

# Forest and environment

*Yves Zanatta, Eero Mikkola, Markus Engels*

The forests of the European Union vary widely in the structure of their biological and economic resources and in the functions they are expected to serve. Figures available today are suitable only for overall descriptions of the environmental aspects of forests. They might show (or hide) problems that do not play a role (or that could be essential) on the local level.

The importance of forests differs depending on which of their numerous functions are taken into consideration.

Environmental and other benefits of forests are potentially endangered by both natural and man made damage. Although the consequences of the damage may be of minor consequence at the global level at the moment, they are certainly serious in the affected regions. They will become perceptible also at national or European levels if the frequency and strength of damage events continue to develop.

The main **source** of data used is TBFRA 2000 (Temperate and Boreal Forest Resource Assessment) compiled by UN-ECE/FAO.

Data on defoliation originates from the ICP (International Co-operative Programme on the Assessment and Monitoring of Air Pollution Effects on Forests). Data on forest fires are collected by the Directorate General of Agriculture of the European Commission.

The source of the data on strictly protected forests is the COST 4 project of the EU.

## 1 Today's forest in the European Union

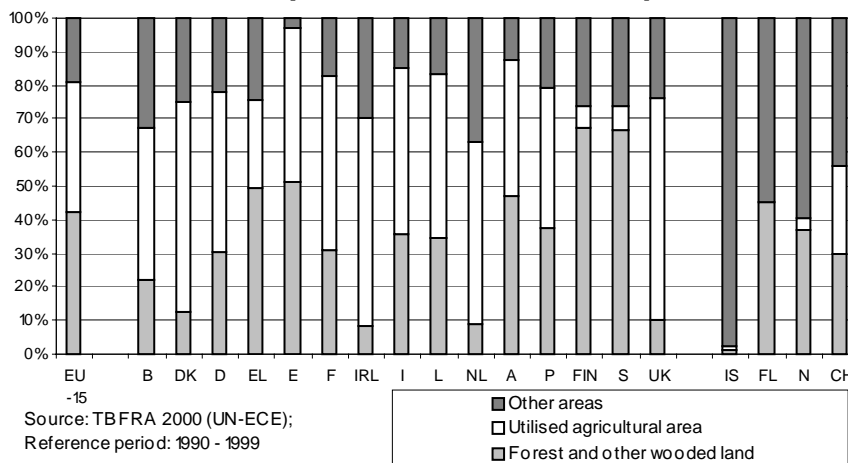
### 1.1 Forest and other wooded land

Tree covered ground exists in a variety of formations, closed (*Forests (F)* as such) and others with lower density of the canopy (so-called *Other wooded land (OWL)*).

*Forest and other wooded land (FOWL)* plays a big role in terms of land cover. With more than 40 % of the total area, it matches the agricultural area in the EU-15.

On the other hand, the share of the Gross Value Added (sum of all Member States for which data was available) contributed by forestry to the corresponding sum of Gross Domestic Products in 1997 was 0.17 % and is thus negligible in discussions at the overall level.

**Graph 1: Land use in Europe**



## Statistics in focus

### AGRICULTURE AND FISHERIES

THEME 5 – 17/2000

### AGRICULTURE

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Source: TBFRA 2000 (UN-ECE);  
Reference period: 1990 - 1999

■ Other areas  
□ Utilised agricultural area  
■ Forest and other wooded land

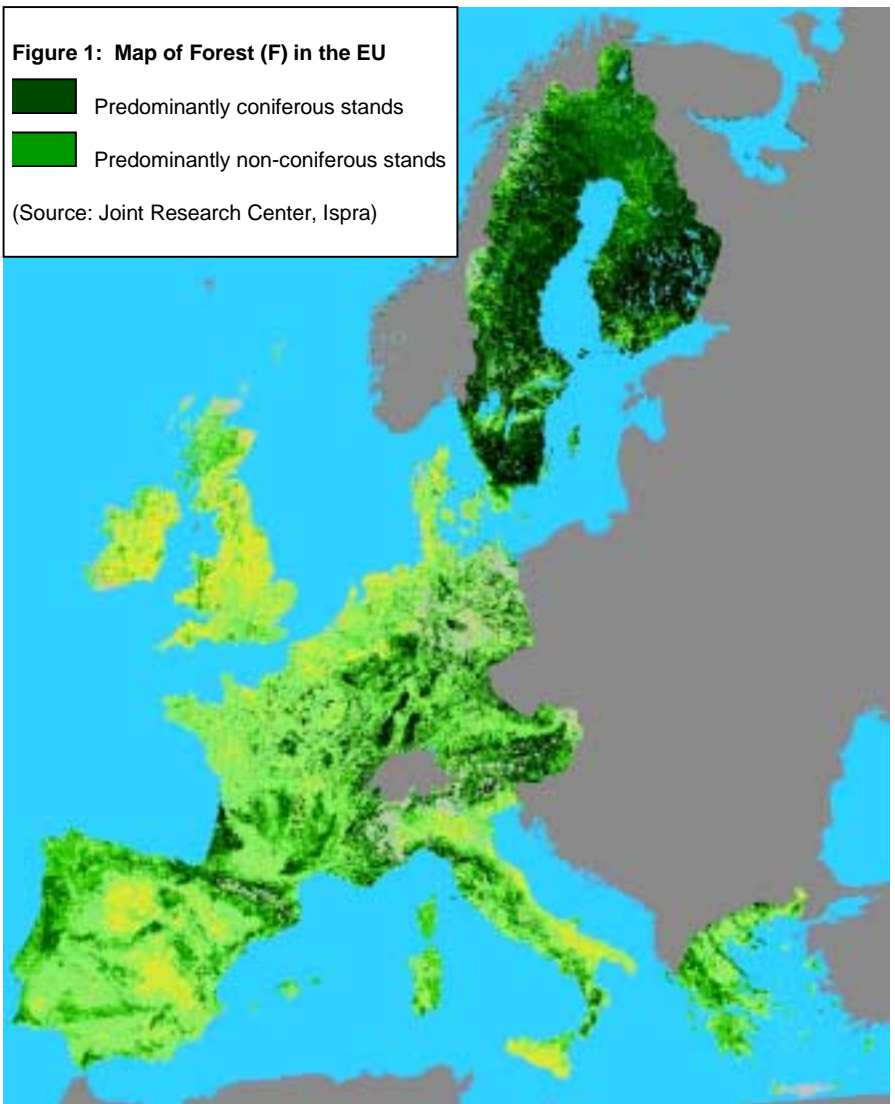
	FOWL 1000 ha	F %	OWL %
EU-15	136204	83	17
Belgium	672	96	4
Denmark	538	83	17
Germany	10740	100	0
Greece	6513	52	48
Spain	25984	52	48
France	16989	89	11
Ireland	591	100	0
Italy	10842	91	9
Luxembourg	89	97	3
Netherlands	339	100	0
Austria	3924	98	2
Portugal	3467	98	2
Finland	22768	96	4
Sweden	30259	90	10
United Kingdom	2489	99	1

Table 1: Proportions of Forest and Other wooded land in the EU (TBFRA 2000)

Large parts of the *Wooded area* (FOWL) of the EU are located in Scandinavia and in the Mediterranean region. In general, FOWL of Scandinavia and the central EU countries contains a higher share of closed Forest (F) than that of the Mediterranean countries. Taking only the area of Forest land (F), Sweden and Finland lead with a joint share of 43 % of the EU. Spain and Greece have a significant (nearly 50 %) proportion of other wooded land. (Table 1, Fig. 1 and Graph 2)

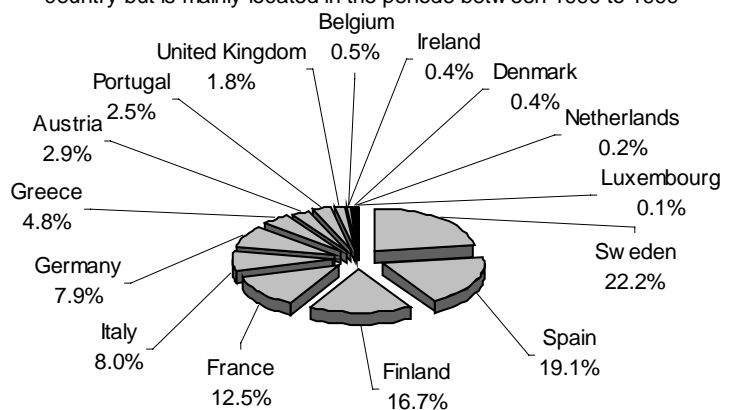
## 1.2 Changes in Forest (F) area

Graph 3 shows a growth in Forest (F) land for all Member States of the Union and the EFTA countries. Greece, Ireland, Italy, the United Kingdom and Iceland have reafforested substantial areas. The steady growth of forest land within the last 50 years in the EU contrasts with a clear diminution in Canada and the USA during the same period.



## Graph 2: Share of Wooded area (FOWL) in EU-15

Source: TBFRA 2000 (UN-ECE) The reference year differs from country to country but is mainly located in the period between 1990 to 1999



*Forest* is defined as land with tree crown cover (or equivalent stocking level) of more than 10 percent 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. It may consist either of closed forest formations or of open forest formations with a continuous vegetation cover in which tree crown cover exceeds 10 percent. Young natural stands and all plantations established for forestry purposes which have yet to reach a crown density of 10 percent or tree height of 5 m are included under forest.

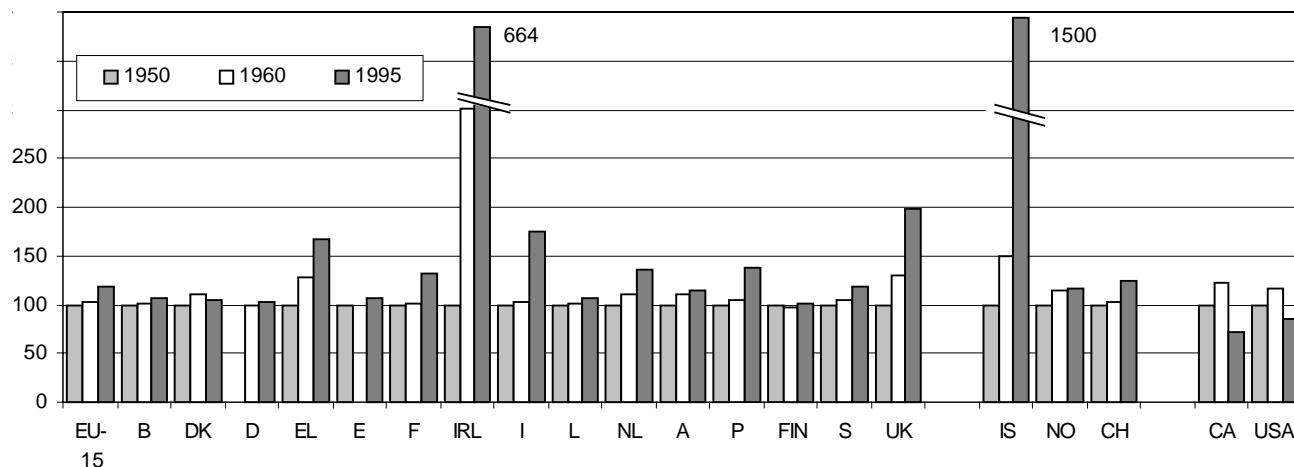
*Other wooded land* is land either with a tree crown cover (or equivalent stocking level) of 5–10 percent of trees able to reach a height of 5 m at maturity in situ; or a crown cover (or equivalent stocking level) of more than 10 percent of trees not able to reach a height of 5 m at maturity in situ (e.g. dwarf or stunted trees) and shrub or bush cover.

### Graph 3: Evaluation of change in forest area

The reference periods of the countries may differ up to 5 years from the presented years

%  
(1950=100)

Source: UN-ECE;  
extracted from EFIDAS



### 1.3 Forest ownership

Data on forest ownership is important in determining the way forests are managed and used. Private forest owners have emphasised generally economic objectives e.g. income from timber sales, but environmental factors play a more important role for private forest owners today. In addition to economic and environmental objectives public owned forests are of special interest for their greater availability for recreational and other purposes of public interest. In EU-15 about 40.6 million ha (30 %) of wooded area (FOWL) are owned by public owners, 95.6 million ha (70 %) by private persons.

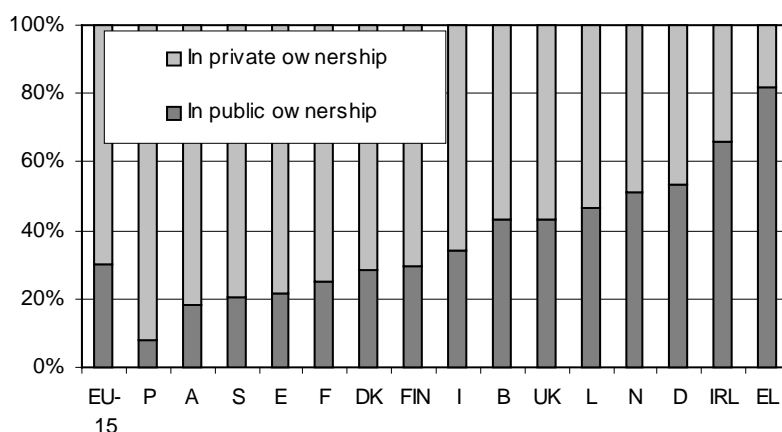
### 1.4 Timber growth

The *Growing stock* gives an overview on what the forests provide in environmental and economic benefits linked to the growth of timber. Sweden, France, Germany and Finland are the four countries with the largest Growing stocks corresponding to their substantial areas of forest land (F). With their better growing conditions however Germany, France Italy and Austria have significantly higher rankings than in the distribution of Forest land. On the contrary, rankings for Spain, Greece and Portugal are

### Graph 4: Ownership of Forest and other wooded land

Reference period 1987 to 1995

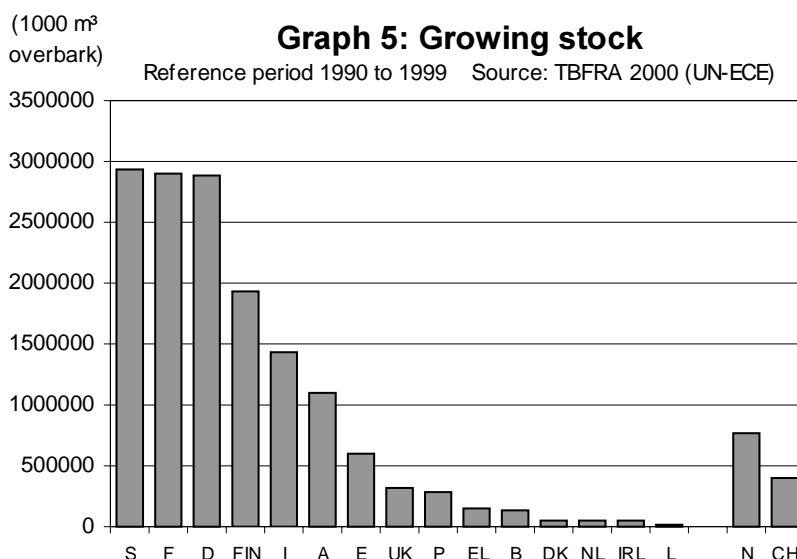
Source: TBFRA 2000 (UN-ECE)



### Graph 5: Growing stock

Reference period 1990 to 1999

Source: TBFRA 2000 (UN-ECE)



lower compared to those of Forest (F) land. The development of the Growing stock is a result of the accumulation of the *Net annual increment* in forests and of the *Removals* of harvested timber. The increment is particularly influenced by the composition of tree species, the length of the average rotation period, soil and climatic conditions as well as age class distributions. The variation of the Net annual

increment between the countries is more influenced by growing conditions than is the Growing stock (see Graph 6). The growing conditions can be quantified by the Net annual increment per hectare of forest land. For this parameter, the central EU countries lead, while Scandinavian and Medi-terranean countries do not reach half of their productivity.

*Today, there is a public interest in indicators on biodiversity. For the global forest figures of this chapter, differences might be expected between the north and the south of Europe in structure and composition of forest stands. But none of the available global figures can reliably detect qualities of biodiversity and there are no comparable methods for direct measurement at the international level.*

## 2 EU forests and their benefits to the environment

### 2.1 Supply of timber

Wood is a raw material that is normally produced without input of external energy or substances except harvesting. Wood growth in forests is quantified by the Net Annual Increment. Annual Fellings (of which ca. 90 % are Annual Removals) give an idea on the amount of wood that is cut per year. Removals show the volume actually

removed from the forest (Graph 6). At the global level the sustainability of the exploitation of wood resources can be shown by the ratio of Fellings to Increment (average values over at least five years should be used). Values below 100 % thereby mean sustainability in wood production. The average for EU-15 is about 65 %. For no Member State is the percentage over 90 % and for 11 of them it is

lower than 70 %. Following this indicator, it can be said, that in EU-15 forests are managed in a sustainable way.

### 2.2 Carbon sequestration

In the context of the global climate change the danger of excessive CO<sub>2</sub> emissions has become

*Growing stock* is the living tree component of the standing volume of all trees.

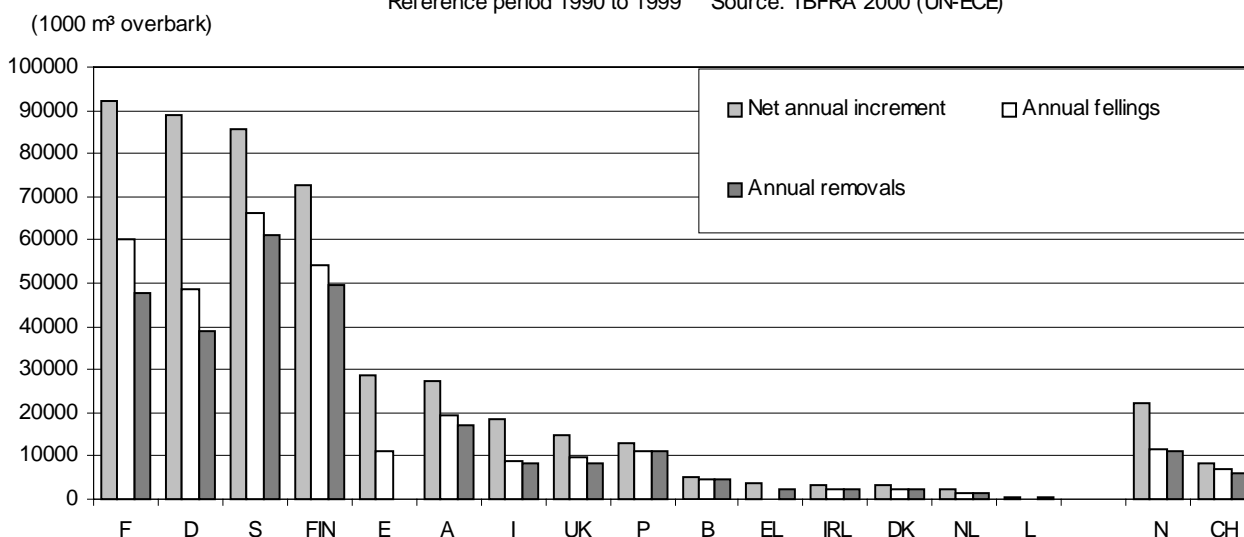
*Net annual increment* is defined as average annual volume over the given reference period of gross increment less that of natural losses on all trees to a minimum diameter of 0 cm (d.b.h. = diameter at breast height; definition of TBFRA 2000).

*Annual fellings* are the 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. It includes silvicultural and pre-commercial thinnings and cleanings left in the forest and trees killed or damaged by natural causes, e.g. fire, windblow, insects and diseases (*natural losses*) that are recovered (harvested).

*Annual removals* are the average annual volume of those fellings that are removed from the forest, other wooded land or other felling site during the given reference period. It includes removals during the given reference period of trees felled during an earlier period and natural losses. (Generally, Removals are measured in m<sup>3</sup> under bark).

**Graph 6: Net annual increment, Fellings and Removals**

Reference period 1990 to 1999 Source: TBFRA 2000 (UN-ECE)



increasingly evident. Forests are able to bind CO<sub>2</sub> emitted by industries and households within the increment of wood. A part of this increment that is accumulated in the growing stock is harvested and removed from the forests each year. The carbon of these removals will of course also be contained in all products which are produced from it, e. g. in sawnwood and wood-based panels.

A high degree of sawnwood and wood-based panels is used for permanent constructions, which means that the carbon persists over a long period of time bound in these materials. The other wooden products (e.g. fuelwood and paper) and also that part of the increment of the forests that is not harvested will be decomposed or burned sooner or later and return to the atmosphere.

In natural forests where removals have never taken place the balance of CO<sub>2</sub> exchanged with the atmosphere usually is zero in the long run.

Therefore, the only possibility to enhance carbon sequestration using forests is to remove harvested timber (provided that it is used for permanent construction) or by afforestation and improvement of low-stocked wooded areas.

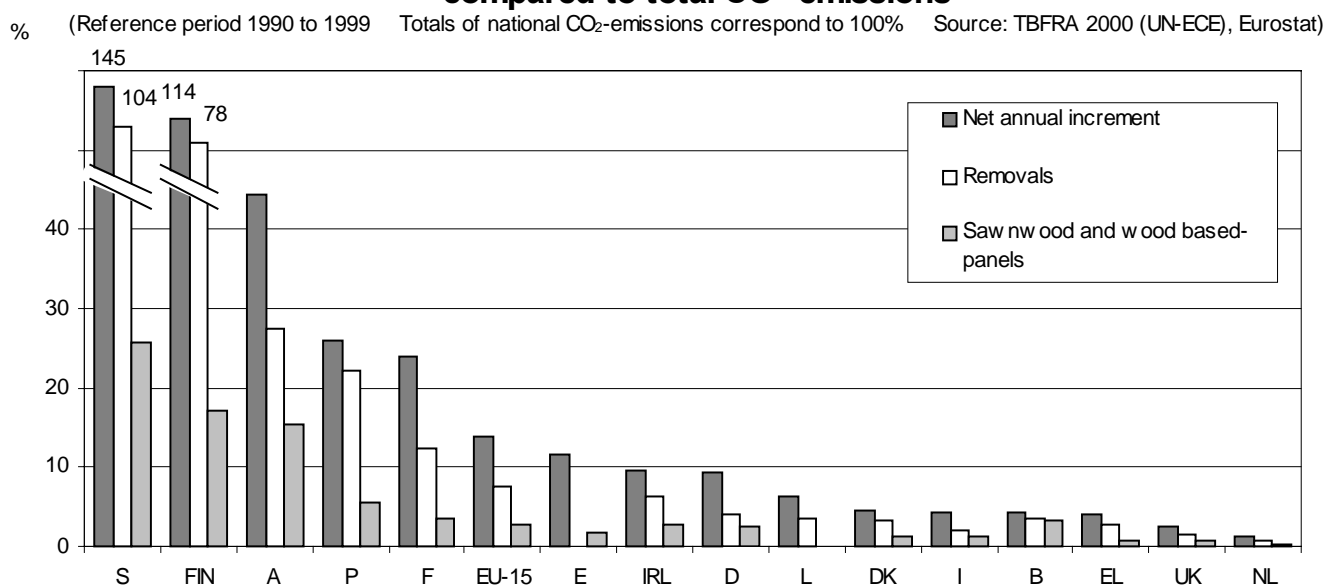
Graph 7 shows that in the most cases the annual emissions exceed the amount of CO<sub>2</sub> that is rebound by the forests by increment of wood (less than 50 % in most of the Member States; 12 % in EU-15). The exceptions are Sweden and Finland where CO<sub>2</sub> equivalents of increment are higher than CO<sub>2</sub>-emissions. The figures were converted to CO<sub>2</sub> equivalents following their carbon content (1m<sup>3</sup> of pure wood corresponds to 0.92 t CO<sub>2</sub>).

These figures show that it is impossible to combat the increase of CO<sub>2</sub> in the atmosphere by forestry alone, even if the existing effects cannot be neglected and they might be reinforced by more extensive use of wood for all type of constructions in combination with other measures.

### 2.3 Strictly protected forests

There are nearly 90 different categories of protected forests ranging from national parks to "aesthetic" forests. In terms of "natural" the most interesting category of forests in Europe are the strictly protected forests, which are left to develop freely in a state which is as original as possible. Due to the historically continuous use of forests, there are few original untouched natural forests remaining in Europe. The total area of strictly protected forest for the EU countries is estimated at nearly 2 million hectares, almost 1.6 % of the total forest area. The number of strict forest reserves in the EU is over 2800. The aims and degree of forest protection vary widely amongst European countries. In Northern Europe the primary goal of forest protection during the last 10-20 years has been the preservation of the old remnants. In the central EU countries however, forests are rather protected as a part of the landscape, as a cultural feature or as specimens of original forests.

**Graph 7: CO<sub>2</sub>-equivalents of Increment, Removals and Wood-based products compared to total CO<sub>2</sub>-emissions**



*Strict forest reserves:* areas in which no silvicultural operations, or any other human impacts are allowed. They occur, where feasible, in Europe under very different forms of protection status: small isolated areas and/or core areas within larger protection categories such as national parks, nature parks, or biosphere reserves. "Strict" may include activities related to hunting, rare species protection, scientific work, etc.

## 2.4 Soil protection

Soil protection is one of the most important of the environmental protection functions of forests. Whereas it is of no or minor significance in northern and central EU countries, it has to be emphasised for the countries in the far south and of course for countries with steeply sloping areas, such as throughout the Alpine range. In Spain 22.13 million ha of FOWL are primarily managed for soil protection, 6.47 million ha in Greece, 0.84 million ha in Austria, 0.48 million in Germany and 0.43 million in Italy.

## 2.5 Recreation

Forests play a considerable role for the individual recreation of the inhabitants of the Member States. The availability per inhabitant of FOWL (wooded area) is presented in Table 2. These figures are, of course, averages for the country as a whole and do not provide any information on regional or local aspects. However, they give a first impression on the global situation. The range amongst the Member States is remarkable.

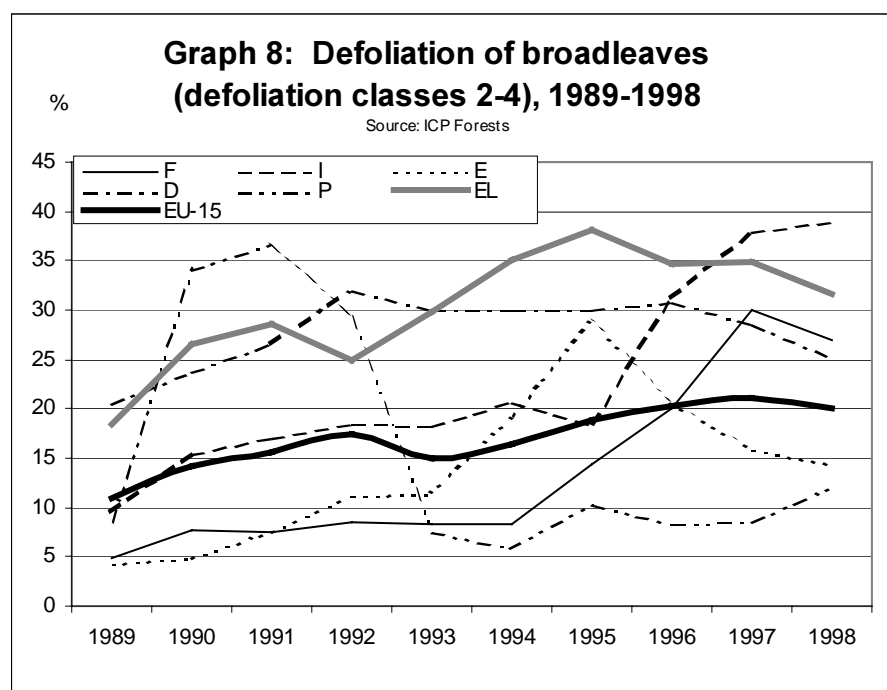
	FOWL (ha/head)
EU-15	0,36
Finland	4,42
Sweden	3,41
Spain	0,66
Greece	0,61
Austria	0,48
Portugal	0,35
France	0,29
Luxembourg	0,21
Italy	0,19
Ireland	0,16
Germany	0,13
Denmark	0,10
Belgium	0,07
United Kingdom	0,04
Netherlands	0,02
Norway	2,72
Iceland	0,47
Liechtenstein	0,23
Switzerland	0,17
Canada	13,66
Russian Federation	6,01
United States	1,09

Table 2: FOWL per Inhabitant

## 3 State of Forests in the EU

### 3.1 Defoliation

As it is impossible to describe forest condition taking into consideration the state of all of its components, some key parameters are used. One of the most common for this purpose is the crown condition. As the crown condition is a non-specific symptom, which reacts to many different stress factors, defoliation values of one year contain only limited information on the influence of single factors. Only the development of defoliation over time may give evidence of continuously acting stress factors such as air pollution. Regarding the development of six main tree species (Scots pine, Norway spruce, European oak, Common beech, Maritime pine and Holm oak) in Europe since 1989, the overall deteriorating trend becomes



Data on defoliation are based on the joint publication on monitoring of forest condition by the European Commission and the UN Economic Commission for Europe carried out in the framework of the ICP (see page 1). The sample survey for 1998 is done for about 371 000 sample trees on 17 861 sample plots (Reference: Forest Condition in Europe: 1999 Report. UN-ECE and European Commission. Geneva and Brussels, 1999).

Defoliation is defined as the percentage of the lack of foliage in relation to a fully foliated tree, which would score 0 % defoliation, while a fully defoliated tree indicates 100 % defoliation. The survey results are presented in terms of percentages of the tree sample falling into five defoliation classes:

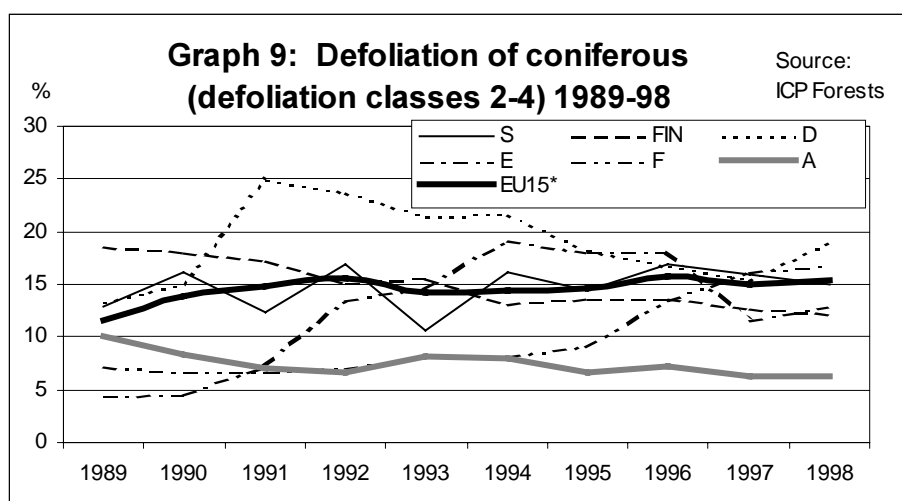
Class 0	Needle/leaf loss (%): up to 10	Degree: none	Class 3	Needle/leaf loss (%): >60 - <100	Degree: severe
Class 1	Needle/leaf loss (%): >10 - 25	Degree: slight	Class 4	Needle/leaf loss (%): 100	Degree: dead
Class 2	Needle/leaf loss (%): >25 - 60	Degree: moderate			

Classes 2 to 4 represent trees of considerable defoliation and are thus referred to as 'damaged'.

obvious. This trend has been most pronounced for non-coniferous species which predominate in the countries of the central EU and Southern Europe (see Graphs 8 and 9).

### 3.2 Forest fires

The role of forest fires can be seen from many different perspectives. In plantation forestry, fire can be a major problem. In some countries fire is seen as normal ecosystem process and, under control, may even be used as a management tool. In Europe, the number of fires and their extent is very variable, depending mostly on the climate. 91 % of all forest fires in the EU are in the Mediterranean region (Table 3), where fire is the major factor influencing the condition of forest and other wooded land. Although the number of forest fires is constantly increasing, the average area annually destroyed by fire has not changed significantly during the period 1992-1997.



**Table 3: Average annual area of FOWL destroyed by fire 1992-1997**

Country	Number	ha	% of FOWL
<b>EU-15</b>	<b>65 095</b>	<b>385 758</b>	<b>0.28</b>
Spain	19 082	153 859	0.74
France	5 600	18 056	0.59
Greece	2 135	48 042	0.11
Italy	11 079	81 649	0.75
Portugal	21 421	77 514	2.24
Other EU-countries	5 778	6 640	0.01

The non-harmonised nature of national forest fire statistics reduces the comparability of country figures. The 1997 data should be treated as provisional. DG Agriculture of the European Commission co-ordinates the annual collection of data on forest fires in the EU. They are published regularly by UN-ECE in Geneva: Forest Fire Statistics 1995-1997. UN-FAO/ECE Timber Bulletin, Volume L (1998), No. 4. New York and Geneva, 1998).

### STORM DAMAGES IN EU-COUNTRIES AT THE END OF 1999

Fortunately, Europe is not very exposed for disastrous storms, even if every year local storms cause damage to some forest holdings. But, in December 1999 there were three strong storms, and countries sustained damage to their forests, which in terms of volume of wood blown down is the highest in Europe since the disastrous storms of 1990. Actually, the estimate of the total volume of blown wood was nearly 180 million m<sup>3</sup> in the EU, almost 70 % of the normal volume of the annual harvest. France was the country most affected, with an estimated total of 140 million m<sup>3</sup>, followed by Germany with 30 million m<sup>3</sup> and, outside the EU, Switzerland with 12 million m<sup>3</sup>, which is about three times the annual harvest in Switzerland. The fallen timber is only 0.6 % of the wood in Europe's forests

In the affected countries wind blown wood has significant consequences at the local level. The unexpected over-supply of roundwood has caused troubles in the roundwood market. Despite the increased costs of harvesting windblown trees, wood prices have dropped sharply, and caused major economic damage to forest owners – both public and private. Programmes and strategies have been developed and applied, in consultation with all market partners, to minimise this damage. In addition to immediate economic damage the windblown wood presents ideal circumstances for insect outbreaks and, when it dries, for forest fires, thus threatening forests not affected by the storms themselves. This makes it urgent to clear the wood as fast as possible. There will also be some long term positive consequences of the storm. The new export markets and outlets could be valuable to the sector. Promotion of wood energy, which is renewable and may not raise the level of CO<sub>2</sub> in the atmosphere, could have long term value.

	EU-15	B	DK	D	E	F	L	A	S	CH
Windthrown Timber in December 1999 (million m <sup>3</sup> ) <sup>(1)</sup>	178.7	minor	3.7	30	minor	139.6	minor	0.4	5	12.1
Removals in 1999 (million m <sup>3</sup> )	264.2	4.4	1.5	40	14.9	43.3	0.3	14.1	58.7	4
Windthrown timber of removals in 1999 (%)	68	-	242	75	-	322	-	3	9	303

<sup>(1)</sup>Source: UN-ECE Timber Committee, June 2000 (<http://www.unece.org/trade/timber>)



# Further information:

## ➤ Reference publications

Title Forestry Statistics 1995-1998  
 Catalogue No KS-27-00-613-3A-C Price EUR20,50

## ➤ Databases

New Cronos, Theme 5, Forest

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## For information on methodology

Yves Zanatta, Eurostat/F1, L-2920 Luxembourg, Tel. (352) 4301 33405, Fax (352) 4301 37317, E-mail: yves.zanatta@cec.eu.int

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