2.4. Forestry

The total area of forest in Europe is increasing and the annual increment of growing stock has been larger than annual felling in nearly all countries. The timber resource is therefore increasing. The expansion of forest area has been mainly in the Mediterranean region and the southeastern countries of eastern Europe, the Caucasus and central Asia. In the Russian Federation, there has been an annual decline of forest area, but the combined area of forest and 'other wooded land' has been increasing.

About three quarters of the total forest area is considered 'undisturbed'; most of this is located in the Russian Federation. Recent studies suggest, however, that only about 26 % of the forest zone in the Russian Federation remain as large, intact forest landscape. About 7 % of the European forest area is under some form of protection and about 3 % under strict protection. A general strategy has been to expand existing protection networks, such as Natura 2000 in the European Union, in order to improve to improve protection in all regions.

Crown condition in European forests deteriorated considerably during the 10 years that followed the setting up of monitoring in 1985 as response to the UNECE Convention on Long-range Transboundary Air Pollution. After some recovery in the mid-1990s, deterioration has resumed in recent years with more than 20 % of trees now classified as damaged.

The relatively low utilisation of Europe's valuable timber resources provides opportunities for policy-makers and forest managers to diversify the functions of Europe's forests and achieve a better balance between environmental, social and economic interests in forest areas. In extensive forests, generally far from human settlements, current sustainable management practices should continue while allowing the protection of biodiversity, soil and water catchments. The smaller forests areas, in countries not highly dependent on forestry or where opportunities for commercial use are more limited, could increasingly satisfy functions other than production, including recreation, education, nature protection and buffer zones between built-up areas.

2.4.1. Introduction

Forests and 'other wooded land' (see definition in Section 2.4.5) constitute an important natural resource. They cover about 38 % of the land area of Europe and provide a wide range of goods and services for society. These include renewable fibre and timber resources and non-wood goods and services. Forests are a major reserve for Europe's biodiversity, provide important general ecological functions, since they serve as carbon sinks, protect water quality and soils. They are also of great value for tourism, recreation and education.

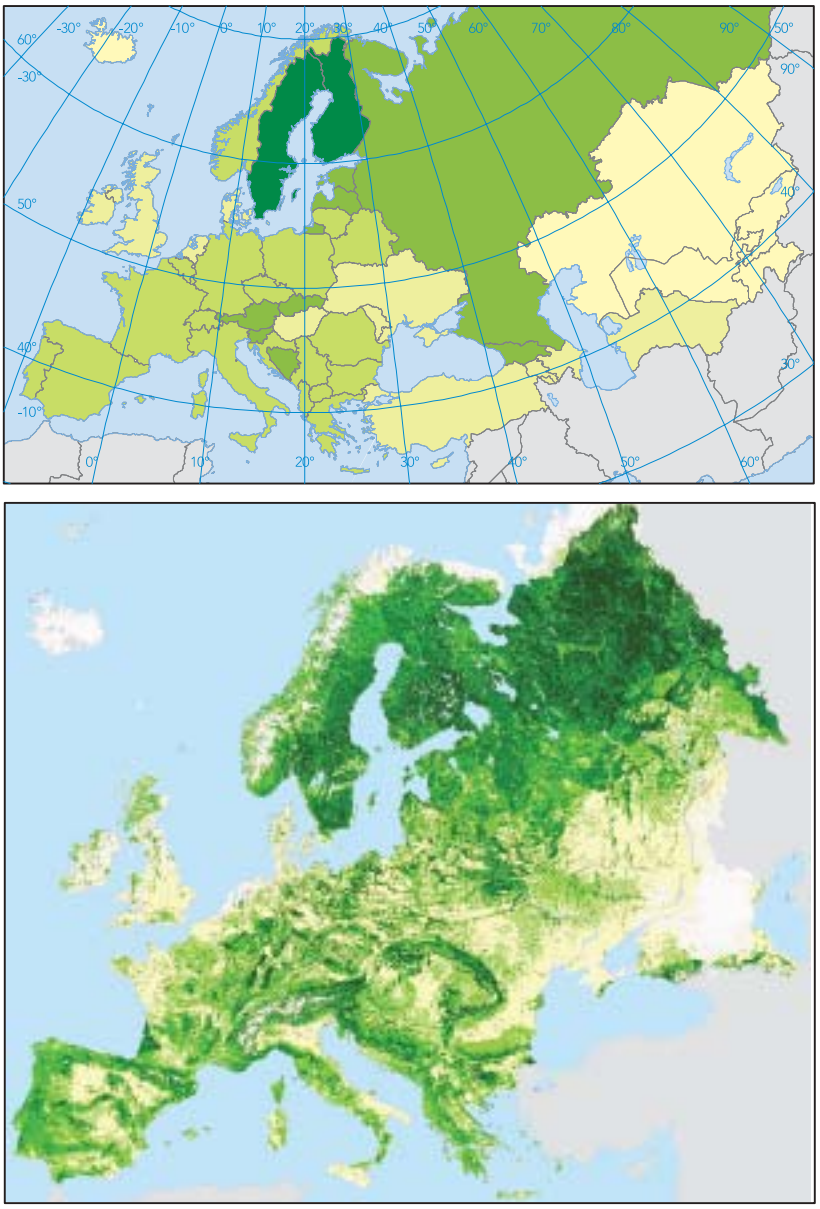
An important characteristic of European forests is that each country has its own management culture and specific goals, different ownership structures and particular societal demands and pressures on forests (e.g. climate change, biodiversity loss, illegal logging). This is one of the reasons why European forests are subject to many political initiatives and processes at different levels. These include a number of international conventions and two ministerial processes at the European level — 'Environment for Europe' and the Ministerial Conference on the Protection of Forests in Europe (MCPFE) — which aim at identifying common denominators and necessary actions.

In particular, an integrated approach is needed for maintaining biodiversity; this is reflected in the MCPFE process, in which biodiversity is regarded as part of sustainable forest management. MCPFE uses one biodiversity criterion for protected forests and eight (biodiversity) criteria for other forests.

In the EU, these initiatives are implemented through a set of strategies, action plans, directives and regulations. This policy framework reflects the long silvicultural tradition of the Member States and ensures that the forest resource is relatively well controlled and protected, although environmental challenges remain (halting the gradual loss of biodiversity, improving carbon sink capacities, etc.).

On a European scale, the situation is more complex. For example, forests in countries

Forest map of Europe Map 2.4.1 .



Notes: Based on remote sensing technologies and forest inventory statistics. Most of EECCA (including parts of the Russian Federation), Turkey and Cyprus are visualised by one %-class for the whole country as the current forest map does not cover the entire region.

Sources: Schuck *et al.*, 2002; Päivinen *et al.*, 2001; UNECE/FAO, 2000

with economies in transition are experiencing many changes resulting from the opening-up of new export markets, institutional restructuring and changes in ownership structures. The amount of virgin forest in the Russian Federation, in particular, is declining, most visibly in the western areas, western Siberia, the southern parts of eastern Siberia and the Russian far east. This is due mainly to fundamental transformation of the forest vegetation by human activity having considerable impact on the existing areas of intact natural forest ecosystems and the biodiversity within them (Aksenov *et al.*, 2002).

Evaluating the development of forests and forestry requires indicators that reflect the various functions of the forest resource: forest area and composition, the volume and increment of the timber resource, markets and use of forest products, socio-economic factors and environmental conditions. The information base should improve significantly as a result of the set of indicators for sustainable forest management that has been prepared for adoption at the 2003 Ministerial Conference on the Protection of Forests in Europe.

2.4.2. Forest area

2.4.2.1. Total forest area

The total forest area of Europe (excluding 'other wooded land') amounts to 10.3

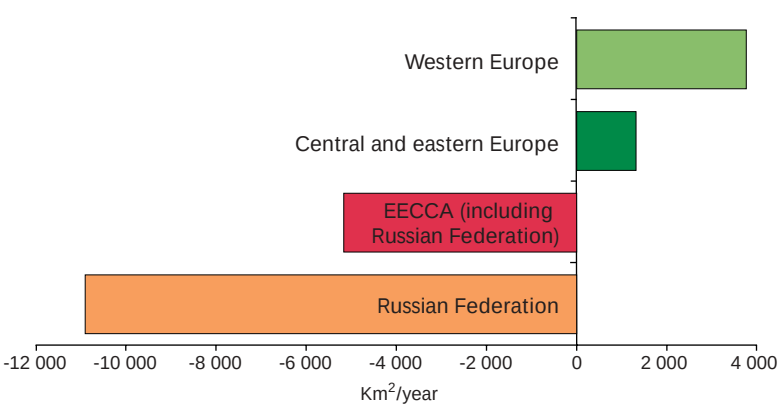
million km². Even without taking into account the vast resources of the Russian Federation, the forest area is 2.1 million km².

Figure 2.4.1 shows the recent average annual change in forest area based on two reference periods for different country groupings and separately for the Russian Federation.

The total forest area of Europe, excluding the Russian Federation, is increasing by about 11 000 km²/year. Expansion has been mainly in the Mediterranean region and the southeastern countries of eastern Europe, the Caucasus and central Asia. The Russian Federation reported a decrease in forest area at a very similar rate. This, however, was more than offset by an increase of about 16 000 km²/year in the area of 'other wooded land'. The increase in forest area (excluding the Russian Federation) has taken place mainly in forest not available for wood supply (around 7 700 km²/year).

The largest increases are reported in EECCA (in particular Belarus and Kazakhstan) and countries in the Mediterranean region (Spain, France, Portugal, Greece and Italy). The only countries indicating a slight decline in forest area are Serbia and Montenegro, Albania and Belgium. Countries with an expanding forest area in the EU are mainly those that have implemented afforestation programmes through planting or by allowing 'other wooded land' to be converted to forest.

Figure 2.4.1. **Average annual change of forest area in Europe between two reference periods**



Notes: Calculation of annual change is based on two reference periods; most countries compared data for a period of 1-5 years in the mid-late 1990s with a reference period that was generally 5-10 years earlier.

Source: UNECE/FAO, 2000.

A problem related to monitoring developments in forest areas is the lack of comparability between inventories in different countries, especially for changes over time because of changes in definitions between assessment periods. Land-use change is an important indicator related, for example, to biodiversity and carbon sequestration; frequent reporting is therefore likely to be demanded in future. In the near future, more emphasis will need to be put on using remote sensing technologies and combined approaches (remote sensing and inventory statistics) in order to guarantee continuous and harmonised monitoring of changes in forest area.

2.4.2.2. Composition trends

In Europe, broadleaved forests dominate in several countries of EECCA (Republic of Moldova, Ukraine, Azerbaijan, Turkmenistan, Uzbekistan) and in the Balkans (Serbia and Montenegro, Croatia). Coniferous forests dominate in the densely forested countries, particularly the Nordic countries (Sweden and Finland: more than 75 %) but also western and central Europe (e.g. Austria: around 70 %). Some countries have a roughly equal share of broadleaved and coniferous forest (e.g. Belgium, Greece, the Netherlands and Ukraine).

Forest management in many parts of Europe during the past two centuries has often favoured single-species stands. Currently, there is a general trend, especially in western and central Europe, to increase the share of mixed forests by converting monocultural stands (Bengtsson *et al.*, 2000). Natural regeneration is becoming a more common forest management practice and often increases the amount of mixed forests (Bartelink and Olsthoorn, 1999). According to UNECE/FAO (2000), however, only about 17 % of the forests are considered mixed for all Europe (excluding the Russian Federation, in which 41 % are reported as mixed). In the EU, 13 % of the forest is mixed.

Even active tree species policies result in only slow changes in forest composition. They depend, for example, on the rotation period of forest stands and the area available for regeneration. The multiple functions of forests imply that there are many different targets that relate to the composition of

forests which will also influence the rate of change. For example demands for more stability of forests against natural disturbances, biodiversity issues, forest protection and the use of forests as carbon sinks may target different tree species or mixes of species.

2.4.2.3. Naturalness

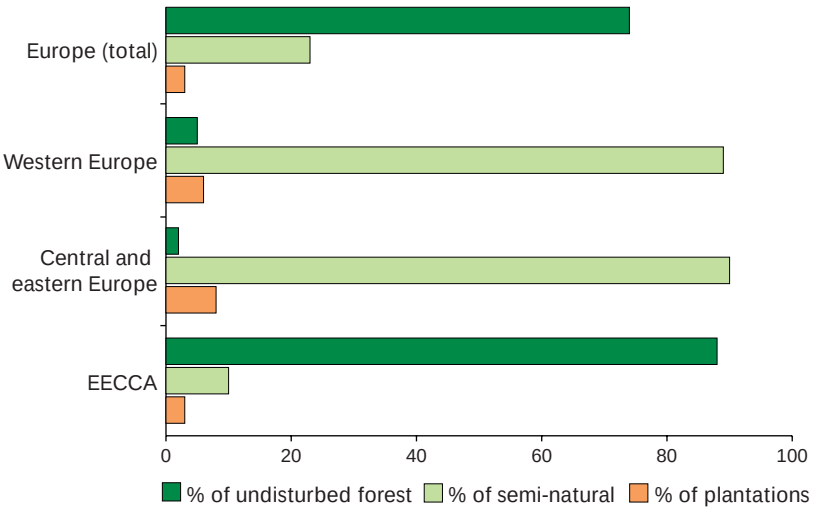
About three quarters of the forest area of Europe is considered to be undisturbed. However, nearly all of this lies within the Russian Federation, mainly in its northern regions. According to UNECE/FAO (2000) 92 % of Russian forests are considered undisturbed.

In contrast, a study by Aksenov *et al.* (2002) shows that about 290 million hectares, or 26 % of the forest area in the Russian Federation remain as large, intact forest landscape. The eastern Siberian region is least affected by modern land use. The western part of the Russian Federation has only small amounts of intact forest landscape (9 %). More than 80 % of the intact forest landscapes are located in the boreal forests/taiga of the Russian Federation. The forests in these areas mostly have a very low production potential (often less than 1 m^3/ha/year) and are therefore not suitable for sustainable wood production (Yaroshenko *et al.*, 2001).

The main causes of fragmentation, according to Aksenov *et al.* (2002), are industrial forest harvesting and the fires that follow logging, agricultural use and road construction. This applies in particular to the western part of the Russian Federation. Extraction of mineral resources can be a further cause of forest fragmentation. The financial crisis of 1998 led to the highest rates of forest utilisation for a decade, as it became more profitable to harvest and export raw material; this caused a real threat to the remaining intact forests (Yaroshenko *et al.*, 2001).

With the exception of the Russian Federation and the Nordic countries (northern Sweden, Finland and Norway), the proportion of forest 'undisturbed' by human activities in most European countries is less than 1 %. The undisturbed boreal forest area of northwestern Europe, with its continuation into the Russian Federation, is therefore quite outstanding. The smallness of the area of totally undisturbed forests that remains in Europe reflects the long tradition of forest use and management. However, such small remnants may be of high importance for nature protection and the conservation of biological diversity. A number of prominent examples are the Bialowieza forest in Poland and Belarus, strict forest reserves in the Carpathian mountains of Romania and the protected laurel forests in Atlantic islands such as Madeira (Portugal) and La Gomera (Spain).

Forest land in categories of 'naturalness', Europe Figure 2.4.2.



Note: No data available for Greece and Luxembourg.

Source: UNECE/FAO, 2000

Forest classified as 'semi-natural' dominates in Europe (excluding the Russian Federation). Some countries in WE (Germany, Austria, Switzerland, Italy), CEE (Czech Republic, Slovakia, Poland, and Serbia and Montenegro) and EECCA have reported their forests to be between 98 % and 100 % semi-natural. Overall, semi-natural forests comprise only about 23 % of the total forest area when including the Russian Federation (Figure 2.4.2.).

'Plantations' are defined as forest areas established by planting or/and seeding in the process of afforestation or reforestation. They can consist of non-native tree species or intensively managed stands of indigenous species which meet three criteria: one or two species, even age class, and regular spacing (UNECE/FAO, 2000). They comprise only 3 % of the total forest area. Countries with large proportions of plantations are Ireland, Denmark and the United Kingdom. Other countries with notable amounts of plantation area are Bulgaria, France, Portugal, Spain and Turkey. In the Nordic countries, the plantation criteria may apply to large areas of

forest, but since these are also characteristic of semi-natural and natural boreal forests they have not been reported as plantations but under one of the other categories.

2.4.2.4. Forest condition

Forest condition is assessed annually in 37 European countries participating in the international cooperative programme on forests set up in 1985 under the United Nations Economic Commission for Europe (UNECE) Convention on Long-range Transboundary Air Pollution (CLRTAP).

Crown condition in European forests deteriorated considerably during the first decade of monitoring. After some recovery in the mid-1990s, deterioration resumed in recent years with more than 20 % of trees now classified as damaged. Significant deterioration in crown condition is to be found in southern Finland, Estonia and Latvia. Increasing defoliation was registered in central Romania, Bulgaria and the west of the Iberian Peninsula. Improving crown condition was observed mainly in southern Poland, western Romania and in Slovakia, after considerable damage in the past.

Results from intensively monitored plots indicate a continuing threat to forests from deposition of nitrogen and acidity, particularly in central Europe. Nitrogen deposition constitutes a particular risk in WE. Sulphur depositions were reduced on many plots — a clear result of the drastic reduction in sulphur emissions in Europe resulting from CLRTAP and other pollution-abatement strategies (UNECE, 2002).

2.4.2.5. Protected areas

Concerns about a decline in natural forests, accompanied by a loss of biological diversity, created a political momentum, particularly during the 1980s, to increase the area of protected forest. The initiatives have aimed mainly at protecting biodiversity but also take related social and cultural values into consideration. A general strategy has been to expand existing protection networks, such as Natura 2000 in the EU, in order to improve protection in all regions.

Including all IUCN-The World Conservation Union categories of protection, 7.3 % of forest land in Europe was reported to the Temperate and Boreal Forest Resources Assessment 2000 as being protected (UNECE/FAO, 2000). About 3 % was classified as being under stricter protection (IUCN categories I and II).

A European project, the 'Forest reserves research network', reported that 1.6 % of the overall forest area in 27 participating European countries was strictly protected (European Commission, 2000). Work is in hand to harmonise definitions and data collection on protected areas in the EU and at the pan-European level.

2.4.3. Annual fellings and total annual increment of growing stock

The Russian Federation has a growing stock of about 85 billion m^3, or three quarters of the total resource of Europe. Together with the growing stock in Finland, Sweden, Germany, France, Poland, Italy and Ukraine this represents 88 % of all forest resources in Europe.

The net annual increment (NAI) of forest available for wood supply in the Russian Federation is about 740 million m^3. By comparison, the remaining European countries (excluding those for which no data were available) have an NAI of 708 million m^3. NAI does not include natural losses, for example from windblow that can be harvested and counted as felling. This can be substantial and lead to 'felling' exceeding NAI without any depletion of the growing stock.

In general, both net annual increment and annual felling have increased during recent decades, with annual felling rising much more slowly. The balance between NAI and annual felling is a major indicator of the long-term sustainability of forestry with respect to the overall timber resource.

NAI is generally well above annual felling in most of Europe (Figure 2.4.3). The Russian Federation uses about 16 % of its NAI. This is mainly explained by the collapse of felling after the break-up of the USSR in the early 1990s. This becomes clearer when looking at the figures of the previous (1990) forest resources assessment, for which the former USSR reported felling reaching about 74 % of the NAI in forests available for wood supply (UNECE/FAO, 1992).

The net annual increment of Europe's forests available for wood supply started to exceed annual fellings significantly in the 1960s (Kuusela, 1994; Silva Network, 1999). Possible causes for the increase (Spiecker *et al.*, 1996; Päivinen *et al.*, 1999) include:

- increased growing stock and expansion of the forest area;
- improved forest management practices and changes in forest structure aimed at higher wood production;
- environmental changes;
- changes in forest definitions and more accurate inventory methods.

The gap between the NAI and annual felling may also be increasing for reasons related to the economic profitability of harvesting and large-scale use of the entire NAI.

If current supply/demand structures stay in place, the growing stock will continue to increase. However, wood supply/demand patterns are dynamic: both market and policy forces can have measurable impacts on felling levels. One example of increasing demand for timber can be related to the aim of the European Commission to increase the share of renewable energy in the EU by 50 % (based partly on wood), to 12 % of total energy use by the year 2010 (European Commission, 1997) (Figure 2.4.4.).

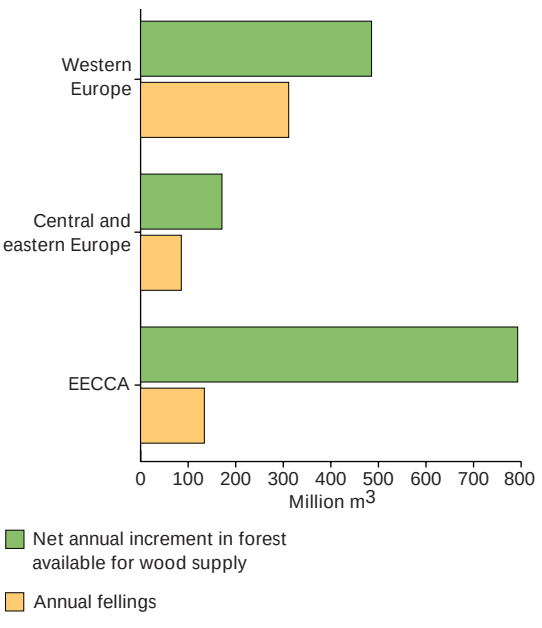
Further increases in private ownership of forests in countries with economies in transition may lead to an increase in felling as the owners continue to see the forest as a potential source of income (Csoka, 1998). However, concerns are also expressed that in these countries where privatisation and restitution are expected to yield some 2.3 to 3.5 million forest owners, many will receive very small holdings for which they may show only limited interest with regard to management.

A recovery of the Russian forestry sector and active consumer behaviour (e.g. increased demand for products from sustainably produced timber) should contribute to an increase in supply and demand for wood and wood products. Other issues related to conservation and biodiversity, social functions of forests, environmental changes and carbon sequestration might result in an adaptation of forest management procedures in ways that enable the demands of various stakeholders to be met simultaneously.

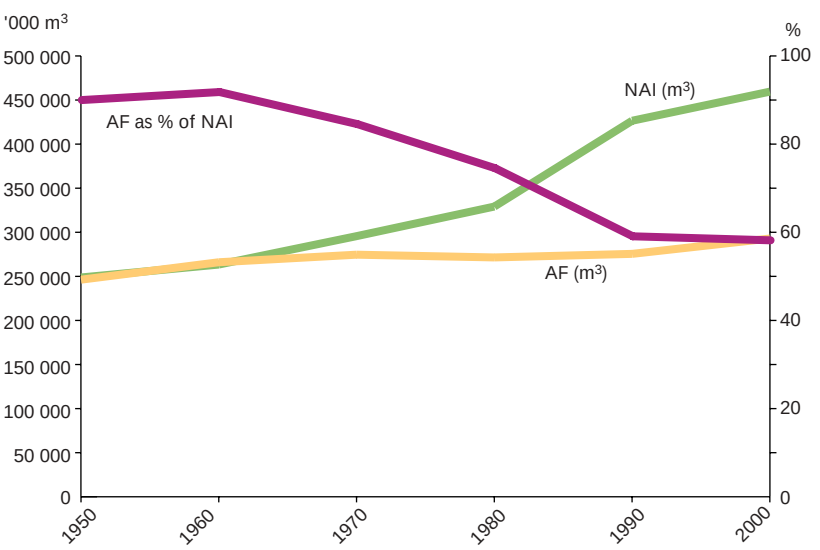
It is the currently low use of the available resources that is providing scope for European policy-makers to design more socially, economically and environmentally balanced options for forest management and utilisation (Nabuurs *et al.*, 2003).

Annual felling and net annual increment of growing stock available for wood supply in Europe — Figure 2.4.3.

Source: UNECE/FAO, 2000



Net annual increment (NAI) and annual felling (AF) of the growing stock of forest for the EU — Figure 2.4.4.



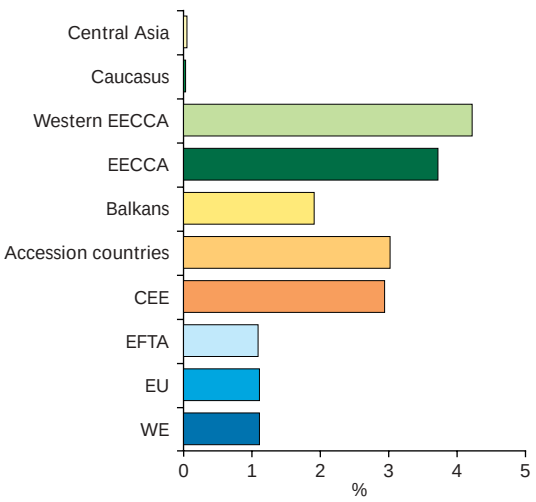
Sources: Kuusela, 1994; UNECE/FAO, 2000

2.4.4. The forestry sector as part of the national economy

The possibilities for changing production forests into forested areas that are able to satisfy a number of functions, including recreation, education, nature protection and buffer zones between built-up areas, are dependent on the importance of forestry for the national economies. The most-used indicator for assessing the role of the forestry sector in the national economy is the ratio of the value added by the sector to the country's GDP (Figure 2.4.5.).

Figure 2.4.5. **Forestry sector share of gross domestic product in Europe, 2000**

Sources: FAOSTAT, 2002; World Bank, 2000



The contribution of the forestry sector to GDP is generally relatively low, below 2 %, but substantially higher, typically more than 10 %, in some western Europe countries like Finland and Sweden and some central and eastern Europe countries like Latvia, Estonia and Lithuania. Even in these countries, however, the ratio has decreased substantially — in Finland, for example, from about one third in the late 1980s to 12 % in 2000.

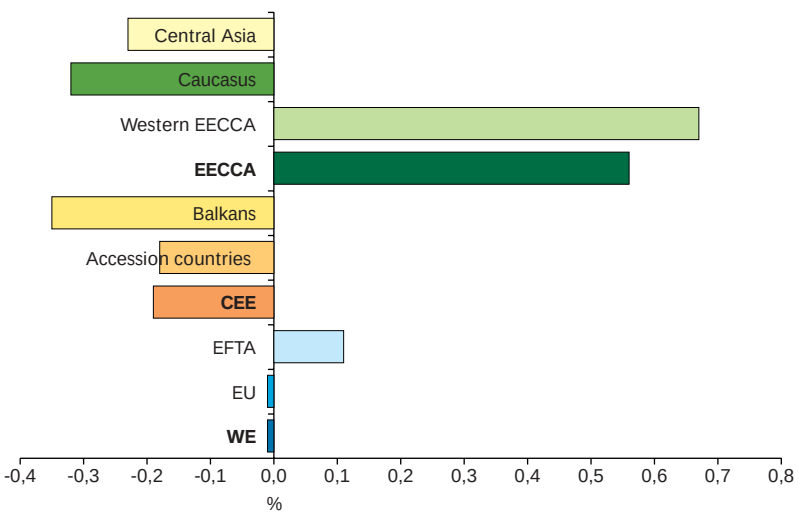
This decrease in relative importance is often the result of faster growth in other sectors, with the value added by the forest sector remaining stable. Forest industries in the EU typically invest less than industries such as telecommunications or other sectors that aim for fast growth. This may reflect the economic maturity of the sector and changes in the geographical distribution of investment following the estimated future consumption of forest products, but may also reflect the availability of raw materials or energy for the processing industries of Europe.

Most trade in forest products in Europe is internal, but many European countries are important exporters, the five largest being Finland, Sweden, Germany, France and Austria (Peck, 2001; EFI/WFSE, 2002). The revealed 'comparative advantage index' (Figure 2.4.6) shows the ratio of net exports of forest products to national GDP. The index follows the logic that if a country devotes more of its total resources to the production of a good than its domestic demand, it will have a comparative advantage with respect to this product in international trade. Thus, the comparative advantage index illustrates the country's position in international markets (Palo and Lehto, 1999). Among the WE and CEE countries, the index was highest (in 2000) in Latvia, Finland, Estonia and Sweden, where the relative share of forest products exports was also highest.

Based on trade indicators, there are countries where the forest sector has a high comparative advantage, a high share of exports and a clearly positive net trade value, e.g. Finland, Sweden, Austria and Norway (WE); Latvia, Estonia, Lithuania Slovenia, Slovakia and the Czech Republic (CEE); and the Russian Federation (EECCA). Other countries have a low comparative advantage and a relatively high share of import of forest products, e.g. Germany, France, Spain, the Netherlands and Italy (WE); Poland, Turkey, and Serbia and Montenegro (CEE). Finally, some countries have little forest product production and nearly total dependency on imports, e.g. Uzbekistan, Turkmenistan, Armenia and Azerbaijan (EECCA).

The rather low exploitation of Europe's timber resources and the limited contribution to GDP and export earnings in many European countries provide opportunities for diversifying the functions of Europe's forests. In countries with large forests, generally far from human settlements, current management activities could coexist alongside ensuring the protection of biodiversity, soil and water catchments. This can only be guaranteed if unsustainable use of forest resources by over-cutting or illegal logging is prevented. These practices have been

Figure 2.4.6. **Revealed forestry comparative advantage index in Europe, 2000**



Sources: FAOSTAT, 2002; World Bank, 2000

receiving increased attention and have been mentioned in particular with regard to EECCA. Smaller-scale forests in countries not strongly dependent on forestry, or where opportunities for commercial forest management are more limited, could increasingly satisfy functions other than production, including recreation, education, nature protection and buffer zones between built-up areas.

2.4.5. Definitions

Terms used in this chapter are based on the following definitions:

Other wooded land
Land either with a tree crown cover (or equivalent stocking level) of 5–10 % 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 % 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.

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.

Forest not available for wood supply
Forest where legal, economic or specific environmental restrictions prevent any significant supply of wood.

Forest/other wooded land undisturbed by humans
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.

Semi-natural forest/other wooded land
Forest/other wooded land which is neither 'forest/other wooded land undisturbed by humans' nor 'plantation' as defined separately.

Plantation(s)
Forest stands established by planting or/and seeding in the process of afforestation or reforestation. They are either:

- 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.

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