100
United Kingdom	7 000	0	7 000	3 000	0	3 000	135 000	0	135 000	646 000	0	646 000
Total Europe (MCPFE)	3 262 043	713 186	4 150 329	2 919 321	315 782	3 579 853	99 071 783	372 515	100 398 205	16 256 486	503 298	18 512 531

* OWL is other wooded land.

** FOWL is forest and other wooded land. Where no information for protected areas on OWL was given the data for protected areas on FOWL are related only to the data on protected forest areas.

*** This figure includes all Natura 2000 areas under class 1.3.

Source: MCPFE (2000 and 2002b).

Table 5.1: Protective forest area and other wooded land, according to the MCPFE Assessment Guidelines (see Annex VI)

	MCPFE class 3.1			MCPFE class 3.2		
	Forest	OWL*	FOWL**	Forest	OWL*	FOWL**
	(ha)					
Albania	134 250	0	134 250	0	0	0
Austria	755 000	..	755 000	165 000	..	165 000
Belarus	..	..	..	..	..	..
Belgium	..	..	..	0	0	0
Bosnia & Herzegovina	..	..	..	..	..	..
Bulgaria	432 882	107 985	540 867	27 975	3 444	31 419
Croatia	38 676	8 947	47 623	0	0	0
Cyprus	105 800	50 775	156 575	0	0	0
Czech Republic	199 482	0	199 482	42 140	0	42 140
Denmark	0	0	0	0	0	0
Estonia	..	..	..	..	..	..
Finland	0	0	0	0	0	0
France	344 000	48 000	392 000	0	0	0
Georgia	..	..	653 500	0	0	0
Germany	2 424 266	..	2 424 266	556 584	..	556 584
Greece	0	0	0	0	0	0
Hungary	179 724	0	179 724	51 520	0	51 520
Iceland	0	0	0	0	0	0
Ireland	0	0	0	0	0	0
Italy	..	..	..	..	..	..
Latvia	62 246	..	62 246	0	0	0
Liechtenstein	0	0	0	2 400	..	2 400
Lithuania	..	..	301 121	..	..	19 383
Luxembourg	0	0	0	0	0	0
Malta	0	0	0	0	0	0
Moldova, Republic of	..	..	..	..	..	..
Netherlands	0	0	0	0	0	0
Norway	..	..	4 280 000	0	0	0
Poland	1 705 113	0	1 705 113	1 666 119	0	1 666 119
Portugal	216 451	3 889	220 340	681	0	681
Romania	..	..	..	..	..	..
Russian Federation	74 554 000	5 198 200	79 752 200	19 084 300	1 063 600	20 147 900
Slovak Republic	262 321	..	262 321	71 295	..	71 295
Slovenia	0	0	0	0	0	0
Spain	699	0	699	0	0	0
Sweden	1 879 000	1 504 000	3 383 000	0	0	0
Switzerland	65 000	..	65 000	700 000	..	700 000
Turkey	1 194 091	2 201 784	3 395 875	0	0	0
Ukraine	..	..	2 068 700	0	0	0
United Kingdom	0	0	0	0	0	0
Total Europe (MCPFE)	84 553 001	9 123 580	100 979 902	22 368 014	1 067 044	23 454 441

* OWL is other wooded land.

** FOWL is forest and other wooded land. Where no information for protected areas on OWL was given, the data for protected areas on FOWL are related only to the data on protected forest areas.

Source: MCPFE (2000 and 2002b).

Table 6.1: Economic accounts for forestry. Gross value added at basic prices in countries where data were available

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	millions of euros, except millions of national currency for Sweden										
Belgium	..	..	..	..	..	140.3	134.7	157.6	151.8	157.9	120.0
Finland	2 204.1	1 679.4	1 596.8	1 569.9	1 921.7	2 186.1	2 057.5	2 340.3	2 528.0	2 539.3	2 656.2
France	2 547.3	2 520.9	2 467.1	2 253.5	2 959.5	3 142.0	2 766.8	2 935.7	3 061.3	3 011.2	2 318.0
Greece	..	..	..	..	..	107.1	103.5	112.6	115.5	..	..
Italy	296.5	338.4	370.1	377.3	419.1	393.4	464.2	467.6	470.9	448.9	416.7
Luxembourg	..	..	..	..	..	13.1	..	..	..	..	..
Sweden	14 774.3	14 293.58	13 976.9	12 925.1	16 195.0	20 890.2	16 995.2	18 400.2	18 122.8	17 333.9	..

Source: Eurostat database (2003): Economic Accounts for Forestry.

Table 6.2: National accounts. Percentage of total gross value added (at basic prices) for the year 2000

	ISIC / NACE category 02, Section A: Agriculture, hunting and forestry	ISIC / NACE category 20, Section D: Manufacturing, Subsection DD: Manufacture of wood and wood products	ISIC / NACE category 21, Section D: Manufacturing: Subsection DE: Manufacture of pulp, paper and paper products, publishing and printing
	(%)		
Albania	..	..	..
Austria	2.2	1.0	2.0
Belarus	..	..	..
Belgium	1.3	0.3	1.5
Bosnia & Herzegovina	..	..	..
Bulgaria	13.8	..	..
Croatia	..	..	..
Cyprus*	3.6	..	..
Czech Republic	4.3	..	..
Denmark	2.3	0.7	1.5
Estonia	5.9	..	..
Finland	3.5	1.2	6.0
France	..	..	..
Georgia	..	..	..
Germany**	1.2	0.4	1.7
Greece	7.0	0.3	0.8
Hungary	4.2	0.5	1.3
Iceland	..	..	..
Ireland	..	..	..
Italy	2.7	0.6	1.4
Latvia	4.5	..	..
Liechtenstein	..	..	..
Lithuania	7.7	1.4	1.4
Luxembourg	0.7	0.2	0.9
Malta	..	..	..
Moldova, Republic of	..	..	..
Netherlands	2.6	0.2	2.0
Norway	..	..	..
Poland	3.7	..	..
Portugal	..	..	..
Romania	12.3	..	..
Slovak Republic	4.0	..	..
Slovenia	3.2	..	..
Spain	..	..	..
Sweden	1.9	0.9	3.5
Switzerland	..	..	..
Turkey	13.2	..	..
Ukraine	..	..	..
United Kingdom	1.0	0.3	2.5

* Provisional value.

** Including ex-GDR from 1991.

Source: Eurostat database (2003): National accounts.

Table 6.3: Employment in the forest sector

Country	Forestry (ISIC / NACE 02.0)				Wood industries (ISIC / NACE 21)			Pulp and paper (ISIC / NACE 22)		
	FTE* in 1990	FTE in 2000	Change (%)	FTE / 1000 ha forest in 2000	FTE in 1990	FTE in 1998	Change (%)	FTE in 1990	FTE in 1998	Change (%)
Albania	..	..	..	..	23 666	567[19]	–98	2 486	10[21]	–99
Austria	9 960	7 968	–20	2.1	19 300	18 285	–5	20 000	20 251	1
Belarus	43 100[11]	32 685	–24	4.2	..	19 382[12]	..	..	12 711	..
Belgium	4 060	2 700[13]	–33	4.0	12 800	12 600[20]	–2	17 900	17 300[20]	–3
Bosnia & Herzegov.	25 5003	2 248[14]	–91	1.0	33 555	4 749[19]	–86	9 339	2 209[19]	–76
Bulgaria	..	23 180		6.5	24 300	14 900	–39	14 900	14 900	0
Croatia	15 033	10 076	–33	5.7	22 190	13 828[16]	–38	9 790	5 604[16]	–43
Cyprus	..	..	..	..	..	..	..	..	..	..
Czech Republic	57 700	33 985[15]	–41	12.9	30 000	30 000[21]	0	25 000	22 000[21]	–12
Denmark	4 532	4 244	–6	8.7	14 328	16 821	17	10 963	10 125	–8
Estonia	11 700	8 800[16]	–25	4.4	13 745[14]	22 066	61	18 053[16]	17 624	–2
Finland	39 000	24 000	–38	1.1	30 400	27 426[13]	–10	44 400	38 255	–14
France	48 440	37 190	–23	2.5	93 200	78 200[22]	–16	107 400	92 460[16]	–14
Georgia	11 700	3 500[14]	–70	1.2	..	..	..	..	..	..
Germany	142 009[17]	61 520[13]	–57	5.7	129 120[18]	112 932	–13	180 367[20]	149 932	–17
Greece	10 350	8 910[13]	–14	2.7	7 413	5 930	–20	9 141	77 812	751
Hungary	17 200[19]	14 800[15]	–14	7.9	15 000	18 360[13]	22	13 000	12 000	–8
Iceland	..	..	..	..	..	..	..	..	..	..
Ireland	3 180	2 417	–24	3.9	4 500	7 836[15]	74	3 400	4 164	22
Italy	56 440[20]	36 050	–36	3.7	37 127	41 285[15]	11	61 863	61 170	–1
Latvia	15 000	15 900	6	5.5	14 577	23 284[15]	60	3 738	1 360	–64
Liechtenstein	..	..	..	..	..	..	..	..	..	..
Lithuania	14 600	12 000[15]	–18	5.9	8 264[20]	14 468[15]	75	6 735[20]	3 722	–45
Luxembourg	..	..	..	..	..	..	..	..	..	..
Malta	..	..	..	..	..	..	..	..	..	..
Moldova, Republic of	4 600	3 200	–30	9.9	11 685	1 501[14]	–87	1 427	1 338[14]	–6
Netherlands	4 510	1 230[13]	–73	3.4	12 592	10 752[13]	–15	24 429	22 272	–9
Norway	6 800	5 200	–24	0.6	15 239	15 266[15]	0	11 829	9 826	–17
Poland	158 900[11]	64 400[16]	–59	7.1	65 000	49 820[13]	–23	42 000	28 200	–33
Portugal	14 750[21]	10 990	–25	3.3	54 890	53 546[15]	–2	18 508	15 094	–18
Romania	107 000	57 670	–46	9.2	94 000	82 500[19]	–12	43 300	28 300[19]	–35
Russian Federation	237 500	239 300	1	0.3	515 300[21]	372 900	–28	184 700[21]	169 500	–8
Slovak Republic	36 316	23 671	–35	11.6	20 314[18]	12 062	–41	13 865[18]	11 467	–17
Slovenia	6 550	4 090	–38	3.6	19 600	11 035	–44	16 600	14 847	–11
Spain	26 460	33830	28	2.5	73 760	83 768	14	41 263	48 834	18
Sweden	33 700	20 000[13]	–41	0.7	44 000	34 247	–22	51 600	42740	–17
Switzerland	9 304[11]	9 102[14]	–2	7.8	95 200	75 300[22]	–21	16 900	14 900[22]	–12
Turkey	498 715[11]	472 408[22]	–5	47.1	13 349	11 588	–13	21 556	20 230	–6
Ukraine	42 700[20]	53 600[14]	26	5.7	83 000	76 000	–8	29 000	20 000	–31
United Kingdom	24 000	18 000[13]	–25	6.5	78 000	85 540	10	148 000	117 080	–21
Total Europe (MCPFE)	1 741 309	1 358 864	–22	1.4	1729414	1458744	–16	1223452	1128237	–8

* FTE are full time equivalents.

Source: UNECE/FAO (2002).

[11] 1985 [13] 1999 [15] 1998 [17] 1980 [19] 1994 [21] 1993
[12] 2000 [14] 1995 [16] 1997 [18] 1991 [20] 1992 [22] 1996

Table 6.4: Area of forest and other wooded land where access to public is legally allowed and not allowed.

	Reference period	Forest and other wooded land in public ownership			Forest and other wooded land in private ownership		
		Area with public access excluded	Area with public access	Percent of total	Area with public access excluded	Area with public access	Per cent of total
		(1 000 ha)		(%)	(1 000 ha)		(%)
Albania	2000	13	1 029	98.8	0	11	100.0
Austria	1992-96	30	682	95.8	162	3 050	95.0
Belarus	1997	148	8 788	98.3	0	0	..
Belgium	2000	16	285	94.8	0	393	100.0
Bosnia & Herzegovina	1995	0	2 125	100.0	0	584	100.0
Bulgaria	1995	73	3 830	98.1	0	0	..
Croatia	1996	0	1 651	100.0	0	454	100.0
Cyprus	1999	0	157	100.0	0	229	100.0
Czech Republic	1995	122	2 091	94.5	0	418	100.0
Denmark	2000	5	183	97.3	2	389	99.5
Estonia	1994	7	1 971	99.6	..	..	..
Finland	1991-00	306	6 185	95.3	47	16 344	99.7
France	1997	45	4 183	98.9	12 761	0	0
Georgia	1995	..	..	..	..	..	..
Germany	..	0	5 762	100.0	0	4 978	100.0
Greece	1992	108	5 223	98.0	23	1 159	98.1
Hungary	2001	4	1 869	99.8	..	..	..
Iceland	1998	0	39	100.0	5	86	94.5
Ireland	2001	..	441	66.0	..	..	..
Italy	1995	6	3 681	99.8	0	7 155	100.0
Latvia	1997	4	1 674	99.8	..	..	..
Liechtenstein	1995	0	7	100.0	0	1	100.0
Lithuania	2001	32	1 481	97.9	8	598	98.7
Luxembourg	1994-97	0	41	100.0	0	47	100.0
Malta	1996	0	0	0.0	0	0	..
Moldova, Republic of	1988-97	44	311	87.6	0	0	..
Netherlands	1990	21	153	88.2	35	131	79.0
Norway	1994-96	0	2 936	100.0	0	9 064	100.0
Poland	2001	805.2	6 687	89.3	..	..	..
Portugal	1995	3	255	98.9	0	3 091	100.0
Romania	..	0	6 320	100.0	0	360	100.0
Russian Federation	1998	15 565	866 409	98.2	0	0	0
Slovak Republic	1996	54	1 079	95.2	34	864	96.2
Slovenia	2001	10	340	97.1	0	844	100.0
Spain	..	..	..	..	..	..	..
Sweden	1992-96	77	6 070	98.7	0	24 112	100.0
Switzerland	1993-95	0	850	100.0	0	384	100.0
Turkey	1999	22	20 722	99.1	..	..	..
Ukraine	1996	500	8 994	94.7	0	0	..
United Kingdom	1995	20	1 052	98.1	..	..	..
Total Europe (MCPFE)		18 040.2	975 556	98	13 077	74 746	85

Source: UNECE/FAO (2000) (Table 81) and updates.

Comments:

Hungary: Areas with public access excluded are the core areas of forest reserves.

Portugal: The area was calculated with the proportions of 'public and private areas' observed in the TBFRA-2000 data. There are no new data on accessibility.

Russian Federation: On forest and OWL land 15.565 million ha for military purposes and as a strict nature reserve.

ANNEX V: Terms and Definitions

Terms	Definitions
Source: UNECE/FAO (2000)	
Above-stump woody biomass	The mass of the woody part (stem, bark, branches, twigs) of trees, alive or dead, shrubs and bushes, excluding stumps and roots.
Annual fellings	Average annual standing volume of all trees, living or dead, measured overbark to a minimum diameter of 0 cm (d.b.h.) that are felled during the given reference period, including the volume of trees or parts of trees that are not removed from the forest, other wooded land or other felling site. Includes: Silvicultural and pre-commercial thinnings and cleanings left in the forest and natural losses that are recovered (harvested).
Annual removals	Average annual of those fellings that are removed from the forest, other wooded land or other felling site during the given reference period. Includes: Removals during the given reference period of trees felled during an earlier period and removal of trees killed or damaged by natural causes (natural losses), e.g. fire, windblow, insects and diseases.
Broadleaved	All trees classified botanically as Angiospermae. They are sometimes referred to as 'non-coniferous' or 'hardwoods'.
Coniferous	All trees classified botanically as Gymnospermae. They are sometimes referred to as 'softwoods'.
Coppice and coppice with standards	Forest composed of stool-shoots or root suckers with or without scattered trees (standards), which may be of seedling or coppice origin.
Damage to forest	Disturbance to the forest which may be caused by biotic or abiotic agents, resulting in death, or a significant loss of vitality, productivity or value of trees and other components of the forest ecosystem.
Defoliation classes	The extent of visually assessed defoliation of trees, as developed by the International Co-operative Programme (ICP Forests) of the Executive Committee for the Convention on Long-range Transboundary Air Pollution in Europe. Damage classes are from 0 to 4, as follows: Class 0: up to and including 10% — none Class 1: > 10 to 25% — slight (warning stage) Class 2: > 25 to 60% — moderate Class 3: > 60 to < 100% — severe Class 4: 100% — dead
Endangered species	Species classified by an objective process (e.g. national 'Red Book') as being in IUCN categories 'critically endangered' and 'endangered'. A species is considered to be a critically endangered when it is facing an extremely high risk of extinction in the wild in the immediate future. It is considered 'endangered' when it is not critically endangered but is still facing a very high risk of extinction in the wild in the near future.
Even-aged (high forest)	High forest in which the predominant proportion of the trees falls into the same age class, generally resulting in a single-storey forest.
Forest available for wood supply	Forest where any legal, economic, or specific environmental restrictions do not have a significant impact on the supply of wood. Includes: Areas where, although there are no such restrictions, harvesting is

Terms	Definitions
	not taking place, for example areas included in long-term utilisation plans or intentions.
Forest	Land with tree crown cover (or equivalent stocking level) of more than 10 per cent and area of more than 0.5 ha. The trees should be able to reach a minimum height of 5 m at maturity in situ. May consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground; or of open forest formations with a continuous vegetation cover in which tree crown cover exceeds 10 per cent. Young natural stands and all plantations established for forestry purposes which have yet to reach a crown density of 10 per cent or tree height of 5m are included under forest, as are areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention or natural causes but which are expected to revert to forest. Includes: Forest nurseries and seed orchards that constitute an integral part of the forest; forest roads, cleared tracts, firebreaks and other small open areas within the forest; forest in national parks, nature reserves and other protected areas such as those of special environmental, scientific, historical, cultural or spiritual interest; windbreaks and shelterbelts of trees with an area of more than 0.5 ha and a width of more than 20 m. Rubberwood plantations and cork oak stands are included. Excludes: Land predominantly used for agricultural practices.
Forest fire	Fire which breaks out and spreads on forest and other wooded land or which breaks out on other land and spreads to forest and other wooded land. Excludes: Prescribed or controlled burning, usually with the purpose of reducing or eliminating the quantity of accumulated fuel on the ground.
Forest not available for wood supply	Forest where legal, economic or specific environmental restrictions prevent any significant supply of wood. Includes: (a) Forest with legal restrictions or restrictions resulting from other political decisions which totally exclude or severely limit wood supply, inter alia for reasons of environmental or biodiversity conservation, e.g. protection forest, national parks, nature reserves and other protected areas, such as those of special environmental, scientific, historical, cultural or spiritual interest. (b) Forest where physical productivity or wood quality is too low or harvesting and transport costs are too high to warrant wood harvesting, apart from occasional cuttings for auto-consumption.
Forest / other wooded land with damage from unidentifiable causes	Forest / other wooded land with damage, the cause of which is unknown or could be a combination of a number of agents.
Forest / other wooded land undisturbed by man	Forest / other wooded land which shows natural forest dynamics, such as natural tree composition, occurrence of dead wood, natural age structure and natural regeneration processes, the area of which is large enough to maintain its natural characteristics and where there has been no known significant human intervention or where the last significant human intervention was long enough ago to have allowed the natural species composition and processes to have become re-established.
Gross annual increment	Average annual volume of increment over the reference period of all trees, measured to a minimum diameter breast height (d.b.h.) of 0 centimetres (cm). Includes: The increment on trees which have been felled or die during the reference period.
Growing stock	The living tree component of the standing volume.
High forest	Forest normally composed of trees of seedling origin, but may also include trees from vegetative reproduction, e.g. poplars. Includes: Stands in process of transformation into high forest.

Terms	Definitions
Holding	One or more parcels of forest and other wooded land which constitute a single unit from the point of view of management or utilisation. For state-owned forest and other wooded land a holding may be defined as the area forming a major management unit administered by a senior official, .e.g. a Regional Forestry Officer. For forest and other wooded land that is owned publicly, other than by the state, or owned by large-scale forest owners, e.g. forest industries, a holding may consti-tute a number of separate properties which are, however, managed according to one corporate strategy. Under any category of ownership, other than state-owned, one holding may be the property of one or several owners.
Introduced tree species	Tree species occurring outside their natural vegetation zone, area or region. May also be termed non-indigenous species. Includes: Hybrids
Invasive species	Species of fauna and flora of non-local origin which has established itself or has been introduced into a given area and has spread in the natural conditions on an undesirable scale, e.g. to the extent that it has replaced or seriously suppressed the species previously occupying this specific area.
Land area	Total area, excluding inland water.
Legal right of access	Where the public is legally entitled to visit forest and other wooded land, whether publicly owned or owned by third parties. Some activities by the visiting public may however be forbidden or restricted.
Managed forest / other wooded land	Forest and other wooded land which is managed in accordance with a formal or an informal plan applied regularly over a sufficiently long period (five years or more). The management operations include the tasks to be accomplished in individual forest stands (e.g. compartments) during the given period.
Mixed forest / other wooded land	Forest / other wooded land on which neither coniferous, nor broadleaved, nor palms, bamboos, etc. account for more than 75 per cent of the tree crown area.
Natural colonisation of non-forest land	The colonisation of non-forest land with forest trees through stages of natural succession without human intervention. Natural colonisation may frequently occur after other (non-forest) land has been abandoned or withdrawn from its former utilisation, e.g. farming or pasturing.
Natural conversion of other wooded land to forest	The conversion of other wooded land to forest as a result of natural processes. The process may occur without intentional intervention by man, but may be aided by human interventions such as the withdrawal of animal grazing from the land allowing tree regeneration to succeed, soil scarification, or actions to protect the area from fire, over-cutting, etc.
Natural regeneration	Re-establishment of a forest stand by natural means, i.e. by natural seeding or vegetative regeneration. It may be assisted by human intervention, e.g. by scarification or fencing to protect against wildlife damage or domestic animal grazing.
Natural regeneration enhanced by planting	Natural regeneration which has been combined with artificial planting or seeding, either to ensure satisfactory restocking with the naturally regenerated species or to increase species diversity.
Other wooded land	Land either with a tree crown cover (or equivalent stocking level) of 5-10 per cent of trees able to reach a height of 5 m at maturity in situ; or a crown cover (or equivalent stocking level) of more than 10 per cent of trees not able to reach a height of 5 m at maturity in situ (e.g. dwarf or stunted trees) and shrub or bush cover. Excludes: Areas having the tree, shrub or bush cover specified above but of less than 0.5 ha and width of 20 m, which are classed under 'other land'; land predominantly used for agricultural practices.
Plantation (s)	Forest stands established by planting or / and seeding in the process of afforestation or reforestation. They are either:

Terms	Definitions
	- of introduced species (all planted stands), or - intensively managed stands of indigenous species which meet all the following criteria: one or two species at plantation, even age class, regular spacing. Excludes: Stands which were established as plantations but which have been without intensive management for a significant period of time. These should be considered semi-natural.
Planting and seeding	The act of establishing a forest stand (e.g. plantation) or re-establishing a forest stand by artificial means, either by planting seedlings or by scattering seed. The material used may be of indigenous or introduced origin. Planting and seeding may take place on forest, other wooded land or other land.
Predominantly broadleaved	Forest / other wooded land on which more than 75 per cent of the tree crown cover consists of broadleaved species.
Predominantly coniferous	Forest / other wooded land on which more than 75 per cent of the tree crown cover consists of coniferous species.
Primarily damaged by fire	Forest and other wooded land, the vegetation on which, including the trees, has been wholly or largely destroyed by fire.
Primarily damaged by insects and disease	Forest and other wooded land where insect attack or disease has been identified as the primary cause of damage.
Primarily damaged from known local pollution sources	Forest and other wooded land where damage can be attributed with reasonable certainty to pollutant deposition from an identified local source or sources.
Primarily damaged by storm, wind, snow or other identifiable abiotic factors	Forest and other wooded land on which the trees have been felled or damaged by storm, wind, snow or other abiotic factors such as avalanches, landslides or flooding.
Primarily damaged by wildlife and grazing	Forest and other wooded land where damage has been caused by wildlife or grazing by domestic animals. Includes: Grazing or browsing of young plants, preventing or delaying the establishment or regeneration of the stand.
Private ownership (in)	Forest / other wooded land owned by individuals, families, co-operatives and corporations which may be engaged in agriculture or other occupations as well as forestry; private forest enterprises and industries; private corporations and other institutions (religious and educational institutions, pension and investment funds, nature conservation societies, etc).
Public ownership (in)	Forest / other wooded land belonging to the state or other public bodies.
Reference period	The year or years during which the national forest inventory or other method of collection of the data reported in the forest resources assessment was carried out.
Regeneration	Re-establishment of a forest stand by natural or artificial means following the removal of the previous stand by felling or as a result of natural causes, e.g. fire or storm.
Semi-natural forest / other wooded land	Forest / other wooded land which is neither 'forest / other wooded land undisturbed by man' nor 'plantation' as defined separately.
Species occurring on forest / other wooded land	Species of fauna and flora which occurs on forest or other wooded land for at least part of its everyday existence, e.g. for shelter, feeding, nesting or breeding.
Standing volume	Volume of standing trees, living or dead, above-stump measured overbark to top (0 cm). Includes all trees with diameter over 0 cm (d.b.h.) Includes: Tops of stems, large branches; dead trees lying on the ground which can still be used for fibre or fuel. Excludes: Small branches, twigs and foliage.
Total area	Total area of country, including area of inland water bodies.

Terms	Definitions
	Excludes: Offshore territorial waters.
Tree	A woody perennial with a single main stem or, in the case of coppice, with several stems, having a more or less definite crown. Includes: Bamboos, palms and other woody plants meeting the above criterion.
Trees outside the forest	Trees on land other than forest or other wooded land. Includes: Trees on land that meets the definitions of forest and of other wooded land except that the area is less than 0.5 ha and the width is less than 20 m; scattered trees in permanent meadows and pastures; permanent tree crops such as fruit tree orchards and coconut palm plantations; trees in parks and gardens, around buildings, in hedgerows and in lines along streets, roads, railways, rivers, streams and canals; trees in shelterbelts and windbreaks of less than 20 m in width and 0.5 ha in area.
Uneven-aged (high forest)	High forest in which there is a mixture of different age classes. Usually, the trees cannot be separated into different storeys.
Woody biomass	The mass of the woody parts (wood, bark, branches, twigs, stumps and roots) of trees, alive and dead, shrubs and bushes, measured to a minimum diameter of 0 mm (d.b.h.). Includes: Above-stump woody biomass, and stumps and roots. Excludes: Foliage.
Source: IPGRI/EUFORGEN Database (2003)	
Ex situ conservation	Conservation of genetic resources that entails removal of individuals or reproductive material from its site of natural (original) occurrence, i.e. conservation 'off site'.

Annex VI: MCPFE Assessment Guidelines for Protected and Protective Forest and Other Wooded Land in Europe

1 Introduction

The MCPFE Assessment Guidelines for Protected and Protective Forest and Other Wooded Land in Europe are an outcome of the implementation of the joint 'Work-Programme on the Conservation and Enhancement of Biological and Landscape Diversity in Forest Ecosystems 1997 – 2000' of the MCPFE and 'Environment for Europe'[23]. They are based on the analysis of national data on protected and protective forest and other wooded land in the European countries, which has been collected within the framework of a supplementary TBFRA[24] enquiry in 2000. The MCPFE Assessment Guidelines were elaborated in a consultative process in preparatory groups, working groups and workshops, involving the countries and organisations participating in the MCPFE.

The MCPFE Assessment Guidelines aim to give a comprehensive picture of protected and protective forest and other wooded land in Europe, while keeping links to international classification systems used for all kinds of protected areas[25]. As comparability at the international level is a goal of the MCPFE Assessment Guidelines, terms and definitions used are in compliance with the TBFRA terminology.

The MCPFE Assessment Guidelines for Protected and Protective Forest and Other Wooded Land in Europe should thus provide an important tool for further MCPFE work on the conservation of all types of forest and other wooded land.

2 General Principles

Protected and protective forest and other wooded land have to comply with the following general principles in order to be assigned according to the MCPFE Assessment Guidelines:

- Existence of legal basis
- Long term commitment (minimum 20 years)
- Explicit designation for the protection of biodiversity, landscapes and specific natural elements or protective functions of forest and other wooded land

'Explicit designation' within the context of these guidelines comprises both:

- Designations defining forest and other wooded land within fixed geographical boundaries delineating a specific area

[23] The pan-European ministerial process of the ministers for the environment

[24] Temperate and Boreal Forest Resource Assessment of UNECE / FAO

[25] There is a clear distinction between protected forests and protective forests, as the former are especially dedicated to the conservation of forest biodiversity, while protective forests are mainly managed for the protection of other natural resources, infrastructure and people.

- Designations defining forest and other wooded land not within fixed geographical boundaries, but as specific forest types or vertical and horizontal zones in the landscape
  Data on forest and other wooded land according to these two designation types should be distinguished in the reporting

In addition to the regimes complying to these principles, the MCPFE takes account of protected and protective forest and other wooded land based on voluntary contributions without legal basis. As far as possible these forests and other wooded lands should be assigned to the same classes used for the legally based regimes. However, data on these forests and other wooded lands should be compiled separately.

3 Structure

Protected and protective forests and other wooded lands are grouped according to their main management objective. In addition, restrictions to interventions are used as distinguishing factors. As a result, five classes of protected and protective forest and other wooded land in Europe are defined. As far as possible these classes are associated with the respective Protected Area Management Categories of IUCN – The World Conservation Union[26]. In addition, they are linked to the designation types used by EEA[27] in its Data Base on Designated Areas. The intention is to establish proper linkages between the MCPFE Assessment Guidelines for Protected and Protective Forest and Other Wooded Land in Europe and these systems, which are used for all kinds of protected areas. The references are agreed with IUCN and EEA as indicated in the table below.

MCPFE Classes		EEA*	IUCN**
1: Main Management Objective 'Biodiversity'	1.1: 'No Active Intervention'	A	I
	1.2: 'Minimum Intervention'	A	II
	1.3: 'Conservation Through Active Management'	A	IV
2: Main Management Objective 'Protection of Landscapes and Specific Natural Elements'		B	III, V, VI
3: Main Management Objective 'Protective Functions'		(B)	n.a.

* References as identified in the Standard Data Form of the Natura 2000 and Emerald networks and used in the same way in the framework of the Common Database on Designated Areas (CDDA), managed by the EEA on behalf of two other organisations (Council of Europe and UNEP-WCMC). The groups (A, B or C) are related to designation types and not to individual sites.

** Indicative reference:
- The equivalence of IUCN Categories may vary according to the specific management objective (of the forested part) of each individual protected area. A technical consultation process with IUCN and its World Commission on Protected Areas (WCPA) is underway to ensure full comparability between the MCPFE and IUCN systems.
- IUCN Categories III, V and VI have biodiversity conservation as their primary management objective. However, they fit more easily under MCPFE Class 2 than 1.

The area of forest and other wooded land assigned to the classes 1 and 2 should not be summed up with the data collected under class 3 to avoid double counting.

[26] World Conservation Union

[27] European Environment Agency

4 Definition of Classes

The individual classes of protected and protective forest and other wooded land are defined by the management objective and restrictions to interventions as follows:

Class 1: Main Management Objective 'Biodiversity'

Class 1.1: 'No Active Intervention'

- The main management objective is biodiversity
- No active, direct human intervention is taking place
- Activities other than limited public access and non-destructive research not detrimental to the management objective are prevented in the protected area

Class 1.2: 'Minimum Intervention'

- The main management objective is biodiversity
- Human intervention is limited to a minimum
- Activities other than those listed below are prevented in the protected area:
  - Ungulate/game control
  - Control of diseases/insect outbreaks*
  - Public access
  - Fire intervention
  - Non-destructive research not detrimental to the management objective
  - Subsistence resource use**

* In case of expected large diseases/insect outbreaks control measures using biological methods are allowed, provided that no other adequate control possibilities in buffer zones are feasible.

** Subsistence resource use to cover the needs of indigenous people and local communities, in so far as it will not adversely affect the objectives of management.

Class 1.3: 'Conservation Through Active Management'

- The main management objective is biodiversity
- A management with active interventions directed to achieve the specific conservation goal of the protected area is taking place
- Any resource extraction, harvesting, silvicultural measures detrimental to the management objective as well as other activities negatively affecting the conservation goal are prevented in the protected area

Class 2: Main Management Objective 'Protection of Landscapes and Specific Natural Elements'

- Interventions are clearly directed to achieve the management goals of landscape diversity, cultural, aesthetic, spiritual and historical values, recreation and specific natural elements
- The use of forest resources is restricted
- A clear long-term commitment and an explicit designation as specific protection regime defining a limited area is existing

- Activities negatively affecting characteristics of landscapes or/and specific natural elements mentioned are prevented in the protected area

Class 3: Main Management Objective 'Protective Functions'[28]

- The management is clearly directed to protect soil and its properties or water quality and quantity or other forest ecosystem functions, or to protect infrastructure and managed natural resources against natural hazards
- Forests and other wooded lands are explicitly designated to fulfil protective functions in management plans or other legally authorised equivalents
- Any operation negatively affecting soil or water or the ability to protect other ecosystem functions, or the ability to protect infrastructure and managed natural resources against natural hazards is prevented

[28] According to the recommendations for improved pan-European indicators for sustainable forest management, class 3 is divided into the following two subclasses for this report:
· 3.1: Management clearly directed to protect soil and its properties or water quality and quantity or other forest ecosystem functions
· 3.2: Management clearly directed to protect infrastructure and managed natural resources against natural hazards

ANNEX VII: Improved and Original Pan-European Indicators for Sustainable Forest Management

1 Quantitative Indicators

Criteria	No.		Improved indicator	Original indicator
C 1: Maintenance and Appropriate Enhancement of Forest Resources and their Contribution to Global Carbon Cycles	1.1	Forest area	Area of forest and other wooded land, classified by forest type and by availability for wood supply, and share of forest and other wooded land in total land area	*Area of forest and other wooded land and changes in area (classified, if appropriate, according to forest and vegetation type, ownership structure, age structure, origin of forest)*
	1.2	Growing stock	Growing stock on forest and other wooded land, classified by forest type and by availability for wood supply	*Changes in total volume of the growing stock* *Changes in mean volume of the growing stock on forest land (classified, if appropriate, according to different vegetation zones or site classes)*
	1.3	Age structure and / or diameter distribution	Age structure and / or diameter distribution of forest and other wooded land, classified by forest type and by availability for wood supply	*Changes in age structure or appropriate diameter distribution classes*
	1.4	Carbon stock	Carbon stock of woody biomass and of soils on forest and other wooded land	*Total carbon storage and changes in the storage in forest stands*
C 2: Maintenance of Forest Ecosystem Health and Vitality	2.1	Deposition of air pollutants	Deposition of air pollutants on forest and other wooded land, classified by N, S and base cations	*Total amount of and changes over the past five years in depositions of air pollutants (assessed in permanent plots)*
	2.2	Soil condition	Chemical soil properties (pH, CEC, C / N, organic C, base saturation) on forest and other wooded land related to soil acidity and eutrophication, classified by main soil types	*Changes in nutrient balance and acidity over the past 10 years (pH and CEC); level of saturation of CEC on the plots of the European network or of an equivalent national network*
	2.3	Defoliation	Defoliation of one or more main tree species on forest and other wooded land in each of the defoliation classes 'moderate', 'severe' and 'dead'	*Changes in serious defoliation of forests using the UNECE and EU defoliation classification (classes 2, 3, and 4) over the past five years*
	2.4	Forest damage	Forest and other wooded land with damage, classified by primary damaging agent (abiotic, biotic and human induced) and by forest type	*Serious damage caused by biotic or abiotic agents – severe damage caused by insects and diseases with a measurement of seriousness of the damage as a function of (mortality or) loss of growth* *Serious damage caused by biotic or abiotic agents – annual area of*

Criteria	No.		Improved indicator	Original indicator
				burnt forest and other wooded land Serious damage caused by biotic or abiotic agents – annual area affected by storm damage and volume harvested from these areas Serious damage caused by biotic or abiotic agents – proportion of regeneration area seriously damaged by game and other animals or by grazing
C 3: Maintenance and Encouragement of Productive Functions of Forests (Wood and Non-Wood)	3.1	Increment and fellings	Balance between net annual increment and annual fellings of wood on forest available for wood supply	*Balance between growth and removals of wood over the past 10 years*
	3.2	Roundwood	Value and quantity of marketed roundwood	
	3.3	Non-wood goods	Value and quantity of marketed non-wood goods from forest and other wooded land	*Total amount of and changes in the value and/or quantity of non-wood forest products (e.g., hunting and game, cork, berries, mushrooms, etc.)*
	3.4	Services	Value of marketed services on forest and other wooded land	
	3.5	Forests under management plans	Proportion of forest and other wooded land under a management plan or equivalent	*Percentage of forest area managed according to a management plan or management guidelines*
C 4: Maintenance, Conservation and Appropriate Enhancement of Biological Diversity in Forest Ecosystems	4.1	Tree species composition	Area of forest and other wooded land, classified by number of tree species occurring and by forest type	*Changes in the proportions of mixed stands of 2-3 tree species*
	4.2	Regeneration	Area of regeneration within even-aged stands and uneven-aged stands, classified by regeneration type	*In relation to total area regenerated, proportions of annual area of natural regeneration*
	4.3	Naturalness	Area of forest and other wooded land, classified by 'undisturbed by man', by 'semi-natural' or by 'plantations', each by forest type	*Changes in the area of natural and ancient semi-natural forest types*
	4.4	Introduced tree species	Area of forest and other wooded land dominated by introduced tree species	
	4.5	Deadwood	Volume of standing deadwood and of lying deadwood on forest and other wooded land classified by forest type	
	4.6	Genetic resources	Area managed for conservation and utilisation of forest tree genetic resources (in situ and ex situ gene conservation) and area managed for seed production	*Changes in the proportions of stands managed for the conservation and utilisation of forest genetic resources (gene reserve forests, seed collection stands, etc.); differentiation between indigenous and introduced species*
	4.7	Landscape pattern	Landscape-level spatial pattern of forest cover	
	4.8	Threatened forest species	Number of threatened forest species, classified according to IUCN	*Changes in the number and percentage of threatened species in relation*

Criteria	No.		Improved indicator	Original indicator
			Red List categories in relation to total number of forest species	*to the total number of forest species (using reference lists, e.g. IUCN, Council of Europe or the EU Habitat Directive)*
	4.9	Protected forests	Area of forest and other wooded land protected to conserve biodiversity, landscapes and specific natural elements, according to MCPFE protection categories	*Changes in the area of strictly protected forest reserves* *Changes in the area of forests protected by special management regime*
C 5: Maintenance and Appropriate Enhancement of Protective Functions in Forest Management (notably soil and water)	5.1	Protective forests – soil, water and other ecosystem functions	Area of forest and other wooded land designated to prevent soil erosion, to preserve water resources, or to maintain other forest ecosystem functions, part of MCPFE protection category 'Protective Functions'	*Proportion of forest area managed primarily for soil protection* *Proportion of forest area managed primarily for water protection*
	5.2	Protective forests – infrastructure and managed natural resources	Area of forest and other wooded land designated to protect infrastructure and managed natural resources against natural hazards, part of MCPFE protection category 'Protective Functions'	
C 6: Maintenance of other socio-economic functions and conditions	6.1	Forest holdings	Number of forest holdings, classified by ownership categories and size classes	
	6.2	Contribution of forest sector to GDP	Contribution of forestry and manufacturing of wood and paper products to gross domestic product	*Share of the forest sector in the gross national product*
	6.3	Net revenue	Net revenue of forest enterprises	
	6.4	Expenditures for services	Total expenditures for long-term sustainable services from forests	
	6.5	Forest sector workforce	Number of persons employed and labour input in the forest sector, classified by gender and age group, education and job characteristics	*Changes in the rate of employment in forestry, notably in rural areas (persons employed in forestry, logging, forest industry)*
	6.6	Occupational safety and health	Frequency of occupational accidents and occupational diseases in forestry	
	6.7	Wood consumption	Consumption per head of wood and products derived from wood	
	6.8	Trade in wood	Imports and exports of wood and products derived from wood	
	6.9	Energy from wood resources	Share of wood energy in total energy consumption, classified by origin of wood	
	6.10	Accessibility for recreation	Area of forest and other wooded land where public has a right of access for recreational purposes and indication of intensity of use	*Provision of recreation: area of forest with access per inhabitant, per cent of total forest area*
	6.11	Cultural and spiritual values	Number of sites within forest and other wooded land designated as having cultural or spiritual values	

2. Qualitative Indicators

A. Overall policies, institutions and instruments for sustainable forest management

A.1 National forest programmes or similar
A.2 Institutional frameworks
A.3 Legal/regulatory frameworks and international commitments
A.4 Financial instruments/economic policy
A.5 Informational means

B. Policies, institutions and instruments by policy area

Ind. no.	Crit.	Policy area	Main objectives	Relevant institutions	Main policy instruments used			Significant changes since last Ministerial Conference
					Legal/ regulatory	Financial/ economic	Informa-tional	
B.1	C1	Land use and forest area and OWL[29]						
B.2	C1	Carbon balance						
B.3	C2	Health and vitality						
B.4	C3	Production and use of wood						
B.5	C3	Production and use of non-wood goods and services, provision of especially recreation						
B.6	C4	Biodiversity						
B.7	C5	Protective forests and OWL						
B.8	C6	Economic viability						
B.9	C6	Employment (incl. safety and health)						
B.10	C6	Public awareness and participation						
B.11	C6	Research, training and education						
B.12	C6	Cultural and spiritual values						

[29] OWL = other wooded land.

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