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State of Europe's Forests 2011

Status & Trends in **Sustainable Forest Management** in Europe

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State of Europe's Forests 2011

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Jointly prepared by FOREST EUROPE Liaison Unit Oslo, the United Nations Economic Commission for Europe (UNECE) and the Food and Agriculture Organization of the United Nations (FAO).

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Foreword

Forests provide a multitude of benefits. Sustainably managed forests will give environmental benefits, provide sustainable economic development and improve the quality of life of people across the world. Forests are considered an essential part of the solution to many global challenges. In recent years, the capability of forests to mitigate climate change, provide renewable products and energy, and contribute to developing a greener economy has received increasing attention. But at the same time, these benefits are threatened by global warming and extreme weather events.

The challenges and opportunities forests are facing need to be dealt with in an effective and balanced way – globally, regionally and locally. A holistic approach to the different functions and demands on forests is necessary to ensure lasting provision of the ecological, economic and social functions of forests. The Pan-European Criteria and Indicators for Sustainable Forest Management are helpful and beneficial tools in this endeavour.

Evidence-based information on status and trends in forests and forest management is fundamental for sound policy making and for communication and dialogue with forest-related sectors and the general public. It is my hope that this report will contribute to fruitful discussions among policy makers, the private sector and civil society within and outside the forest sector, and that this report will be used as a knowledge base for decision makers.

Let me thank all individuals, organisations and countries that have contributed to the completion of the present report on the State of Europe's Forests. This third report in a series is an excellent example of co-operation among organisations that we should strive to maintain in our future work. New challenges and opportunities are approaching forests and society. The pan-European collaboration is a useful way to strengthen co-operation also in the years to come, in order to meet the needs of people.

Lars P. Brekk

Lars Peder Brekk
Minister of Agriculture and Food, Norway
Chair of FOREST EUROPE 2008-2011

Preface

There is no better time to issue this comprehensive analysis of forests in the pan-European region than 2011, the International Year of Forests. Information and work related to forests is indeed at an all-time high, and the political attention given to forests and sustainable forest management is rising in the pan-European region, as well as globally.

Since the 1990s, the forest area in Europe has been increasing steadily. In the FOREST EUROPE region alone, the forest area increased by 17 million hectares in the last two decades. In addition to forest area, the volume of wood in pan-European forests is growing and a steady amount of roundwood is delivered by forests every year.

While productive, European forests also play an important role in the conservation of biological diversity and the area of forest primarily designated for this purpose is expanding. Moreover, while globally, terrestrial carbon stocks are decreasing as a result of the loss of forest area, thus causing substantial carbon emissions, forests in the FOREST EUROPE region store and sequester increasing amounts of carbon in their biomass.

Nevertheless, it should not be forgotten that European forests still face severe threats, such as the effects of climate change including climate variability. Europe will also need to address an increasing pressure on resources, and competition amongst uses such as wood energy, timber production, biodiversity conservation and carbon storage. This will make sustainable forest management even a more crucial tool to maintain healthy, diverse and productive forests.

This report is an attempt to provide you with a clear picture of the interactions between forests and society, and a snapshot of the main forest functions, their status and trends. This is also a tale of twenty years of commitments towards sustainable forest management in the pan-European region. The report confirms that sustainable forest management has proven to be successful in addressing challenges through the promotion of a balanced approach to forest uses that is capable of supporting environmental, economic and social functions alike. It is worthwhile noting that sustainable forest management was proved to be effective in countries with different social and economic backgrounds and natural conditions.

This success is a vital message put forward by this report as the region looks to be able to address old as well as new challenges for forest management. The report is not only addressed to forest experts, but also to the world of sustainable development, as it embarks on the Rio+20 process that will culminate in the United Nations Conference on Sustainable Development in 2012. It is essential that when discussing sectoral issues and solutions, forests and sustainable forest management are acknowledged as crucial in the efforts to move towards a green economy.

We trust that you will find this report of interest and hope it will further stimulate discussions and deliberations on the role of forests in society and implementation of sustainable forest management in the region.

We also wish to thank all the contributors that made this publication possible. This publication reflects the effort and commitment of over 60 authors and 400 national experts who have worked together to provide us with the most up-to-date information on the status and trends of forest in the region. To them goes all our gratitude and congratulations.

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Summary for Policy Makers

__The State of Europe's Forests 2011__ report provides a comprehensive, up-to-date description of the status and trends of forests and forest management in Europe. The report aims to stimulate sound policy decisions on forests and forest-related issues in Europe by providing objective and harmonized data for FOREST EUROPE's Signatories. This Summary for Policy Makers presents a compact and comprehensive overview of status and trends, as well as challenges and opportunities for forests, forest policy and forest management in Europe.

The report is structured according to the Pan-European Criteria and Indicators for Sustainable Forest Management. For the first time, the report also contains an assessment of progress towards sustainable forest management, derived from a new, experimental method. The report further identifies four future challenges and opportunities for forest policy and forest management in Europe.

Forest Resources and their Contribution to Global Carbon Cycles

Forests cover almost half of Europe's land surface and forest area continues to increase

There are 1.02 billion hectares of forest in Europe, which amount to 25 percent of the world total. Over the last 20 years, the forest area has expanded in all European regions and has gained 0.8 million hectares each year. Over the same period, the total growing stock of forests in Europe has increased by 8.6 billion cubic metres, an equivalent to the total combined growing stock of France, Germany and Poland. Growing stock has increased faster than area, which means that average standing volume of wood per hectare in Europe has increased.

European forests sequester increasing amounts of carbon in tree biomass

Between 2005 and 2010, about 870 million tonnes of CO_2 have been removed annually from the atmosphere by photosynthesis and tree biomass growth in European countries. This corresponds to about 10 percent of the greenhouse gas emissions in 2008 of these countries.

Forest Ecosystem Health and Vitality

Sulphur deposition has decreased over the last decade

Mean annual sulphur inputs decreased by 30 percent between 1998 and 2007, with significant reductions measured on half of the observed plots. For nitrogen compounds there is no clear trend in measured deposition.

In many parts of Europe, there is a tendency to acidification and eutrophication of soils

The development of pH and base saturation of soils did not show a uniform pattern within Europe. However, increased pH and base saturation were found in acid forest soils.

About a fifth of all trees are damaged or dead

Crown defoliation is a key factor which indicates the health condition of a tree. The rate of defoliation of most tree species varied moderately during the last decade, and the level is still alarming. Roughly 20 percent of all trees which were assessed in 2009 showed a mean defoliation of 25 percent or more and were thus classified as damaged or dead.

Eleven million hectares or 1 percent of Europe's forests are affected by forest damage, most frequently caused by insects and diseases

Insects and diseases are the damaging agents, which are most frequently observed in European forests – followed by wildlife and grazing. However, the level of damage is often not recorded. One percent of the European forest area is affected by one or more damaging agents (6 percent for Europe without the Russian Federation). Damage due to storms, wind and snow was mainly observed in Central-West, Central-East, North and South-West Europe, while damage due to forest fires has mainly been reported for the Russian Federation, South-West and South-East Europe.

Productive Functions of Forests

Fellings are well below increment

In almost all countries, the net annual increment is higher than the annual fellings. In the European region, approximately 40 percent of the increment is utilized. In the Russian Federation the felling rate has decreased from 41 percent in 1990 and stabilized around 20 percent since 2000. In Europe without the Russian Federation, the felling rate increased from 58 percent in 1990 to 62 percent in 2010.

Europe remains one of the largest producers of roundwood in the world

In 2010, more than 578 million cubic metres of roundwood were produced. The overall value of marketed roundwood is still increasing and reached EUR 21.1 billion[1] in 2010. Europe's forests continue to be one of the main roundwood producers in the world. The demand for wood fuel is increasing at a high rate in many European countries.

Non-wood goods can be an important source of local income

The importance of non-wood goods differs between countries, thus a comprehensive view on all types of these goods across Europe is difficult to obtain. However, the reported data clearly shows that non-wood goods can be an important source of local income. The total reported value of marketed non-wood goods amounts to EUR 2.7 billion and has almost tripled since the 2007 assessment – although some of the increase may be due to improved reporting. In 2010, Christmas trees, fruits and berries, and cork were the most important non-wood income sources. The value of marketed non-wood goods represented 15 percent of the value of marketed roundwood in countries that reported both values.

Marketed services are an important source of income for a number of forest owners

Marketed services can be a source of significant income for private and public landowners. Social services, including hunting licences, are one of the most important traditional services. The total value of marketed services, reported by relatively few countries, is almost EUR 818 million and has remained more or less stable since 2007.

Most forests in Europe have a management plan

Management plans and their equivalents are key tools for sustainable forest management. Most of the forest area in Europe is covered by a forest management plan or its equivalent.

Biological Diversity in Forest Ecosystems

The area of protected forests is expanding in Europe

Protected forests are important to maintain and enhance biodiversity, as well as to conserve landscapes and provide recreation opportunities. The area of protected forests in Europe has increased by around half a million hectares annually over the last 10 years due to policies to improve biodiversity. In Europe without the Russian Federation, about 10 percent of forests are protected

[1] Based on data from 33 countries representing more than 90 percent of the FOREST EUROPE area.

with the main objective to conserve biodiversity and about 9 percent with the main objective to protect landscape – together, these account for a total area of 39 million hectares. The Russian Federation has 17 million hectares of protected forest. The strictness of and measures for protection varies considerably among countries.

Forest management practices increasingly promote the conservation and sustainable use of biodiversity
Forest management practice has changed towards greater integration of biodiversity aspects. For instance, deadwood components and important vulnerable small biotopes are kept in forests managed for wood production. There is an increasing use of natural regeneration and mixed tree species stands. In several countries, long-term monitoring of threatened forest species has indicated that adoption of new forest management measures has reduced the decline of threatened species.

The majority of European forest landscapes have been influenced by humans
About 70 percent of Europe's forests are classified as semi-natural, as a result of many centuries of human influence. Long historical use of wood, high population density, fragmented forest landscapes and forest ownership structure, with many small private forest holdings, have been driving factors. Undisturbed forest amounts to 26 percent and is located primarily in remote and inaccessible areas in eastern and northern Europe, and in the Russian Federation. Plantations cover 4 percent of the forest area and are located mainly in Central-West Europe. The assessment of forest landscape pattern indicates that expanding forest area, by natural succession or restoration, does not necessarily enhance forest connectivity.

Genetic diversity helps forests adapt to a changing climate
Forest genetic resources are an important component of sustainable forest management. Genetic diversity will help to ensure that forest trees survive, adapt and evolve in the light of changing climate. Almost all European countries have established networks of stands or large forest areas to conserve forest genetic diversity.

Protective Functions in Forest Management

There is growing awareness of the importance of forest management for protection of water, soil and infrastructure
More than 20 percent of Europe's forests are reported to fulfil protective functions for soil, water and other ecosystem services, as well as to protect infrastructure and managed natural resources. The importance of protective forests is clearly recognized, especially in mountainous areas. Management restrictions for protective forests vary among regions depending on local geological and ecosystem conditions.

Socio-Economic Functions and Conditions

Outside the Russian Federation, 50 percent of forests are in private ownership
All forests in the Russian Federation are publicly owned – they represent 80 percent of the forest area in the FOREST EUROPE region. Outside the Russian Federation, ownership is distributed equally between private and public, with considerable variation between countries. The proportion of private forests and numbers of private forest holdings have increased over the last 20 years, mainly because of privatization and restitution processes in a number of countries.

Potential for further mechanization vary substantially between regions
Around 4 million people work in the European forest sector, including wood processing and pulp and paper industries. The general trend is a decrease in occupation, but there are substantial differences between regions, which reflect the mechanization level and the potential for increased productivity. As the forestry workforce is ageing, the recruitment of new workers to the sector is a challenge. Forest work still reports a very high accident rate, and relatively few improvements were identified over the past decade.

While some economic functions are decreasing in importance, other functions are gaining ground
The forest sector, including wood processing and pulp and paper industries, contributes on average 1 percent of GDP (gross domestic product). However, during the last few years, most regions have shown an increase in net value added and net entrepreneurial income of forestry enterprises. The importance and recognition of other forest services, as source of energy, recreation and cultural and spiritual values, are increasing. Rising energy prices and political initiatives to promote the use of wood for energy have increased the value of small timber assortments.

Overall Policies, Institutions and Instruments for Sustainable Forest Management

National forest programmes are increasingly developed and applied
National Forest Programmes are the most widely applied approach by countries to develop sound forest policy frameworks. They are usually based on and elaborated through participatory processes. In many countries, national forest programmes contribute to consistent and broadly supported policies and strategies for putting sustainable forest management into practice. However, particular effort is needed to keep such processes relevant for key stakeholders and flexible, to effectively respond to emerging issues, and keep related costs low. While national forest programme principles are more widely followed than before, there is a need to strengthen substantive participation and the link to overall national development goals and forest-related sectors.

Institutional and legal frameworks adapt to changing societal needs and priorities
Countries in Europe continue to adapt their institutional and legal frameworks to new roles and requirements in the wake of changing societal priorities. Timely and adequate changes are necessary to address current

challenges effectively. Moreover, more proactive and strategic decisions and alignments will be necessary in order to seize emerging opportunities and to contribute to fostering a green economy.

Policies, Institutions and Instruments by Policy Area

National forest policies are affected by and respond to multiple policy challenges

During the last years, forests and forest management have received increasing political attention. Most European countries are pursuing active and target-oriented policies in a number of forest-related policy areas. Critical issues currently in focus are:

- Forests and climate change, and development of adequate adaptation and mitigation measures;
- Increased use and mobilization of wood resources, particularly with respect to renewable energy targets;
- Improvement of biodiversity, through increased nature conservation and improved integrated forest management;
- Promotion and improved marketing of non-wood goods and forest ecosystem services, such as protective functions, biodiversity and land integrity;
- Economic viability of the forest sector and its contribution to rural development and a green economy.

Most national forest-related policies are increasingly influenced by international processes and other sectoral policies on energy, climate change, agriculture and biodiversity

The need for cross-sectoral approaches and innovation in the forest sector and policy development and implementation is widely acknowledged. This is a response to the growing multiple requirements placed on forests by society and global markets, and is reflected in the concept of sustainable forest management. In continuing to develop and implement national policies towards sustainable forest management and multiple-use of forests, countries have highlighted the need for improved forest information and monitoring. This applies particularly to policies on forest health and vitality, forest biodiversity and the valuation of non-wood goods and ecosystem services.

Changes in national policy objectives are related mainly to biodiversity, the production and use of wood, carbon balance and land use and forest area

New or amended objectives are often complemented by specific target-oriented regulations or by amendments to existing regular legal frameworks – like forest laws or the National Forest Programmes. Institutional reforms have mainly affected policy areas like climate change and carbon as well as research, training and education.

Changes in objectives and instruments have occurred in most policy areas in more than half the reporting countries since the FOREST EUROPE Ministerial Conference in 2007

Changes since 2007 reflect the current dynamics and challenges in forest policy development. Most countries have, or are developing, general objectives and adequate policy instruments for the forest sector. However, there is still a need for improved coordination and coherence among multiple policies which affect the forest and wood sector as well as for the formulation of more target-oriented objectives.

Sustainability of Forest Management in Europe

A new and experimental method to assess progress towards sustainable forest management

In addition to describing the status and trends for the quantitative and qualitative indicators, the State of Europe's Forests 2011 report assesses progress towards sustainable forest management in Europe. For this purpose, a new, experimental method has been used. For each indicator, the official data supplied by countries were assessed on a scale from one (🌲) to five (🌲🌲🌲🌲🌲) trees[2], using objective and transparent parameters and thresholds. These results were combined to provide assessments at the level of six country groups, and have been accompanied by detailed comments to put the situation in context. Despite shortcomings, the results appear sufficiently robust to be used for giving a broad picture of developments at the country group level. The

Table A: Assessment by country group and criterion, quantitative and qualitative indicators

	Forest resources and global carbon stock	Health and vitality	Productive functions	Biodiversity	Protective functions	Socio-economic functions	Overall policies, institutions and instruments for sustainable forest management	Policies, institutions and instruments by policy area
Russian Federation	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲
North Europe	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲
Central-West Europe	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲
Central-East Europe	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲🌲	🌲🌲🌲
South-West Europe	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲
South-East Europe	🌲🌲🌲	🌲🌲	🌲🌲	🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲🌲	🌲🌲🌲

[2] When no data are available for an indicator, the assessment is 🌲, as there is no evidence to support any other ranking. Furthermore, it could be said that management decisions based on insufficient information are not really sustainable.

data and method are not yet suitable to assess individual countries, or to provide a single overall assessment for sustainability.

The assessment aims to give policy and decision makers as well as the general public a clear overview of complex issues. This should facilitate balanced strategic and operational decision-making, as well as communication and dialogue with the general public and other relevant sectors. It is also hoped that this new approach will encourage further improvements in assessing the sustainability of forest management.

For most country groups and indicators, the assessment shows a balanced and generally satisfactory situation

Almost all the assessments at the level of criteria and country groups are satisfactory, at the levels 🌲🌲🌲 and 🌲🌲🌲🌲. There is no evidence of systematic imbalance at the European level – such as systematically prioritizing production over biodiversity or *vice versa*. However, there are a number of challenges and areas of concern which are indicated by 🌲🌲 at the level of particular indicators and country groups.

Where the assessment is less satisfactory (🌲🌲), the main causes are weak data. For quantitative indicators, other concerns include decline of forest area (in a very small number of countries); nitrogen depositions exceeding critical limits; soil condition; fragmentation and reduced forest connectivity; low value of marketed wood and non-wood goods and services; low levels of occupational safety and health for the forest workforce; and declining employment in the sector.

Forest sector policies, institutions and instruments in Europe are stable and adapted. The main areas of concern for the qualitative indicators are the economic instruments to support sustainable forest management and whether policies and institutions are sufficiently strategic in their approach and integrated with other sectors.

Russian Federation – the Russian forest has enormous economic and biodiversity significance even at the global scale, but problems of monitoring prevail

The Russian forest resource is the largest in the world, with a much higher share of forest untouched by man than any other European country. Most of the area west of the Urals is managed in a relatively intensive way, but to the east there is a huge expanse of remote forest with difficult and expensive access. The process of transition is on-going, but all forests will remain in public ownership, with arrangements for long-term leases. A new Forest Code was approved in 2006 after intense discussion. There is concern about illegal logging in some parts of the Russian Federation, as well as about vulnerability of the boreal forest ecosystem to climate change (fires and melting of permafrost).

Areas of concern identified by the State of Europe's Forests 2011 report are the decline in area of other wooded land; possible decrease in carbon stock; low value of marketed roundwood compared to volume of resource; low per hectare values for marketed non-wood goods and services; relatively small percentage of protected forest and of area managed for gene conservation; low revenue and government expenditure per hectare; and low share of wood used for energy.

North Europe – the forest sector is mostly privately-owned, well organized, and focused on wood production, with a strong commitment to achieving environmental objectives

In most of North Europe, the boreal forest is at the centre of the landscape. There is an intensive use of the resource and a sophisticated and well-resourced institutional structure. Forest-related questions have a high policy importance in the region.

Areas of concern identified are the large area at risk from eutrophication; the Carbon/Nitrogen ratio in forest soil approaching warning level in two countries; and the low percentage of forest protected for biodiversity in some countries.

Central-West Europe – forest-related issues are not central to these countries' economy or society, although populations have tended to react strongly to threats to their forests

Central-West Europe contains many densely populated and highly prosperous urban countries, although there are significant rural and mountainous areas, which is where most of the forests are. Forest institutions are stable and well-resourced, even if they lack political weight relative to other parts of society, which can mobilize more financial and human resources.

Areas of concern identified are the high percentage of land area at risk of eutrophication from nitrogen deposition; the Carbon/Nitrogen ratio near warning level for soil imbalances in some countries; problems with landscape pattern and fragmentation, negative net entrepreneurial revenues in a few countries; negligible share of wood in total energy supply in a few countries; and the small share of the total workforce engaged in the forest sector.

Central-East Europe – the transition process has been a challenge to forest institutions, but in many countries these institutions have retained their basis

The countries in Central-East Europe were all centrally planned 25 years ago, but many have now been transformed and are increasingly prosperous. Five countries in this group are now members of the European Union. Ecologically the country group is heterogeneous, running from the Alps to the Caucasus and the Volga basin.

Areas of concern identified are the decline in forest cover in one country; the fact that the entire land area of the region is at risk of eutrophication from nitrogen deposition; the Carbon/Nitrogen ratio near warning level for soil imbalance in one country; high defoliation level in one country; generally low per hectare values for marketed non-wood goods and services; the small share of the total workforce engaged in the forest sector; low levels of wood consumption; and the low reported share of wood in total energy supply.

South-West Europe – some intensive management, but many forests suffer from fire, nitrogen deposition, changes in landscape pattern and rural depopulation

In South-West Europe, most countries have a distinctively Mediterranean forest on much, but not all, of their territory. Despite the threats, some areas are managed intensively, sometimes with introduced species. There are serious information gaps.

Areas of concern identified are the high percentage of land at risk of eutrophication due to nitrogen input; significant fire damage; high fragmentation; and negative trends for forest landscape pattern in some countries.

South-East Europe – diverse forestry situations, many with weak information systems

Most of the countries in South-East Europe have rather large rural populations and low per capita income by European standards. Some have new institutions which emerged after the conflicts in the former Yugoslavia. Fire is an issue throughout the region. In one country, the forest itself is under severe pressure from overgrazing and over- cutting (mostly for fuel) by the rural population. It appears that, in many areas, the forests are not intensively managed and not well protected for biodiversity – but information is very weak, so this cannot be verified. Due to the lack of adequate information provided, and possibly also because the relevant forest-sector information does not exist at the national level, it is not possible to say with any objectivity whether or not forest management is sustainable.

Areas of concern identified are one country with steeply falling forest cover and growing stock; nearly all land area of the region at risk of eutrophication due to nitrogen deposition; significant fire damage; fellings greater than net annual increment in one country; rather low per hectare values for marketed non-wood goods; several countries with a high share of single species stands; low share of forest protected for conservation of biodiversity in many countries; and low levels of wood consumption.

Future Challenges and Opportunities for Forest Policy in Europe

On the basis of the information provided for the State of Europe's Forests 2011, four major challenges and opportunities for forest policy in Europe have been identified.

The forest sector is playing a major role in ***climate change*** mitigation through carbon sequestration and substitution of non-renewable energy and materials. At the same time it must adapt to a changing climate, which requires significant investment. The challenge is thus to find and deliver the optimum balance among the various forest functions in the context of changing climate and societal needs.

Ambitious targets for renewable energy throughout Europe have resulted in more use of ***wood for energy***, and there are clear signals that this trend will continue. The challenge is not only to mobilize more wood to meet the targets but also to reconcile this mobilization with the other dimensions of sustainable forest management.

It appears that there has been strong progress in the ***conservation of forest biodiversity***, although there are still significant monitoring and measurement problems. The challenge is to reconcile measures for biodiversity conservation with the more intensive forest management likely to be necessary to meet the expected higher demands for wood, including for renewable energy.

The European forest sector already displays many of the characteristics of a ***green economy*** and has the potential to play a major, even exemplary, role in the emerging green economy – notably by promoting sustainable production and consumption patterns, green building, green jobs in the sector, and the supply of renewable energy, as well as developing payment for ecosystem services. The challenge is to achieve this potential by strongly developing the "green" features of the forest sector.

Introduction

Figure A: FOREST EUROPE Signatories

The *State of Europe's Forests 2011* report provides an overview of the status and trends of forests and sustainable forest management in Europe in the period 1990–2010. It is prepared for the FOREST EUROPE Ministerial Conference on the Protection of Forests in Europe Oslo, Norway 14-16 June 2011, as a continuation of reporting on European forests for FOREST EUROPE Ministerial Conferences.

This report was jointly prepared by the FOREST EUROPE Liaison Unit Oslo, the United Nations Economic Commission for Europe (UNECE) and the Food and Agriculture Organization of the United Nations (FAO) in collaboration with the European Forest Institute (EFI) and with significant support from the governments of Finland, France, Norway and Switzerland.

The State of Europe's Forests 2011 report covers the 46 FOREST EUROPE signatory countries and the European Union (Figure A). In order to display regional differences, FOREST EUROPE countries are grouped into six country groups (Figure B). Major parts of Europe's forests are located in the Russian Federation, accounting for almost 80 percent of the region's total forest area. The Russian Federation is therefore presented as a separate country group.

The report describes in a highly structured and documented way the status and trends of Europe's forests, based on information supplied by governments and international data providers. The data presented has been provided by individual countries through joint FOREST EUROPE/UNECE/FAO enquiries on quantitative and qualitative indicators and by international data providers, namely the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP-Forests), the EC-Joint Research Centre, Bioversity International, the Statistical Office of the European Communities (EUROSTAT) and the UNECE/FAO Forestry and Timber Section. Data quality and completeness has improved since earlier reports, but vary significantly, depending on the specific indicator and countries' conditions. Due to changes in data collection and reporting methodology, data and analysis are not always comparable to previous reports.

The State of Europe's Forests 2011 report consists of three substantive parts. The first two parts are structured according to the pan-European criteria and indicators for sustainable forest management, which consist of quantitative and qualitative indicators covering all central aspects of sustainable forest management. Part I reflects changes in quantitative indicators over time for the six criteria, i.e. forest resources and their contribution to global carbon cycles; forest ecosystem health and vitality; productive functions of forests; biological diversity in forest ecosystems; protective functions in forest management; and other socio-economic functions and conditions. Part II focuses on qualitative indicators and provides an overview of the policies, institutions and policy instruments for sustainable forest management in the FOREST EUROPE signatory countries and the European Union and presents changes by policy area.

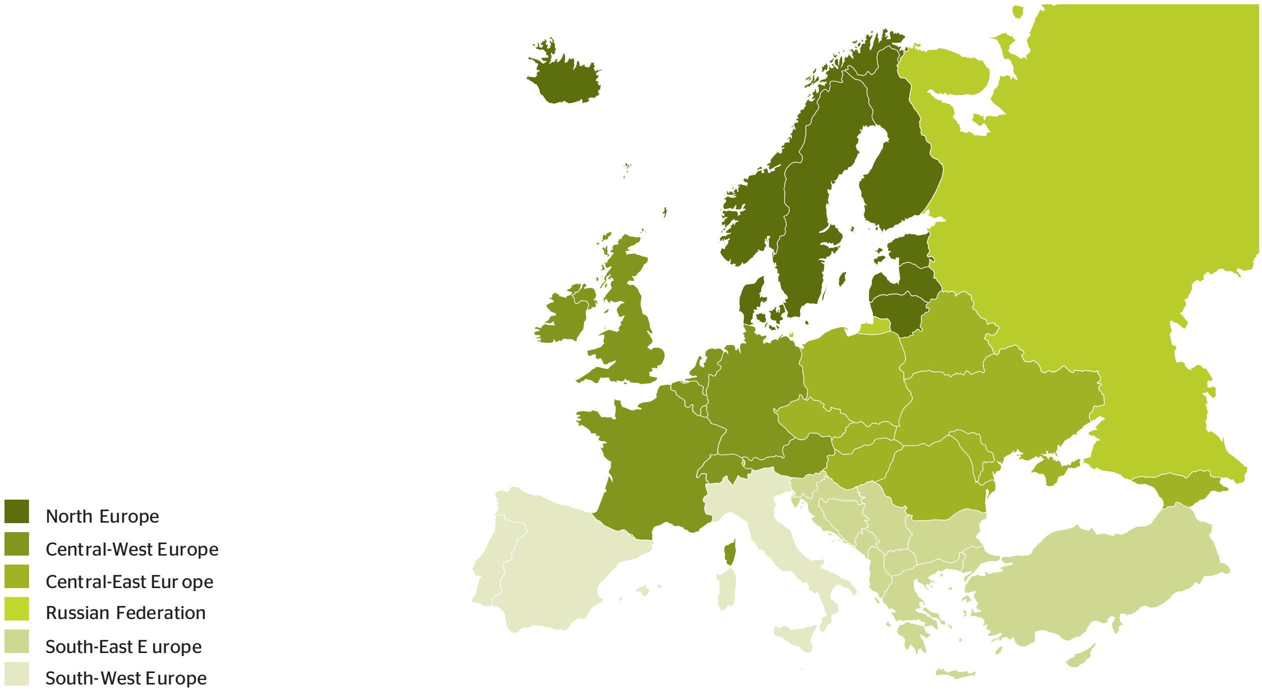

Figure B: FOREST EUROPE Country Groups

The first two parts, focusing on information on quantitative and qualitative indicators for sustainable forest management, do not specifically address the overall extent to which forest management in Europe is sustainable. Part III of the report, sustainability assessment and policy challenges, is an attempt to address and evaluate the sustainability of forest management.

It offers an experimental method to assess sustainability of forest management in Europe, providing preliminary results by country groups. The intention is that this approach will stimulate widespread discussion on the nature of sustainable forest management; how to assess it and facilitate further improvements. Furthermore, part III presents four future major challenges and opportunities for the forest sector, all highly complex: Contributions by forests and forest management to climate change mitigation, wood for energy, protection of biodiversity and in amplifying a low-carbon, green economy. For each of these areas, part III synthesizes the relevant data which has been made available by the State of Europe's Forests 2011 report and briefly summarizes the main challenges facing policy-makers.

The overall aim of this report is to provide policy and decision-makers and stakeholders with up-to-date information on the status and trends in forests and sustainable forest management in Europe. As it presents the most recent, objective and harmonized data on sustainable forest management in Europe, it can also provide a solid basis for future political commitments on forests and forest related issues.

The Joint Pan-European Definition of Sustainable Forest Management

Sustainable management means the stewardship and use of forests and forest lands in a way and at a rate that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfill, now and in the future, relevant ecological, economic and social functions, at local, national and global levels, and that does not cause damage to other ecosystems.

Additional material:
Supplementary material and source data to the State of Europe's Forests 2011 report are accessible from www.foresteurope.org and www.unece.org/timber (http://live.unece.org/forest/fr/outputs/soef2011.html).

Part I

Pan-European **Quantitative Indicators** *for Sustainable Forest Management*

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Part I: Introduction

The Pan-European Indicators for Sustainable Forest Management were developed as a common policy instrument to monitor, evaluate and report progress towards sustainable forest management (SFM). The Improved Criteria and Indicators, endorsed at the fourth Ministerial Conference on the Protection of Forests in Europe in 2003 in Vienna, Austria, represent the consensus achieved by the European countries on the most important aspects of SFM.

The fulfilment of the criteria can be evaluated through a set of 35 quantitative and 17 qualitative indicators. The quantitative indicators, which are presented in this part, provide information on the status and changes of major aspects underlying SFM. This information is meant to facilitate the evaluation of the achievements towards each criterion's goals, and the subsequent progress in SFM advancement. The State of Europe's Forest 2011 attempts to cover trends from the last two decades. Most indicators present data for 1990, 2000, 2005 and 2010. However, for some indicators the information provided is narrowed to one or two reference points, mainly due to the limited availability of data.

Information on 28 (out of 35) quantitative indicators was directly provided by countries through the national enquiry. Part of the enquiry was pre-filled with data already reported by countries for FAO Global Forest Resources Assessment 2010 and Eurostat. 36 countries, and therefore almost 99 percent of total forest and other wooded land in the FOREST EUROPE region responded to the enquiry and provided a national report. The secretariat prepared studies and improved the general information for countries that did not respond using available data.

Data for the remaining 7 indicators was provided by other organisations/ processes. This data was verified and validated by countries to the most possible extent. Detailed information about data collection and processing is presented at the beginning of each criterion and in Annex 2.

Criterion 1: Maintenance and Appropriate Enhancement of Forest Resources and their Contribution to Global Carbon Cycles

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Chapter reviewer **Hans Verkerk**

Data sources **Indicators 1.1, 1.2, 1.3, 1.4 – national reports on quantitative indicators**

Key findings by indicator

Indicator 1.1 Forest area

Forest area amounts to 1.02 billion ha in Europe, of which 83 percent is available for wood supply. Other wooded lands cover an additional area of 109 million ha. Europe is the most forest-rich region in the world, with forests covering 45 percent of Europe's total land area, mainly due to the forest cover in the Russian Federation. Indeed, forest cover in Europe is very heterogeneous among countries. North Europe and the Russian Federation are the European regions with the largest forest cover, while South-East Europe is the least forested European region. Half of the European forests are predominantly coniferous, a quarter are predominantly broadleaved, and a quarter are mixed. The forest composition has not changed since 2005.

In all the European regions forest area has increased since 1990. Europe is the only World region having a positive net change in forest area for the past 20 years. Europe has gained 5.1 million ha of forest since 2005.

Indicator 1.2 Growing stock

The total growing stock of forests in the European regions is estimated at 114.2 billion m3, of which 75.7 percent is available for wood supply. The regions with the largest volume available for wood supply are the Russian Federation and Central-East Europe. Europe is the World region with the second highest growing stock, following South America. However, Europe's growing stock per hectare (105 m^3/ha) is lower compared to that of the World (130 m^3/ha). 71 percent of Europe's total growing stock is made up of conifers; the remainder is broadleaves. In the last 20 years, an average of more than 432 million m^3 has been added each year due to expansion of the forest area and an increase in stocking levels. This represents about 20 percent more than the annual change in growing stock in 2005.

Indicator 1.3 Age structure and/or diameter distribution of forest

Forests in Europe are largely even-aged and between 20 and 80 years old. For European countries, without the Russian Federation, 12 percent of the forests are younger than 20 years, 43 percent are between 20 and 80 years, 18 percent are above 80 years, and 27 percent are uneven-aged or non-categorized. The areas of old and uneven-aged forests tend to increase slightly.

Indicator 1.4 Carbon stock

Europe's forests are major carbon sinks, i.e. they absorb large amounts of CO2 from the atmosphere. Between 2005 and 2010 the average annual sequestration of carbon in forest biomass reached 870 and 430 million tonnes in the European region and EU-27, respectively. This corresponds to about 10 percent of the greenhouse gas emissions for the European countries and about 9 percent of the emissions within EU-27 (in 2008). The stocks of dead organic matter and soil organic carbon also seem to have increased, but data are uncertain.

Indicator 1.1 Forest area

Area of forest and other wooded land, classified by broadleaves and conifers, and by availability for wood supply, and share of forest and other wooded land in total land area.

Introduction

This indicator provides a complete perspective of European forest resources and is a valuable source of information for national forest policies and forestry programs. The extent of and, particularly, changes in forest area are crucial elements in assessing the sustainability of forest management for an increasing number of political processes, including their requirements for monitoring and reporting.

Estimates of forest areas are available for all countries in the FOREST EUROPE region for the years 1990, 2000, 2005 and 2010. Seven countries did not report on forests available for wood supply, and 14 countries did not report the distribution of forest area by main tree species (predominantly coniferous, predominantly broadleaved or mixed). For the missing figures, extrapolations were made.

Status

Forests cover more than 1.02 billion ha in Europe, i.e. 45 percent of Europe's land area. Forest area is unequally distributed over the European territory and the percentage of forest shows significant differences among European countries (Figure 1). Forest area amounts to almost three quarters of the Finnish land area, whereas only 11 percent of the land area of Ireland and the Netherlands is covered by forests.

Other Wooded Lands (OWL) represent only a tiny part of the land area, except for South Europe (Table 1). Indeed, in South Europe the climatic and edaphic conditions favour scattered vegetation.

The area of forests available for wood supply amounts to 846 million ha, corresponding to 83 percent of the total forest area. Excluding the Russian Federation, the share of European forests available for wood supply in 2010 was the same as in 2005.

South-East Europe is the European region with the lowest share of forests available for wood supply (71 percent of total forest area). This can be related to the growth conditions, as mentioned above, but also to the difficulties in wood mobilization, particularly in mountainous areas. Central-East Europe and North Europe are also European regions with less than 80 percent (77 percent and 79 percent, respectively) of forest area available for wood supply.

The forests in Europe are mainly made up of predominantly coniferous stands (50 percent) and predominantly broadleaved stands (27 percent). The remaining part is mixed stands, including coniferous and broadleaves (Figure 2). Due to the climate, conifers are mostly found in North Europe (e.g. Finland and Sweden hold 7.5 percent of Europe's predominantly coniferous forests).

Table 1: Extent of forest and other wooded land, 2010

Region	Forest…		of which available for wood supply		Other wooded land		Total
	1 000 ha	% of land area	1 000 ha	% of land area	1 000 ha	% of land area	1 000 ha
Russian Federation	809 090	49.4	677 204	41.3	73 220	4.5	1 638 139
North Europe	69 278	52.1	54 478	41.0	5 651	4.3	132 869
Central-West Europe	36 882	26.4	34 382	24.6	1 923	1.4	139 962
Central-East Europe	43 959	26.8	33 925	20.7	848	0.5	164 051
South-West Europe	30 795	34.8	24 839	28.1	11 496	13.0	88 475
South-East Europe	29 936	23.1	21 316	16.4	15 427	11.9	129 778
Europe	1 019 940	44.5	846 144	36.9	108 565	4.7	2 293 274
Europe without the Russian Federation	210 850	32.2	168 940	25.8	35 345	5.4	655 135
EU-27	157 194	37.6	133 262	31.8	19 810	4.7	418 613

Figure 1: Forest area (million ha) and share (percent) of land area by country, 2010

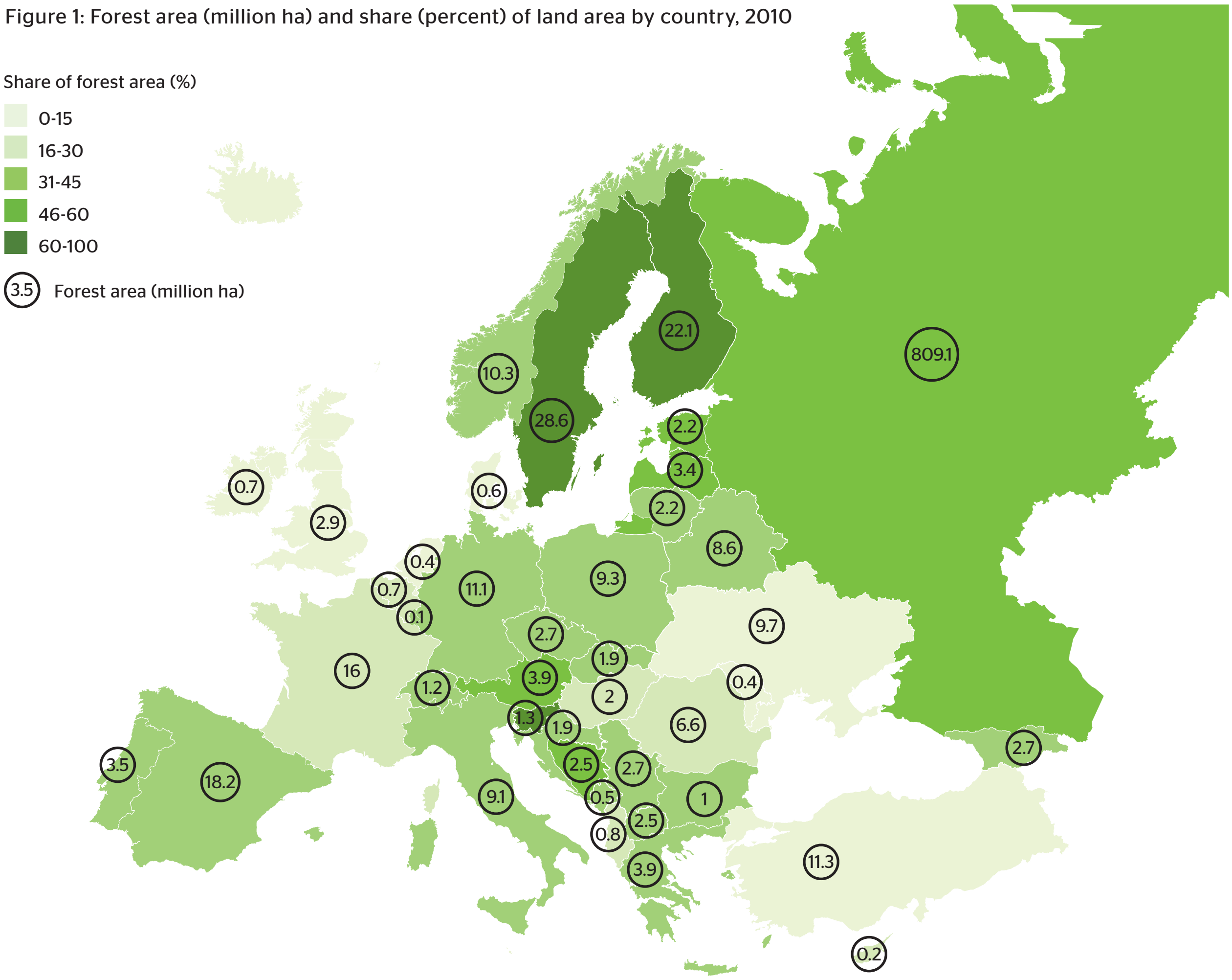


Figure 2: Proportion of forest area by forest composition, by region, 2010 (percent)

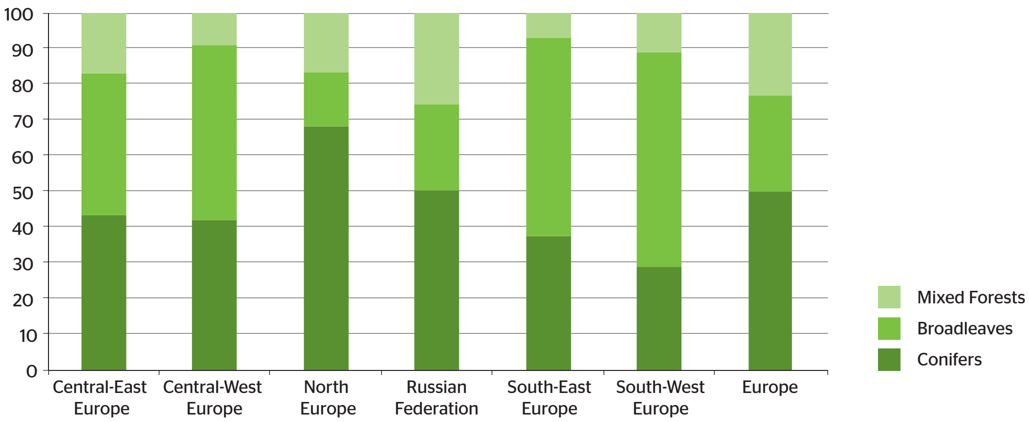
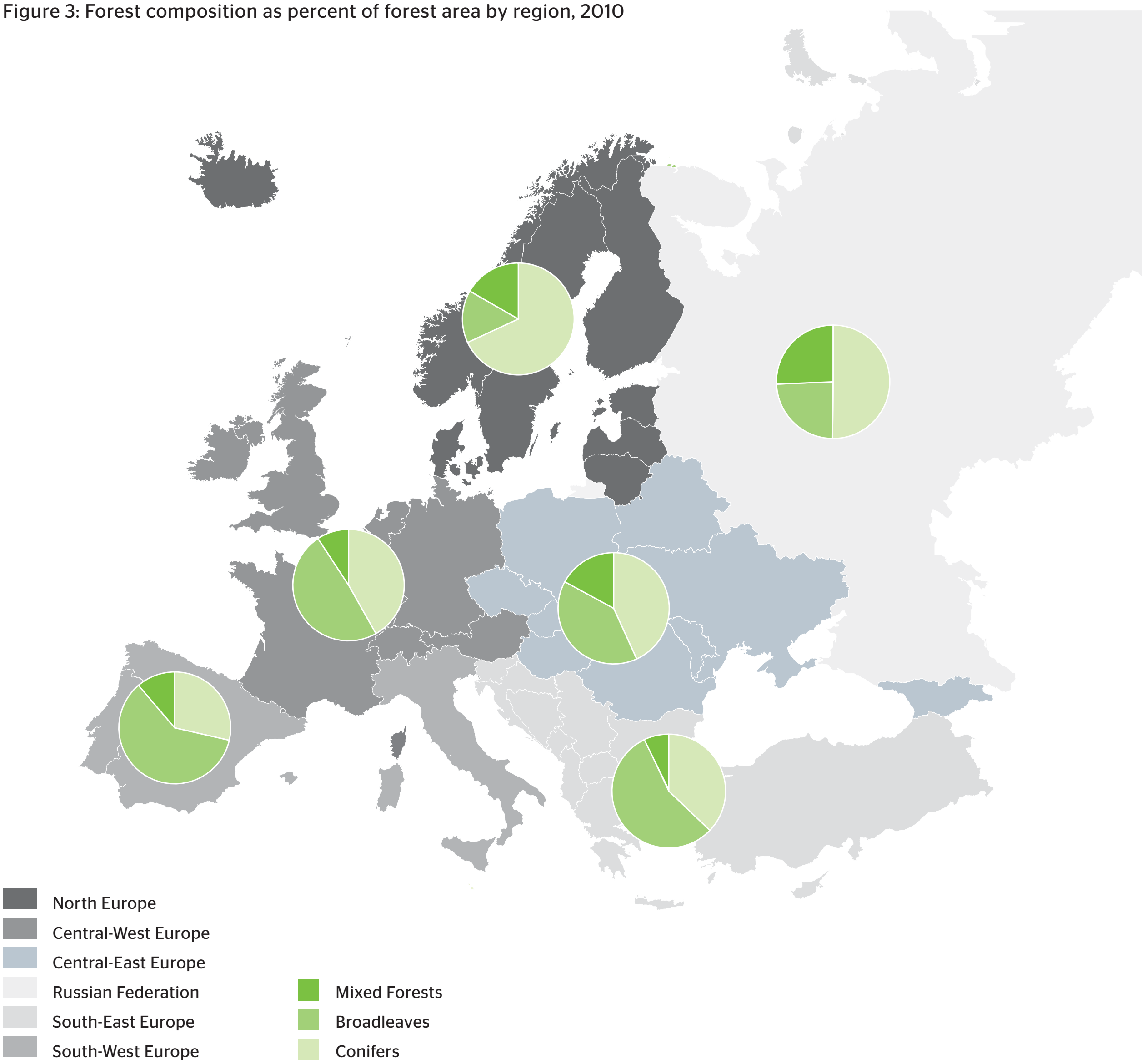


Figure 3: Forest composition as percent of forest area by region, 2010



Predominantly broadleaved stands are located in Mediterranean countries (South-West and South-East Europe) or in countries under oceanic influence (Central-West Europe) (Figure 3).

Trends 1990–2010

Forest area in Europe has expanded by 17 million ha during the past 20 years. On average, Europe's forest area has risen by 834 499 ha (0.08 percent) per year (Figure 4). The presented changes in forest area are net changes and are the results of afforestation, natural forest expansion and deforestation. Changes in forest area are to some extent caused by changes in the definition of forest.

Except for the Russian Federation, the European regions continually gained forest area over the past 20 years (Table 2). Although this is true for total forest area, the trends for forests available for wood supply are inverted. From 1990 to 2010 the forest area available for wood supply decreased, at least during a short period, in almost all European regions except for Central-West Europe and South-West Europe. Between 1990 and 2005, the forests available for wood supply in Central-East Europe declined by 848 000 ha, but this trend reversed during the period 2005-2010, recovering 102 000 ha. During the past 20 years, North Europe lost 0.16 percent of forests available for wood supply every year. The forests available for wood supply in the Russian Federation and in South-East Europe increased from 1990 to 2000 and then decreased by 0.39 percent per year and 0.21 percent per year, respectively, during the next 10 years. As the total forest area has increased over the past 20 years in all European regions except for the Russian Federation, the decrease of forest area available for wood supply in the last decade is due to the fact that forest functions have changed and part of the forests available for wood supply have been used for other purposes (recreation, biodiversity protection, etc.).

At the national level, disparities can be noticed (Figure 5). From 1990 to 2010, the area of forest in Georgia declined by 1 850 ha each year, which represents a 0.07 percent reduction of the forest area in this country over this 20-year period. In Spain forest area increased by 217 750 ha during the same period. Changes in forest area are to some extent caused by changes in the definition of forest.

Figure 4: Annual rate of change in forest area by region, 1990-2010 (percent of forest area/year)

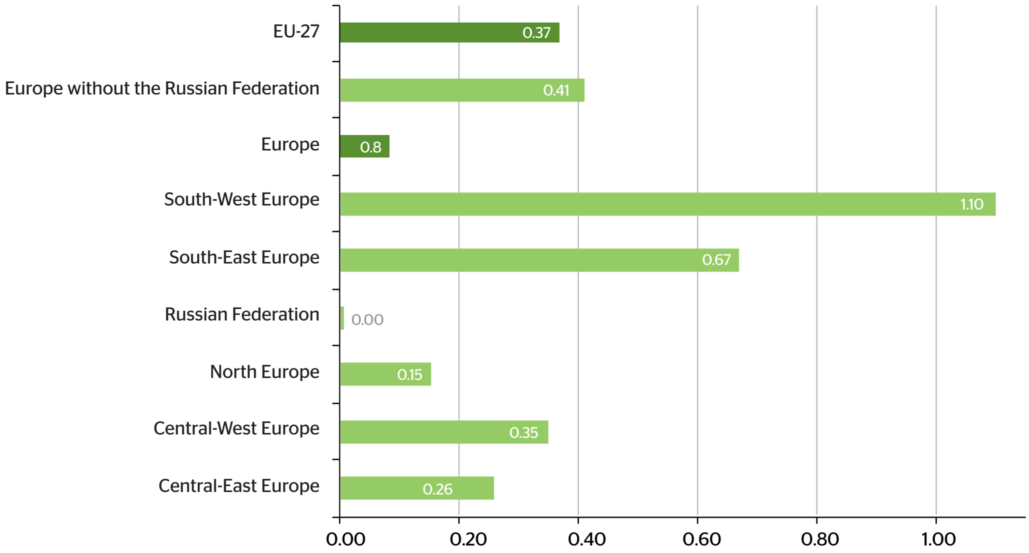


Figure 5: Annual rate of change in forest area by country, 1990-2010 (percent)

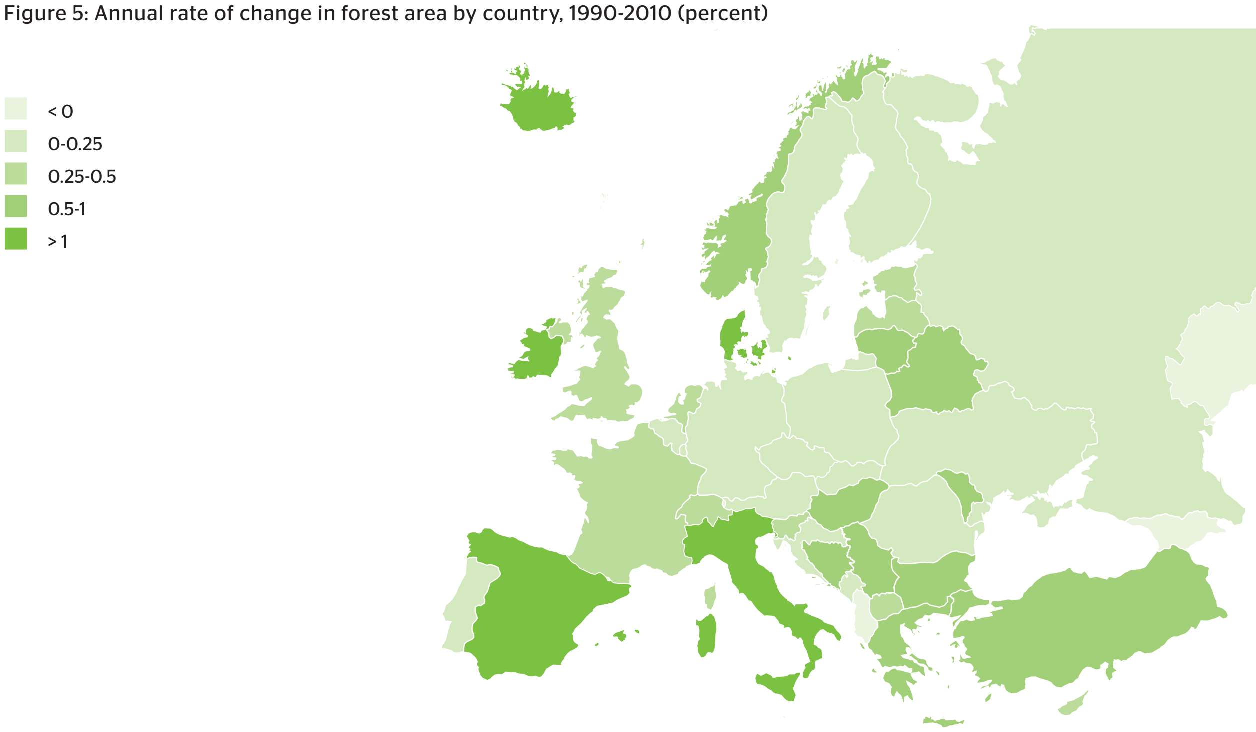


Table 2: Trends in forest area by region, 1990-2010

Region	1990	2000	2005	2010
	1 000 ha			
Russian Federation	808 950	809 269	808 790	809 090
North Europe	67 200	68 280	68 604	69 278
Central-West Europe	34 396	36 010	36 529	36 882
Central-East Europe	41 756	42 765	43 282	43 959
South-West Europe	24 752	28 793	29 506	30 795
South-East Europe	26 196	27 251	28 527	29 936
Europe	1 003 250	1 012 367	1 015 238	1 019 940
Europe without the Russian Federation	194 300	203 098	206 448.00	210 850.00
EU-27	146 082	152 817	154 662	157 194

Indicator 1.2 Growing stock

Growing stock of forest and other wooded land, classified by broadleaves and conifers, and by availability for wood supply.

Introduction

Growing stock, the stem volume of living trees, is a basic variable in forest inventory. The estimates of total growing stock (m^3) and growing stock density (m^3/ha forest) by forest type and by availability for wood supply provide basic information for the assessment of the sustainability of forest management.

Growing stock information is also used as a basis for estimating the amount of carbon accumulated in standing living trees.

Figures for forest growing stock were provided by almost all countries for the years 1990, 2000, 2005 and 2010. Growing stock of other wooded land in 2010 was not reported by 13 out of the 46 FOREST EUROPE countries. In 2010, eight countries did not report on growing stock available for wood supply, and six countries did not report the distribution of growing stock by tree species (broadleaves and conifers). In these two latter cases, figures have been imputed.

Status

Total growing stock of European forests adds up to 114.2 billion m3. Ninety six billion m^3 are available for wood supply (Table 3). Excluding the Russian Federation, Central-East Europe has the highest volume of growing stock with a total of 9.5 billion m^3. It is followed closely by Central-West Europe (8.4 billion m^3). In Europe, the mean volume of growing stock is 105 m^3/ha. However, this average hides heterogeneous values depending on the country, from 15 m^3/ha for Iceland to 346 m^3/ha for Switzerland.

Several countries from the Central Europe region (e.g. Switzerland, Austria, Czech Republic, Slovakia, Slovenia) report a stocking density of forests greater than 250 m^3/ha. This high value can be explained mainly by ecological conditions in favour of tree growth, by the protection of forest areas, by silvicultural theory and practices and locally by forest harvesting difficulties. Low stocking densities are mainly due to young forests (e.g. in Ireland) but also to poorer soils, to climatic conditions limiting tree growth, or to short rotations with a production goal of medium-sized trees. In the Mediterranean countries (e.g. Spain, Portugal and Greece), the large areas of open forests, the coppice forests and the summer droughts lead to low growing stock densities (Figure 6).

Conifers account for 71 percent of the European growing stock of forests, i.e. 80.7 billion m^3, whereas broadleaved growing stock amounts to 33.5 billion m^3. In each European region the share of growing stock by forest type is quite the same as the distribution of forest area (Figure 6). In general, the European growing stock is evenly divided between broadleaves and conifers in all regions of Europe, except for Northern Europe and the Russian Federation, where only a quarter of the growing stock is of broadleaves.

Trends 1990–2010

Growing stock in Europe expanded by 8.6 billion m^3 during the past 20 years (Table 4). Each year, the growing stock in all European regions increased by 0.39 percent on average during this period (Figure 7). The European growing stock is mainly in the Russian Federation due to its vast forest area.

The Russian Federation and South-East Europe are the only European regions where the annual rate of change of growing stock increased from the 1990-2000 period to the 2000-2010 period. The annual rate of change of growing stock in the other European regions decreased between the above-mentioned ten-year periods. Between 1990 and 2000, the growing stock in Central-East Europe increased by 1.53 percent per year, and then by only 1.42 percent per year during the 2000-2010 period.

Table 3: Growing stock of forest by region, 2010

	Growing stock (million m^3)	
Region	**Forest**	**… of which available for wood supply**
Russian Federation	81 523	68 234
North Europe	8 114	6 974
Central-West Europe	8 364	8 103
Central-East Europe	9 533	7 539
South-West Europe	2 484	2 223
South-East Europe	4 198	3 178
Europe	114 215	96 252
Europe without the Russian Federation	32 692	28 018
EU-27	24 132	21 750

Figure 6: Growing stock by forest composition by region, 2010 (m³/ha)

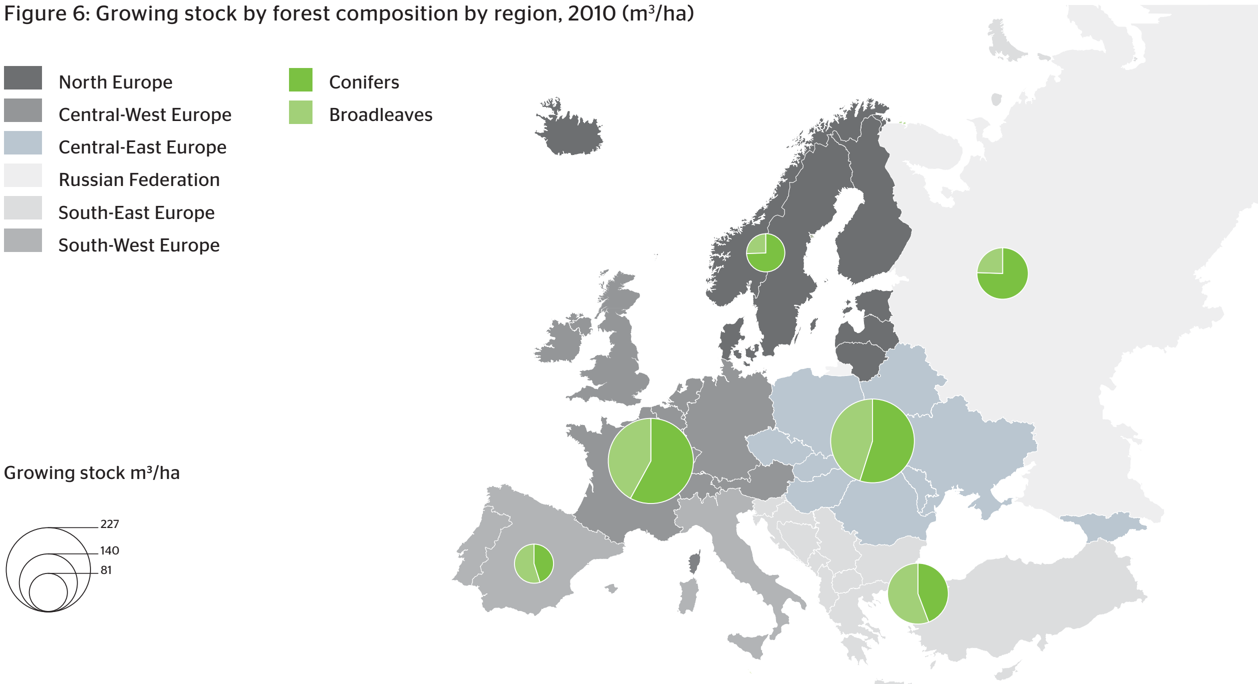


Figure 7: Trends in growing stock by region, 1990-2010 (million m³/ha)

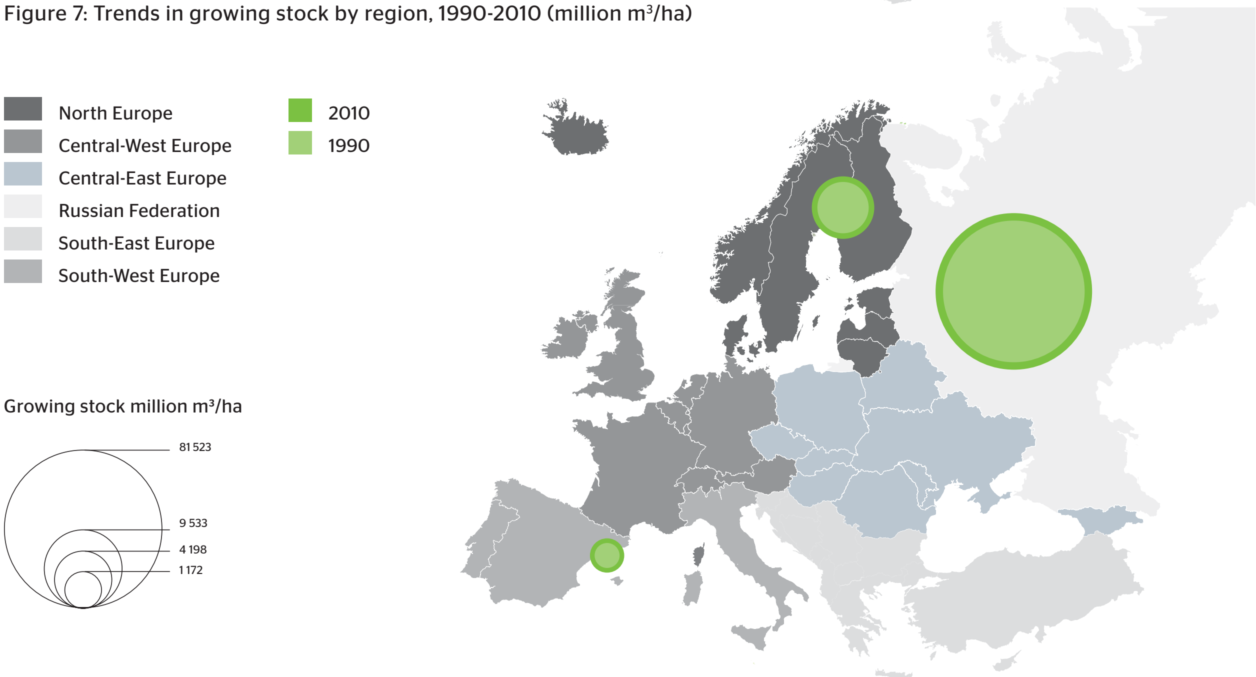


Table 4: Trends in total growing stock in forests, 1990-2010

Region	Total growing stock in forest (million m³)				Annual change rate (1990-2010)	
	1990	2000	2005	2010	million m³	%
Russian Federation	80 040	80 270	80 479	81 523	74.2	0.09
North Europe	6 702	7 509	7 892	8 114	70.6	0.96
Central-West Europe	6 826	7 764	8 184	8 364	76.9	1.02
Central-East Europe	7 111	8 281	8 772	9 533	121.1	1.48
South-West Europe	1 722	2 222	2 332	2 484	38.1	1.85
South-East Europe	3 176	3 613	3 868	4 198	51.1	1.40
Europe	105 576	109 659	111 526	114 215	432.0	0.39
Europe without the Russian Federation	25 563	29 389	31 047	32 692	356.5	1.24
EU-27	19 143	21 874	23 067	24 132	249.5	1.16

Indicator 1.3 Age structure and/or diameter distribution of forest

Age structure and/or diameter distribution of forest and other wooded land, classified by forest type and by availability for wood supply.

Introduction

This indicator concerns the age class structure of forests and, for uneven-aged forests, their diameter distributions. The indicator is important for understanding the history of forests and their likely future development. From a traditional forest management point of view, it facilitates a general assessment of harvesting potentials; however, it also provides insights into, for example, biodiversity and recreation conditions which are generally more favourable in uneven-aged and old even-aged forests compared to young even-aged forests.

In assessing the status and trends for this indicator, it should be noted that data are frequently missing. This is especially the case for diameter distributions, which are therefore not included. Furthermore, reliable information on age structure is only available for Central-East, Central-West and North Europe. While results for South-East and South-West Europe are also provided, they should be interpreted with caution; no results are given for the Russian Federation due to lack of data. In addition, definitions of even-aged and uneven-aged forest vary between countries and some forests are non-categorized, i.e. reported as neither even-aged nor uneven-aged.

The reporting in this section focuses on area proportions for even-aged and uneven-aged (including non-categorized) forests and is subdivided into age classes for even-aged forests.

Status

The age structure of European forests in 2010 is shown in Figure 8. Overall, even-aged forests dominate, especially forests aged 20-80 years. For Europe, excluding the Russian Federation, 73 percent of the forests are reported as even-aged: 12 percent below 20 years, 43 percent between 20 and 80 years, and 18 percent above 80 years. Uneven-aged forests are common mainly in Central-West and South-West Europe; however, they also are common in the Russian Federation. Old even-aged forests are frequently occurring mainly in North and Central-West Europe.

It should be noted, however, that stand age is a rather crude measure of stand maturity as, for example, an 80-year-old forest could be considered premature in the northern Europe while over-mature in the southern Europe.

Trends 1990-2010

Forest management practices vary among different European regions and thus it is interesting to study how this has affected the age structure of forests over time. In Figure 9, the trend for the sum of old forest (>80 years) and uneven-aged forest (including non-categorized forest) is presented. The reason for this aggregation is that both these categories are valuable for biodiversity and recreation, in addition to being potential sources of timber. Furthermore, it is known that the categorization into either of these two classes may be difficult and, by presenting the trend for the total, some classification uncertainties can be avoided.

It is seen that the proportion of old plus uneven-aged forest increased slightly in most regions. While these increases are small, they are still noteworthy because change in forest structure is generally a very slow process. The regions with the largest increases are South-West and Central-West Europe; however, for South-West Europe data are missing for several countries and for Central-West Europe the change stems mainly from one single country (France).

Figure 8: The age structure of European forests in 2010 in terms of percent of forest in different age classes of even-aged forest and uneven-aged – including non-categorized – forest (the Russian Federation is not included due to lack of data)

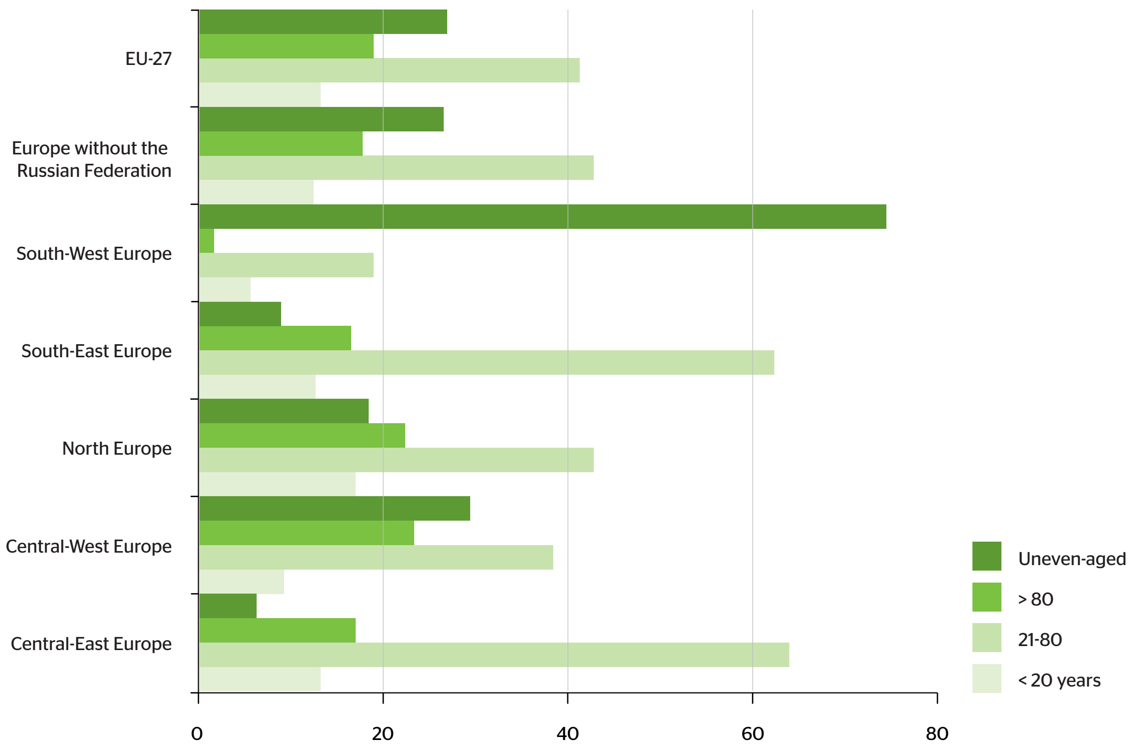
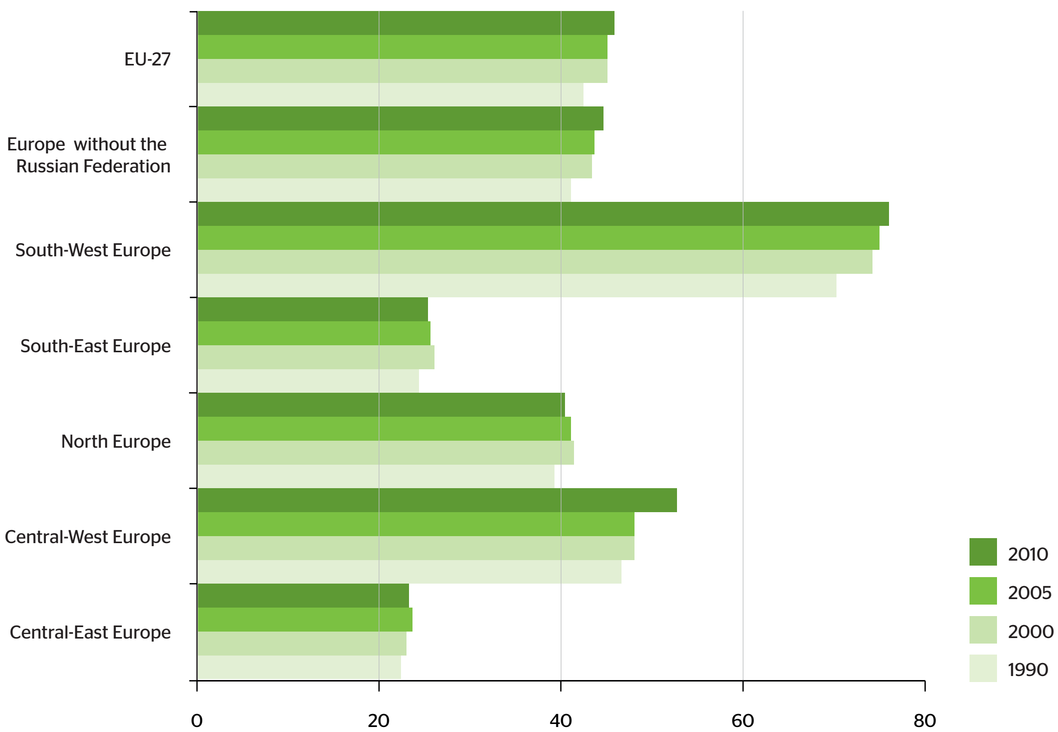


Figure 9: Trends in the proportion of old (>80 years) plus uneven-aged (including non-categorized) forest (percent of total forest area). The Russian Federation is not included due to lack of data



Indicator 1.4 Carbon stock

Carbon stock of woody biomass and of soils on forest and other wooded land.

Introduction

This indicator is linked to society's efforts to mitigate climate change through reducing net emissions of greenhouse gases to the atmosphere. By tree growth, carbon is sequestered in biomass. As a consequence, forests contain large stocks of carbon in biomass, dead organic matter and soils that could either increase or decrease depending on what forest management practice is adopted. By assessing the trends of the forest carbon stocks, it can be determined whether forests are sources or sinks of carbon and to what extent forests compensate for greenhouse gas emissions in other sectors.

Under the UN Framework Convention on Climate Change and its Kyoto Protocol, parties are obliged to submit annual reports on greenhouse gas emissions and removals by different land-use categories and carbon pools. In this context, forest is an important land-use category in many European countries. While the focus of this indicator is the carbon stocks within forests, it should be pointed out that forests and forestry also may serve to reduce greenhouse gas emissions in other ways. By using wood-based biofuels, fossil fuel usage can be reduced. Furthermore, wood in harvested wood products may act as a carbon sink by substituting for more energy-demanding material in industrial sectors and by storing carbon in structures of long life span, such as wooden buildings. However, the present indicator only addresses the carbon stocks within forests.

As for the reporting to the Kyoto Protocol, a separation is made between biomass (above- and below-ground), deadwood, and soils (litter and soil organic carbon).

However, specific analyses are made only for the biomass pool as it may change rather markedly over short periods of time in response to growth and harvests. For the other pools, changes tend to be slower and the data is missing or of lower quality.

Status

The biomass carbon stocks in different European regions are presented in Table 5.

As in many other cases, the impact of the Russian Federation on the results is substantial; 70 percent of the biomass carbon stocks is located in Russia. The proportion of the total biomass carbon stock in the other regions ranges from 2.3 percent to 8.6 percent. Furthermore, it may be noted that the forest biomass carbon stock within European countries amounts to about 16 percent of the world's forest biomass carbon stocks (FAO, 2010).

An analysis was made to assess the relative share of different forest carbon pools (i.e. above- and below-ground biomass, deadwood, litter, and soil organic carbon) based on data from those countries that reported all five pools. The results are shown in Figure 10. It can be observed that the carbon stock in soils dominates and is about twice as large as the biomass pool. The other pools are small relative to biomass and soils.

Trends 1990-2010

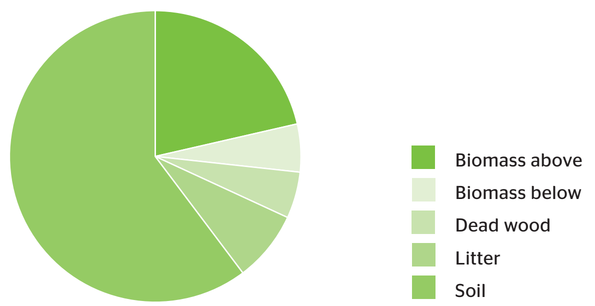
Biomass carbon stocks in European forests from 1990 to 2010 are presented in Table 6 and Figure 11.

In all regions, except the Russian Federation, the biomass carbon pool increased steadily from 1990 to 2010. The rate of increase in the period 1990 to 2005 for most regions was of similar magnitude as the rate of increase between 2005 and 2010. However, at the level of the European region the increase of biomass stocks between 2005 and 2010 compared to the period between 1990 and 2005 was quite substantial.

Overall, the carbon stock increase is very large. For the European countries it amounts to 238 Mt C per year (873 Mt CO_2), for the period 2005 - 2010. For EU-27, the corresponding figure is 429 Mt CO_2, which amounts to almost 10 percent of the gross greenhouse gas emissions during this period. Thus, the European forests are important from a climate change mitigation perspective, especially considering the additional potential benefits mentioned in the introduction. The major reason for the observed changes is that the growth has been larger than the cuttings and other removals of biomass. However, in some regions the growing stock levels have become very high. Hence, it is unlikely that forests in the long run would be as substantial as carbon sinks as they are currently in these regions.

Due to missing data and other uncertainties, no change figures are presented for the non-biomass carbon pools. However, from the available data it seems that these pools are also increasing, although not as markedly as the biomass pool.

Figure 10: Proportions of the five forest carbon pools in Europe countries (upper) and Europe without the Russian Federation (lower), in percent. (Figure based on data from countries that reported on the carbon pools)



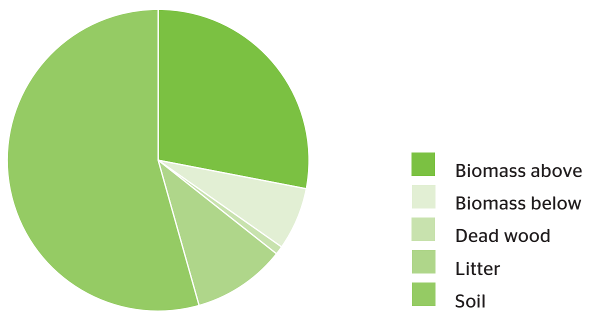


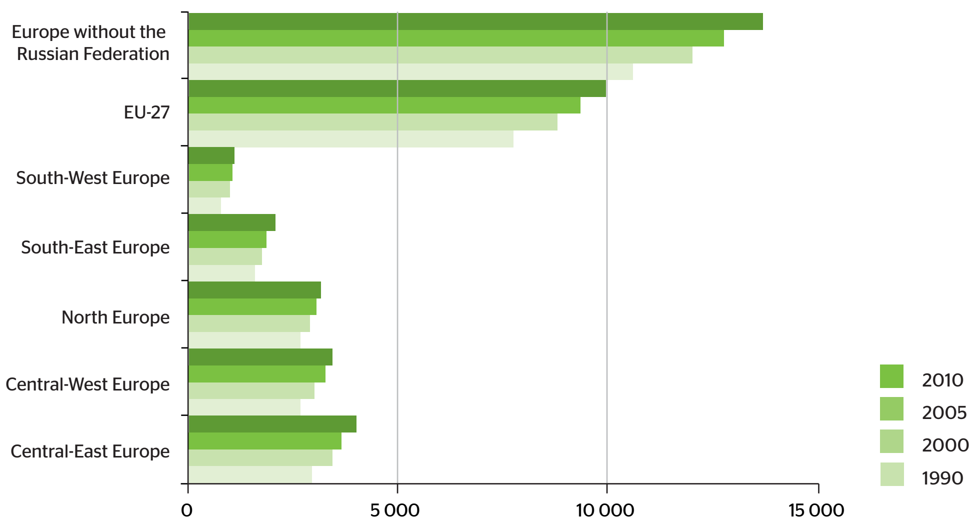
Table 5: Carbon stocks in biomass separated on above- and below-ground components for different European regions in 2010. The percentages show proportions of total biomass carbon in Europe

Region	Above-ground biomass (Mt C)	%	Below-ground biomass (Mt C)	%	Total biomass (Mt C)	%
Russian Federation	26 000	56.4	6 500	14.1	32 500	70.4
North Europe	2 565	5.6	550	1.2	3 115	6.8
Central-West Europe	2 655	5.8	754	1.6	3 410	7.4
Central-East Europe	3 185	6.9	803	1.7	3 988	8.6
South-West Europe	835	1.8	247	0.5	1 082	2.3
South-East Europe	1 595	3.4	443	1.0	2 038	4.4
Europe	36 835	79.8	9 297	20.2	46 132	100.0
Europe without the Russian Federation	10 835	23.5	2 797	6.1	13 632	29.6
EU-27	7 878	17.1	2 023	4.4	9 901	21.5

Table 6: Carbon stock in forest biomass, 1990, 2000, 2005 and 2010, and annual rates of change between 1990 and 2005, and between 2005 and 2010

Region	Carbon stock in biomass Mt C				Annual change %	
	1990	2000	2005	2010	1990-2005	2005-2010
Russian Federation	32 504	32 157	32 210	32 500	-0.06	0.18
North Europe	2 666	2 882	3 011	3 115	0.86	0.69
Central-West Europe	2 625	2 985	3 232	3 410	1.54	1.10
Central-East Europe	2 934	3 398	3 627	3 988	1.57	1.99
South-West Europe	773	972	1 014	1 082	2.07	1.35
South-East Europe	1 549	1 743	1 846	2 038	1.28	2.07
Europe	43 052	44 136	44 940	46 132	0.29	0.53
Europe without the Russian Federation	10 548	11 979	12 730	13 632	1.38	1.42
EU-27	7 806	8 782	9 317	9 901	1.29	1.25

Figure 11: Carbon pools in forest biomass from 1990 to 2010 in different European regions (Mt C)



Criterion 2: Maintenance of Forest Ecosystem Health and Vitality

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Chapter reviewer **Andy Moffat**

Data sources **Indicators 2.1, 2.2, 2.3 – data delivered by ICP Forest/EC-JRC**
Indicator 2.4 – national reports on quantitative indicators

Key Findings by Indicator

2.1 Deposition of air pollutants

Mean annual sulphur inputs decreased by 30 percent between 1998 and 2007, with statistically significant reductions measured on half of the plots. For nitrogen compounds there is no clear tendency in measured deposition which increased on a number of plots yet decreased on others. However, modelled critical load exceedances for nitrogen suggest possible success of clean air policies. It is estimated that, until 2020, maximum technically feasible reductions could lead to 90 percent of the plots being protected from harmful effects. The continued exceedance of critical loads indicates a clear need for further nitrogen emission reductions.

2.2 Soil condition

Acidification and changes in chemical soil properties and related nutrient cycling directly or indirectly affect tree vitality, species composition and tree resistance to insect attacks and diseases. The tendency to acidification and eutrophication of forest soils in many parts in Europe is a potential area of concern.

Between two European forest soil surveys, there was a mean increase in pH and base saturation in acid forest soils but a mean decrease of soil pH and base saturation in other forest soils. Additionally, it was found that there was an increase in organic carbon in the organic and upper soil layer for the majority of revisited sites. In the second soil survey, it was noticed that N deposition still causes disturbed organic matter and nutrient cycling on 14 percent of 2 738 observation plots, evidenced by a C/N index lower than 1. The plots in Central-Western Europe especially are severely affected.

2.3 Defoliation

About a fifth of the surveyed trees were assessed as damaged over the last five years. Tree crown condition remained unchanged on most plots, but on 29 percent of the plots forest health deteriorated between 1998 and 2009. In-depth assessments point to insect attacks, fungal diseases and weather extremes as the most widespread influencing factors. These factors are assumed to still gain increased importance under accelerating climate change scenarios and more frequently occurring extreme events.

2.4 Forest damage

Forests can be subject to abiotic, biotic and human-induced damaging agents. While in natural forest ecosystems biotic and abiotic damaging agents are essential components of forest ecosystem development, they can cause substantial economic losses in managed forest ecosystems and are a threat to sustainable forest management at the local level.

Insects and diseases as well as wildlife are the most frequently reported damaging agents in European forests, although the level of damage caused to forests is often unknown. Between 1990 and 2005 the forest area affected by those damaging agents nearly doubled in Europe without the Russian Federation. Damage caused by storm, wind, snow and fires shows regional patterns and can have devastating impacts on a local scale. Since 1990, Europe has faced several heavy storms that have led to substantial damage and have had impacts on timber markets.

Indicator 2.1 Deposition of air pollutants

Introduction

Nitrogen, sulphur dioxide, heavy metals and ozone can be conveyed in the atmosphere over long distances. They cover distances of several hundreds to thousands of kilometres as gases or microscopic particles (aerosols). Forests are exposed to particularly high inputs since their large crown surfaces are very effective at capturing deposition. Deposition can affect organisms or ecosystems either directly or by soil acidification and eutrophication. The nutrient status of trees may be influenced by the interaction of air pollutants with the foliage and also by changing availability of nutrients in the soil. Direct or indirect adverse effects of deposition on forest tree health and ground vegetation composition have also been demonstrated. Air pollution may also make trees more vulnerable to the effects of drought and attacks by fungi or insects.

Critical loads – the thresholds for long-term deposition – are calculated to identify sites where deposition levels have reached a critical state. According to current knowledge, inputs below critical loads do not lead to significant negative effects for the ecosystems concerned. The calculation of critical loads is based on a mass balance that takes into account stand structure, bedrock and soil chemistry.

Deposition of air pollutants has been measured jointly by the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests) and the European Commission. Information is available from up to 300 intensive monitoring plots ('Level II') in the major European forest types.

Status

The highest sulphate inputs occur in central Europe and on some of the investigated plots in the Mediterranean region (see Figure 12). A proportion of the sulphate input to plots near the coast is of natural maritime origin; seawater contains sulphate which is transported to the land surfaces in spray. High inputs in central Europe are mostly due to human activities.

The highest atmospheric nitrogen deposition was measured in central Europe between the north of Italy and Denmark (see Figure 13). Very high nitrogen deposition loads were also measured in some regions in Spain and Romania. The deposition of calcium (Ca) is highest in Central and Mediterranean Europe, but for sodium inputs (Na) there is generally a very clear maritime-inland gradient showing that the natural origin of sodium deposition is from sea salt spray.

Trends and explanations

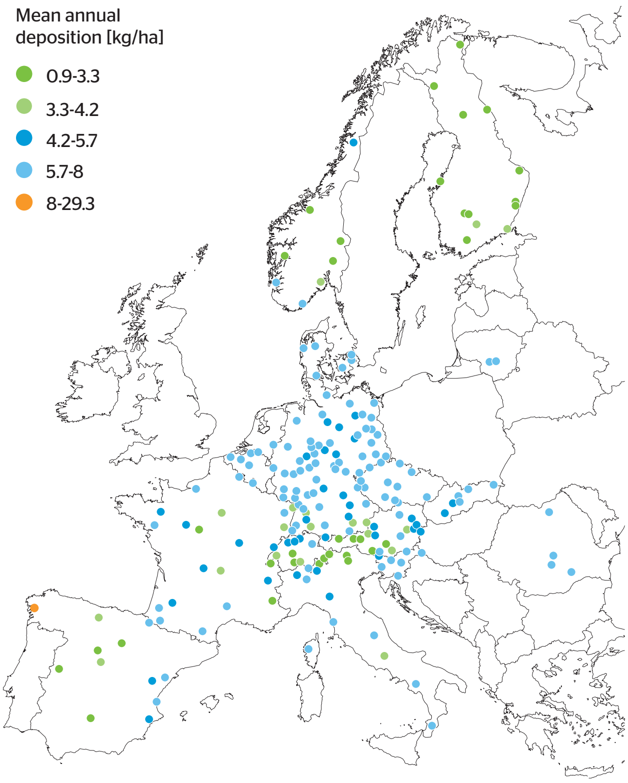
Between 1998 and 2007, mean sulphate inputs decreased by a statistically significant amount on 50 percent of the evaluated plots. Pollution from smelter operations results in a relationship between sulphur and calcium deposition. Mean nitrogen deposition remained mostly unchanged over time (see Figure 14) with a significant increase on around 5 percent and a decrease on around 10 percent of the plots (not depicted).

Critical loads are calculated to determine the effects of the atmospheric deposition on the specific forest stands. Out of the existing ICP Forests data base, Level II sites with best data availability located in 17 countries were selected for the application of a critical load approach based on recently updated soil, soil solution and deposition data. Deposition scenarios based on European Monitoring and Evaluation Programme (EMEP) data (www.emep.int) were provided by the ICP Modelling and Mapping programme (www.icpmapping.org) and were used to model deposition trends of nitrogen and sulphur. The critical loads for acidity or nutrient nitrogen are exceeded if sulphur or nitrogen inputs are above the biological demand and the storage capacity of the soil.

In 1980, critical loads for acidity were exceeded on 56.5 percent of the plots. On a number of plots there were no exceedances due to the fact that, on the one hand, acidic sulphur inputs do not lead to critical load exceedances on calcareous soils (like in many Mediterranean sites) and, on the other hand, there are low deposition areas (like in Scandinavia). In general, exceedances were reduced until the year 2000, when critical loads were only exceeded on 17.6 percent of the plots. Deposition scenarios that are based on present national legislation predict that in 2020 sulphur deposition will hardly exceed critical loads for acidity (see Figure 15). Critical loads for nutrient nitrogen were exceeded on 59.7 percent of the plots in 1980. Some emission reduction based on current legislation will reduce the share of plots with exceedances to 30.6 percent in 2020 according to the models. The remaining critical load exceedances in 2020 are thus expected to be nearly exclusively caused by nitrogen deposition (see Figure 16). Maximum technically feasible nitrogen emission reductions (not depicted) could, however, bring down the exceedances to below 10 percent of the plots.

The deposition reduction, especially for sulphur, shows the success of the clean air policies of the UNECE and the EU. However, previous soil acidification is still a burden to forest soils as recovery takes decades. In addition, emissions of nitrogen compounds affect the forests. Both nitrogen and ammonia depositions indicate the need for further emission reductions.

Figure 12: Mean annual sulphur deposition measured below the forest canopy of intensive monitoring plots; mean values 2005-2007 (kg/ha)



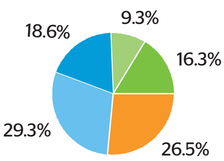
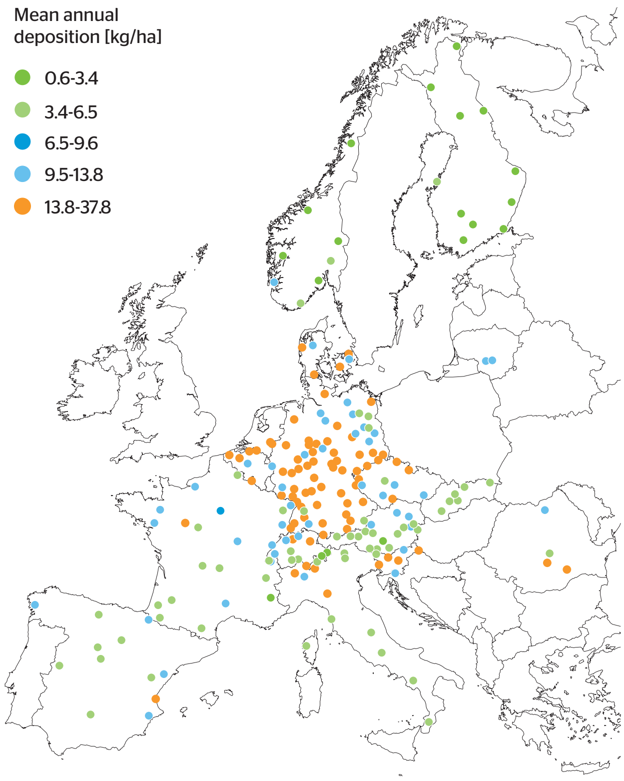


Figure 13: Mean annual nitrogen deposition measured below the forest canopy of intensive monitoring plots; mean values 2005-2007 (kg/ha)



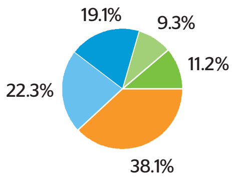


Figure 14: Development of mean plot deposition of sulphur, nitrogen compounds and base cations (in brackets: number of plots) from 1998 to 2007 (kg/ha/year)

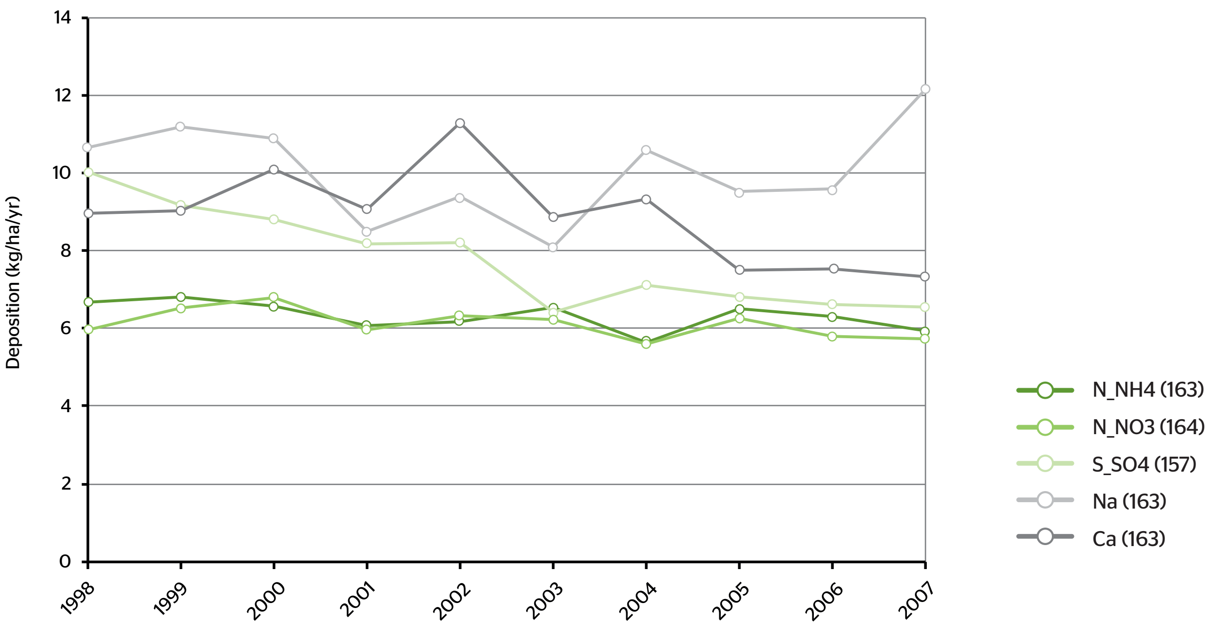


Figure 15: Exceedance of critical loads for acidity in 1980 (top), 2000 (middle), and 2020 (bottom) assuming deposition scenarios based on current national legislation (eq/ha/year)

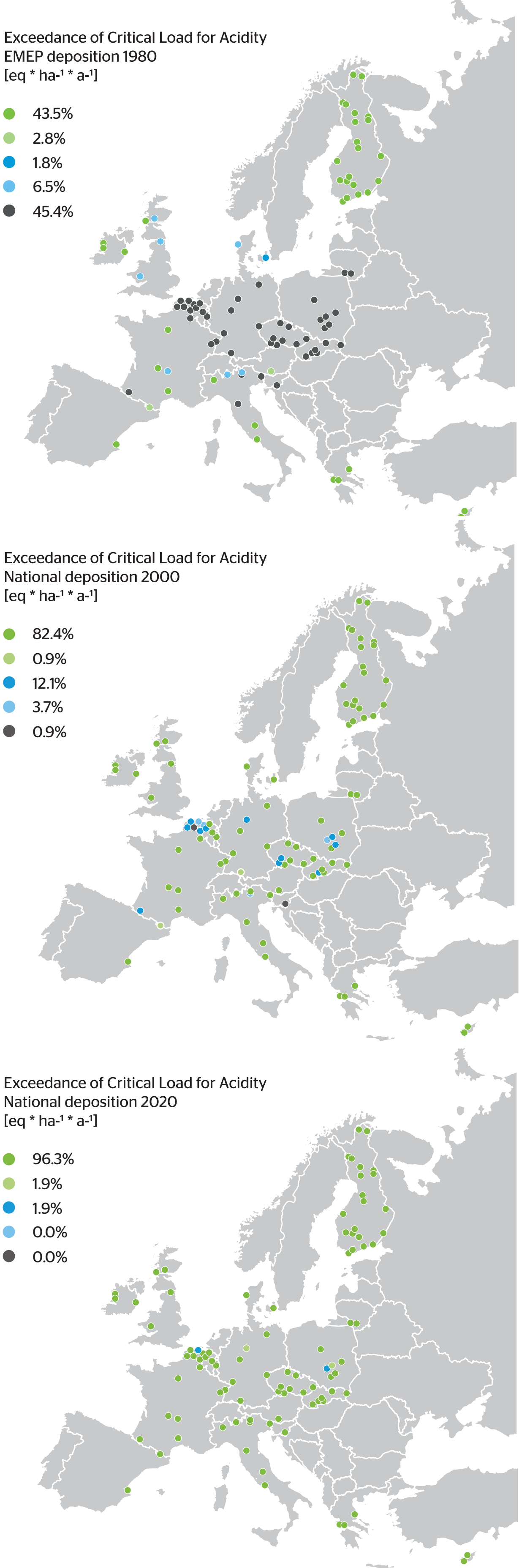
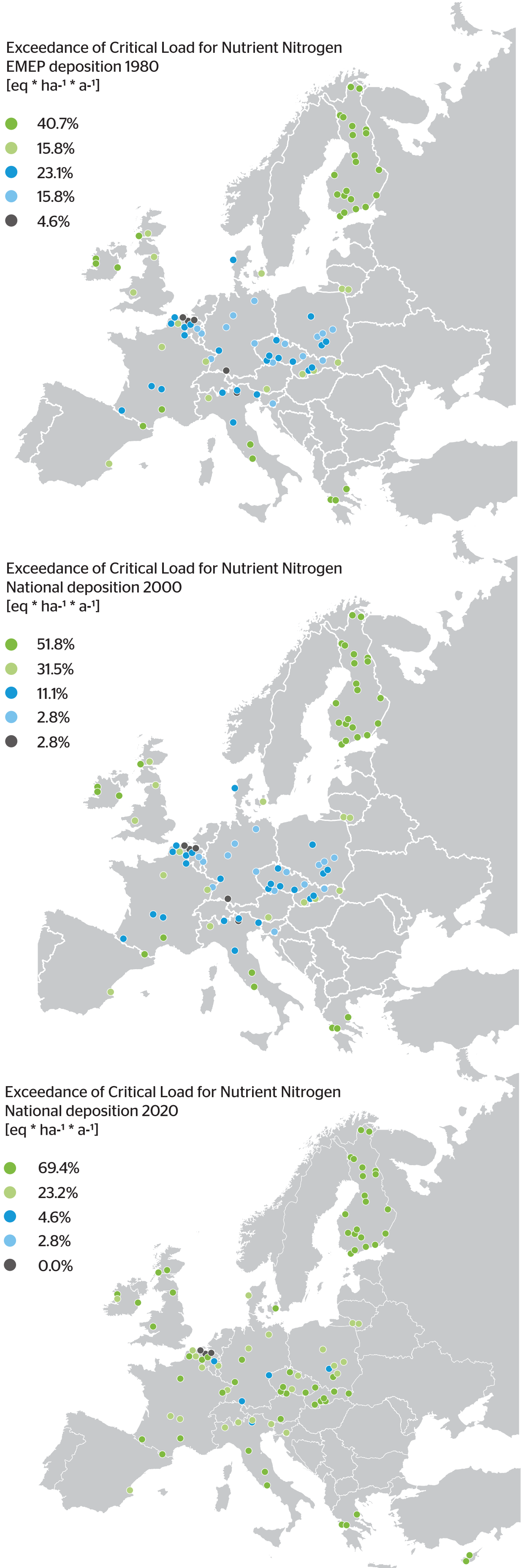


Figure 16: Exceedance of critical loads for nutrient nitrogen in 1980 (top), 2000 (middle), and 2020 (bottom) assuming deposition scenarios based on current national legislation (eq/ha/year)



Indicator 2.2 Soil condition

Chemical soil properties (pH, cation exchange capacity, C/N ratio, organic C, base saturation) on forest and other wooded land related to soil acidity and eutrophication, classified by main soil types.

Introduction

The data used in the assessment of this indicator are based on two forest soil surveys, each including more than 5 000 plots, spread across Europe. The first soil condition survey took place in the period between 1986 and 1996. The second survey was conducted between 2004 and 2008 in the course of Forest Focus (EC 2152/2003), within the BioSoil Project. This project was carried out to investigate how a large-scale European study can provide harmonized soil and biodiversity data and contribute to research and forest-related policies. One of the main objectives of the project was the evaluation of changes in forest soils in Europe. The BioSoil soil survey was performed in 23 Member States[2]. For estimating forest soil properties at regional and European scales, the sample sites of the second survey were arranged systematically on the 16 x 16 km ICP Forests grid to coincide with the locations of the first forest soil condition survey.

The ratio of the carbon-to-nitrogen concentration (C/N ratio) in organic layers and soils is a suitable indicator for the decomposition rate of organic matter, the availability of nitrogen and turnover of nutrients. As forest litter with a C/N ratio between 20 and 100 is decomposed, its ratio decreases gradually and stabilizes at 15-20 in mineral topsoil (0-10 cm) and about 10-15 in subsoil. Organic matter with a low C/N ratio will require less energy for decomposition, and the released nitrogen is sufficient to meet the demands of the micro-organisms, facilitating rapid decay and nutrient release. Decomposition rate is also influenced by climatic conditions and species specific litter quality, among other factors.

In healthy forests the C/N ratio of the forest floor is distinctly higher than in the mineral soil (see Table 7). and it further narrows with depth. However, in areas with a high nitrogen deposition load, the C/N ratio of the forest floor, C/N_{FF}; may become smaller than the C/N ratio of the mineral topsoil, C/N_{MIN}. Hence, the proportion of the C/N_{FF} over C/N_{MIN}, referred to as the C/N-index, is a useful indicator for the imbalance induced by excess nitrogen input. If this index is less than 1, the organic matter and nutrient cycling is most likely disturbed and forest health and vitality may be at risk.

Table 7: Country specific median and 95 percent range of C/N ratios in forest floor (C/N_{FF} of the forest floor) and in mineral topsoil (C/N_{MIN} 0-10 cm) and their respective proportion (C/N-index). The 95 percent range is comprised between the 2.5 and 97.5 percentiles. Data relate to soil samples taken during the second survey

			Forest floor C/N_{FF}		Mineral topsoil C/N_{MIN}		C/N-index C/N_{FF} to C/N_{MIN}	
	Country	No Plots	median	95% range	median	95% range	median	95% range
North Europe	Denmark (DK)		28.2	22.2 - 39.8	25.5	15.0 - 40.5	1.09	0.75 - 2.39
	Estonia (EE)	26	28.9	22.4 - 103	16.5	11.4 - 27.8	1.70	0.80 - 5.10
	Finland (FI)	493	30.1	18.8 - 44.7	22.2	14.4 - 31.4	1.31	0.94 - 2.45
	Latvia (LV)	70	24.2	16.1 - 47.2	19.6	9.21 - 61.9	1.02	0.44 - 2.15
	Lithuania (LT)	43	27.6	15.2 - 38.1	14.6	9.28 - 23.9	1.72	1.03 - 3.02
	Sweden (SE)	216	26.1	14.3 - 44.4	19.0	10.5 - 30.4	1.28	0.91 - 2.64
Central-West Europe	Austria (AT)	128	26.0	19.5 - 32.5	18.4	12.8 - 25.3	1.40	1.05 - 2.38
	Belgium (BE)	9	26.7	18.6 - 33.9	22.7	11.5 - 33.8	1.01	0.84 - 1.46
	France (FR)	133	22.5	16.7 - 39.0	16.6	12.0 - 34.8	1.12	0.74 - 1.56
	Germany (DE)	208	24.7	18.7 - 34.9	19.0	12.0 - 32.5	1.12	0.75 - 1.89
	Ireland (IE)	28	28.5	18.1 - 41.2	19.3	13.2 - 33.3	1.18	0.94 - 1.69
	United Kingdom (UK)	115	22.4	16.3 - 37.1	15.4	10.7 - 28.2	1.26	0.78 - 1.73
Central-East Europe	Czech Rep. (CZ)	145	21.7	14.3 - 30.8	18.6	11.1 - 27.3	1.14	0.90 - 1.78
	Hungary (HU)	19	22.3	13.8 - 31.6	13.2	10.3 - 20.1	1.42	1.05 - 1.97
	Poland (PL)	382	24.0	16.7 - 35.6	17.6	10.3 - 30.2	1.26	0.79 - 2.00
	Slovakia (SK)	70	22.5	16.1 - 31.0	14.3	10.3 - 21.6	1.49	1.02 - 2.23
South-West Europe	Italy (IT)	112	21.1	14.1 - 29.2	12.6	7.48 - 19.9	1.62	0.97 - 2.82
	Portugal (PT)	89	31.6	16.8 - 57.4	16.4	11.0 - 33.1	1.61	1.12 - 3.24
	Spain (ES)	384	26.8	14.0 - 47.9	14.6	6.00 - 29.3	1.70	0.94 - 7.07
South-East Europe	Cyprus (CY)	15	32.3	24.3 - 53.9	17.2	12.3 - 27.2	1.87	1.30 - 3.08
	Slovenia (SI)	28	24.1	17.4 - 30.6	16.3	12.1 - 22.2	1.31	1.02 - 1.81
All countries		2738	25.3	15.9 - 43.4	17.4	9.75 - 32.4	1.32	0.80 - 2.82

[2] No BioSoil soil survey carried out in Bulgaria, Malta, The Netherlands, Luxemburg, Wallonia (S. Belgium) and Romania. Data submitted by Poland was later withdrawn on request from MS.

The soil pH is an indication of the degree of acidity or alkalinity of a soil. In both surveys the 'potential' pH was measured in a $CaCl_2$ extract which is more stable than the 'actual' pH measured in water. The base saturation, calculated as the proportion of basic exchangeable cations (Ca^{2+}, Na+, Mg^{2+} and K+) to the cation exchange capacity of the soil, is considered a measure of the buffering capacity of the soil against soil acidification. The buffering capacity indicates how resistant the soil is to conditions that might change its pH. When the base saturation is depleted below levels of 10–20 percent, the remaining basic cations are more tightly held and are less available for counteracting soil acidification (Reuss and Johnson, 1986; Ulrich, 1995).

Status

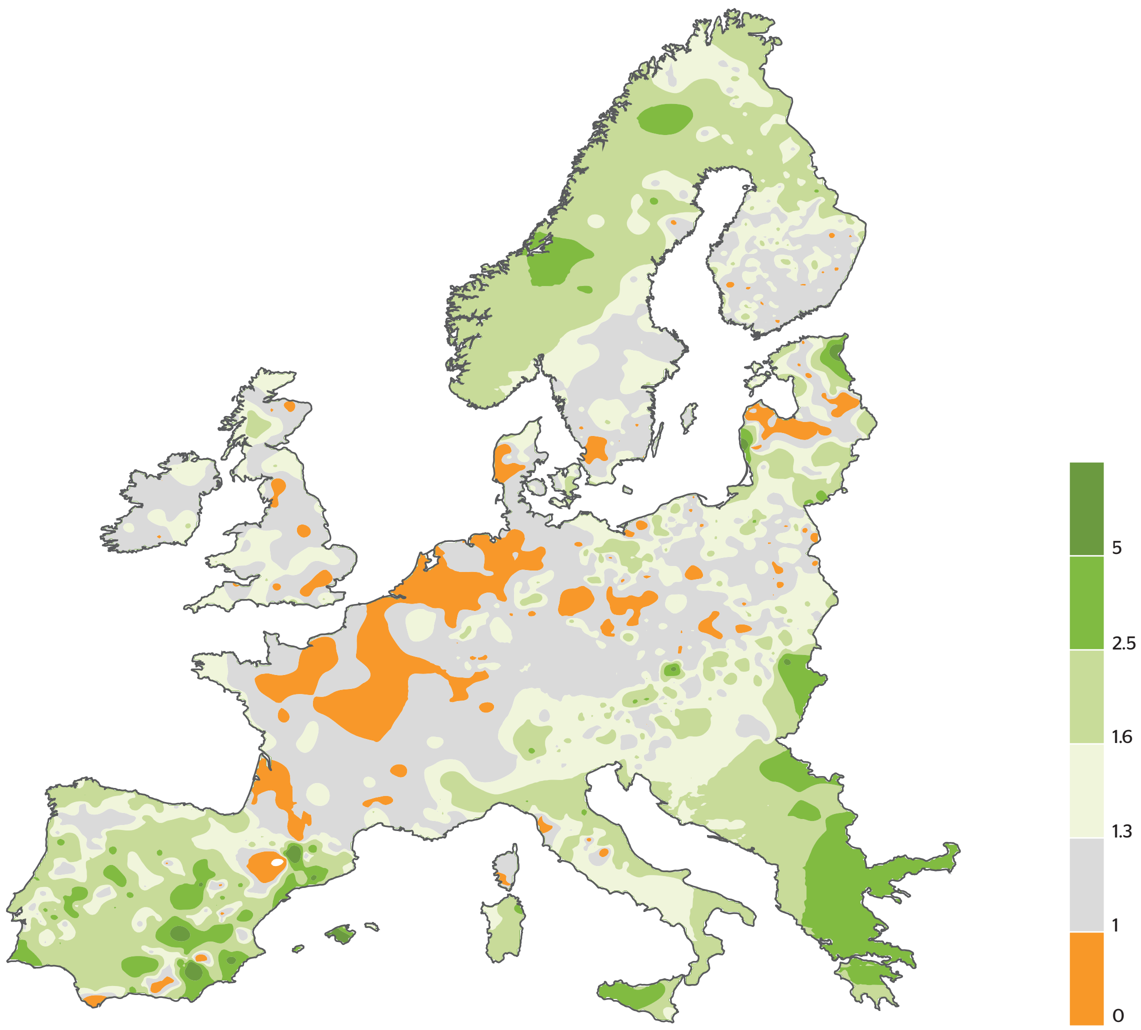
C/N ratio

Country-based values for C/N ratios and index of the forest floor and mineral topsoil are given in Table 7. The median and range values of the C/N index for the Central-Western European countries are low compared to those of the South-West. Austria, Cyprus, Hungary, Lithuania, Portugal, Slovakia and Slovenia have minimum range index values above 1 and consequently less than 5 percent of their plots are considered disturbed by N deposition during the second survey. The affected area (illustrated in red in Figure 17) is mainly situated in Central-Western Europe and parts of Central-Eastern Europe and the Baltic States.

Forest growth is strongly stimulated by N deposition and by smaller C/N ratios in the forest floor. However, if the forest soil cannot supply other nutrients (especially base cations like calcium and magnesium) in a balanced and sustainable way, impaired tree health is likely to occur.

Furthermore, when C/N ratio in the forest floor is small and N deposition is high (> 20 kg N ha-1 yr-1), nitrates leach from the soil into ground- and surface waters, leading to eutrophication.

Figure 17: Kriged map of European areas with forest soil C/N-index based on the second soil survey. Affected area, where C:N index is less than 1, is indicated in orange



Base saturation

The gradient from low base saturation in Northern and Central-Eastern Europe, over moderate base saturation in Central-Western Europe to higher values in Southern Europe, is natural in origin rather than induced by atmospheric pollution. Geology is the main driver behind the location of acidic Podzols in Northern Europe, sandy soils (Arenosols) in the Central-East of Europe (mainly Poland) and calcareous soils in Southern Europe. Figure 18 shows the status of the base saturation in the upper 10 cm of the mineral soil in the second soil survey. Figure 19 shows the trend in soil pH in the upper 10 cm of the mineral soil between the two surveys. The classes with base saturation below 10–20 percent indicate forest soils with low buffering capacity against soil acidification.

Organic carbon storage in European forest soils

Under the BioSoil project, soil samples from 4 033 sites were collected. The majority of the samples were taken in 2006 (45.4 percent) and 2007 (31.4 percent). The survey dates for the remaining samples show a steady decrease in number going back as far as 1992.

In the sampling procedure for soil properties a distinction was made between the organic layer (forest floor) and the mineral soil material. An organic layer over soil material was reported for 3 202 sites (79.4 percent). Only soil material without an organic layer was reported for 478 sites (11.9 percent). For the remainder only data on organic layers or organic soil material (e.g., peat soils) were reported. The distribution of the average OC content in the organic layer and the mineral topsoil (0 – 20 cm) by major region is presented in Figure 20.

The maps show a distinctly diverse regional distribution of OC content in the organic layer and in mineral topsoil. The highest OC contents in the organic layer were reported for sites in the West EU region (384.8 g kg-1) and lower contents in the southern regions of the Mediterranean basin (300.5 g kg-1). For the upper 20 cm mineral soil, the mean OC content for a region is highest under forests in the North EU region (77.1 g kg-1), followed by soils of the West EU region (62.1 g kg-1). The OC content is lowest in forest soils in South-East EU (18.6 g kg-1). The average OC content for the survey area is 366.5 g kg-1 for the organic layer and 61.7 g kg-1 for the upper soil substrate. For all estimates the figures for the South-East EU region are highly biased by the values reported for Cyprus, since no data were reported for sites of the large-scale monitoring survey by Bulgaria, Greece and Romania. Regional estimates of OC densities and, subsequently, stock depend on the combination of several parameters. For the organic layers, the weight and OC content directly provide the OC density in the layer. For the soil material the procedure for determining the OC density is more elaborate. The major parameter is dry bulk density, which is difficult to determine for organic substrates. The more parameters that are needed for the determination of OC density, the more important it is that the data set be complete with reliable data. Therefore, where values for parameters are not reported the effect is cumulative and results in a distinct decrease in the number of useful observations.

The density of the OC in the organic layer could be computed for 2 658 sites (83.0 percent of sites with organic layer). For the upper soil substrate the parameter could be computed for 3 204 sites (87.1 percent of sites with soil substrate). Summaries of mean regional OC densities for the organic layer, the upper soil material and the combined strata are presented in Table 8.

Table 8: Regional Mean of Organic Carbon Density (t ha-1) in Organic Layer, Upper Soil Material and Combined Strata

	Organic Layer		Soil 0 – 20 cm		Combined Strata*	
	OC Density	Confidence Limit (95%)	OC Density	Confidence Limit (95%)	OC Density	Confidence Limit (95%)
Region	t/ha					
South-West EU*	6.6	± 0.62	58.8	± 3.03	64.2	± 3.2
South-East EU**	-	-	-	-	-	-
West EU	17.3	± 1.36	70.5	± 3.03	80.3	± 3.3
East EU	18.3	± 2.59	56.2	± 2.91	67.5	± 4.0
North EU	34.3	± 2.40	35.2	± 1.88	63.6	± 2.9
All	23.2	± 1.27	54.1	± 1.51	70.1	± 1.8

* Sum may differ from individual strata due to data availability for combined strata.
** Incomplete parameters to compute OC density.

Figure 18: The base saturation measured in the top mineral soil layer (0 – 10 cm) in the second soil survey (percent)

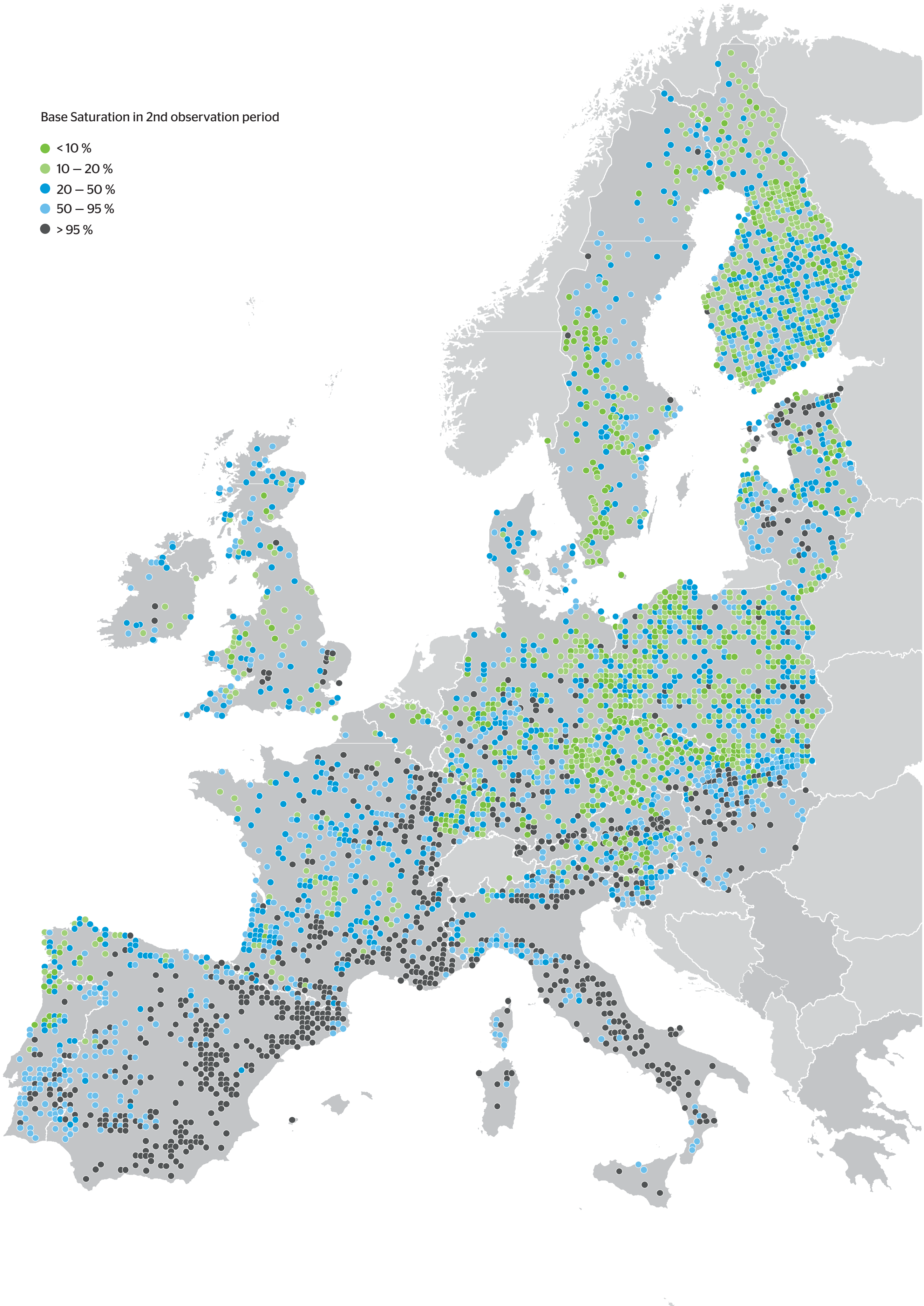


Figure 19: Trend in soil pH in the top mineral soil layer (0 – 10 cm) between the two surveys. Missing points compared to Figure 18 are mainly due to a change of observation plots

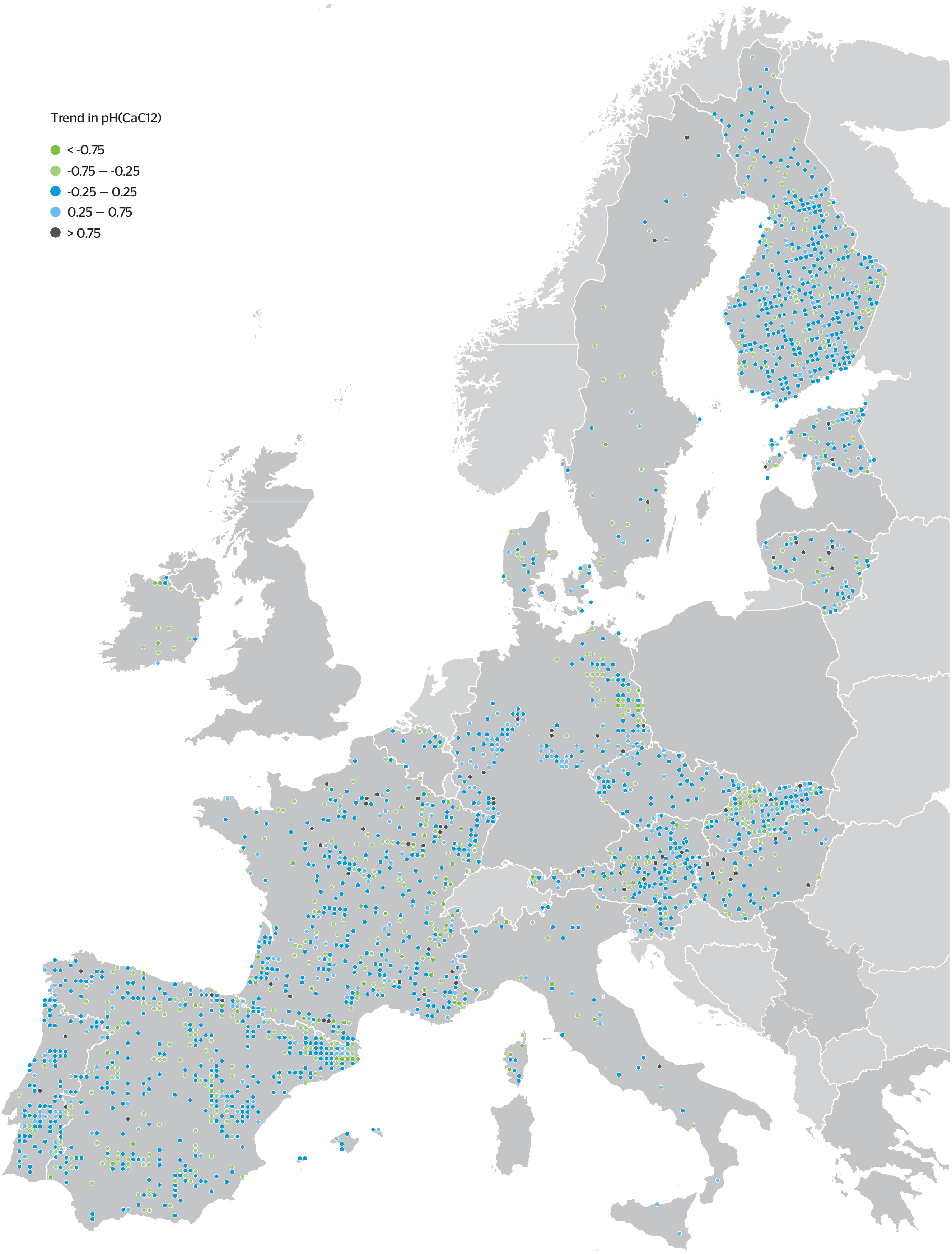


Figure 20: Mean Organic Carbon Content (g/kg) in Organic Layers and in Mineral Layers (0-20cm) of forest soils

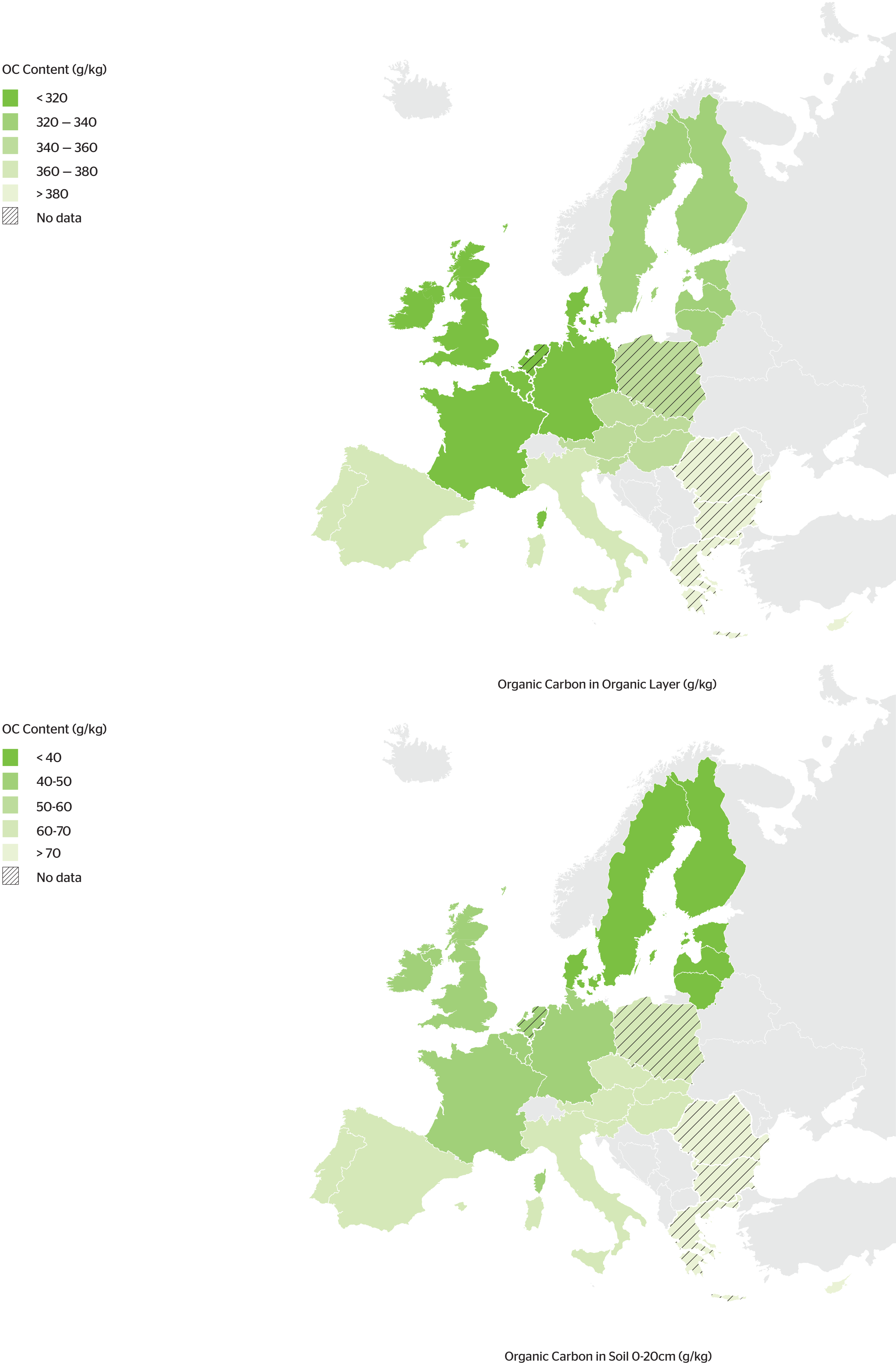
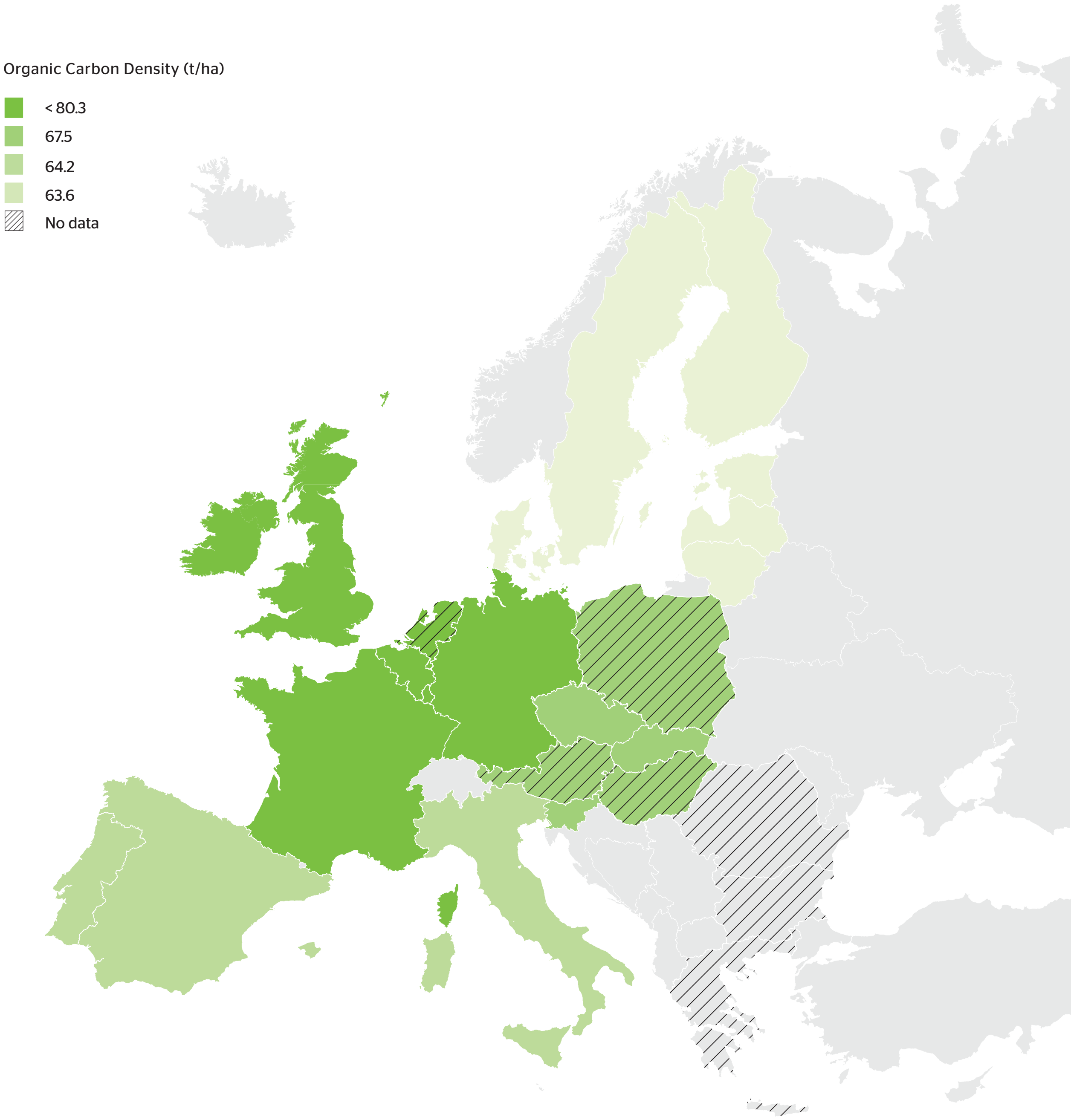


Figure 21: Mean Regional Organic Carbon Density (t/ha) in Combined Organic Layer and Soil Material 0-20cm in Soils under Forest



The summary table shows that the mean regional densities of OC only loosely follow the distribution of the OC content. The organic layers of the North EU region contain twice as much OC (34.3 t ha-1) than the layers in West EU (17.3 t ha-1). The situation is reversed when looking at the upper soil material where the highest mean regional OC density is reported for West EU (70.5 t ha-1). The OC density of forest soils in the North EU region (35.2 t ha-1) is even lower than in South-East EU (58.8 t ha-1). A further investigation into the differences of the distribution of OC between the organic layer and the soil material identified regionally specific variations when separating the material boundaries. Such differences should be largely offset in the combined strata density. From the data reported, only the forest soils in the West EU region have significantly higher OC densities (80.3 t ha-1) than in other regions covered by the survey. At a confidence level of 95 percent, there is no significant difference among the mean OC densities for the other regions.

A graphical presentation of the mean OC density by region is given in Figure 21.

The mean OC density of all sites of the BioSoil survey is 70.1 t ha-1 (1.8 t ha-1, 95 percent confidence level). Under the assumption that the mean OC density for areas without data can be estimated from the regional mean (i.e. for The Netherlands from West EU and for Poland, Austria and Hungary from East EU), the OC stock in soils to a depth of 20cm is estimated at 9.6 Gt. No suitable survey data from the demonstration project are available to estimate OC stocks for South-East EU.

Trends

C/N index

When compared with the status of the first survey, the percentage of affected plots (index < 1) increased for Belgium, Finland, France, Germany, Ireland and Italy, but this might be slightly biased by differences in the observed set of plots (see Figure 22). For instance for Belgium (Belgium), only Flanders was resampled in the second survey and these plots are more severely affected than in Wallonia. For the United Kingdom, none of the plots coincide between the surveys. The percentage of affected plots decreases in the Czech Republic, Lithuania, Portugal, Sweden and United Kingdom.

pH

Figure 19 shows the evolution of pH on revisited observation plots across Europe. From the 2 182 plots, 4 percent have become more acidic by more than 0.75 pH units, 21 percent between 0.25-0.75 units, 57 percent remained stable, 15 percent recovered between 0.25-0.75 units and 3 percent recovered by more than 0.75 pH units. Considering all observations, soils are slightly acidifying by 0.03 pH units on average. However, pH increased in the acid forest soils (with pH below 4.0), but it decreased in forest soils with pH above 4.0. Both changes were statistically significant. This finding confirms the modelled recovery of the pH in the previous report on State of Europe's Forest 2007 where the recovery was indeed more pronounced at low pH values.

Base saturation

Following the trend in pH, the base saturation increased significantly in the acidified forest soils (with a base saturation below 20 percent) and decreased in forest soils with initial (first survey) base saturation values above 20 percent. The percentage of plots with low buffering capacity decreased from 48 percent in the first observation period to 28 percent in the second observation period. This again indicates a recovery from soil acidification at the European level. Classified by the major reference soil groups according to the soil classification system of the World Reference Base for Soil Resources (IUSS Working Group on WRB, 2006), there has been a statistically significant decrease in base saturation in the topsoil of Regosols, Arenosols and Stagnosols whereas a statistically significant increase was found in Luvisols and Gleysols (see Figure 23).

Organic Carbon

Compared to the first forest soil condition survey, the BioSoil Demonstration Project found an increase in organic carbon in the organic and upper 20 cm soil layer for the majority of revisited sites. However, changes in sample analysis methods between the two surveys hinder quantifying this trend in the data unequivocally. The changes in OC quantity in the combined organic layer and soil material to a depth of 20 cm are presented in Figure 24.

The changes in OC density from the FSCC/ICP Forest survey to BioSoil are limited to plots common to both surveys and they may due to differences in the field sampling and soil analysis methods between both surveys.. A clear trend of an increase in OC is only found on plots in Portugal and on the few plots in Sweden common to both surveys. Only on plots in the Slovak Republic was there a general trend of a decrease in OC between surveys. On plots in other participating countries, both increases and decreases are reported. Methodological divergences between countries and between the surveys, such as separating the organic layer from the mineral soil material, played a significant role in producing the differences in OC quantity obtained from the two datasets.

Figure 22: Percentage of total plots per country for which the C/N ratio of the mineral topsoil (0-10 cm) exceeds that of the forest floor. The percentages of the first survey are indicted in dark green; the percentages of the second survey are indicated in light green. Plots do not necessarily coincide between surveys

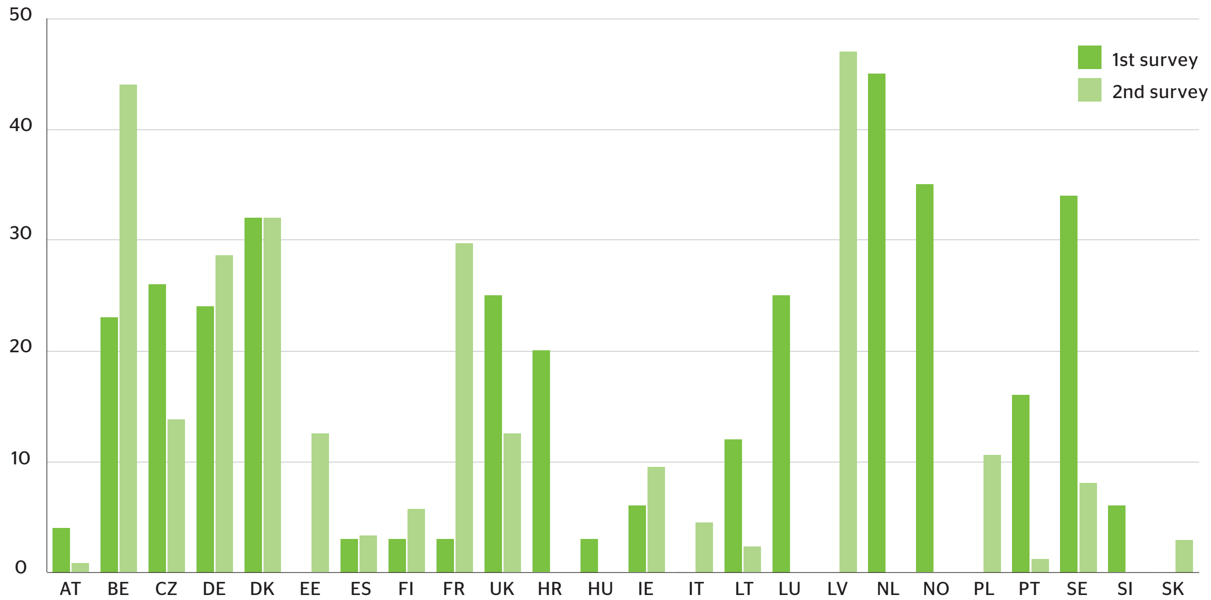


Figure 23: Mean change in percentage base saturation between the first and the second forest soil survey. When the error bars (95 percent confidence interval of the mean change) do not cross the 0 line, the change is statistically significant

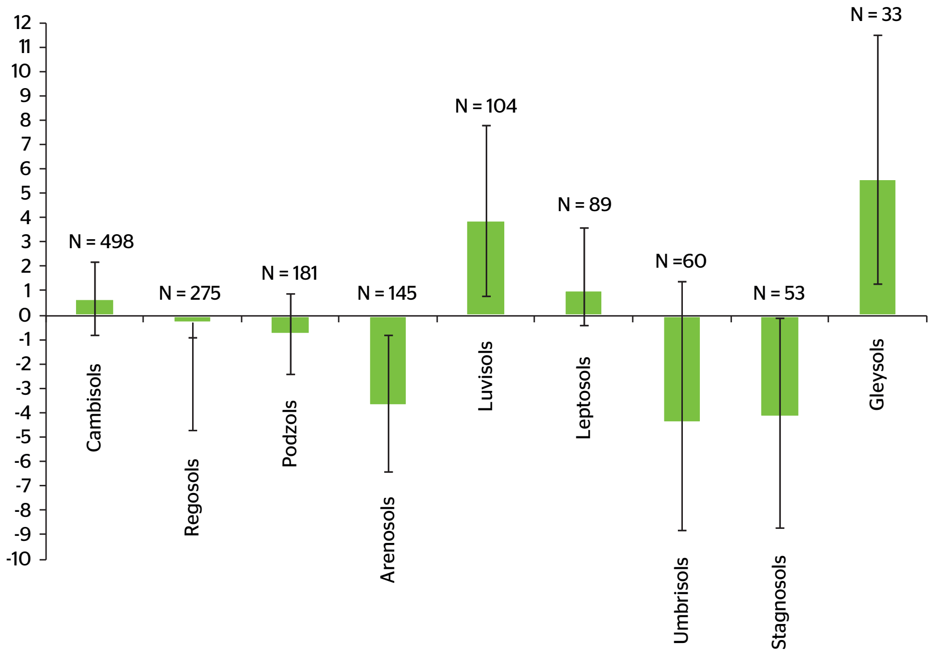
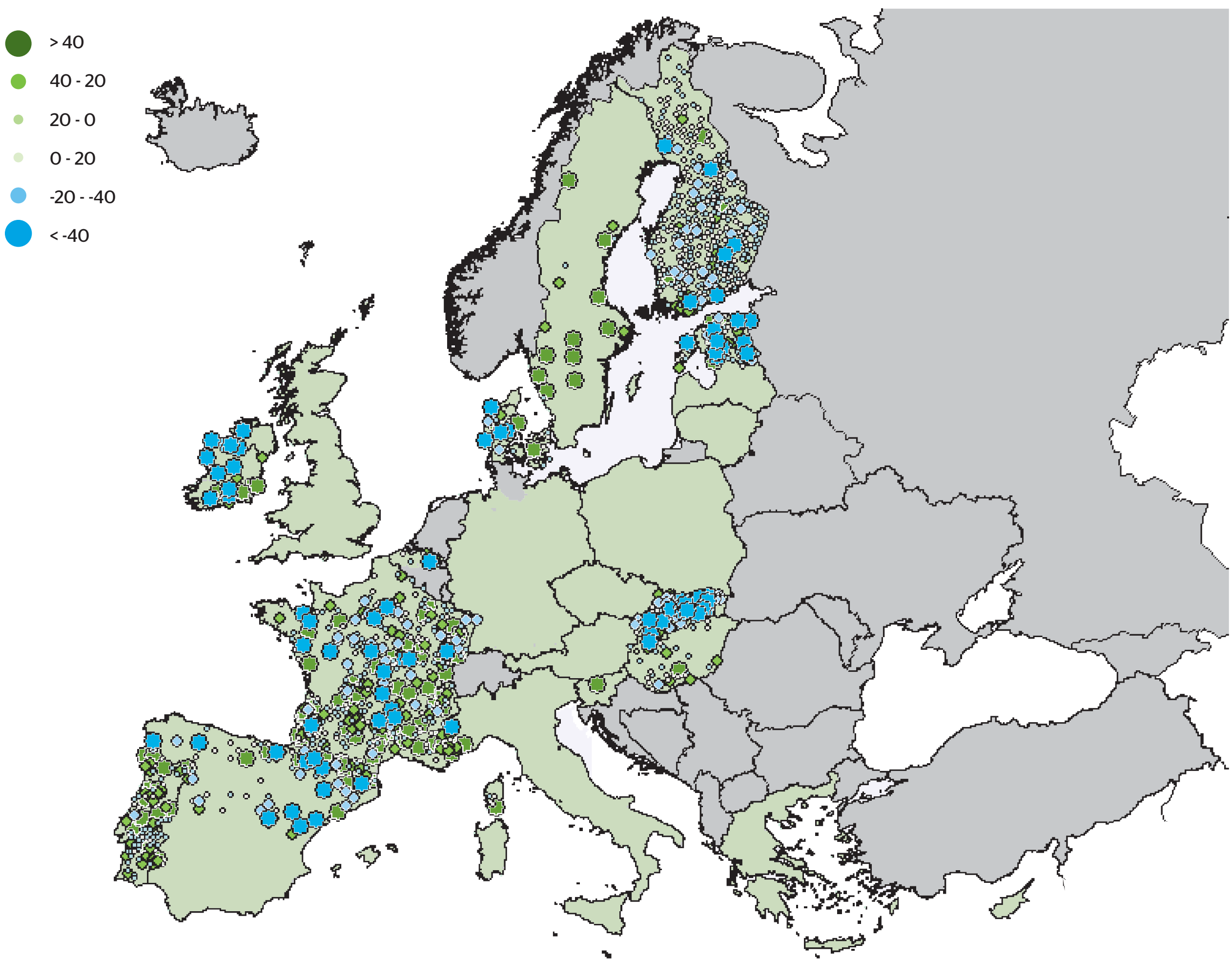


Figure 24: Change in Organic Carbon Density in Combined Organic and mineral topsoil(0-20 cm) Layer from FSCC- ICP Forests to BioSoil (t/ha)



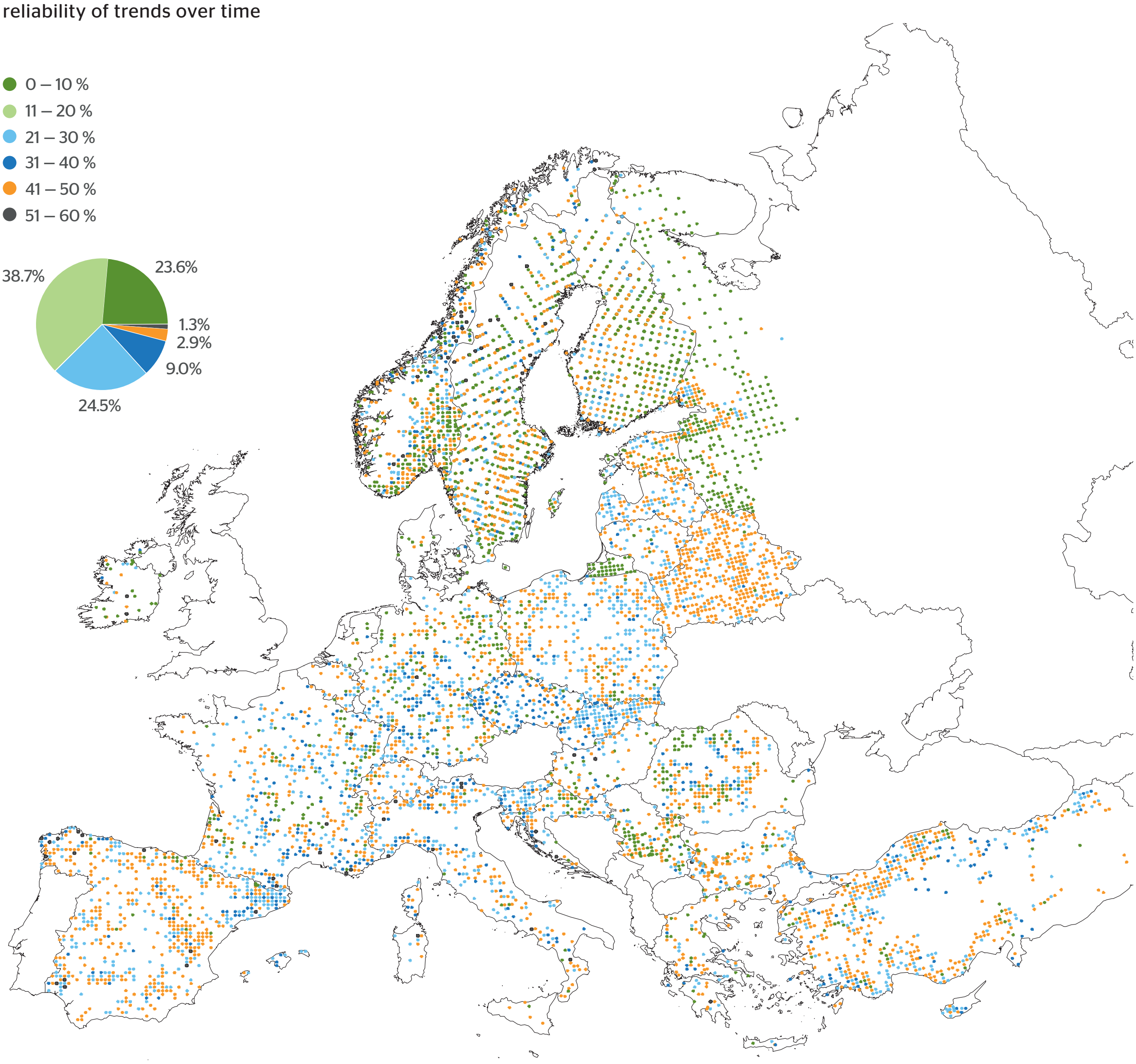
Indicator 2.3 Defoliation

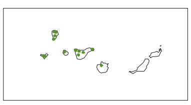
Defoliation of one or more main tree species on forest and other wooded land in each of the defoliation classes "moderate", "severe" and "dead".

Introduction

The health status of forest trees in Europe is systematically monitored by surveys of tree crown condition. Defoliation is an indicator of tree health and vitality. It reacts to many different factors, including climatic conditions and weather extremes as well as deposition and insect and fungal infestations. The assessment of defoliation represents a valuable early warning system for the response of the forest ecosystems to change. Trees that are fully foliated, i.e. that do not show any signs of leaf or needle loss, are rated with 0 percent defoliation and are regarded as healthy; those with more than 25 percent of leaf or needle loss are classified as damaged. Defoliation of 100 percent indicates dead trees. For 2009, crown condition data were submitted for 7 193 plots in 30 countries. In total, 136 778 trees were assessed including more than 100 different tree and some tall growing shrub species. The 20 most frequent tree species accounted for 85 percent of the sample. Time trends for main tree species were calculated for plots in 14 countries with 19 years of continuous data submission. Changes on a per plot basis are depicted for the larger number of 20 countries that continuously submitted data over a 12-year period. The survey is annually carried out under ICP Forests and the European Commission.

Figure 25: Mean plot defoliation of all tree species 2009 (percent). Note: some differences in the level of damage across national borders may at least be partly due to differences in standards used. This restriction, however, does not affect the reliability of trends over time





Canary Islands (Spain)

Status

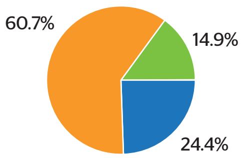
In 2009, 20.2 percent of all trees assessed had a needle or leaf loss of more than 25 percent and were thus classified as either damaged or dead. The status and trends in forest condition vary regionally and for different species. Defoliation averaged across all tree species was higher in central Europe and along the Mediterranean coast in Croatia, Italy and France. Plots with lower mean defoliation were clustered in Northern Europe (see Figure 25).

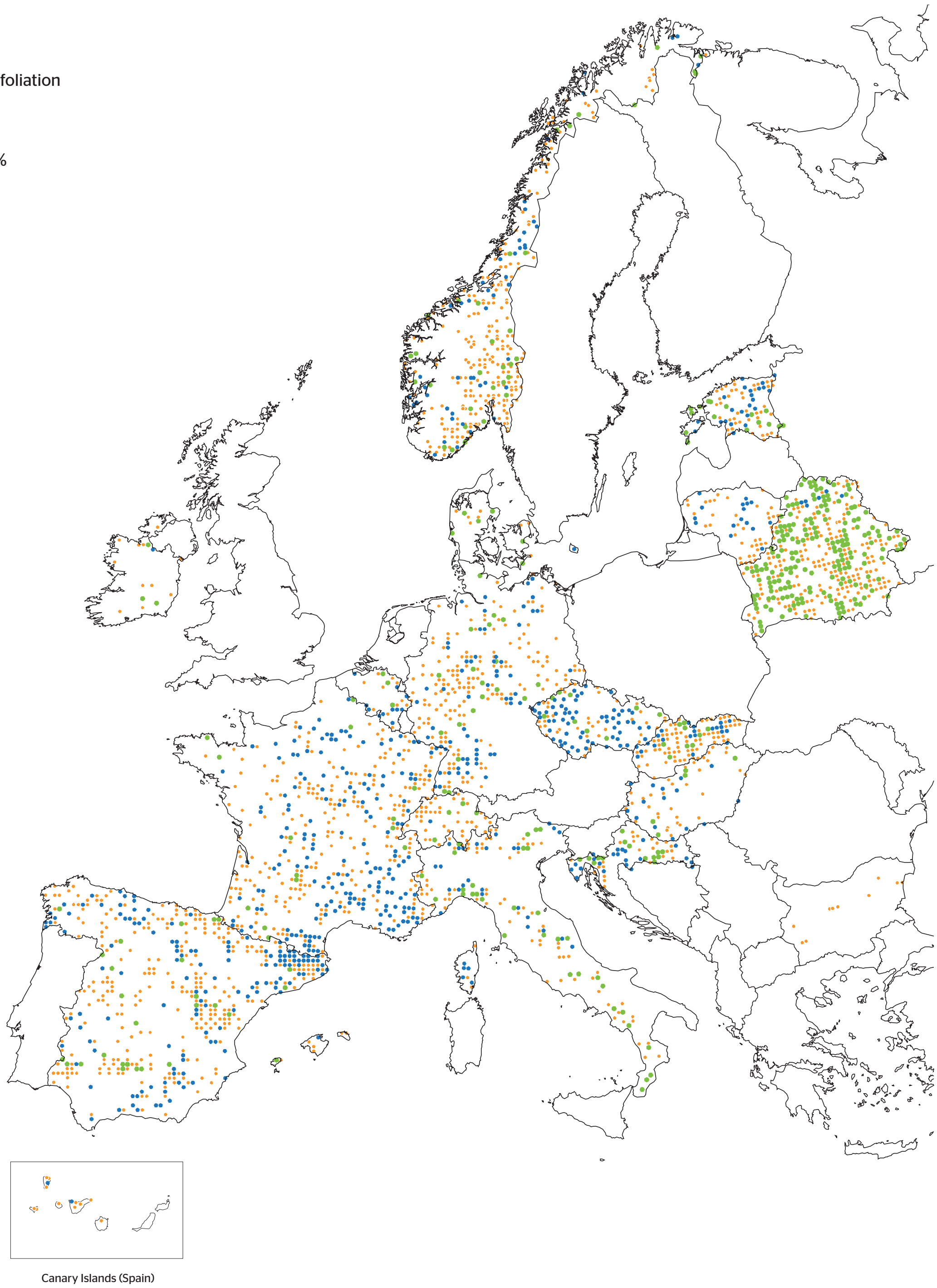
Trends and explanations

Defoliation increased on 24.4 percent of the plots continuously monitored over the last 12 years and decreased, indicating an improvement in crown condition, on only 14.9 percent. There has been no change in tree health on around two thirds of the plots monitored (see pie diagram, Figure 26).

Figure 26: Change in defoliation for all tree species over the period 1998 to 2009. Only plots with continuous 12 years assessment. For some countries and regions changes in plot location prevent this assessment

decrease
no clear trend
increase of mean plot defoliation

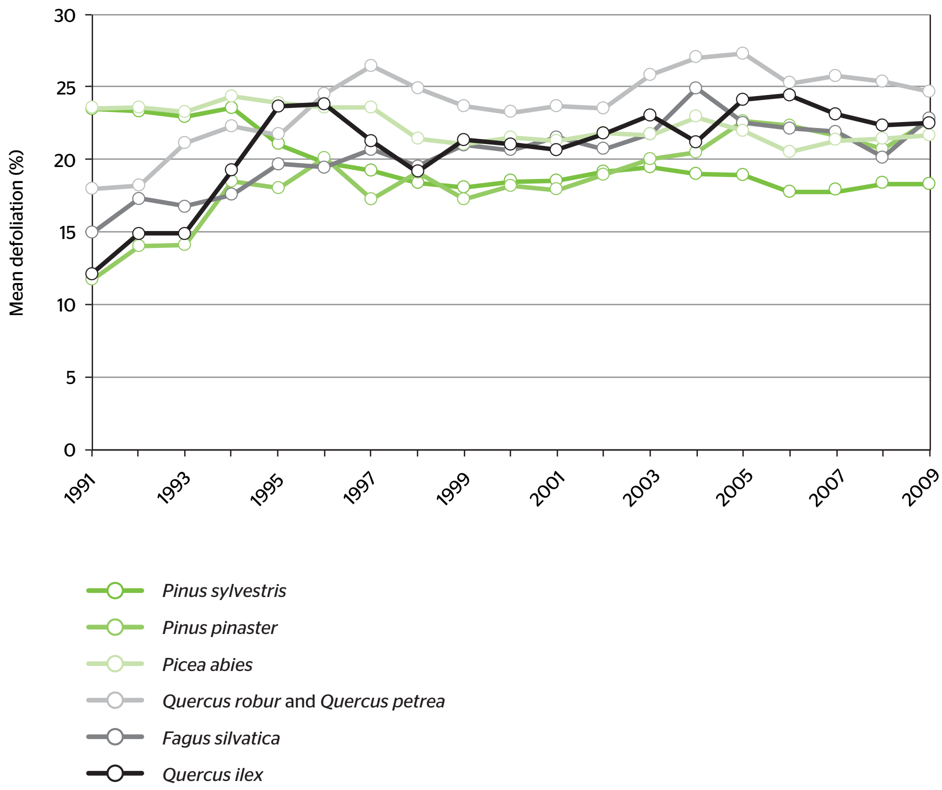




Of the main tree species, *Quercus robur* and *Quercus petraea* had the highest levels of damaged and dead trees in 2009 and have shown the highest mean defoliation over the past decade. Crown condition for *Pinus sylvestris* has shown a clear improvement over the last 18 years. *Picea abies*, *Fagus silvatica* and *Quercus ssp*. showed clear reactions to the extremely dry and warm summer in 2003. These reactions are still more pronounced in regional and national evaluations from central Europe. Drought and water shortages as well triggered an extreme increase of *Quercus ilex* defoliation in the mid 1990s. With some fluctuations, *Pinus pinaster* shows a worrying deterioration since the beginning of the evaluations (see Figure 27).

Insect attacks and fungal diseases, in combination with increased vulnerability caused by deposition loads, weather conditions, and other anthropogenic factors, are linked to these trends. The observed high levels of defoliation may therefore indicate that trees have a reduced potential to withstand adverse environmental impacts. This is particularly relevant as climatic extremes are predicted to occur more frequently in the relatively near future and as nitrogen deposition has hardly been reduced in recent years.

Figure 27: Mean percentage defoliation for the most frequent tree species in European forests. Note: samples are based on data from countries with continuous data submission



Indicator 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.

Status

Several damaging agents affect forests in Europe. The agents can be biotic or abiotic, of natural origin or human-induced. Biotic agents include insects and diseases, wildlife and cattle grazing in woodland. Abiotic agents include fire, storm, wind, snow, drought, mudflow and avalanche. Damage by biotic and abiotic sources is an essential component of natural ecosystems, since it fosters processes such as regeneration, selection, adaptation and evolution. In managed forest ecosystems, however, damage often results in economic losses. Human-induced, long-range impacts on the environment, such as air pollution or climate change, expose forests to aggravated risks; reduced health and vitality of forests may promote a cascade of damaging effects and hinder the sustainable management of forests. Future climate change could reinforce damage by drought, fire, storm, and insect calamities.

Damaged forest area

A forest can be affected by more than one damaging agent, for example by insects following storm damage or drought. Therefore the total area of damaged forests, regardless of the damaging agents, was requested by the questionnaire in addition to areas subject to individual damaging agents, in order to avoid double counting.

Information on total area of forests with damage (see Table 9) was provided by 20 countries representing 943 million ha or 92 percent of the total forest area in the European region (excluding the Russian Federation, 124 million ha or 59 percent). Most data, except for forest fires, refer to the period up to 2005. Data provision was highest for the Russian Federation (100 percent) and Northern Europe (85 percent) and lowest for Central-West Europe (8 percent), where only United Kingdom provided data on total forest area with damage. 1.2 percent of the forest area in the European region is affected by damage, while in Europe, without the Russian Federation, damage was reported for 5.8 percent of the total forest area. The largest proportions of area of forests with damage were reported for Portugal (24.5 percent) and Italy (22.5 percent), followed by Sweden (12.2 percent), Hungary (12.1 percent), Cyprus (5.8 percent) and Lithuania (4.7 percent). In the remaining 14 countries the proportion of forests with damage ranged from 3.4 percent (Croatia, Bulgaria) to less than 0.1 percent (Finland, Iceland, Ukraine).

Insects and diseases

Heavy attacks of insects and phytopathogens (bacteria, viruses, fungi) may cause major impacts on forests, resulting in a weakening of forest ecosystem health and vitality, and economic losses. Insect populations are also likely to react to long-term change processes such as climate change. Furthermore, biotic damage may result in deterioration of tree condition, not only in the year of occurrence, but also in later years. In particular, heavy storm damage and drought increase the risk of a mass propagation of bark beetles.

Table 9: Reported forest area and forest area with damage

Region	Reported forest area (1 000 ha)	Reported forest area (in % of total forest area)	Total forest area with damage (1 000 ha)	Percent of forest area damaged (%)
Russian Federation	809 090	100	4 152	0.51
North Europe	59 028	85	3 663	6.20
Central-West Europe	2 881	8	11	0.38
Central-East Europe	24 939	57	592	2.37
South-West Europe	30 794	41	2 808	9.12
South-East Europe	7 273	24	210	2.89
Europe	943 005	92	11 436	1.21
Europe without the Russian Federation	124 915	59	7 284	5.83
EU-27	108 547	69	6 990	6.44

Information on the area of forest damaged by insects and diseases (see Table 10) was provided by 29 countries (95 percent of the forested area of the European region). Due to the low percentage of forest area damaged by insects and diseases in the Russian Federation (0.04 percent) and the large weight of this region in the European forest area, less than 1 percent of the forest area in the European region was affected by damage caused by insects and diseases. In Europe, without the Russian Federation, 3.2 percent of the forest area was adversely affected by insects and diseases and 2.8 percent in the EU-27 region. Except for southwest Europe, where 13.4 percent of the area was subject to damage by insects and diseases, less than 5 percent of the respective forest area was affected in the other European regions, ranging from 4.8 percent in the Central-Eastern region to 0.7 percent in the Northern region. The highest proportions of forest area damaged by insects and diseases were reported by Portugal (20 percent), Romania (20 percent) and Italy (10 percent).

Wildlife and grazing

Forests are the habitat for different forms of wildlife. Large abundance of herbivore populations can become a major threat to the regeneration of forests. With the exception of local incidences, grazing is generally not a problem in European forests.

For the Central, North, South-West and South-East European regions, as well as for the Russian Federation, sufficient information on forest damage caused by wildlife was provided (see Table 11). The forest area affected by damage from wildlife was highest in the Nordic region (2.7 percent) and the South-Western region (2.9 percent). Data provided for the European region, without the Russian Federation, indicated that approximately 2 percent of the forests are facing damage by wildlife. In the EU-27 countries the corresponding proportion was slightly higher (2.2 percent). Albania (13 percent), Sweden (6.2 percent), and Italy (3.5 percent) faced the largest areal proportions affected by wildlife; in all other countries that provided data, the corresponding proportion was well below 2 percent.

Table 10: Damage by insects and diseases

Region	Reported forest area (1 000 ha)	Reported forest area (in % of total forest area)	Total forest area with damage (1 000 ha)	Percent of forest area damaged (%)
Russian Federation	809 090	100.0	288.7	0.04
North Europe	69 278	100.0	476.2	0.7
Central-West Europe	14 051	38.1	447.9	3.2
Central-East Europe	40 831	92.9	1 951.4	4.8
South-West Europe	12 605	40.9	1 685.1	13.4
South-East Europe	23 094	77.1	509.9	2.2
Europe	968 949	95.0	5 359.2	0.6
Europe without the Russian Federation	159 859	75.8	5 070.5	3.2
EU-27	157 193	100.0	4 429.8	2.8

Table 11: Damage by wildlife

Region	Reported forest area (1 000 ha)	Reported forest area (in % of total forest area)	Total forest area with damage (1 000 ha)	Percent of forest area damaged (%)
Russian Federation	809 090	100.0	n.s.	n.s.
North Europe	69 278	100.0	1 854.0	2.7
Central-West Europe	3 246	8.8	3.0	0.1
Central-East Europe	31 126	70.8	108.2	0.3
South-West Europe	12 605	40.9	367.1	2.9
South-East Europe	10 762	36.0	114.2	1.1
Europe	936 107	12.5	2 446.5	0.3
Europe without the Russian Federation	127 017	60.2	2 446.5	1.9
EU-27	102 728	65.4	2 288.1	2.2

Forest fires

Fires are affecting forests particularly in the Mediterranean area. While controlled burning increases ecosystem biodiversity, uncontrolled forest fires might have major negative consequences for the ecosystem, such as desertification, soil erosion, loss of water supply or economic loss.

The largest areas damaged by forest fires (see Table 12) are found in the Russian Federation, where 1.1 million ha were burned. However, the proportion of forest area burned is slightly above 0.1 percent and thus within the range of all other European regions, except South-West Europe, where countries reported that 0.6 percent of the forest area was damaged by fire. The largest area damaged by fire was found in Portugal (104 000 ha or 3 percent of the total forest area), while in Italy, Spain and France less than 1 percent of the forest area was burned.

The data on burned areas for the EU-27 countries (see Figure 28) has been elaborated from the European Forest Fire Information System (EFFIS) developed jointly by the European Commission and European countries and hosted by the Joint Research Centre. This resulted in additional information and changes to the data provided through FOREST EUROPE.

Storm, wind and snow

Storm damage is also a serious threat to forest and other wooded land, causing a possible loss of timber yield, landscape quality and wildlife habitat. According to a recent study on the impact of storms (Gardiner et al. 2010), since 1950 more than 130 storms have caused notable damage to forests in the current European Union and, on average, there are two destructive storms in Europe each year (see Table 13). In December 1999, catastrophic storm Lothar felled 165 million m3 of timber, mainly in France, Germany, Switzerland and Scandinavia, equivalent to 43 percent of the normal harvest. In 2005, 75 million m^3, equivalent to one year's cutting, were damaged by storm Gudrun in Sweden. The economic consequences of storm damage can be severe. After the storm damage in 2007

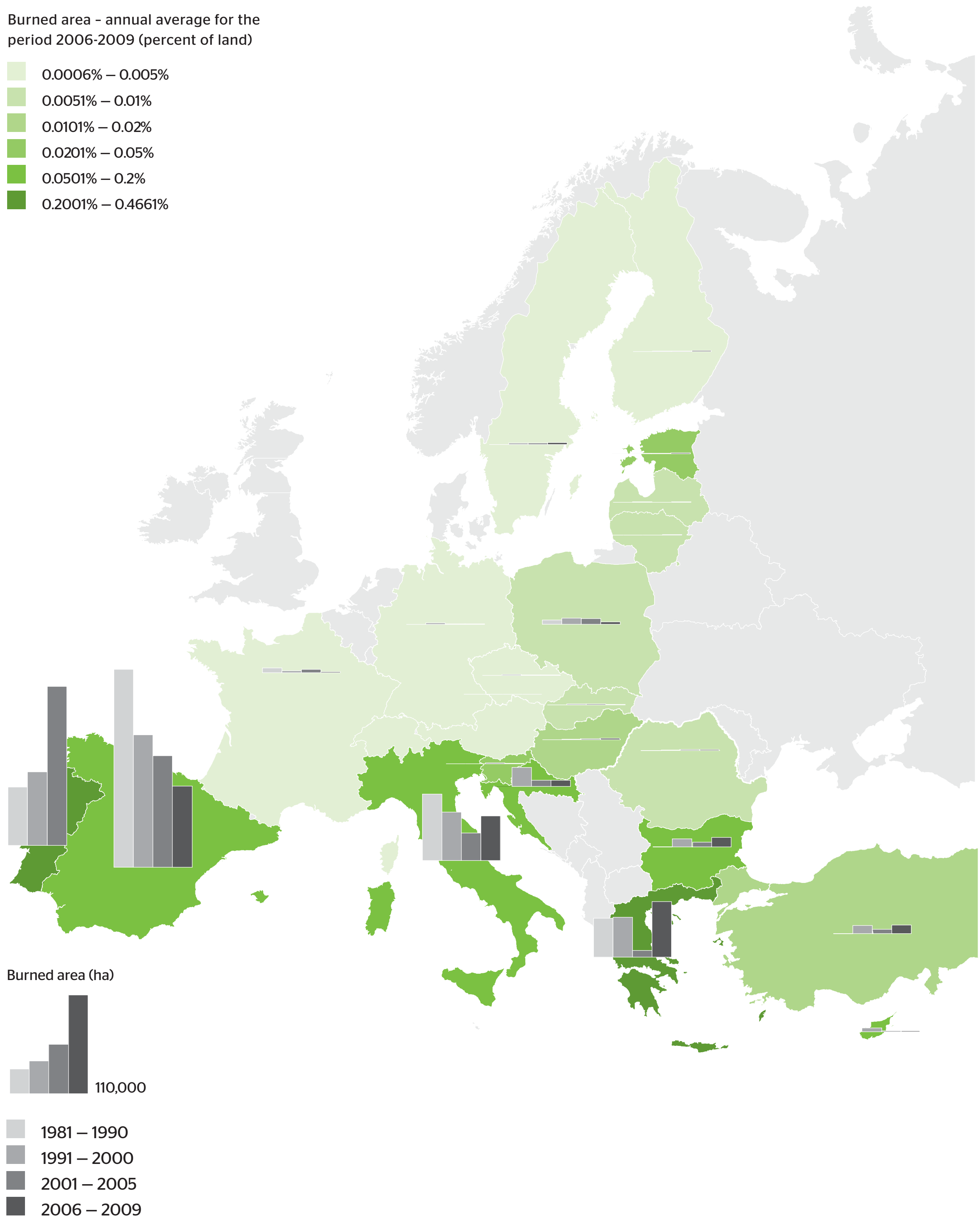
Table 12: Damage by forest fires

Region	Reported forest area (1 000 ha)	Reported forest area (in % of total forest area)	Total forest area with damage (1 000 ha)	Percent of forest area damaged (%)
Russian Federation	809 090	100.0	1 081.3	0.1
North Europe	69 278	100.0	5.3	0.0
Central-West Europe	36 882	100.0	27.3	0.1
Central-East Europe	43 959	100.0	18.7	0.0
South-West Europe	30 778	99.9	196.1	0.6
South-East Europe	23 094	77.1	37.3	0.2
Europe	1 013 082	99.3	1 366.0	0.1
Europe without the Russian Federation	203 992	96.7	284.7	0.1
EU-27	153 290	97.5	251.2	0.2

Table 13: Storm, wind and snow damage

Region	Reported forest area (1 000 ha)	Reported forest area (in % of total forest area)	Total forest area with damage (1 000 ha)	Percent of forest area damaged (%)
Russian Federation	809 090	100.0	1 351.0	0.2
North Europe	69 278	100.0	1 333.8	1.9
Central-West Europe	31 888	86.5	70.5	0.1
Central-East Europe	40 831	92.9	563.1	1.4
South-West Europe	30 778	99.9	635.5	2.1
South-East Europe	25 999	86.8	37.4	0.1
Europe	1 007 865	98.8	3 991.3	0.4
Europe without the Russian Federation	198 775	94.3	2 640.3	1.3
EU-27	152 207	96.8	2 517.9	1.7

Figure 28: Forest area affected by fire



(storm Kyrill), the German Forestry Council estimated that the storm toppled some 20 million m^3, which would cost the country's forestry industry about EUR 1 billion in lost revenue. In 2009 and 2010, the storms Klaus and Xynthia hit forests in France and Germany and caused timber losses of approximately 50 million m^3. In the case of badly adapted forest stands, however, the impacts may be considered as less serious than in the case of natural, semi-natural or site-adapted forest stands, since necessary reforestations may lead to site-adapted forests in the future.

For Europe without the Russian Federation, 2.6 million ha (1.3 percent) of forests were damaged by storm, wind and snow. The largest proportion damaged by storm is found in southwest Europe (2.1 percent) and north Europe (1.9 percent). In the majority of countries, the area affected by storms was below 2 percent of the total forest area, while higher proportions were reported for Italy (6.4 percent), Sweden (4.3 percent), Romania (3.5 percent, and Poland (2.7 percent).

Human-induced damage

Direct human-induced damage factors include harvesting and forest operations damage, which can cause economic losses and decrease of the ecosystems' health and vitality (for example decrease in timber quality, rot, decay, destruction of natural regeneration, soil degradation).

Intensive tourism and recreational activities can also have an impact on forests and other wooded land, causing negative side effects such as contamination and vandalism. Human-induced damage by unidentifiable causes includes damage from air pollution (see indicator 2.1), traffic and cattle breeding.

Damage by forest operations and other human-induced sources was reported by only a few countries and affected less than 0.5 percent of the forest areas. Given the low response rates, no differences between regions could be found.

Overall forest damage trends, 1990–2005

No consistent trends could be identified in the size of forest areas affected by the different damaging agents between 1990 and 2005 (see Table 14). In the European region the forest area with damage by insects and diseases doubled between 1990 and 2000 and decreased again between 2000 and 2005; it showed a constantly increasing trend in Europe, without the Russian Federation. Information on forest area damaged by wildlife and grazing in Europe, without the Russian Federation, indicates that between 1990 and 2005 the forest area subject to damage by wildlife and grazing doubled but did not exceed 2 percent of the total reported area. The area damaged by snow, wind and storms increased moderately. In 2005 forest fires affected a larger area in theEuropean region than in 1990, whilst in Europe without the Russian Federation the trend was reversed. Regional trends could not be observed for any of the damaging agents.

The forest area with damage caused by the different agents is comparatively small. The largest proportion was 3.2 percent, observed for insects and diseases in 2005. Changes in the proportions of areas affected only partially reflect trends. As the number of countries reporting observations varies between the points in time, changes might be an artefact due to differences in the national forest areas represented in the tables.

Table 14: Overall forest damage trends 1990-2005 (1000 ha)

		Insects & disease			Wildlife & grazing			Storm, wind & snow			Fires		
	Country	1990	2000	2005	1990	2000	2005	1990	2000	2005	1990	2000	2005
Europe	Forest area with damage (million ha)	5.2	10.3	7.9	1.0	1.0	2.4	1.2	2.4	4.0	1.0	1.5	1.4
	Represented forest area (million ha)	928.1	968.4	968.9	93.7	107.8	127.0	944.8	978.9	985.8	987.4	1 019.4	979.1
	Represented forest area (%)	91.0	94.9	95.0	9.2	10.6	12.5	92.6	96.0	96.7	96.8	99.9	96.0
	Forest area with damage (%)	0.6	1.1	0.8	1.1	0.9	1.9	0.1	0.2	0.4	0.1	0.2	0.1
Europe without the Russian Federation	Forest area with damage (million ha)	3.4	4.4	5.1	1.0	1.0	2.4	1.0	1.9	2.6	0.3	0.3	0.3
	Represented forest area (million ha)	119.0	159.3	159.9	93.7	107.8	127.0	135.7	169.9	176.7	178.3	210.3	170.0
	Represented forest area (%)	56.4	75.6	75.8	44.5	51.1	60.2	64.3	80.6	83.8	84.6	99.8	80.6
	Forest area with damage (%)	2.8	2.8	3.2	1.1	0.9	1.9	0.8	1.1	1.5	0.2	0.1	0.2

Criterion 3: Maintenance and Encouragement of Productive Functions of Forests (Wood and Non-Wood)

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Chapter reviewer **Andreas Zingg**

Data sources **Indicators 3.1, 3.2, 3.3, 3.4, 3.5 – national reporting on quantitative indicators**

Key findings by indicator

3.1 Increment and fellings

Forests in Europe are growing at a high rate, the only exception being Central-West Europe where catastrophic events, mainly storms, have significantly influenced the negative trend between 2005 and 2010. Harvesting of wood has decreased in all of Europe. Less than 2/3 of the increment is removed from the growing stock by fellings.

3.2 Roundwood

In 2010 more than 578 million m³ of roundwood have been produced. The overall value of marketed roundwood is still increasing and reached EUR 21 152 million[3] in 2010. Europe remains one of the main roundwood producers in the world. The demand for wood fuel is increasing at a high rate in some Western European countries.

3.3 Non-wood goods

The total value of non-wood goods (NWGs) reported has almost tripled since the 2007 assessment. This is partly due to the improved reporting. However, NWGs are an important source of income and their share of the total economic value generated by forests is increasing. In 2010, Christmas trees, fruits and berries, and cork were the most important NWGs. The total value of marketed NWGs represented 15 percent of the roundwood value when comparing countries reporting both values.

3.4 Services

The total amount of value for marketed services is more or less stable in comparison with 2007, and amounts to at EUR 818 million. The value of total marketed services represents 7 percent of the roundwood value when comparing countries that reported both values. There is evidence for a positive trend.

3.5 Forest under management plans

Most forest area in the reporting countries is covered by a forest management plan or an equivalent. There are substantial differences in forma and content of management plans in European countries.

[3] Based on data from 33 countries representing more than 90 percent of the Forest Europe area.

Indicator 3.1 Increment and fellings

Introduction

The balance between net annual increment (NAI) and annual fellings has been the first criterion for assessing the sustainability of forests. The relation between increment and fellings is decisive for the current and future availability of wood and for shaping a stable growing stock. Fellings should not exceed increment in the long run. From a mid-term perspective, forest management may still be sustainable even if fellings exceed increment. As timber markets are volatile, growing stock surplus, which was aggregated in periods of weak markets, can be utilized under prospering market conditions without harming the principle of sustainability.

Concerns about the emission of greenhouse gases and shortage of natural resources have led to increasing demand for woody biomass as a renewable material and energy source. The transition to a market economy in Eastern Europe fostered wood utilization and timber processing. These developments have had an impact on the amount of fellings. Fellings were and still are smaller than increment, but the proportion of increment that is utilized is likely to increase in the future.

Status

In order not to debase the proportion of increment extracted through fellings with forests that are not utilized for timber production, the following information refers to Forest Available for Wood Supply (FAWS) only. Increment is given as NAI, which is defined as the average annual volume over the given reference period of gross increment (i.e. the total increase of growing stock during a given time period) less that of natural losses on all trees to a minimum diameter at breast height (d.b.h.) of 0 cm. If fellings are lower than the net increment, the growing stock is increasing (see Figure 29 and Table 15). A part of the fellings remains in the forest as logging losses (e.g. stem sections with defects) and is not utilized for energy or wood products. The discrepancy between fellings and removals is reflected under Indicator 3.2 "marketed roundwood."

Information on NAI in the year 2010 was provided by 24 countries, representing 96 percent of the forests in Europe (77 percent of Europe without the Russian Federation), NAI reported for 2010 was slightly higher than 1 500 million m³. Expanding this figure to the entire FOREST EUROPE area would yield an annual increment of approximately 2 100 million m³ for the European forest area available for wood supply. Among the reporting countries, the Russian Federation has the highest share (about 56 percent of the total), while Central-West Europe and North Europe together account for about 33 percent of the total NAI. At the country level the Russian Federation reported the highest total NAI, followed by Germany, Sweden, France and Finland (see Figure 30). NAI per ha was highest in Central-West Europe (7.8 m³/ha) and lowest in the Russian Federation (1.3 m³/ha). In Germany and Denmark the NAI per ha exceeded 10 m³/ha.

In 2010, 680 million m3 of fellings were reported by 31 countries, representing 98 percent of the European forests (90 percent for Europe without the Russian Federation). The largest total volumes of fellings were reported for North Europe (181 million. m³), Central-West Europe (172 million m³) and the Russian Federation (170 million. m³); those three regions share about 76 percent of the total fellings reported for Europe.

For a consistent comparison of increments and fellings and the calculation of felling rates, information on both increments and fellings is required at the country level. 24 countries representing 95 percent of Europe's FAWS, or 77 percent of Europe's FAWS without the Russian Federation, provided this information (see Figure 30). Table 16 combines the NAI and fellings shown in Figure 30 and provides the felling rates in terms of fellings as percent of NAI.

In none of the 24 reporting countries did fellings exceed NAI. Based on the countries reporting in the FOREST EUROPE region, approximately 40 percent of the NAI is utilized by fellings (62 percent in Europe without the Russian Federation). The highest felling rates are reported for Switzerland (99 percent), Austria (99 percent), Lithuania (86 percent), Sweden (83 percent) (see Figure 31). Lowest felling rates were reported for the Russian Federation (20 percent), Cyprus (25 percent), Ukraine (33 percent), Spain (36 percent), Slovenia (37 percent) and Italy (39 percent).

Table 15: Net annual increment and fellings by region, 2010

Region	Net Annual Increment		Fellings	
	Million m³	m³/ha	Million m³	m³/ha
Russian Federation	852.9	1.3	170.0	0.3
North Europe	237.2	4.6	181.1	3.3
Central-West Europe	261.0	7.8	172.4	5.0
Central-East Europe	98.3	5.6	114.2	3.6
South-West Europe	78.4	3.3	29.3	1.4
South-East Europe	23.9	5.9	16.9	2.7
Europe	1 551.6	1.8	683.2	0.8
Europe without the Russian Federation	698. 7	4.2	513.2	3.5
EU-27	619.7	4.7	469.3	3.7

Table 16: Felling rates (fellings as percent of net annual increment), 2010, based on data from 24 countries

Region	Felling rate (%)
Russian Federation	19.9
North Europe	70.9
Central-West Europe	65.0
Central-East Europe	57.2
South-West Europe	42.1
South-East Europe	46.9
Europe	38.9
Europe without the Russian Federation	62.4
EU-27	64.2

Figure 29: Components of gross increment and drain

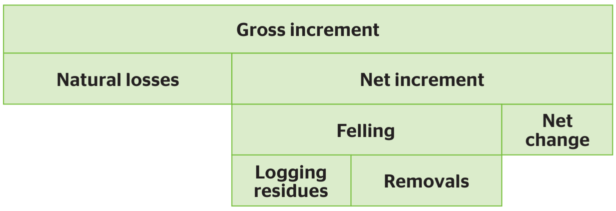


Figure 30: Annual fellings and annual increment for European reporting countries (million m³), 2010

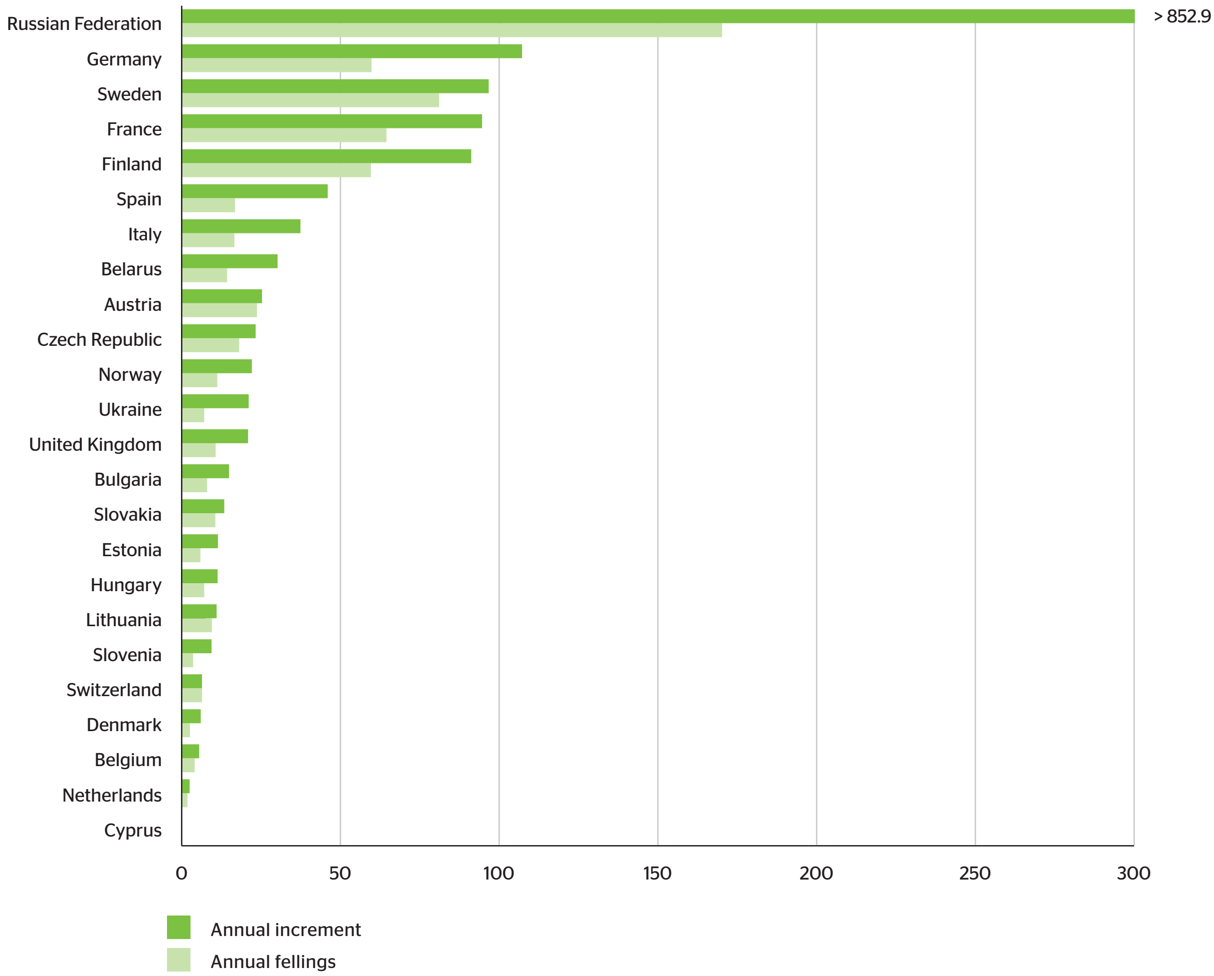


Figure 31: Geographical distribution of felling rates, 2010 (percent)

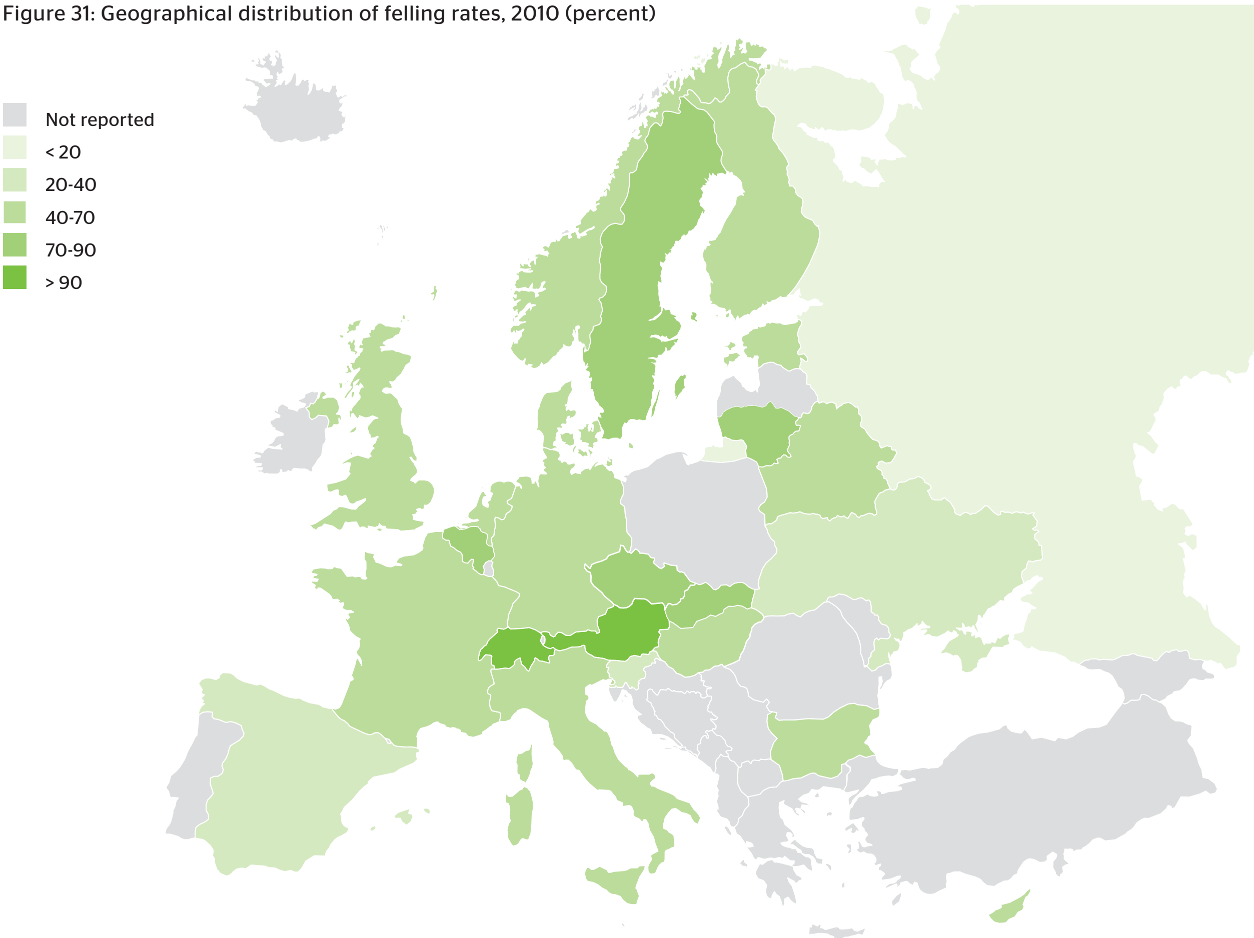


Figure 31 shows that utilization rates in the reporting countries do not exceed increment and thus comply with sustainable forest management. Sweden, Austria and Switzerland have faced catastrophic storms in the past decade, which resulted in high natural losses and consequent removal of downed timber as well as reductions in NAI. Growing stock in Switzerland (over 350 m³/ha) has increased due to cautious cutting regimes over the last decades, making that country the front-runner in Europe. Under these conditions utilization rates greater than 100 percent could still be sustainable. However, the current Swiss utilization rate of 99 percent does not reduce the country's outstanding high growing stocks.

At least for the 24 countries reporting, the mobilization of a substantial amount of timber by increasing fellings would be possible without any threat for the sustainability of growing stock.

Trends

Twenty-three countries provided a complete series for NAI and fellings for all four reporting years (1990, 2000, 2005 and 2010). Those countries represent approximately 95 percent of the European forest area (77 percent for Europe without the Russian Federation).

In the reporting countries NAI has been increasing by approximately 4.2 million m³ per year since 1990 (see Table 17). Between 2005 and 2010 NAI decreased by 0.4 million m³ or 1.2 million m³ per year for Europe without the Russian Federation. This decrease is a result of the annual decrease of NAI by approximately 4.8 million m³ in the Central-West Europe region. Among the reporting countries this trend is mainly influenced by the changes of NAI in Germany and France.

Fellings in the reporting countries (see Table 18) decreased in the course of the 1990s (about 12.3 million m³ per year), followed by an increase of 10.9 million m³ per year between 2000 and 2005, and decreasing again in the last five years (about 7.5 million m³ per year). These trends are strongly influenced by the changing felling patterns in the Russian Federation. In Europe without the Russian Federation, fellings were reduced only in Central-West Europe and North Europe between 2005 and 2010. In all other regions and periods fellings increased consistently.

The felling rates between 1990 and 2010 remained considerably below 100 percent (see Table 19). In the Russian Federation the felling rate decreased from 41 percent in 1990 and reached a steady state of approximately 20 percent since 2000. In Europe without the Russian Federation the felling rates increased from 58 percent in 1990 to 62.4 percent in 2010. The largest variability in felling rates over time can be found in the North Europe region.

Table 17: 1990-2010 trends of net annual increment at regional level for the FOREST EUROPE countries with data available for each reporting year (23 countries reporting on NAI)

	Net Annual Increment						
	Subtotals (million m³)				Annual change (million m³/yr)		
Region	1990	2000	2005	2010	1990-2000	2000-2005	2005-2010
Russian Federation	832.7	841.1	848.8	852.9	0.8	1.6	0.8
North Europe	200.8	206.3	221.9	226.4	0.6	3.1	0.9
Central-West Europe	264.3	284.4	284.8	261.0	2.0	0.1	-4.8
Central-East Europe	84.0	87.9	89.5	98.3	0.4	0.3	1.7
South-West Europe	57.8	73.9	75.2	78.4	1.6	0.3	0.6
South-East Europe	17.3	20.9	22.4	23.9	0.4	0.3	0.3
Europe	1 456.9	1 514.5	1 542.7	1 540.8	5.8	5.6	-0.4
Europe without the Russian Federation	624.2	673.4	693.9	687.9	4.9	4.1	-1.2
EU-27	550.6	597.8	619.5	608.9	4.7	4.3	-2.1

Table 18: 1990-2010 trend of annual fellings (23 countries)

	Fellings						
	Total (million m³)				Annual change (million m³/yr)		
Region	1990	2000	2005	2010	1990-2000	2000-2005	2005-2010
Russian Federation	340.0	166.0	186.0	170.0	-17.4	4.0	-3.2
North Europe	130.1	163.1	171.0	159.4	3.3	1.6	-2.3
Central-West Europe	149.8	166.3	181.3	169.5	1.7	3.0	-2.4
Central-East Europe	44.9	45.6	55.1	56.2	0.1	1.9	0.2
South-West Europe	31.1	31.2	30.7	29.3	0.0	-0.1	0.3
South-East Europe	6.1	6.3	9.0	11.2	0.0	0.5	0.4
Europe	701.9	578.4	633.1	595.7	-12.3	10.9	-7.5
Europe without the Russian Federation	361.9	412.4	447.1	425.7	5.1	6.9	-4.3
EU-27	325.5	378.1	408.5	387.6	5.3	6.1	-4.2

Table 19: Felling rates for 2010, based on data from 23 countries

	Felling rates			
Region	1990	2000	2005	2010
Russian Federation	40.8	19.7	21.9	19.9
North Europe	64.8	79.0	71.0	70.4
Central-West Europe	56.7	58.5	63.7	65.0
Central-East Europe	53.5	51.9	61.6	57.2
South-West Europe	53.7	42.2	40.8	63.0
South-East Europe	35.1	30.2	40.2	46.9
Europe	48.2	38.2	41.0	38.9
Europe without the Russian Federation	58.0	61.2	64.4	62.4
EU-27	59.1	63.2	65.9	64.2

Indicator 3.2 Roundwood

Introduction

Roundwood comprises all wood obtained from removals, including wood recovered from natural, felling and logging losses. Roundwood can be sub-divided into industrial roundwood (wood in the rough), which is mainly used for construction and processed timber products, and wood fuel, which is increasingly important as a source of renewable energy. Roundwood production acts as an interface between the forestry and the timber sector: it provides income for forest owners, serves as resource for the timber sector and its added value, and contributes to the economy, especially in rural areas.

Only a few countries assess the removal of wood fuel on a representative scale. It is widely accepted that a considerable amount of wood fuel is utilized for self-consumption and enters neither markets nor statistical records. The figures presented in the following might show such a bias and underestimate the total removals of wood fuel from forests.

Status

Information on total roundwood production was provided by 38 countries, representing 98 percent of the forests in the European area (89 percent for Europe without the Russian Federation). 578 million m³ of roundwood removals have been reported for 2010 (468 million m³ for Europe without the Russian Federation) 150 million m³ of which is in Central-West Europe and 144 million m³ in North Europe (see Table 20). The highest total removals of roundwood at the country level have been realized in the Russian Federation (110 million m³), Sweden (74 million m³), France (62 million m³), Germany (48 million m³), and Finland (47 million m³). Removals per hectare ranged from 4.4 m³/ha in Central-West Europe to 0.2 m³/ha in the Russian Federation.

Thirty-three countries reported data on the value of total removals for 2010 (see Table 20), representing 94 percent of the European area (69 percent for Europe without the Russian Federation). The value of roundwood removals amounts to EUR 21 152 million (EUR 17 743 million for Europe without the Russian Federation). The highest value was reported for the Russian Federation (EUR 3 409 million), followed by Germany (EUR 3 003 million) and France (EUR 2 980 million). The value reported for Central-West Europe (EUR 7 941 million) is well above the values reported for the other regions. The value of wood removals varied between EUR 5/ha (the Russian Federation) and EUR 241/ha (Central-West Europe).

The figures presented in Table 20 relate to the total removals and do not take into account if removals were de facto marketed or not. 24 countries (19 percent of Europe, 97 percent of Europe without the Russian Federation) provided data on marketed roundwood, i.e. roundwood sold on markets. Marketed roundwood excludes roundwood harvested for self-consumption (subsistence) and other forms of uses without market transaction.

Table 21 and Figure 32 presents the proportion of marketed roundwood as a share of the total removals by regions. On average 89 percent of the total removals were marketed. The lowest proportion was found in the Central-West Europe region. Here 20 percent of the total removals did not enter markets. In all other regions the percentage of marketed removals was well above 90 percent. In the South-West Europe region, for which two countries provided data, the entire removals were reported to be marketed. The data in Table 21 and Figure 32 need to be interpreted with care, especially because removals of wood fuel are not well monitored in all countries and could cause a bias in the estimation of the marketed roundwood.

Trends

The trend of marketed total roundwood is based on 25 countries, representing approximately 94 percent of Europe or 69 percent of Europe without the Russian Federation. 25 countries provided sufficient data for volume and value of removals in order to calculate a time series for the period 1990 to 2010 (see Table 22).

Table 20: Volume and value of marketed and non-marketed roundwood, 2010

Region	Volume (1 000 m³)	Volume (m³/ha FAWS)	Value (million EUR)	Value (EUR/ha FAWS)
Russian Federation	110 000	0.2	3 408	5.0
North Europe	143 813	3.0	4 979	110.9
Central-West Europe	150 473	4.4	7 941	240.9
Central-East Europe	103 500	3.3	2 596	180.7
South-West Europe	24 846	1.5	703	47.1
South-East Europe	45 048	2.2	1 524	109.7
Europe	577 680	0.7	21 152	26.6
Europe without the Russian Federation	467 680	3.1	17 743	145.2
EU-27	404 938	3.3	16 077	145.7

Table 21: Proportion of marketed roundwood from total removals, 2010 (24 countries reporting)

Region	Proportion roundwood marketed from total removals %
Russian Federation	-
North Europe	91.9
Central-West Europe	79.7
Central-East Europe	99.8
South-West Europe	100
South-East Europe	92.0
Europe	-
Europe without the Russian Federation	89.0

Figure 32: Value of marketed roundwood, 2010 (EUR million)

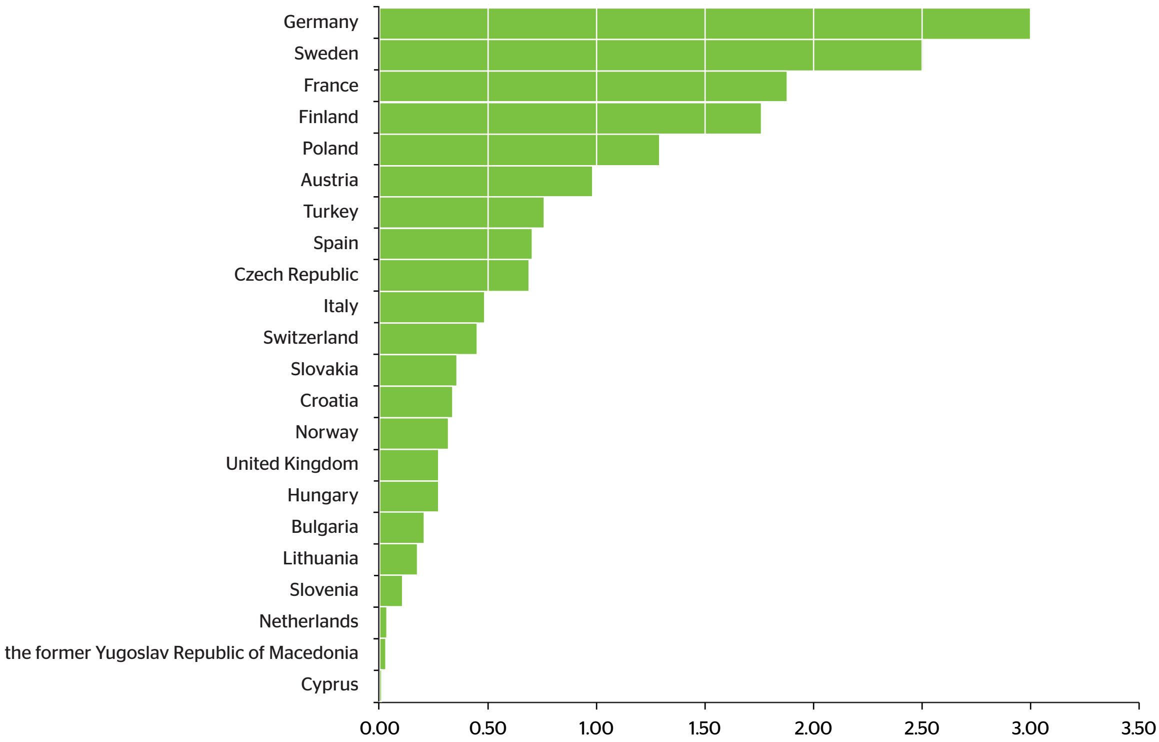


Table 22: Trend in volume and value of total roundwood, 1990 - 2010 (25 countries)

	Total roundwood															
	Volume (1 000 m³)				Volume (m³/ha FAWS)				Value (million EUR)				Value (EUR/ha FAWS)			
Region	1990	2000	2005	2010	1990	2000	2005	2010	1990	2000	2005	2010	1990	2000	2005	2010
Russian Federation	238 188	92 000	113 000	110 000	0.3	0.1	0.2	0.2	-	1 183	1 626	3 408	-	2	2	5
North Europe	99 231	136 408	146 347	132 722	2.3	3.3	3.6	3.2	3 714	4 720	4 867	4 979	83	105	108	111
Central-West Europe	132 991	144 259	155 919	147 857	4.3	4.5	4.8	4.5	6 358	6 216	7 024	7 941	189	184	208	235
Central-East Europe	46 054	53 786	64 188	66 991	3.2	3.8	4.7	4.7	933	1 884	2 341	2 596	65	131	163	181
South-West Europe	15 471	14 995	15 641	13 980	1.1	1	1	0.9	539	689	757	703	36	46	51	47
South-East Europe	26 441	27 654	31 394	35 253	1.9	2	2.4	2.7	1 323	1 354	1 538	1 524	95	97	111	110
Europe	558 375	469 101	526 488	506 803	0.7	0.6	0.7	0.6	12 867	16 047	18 154	21 151	16	20	23	26
Europe without the Russian Federation	320 187	377 101	413 488	396 803	2.8	3.2	3.5	3.4	12 867	14 864	16 528	17 743	106	122	136	146

The 25 countries reporting show a decrease in removals between 1990 and 2010, which was mainly caused by the Russian Federation, where removals in 2010 were less than half of the removals realized in 1990. In Europe without the Russian Federation, removals increased between 1990 and 2010 by approximately 66 million m³, with a high in 2000 (413 million m³) caused by sanitary fellings and the removal of downed trees after heavy storms in the end of the 1990's. Between 1990 and 2010 the level of removals per ha was maintained in all European regions, except the Central-East Europe region where a consistent rise from 3 m³/ha in 1990 to 5 m³/ha in 2010 was reported.

The value of removals increased steadily in all regions. A pronounced increase of value of removals can be observed in the Central-East Europe region (from EUR 933 million in 1990 to EUR 2 596 million in 2010) and in the Russian Federation (from EUR 1 183 million in 1995 to EUR 3 408 million in 2010).

Indicator 3.3 Non-wood goods

Introduction

Temperate and boreal forests are a traditional source not only for timber but also for many products that have been extracted from forests, including resin, tannin, fodder, litter, medical plants, fruits, nuts, roots, mushrooms, seeds, honey, ornamentals and exudates. In many parts of central Europe, forest sites became subject to nutrient imbalance due to using forests for grazing and extracting litter. Over time the utilization of non-timber products became marginalized as the management objectives shifted to timber production. The shift has been driven by different processes: the increasing estrangement of local people by an increasing disregard of subsistence use and small-scale rural industries, technological substitution, intensification of agricultural production and prosperity development.

Today there is an institutional rediscovery of the value of forest products and services other than timber. The socio-economic contribution of forests to livelihood and the impact of their use on the environment are essential components of modern concepts for sustainable forest management (Vantome, 2003) . The integration of the assessment of non-wood goods (NWGs) in extensive forest surveys causes problems as most NWGs are site specific, depend on spatial distributions and may be of only local importance.

The present indicator covers the value and quantity of marketed NWGs from forest and other wooded land. For reasons of consistency, NWGs harvested for self-consumption and other forms of uses are excluded, even if they could represent a substantial part of the total amount of harvested NWGs. In the available datasets, the main NWGs identified are as follows: Christmas trees, mushrooms and truffles, fruits and berries, cork, ornamental plants, medicinal or colorant products, seeds of forest tree species, game products and honey.

Status and trends

Quantities and/or values of marketed NWGs were provided by 33 countries. The available data sets are fragmentary for several reasons: the utilized assessment measures for quantity are not harmonized and render it difficult to compare data, collecting data on NWGs is costly, and most countries collect data only for specific NWGs that are of local significance. As the importance of NWGs differs among countries, a holistic view of all types of NWGs across Europe is difficult to obtain. However, the reported data clearly show that NWGs can be an important source of income on the local level (see Figure 33 and Table 23).

Due to the differences in reference units (e.g. weight, volume, number, or price) the following remarks relate not to quantity but to the value of NWGs. The total value that was reported for NWGs reaches almost EUR 2 763 million for the entire FOREST EUROPE region, of which EUR 2 116 million are marketed plant products and EUR 648 million are marketed animal products. The need for further processing differs significantly among individual NWGs; as a consequence, for some products, the marketed value of NWGs generates only marginal income for the forest owners as most of the marketed value is related to processing.
Christmas trees, fruits, berries and edible nuts, and cork are the three categories of NWGs for which the highest total values were obtained. In 2010, the reported values for those NWGs represented 83 percent of the total value of marketed NWGs in the FOREST EUROPE region.

The highest shares in the value generated by NWGs are tied with the Central-West (EUR 813 million) and the South-West Europe region (EUR 869 million). Lowest shares are reported for the South-East (EUR 35 million) and the Central-East (EUR 4 million) Europe region.

In 2010 almost EUR 980 million were realized by the marketing of Christmas trees, with highest values reported

Figure 33: Share of total value of marketed NWGs – plant products; absolute values given in EUR 1 000

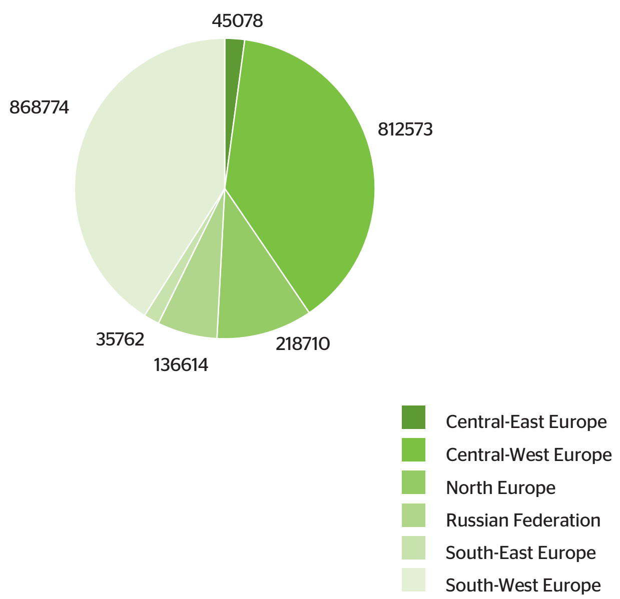


Figure 34: Share of total value of marketed NWGs – animal products; absolute values given in EUR 1 000

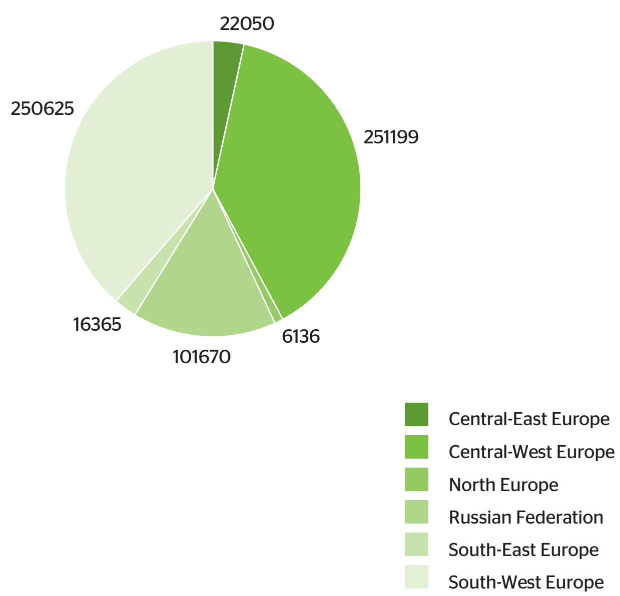


Table 23: Quantity and value of marketed NWGs: marketed plant products

Region	Christmas trees		Mushrooms and truffles		Fruits, berries and edible nuts		Cork		Resins, raw material – medicine, aromatic products, colorants, dyes		Decorative foliage, incl. ornamental plants (mosses,..)		Other plant pro-ducts
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Value
	1 000 pcs	1 000 €	tonnes	1 000 €	tonnes	1 000 €	tonnes	1 000 €	tonnes	1 000 €	tonnes	1 000 €	1000 €
Russian Federation	6	4	9 332	21 006	49 053	105 501	-	-	5 059	7 861	-	2 240	3
North Europe	17 162	132 104	4 428	12 493	52 231	15 107	-	-	882	182	400	58 824	-
Central-West Europe	38 850	733 900	732	14 550	239	883	1 550	775	145	32	1 581	7 202	55231
Central-East Europe	1542	2 830	29 935	10 587	61 362	28 132	-	-	957	1 621	350	1 802	106
South-West Europe	-	110 828	366 873	124 161	208 236	299 574	167 665	323 850	7 351	2 364	-	-	7997
South-East Europe	631	377	17 398	11 283	5 056	10 296	-	-	17 368	12 476	37	921	408
Europe	58 193	980 043	428 699	194 081	376 178	459 494	169 215	324 625	31 762	24 536	2 368	70 989	63745
Europe without the Russian Federation	58 187	980 039	419 367	173 075	327 125	353 993	169 215	324 625	26 703	16 675	2 368	68 749	63742

for Central-West Europe (EUR 734 million) and North Europe (EUR 132 million). Christmas trees account for 34 percent of the total reported value of NWGs. 25 countries reported data on Christmas tree production. In Croatia, Denmark and Germany, harvested quantities exceeded 10 million pieces; the whole production in FOREST EUROPE countries amounted to 58 million Christmas trees. Values above EUR 100 million from Christmas tree production were realized in Denmark, France, Germany and Spain.

Data on mushrooms and truffles were provided by 24 countries and account for 9 percent (EUR 194 million) of the total value generated by NWGs. The highest values were reported for South-East and South-West Europe. Central-East Europe shows the lowest value obtained for mushrooms and truffles but the second highest quantity (30 million tonnes) after South-West Europe (367 million tonnes). Italy is by far the most important producer of mushrooms and truffles, with a share of 357 million tonnes or 83 percent of the total quantity.

Information on the quantity of fruits, berries and edible nuts has been reported by 23 countries, and on their value by 17 countries. In the reporting countries harvested fruits, berries and edible nuts amounted to 376 000 million tonnes, or EUR 459 million. The main producers in quantitative terms were Italy (116 million tonnes), Spain (70 million tonnes) and the Russian Federation (49 million tonnes), in terms of value, the main producers were Italy (EUR 187 million), the Russian Federation (EUR 106 million), Spain (EUR 60 million) and Portugal (EUR 34 million).

Data on cork production, which is limited to the Mediterranean region, were provided by France, Italy, Portugal and Spain. Portugal was the most important producer of cork and reports a production of 100 million tonnes with a value of EUR 203 million. The production in Spain (62 million tonnes; EUR 111 million), Italy (6 million tonnes; EUR 9 million) and France (1.6 million tonnes, EUR 0.7 million) was considerably lower.

Data on the three categories “Resins, raw material-medicine, aromatic products, colorants, dyes”, “Decorative foliage, incl. ornamental plants”, and “other plant products” were provided by 23 countries (“Resins etc.”: 13 countries, “Decorative foliage”: 9 countries; “other plant products”: 10 countries). The total value of these three categories comprised approximately EUR 160 million. Among the countries reporting, the highest values were generated for decorative foliage in Denmark (EUR 58 million), for other plant products in Germany (EUR 54 million) and for resins, raw material- medicine, aromatic products, colorants, and dyes in Turkey (EUR 10.6 million) and the Russian Federation (EUR 7.9 million).

The share of total marketed values for marketed animal products is given in Figure 34. Central-West-Europe and South-West Europe (each about EUR 251 million) show the highest share. Table 24 presents the quantity and value of different types of marketed animal products.

Game comprises all hunted birds and mammals, such as partridge, pheasant, hare, deer, wild boar and chamois. The figures presented include game whose habitats are forest-related or forest-dependent. Excluded is game roaming on farms. Data on game harvest, meat and hides were reported by 23 countries for the quantity and 19 countries for the value. In many countries, the commercial sale of game meat is an important economic activity. Among the reporting countries Germany (EUR 180 million) was by far the highest producer of game meat in terms of value. Among the reported value of non-wood products, game made up EUR 409 million (14 percent of NWGs) for all responding FOREST EUROPE countries.

Honey and bees wax production was mentioned by nine countries for quantities. The total value of marketed honey and bees wax amounted to EUR 243 million. The Russian Federation alone accounted for 47 percent of the total value.

The other categories of marketed animal products contributed approximately 3 percent to the total value generated by NWGs.

The value of NWG has almost tripled since the last State of Europe's Forests report in 2007. However, this increase is partly an artefact due to the rising information needs on NWGs and respective increase of assessment activities. Thus no trend for NWGs is presented.

Indicator 3.4 Services

Introduction

Forests provide numerous services beneficial to the public, e.g. their role in the global carbon cycle or in the protection of infrastructure. In the neighbourhood of agglomerations forests provide significant facilities for recreation. Forest services can either be marketed and generate economic values, or occur as side-effects of forest management without any economic benefits. The reported marketed services are forest-dependent or mainly forest-related and can be marketed by forest owners or others.

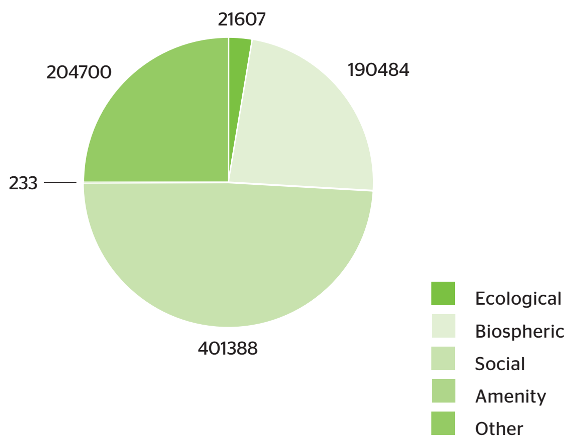
Marketed ecological services include those related to Indicators 5.1 and 5.2 (soil, water and other environmental functions as well as infrastructure and managed natural resources) on a voluntary contractual basis with compensation or other payments from private or public bodies.

Marketed biospheric services include services related to Indicator 4.6 (in situ or ex situ gene conservation of genetic resources) as well as Indicator 4.9 (protected forest area), e.g. nature protection on a voluntary contractual basis with compensation or other payments from private or public bodies. This includes NATURA 2000 sites. Contract nature protection schemes are increasingly discussed as a measure to promote ecological services of forests. This class also includes afforestation projects initiated for carbon sequestration in the context of the Kyoto Protocol.

Marketed social services include hunting or fishing licences, renting of huts and houses, as well as forest-based leisure, sports, and outdoor activities and educational activities that are not free of charge to the consumers (e.g. public and schools). Recreational services not exchanged via market transactions are not reported.

Amenity services include those related to spiritual, cultural and historical functions, e.g. sacred, religious, or other forms of spiritual inspiration, sites of worship, landscape features (mountains and waterfalls), "memories" in the landscape from past cultural ties, aesthetic enjoyment and inspiration, as well as historic artefacts.

Figure 35: Marketed services from forest and other wooded land in Europe (based on data from 16 reporting countries)



Other marketed services include payments to woodland owners for licences that regulate land use for gravel extraction, telecommunication masts, wind farms, and electricity distribution, among others.

Depending on national laws, these marketed services of the forest may contribute directly to the income of forest owners and thus contribute to the economic viability of sustainable forest management.

Status and trends

Data on the value of marketed services were reported by 16 countries, representing 86 percent of the whole FOREST EUROPE area, even if data were limited in most countries. Figure 35 presents the proportion of marketed services as provided by the reporting countries.

A number of countries reported difficulties in quantifying the value of marketed services. The main reason is the impossibility of properly identifying marketed and non-marketed services. Although the marketed forest-related services are well identified, income is not known or registered or covers only part of the forest sector (e.g. private versus public ownership). The only well-documented marketed services are hunting and fishing licences.

About half of the reporting countries provided data on hunting licences, which are one of the most important traditional services. Hunting licences can be a source of significant income for private and public landowners. The rates vary considerably across Europe and depend, among other factors, on the location and attractiveness of the hunting grounds.

The total value for marketed services, considering the relatively few responding countries, was almost EUR 818 million and more or less stable in comparison with the EUR 941 million reported in 2007. The highest share was reported for social services (EUR 401 million), the lowest for amenity services (EUR 0.2 million).

From the enquiry, it is obvious that even if data on marketed services are very limited in FOREST EUROPE countries, they represent a non-negligible income for forest owners.

Table 24: Quantity and value of marketed non-wood goods (NWGs) marketed animal product

Region	Game meat		Living animals		Pelts, hides, skins and trophies		Wild honey and bee-wax		Raw material for medicine, colorants		Other animal pro-ducts
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Value
	tonnes	1000 €	1000 pcs	1000 €	1000 pcs	1000	tonnes	1000 €	tonnes	1000 €	1000 €
Russian Federation	16 945	16 945	16 945	16 945	16 945	16 945	16 945	16 945	16 945	16 945	16 945
North Europe	33 535.2	5 791	-	-	47 316	345.5	-	-	-	-	-
Central-West Europe	42 264	217 505	-	-	28 700	6 738	10 150	25 616	-	-	1 340
Central-East Europe	23 903.4	15 117	3 117	1 221.2	50 358.6	2 136	-	-	160	1 115	2 461.1
South-West Europe	2 634	149 537	-	-	-	-	37 869	101 088	-	-	-
South-East Europe	2 368.31	4 266.5	-	-	6 526.3	8 439.16	4 275	3 660	-	-	-
Europe	121 650	409 162	20 062	18 166	149 846	34 604	69 239	147 309	17 105	18 060	20 746
Europe without the Russian Federation	104 705	392 217	3 117	1 221	132 901	17 659	52 294	130 364	160	1 115	3 801
EU-27	121 650	394 457	3 117	1 221	126 032	16 679	47 469	119 704	160	1 115	1 366.1

Indicator 3.5 Forest under management plans

Introduction

Management plans (or equivalents, such as guidelines at various administrative levels) allow countries to maintain and foster a valuable approach towards implementation of multiple long-term sustainability goals. FOREST EUROPE defines forest management plans as "Information (in the form of text, maps, tables and graphs) collected during (periodic) forest inventories at operational forest units level (stands, compartments) and operations planned for individual stands or compartments to reach the management goals" and equivalents as "Information collected on forest area, at forest management or aggregated forest management unit level (forest blocks, farms, enterprises, watersheds, municipalities, or wider units), and strategies/ management activities planned to reach the management or development goals".

The concept and implementation of management plans vary a lot among and within countries. Some countries consider management plans as both formal and informal.

Status

29 countries reported the area of forest under management plans or equivalents for a total of 190 million ha, representing nearly 77 percent of European forest area without the Russian Federation.

Figure 36 shows the share of forests under management plans or equivalents for FOREST EUROPE countries with available data for 2010. Around 90 percent of the forests in these countries were actually under a management plan or an equivalent. Countries such as Malta, Turkey, Slovenia, Bulgaria, Liechtenstein Slovakia, Czech Republic and Belarus as well as the Russian Federation reported that all forest area was covered by management plans. Serbia, Georgia and Albania provided data without any distinction between a management plan and an equivalent.

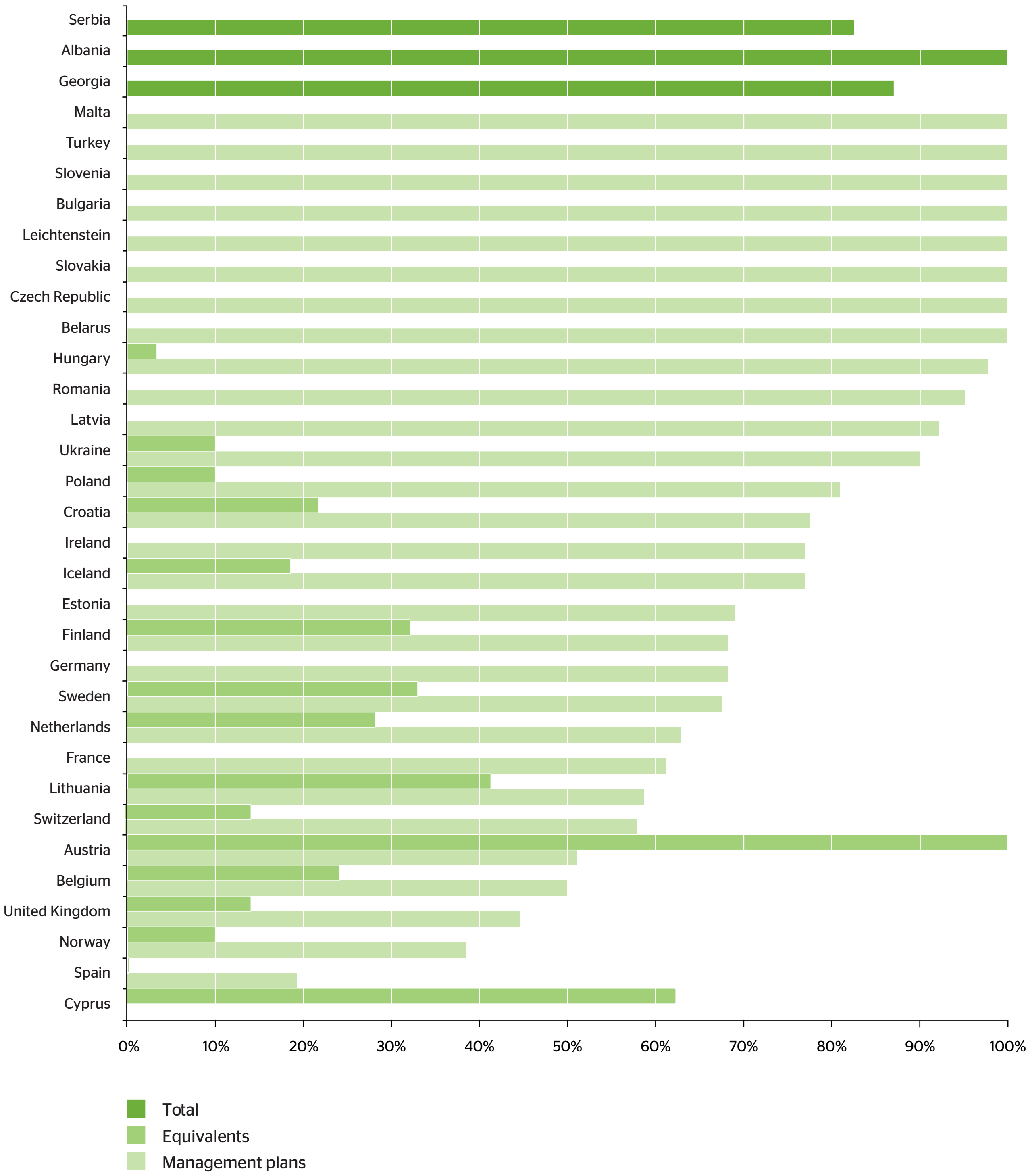
Twenty-three countries reported about management of other wooded land. Approximately 65 percent of the other wooded land in these countries were under management plans or equivalents.

In the Central-West and South-East Europe, forest management was mainly regulated by management plans. Equivalents to management plans were important in the North and Central-East Europe for small, privately-owned forest holdings. With the exception of Spain and Malta, current information on forests under management plans was missing for South-West Europe.

Trends

24 countries provided information covering the period between 1990 and 2010. The change rate of forests covered by management plans or equivalents was slightly increasing in the last ten years, yet information was only available for 12 percent FOREST EUROPE's forest area. Only Central-West Europe (and in particular France) reported a negative change rate over the period from 2000 to 2010. The data reported indicate that the change rate of other wooded land under management plans or equivalents remained almost constant for the period 1990–2010.

Figure 36: Percentage of forest area under management plans or equivalents, 2010



Criterion 4: Maintenance, Conservation and Appropriate Enhancement of Biological Diversity in Forest Ecosystems

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Indicator 4.7 – data delivered by EC JRC
Indicators 4.1, 4.2, 4.3, 4.4, 4.5, 4.8, 4.9 – national reports on quantitative indicators

Key Findings by Indicators

4.1 Tree species composition

The area of forest that consists of a single tree species has decreased annually by around 0.6 percent during the last 15-year period. About 70 percent of the forests in Europe are dominated by two or several tree species, and the remaining 30 percent are dominated by one tree species alone, mainly coniferous.

4.2 Regeneration

Natural regeneration is expanding in Central European regions, while in other European regions planting and afforestation are the most used regeneration types. Nearly 70 percent of the total forest area in Europe, without the Russian Federation, is regenerated naturally or through natural expansion. In the Russian Federation, the share of naturally regenerated forests is as high as 98 percent. In some European countries, coppicing with rotation poplar and willow coppice as a renewable energy source is becoming more common.

4.3 Naturalness

About 87 percent of the European forests, excluding the Russian Federation, is classified as semi-natural. Undisturbed forests and plantations cover 4 percent and 9 percent, respectively, of the forest area in Europe. The highest share of undisturbed forests of the forest area can be found in the Russian Federation (32 percent) and in countries in North Europe, while the share of plantations is highest in the Central-West European region.

4.4 Introduced tree species

The area dominated by introduced tree species covers 4 percent of the forest area in Europe, equal to the land area of Portugal. The Russian Federation is not included as its area of introduced tree species is negligible. No significant changes are observed over the last 10 years. The highest share of introduced tree species is found in Central-West Europe. A very small proportion of the forest area, 0.5 percent, is occupied by invasive tree species.

4.5 Deadwood

The average volume of deadwood, both standing and lying, is about 20.5 m^3/hectare in the forest area of the European region. When excluding the Russian Federation, this average ranges between 8 m^3/hectare in North Europe and 15 m^3/hectare in South-East Europe. Data suggest that the amount of deadwood, particularly the standing deadwood, has been slightly increasing in most of Europe's regions over the past 20 years. However, the amount of deadwood varies considerably based on forest types, standing volume of the stands, rate of decay and vegetation zones and is influenced by forest management regimes. The results indicate that the increase of deadwood in forests is furthered by policies that support a shift towards more nature-oriented management and by certification standards.

4.6 Genetic resources

The areas managed for ex situ conservation and seed production increased during the 1990-2010 period. In 2010, a total of 476 000 hectares and 7 700 hectares of forests were managed for in situ and ex situ gene conservation, respectively, and 870 000 hectares for seed production in Europe, without the Russian Federation. Overall, the areas were managed for a total of 142 tree species including subspecies and hybrids. There are significant gaps in the geographical representativeness of in situ gene conservation areas as compared to the distribution maps of European tree species. Wide coverage of areas for gene resources ensures the capacity of forest trees to adapt to climate change.

4.7 Landscape pattern

European maps on landscape-level forest fragmentation and connectivity are available for the first time for the year 2006 from a low- and high-scale perspective. Trends in forest connectivity in the landscape context have been assessed at low scale and are reported per country for the 1990-2006 time period. Results indicate that expansion of forest area after natural succession or restoration in a given region does not necessarily improve the forest connectivity. Fragmentation and defragmentation are local processes that can be identified and measured in a harmonized manner over Europe, but their observation requires the availability of European-wide harmonized forest maps at different spatial and temporal scales in order to make conclusions about the trends.

4.8 Threatened forest species

Reporting on threatened forest species has improved as more countries are providing information. Of the tree species reported under the IUCN Red List categories, 77 percent were classified as vulnerable and endangered while 21 percent were seen as critically endangered. This includes trees growing at the limits of their potential range. Information on other threatened forest species groups is more heterogeneous and sometimes fragmentary; thus, changes have to be interpreted with care as the number of threatened species may coincide with improved knowledge of species and monitoring surveys.

4.9 Protected forests

Over the last 10 years, Europe's forest area designated for biodiversity and landscape protection has increased by half a million hectares annually. About 10 percent of European forests, without Russian Federation, are protected with the main objective of conserving biodiversity and about 9 percent with the main objective of protecting landscape, which accounts for an area of 39 million hectares. The strictness of protection for biodiversity varies considerably within Europe: in North Europe and in some Eastern European countries, restrictive protection with no or minimal intervention dominates, whereas in Central and Southern European countries, active management in protected areas is emphasized. In the Russian Federation the area of protected forests with no or minimal intervention is 17 million hectares. This shows the different policies applied across Europe due to natural conditions, traditions and population density.

Indicator 4.1 Tree species composition

Introduction

Area of forest and other wooded land, classified by number of tree species occurring and by forest type.

Species diversity and dynamics of forest ecosystems differ considerably throughout Europe. This is reflected by a broad range of forest types, from boreal forest in Northern Europe to broadleaved evergreen forests in the Mediterranean region (EEA, 2006). These forest types are differentiated through unique key factors related to structural, compositional (including tree species composition) and functional forest ecosystem components such as biotic and abiotic disturbance factors and forest management (Larsson et al., 2001). Mixed forests and other wooded land, being composed of several tree species, are often richer in biodiversity than those comprised of one tree species. However, some natural forest ecosystems are dominated by only one or two species, such as natural boreal pine forests on dry sites, natural sub-alpine spruce stands and beech forests growing in favourable conditions on lowlands.

Countries were asked to provide updates for the tree species occurrence data for 2005 and additional trend information for the years 1990 and 2000. For the year 2005, countries were asked also for the first time to provide tree species occurrence data by 14 Forest Types (EEA, 2006).

Status

Forest data were reported for the year 2005 by twenty-nine countries, which account for 75 percent of the total forest area of Europe when excluding the Russian Federation. The data show that about a third of European forests is dominated by a single tree species (Figure 37). About half of the forests contains two to three tree species, 15 percent has four to five tree species and only 5 percent is composed of six or more tree species.

Figure 37: Forest area by species abundance category in Europe, without the Russian Federation; the categories 6-10 and 10+ were merged (applicable area 155 million ha)

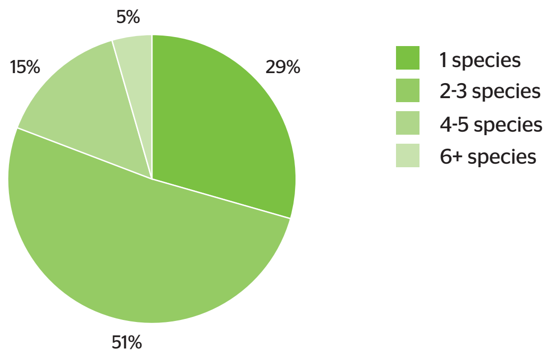


Figure 38: Other Wooded Land area by species abundance category in Europe, without the Russian Federation; the categories 6-10 and 10+ were merged (applicable area 155 million ha)

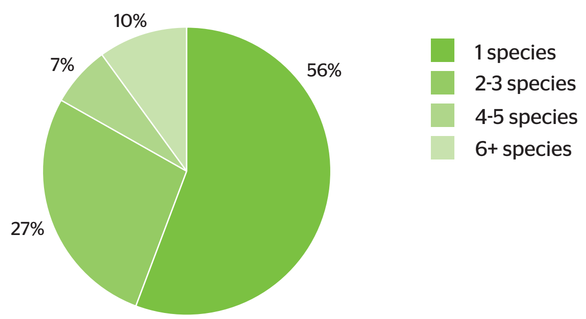
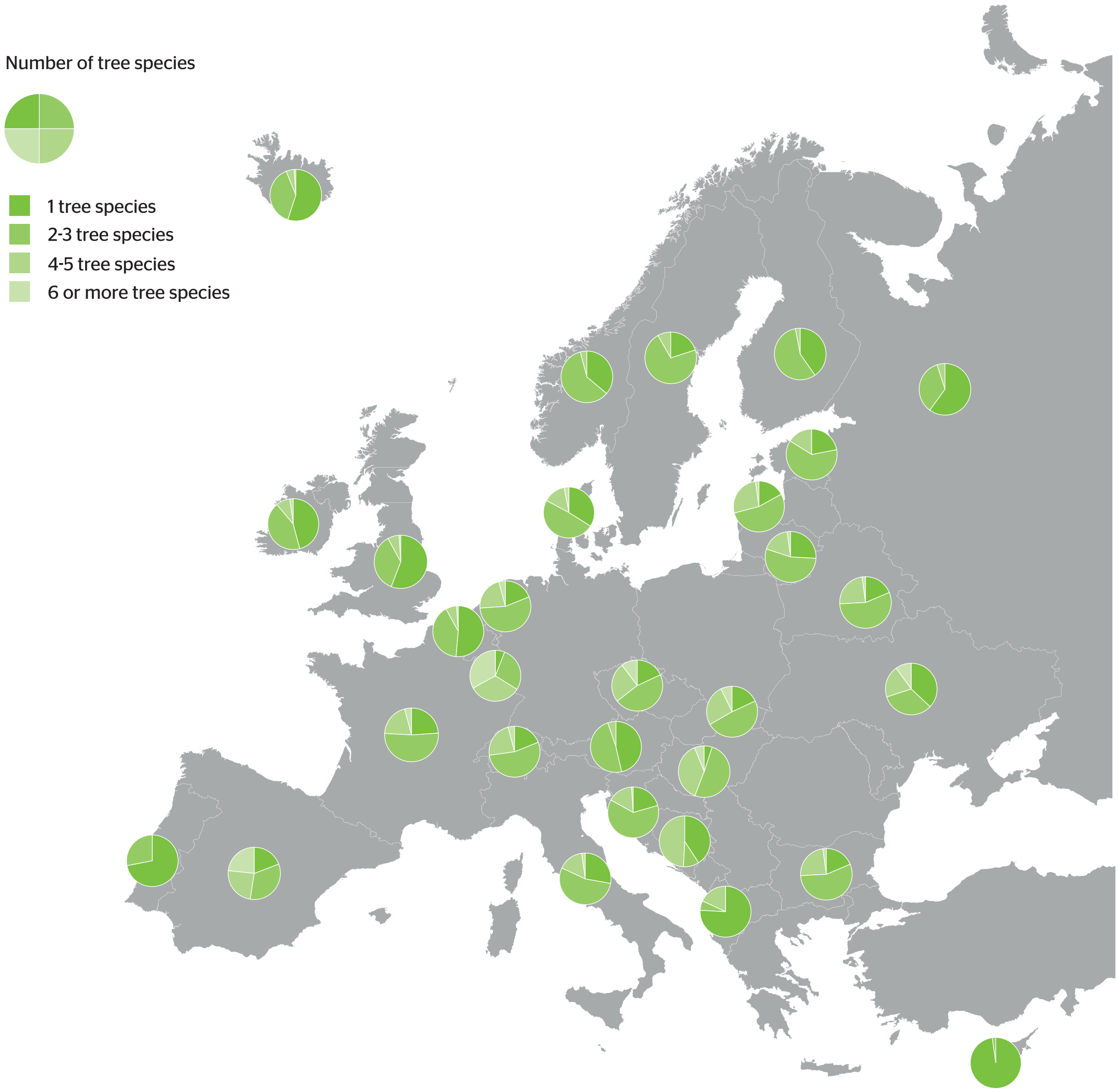


Figure 39: Forest area by species abundance category; the categories 6-10 and 10+ were merged



Single tree species forests, representing more than 40 percent of the forest area, are found in Finland, Bulgaria, Ireland, Austria, Belgium, Iceland, United Kingdom, Portugal, Albania and Cyprus (see Figure 39). These forests are typically homogenous single-age coniferous forests. Broadleaf forests are more likely to show a higher degree of mixture of tree species.

Data on other wooded land were reported by far fewer countries, nineteen in all, which account for slightly less than 60 percent of the total other wooded land in Europe when excluding the Russian Federation (Figure 38). More than half of other wooded land (56 percent) is made up of single tree species. Other wooded land with two to three tree species has a share of 27 percent and that with four to five tree species has a share of 7 percent. The percentage of forest and other wooded land by species abundance category in the Russian Federation is shown in Figure 40.

The incomplete dataset for information on the number of species related to forest type does not allow an assessment by European sub-regions. About half of the North Europe regions' forests is classified by forest type and tree species category. For all other regions, the data coverage is either much lower or no forest type information has been reported.

Trends 1990-2005

Regional trend data suggest a steady decrease of forests dominated by a single tree species (Figure 41). Between 1990 and 2000, North Europe regions' forests in particular have gained in tree species composition. In general a rather steady evolution towards mixed forest composition can be observed in all regions between 1990 and 2005. A slight decline of forests composed of more than ten tree species is observed in Central-West, North and South-East Europe, during the last five years (see Figure 41).

Figure 40: Forest and other wooded land by species abundance category in the Russian Federation (applicable area 155 million ha)

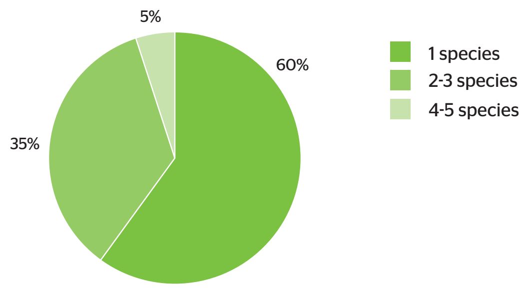
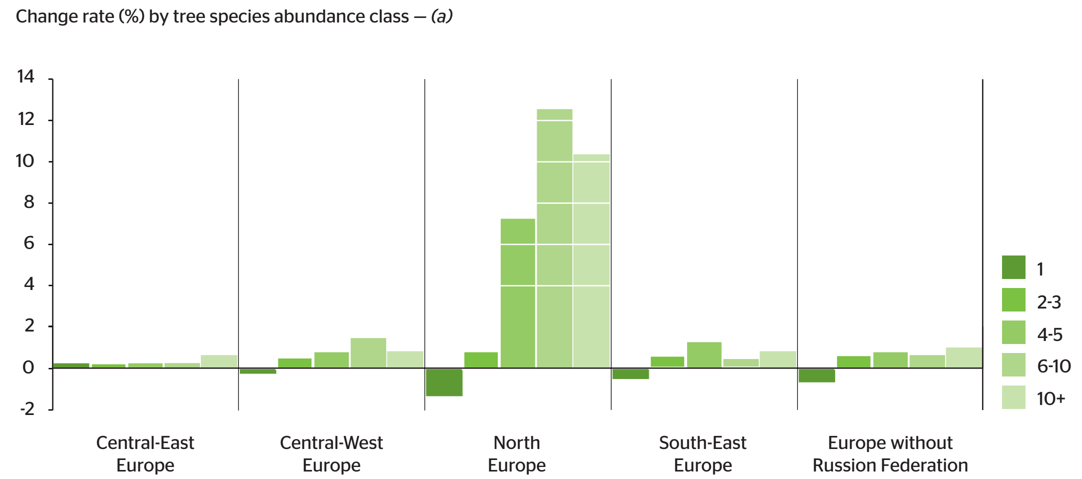
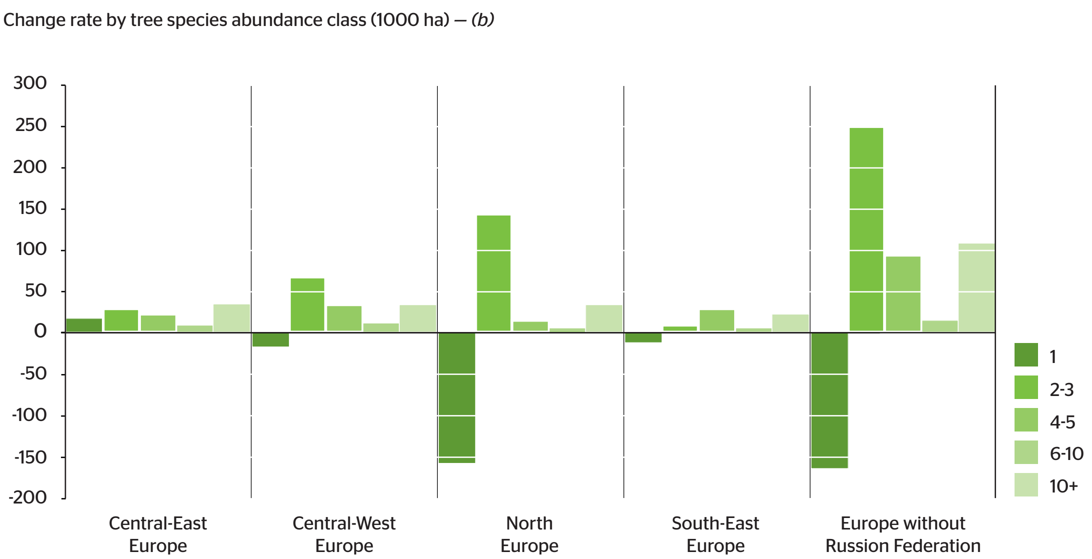


Figure 41: Trend analysis 1990-2005: European and regional totals are based on those countries that have a complete time series for applicable years. Change rate by tree species abundance class: (a) annual change relative to 1990 (%) and (b) absolute annual change (1 000 ha)





Indicator 4.2 Regeneration

Regeneration: Area of regeneration within even-aged stands and uneven-aged stands, classified by regeneration type.

Regeneration by natural seeding, vegetative regeneration or artificial planting and seeding is the prerequisite for maintaining the forested land permanently or long term as forests. Natural regeneration contributes to conserving the diversity of the genotypes and to maintaining the natural tree species composition, structure and ecological dynamics.

Natural regeneration, however, may not always be adequate to achieve biodiversity conservation goals. For instance, to convert forests from introduced tree species to native tree species, planting is necessary in most cases, and restoration activities may require the elimination of naturally regenerating trees growing outside their natural range. Also, the occasional replanting programmes, which were due to the heavy storms in Europe since 1990, may influence the share of regeneration methods and, consequently, the statistics.

Status

Forests regenerated by various regeneration types

The data were collected for this report by asking countries to estimate the share of forest area regenerated by natural regeneration, natural expansion, afforestation, planting, seeding or coppice. Thus these figures for 2010 show the area of present forests established by various regeneration types. The annual regeneration by various regeneration types is reported separately.

Over thirty European countries have reported the share of forest area expressed by regeneration types. There are few data that distinguish between regeneration methods of even-aged and uneven-aged forests. Therefore the results presented are combined for both these two forest structures. Forests regenerated naturally and through natural expansion clearly dominate throughout Europe. Based on the available data from the countries in 2010 (see Table 25), 125 million hectares, or about 67 percent of even-aged and uneven-aged forests in Europe, without the Russian Federation, were regenerated through natural regeneration and natural expansion. The forests regenerated by afforestation and by planting and seeding represent one third of the total forest area in Europe. Coppicing is common only in a few European countries.

The type of regeneration between the individual countries and different regions varies considerably. In Central-East and Central-West Europe both natural regeneration and natural expansion, and afforestation and regeneration by planting and seeding have been practiced nearly to a similar extent. Natural regeneration and natural expansion are the most dominant in North, South- East and South-West Europe. In the Russian Federation as much as 98 percent of the forests are regenerated by natural means.

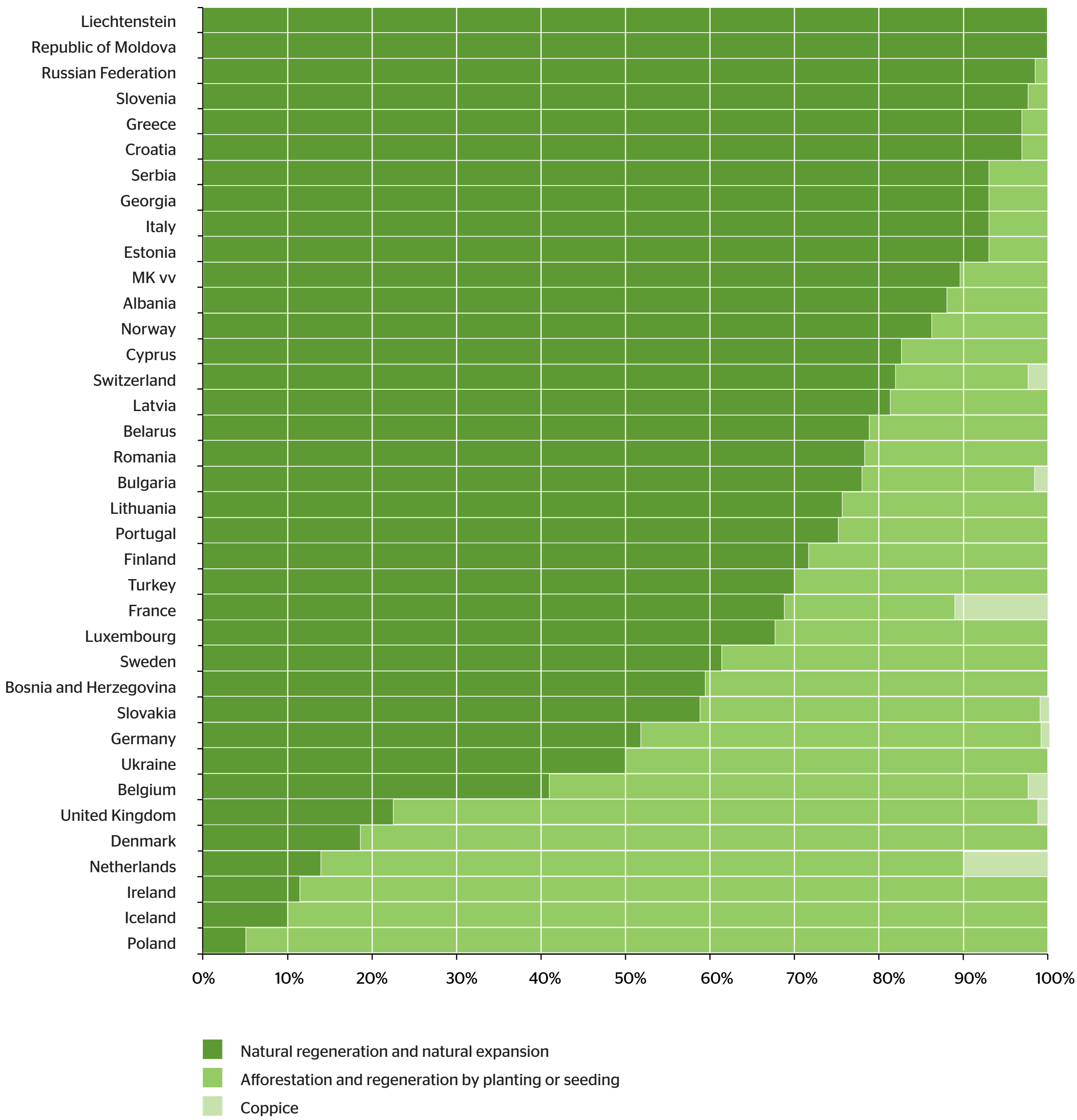
More than half of the forests in 2010 is regenerated by *planting and seeding* in Poland, Iceland, Ireland, the Netherlands, Denmark, United Kingdom, Belgium and Ukraine (see Figure 42). In Liechtenstein, the Republic of Moldova, the Russian Federation, Slovenia, Greece, Croatia, Serbia, Georgia, Italy and Estonia, over 90 percent of the forests were regenerated by natural means.

In 2010 in some European countries, especially France, Germany, Bulgaria, Netherlands, Switzerland, United Kingdom Slovakia and Belgium, coppicing accounted for 2.9 million hectares of the forest area. Short rotation poplar and willow coppice as a renewable energy source are becoming more common in Europe.

Table 25: Share (percent and 1 000 hectares) of forest area (uneven-aged and even-aged) by regeneration types, European regions, 2010

Region	Natural regeneration and natural expansion		Afforestation and regeneration by planting and seeding		Coppice	
	1 000 hectares	Percent of forest area	1 000 hectares	Percent of forest area	1 000 hectares	Percent of forest area
Russian Federation	792 099	98	16 991	2	n.s.	n.s.
North Europe	48 912	71	20 358	29	1	n.s.
Central-West Europe	19 623	57	12 594	37	2 001	6
Central-East Europe	21 291	54	17 972	46	23	n.s.
South-West Europe	11 135	88	1 470	12	777	6
South-East Europe	23 578	80	5 887	20	77	n.s.
Europe	916 639	92	75 272	8	2 879	n.s.
Europe without the Russian Federation	124 539	67	58 281	31	2 879	2
EU-27	84 803	64	44 851	34	2 848	2

Figure 42: Share (percent) of forest area (even-aged and uneven-aged) by regeneration types for countries in Europe, 2010



Annual regeneration by 2005

Nearly forty countries have provided data on the annual regeneration types for 2005. This information does not differ considerably from the previous figures on the share of forest area divided by regeneration types. Regeneration by planting is dominant in Central-East and North Europe (see Figure 43). The share of annual afforestation is the highest in South-East and South-West Europe. In those regions also the share of annual natural expansion is the highest. Taking those figures into account, it can be stated that the increase of new forest area is most intensive in South-East and South-West Europe and it has been taking place by both natural and artificial regeneration means. Natural regeneration as annual regeneration type is most common in the Russian Federation, in Central-West (Switzerland, Liechtenstein) and in North Europe (Estonia, Latvia, Lithuania and Norway).

Trends 1990–2010

Thirty-three European countries have provided the complete data set on regeneration for 1990, 2000, 2005 and 2010. A comparison between 1990 and 2010 in all of Europe, excluding the Russian Federation, indicates that the forest area regenerated by both main regeneration types has increased: natural regeneration and expansion (4 million hectares), and regeneration by planting and seeding (6 million hectares). No clear difference in trends between these two regeneration types can be distinguished, but these trends seem to be connected to the increase in new forest area in Europe between 1990 and 2010.

A detailed analysis by European regions and countries shows that natural regeneration and natural expansion as regeneration types have increased in all regions except North Europe. In Sweden and Finland the shares of natural regeneration and planting/seeding have remained nearly stable during the last 20 years. From the annual regeneration methods it can be assumed that natural regeneration has increased in Central-East Europe, whereas in South-East and South-West Europe the natural expansion shows an increased trend during the last 20 years (see Figure 44).

Figure 43: Share (percent) of annual afforestation, natural expansion, natural regeneration, planting and coppice from the total area regenerated in 2005 in European regions and the Russian Federation

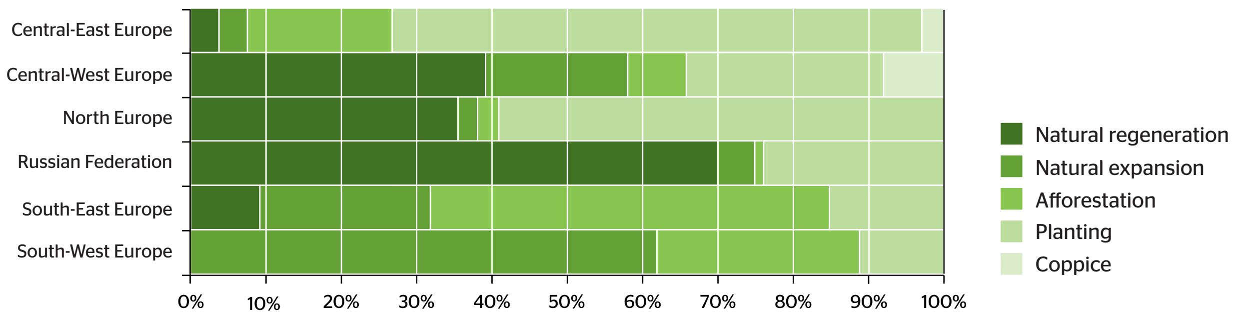
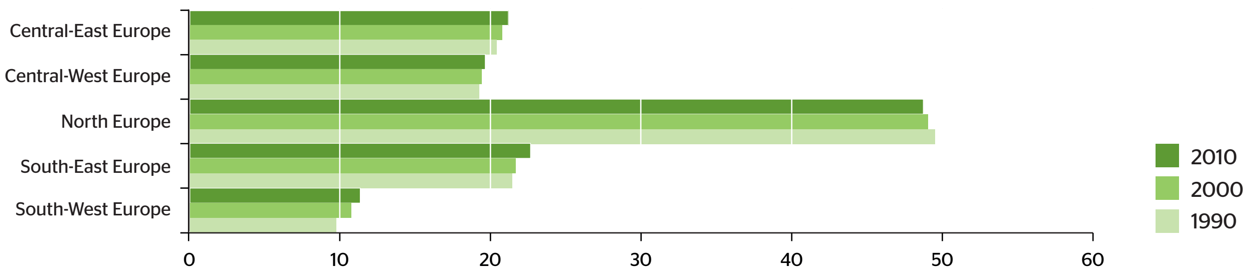


Figure 44: Natural regeneration and natural expansion of forest area (million hectares) in European regions for 1990, 2000 and 2010



Indicator 4.3 Naturalness

Naturalness: Area of forest and other wooded land, classified by "undisturbed by man", by "semi-natural" or by "plantations", each by forest type.

The degree of naturalness of forests shows the intensity and history of human interventions. Different intensities of utilization are characterized not only by the remaining forest area in the country, but also by changing structures and different species communities within the forested areas.

Degrees of naturalness are described in this report by three categories: forest area undisturbed by man, semi-natural forests and plantations. Forests undisturbed by man are those where the natural forest development cycle has remained or been restored, and show characteristics of natural tree species composition, natural age structure, deadwood component and natural regeneration and no visible sign of human activity.

Forests undisturbed by man have a high conservation value, especially when they form large-scale continuous forest areas allowing natural disturbance processes to occur. Undisturbed forests also serve as reference areas for understanding ecological principles and contribute to the development of forest management methods.

Plantations usually are intensively managed and represent ecosystems on their own, established artificially by planting or seeding, often with introduced tree species. Semi-natural forests are neither undisturbed by man nor plantations but display some characteristics of natural ecosystems. However, stands which were established as plantations but that have been without intensive management for a significant period of time are also considered semi-natural forests.

Status

The analyses of classes of naturalness are based on data from over thirty European countries. Most forests in Europe (70 percent, 718 million hectares of the forest area) were classified in 2010 as semi-natural (see Figure 45, Figure 46 and Table 26). In Europe, without the Russian Federation, the share of semi-natural forests is as high as 87 percent (182 million hectares of the forest area). Due to the definition, semi-natural forests include a broad range of forests with different levels of naturalness and biodiversity.

In Europe as a whole, the share of forests undisturbed by man is 26 percent of total forest area (264 million hectares). When excluding the Russian Federation, undisturbed forests cover 4 percent (8 million hectares).

Figure 45: Distribution (percent) of forest area in Europe (left) and without the Russian Federation (right) by classes of naturalness, 2010

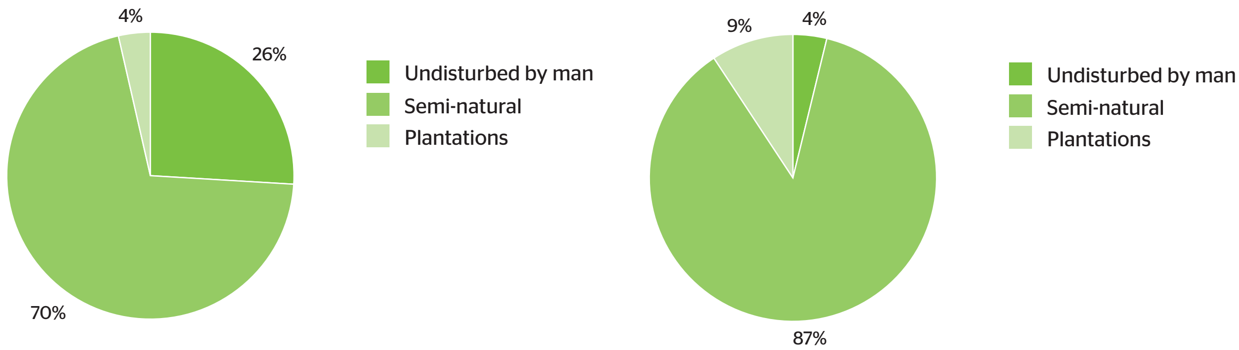
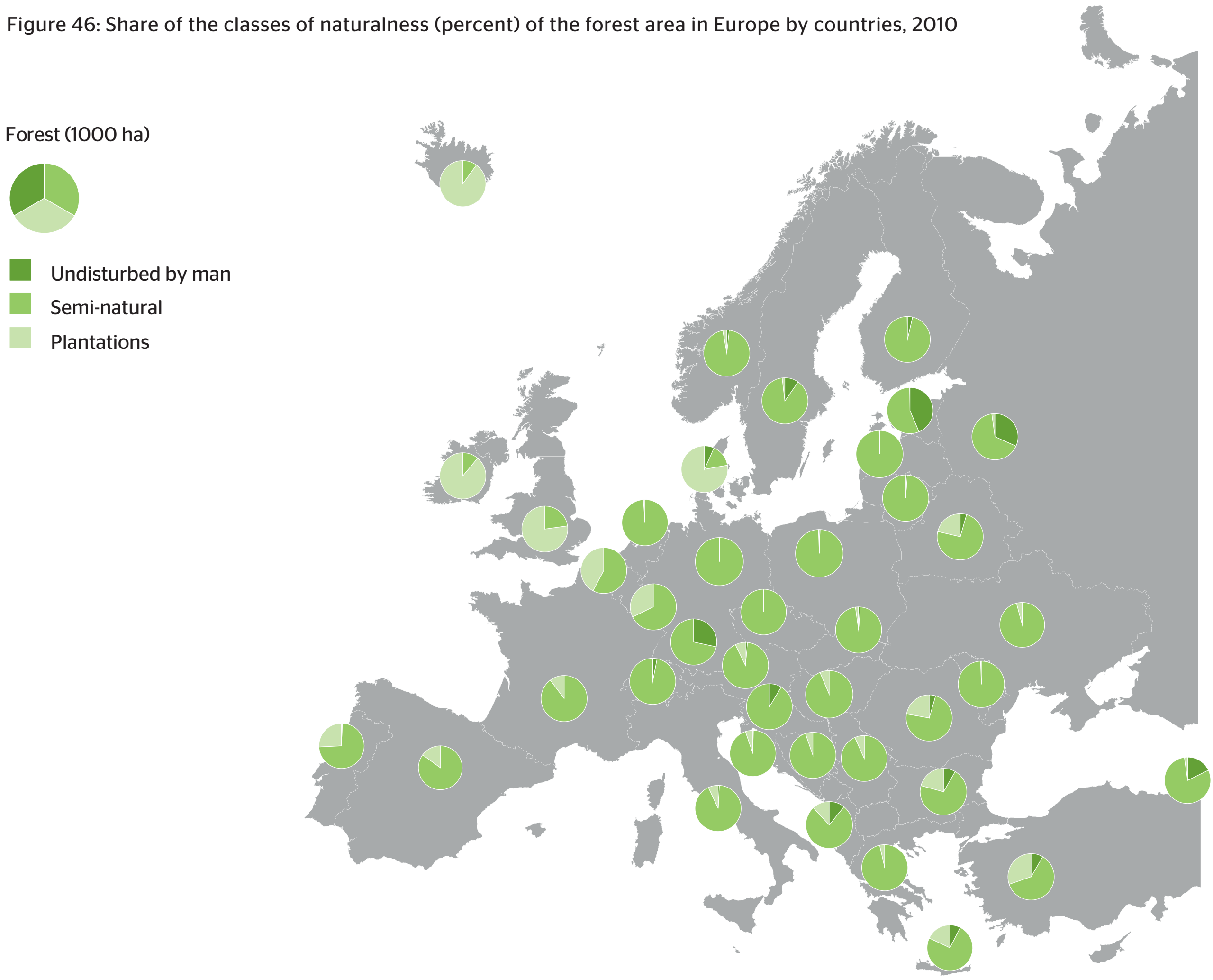


Table 26: Share (percent and 1 000 hectares) of forest area by classes of naturalness for European regions, 2010

Region	Undisturbed by man		Semi-natural		Plantations	
	1 000 hectares	Percent of forest area	1 000 hectares	Percent of forest area	1 000 hectares	Percent of forest area
Russian Federation	256 482	32	535 618	66	16 991	2
North Europe	4 858	7	63 932	91	1 341	2
Central-West Europe	129	n.s.	31 649	86	5 104	14
Central-East Europe	1 347	3	38 552	88	3 962	9
South-West Europe	117	0	26 340	86	4 156	14
South-East Europe	1 528	6	22 045	77	4 905	17
Europe	264 460	26	718 136	70	36 458	4
Europe without the Russian Federation	7 978	4	182 519	87	19 467	9
EU-27	5 739	4	139 078	88	12 937	8

Figure 46: Share of the classes of naturalness (percent) of the forest area in Europe by countries, 2010



Considerable differences exist by class of naturalness among European regions (see Table 26). The highest share of undisturbed forests of the forest area can be found in the Russian Federation and in countries in North Europe, while the share of plantations is the highest in Central-West, South-East and South-West Europe. Large areas of forests undisturbed by man, over 100 000 hectares, can be found in Sweden, Turkey, Estonia, Finland, Georgia, Belarus, Bulgaria, Romania and Slovenia, as well as in the Russian Federation (see Figure 47). In most European countries, the share of forests undisturbed by man is low, ranging from 0 to 1 percent. Forests undisturbed by man are mostly located in remote or inaccessible areas where extreme climatic or topographic conditions prevail.

Other wooded land is most often classified as semi-natural. Large areas of semi-natural other wooded land (over 100 000 hectares) can be found in Spain, Greece, Italy, France, Sweden, Finland, Croatia, Bosnia and Herzegovina, Belarus, Serbia and Latvia. In general, there are no plantations growing on the other wooded land and only a small share is classified as undisturbed by man in most countries. An exception is the Russian Federation, which has up to 79 percent of the total area of other wooded land in Europe, and where nearly all the other wooded land areas are classified as undisturbed by man. Also, in Sweden, Austria, Denmark and Estonia, sizeable shares of other wooded land are classified as "undisturbed by man".

Plantations cover about 37 million hectares, or 4 percent of the total forest area in Europe, and about 20 million hectares, or 9 percent, of the forest area in Europe without the Russian Federation. Plantations are important for wood production in many countries and dominate forest areas in Iceland, Ireland, Denmark and the United Kingdom (Figure 48). The definition of plantation includes a reservation that the stands of native tree species that were established as plantations but that have been without intensive management for a significant period of time could be considered semi-natural forests. This might influence the interpretation, especially regarding the old plantations that have been partly shifted to semi-natural forests.

Trends 1990–2010

In Europe, without the Russian Federation, the area of semi-natural forests and plantations increased during the 20-year period (Figure 49). The area of semi-natural forests expanded considerably by 11.8 million hectares while the area of plantations increased by 3.8 million hectares. These changes can be partly explained by the increase of the total forest area, afforestation and different interpretations of the definitions. The small increase of the area of undisturbed forests may be influenced by the protection of forests, while in several countries, what used to be identified as semi-natural forests were designated for protected areas and then considered undisturbed forests.

Figure 47: European countries with a share of over 2 percent of forest undisturbed by man of the total forest area, 2010 (percent)

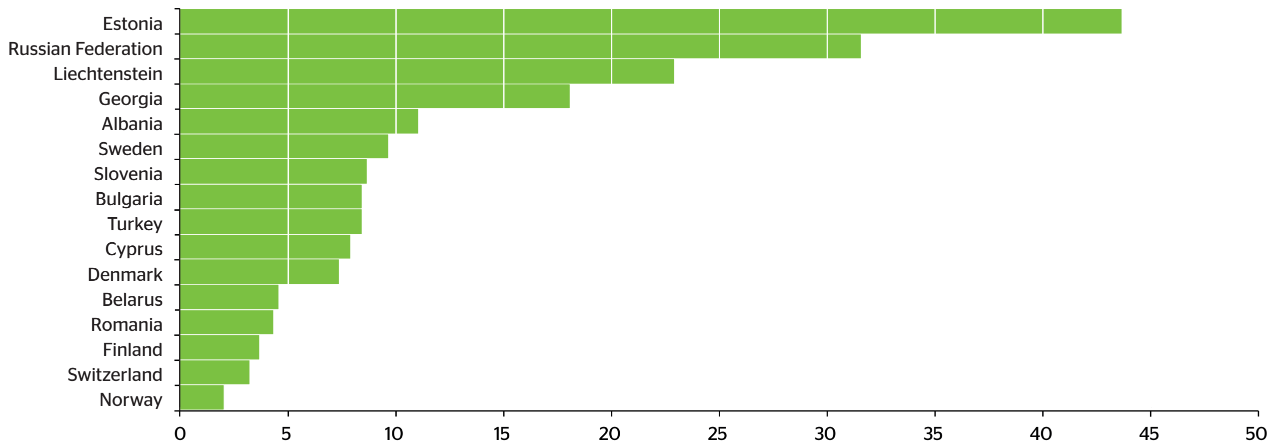


Figure 48: European countries with a share of over 5 percent of plantations of the total forest area, 2010 (percent)

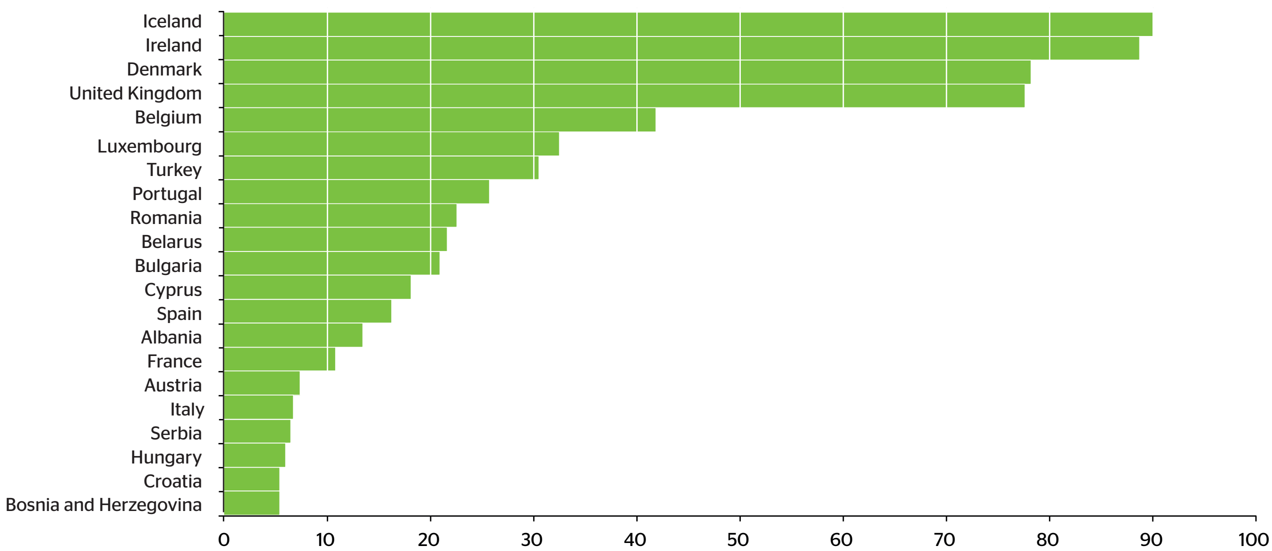
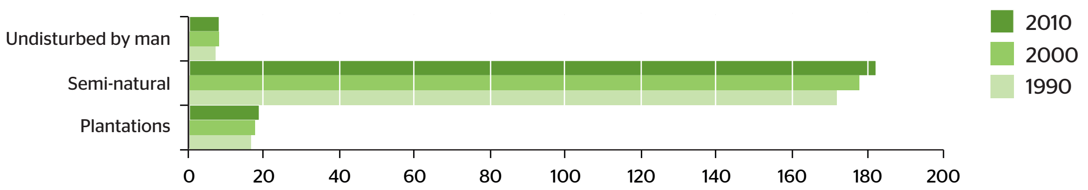


Figure 49: Forest by class of naturalness in Europe without the Russian Federation for 1990, 2000 and 2010 (million ha)



Indicator 4.4 Introduced tree species

Area of forest and other wooded land dominated by introduced tree species.

Non-indigenous tree species have been introduced for various reasons, such as forestry, gardening, protective functions, arboreta, erosion protection and for increasing the forest area through afforestation of abandoned land. Introduced species make a significant contribution to wood production and supply in many countries.

Introduced species are tree species occurring outside their natural vegetation zone, area or region. They are also known as non-indigenous species, exotic species or alien species. Some introduced tree species have become problematic due to their ecological characteristics. Their competitiveness may change the dynamics of forest ecosystems and influence site characteristics, species composition, structure and functional diversity. These introduced tree species are termed invasive species.

Status

The area dominated by introduced tree species covers about 9 million hectares or 4 percent of the total forest area (without the Russian Federation). In the Russian Federation less than 100 000 hectares of its vast forest area was reported as introduced, thus being negligible. In Denmark, Iceland and Italy, introduced tree species are reported to occur also on other wooded land.

A small proportion of the area dominated by introduced species, 10 percent, is occupied by invasive tree species. In relation to the total forest area (without the Russian Federation), this amounts to 0.5 percent and constitutes a minimal area of one million hectares. The largest share of invasive tree species is found in Hungary, where invasive tree species, mainly *Robinia pseudoacacia,* occupy 20 percent (about 400 000 hectares) of the Hungarian forest area. Denmark follows with 6 percent and other countries with less than 3 percent being covered by invasive tree species.

The largest areas dominated by introduced tree species are found in Central-West and South-West Europe, amounting to about 3.9 million hectares and 2.2 million hectares, respectively. While the proportion of forest area dominated by introduced tree species is highest in Central-West European countries (nearly 11 percent), it is below 7 percent in the other regions and lowest in South-East Europe (1.4 percent). The largest share of introduced tree species is found in Iceland, Ireland, United Kingdom, Denmark, Belgium, Luxembourg and Portugal (Figure 50). In those countries, the share of plantations is noticeable and is reflected in the tree species composition which is to a large extent characterized by a single tree species. Having only one native species, downy birch (*Betula pubescens*), and a small forest area, Iceland has a high proportion of introduced tree species due to afforestation efforts through planting trees, using principally introduced species. Also in Ireland introduced tree species, mainly Sitka spruce (*Picea sitchensis*) and lodgepole pine (*Pinus contorta*) are predominantly used for afforestation to increase the forest area.

A shift in forest management to increase the share of native tree species has led to a steady decline of introduced tree species (e.g. in the Netherlands). Countries with a very low share, i.e. below 0.5 percent, of introduced tree species or no introduced tree species are Lithuania, Finland, Estonia, Serbia, Latvia, Belarus, Liechtenstein and Georgia.

Introduced conifer tree species with high importance for forestry purposes are *Pseudotsuga menziesii, Picea abies*, various pine species (most often *Pinus contorta, Pinus nigra, Pinus strobus*) and *Picea sitchensis*. *Pseudotsuga menziesii* is by far the most common planted introduced tree species in the reporting countries due to its characteristics as a fast growing and highly productive tree species (Table 27). Furthermore, when considering climate change, Douglas fir is seen to have competitive advantages as it is less susceptible to heat and drought than, for example, *Picea abies*.

The most common broadleaved introduced tree species for forestry and wood production purposes are *Robinia pseudoacacia, Quercus rubra* and poplar species. The total area covered by *Robinia pseudoacacia* was provided by a few reporting countries (Table 27). Eucalyptus species have been planted for forestry in large areas in Spain and Portugal, and in a small area in Turkey. In Spain slightly more than 3 percent or over 580 000 hectares (Anuario de estadística forestal 2007) and in Portugal 23 percent or about 740 000 hectares) (Inventarío Florestal Nacional 5, 2005-06) of the total forest area are covered by eucalyptus species.

Conifers are generally not considered invasive but some of the introduced broadleaved species are. With a clear majority, ten countries (Austria, Croatia, Denmark, France, Hungary, Italy, Poland, Slovakia, Slovenia, and Spain) stated *Robinia pseudoacacia* as an invasive tree species. *Ailanthus altissima* is considered invasive in France, Hungary, Italy, Slovakia and Spain. *Robinia pseudoacacia* has been widely used for various purposes such as ornamentation, timber, firewood, re-vegetation of dry land and providing nectar for honey production (EEA, 2008). *Ailanthus altissima* has been mainly employed as an ornamental or in roadside planting. *Acer negundo* and *Prunus serotina* are both on the third rank and reported invasive by several countries.

Trends

The total area of introduced tree species in Europe (without the Russian Federation) has remained relatively stable with only a slight increase of 620 000 hectares between 2000 and 2010 in the thirty-five reporting countries (Table 28). An increase during the ten year period is observed for example in Bulgaria, France, Hungary, Iceland, Ireland, Portugal and Spain. The increase may be linked to the planting of introduced species for protective and wood production measures or expanding the forested area.

In most of the countries only marginal changes occurred in the extent of the area dominated by invasive tree species. Only Austria and Hungary show a slight increase in the area dominated by invasive tree species.

Figure 50: Share of forest area dominated by introduced tree species of the total forest area (percent) for countries in 2010

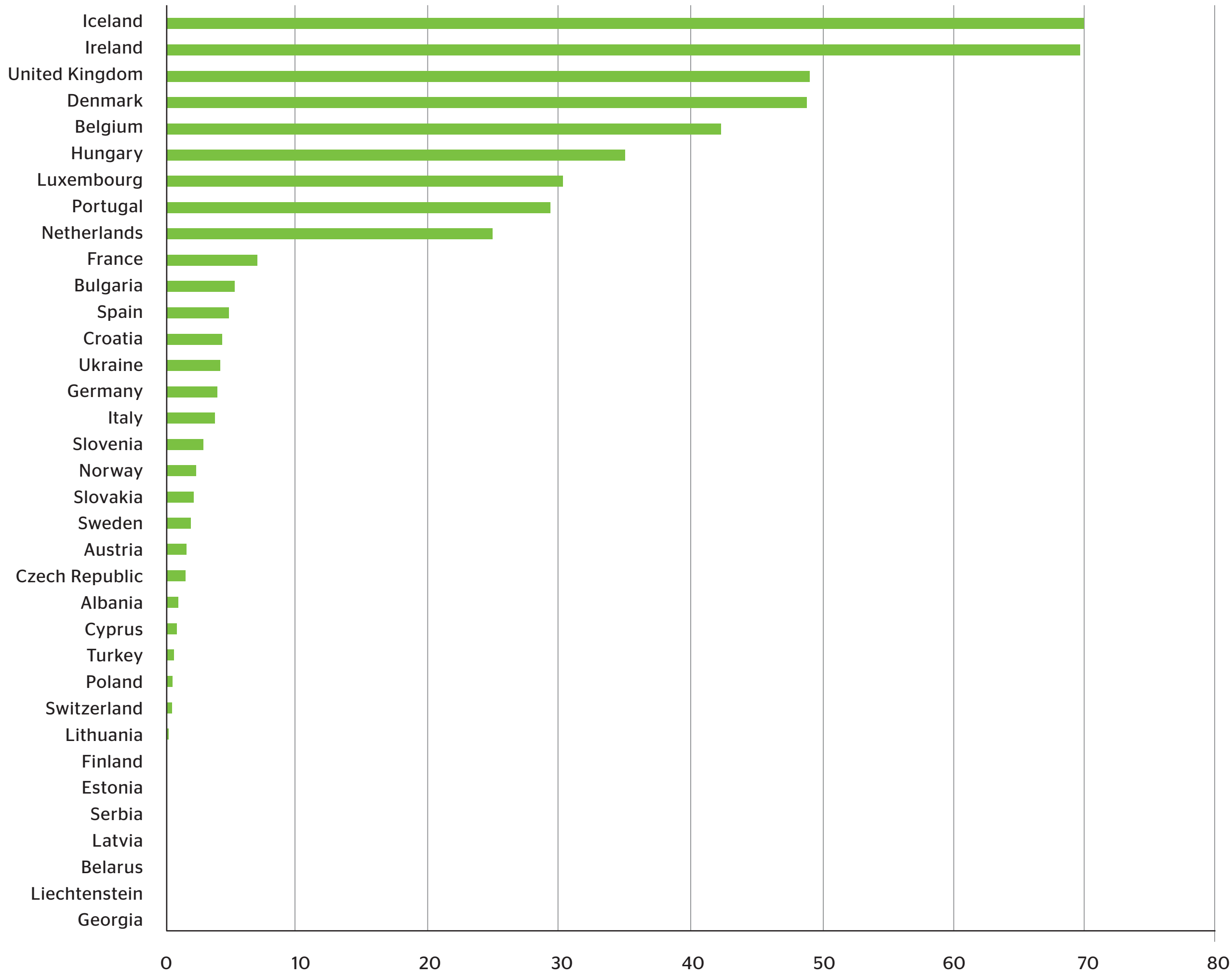


Table 27: Total area occupied by *Robinia pseudoacacia* in 2010 (based on available data) and *Pseudotsuga menziesii* in 2008 (based on Dossier Douglasie, 2008) in selected European countries

Region	Robinia pseudoacacia		Pseudotsuga menziesii	
	Area (hectares)	Percent of total forest area	Area (hectares)	Percent of total forest area
Austria	29 000	0.8	-	<< 0.2
Croatia	56 000	2.9	-	-
Czech Republic	-	-	-	0.2
France	190 000	1.2	427 000	2.9
Germany	-	-	179 000	1.7
Hungary	400 000	19.6	-	-
Slovenia	9 000	0.7	-	-
Switzerland	-	-	-	0.2

Table 28: Trends in area of introduced tree species by regions

Region	Area				
	(1 000 hectares)				%
	2000	2005	2010	Annual change (2000-2010)	Change rate (2000-2010)
North Europe	1 075	1 096	1 126	5	0.5
Central-West Europe	3 777	3 873	3 950	17	0.4
Central-East Europe	1 116	1 189	1 243	13	1.1
South-West Europe	2 065	2 137	2 238	17	0.8
South-East Europe	317	357	410	9	2.6
Europe without the Russian Federation	8 350	8 652	8 966	62	0.7

Note: Missing data were replaced by duplicates of the nearest available reference year.

Indicator 4.5 Deadwood

Introduction

Volume of standing deadwood and of lying deadwood on forest and other wooded land classified by forest type.

Deadwood is both an important substrate for a large number of forest species such as insects and other invertebrates and a refuge and nesting place for several mammals and birds.

Deadwood can be considered as an array of microhabitats that evolves continuously through time towards increasing decay and is distinguished by associated species. The amount of deadwood in natural forests depends on many factors such as tree species composition and structure, stage of succession, type and frequency of natural disturbance in the region, type of management, and soil and climatic characteristics (EEA, 2008). The amount of deadwood varies considerably between undisturbed and managed forests. Late development stages of natural forests are characterized by a large amount and diversity of deadwood.

The type of deadwood is important and refers to properties such as whether deadwood is standing or lying, size-dimensions and tree species of deadwood (Verkerk et al., 2011). In general, lying deadwood is more species rich than is standing deadwood (Berg et al., 1994; Franc, 2007; Heilmann-Clausen and Christensen, 2004), but some species or species assemblages are confined to standing or downed deadwood only (Franc, 2007; Harmon et al., 1986; Jonsell et al., 1998), indicating that both deadwood types are important. Felling residues form yet another type important to many species (Jonsell et al., 2007). The size dimension (diameter) of deadwood is also an important deadwood property, because different saproxylic species are confined to different size-dimensions (Grove, 2002; Heilmann-Clausen and Christensen, 2004).

As the European forests have been managed over long periods of time, the late development phases are missing or scarce. Because of the lack of deadwood in many forests, several of the deadwood-dependent species are endangered. Indeed, the increase in the amount of deadwood is seen as a potential management option to increase biodiversity in most of Europe's forest types (EEA, 2008). On the other hand, in some circumstances, accumulated deadwood may increase the risk of insect outbreaks.

Countries were asked to provide updates for deadwood for 2010 and additional trend information for the years 1990, 2000 and 2005. For the year 2010, countries were asked also for the first time to provide deadwood data by forest type. Data descriptive text is presented in the following sections.

Status

Total deadwood, standing and lying

In total twenty-one countries, which account for 92 percent of forest in the FOREST EUROPE region, provided information on the state of deadwood in 2010. Values reported here concern deadwood in forests. Deadwood on other wooded land is not discussed here as data did not allow for a comprehensive assessment. The weighted average volume of total deadwood, as the sum of both standing and lying deadwood, is about 20.5 m³/hectare in the forest area of the FOREST EUROPE region. This is due to the large stock of deadwood in the forest of the Russian Federation. Estimates for total deadwood amounts average out to about 10 m³/hectare for Europe, without the Russian Federation. This is consistent with what has been reported earlier in European assessments. When looking at individual regions, deadwood amounts range from 8 m³/hectare in North Europe to 15 m³/hectare in South-East Europe. At the country level, the estimates for standing and lying deadwood range between 5 and 15 m³/hectare for most countries. Outliers are countries such as Belarus and the United Kingdom that reported values below 5 m³/hectare. The Russian Federation, Lithuania and Ukraine report figures above 20 m³/hectare (Figure 51), while Slovakia has reported a very high average amount of standing and lying dead wood of 40 m³/hectare.

Caution is needed when interpreting any averaged data. In the explanatory information provided by countries, it was remarked that volume of deadwood per hectare is calculated based on the total forest area, while the area on which deadwood may occur is smaller so that part of the forest area does not have any deadwood.

Total deadwood, standing and lying, and by forest type

Countries were asked for the first time to report deadwood data by the new scheme of 14 pan-European forest types, for the reference year 2005. The average number of countries reporting on forest types was around five per forest type, although for some forest types the average data depend on the reporting of only two to three countries. While the lowest amounts of deadwood can be found in floodplains, mires and swamp forests and in forests with introduced species, quite remarkably high amounts can reportedly be found in non-riverine alder, birch or aspen forest and in Alpine coniferous forests. No data coverage was provided for either coniferous forests of the Mediterranean, Anatolian and Macaronesian regions or for broadleaved evergreen forests. Although the comprehensiveness of the data for standing and lying deadwood by forest types was rather moderate in 2010, the results (see Figure 52) are encouraging as they give a first insight into the availability of deadwood in different forest types in a way that is independent of country groupings.

Figure 51: Average volume of standing and lying deadwood by country, reference year: 2010 (m³/ha)

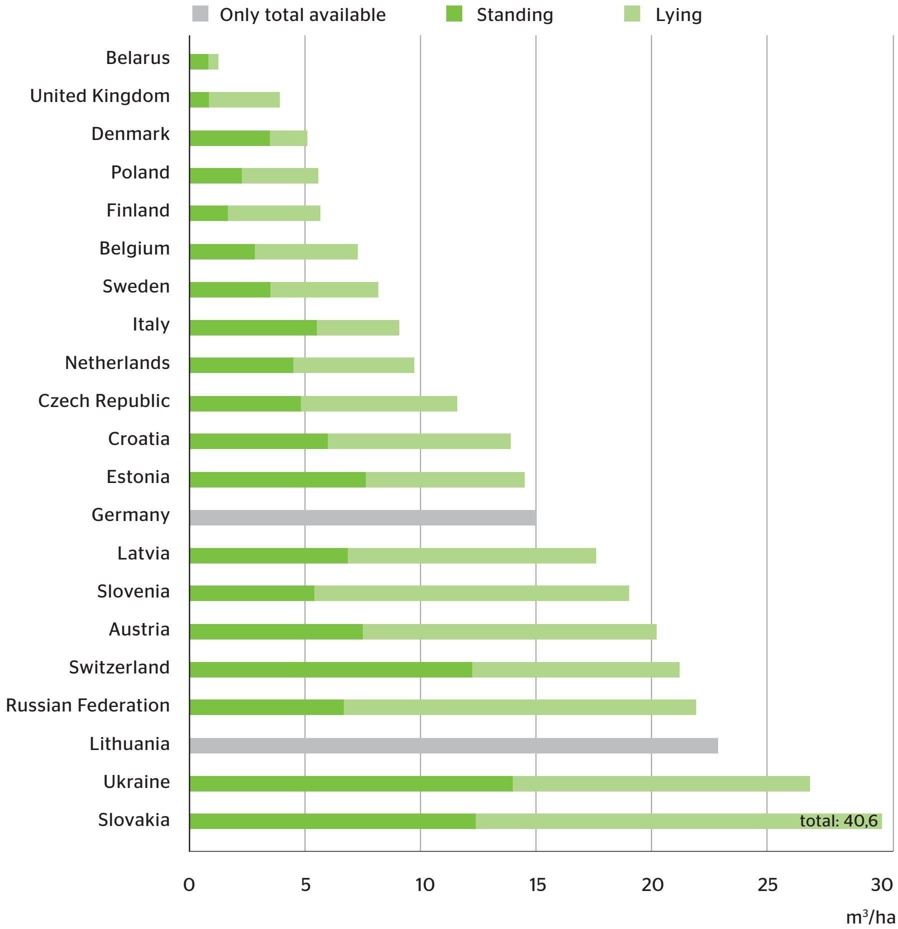
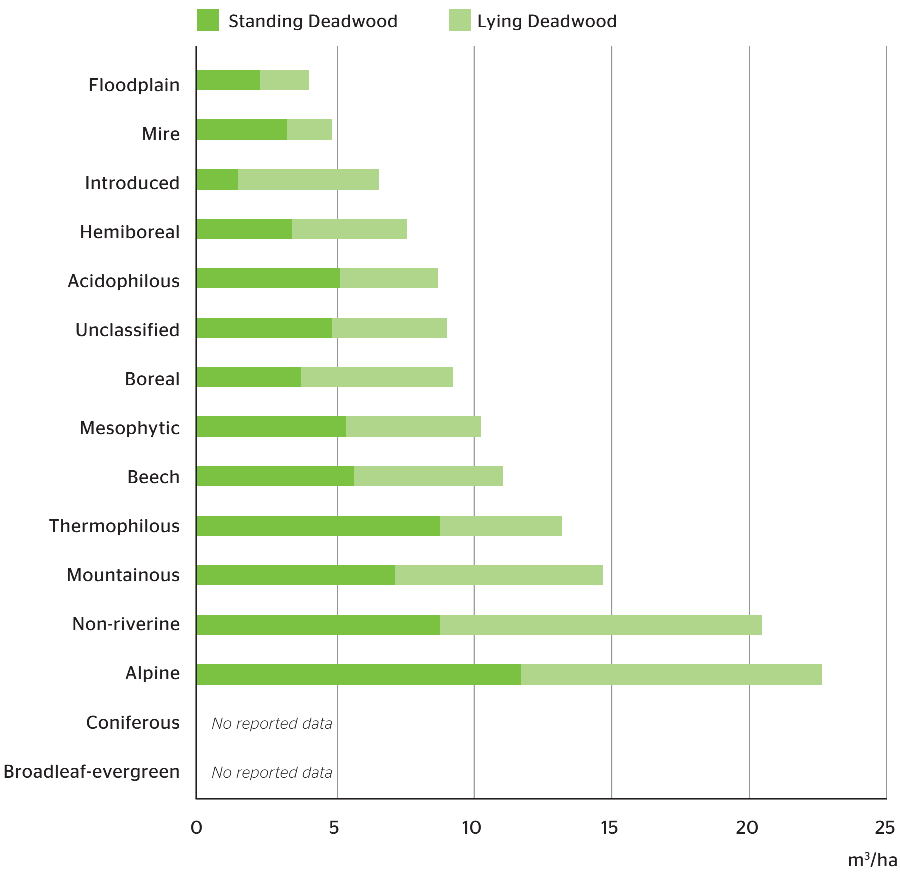


Figure 52: Average volume of standing and lying deadwood by forest type, based on available data for Europe without the Russian Federation, reference year: 2005 (m³/ha)

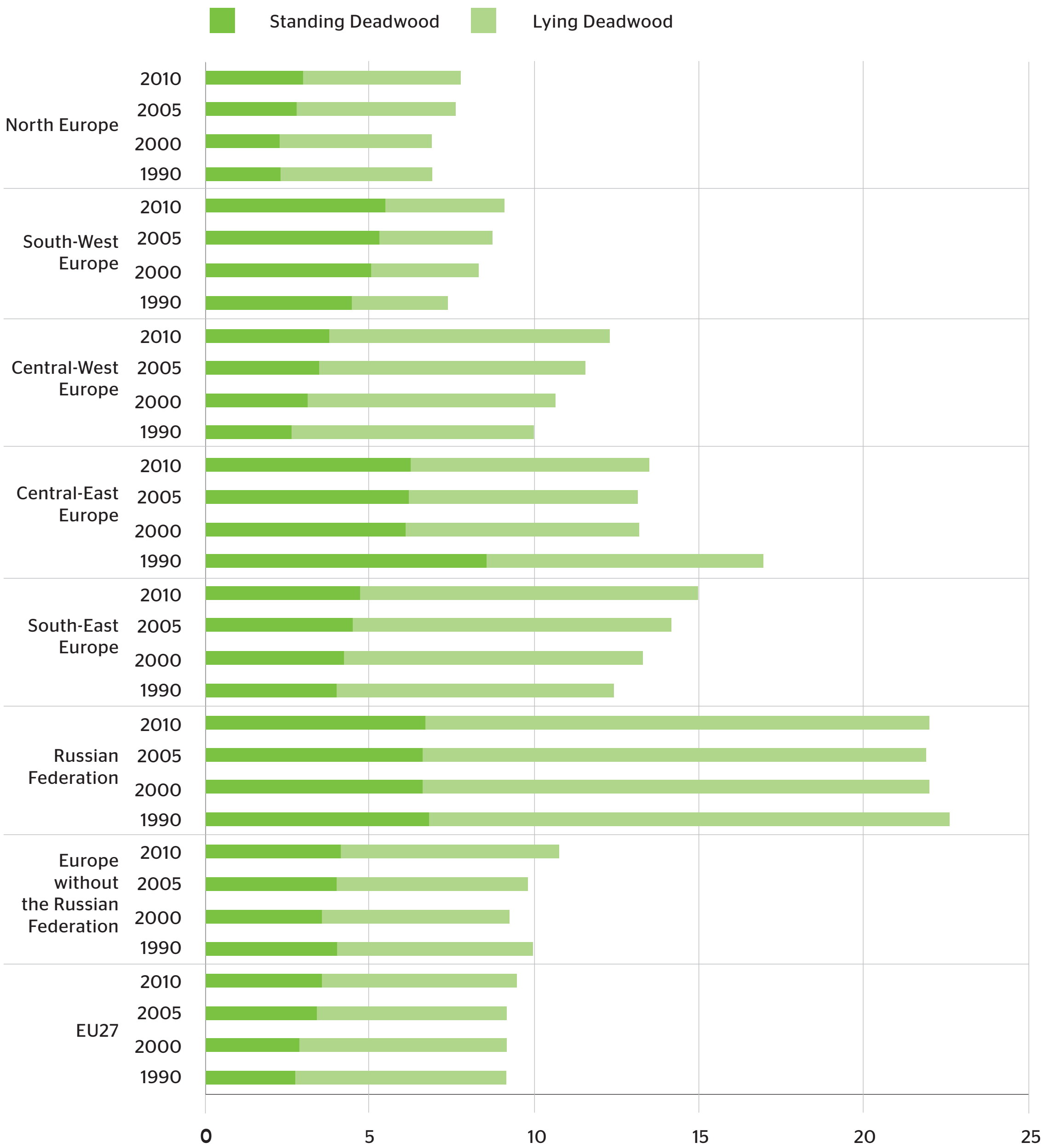


Trends 1990-2010

A sufficient amount of data allowed for the analysis of trends for the regions of Central-West Europe and North Europe. The data for these regions suggest a continuing increase of deadwood in forests. For other regions, the relative importance of the actual available trend information was balanced by complementing missing data. Nevertheless also for these regions, a similar trend can be assumed with some caution. The amount of deadwood in the Russian Federation, considering its size, remains relatively constant (see Figure 53).

Countries have stated several reasons for the increase in amounts of deadwood, such as the effect of policy that stimulates nature-oriented forest management through actively increasing the amount of deadwood in managed forests either as a result of governmental policy or through requirements set for forest certification; but also large disturbances such as storms can result in considerable increases.

Figure 53: Weighted average volume of standing and lying deadwood by regions, for the years: 1990, 2000, 2005, 2010. Based on data for those countries where data were available for at least one reference year. Missing data were replaced by duplicates of the nearest available reference year (m³/ha)



Indicator 4.6 Genetic resources

Area managed for conservation and utilization of forest tree genetic resources (in situ and ex situ gene conservation) and area managed for seed production.

Conservation and use of forest genetic resources is an important component of sustainable forest management. Genetic diversity ensures that forest trees can survive, adapt and evolve under changing environmental conditions. Genetic diversity is also needed to maintain the vitality of forests and to cope with pests and diseases. Forest management in Europe is largely based on managing wild or semi-wild tree populations, and the establishment of new forests, through artificial or natural regeneration, always involves deployment of genetic material.

Nearly all European countries have established networks of stands or larger forest areas which are managed for conservation of forest genetic resources. *In situ* gene conservation units harbour tree populations which have adapted to specific environmental conditions. These units are typically located in forests managed for multiple uses, protected areas and seed stands. *Ex situ* gene conservation units consist of stands and clone collections established with collected or multiplied genetic material. Seeds of forest trees are produced in specific areas established (seed orchards) or selected (seed stands) for this purpose.

The previous European scale reporting efforts for genetic resources were hampered by a lack of harmonized data on areas managed for gene conservation of forest trees, especially for *in situ* conservation. In addition, it was not clear to countries how these areas should be managed so that they contribute to gene conservation at the pan-European level. This made it difficult to assess the status of gene conservation efforts at the pan-European level.

During 2007-2010, the EUFGIS[5] project addressed these problems and developed pan-European minimum requirements and common data standards for dynamic gene conservation units of forest trees in collaboration with experts in EUFORGEN member countries. The minimum requirements are based on the concept of dynamic gene conservation which emphasizes maintenance of evolutionary processes within tree populations to safeguard their potential for continuous adaptation. Dynamic gene conservation units largely consist of tree populations growing at their natural sites within the environment to which they are adapted (*in situ*). In some cases, artificial but dynamically evolving tree populations elsewhere (*ex situ*) also contribute to dynamic gene conservation. These also include landraces of introduced tree species which have adapted to specific environmental conditions in Europe. Other *ex situ* stands, clone collections and provenance trials are designed to maintain the sampled genetic material without evolutionary processes.

Status

Data available

A total of thirty-nine countries reported the 2010 data on this indicator (or part of it) to the EUFORGEN Secretariat at Bioversity International (Annex Table A4.6, data per country). Of these countries, only twenty-five also provided the 1990 and 2000 data for the previous State of Europe's Forests report. Most countries (thirty-one) used the EUFGIS Portal (http://portal.eufgis.org) to report areas managed for gene conservation. The EUFGIS database is populated by national data providers and it contained data on 2 358 units in December 2010. The units harbour a total of 3 137 tree populations and most of them (90 percent) are managed for *in situ* gene conservation. The reported data on area managed for *ex situ* gene conservation include both dynamic and static *ex situ* gene conservation units. Areas managed for seed production include seed orchards and seed stands. Seed sources identified for seed collection in the national registers of basic material were excluded as they are not actively managed for seed production.

The total areas managed for gene conservation per country do not provide adequate information to assess the status of gene conservation of various tree species at the pan-European level as their distribution ranges and biological characteristics are considerably different. Therefore, the countries were also asked to report the areas per tree species. Annex Table A4.8 shows species-specific data for selected tree species included in the EUFGIS database and/or listed under the Council Directive (1999/105/EC) on the marketing of forest reproductive material. As the EUFGIS database provides geo-referenced data on the dynamic gene conservation units, the geographical distribution of units was compared with the distribution maps of selected tree species to draw some conclusions on the geographical representativeness of the gene conservation efforts at the pan-European level.

Area managed for genetic resources

A total of 476 385 hectares were managed for *in situ* gene conservation of forest trees in thirty-eight countries in 2010. The total area managed for *ex situ* gene conservation was 7 697 hectares in thirty-six countries, and the total area managed for seed production was 872 077 hectares in thirty-nine countries.

A total of 142 tree species (including subspecies and hybrids) was reported for this indicator. However, these species are not equally managed for gene conservation (*in situ* and *ex situ*) and seed production. A large part of *in situ* gene conservation and seed production efforts has been targeted to widely occurring, stand-forming tree species which are important for forestry. A group of five economically important tree species (*Abies alba, Fagus sylvatica, Picea abies, Pinus sylvestris* and *Quercus petraea*)

[5] Establishment of European Information System on Forest Genetic Resources, www.eufgis.org

alone account for 74 percent and 66 percent of the total areas managed for in situ gene conservation and seed production, respectively. There are also other economically important tree species (e.g. *Castanea sativa, Junglans regia* and *Quercus suber*) for which only small areas are managed for *in situ* and/or *ex situ* gene conservation. Furthermore, very few gene conservation areas are managed for scattered tree species (e.g. *Populus nigra, Sorbus domestica* and *Ulmus laevis*) which are often considered, incorrectly, to have low importance. In addition to specific uses, many scattered tree species have a high value in terms of maintaining forest biodiversity and/or providing ecosystem services.

The assessment of geographical representativeness of the gene conservation areas in Europe showed that there is a clear need to develop species-specific gene conservation strategies at the pan-European level. There are significant gaps in the gene conservation efforts even in the case of common forestry species for which large areas are managed for gene conservation (see Figure 54). The geographical representativeness of the gene conservation areas is considerably lower for most other tree species in Europe. These gaps mean that large amounts of valuable genetic resources are not managed for long-term gene conservation.

Trends 2000-2010

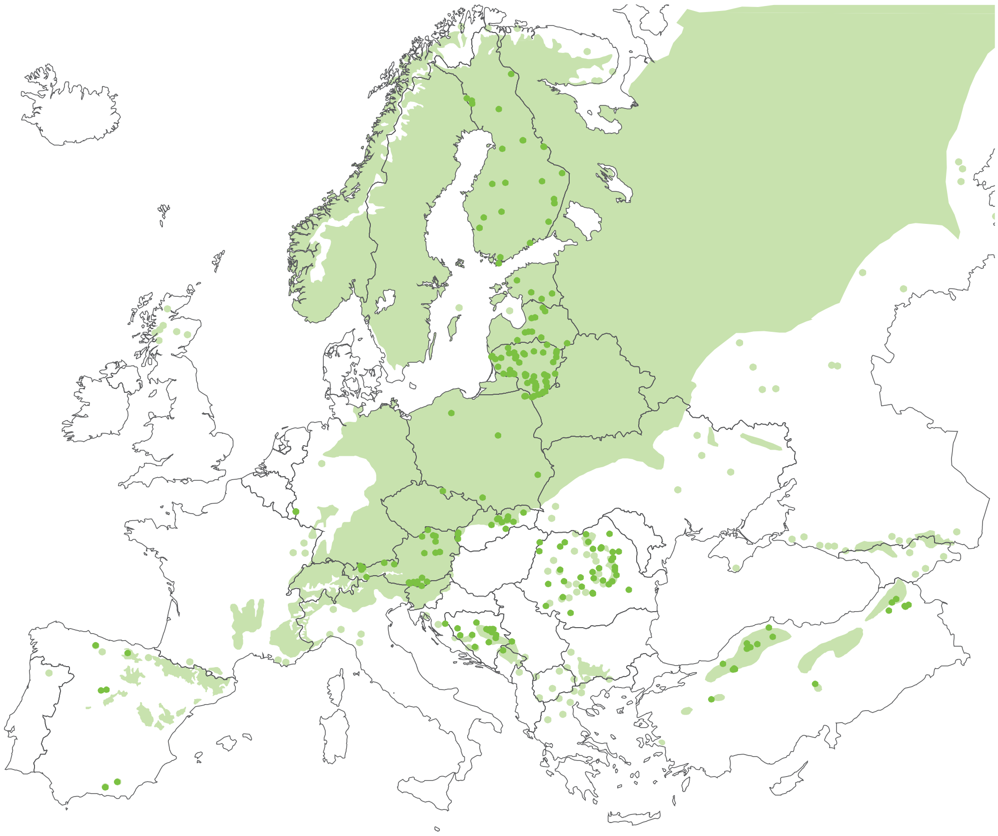
Due to the new pan-European minimum requirements for the gene conservation units, the trend for in situ gene conservation areas per country cannot be reliably analysed between 2000 and 2010. However, despite the stricter definition applied in 2010, a total of fourteen countries reported increased areas managed for *in situ* gene conservation during this period (twenty-four countries provided data for both 2000 and 2010).

The trend in areas managed for *ex situ* gene conservation was analysed based on those countries (thirty-one) which provided their data for both 2000 and 2010. The area increased in twenty-two (70 percent) countries and decreased in nine (30 percent) countries between 2000 and 2010. The total area managed for *ex situ* conservation in these thirty-one countries increased from 6 350 hectares in 2000 to 7 469 hectares in 2010.

A large part of the increase in the area of seed production areas is explained by the fact that more countries reported their seed production areas in 2010 than before. However, the trend was also positive in those countries (thirty) which provided data for both 2000 and 2010; the seed production area increased in nineteen (63 percent) countries and remained at the same level in two (7 percent) countries during this period. The total area managed for seed production in these 30 countries increased from 531 432 hectares in 2000 to 825 658 hectares in 2010.

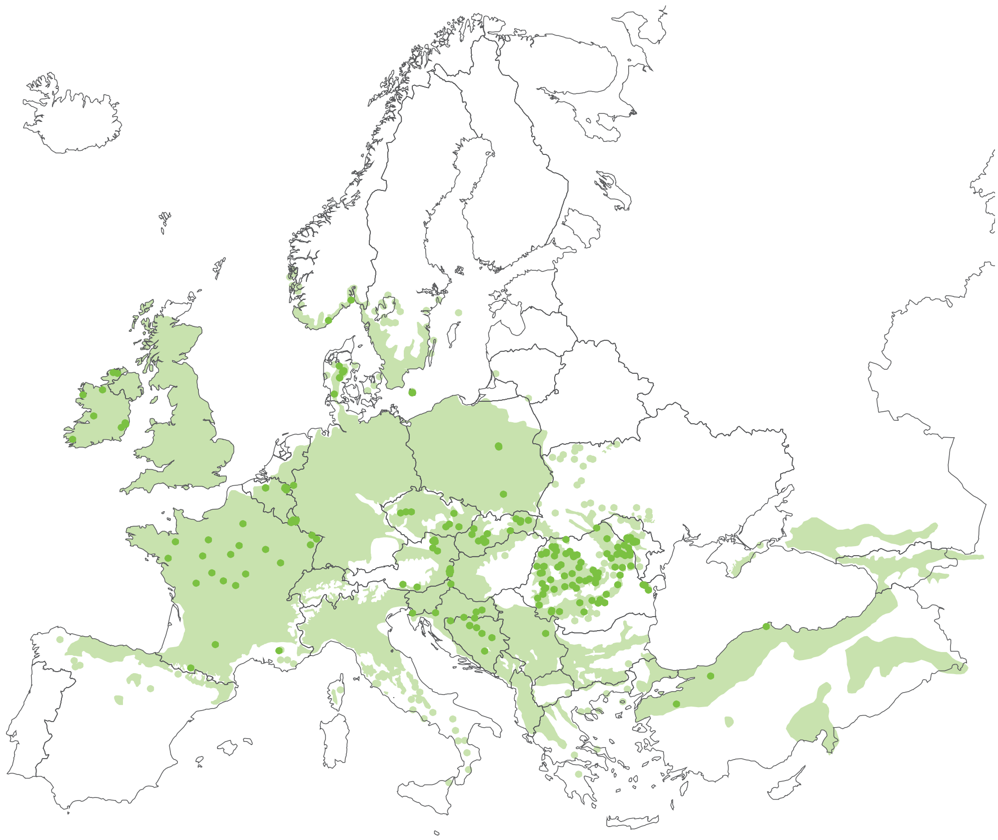
The trends in areas managed for species-specific gene conservation and seed production were analysed based on those countries which provided their 2000 and 2010 data, and taking into account only those tree species which were reported for both years. Areas managed for *in situ* gene conservation increased for 24 species (48 percent) while the areas decreased for 26 species (52 percent of 50 species reported). In case of *ex situ* conservation, the areas increased for 33 species (65 percent) and decreased for 18 species (35 percent of 51 species reported). The trend in seed production was strongly positive; during the 2000-2010 period, the area increased for 43 species (75 percent) and decreased for 14 species (25 percent of a total of 57 species reported).

Figure 54: Gene conservation units managed for *Pinus sylvestris* and *Quercus petraea* and the distribution maps of the two species, (Data sources: EUFGIS Portal (http://portal.eufgis.org) and EUFORGEN (www.euforgen.org)



Pinus sylvestris

Gene conservation units



Quercus petraea

Gene conservation units

Indicator 4.7 Landscape pattern

Landscape pattern: Landscape-level spatial pattern of forest cover.

Forest spatial pattern refers to the spatial distribution of forest across the landscape. This indicator aims to illustrate landscapes with different degrees of connectivity, as well as to identify landscapes undergoing fragmentation/ defragmentation processes over time. Landscape pattern and their changes are important because they impact ecological processes such as gene flow, pollination, wildlife dispersal, or pest propagation in different ways.

Forest connectivity is based on forest availability and distance between patches; it refers to the degree to which the landscape facilitates or impedes the movement of species with specific dispersal capabilities. Forest fragmentation relates to three main alterations in the landscape: insufficient total forest habitat area, isolation of forest habitat patches, and edges where forest habitat areas abut modified ecosystems. The two key components in a pattern assessment are, firstly, the spatial structure and connectivity of forest cover and, secondly, the landscape mosaic composition and interface zones of forest with adjacent habitats in a landscape.

In the past decades, the area of forest in Europe has increased mainly due to the planting of new forests and the natural expansion of forests onto former agricultural land. This increase, however, is not homogeneously distributed. Furthermore, nationally aggregated area estimates do not provide an insight into the change in forest spatial pattern after the cumulative impact of forest losses and gains. For example, new forest areas in a region can contribute significantly to habitat connectivity (such as woodland islets in the landscape acting as new stepping stones between isolated patches). On the contrary, new forest areas may have no impact on connectivity when they are planted too remotely from other woodlands. They may have a minor impact on connectivity when they only enlarge an existing patch. Fragmentation of forest cover typically associated with forest loss is about the isolation of forest areas within other land use forms caused by the expansion of agricultural areas, transport infrastructures or settlements. Typically, landscapes with mixed forest pattern where forest is intermingled with agricultural and artificial lands are fragmented and are expanded in rural lands close to cities. Fragmentation may also be temporary and recoverable within forested areas after forest operations such as cuttings.

It has not been possible to evaluate the current situation and trends in forest patterns in Europe from national pattern data due to their poor availability and lack of harmonization according to a commonly agreed definition and assessment methodology. For the purposes of this status report, a European-wide case study on landscape forest pattern status at year 2006 and its changes in the time period 1990-2006 is presented with a focus on forest connectivity and the landscape composition in the areas surrounding forest lands. The proposed definition and methods represent an applicable assessment scheme, suitable for large regions and complex implementation such as for the whole European territory (Estreguil and Caudullo, 2011; Estreguil and Mouton, 2009; Saura et al 2011). Implementation is done at the European Commission – Joint Research Centre (JRC).

The data available

The spatial pattern of forest areas was assessed from a low- and high-scale perspective from two available datasets. The Corine Land Cover based forest map (available for years 1990, 2000 and 2006) provides broad patterns of forest with a minimum mapping unit of 25 ha. The JRC 25 m Pan-European forest map (available for 2006 (Kempeneers et al, in review)) shows spatial details down to approximately 1 ha, which is relevant for identifying hedgerows, woodland islets and perforations in large forest patches.

Two pattern measures were used (Saura et al, 2011; Estreguil and Caudullo, 2011; Riitters et al, 2009). The degree of connectivity of the forest cover was calculated locally using landscape units of 25 by 25 km². The other forest pattern measure aimed to answer where and how each hectare of forest land is surrounded by natural/semi-natural lands, or is intermingled with agricultural and artificial lands.

Status

The European-wide map in Figure 55 shows the degree of landscape level forest connectivity for the year 2006 from a high-scale perspective and for species dispersal at 1 km. Similarly, European maps for the years 1990, 2000 and 2006 were obtained to provide a low-scale perspective. Forest includes broadleaved, coniferous and mixed forest. The average of the landscape level normalized connectivity per country is reported in Figure 56. Countries with on average a similar forest cover per landscape unit exhibited different degrees of connectivity. This was, for example, the case of Latvia that showed on average a less connected forest landscape pattern than Estonia; the same for the Czech Republic versus Slovakia, or for United Kingdom and Ireland versus Denmark.

The ranking of countries from low to high forest connectivity was similar for the two scales of observation except for a few differences for countries close in connectivity degree (France and Spain had a similar degree of connectivity at a broad scale while France was more connected at a high scale). Concerning the landscape surrounding a forest, Figure 57a shows the forest share in the four forest pattern types with countries ranked per increasing 'core natural' share. Countries may have on average a strongly connected forest pattern that is not obviously associated with a high share of 'core natural' forest landscape pattern, such as, for example, in Estonia in contrast to Finland. On average, half of the forest lands in Estonia are intermingled with agricultural and/or artificial lands (share of 'mixed forest' and 'some natural' above 50 percent).

Trends

European-wide maps on changes in forest connectivity are for the first time available based on a low-scale dataset for the time period 1990-2006 and enable the identification of areas with significant loss (or gain) of connectivity (see Figure 58 for 2000-2006).

Average country profiles in landscape level connectivity (Figure 56) do not exhibit a clear unique trend over the short time period (1990-2006) and at low-scale observation: stable for some countries; an increase for Czech Republic, Poland, and Lichtenstein; a decrease for other countries like Estonia, Latvia, Portugal, Netherlands, and Denmark. Regarding the landscape surrounding forest, two countries were illustrated in Figure 57b to show the observed trends of decreasing share of core natural forest pattern (likely intact forest and including forest edges adjacent to natural lands) and an increased amount of forest intermingled with agricultural and/or artificial lands.

Figure 55: Landscape level forest connectivity for selected European countries, 2006 (high scale)

The degree of forest connectivity is calculated per landscape unit 25 x 25 km² on the basis of the JRC forest type map of year 2006 (spatial details down to 1 ha).

The index varies between 0% and 100% (all forest maximally connected, no fragmentation), with the spatial arrangement of forest, in particular inter-patch distances and patch sizes, and with dispersal abilities of forest species (1 km average dispersal for this map).

The index was computed with Conefor Sensinode freeware (http://www.conefor.org) and further elaborated in GIS (Estreguil and Caudullo, 2011).

Figure 56: Country average of normalized connectivity per landscape unit for 1990, 2000, 2006 (low scale based on Corine Land Cover, high scale not shown, countries ranked per increasing connectivity)

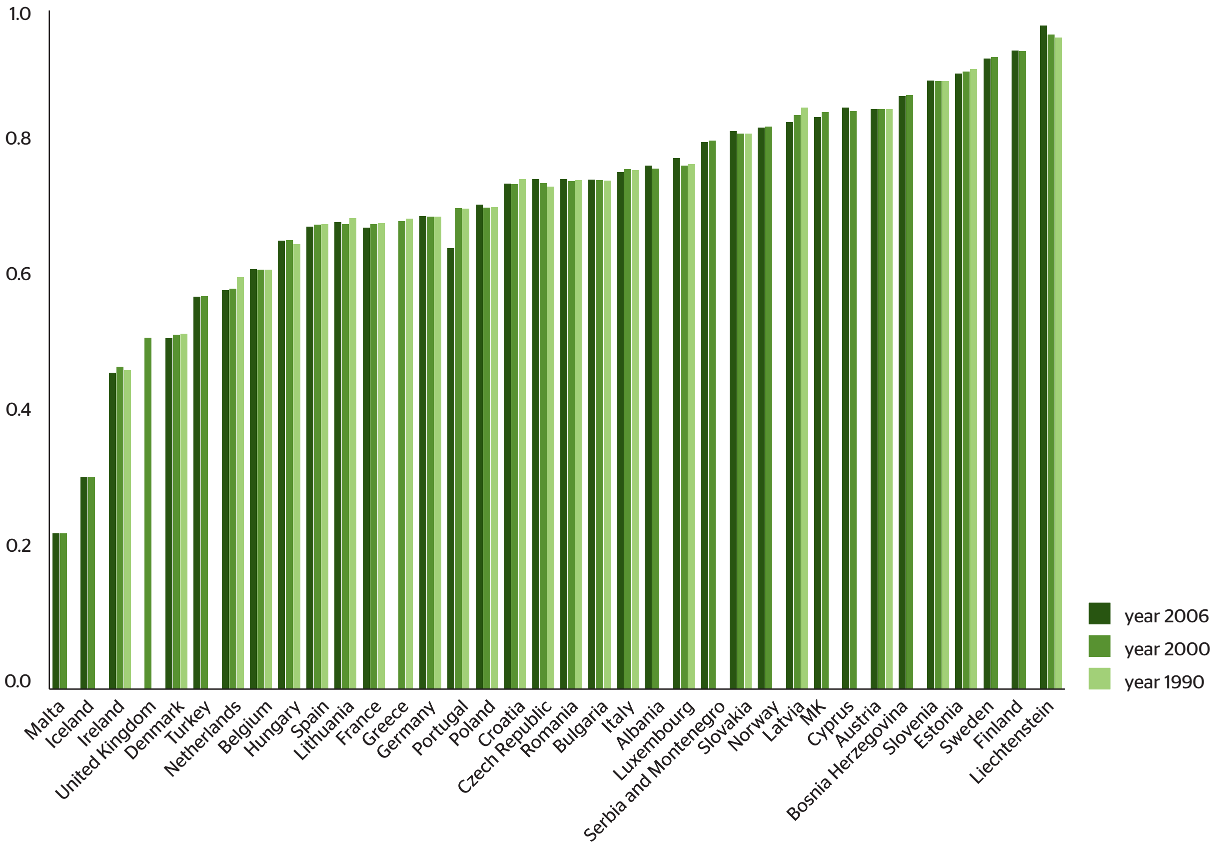
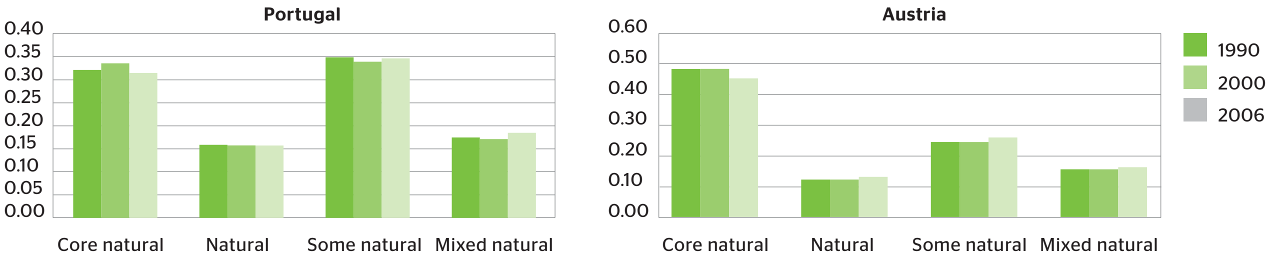


Figure 57: (a) Country based forest cover shares in the four forest pattern types in 2006 (low scale). It shows how much forest is 'core natural' likely intact and always adjacent to other natural/semi-natural lands, or 'mainly natural', how much is 'mixed natural' thus fragmented by agricultural and/or artificial land uses, still in a predominant natural context, or 'some natural' when woodlands are embedded in a predominantly agricultural or artificial context. Countries are ranked per increasing share of 'core natural' forest pattern. (b) Changes in shares in 1990, 2000, and 2006 for two countries. 'Mixed natural' and 'some natural' patterns shares were increased at the expenses of 'core natural' in these two examples (Estreguil and Caudullo, 2011)



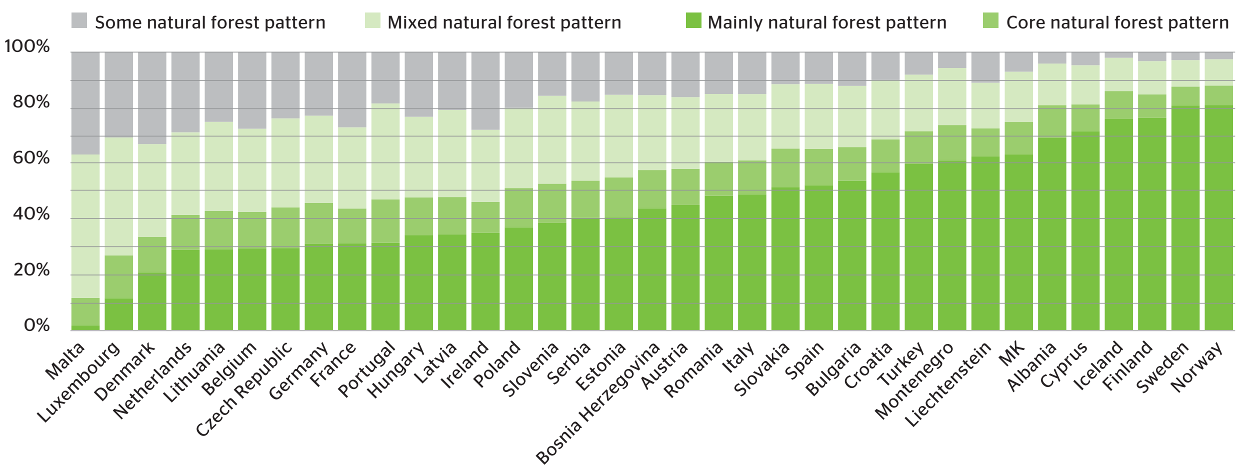
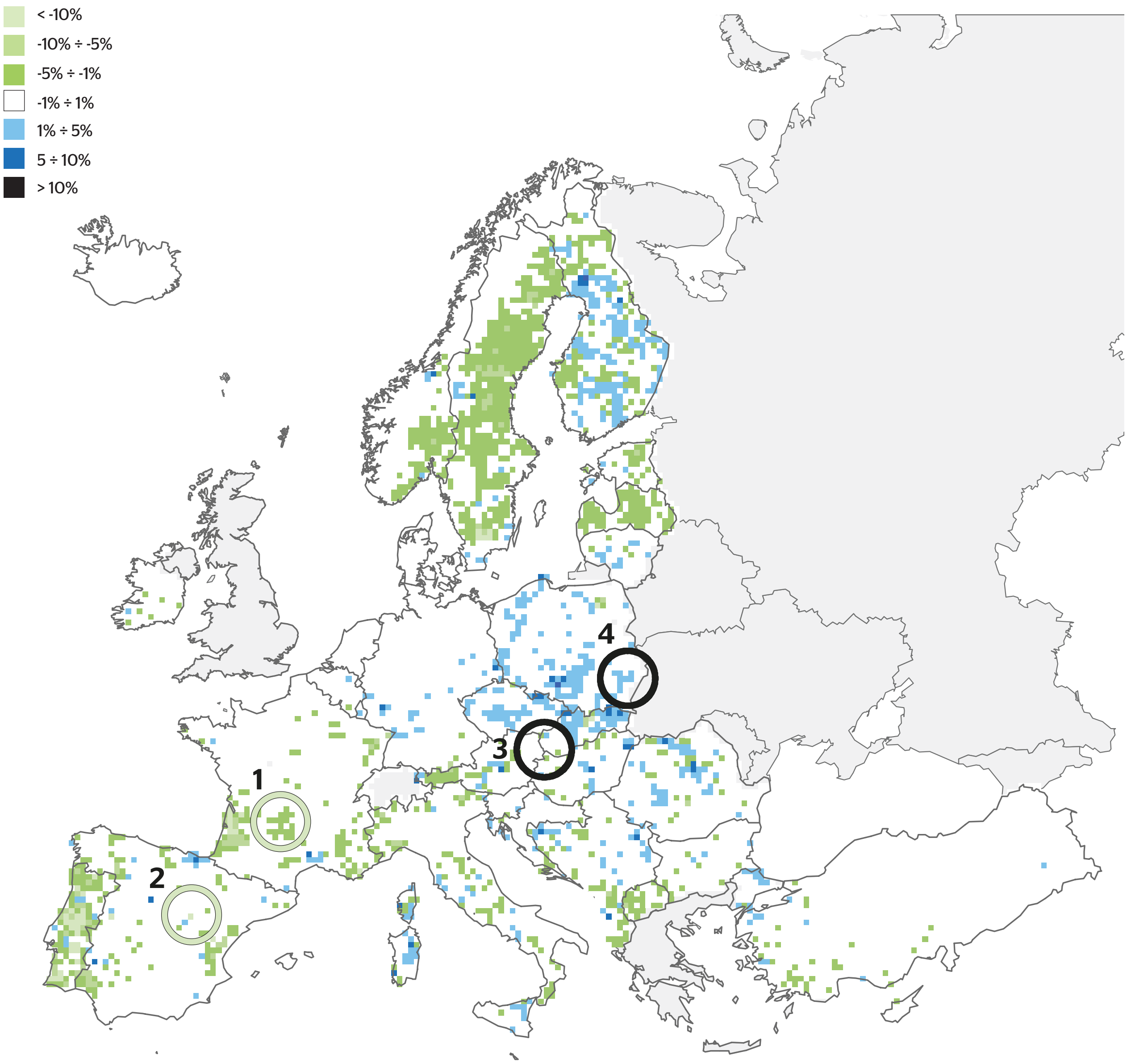


Figure 58: European-wide changes in forest connectivity in the 2000-2006 time period (low scale)



Change in degree of forest connectivity is calculated per landscape unit in the time period 2000-2006 (reference year 2000). Connectivity maps for year 2000 and 2006 are derived as described in Figure 55 from the low scale Corine Land Cover data (spatial details down to 25ha only).

On the map, cases 1 (building-up of highway) and 2 (fire) show landscapes with respectively medium and high connectivity loss. Cases 3 (enlarged forest patches after land abandonment) and 4 (restored woodlands linear features) show landscapes with respectively minor and medium connectivity gain (Estreguil and Caudullo, 2011).

Indicator 4.8 Threatened forest species

Number of threatened forest species, classified according to the World Conservation Union (IUCN) Red List categories in relation to total number of forest species.

The most recognizable form of depletion of biodiversity is the loss of plant and animal species. Slowing down the rate of species extinction due to anthropogenic factors is a key objective of biodiversity conservation. Threatened forest species are seen as indicators of change in the forest ecosystems.

According to the IUCN Red List categories, a species is listed as threatened if it falls in the critically endangered, endangered or vulnerable categories. A forest species is one that is dependent on a forest for part or all of its requirements for day-to-day living or reproduction[6]. Therefore, an animal species may be considered a forest species even if it does not spend most of its life in a forest.

The relationships between threatened species and forest structure and its components are complex. Threats to a certain species are often the result of multiple factors, making it difficult to determine clear causalities. In particular, the required amount and quality of deadwood need more research and quantification. Many species are also dependent on small key biotopes or habitats within the managed forests. To date, these elements have not been sufficiently monitored or studied in all countries in Europe, but there are indications of a change of forest management practices towards greater integration of biodiversity aspects.

Data availability

Collecting information on various species groups is very demanding and time-consuming. The enquiry for this report requested data on numbers of threatened forest species and their relation to the total number of forest species for trees, birds, mammals, other vertebrates, invertebrates, vascular plants and cryptogams and fungi. The data coverage in terms of reported countries is the most extensive on the number of threatened tree species, vascular plants, mammals and birds, and least extensive on the number of invertebrates, cryptogams and fungi.

In total, twenty-seven countries reported figures for threatened forest species in at least one of the organism groups for the 2010 assessment. More countries have provided information for 2010 as compared to previous assessments thus improving the reporting situation. The category of threatened forest tree species is best covered. It is noted that information is particularly lacking in countries of Central-East, South-East and South-West Europe, thus giving only a partial picture of threatened forest species in those regions.

The data provided by countries are very heterogeneous. While some countries have detailed inventories of forest species and threatened species (Red Lists), others could provide only fragmentary information or none at all. Visible differences in the numbers of threatened species between neighbouring countries, such as Latvia and Lithuania, signal either a lack of data or different approaches to reporting.

In several countries, data reported for 2010 are identical to data from 2005 or before. Often they come from national classification systems rather than from the IUCN Red List. Further, secondary sources are used, and data often represent estimations due to the lack of quantitative measurements. Also, the reliability and accuracy of the information vary depending on the quality and coverage of data as well as on how the risk of becoming a threatened species is assessed. In some cases reporting countries have occasionally stated notable difficulties in distinguishing between forest and non-forest species or in providing figures for the total number of forest species.

In general, species richness is higher in southern as compared to northern Europe; however, forest-occurring species are proportionally more abundant in the north and in countries with a high forest cover (Puumalainen, 2001). Therefore, comparisons of absolute numbers between countries are not always meaningful. Also, if the total number of forest-occurring species is related to the unit area, i.e. divided by the area of forest and other wooded land in a country, small countries may appear as more species-rich. When looking at the European area, the situation of threatened forest species may differ, probably being more positive than when looking at individual countries. For instance, species which have a limited distribution in one country may be classified as threatened in that country while, on the European level, the species can be more widespread.

Status

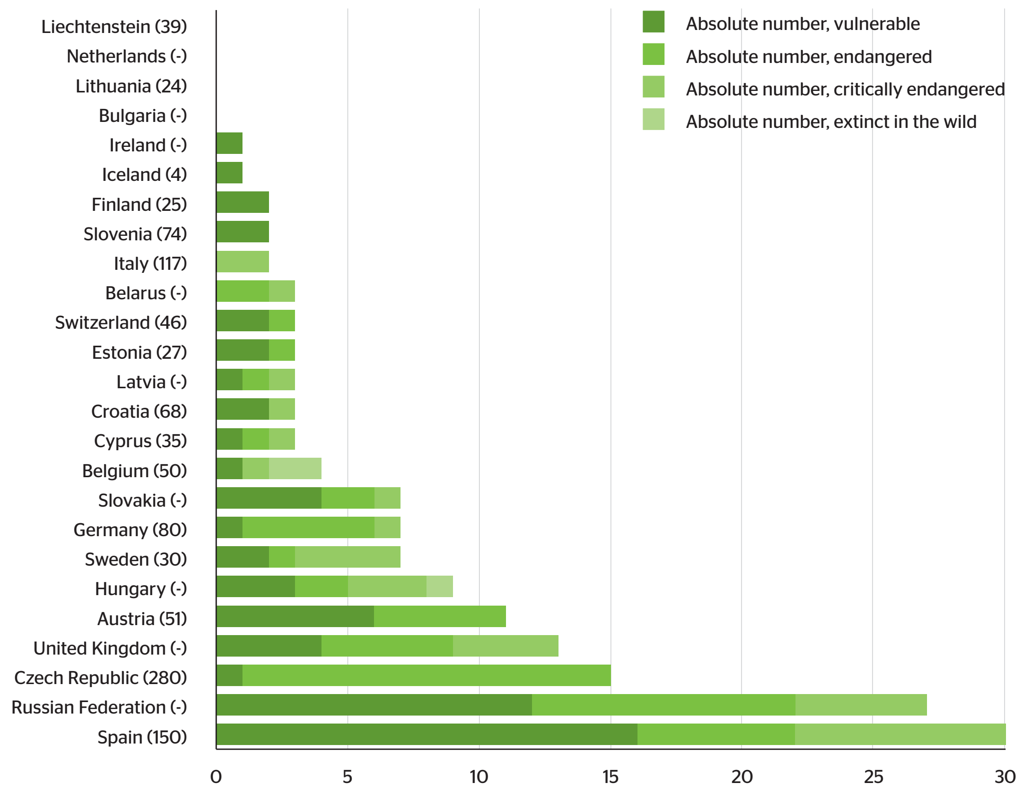
The number of threatened tree species generally ranges between one and eight species (Table 29). Five countries (Austria, Czech Republic, Russian Federation, Spain and United Kingdom) reported more than 10 forest-occurring tree species as endangered. The largest number of threatened tree species is found in the Russian Federation (27) and Spain (30). Four countries have indicated that there are no threatened tree species. On average, with some exceptions, the share of threatened tree species of the total forest-occurring tree species ranges in reporting countries from 5 to 10 percent (Figure 59). Sweden reported that, for the first time, two widespread tree species, *Fraxinus excelsior* and *Ulmus glabra*, are categorized as threatened. Their steep decline was caused by the Ash dieback and the Dutch elm disease, respectively. In total, three tree species have been reported as extinct in the wild, two in Belgium and one in Hungary (Table 30).

Table 29: Numbers of threatened[7] forest-occurring tree species, birds, mammals, other vertebrates, other invertebrates, vascular plants, cryptogams and fungi in 2010

Region	Tree species	Birds	Mammals	Other vertebrates	Other inverte-brates	Vascular plants	Fungi
Austria	11	16	13	18	-	267	88
Belarus	3	57	15	4	75	144	95
Belgium	2	11[8]	10	3	-	29	-
Bulgaria	0	12	8	17	11	0	0
Croatia	3	23	5	1	10	30	257
Cyprus	3	3	8	2	-	89	-
Czech Republic	15	248	31	47	100	771	582
Estonia	3	13	1	0	5	38	147
Finland	2	7	7	0	476	32	292
France	-	20	5	2	-	-	-
Germany	7	14	-	-	-	205	1 284
Hungary	8	2	-	-	5	-	-
Iceland	1	0	0	0	-	4	15
Ireland	1	1	-	-	10	7	2
Italy	2	15	21	3	-	-	-
Latvia	3	19	9	2	46	76	28
Liechtenstein	0	-	-	-	-	-	-
Lithuania	0	0	2	-	4	-	-
Netherlands	0	0	0	0	0	0	0
Russian Federation[9]	27	41	17	17	78	165	109
Slovakia	7	22	7	-	-	207	77
Slovenia	2	39	19	29	212	-	82
Spain	30	-	-	-	63	1 196	-
Sweden	7	10	7	3	320	54	499
Switzerland	3	28	21	81	81	107	968
Turkey	-	-	4	-	-	-	-
United Kingdom	13	0	3	0	38	29	78

[6] Ad hoc Technical Expert Group on Forest Biological Diversity 2001. Convened by the Secretarial of the CBD to prepare a report for SBSTTA-7.
[7] Threatened forest-occurring species include the IUCN Red List categories "vulnerable", "endangered" and "critically endangered".
[8] Data from 2005
[9] The Russian Federation reported the total number of threatened species by organism groups for 2010; information is not available separately for the threatened species categories 'vulnerable', 'endangered', 'critically endangered' and 'extinct in the wild' in 2010 with the exception of the 'tree species' organism group. 2005 data is used for: birds, mammals, other vertebrates, other invertebrates, vascular plants, cryptogams and fungi; 2010 data is used for tree species.

Figure 59: Number of threatened forest tree species, classified according to IUCN Red List categories, 2010. Note: The number in brackets after the country name indicates the total number of forest tree species reported by countries



An overview of the distribution of forest tree species which were classified under the IUCN Red List categories shows that about 40 percent of threatened tree species are assorted as vulnerable, 36 percent are considered endangered, and 20 percent are considered critically endangered (Figure 60). This includes trees growing at the limits of their potential range. Economically important and abundant tree species for wood production are not found amongst threatened tree species.

The total number of extinct forest-occurring species reported for 2010 is lowest for tree species, while other organism groups with higher species richness also show larger numbers. Fungi and invertebrates are the organism groups indicating the highest total number of extinct forest-occurring species (Table 30). On the other hand, some countries taking efforts to preserve species from extinction or to re-colonize extinct species could report positive results; for example, Austria noted the return of the wild cat (*Felis silvestris silvestris*) which had been extinct in Austrian forests.

Birds and mammals are the best covered categories with most data available. Typically, about 20 percent of forest-occurring bird species have been reported as threatened. Due to the high number of threatened forest-occurring birds reported for the Czech Republic (248), the most noticeable number of threatened birds is found in Central-East Europe (in total 329) while Central-West, South-East and North Europe have between 50 and 80 threatened birds. In the South-West region only one country, Italy, reported 15 threatened forest-occurring birds.

Most mammals reported to be threatened are found in Central-East Europe, although country coverage is rather limited. Information is particularly lacking in countries of South-East and South-West Europe, thus giving only a partial picture of threatened forest species in those regions. Best covered are North Europe and the Russian Federation. The number of threatened mammals ranges from one in Estonia to seventeen in the Russian Federation. The proportion of threatened mammals out of the total number of forest-occurring mammals ranges between 5 and 41 percent in the reporting countries. More than 25 percent of the mammals are reported endangered in Austria, Belarus, Cyprus, Switzerland, Italy and Czech Republic.

The proportion of threatened vascular plants out of the total number of forest-occurring vascular plants ranges from 1 to 30 percent. The highest absolute numbers of threatened vascular plants are recorded in Spain (1 196) and Czech Republic (771). The high number of threatened vascular plants in these two countries makes South-West and Central-East Europe the regions with the highest record of threatened vascular plant species occurring in the forest. The lowest figures are found in Iceland, Ireland, Belgium and United Kingdom.

Based on the available data, the organism group 'other vertebrates' tends to be proportionally more threatened than other organism groups. This observation is partially linked to improved country coverage in 2010. 50 percent or more of other vertebrates are threatened in Belarus, Czech Republic, Austria, and Slovenia. Less than 10 percent out of the total number of forest-occurring other vertebrates are recorded as threatened in Croatia, Cyprus and France.

More countries reported in 2010 on threatened invertebrates, and fungi and cryptogams than in previous assessments. For the latter, eighteen countries reported but none of them in South-West Europe. North Europe has the most complete data coverage, thus indicating well-established reporting systems. The share of threatened fungi out of the total number of forest-occurring fungi is lowest in Belarus, Finland, Croatia and Slovenia (1-3 percent). In countries of Central-East and Central-West Europe the percentage of threatened fungi can reach 50 percent. The total number of forest-occurring fungi and cryptogams, however, varies largely between individual countries. Other invertebrates were recorded in all regions but in South-West Europe only for Spain. The proportion of threatened forest-occurring other invertebrates is in general very low with less than 3 percent.

Trends

The reporting situation has positively developed and more countries have provided information than for earlier assessments. However, the data on threatened species by country are still very heterogeneous and sometimes fragmentary. Any changes have to be interpreted carefully and an increase in the number of endangered species may not necessarily indicate a loss of biodiversity. For instance, an increased number of threatened species can be a real deterioration of the situation but can also be a result of better knowledge of species, the implementation of more comprehensive and detailed surveys of biodiversity and better mapping of species distribution. Furthermore, the number of endangered species can have risen in one organism group in a country while in another organism group, the country may have been successful in preserving species from becoming threatened or even extinct. Besides the protection of forests, forest management practices are developing towards greater integration of biodiversity aspects, thus allowing for improved habitat conditions for threatened species. Biodiversity-oriented management practices, however, will only show effects in the long run and rely on long-term monitoring of the development of threatened forest species.

Figure 60: Share (percent) of vulnerable, endangered, critically endangered and extinct forest tree species out of the total number of threatened tree species in 2010

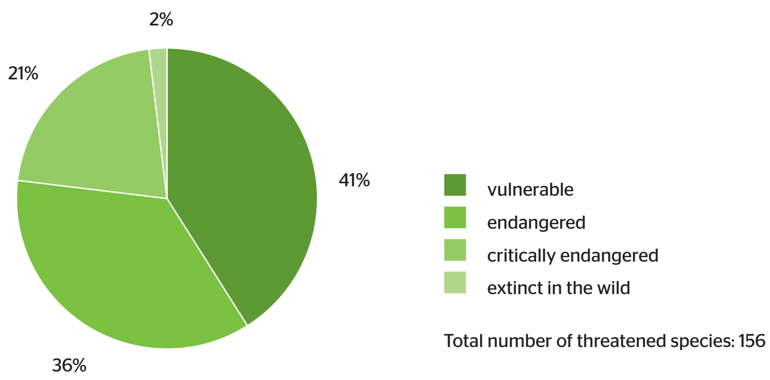


Table 30: Numbers of 'extinct in the wild' forest-occurring tree species, birds, mammals, other vertebrates, other invertebrates, vascular plants, cryptogams and fungi in 2010 by regions

Region	Tree species	Birds	Mammals	Other vertebrates	Other inverte-brates	Vascular plants	Fungi
Russian Federation [10]	0	0	1	2	0	1	0
North Europe	0	2	1	0	144	4	66
Central-West Europe	2	5	6	5	4	13	213
Central-East Europe	1	0	5	3	1	13	1
South-West Europe	0	1	0	0	-	25	-
South-East Europe	0	10	4	1	16	9	0

[10] 2005 data is used (with exception of the 'tree species' organism group where data was available for the 'extinct in the wild' category in 2010).

Indicator 4.9 Protected forests

Protected forests: Area of forest and other wooded land protected to conserve biodiversity, landscapes and specific natural elements, according to MCPFE[11] Assessment Guidelines.

Protected areas are one of the oldest instruments for protecting nature and natural resources, and are included as a main pillar in nature conservation laws across Europe. Explicitly designated protected areas focus mainly on conserving biological diversity, landscapes, natural monuments and protective functions of forests.

The MCPFE Assessment Guidelines for Protected and Protective Forest and Other Wooded Land in Europe were created in 2001–2003 especially for European countries where protected forest areas are often small, most of which are located in fragmented landscapes with other land use categories and are protected with various management options and regimes.

The classification differs in several aspects from the commonly used IUCN classification. The Assessment guidelines appear stricter than IUCN classification in terms of legal basis of protection, separating the protection functions and development for statistical and reporting purposes. IUCN categories are approaching a global, worldwide view - often in vast untouched, continuous and state-owned areas with overlapping functions of protection - and have not been especially well-suited for classifying forest protection alone.

In order to support and clarify data collection on protected forest areas, and that on a comparable basis, an Information Document was produced as one central outcome of European COST Action E 27 (Protected Forest Areas in Europe - analysis and harmonization) during the years 2002–2006 (Parviainen and Frank, 2006, Frank, et. al., 2007). Experiences in reporting on the Protected and Protective Forest and Other Wooded Land for the State of European Forests 2003 and 2007 reports have shown that there exist discrepancies within countries in the reported figures on protected and protective forests, especially on forest areas within the Natura 2000 network in EU-27 countries. Therefore the MCPFE Information Document has been revised and data collection rules clarified in 2010 for harmonized reporting on the protected forest areas included in Natura 2000 network (Parviainen, et. al. 2010). Additionally EU-27 countries were asked to fill out a separate form on Natura 2000 forest areas in order to have a look at protected forest areas overlapping between Natura 2000 network and areas fitting MCPFE classes.

Natura 2000, an essential conservation network, focuses on the conservation of habitats and species in the EU. It is not a classification system per se and does not exclusively focus on protected forest areas; rather, it also includes areas with a multi-purpose use of forests and other ecosystems. It is not, therefore, included as such in pan-European reporting on protected/protective forests and other wooded land. However, the legally binding and long-term protected areas which are also included in Natura 2000 networks will appear according to the normal assessment rules through the interpretation guidelines into the MCPFE classes.

Status

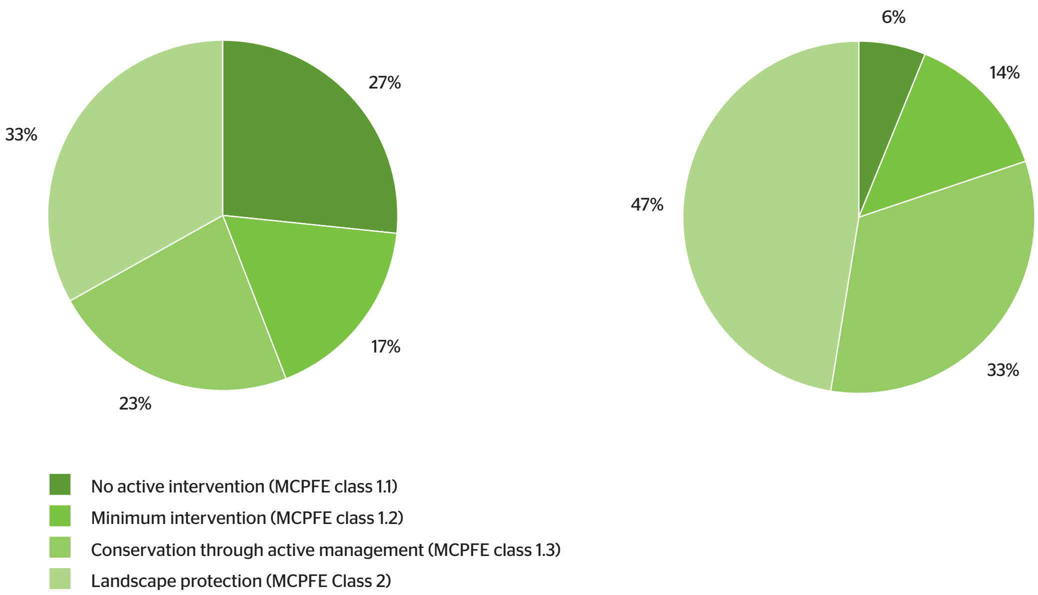
Information was provided from over thirty countries according to the Assessment Guidelines. In some cases, the countries could provide data only for forest but not for other wooded land, whereas in two countries information was available only on the forest and other wooded land combined. The basis for the European scale calculations was the area of forests taking into account the two countries with information on forest and other wooded land.

About 37 million hectares, or 4 percent, of the forest area has been protected in Europe with the main management objective of biodiversity. About half of this area (17 million hectares) is located in the Russian Federation. Without the Russian Federation, the area protected for biodiversity in Europe is about 20 million hectares, or 10 percent, of the forest area (Table 31).

Table 31: Area of forest protected (1 000 hectares) and percent of protection (percent) for biodiversity (MCPFE Classes 1.1–1.3) and landscape (MCPFE Class 2) in Europe without the Russian Federation, EU-27 and the Russian Federation, 2010

Management objective	Europe without the Russian Federation		EU-27		Russian Federation	
	1 000 hectares	Percent of total forest area	1 000 hectares	Percent of total forest area	1 000 hectares	Percent of total forest area
Biodiversity, MCPFE Class 1.1–1.3	20 143	10	17 124	11	16 742	2
1.1 No active intervention	2 353	1	1 980	1	12 325	2
1.2 Minimum intervention	5 243	2	4 414	3	4 387	1
1.3 Conservation through active management	12 547	6	10 730	7	30	n.s.
Landscape, MCPFE Class 2	18 247	9	15 022	10	91	n.s.
Total – Total Class 1 (Biodiversity) and Class 2 (Landscape) together	38 390	18	32 146	20	16 833	2

Figure 61: Share (percent) of MCPFE Classes 1.1–1.3 (1.1 no active intervention, 1.2 minimum intervention, 1.3 conservation through active management) and 2 (landscape protection) of the protected forest area in Europe, 56 million hectares (left) and in Europe without the Russian Federation, 39 million hectares (right), 2010



Within the forest area protected for biodiversity, the share of the category "active conservation management" (MCPFE Class 1.3) is clearly the highest. The share of strictest category "no active intervention" (MCPFE Class 1.1) is only 1 percent of the forest area protected for biodiversity in Europe without the Russian Federation (Figure 61).

The size of forest area protected for biodiversity varies considerably among the countries. Also, the share of the subclasses (MCPFE 1.1–1.3), i.e. the strictness of management for biodiversity, shows very clear differences between the countries (Figure 62). The forest area protected for biodiversity (all MCPFE Classes 1.1- 1.3) is highest in the Russian Federation, Spain, Italy, Finland and Sweden.

The largest forest area with no active intervention of the total area protected for biodiversity in Europe– nearly half (841 000 hectares) of the area, without the Russian Federation, is located in Finland. Sizeable areas with no active interventions over 100 000 hectares are also located in Italy, Ukraine, Estonia, Sweden and Romania, Belarus.

The largest forest areas with minimum intervention (MCPFE Class 1.2) protected for biodiversity are located in Italy and Sweden.

Large forest areas of active conservation management for biodiversity (MCPFE Class 1.3) can be found in Italy, Finland, and Turkey. Germany (3.1 million hectares) and Spain (3.1 million hectares) have also reported large forest areas with active conservation management for biodiversity, but both countries have included (according to the explanatory country information) Natura 2000 forest areas in the MCPFE Class 1.3. In Germany those areas are partly located outside the legally protected forest areas. Spain partly reported Natura 2000 areas in MCPFE Class 1.3 and also partly included the Natura 2000 areas into the MCPFE Class 2 Landscape protection".

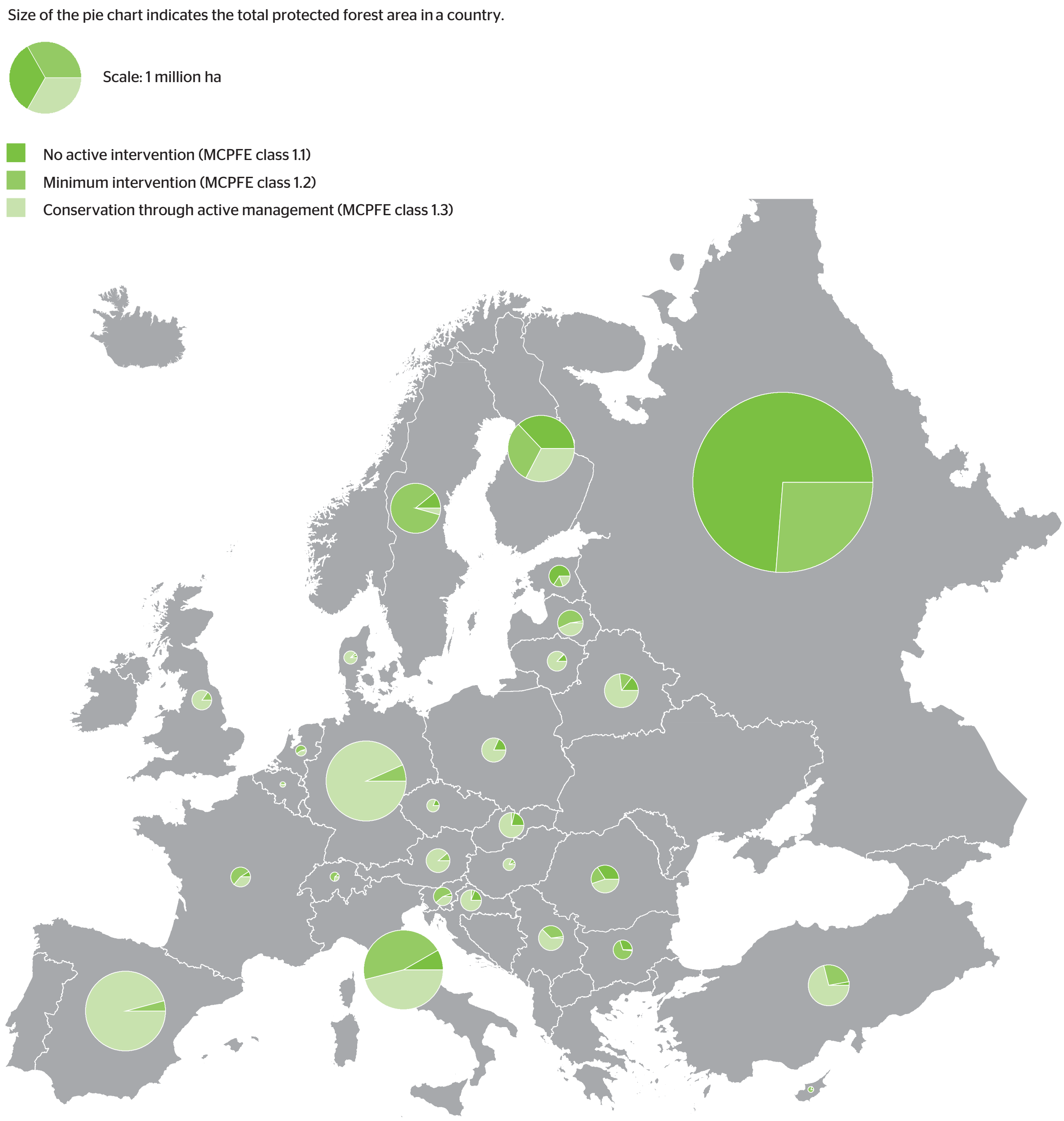
These management differences by protection for biodiversity reflect the various approaches in forest protection: Nordic/Baltic and Eastern European countries emphasize strict protection, whereas Central, North West and South European countries emphasize active management for biodiversity depending on forestry conditions.

The forest protection for "landscape and specific natural elements" (MCPFE Class 2) supports the conservation goal for biodiversity, in particular by protecting special natural elements. However, this objective is principally aimed at achieving the goals of landscape diversity, cultural, aesthetic, spiritual and historical values and recreation. In some cases this class also includes Natura 2000 areas. In general, commercial forestry is possible in these areas as long as it complies with the primary objective of landscape protection. Therefore, the results are described separately from the protected areas for biodiversity (MCPFE Classes 1.1–1.3), whose main conservation goal is unambiguous biodiversity.

Up to 2010, in Europe without Russian Federation, about 18.2 million hectares, or 9 percent of forests land, have been protected for landscape and specific natural elements (Table 31).

[11] The Ministerial Conference on the Protection of Forests in Europe has changed its brand name from MCPFE to FOREST EUROPE.

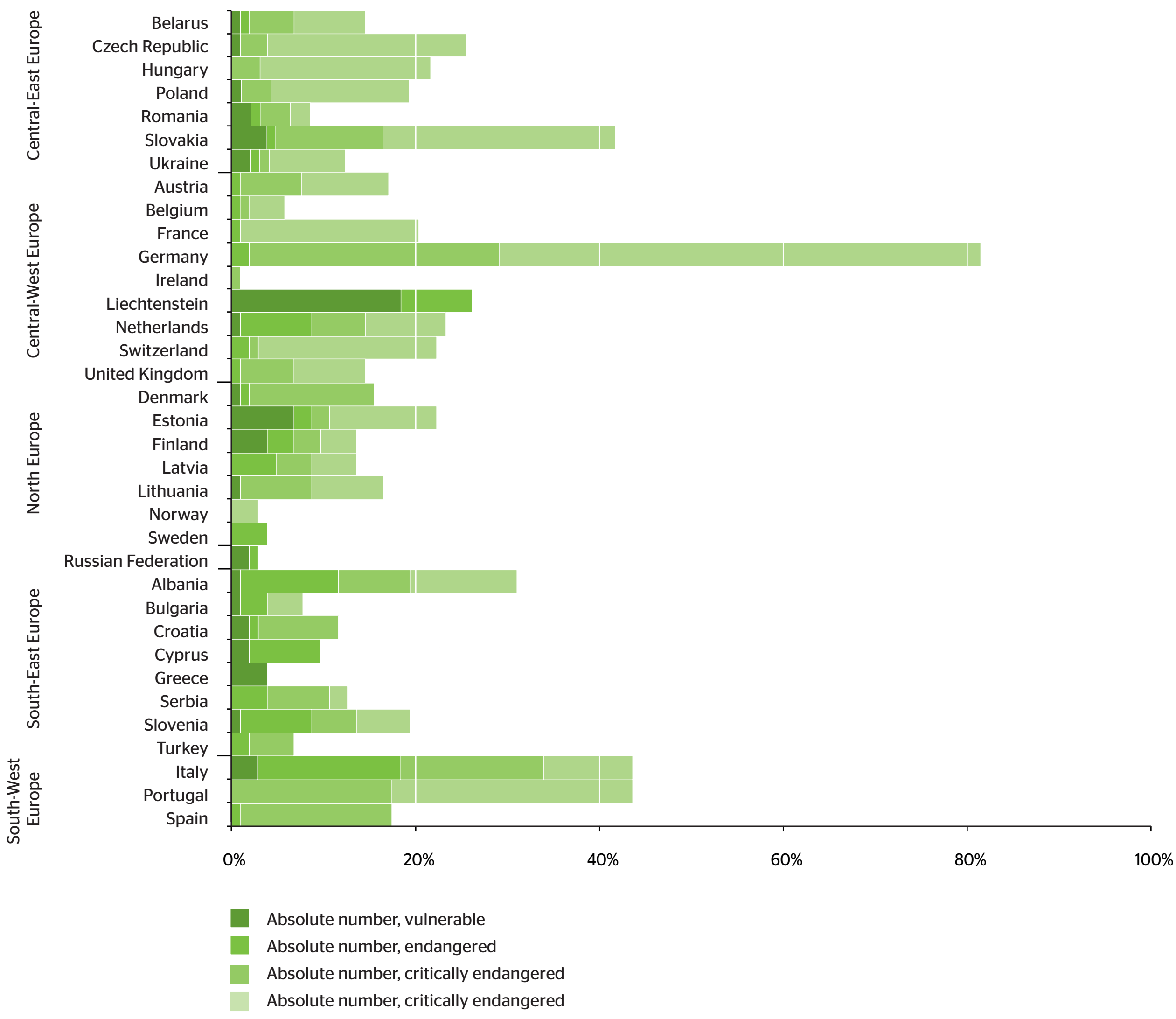
Figure 62: Total forest area protected (size of the pie) and the share of the protected area by MCPFE Classes 1.1–1.3 (1.1 no active intervention, 1.2 minimum intervention, 1.3 conservation through active management) for biodiversity by countries in Europe (1 000 hectares and percent), 2010[12]. (Germany and Spain: included Natura 2000 forest areas in the class 1.3)



Landscape protection prevails mainly in Central and Western European countries. Countries with the highest proportion of landscape protection areas (share of the total forest area over 15 percent) are Germany, Portugal, Slovakia, Czech Republic, Switzerland, France and Hungary (Figure 63). In Germany, the forest area for protection of landscape reaches 6 million hectares, which is over half of the forest area in the country. In countries with a high proportion of boreal forests in landscape and low population density, such as Finland, Sweden, Norway and the Russian Federation, the area of landscape protection area is very small.

The detailed analysis by regions and countries shows that about three quarters of the European countries have protected more than 10 percent of their forests as main management goals of biodiversity and landscape. In several countries (Italy, Portugal, Albania, Slovakia, the Netherlands, Denmark, Slovenia, Croatia, Serbia, Estonia, Latvia and Finland) the share of the protected forest areas for biodiversity alone exceeds the 10 percent.

Figure 63: Share (percent) of protected area of the total forest area for biodiversity (MCPFE Classes 1.1–1.3) and for landscape (MCPFE Class 2) (percent), by country in Europe in 2010 (Classified according to the share of forest protected for biodiversity). (Germany and Spain included Natura 2000 forest areas in the class 1.3)



[12] FOWL for Austria and the Russian Federation. Italy: Legislation (ancient law) corresponds to the requirement of MCPFE classes, although in some National Parks in mountainous areas several goals for protection exist. The restrictions are applied to wood cuttings, which only are allowed by permission.

Natura 2000 areas in EU-27

The response from the EU-27 national correspondents to FOREST EUROPE on forest areas within the Natura 2000 network was sparse. According to the information from EC DG Environment, the forest areas represent half of all the ecosystems included in the Natura 2000 network. The share of forest areas in Natura 2000 network are the largest in Cyprus, Slovenia, Czech Republic, Lithuania, Slovakia and Luxemburg, and the smallest areas are in Ireland, United Kingdom, Denmark and the Netherlands. Table 32 combines information on Natura 2000 forest areas (source: EC DG Environment) and MCPFE Classes 1.1-1.3 and 2. According to the received data it was not possible to evaluate the overlapping areas between protected forests classified by Classes 1.1-1.3 and 2 and Natura 2000 forest area. The available statistics, however, confirm that Natura 2000 forest areas in a country are in most cases larger than the protected forest areas with management goal of biodiversity and landscape classified by MCPFE Classes. This is due to the fact that Natura 2000 area network includes also other forest areas as legally designated and delineated protected forests with boundaries. Often forests including sites belonging to the Natura 2000 network can be managed with normal forest management practices with the reservation that the favourable protection status of the Natura 2000 sites located in a large forest area is guaranteed.

Trends 1990–2010

The changes in the area of protected forests could be analysed only with data from 2000 and 2010, while the situation in 1990 was not possible to fit in the countries according to the MCPFE Classes. A clear trend of increased areas of forests protected for biodiversity and landscape in Europe without the Russian Federation can be observed during the last 10 years. The numbers indicate in particular that the protected forest area of active management for biodiversity and landscape protection (Classes 1.3. and Class 2) has increased. The area of strictly protected forest areas (Class 1.1) has not changed; this may be because countries already had protected the most important, rare and vulnerable forest areas and had segregated these as areas without human impact (Figure 64).

In Europe the area of protected forests for biodiversity and landscape has increased by around 500 000 hectares annually over the last 10 years.

Figure 64: Area of protected forest (million hectares) in Europe without the Russian Federation, by MCPFE Classes (1.1–1.3 and 2), 1990, 2000 and 2010

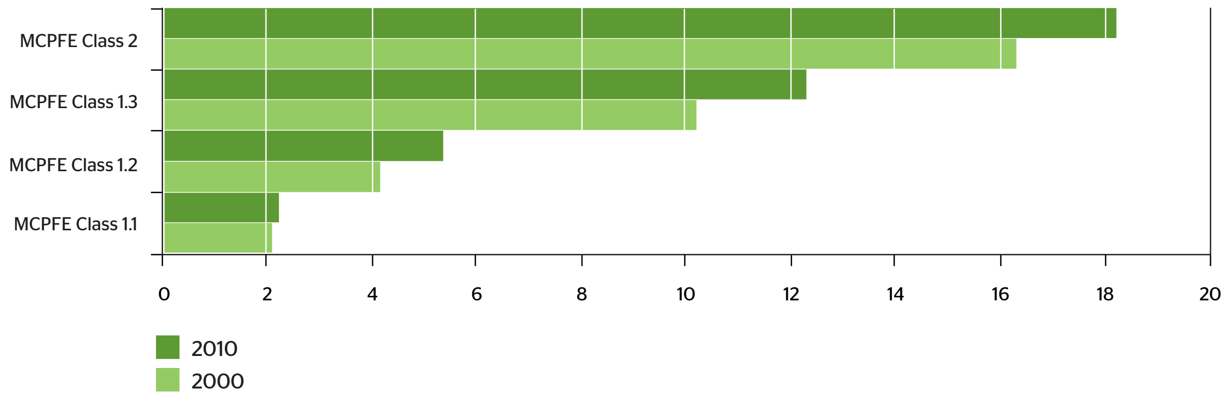


Table 32: Comparison between total Natura 2000 forest area (1 000 hectares) provided by EU-27 DG Environment and the protected forest area (1 000 hectares) collected by MCPFE Classes 1.1-1.3 and Class 2 for 2010

Country	Total Natura 2000 forest area (1000 ha), EU 27 DG Environment	Forest (1000 ha), MCPFE 1.1.-1.3 & 2
Austria	479	659
Belgium	213	42
Bulgaria	2222	347
Cyprus	88	17
Czech Republic	751	665
Denmark	76	92
Estonia	467	486
Finland	2891	3204
France	3009	3373
Germany	2655	9264
Greece	1550	164
Hungary	808	446
Ireland	41	6
Italy	2930	4163
Latvia	403	496
Lithuania	491	375
Luxembourg	28	0
Malta	2	0
Netherlands	121	90
Poland	3347	1609
Portugal	746	1554
Romania	2239	539
Slovakia	946	824
Slovenia	499	258
Spain	7978	3284
Sweden	2353	1325
United Kingdom	129	423
EU-27	37462	33706

Criterion 5: Maintenance and Appropriate Enhancement of Protective Functions in Forest Management (notably Soil and Water)

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Chapter reviewer **Christoph Wildburger**

Data sources **Indicators 5.1 and 5.2 – national reports on quantitative indicators**

Key findings by indicators

5.1 Protective forests – soil, water and other ecosystem functions

About one-fifth of the forest and other wooded land area in Europe is reported to serve the protection of water supplies, the prevention of soil erosion and the provision of other important ecosystem services. When including the Russian Federation the area devoted to protective functions in the FOREST EUROPE region is 11 percent. The importance of these functions is clearly recognized although the mechanisms for ensuring and safeguarding them may vary.

5.2 Protective forests – infrastructure and managed natural resources

Forests protect a wide range of infrastructures and managed natural resources against natural hazards in Europe. Protective functions for infrastructure are often difficult to separate from other protective functions of forests, such as soil and water, and they may overlap. Nineteen countries reporting on protective forests for infrastructure have mechanisms in place to either identify or designate forests for these protective functions. In Europe, including the Russian Federation, about 7 percent of forests are protected for infrastructure and managed natural resources. When excluding the Russian Federation, it amounts to 2 percent.

Introduction

Usually forests provide some sort of protective function. They may include the prevention and mitigation of erosion and loss of soil, the preservation of drinking water resources, the stabilization of stream banks or sand dunes, or the reduction of noise pollution. Forests in mountainous areas often fulfil specific protective functions and services. Besides erosion protection they can serve to protect infrastructures such as roads, railways, settlements and buildings from avalanches, landslides and rock fall. In northern Europe and in alpine areas near the timberline, fellings are often restricted by law to prevent the timberline from receding south or in elevation.

Most forests are regarded as multi-functional to some degree, thus they provide services other than protection, such as recreation and wood production. They also are managed to conserve or enhance biological diversity. Therefore forests may provide protective functions as an indirect benefit, even though such are not the principal management aim.

In the "MCPFE[13] Assessment Guidelines for Protected and Protective Forests and Other Wooded Land," protective forests are described under Class 3 as having 'protective function' as the main management objective. The guidelines ask countries to report on forests that are designated for protective functions and that thus have a legal basis ensuring a long-term commitment. If management plans are used for classification and delineation of protective forest areas, they should also be based on long-term commitments for the protection regime. This illustrates that the emphasis is placed on policy and management decisions that ensure the maintenance and appropriate enhancement of the protective functions and not on the quantification of the potential of European forests to provide protective functions.

Due to overlapping functions it can become challenging to designate protective forest areas to either of the two Criterion 5 indicators. A number of countries have indicated that they were not able to assign data separately to Indicators 5.1 and 5.2, in which case data were reported collectively under Indicator 5.1, thus influencing the figures for the respective analysis. The heterogeneity of reporting due to different interpretations does not allow for full comparability among countries.

Indicator 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 Class "Protective Functions".

Forests are of vital importance for preventing the erosion of soil, protecting water supplies and maintaining other ecosystem functions. Measures are in place in countries to either recognize or safeguard these functions. Such measures may include the restriction or enhancement of certain management practices or zoning of forests. Designations of forests are administrative in nature or the result of decisions in the context of land use and forest management planning.

Status

In 2010, Thirty-seven countries provided information on forest and other wooded land addressing the prevention of soil erosion, preservation of water resources and maintenance of other ecosystem services. Four countries reported that 15-20 percent of their forests are considered protective and ten respectively indicated a share of more than 20 percent, together amounting to 42 million hectares (Figure 65). The Russian Federation reported 75 million hectares of protective forest or 8.5 percent of its total forest and other wooded land.

The reported share of protective forests – soil and water and other ecosystem functions in European countries ranges from 0 to more than 80 percent. The protective area is highest in Italy (83 percent) and above 35 percent in Norway, Germany[14] and Romania. Besides the Russian Federation, South-West Europe shows noticeable areas of protective forests (Table A). In total about 120 million hectares are reported in the FOREST EUROPE region. This represents about 11 percent of the total area of forest and other wooded land area, or 19 percent when excluding the Russian Federation (Table 33).

Explanatory information provided by countries show that the assessment guidelines may have not been interpreted consistently as concepts of protective forests can vary widely. While the guidelines require a legal basis or designated management plans that ensure long-term commitment of protective functions, they are often exercised alongside others (e.g. production, recreation). The explanatory information from countries reveals that protective forests were identified either as having clearly distinguishable protective functions based on surveys (e.g. mapping of forest functions/services), given physical characteristics (e.g. slope; being above a certain elevation) or designations of some sort. Designation is often not formal being, for instance, rooted in management plans. This may then put descriptive figures alongside such figures which are based on legally designated protective forests.

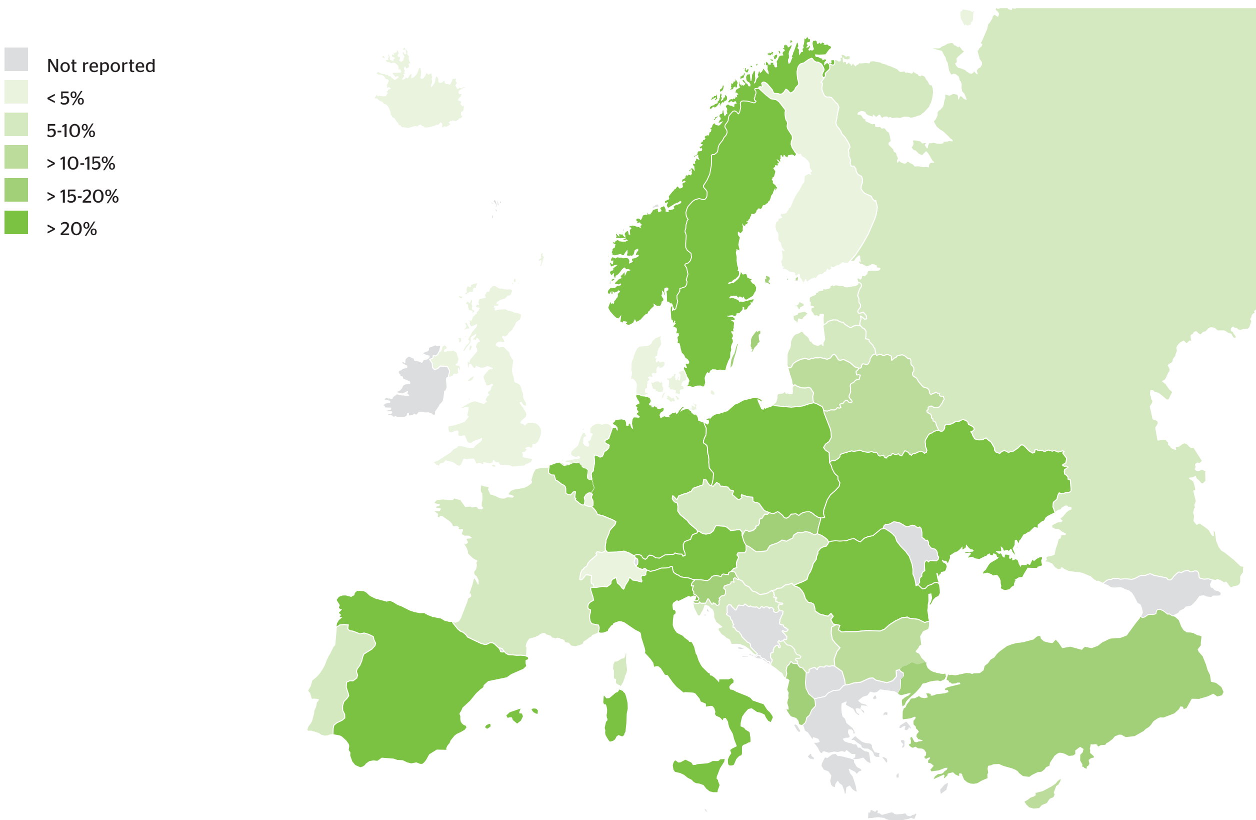
An example of a legal designation mechanism for protective forest exists for Austria. It clearly identifies the functions, rules in a legal way their enforcement and has in place a national designation category entitled 'site-protecting forest'.

Table 33: Forest and other wooded land reported for the protection of soil, water and other ecosystem services in 2010 by regions

Region	Total forest and other wooded land	Protective forest and other wooded land	Percent of total forest and other wooded land
	1 000 hectares		in percent
Russian Federation	882 310	74 948	8.5
North Europe	74 929	12 232	16.3
Central-West Europe	38 805	6 882	17.7
Central-East Europe	44 807	9 306	20.8
South-West Europe	42 291	15 902	37.6
South-East Europe	45 364	3 102	6.7
Europe	1 128 506	122 372	10.8
Europe without the Russian Federation	246 195	47 424	19.2
EU-27	178 314	36 590	20.5

Note: Countries that have reported only 'forest class' are included. Forest and other wooded land is used for percent calculation in regions. Missing data were replaced by duplicates of the nearest available reference year.

Figure 65: Percentage of forest and other wooded land reported for protection of soil and water and other ecosystem functions in 2010



Notes: (1) For countries that reported Indicator 5.1 in 2010 only under 'forest,' forest area in these countries was used to calculate the percentage; (2) France, Germany, Iceland, Montenegro, Norway, Spain and Ukraine reported data for Indicators 5.1 and 5.2 solely under Indicator 5.1.

[13] The Ministerial Conference on the Protection of Forests in Europe has changed its brand name from MCPFE to FOREST EUROPE.
[14] Germany and Norway reported data for Indicators 5.1 and 5.2 solely under Indicator 5.1.

Other countries commented that, while forests fulfil protective functions, their primary aim is "multiple use" and thus they do not qualify for being reported under Criterion 5.

The above should not minimize the fact that a considerable amount of the forest and other wooded land ensures the protection of water supplies and prevents soil erosion.

Trends

Thirty-nine countries are included in the presentation of time trends for the period 2000-2010. A slight increase in protective forest area can be observed from 2000 to 2010. There is an annual change rate in Europe of about 0.6 percent (Table 34). The same annual change rate applies when excluding the Russian Federation. This corresponds to an annual increase of about 280 000 hectares excluding the Russian Federation. The annual change rate is highest in South-East Europe (4 percent). In the other regions it varies between -0.4 and 3 percent.

Due to the variability in interpretation of the indicator the above presentation of trends over time should be treated with caution as it cannot be transparently determined what the causes of change are. Change may be due to limited comparability between reference years, improvements of survey methodologies and intensity or find its origin in policy developments.

Table 34: Trends in area of forest and other wooded land reported for the protection of soil and water and other ecosystem services by regions (2000 – 2010)

Region	2000	2005	2010	Annual change (2000-2010)	Annual change rate
	1 000 hectares				in percent
Russian Federation	70 386	70 556	74 948	456	0.63
North Europe	12 529	12 335	12 232	-30	-0.24
Central-West Europe	5 053	5 951	6 882	183	3.14
Central-East Europe	9 697	9 981	9 306	-39	-0.41
South-West Europe	15 217	15 559	15 902	68	0.44
South-East Europe	2 087	2 765	3 102	101	4.04
Europe	114 950	117 077	122 372	740	0.63
Europe without the Russian Federation	44 564	46 521	47 424	284	0.62
EU-27	33 735	35 059	36 590	286	0.82

Note: Countries that have reported only under 'forest class' are included. Forest and other wooded land is used for percent calculation. Missing data were replaced by duplicates of the nearest available reference year.

Indicator 5.2 Protective Forest – Infrastructure and managed natural resources

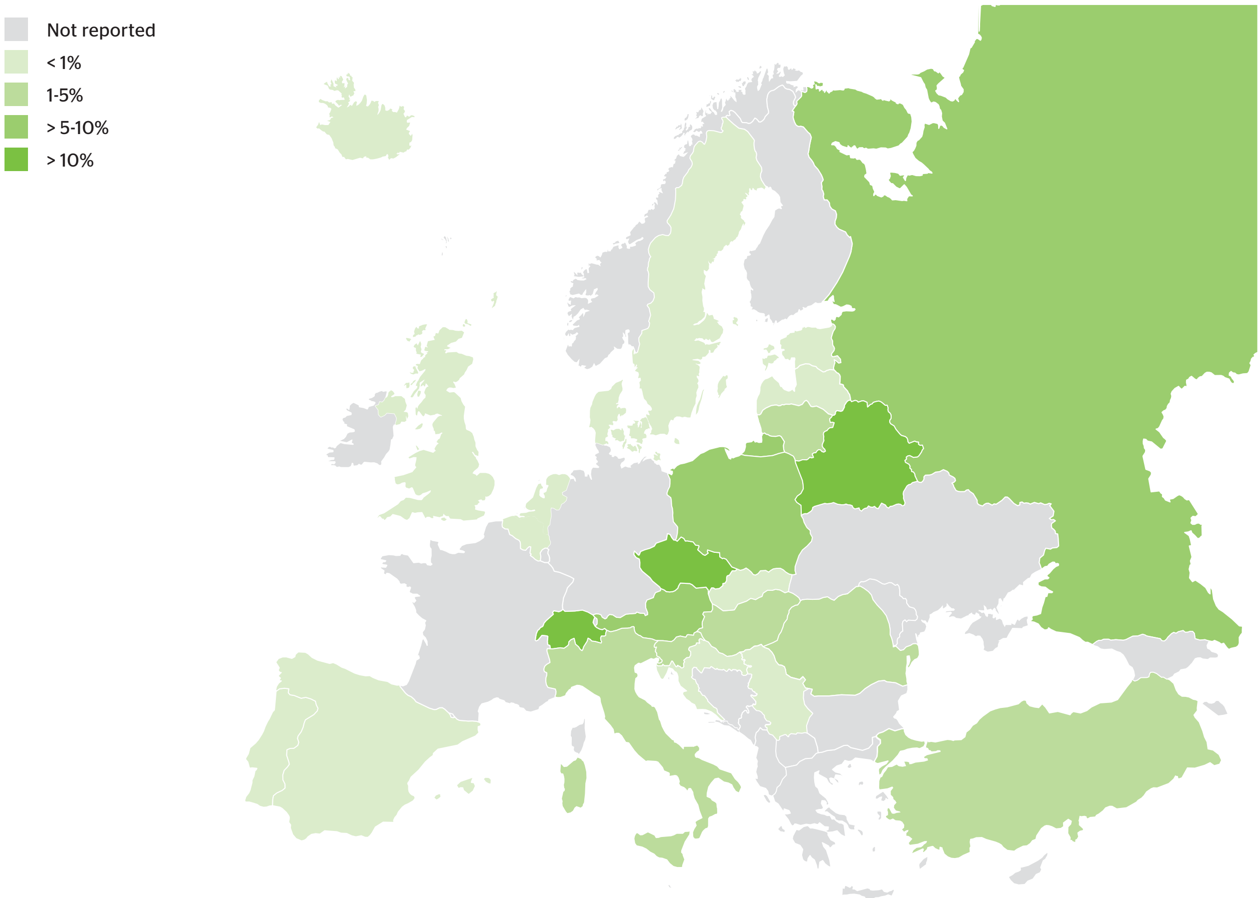
Area of forest and wooded land designated to protect infrastructure and managed natural resources against natural hazards, part of MCPFE Class "Protective Functions".

Forests protect a wide variety of man-made infrastructures. These protective functions are most evident in mountainous areas or areas with extreme climates. Countries reported forests protecting roads and railways, human settlements and other facilities, health resorts, cultivated soils and forest stands of special value and acting as shelter belts. Forests offer protection from various impacts, including rock fall, avalanches, wind, sand drift, noise, emissions and climate. Adapted regimes have been developed for the specific needs of particular types of protective forests.

Status

Data provided for Indicator 5.2 'Protective Forest – infrastructure and managed natural resources' are fragmentary: Twenty-nine countries reported data for 2010, ten of which provided "0" values, while in four protective forest areas are below 1 percent of the total forest area. Seventeen countries did not report (Figure 66). No data were reported for other wooded land. The Russian Federation and Austria provided data only for forest and other wooded land combined and have been included in the further analysis.

Figure 66: Forest area reported for the protection of infrastructure and managed natural resources in 2010 (% of forest area)



Notes: (1) For Austria and the Russian Federation, forest and other wooded land data is used. (2) France, Germany, Iceland, Montenegro, Norway, Spain and Ukraine reported data for Indicators 5.1 and 5.2 solely under Indicator 5.1. (5.2 either reported as '0' or 'not reported').

Good coverage is observed for countries in the alpine area which also yield the highest percentage figures. They are namely Switzerland and Liechtenstein (Figure 66), which reported that more than one-third of their forests protect infrastructures. In addition, Belarus (17 percent) and Czech Republic (11 percent) have shares of more than ten percent. The largest area of protective forest for infrastructure and managed natural resources is located in the Russian Federation with more than 71 million ha. FOREST EUROPE region without the Russian Federation reported about 4 million ha. That represents about 2 percent of the total forest area. When including the Russian Federation, it amounts to 7 percent. Central-East Europe provided the most complete set of country data for 2010 (Table 35).

Comments provided by countries emphasize the difficulty of separating areas between Indicators 5.1 and 5.2. It was also observed that data reported for Indicator 5.2 in most cases are not based on formal designations. In some cases, detailed surveys on the protection of infrastructure and managed natural resources have been carried out which find their application in management plans. Formal designations can be found, for example, in Serbia where protective forests are designated through general and special management plans (e.g. Code 53: road protection forest; Code 43: protection forest against noise) and in Austria where a legal mechanism is in place for designating protective forests for infrastructure and managed natural resources ("Object protecting forests").

Trends

Eighteen countries provided trend data on protective forests – infrastructure and managed natural resources (Table 36). This excludes countries that reported "0" values. Due to the low amount of information available, a trend analysis at a regional level is very limited. The most complete information was provided for Central-East Europe where six out of nine countries provided data for the time series 2000 to 2010. An annual decline of 86 000 ha is observed between 2000 and 2010 in that region with the main negative trend taking place from 2000 to 2005. A decline is also observed in the Russian Federation. A slight increase can be observed during the last ten years in the Central-West Europe region.

Table 35: Forest reported for the protection of infrastructures and managed natural resources in 2010 by regions

Region	Total forest area	Protective forest area	Percent of total forest area
	1 000 hectares		
Russian Federation	882 310	71 343	8.1
North Europe	69 278	22	0.0
Central-West Europe	37 016	821	2.2
Central-East Europe	43 959	2 785	6.3
South-West Europe	30 795	62	0.2
South-East Europe	29 936	291	1.0
Europe	1 019 940	75 324	7.4
Europe without the Russian Federation	210 850	3 982	1.9
EU-27	157 328	1 933	1.2

Note: For Austria and the Russian Federation, forest and other wooded land data were used

Table 36: Trends in area of forest reported for the protection of infrastructure and managed natural resources by regions (2000 – 2010)

Region	2000	2005	2010	Annual change (2000 - 2010)	Annual change rate
	1 000 hectares				in percent
Russian Federation	99 573	99 398	71 343	-2 823.0	-3.28
North Europe	13	22	22	0.9	5.40
Central-West Europe	589	724	821	23.2	3.37
Central-East Europe	3 641	2 871	2 785	-85.6	-2.64
South-West Europe	62	62	62	0.0	0.00
South-East Europe	437	270	291	-14.6	-3.98
Europe	104 315	103 348	75 324	-2 899.1	-3.20
Europe without the Russian Federation	4 743	3 950	3 982	-76.1	-1.73
EU-27	1 767	1 848	1 933	16.6	0.9

Note: For Austria and the Russian Federation forest and other wooded land data were used; missing country data were substituted by nearest neighbour

Criterion 6: Maintenance of Other Socio-Economic Functions and Conditions

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Data sources **Indicators 6.7, 6.8 – data delivered by UNECE/FAO Geneva based on national reporting in the Joint Forest Sector Questionnaire (JFSQ)**
Indicators 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.9, 6.10, 6.11 – national reports on quantitative indicators

Key Findings by Indicator

Indicator 6.1 Forest holdings

The size of the public and the private forest area in Europe without the Russian Federation are both about 100 million ha, while there are about 800 million ha of public forest in the Russian Federation. Although significant forest areas in Europe have been privatized, the total public forest area remains of the same order as 20 years ago, compensated by a general expansion of forests in many countries. At the same time, the private forest area has increased by more than 15 percent. For most countries the number of forest holdings in public ownership has been relatively constant or decreasing, while the total number of private forest holdings increased substantially between 1990 and 2000 and somewhat slower later on. The main driving force behind the changes in ownership structure is the efforts towards privatization and restitution of forest land in countries formerly under centrally planned economies.

Indicator 6.2 Contribution of forest sector to gross domestic product

Forestry activities, wood processing and the pulp and paper industry combined contribute 1 percent to gross domestic product (GDP in Europe as a whole, but significantly more in several countries. The contribution of the forest sector to GDP is decreasing as other sectors of the economy grow faster, including the service sector. Investments and a shift of production from North and West Europe to Eastern Europe (particularly Central-East Europe, the Russian Federation and the Baltic states) helped to maintain relatively stable levels of value added in forestry and the wood industry and their contribution to GDP in Europe. Europe's pulp and paper industry has the weakest performance among the three forest sub-sectors; the value added in the pulp and paper industry experienced a steep decline over the past decade.

Indicator 6.3 Net revenue

The net value added per ha varies greatly among regions, Central-West Europe having the highest figure (171 EUR/ha). During the last few years all regions except Central-East Europe and South-West Europe had an annual increase in net value added, varying from 1.2 to 18.8 percent per annum. Net entrepreneurial income shows a similar picture to net value added.

Indicator 6.4 Expenditures on services

Governments in Europe currently spend a minimum of EUR 3.2 billion on forest services each year. More than half of this is spent to support the provision of ecological and biospheric services. The average level of expenditure per ha is around EUR 15 in Western Europe, EUR 5 in Eastern Europe and EUR 1 in the Russian Federation. Expenditure doubled from 2000 to 2005 but has since fallen back slightly. Expenditure across Europe varies a l ot and appears to be determined by two major factors: the total area of forest in each country and average income levels. This variation can also be partly explained by the particular circumstances of different countries (e.g. with expenditure focused on social and amenity services in some densely populated countries).

Indicator 6.5 The forest sector workforce

Forest sector employment is still decreasing, mainly in countries where there is still a high potential for mechanization of forest operations like in Central-East Europe. However, there are huge differences among regions. Whereas in Central-East Europe a reduction in numbers due to declining productivity continues, Central-West and North European forestry seems to have stabilized the work-force at a rather low level, where most job reductions have been reached.

A severe threat for sustainability is the ageing of the forestry workforce. A quarter of all people employed in forestry in Europe are 50 years and older. A crucial challenge for the next decade will therefore be the recruitment of new entrants to maintain the necessary capacities in forest operations and management, both in numbers and with higher competences.

Indicator 6.6 Occupational safety and health

Forestry work remains a very dangerous and accident-prone occupation. The most critical observation is that over the last 10 years only selective improvements of the work safety were achieved, even if health and safety is often stated to be a priority issue in labour-related policies of many European countries.

Countries where over the last decades a high degree of mechanization of harvesting operations has been achieved have significantly fewer accidents than countries where chainsaw work dominates.

The evidence of high accident frequency in European forestry calls for continuous efforts on all levels to improve the health and safety of those people who earn their living from forestry.

Indicator 6.7 Wood consumption

Wood consumption had been rising steadily in Europe until the 2008-2009 economic crisis, which negatively affected the entire forest sector when consumption declined. Only wood for energy countered the downturn with rising consumption primarily due to governments' renewable energy policies.

Indicator 6.8 Trade in wood

Trade of wood doubled between 1990 and 2005, but primary wood and paper volumes decreased afterwards due to the 2008-2009 economic crisis. However, the value of European trade was more stable. Governments' policies supporting renewable wood energy resulted in a boom in the trade of chips and pellets.

Indicator 6.9 Energy from wood resources

The number of responses to indicator 6.9 doubled since the last State of Europe's Forests. Wood energy is likely to remain on the policy agenda of both energy and forestry due to renewable energy targets in the majority of FOREST EUROPE's signatory countries.

In the reference year 2007, wood energy contributed 3.7 percent of the final energy consumed in Europe outside the Russian Federation and 2.5 percent of the total final energy consumption in all Europe (where data are available).

Indicator 6.10 Accessibility for recreation

Most countries reported that in 2005 at least 90 percent of their forest and other wooded land area had access available to the public for recreational purposes, and that 10 percent or less of their forest and other wooded land area had recreational use as one main management goal. Both measures showed some increase over the period since 1990. Few countries had comprehensive information on numbers of visits.

Indicator 6.11 Cultural and spiritual values

Around one million sites with cultural and spiritual values have been recorded within forests and other wooded land, of which around three-quarters were classed as 'Cultural heritage'.

The number of countries able to provide data on at least one category of site increased from 22 to 29 over the last four years. This increase may partly reflect a growing recognition of the importance of the cultural and spiritual values associated with forests.

Indicator 6.1 Forest holdings

Number of forest holdings, classified by ownership categories and size classes.

Introduction

The number of forest holdings, landholding sizes and ownership are assumed to have implications for forest management and various other socio-economic circumstances. However, these relationships vary across countries and depend on several factors that have not yet been fully investigated. Studies have indicated that on a global basis, private forests provide more market-based goods such as timber than their share of land ownership, while public lands produce relatively more fuelwood and multiple-use goods and services (Siry et al. 2009). Privatization of former state-owned land, such as has taken place in several European countries over the last 20 years, is often associated with forest parcelization, i.e. splitting up larger forest holdings into smaller ones.

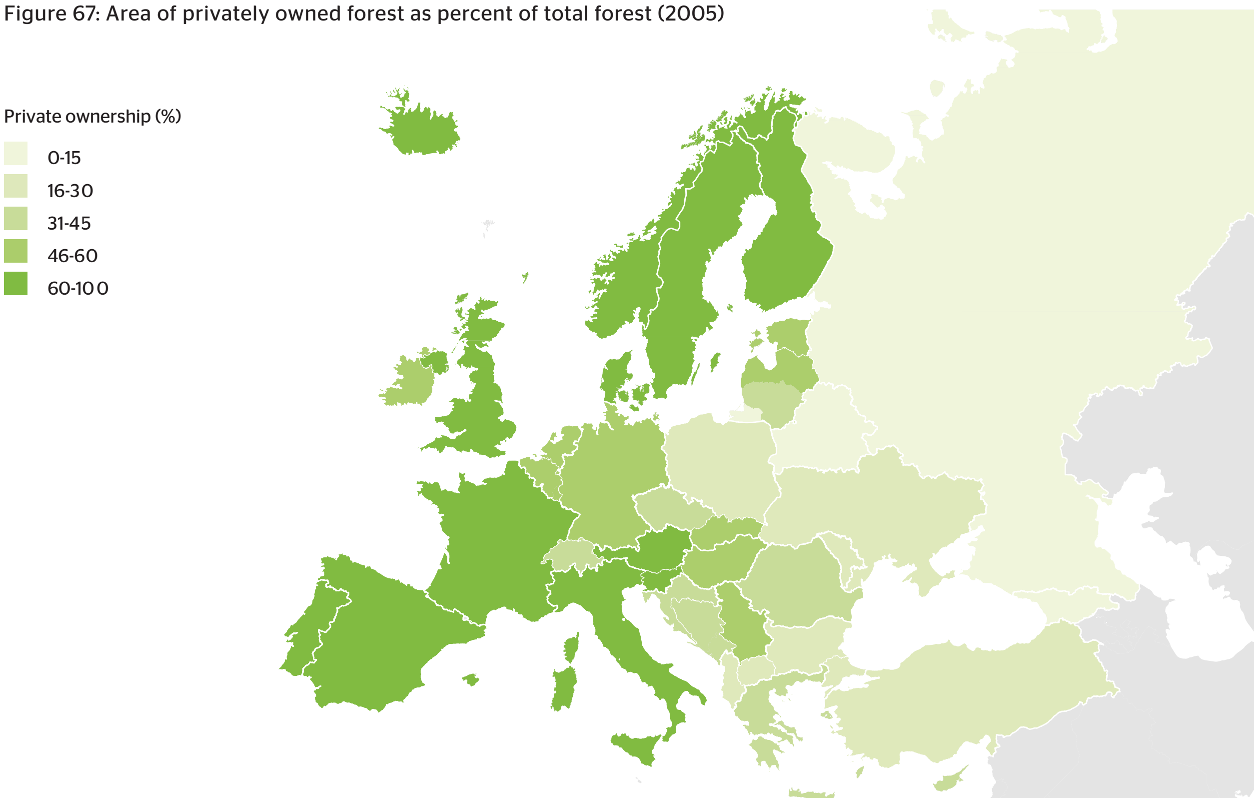
In the Baltic States and in several countries of Central-East and South-East Europe, formerly under centrally planned economies, political decisions resulted in efforts towards privatization and restitution of forest land to the former forest owners or their descendants. In other regions of Europe, changes in ownership structure are relatively small but may occur due to division after inheritance of forest holdings and reorganization of companies fully or partly owned by the State.

Status

Public ownership is dominant in the Russian Federation, Central-East and South-East Europe. In the Russian Federation all forests are publicly owned, while the percentage for these two other regions is more than 80 percent. In addition to the Russian Federation, countries where all or practically all forests are publicly owned are Belarus, Georgia, Republic of Moldova, Ukraine, Albania and Turkey. On the other hand, the average percentage of forests in public ownership is around 30 percent for Central-West Europe, North Europe and South-West Europe. Particularly high proportions of privately-owned forest are found in Austria, France, Denmark, Norway, Sweden, Slovenia, Portugal and Spain. Other ownership occurs only in a few countries and comprises only 0.4 percent of the forest area of Europe outside the Russian Federation. Areas under "other ownership" include forest with unknown status, forest in transitional ownership, forest with mixed ownership and forest owned by institutions that are neither considered public nor private (churches, charities etc.). Variations in ownership among countries are shown in Figure 67.

The number of forest holdings is partly or completely unavailable for many countries, making it difficult to describe the exact status for the various regions. However, generally the number of private forest holdings is much higher than that of public holdings, especially those of the smaller size classes. The number of smaller forest holdings is especially high in South-East Europe, both in private and in public ownership. A particularly large number of forest holdings in public ownership has been reported for Bulgaria. Many of these holdings are in municipal ownership and appeared as a result of restructuring the forestry sector over the last 20 years.

Figure 67: Area of privately owned forest as percent of total forest (2005)



Trends and explanations

The status of forest ownership for 2005 and the development in private forest area are shown in Figure 68 and Figure 69.

In the Central-East region, a moderate, overall decrease of publicly-owned forest area has taken place during the period between the reference years for State of Europe's Forests 2011. For Central-West Europe, no distinct trend can be ascertained. On the other hand, a decrease in public forest area between 1990 and 2010 is quite pronounced for North Europe. This reduction is caused by the restitution and privatization process that has been going on in the Baltic countries, while the change in the Scandinavian countries has been small. In South-East Europe, no strong trend can be detected, although the decrease in public forest area is quite obvious for Slovenia. In South-West Europe an increase in public forest of more than 20 percent has been observed between 1990 and 2010. This trend is seemingly caused by a general increase in the forest area of Italy and Spain, and a similar development has also been found for private forest.

For Central-East and North Europe the increase in private forest seems to be of the same order as the reduction of public forest. The area of private forest in Central-East and North Europe increased by about 7.5 million ha, largely as a result of restitution and privatization measures. For Europe, privatization efforts especially led to a substantial increase in the area of private forest for Estonia, Latvia, Lithuania, Czech Republic, Hungary, Romania, Slovakia and Bulgaria. One might expect that a decrease in the area of public forest would be balanced by a corresponding increase in the area of private forest (or vice versa), but that does not seem to always be the case, as an overall trend in the area of forest to some extent may complicate the picture. Central-West Europe has shown an increase in the area of private forest, although the area of forest in public ownership has been relatively constant. A noticeable increase in the area of private forest was reported both for South-East and South-West Europe.

The area of forest under other ownership increased between 1990 and 2000 but later tended to decline (mainly due to reduction of "Treuhandwald" in Germany: Forest expropriated within the scope of the land reform in the German Democratic Republic, transferred into public ownership and later either privatized or about to be privatized).

Overall, the area of public forest has been fairly stable and slightly above 100 million ha between 1990 and 2005 for Europe (without the Russian Federation). The area of privately owned forest, on the other hand, increased by 16 percent to about 102 million ha. Although the data for 2010 are less complete than for previous reference years, there is no reason to expect any significant changes between 2005 and 2010. Most of the change in status occurred between 1990 and 2000, while the development later on has been slower.

Changes in the numbers of public and private forest holdings, not just the total areas in these categories, have important implications for forest management in Europe. In Central-East Europe the number of forest holdings in public ownership has been relatively constant for the reporting countries. A noticeable increase in the number of private forest holdings was reported by Hungary and Slovakia. In Central-West Europe the number of both public and private forest holdings has generally been constant or somewhat decreasing, with some exception (e.g. Ireland). In North Europe, the number of private forest holdings has substantially increased in the Baltic states and in Iceland but was fairly stable for the Scandinavian countries. Due to limited data, it is difficult to conclude for South-East and South-West Europe. The number of holdings in public ownership increased in Bulgaria and decreased in Slovenia, while the number of private holdings has been growing in both of these countries.

As the reporting on the number of holdings was rather incomplete, it has not been possible to draw any definite conclusions. For public holdings, a substantial increase has been reported for one country (Bulgaria). If this country is excluded, the general trend seems to be somewhat decreasing. Based on available data, the number of private forest holdings increased by almost 40 percent during the period 1990-2010, of which most took place between 1990 and 2000. Although the number of private forest holdings in the smallest size category (< 10ha) is very high for some countries in all geographical regions (except the Russian Federation), their share of the total forest area is generally relatively limited.

Forest ownership structure is known to have implications for forest management and the production of timber and other forest products and services. However, these relationships are not very well known. Parcelization of forest holdings may represent a potential problem to sustainable forest management (SFM), especially when it comes to maintaining a certain level of production and employment. The change in ownership structure that took place in European countries between 1990 and 2010 was mostly affected by the restitution and privatization process that has taken place in countries formerly under centrally planned economies. There is a tendency for the average size of private forest holdings to decrease in countries undergoing this process (e.g. Latvia, Hungary, Slovakia and Slovenia) and also in other countries that have an increasing forest area due to afforestation measures (e.g. Iceland, Ireland).

Figure 68: Distribution of forest area 2005 by ownership classes and region

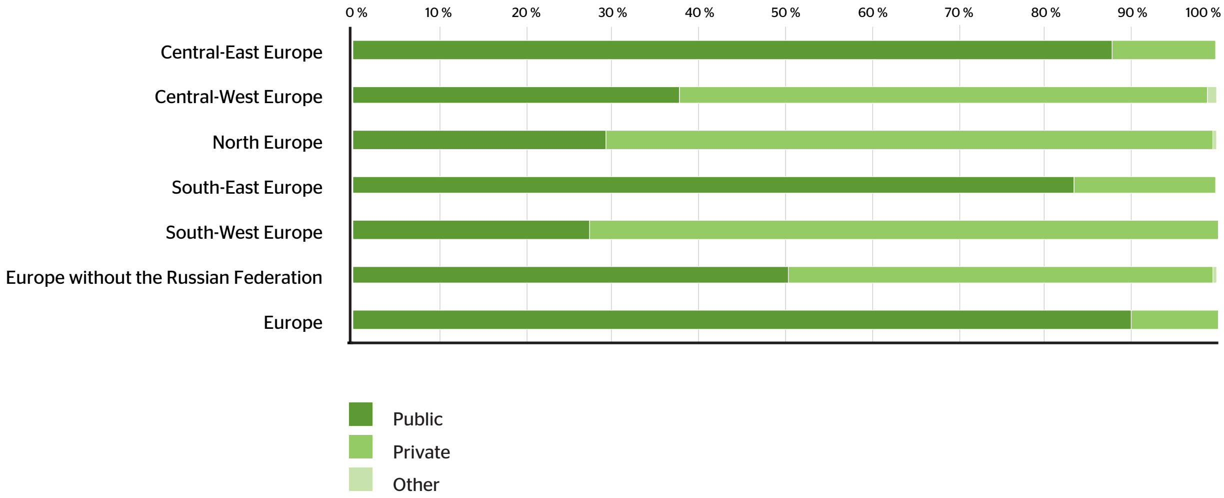
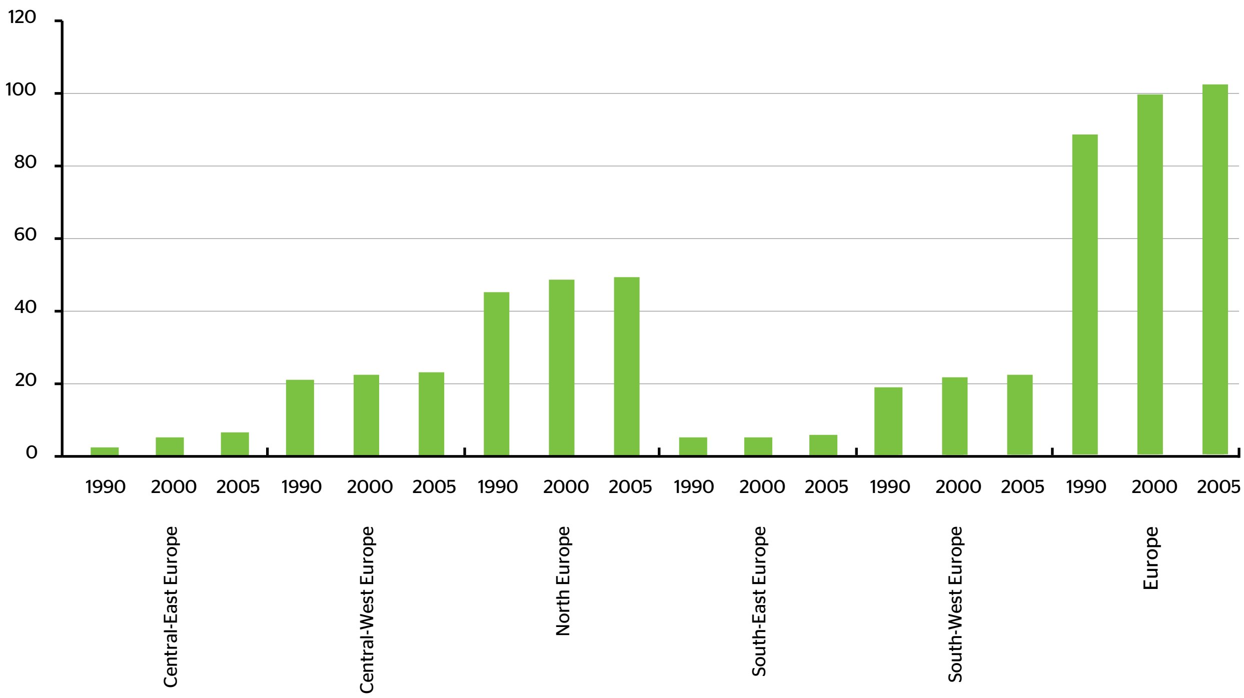


Figure 69: Private forest area 1990 - 2005, by region (million ha)



Indicator 6.2 Contribution of forest sector to GDP

Contribution of forestry and manufacturing of wood and paper products to gross domestic product.

Introduction

The contribution of forestry and the manufacturing of wood and paper products to gross domestic product (GDP) indicates the forest sector's macroeconomic importance. Gross value added (a component of GDP) is equal to the net result of the total value of products produced (output) less the value of the goods and services consumed as inputs by a process of production (intermediate consumption). Note that the figures under this indicator reflect only the direct contribution to GDP[15], i.e. value addition in forestry[16], wood industry[17] and pulp and paper industry[18]. Presented figures do not capture the forest sector's additional contribution to GDP through other economic activities, for example, forest-based tourism, wood energy, manufacturing of furniture, manufacturing of wood processing equipment, and trade in forest products. Inclusion of this additional contribution would certainly increase the figures presented below.

Information about gross value added by the forest sector was collected from countries for four years (1990, 2000, 2005 and latest available year) disaggregated into the value added by three different subsectors: forestry; wood industry; and pulp and paper industry. These figures were converted into a common currency unit (EUR) for aggregation at the European and regional levels[19]. Most of the countries provided value added data; however, in order to obtain comparability across the regions and over time, the dataset was supplemented with the latest national accounts statistics obtained from Eurostat and national statistics offices. The analysis below presents the current status and recent trends in this indicator followed by a few conclusions.

Current status

In 2008, gross value added by forestry, wood industries, and pulp and paper industries totalled EUR 127 billion in Europe and the sector's contribution to GDP was 1.0 percent. Forestry and logging activities account for 20 percent of the forest sector's gross value added; the remaining 80 percent is almost equally distributed between wood and paper industries.

The economic importance of the forest sector and the distribution of value added among the three subsectors vary greatly among countries. The current situation by region and by country is shown in Table 37 and Figure 70.

The forest sector has the strongest macroeconomic importance in North Europe and Central-East Europe, where its contribution is twice as high as in other regions.

Europe's forest sector is concentrated in three regions: Central-West Europe, South-West Europe and North Europe. These three regions, thanks to developed forest industries, account for about 80 percent of Europe's forest sector value added.

In terms of value added within the sector, forestry is most important in North Europe and South-East Europe where it accounts for roughly one third of the sector's value added. Forestry's share is also higher than the average for all of Europe in the Russian Federation and in Central-East Europe.

The wood industry generates about half of the sector's value added in Central-East Europe, South-West Europe and the Russian Federation. In other regions, the wood industry accounts for about one third of the sector's economic output.

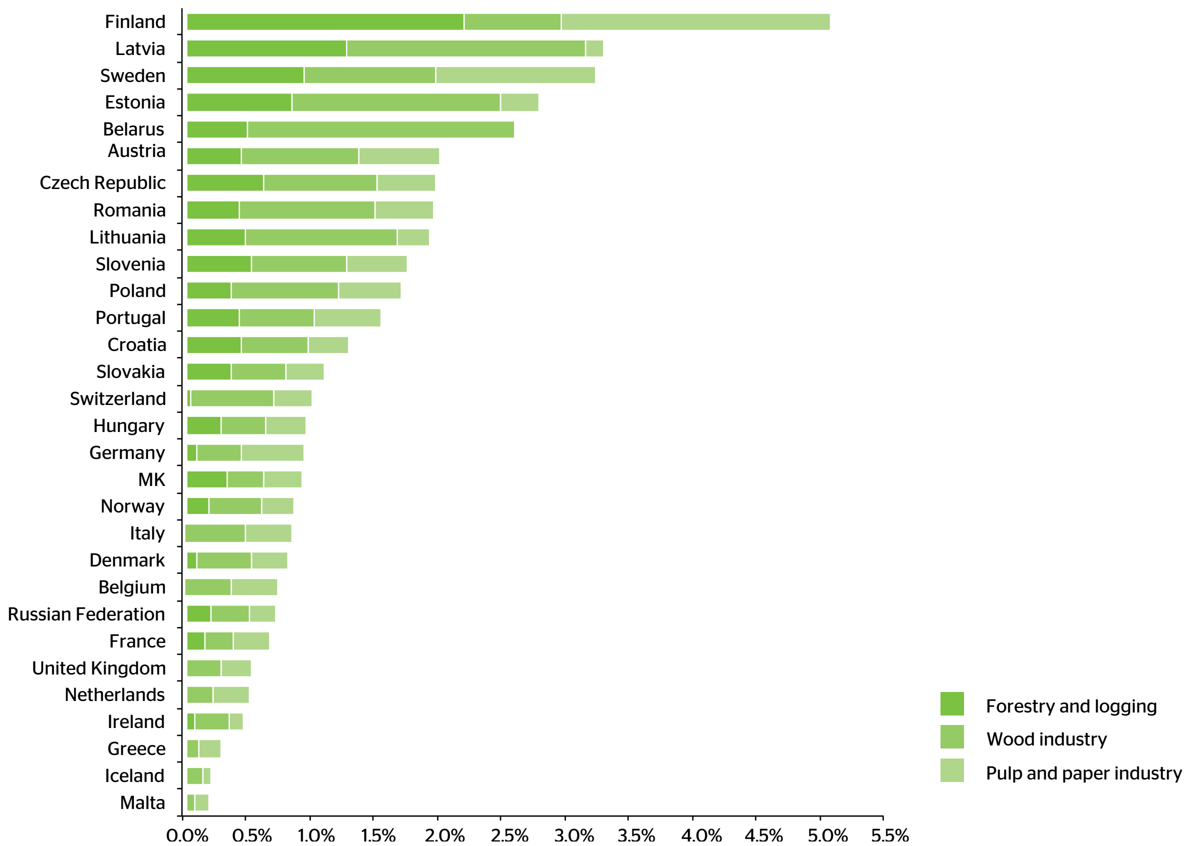
In Central-West Europe value added is highly concentrated in the pulp and paper industry which accounts for half of the sector's value added. In other regions, except South-West Europe, the pulp and paper industry's share in value added is well below the European average.

The forest sector is particularly important for the economies of Finland, Latvia, Sweden (3 to 5 percent of GDP) and Austria, Belarus and Estonia (2 to 3 percent of GDP). Other countries where the forest sector is also important (1.5 to 2 percent of GDP) include the Czech Republic, Lithuania, Poland, Portugal, Romania and Slovenia.

Table 37: Status of forest sector's value added distribution by region

Region	Forestry (ISIC/NACE 02) billion EUR	Forestry %	Wood industry (ISIC/NACE 20) billion EUR	Wood industry %	Pulp and paper industry (ISIC/NACE 21) billion EUR	Pulp and paper industry %	Forest sector (ISIC/NACE 02, 20, 21) billion EUR	Contribution to GDP (%)
	Distribution of forest sector gross value added in 2008							
Russian Federation	2.1	27	3.5	45	2.2	28	7.9	0.8
North Europe	7.8	37	6.0	29	7.0	34	20.9	2.2
Central-West Europe	8.6	14	21.6	36	29.6	49	59.9	0.8
Central-East Europe	2.9	24	6.3	51	3.2	26	12.4	1.6
South-West Europe	2.6	12	9.9	47	8.5	41	21.0	0.8
South-East Europe	1.8	34	1.8	35	1.6	31	5.3	0.7
Europe	25.9	20	49.2	39	52.2	41	127.3	1.0
Europe without the Russian Federation	23.8	20	45.7	38	50.0	42	119.5	1.0
EU-27	21.0	19	40.7	37	47.2	43	108.9	1.0

Figure 70: Contribution of the forest sector to GDP in selected countries (percent of GDP)



Notes: 1) Figures are for the latest available years reported in country reports;
2) Belarus figure for the wood industry includes the pulp and paper industry

[15] Data for this reporting was collected and presented according to ISIC Rev 3.1 (2004) and NACE Rev 1.1 (2002).
[16] ISIC/NACE Division 02: Forestry, logging and related service activities.
[17] ISIC/NACE Division 20: Manufacture of wood and wood products.
[18] ISIC/NACE Division 21: Manufacture of pulp, paper and paper products.
[19] Note that none of the figures presented here have been adjusted for inflation (i.e. they are presented in nominal rather than real terms), unless indicated otherwise in the text.

Trends

Figure 71 shows the annual fluctuation in gross value added in the forest sector over the 2000–2008 period in European Union (EU) and European Free Trade Association (EFTA) countries combined[20]. The countries presented in the graph account for about 90 percent of Europe's GDP and value added in the forest sector. Therefore, trends presented in the graph well represent overall trends for Europe as a whole.

The forest sector value added in EU and EFTA countries combined ranged from EUR 108 to 123 billion from 2000 to 2008, with an average value of EUR 114 billion per year and annual figures within 10 percent of this average. Over the last decade, the year 2007 was particularly noteworthy in terms of overall economic performance led by high demand, prices and consumption. This is also obvious from the graph showing a jump of 8 percent in value added in the forest sector. The global economic recession, which started the following year, caused a decline in value added back to the average level of 2000-2006.

At the time of writing, aggregate 2009 data for the EU and EFTA countries were available only for the wood industry. In 2009, the wood industry experienced a sharp decline of 17 percent in value added as compared to 2008. This was a record low since 1999. Most likely, forestry and pulp and paper also saw a decline of about 20 percent in 2009. Preliminary quarterly data from selected country statistics offices indicate that value added increased somewhat in 2010; however, the recovery was still below the peak 2007 level.

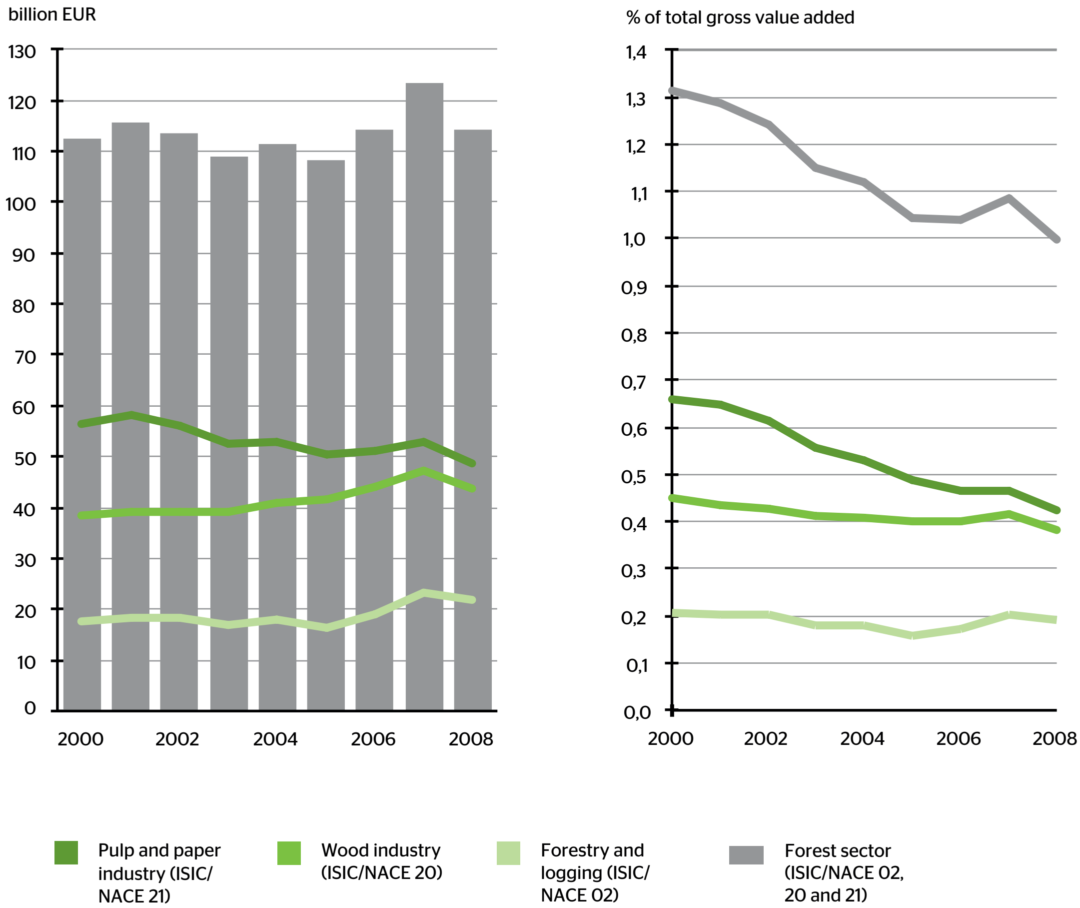
Annual data for value added in EU and EFTA countries reveal two diverging trends for Europe as a whole. First, forestry and the wood industry were growing over the past decade and maintained their share in GDP at about 0.2 percent and 0.4 percent, respectively. Second, the European pulp and paper industry has been experiencing a continuous decline. Its value added has declined by about 15 percent since 2000, resulting in a decline of the whole forest sector's contribution to GDP. Further analysis in the text below focuses on the trends for all of Europe, with a special focus on changes over the past decade.

Overall, the forest sector's value added in Europe increased by 7 percent to EUR 127 billion between 2000 and 2008. However, in real terms (deflated by GDP deflators), this nominal growth translates into a drop of 10 percent, mainly because of the decline in the pulp and paper industry.

There has been a shift in the regional distribution of the forest sector's value added in Europe over the past years (see Figure 72). The share of Central-West Europe has gradually decreased from 52 to 47 percent. North Europe's share has decreased from 19 to 16 percent (these figures mask the growth in three Baltic states from 0.7 to 1.3 percent). On the other hand, the combined share of Central-East Europe and the Russian Federation saw an increase, from 8 to 16 percent.

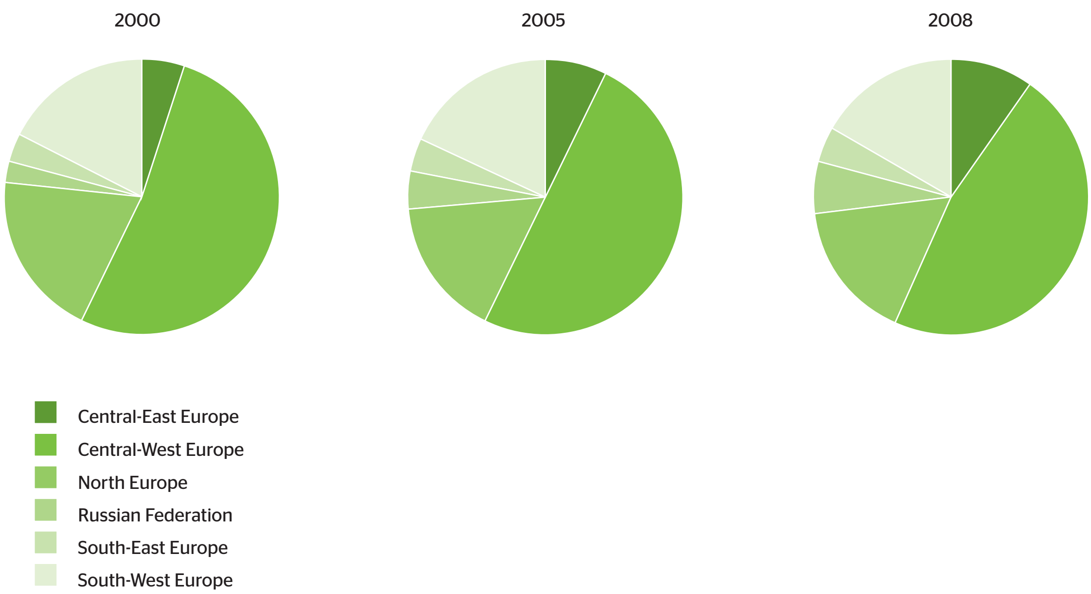
As mentioned above, there have been diverging trends in value added by forestry and the wood industry (both increasing) compared to the pulp and paper industry (declining). Table 38, Table 39 and Table 40 below show recent regional changes in output value, value added and contribution to GDP separately for forestry, wood industry and the pulp and paper industry, respectively.

Figure 71: Trends in forest sector's value added and contribution to GDP in EU and EFTA countries



Source: Eurostat

Figure 72: Regional distribution of forest sector value added, 2000-2008



[20] This includes all 27 member states of the European Union and Iceland, Liechtenstein, Norway and Switzerland.

Forestry experienced a healthy growth in output and value added in all regions except South-East Europe, particularly after 2005. In Europe, forestry's output value per m³ of roundwood removals in 2008 stood at 66 EUR/m³, a 34 percent increase since 2000. Value added was 39 EUR/m³ or a 23 percent increase since 2000. However, in real terms, the value added per m³ of roundwood remained unchanged.

This overall growth in forestry was driven mostly by increased roundwood prices (all regions except South-West Europe) and increased roundwood supply in some regions (Central-East Europe, the Russian Federation, South-East Europe and South-West Europe) over the past years.

Similar to forestry, the wood industry in Europe has grown in terms of output value and value added and maintained its share in GDP stable. However, the trends differ among the regions. Central-East Europe and the Russian Federation accounted for almost all the growth in value added in Europe's wood industry. Value added was growing in line with the output value in these two regions.

In other parts of Europe, the value added remained quite stagnant (+ EUR 3 billion) in spite of a significant increase in output value (+ EUR 19 billion). The wood industry in most of these regions probably faced increased wood raw material costs that hampered growth in its value added.

In Europe overall, output value per m³ of sawnwood and panel production increased by 18 percent since 2008 (but declined by 3 percent in real terms). At the same time, the value added per m³ increased by 11 percent (decreased by 9 percent in real terms). All regions, except North Europe and the Russian Federation, experienced a decline in value added per m³ of sawnwood and panels in real terms. This suggests that, in most countries, the wood industry was neither able to obtain better prices for products nor to reduce costs.

Recent statistics confirm the trend indicated in the previous SoEF report (MCPFE/UNECE/FAO, 2007) that within the European forest sector the pulp and paper industry is facing the biggest challenges. Despite the slight increase in output value (+ EUR 12 billion or 3 percent), value added in Europe has declined by EUR 8 billion (17 percent). Its percentage contribution to GDP has almost been cut in half. Practically all this decline happened in North Europe and Central-West Europe that together represent 70 percent of value added in the European pulp and paper industry. Similarly, in South-East Europe, which accounts for another 16 percent of Europe's value added, output increase has not led to an increase in value added.

Analysis of output value and value added per unit of production (1 tonne of paper and exported market pulp) reveals quite alarming trends in Europe's pulp and paper industry. Output value per tonne has declined by 5 percent (or 19 percent in real terms) since 2000. At the same time, value added per tonne went down by 24 percent (34 percent in real terms). Value added per tonne declined in all regions and countries. It seems that the overall downward trend in Europe will continue in the near future, as most of the pulp and paper industry's new investments are taking place outside the region, where the cost and demand situation is more favourable than in Europe.

As mentioned above, gross value added by the Europe's forest sector declined by 10 percent (in real terms) over the last decade, but trends varied in different sub-sectors. Value added (in real terms) increased by 4 percent in forestry, increased by 2 percent in the wood industry, and decreased by 24 percent in the pulp and paper industry. At the same time, the contribution of the forest sector to GDP has declined from 1.3 percent to 1.0 percent. A continuing decline in the pulp and paper industry influenced the overall reduction in the contribution of the forest sector to GDP. Forestry and the wood industry both maintained their shares of GDP. This result is similar to that reported in the SoEF 2007 report (MCPFE /UNECE/FAO, 2007) highlighting a downward trend in the European pulp and paper industry.

These trends suggest that the pulp and paper industry currently faces the biggest challenges in Europe. The pulp and paper market is truly global, while raw material prices have increased over the last years due to the growing competition from the energy sector. The industry is large scale and requires huge investments and more time to adapt to these changes. Currently most of the new investments are taking place in other parts of the world where raw material supply is higher and costs are lower (Latin America, Oceania) or consumer markets are rapidly growing (Asia).

Other subsectors (forestry and the wood industry) adapt more easily to changes in market conditions and were able to increase the value added during the last decade, possibly due to smaller scale and wider product mix (wood industry). Increased competition between the wood industry and the energy sector and higher prices for low quality roundwood and wood processing residues resulted in an increase of value added in forestry. A strong raw material base, technological innovations, increasing trade liberalization and expansion of the EU single market have helped European forestry and wood industries maintain their growth and competitive position in global markets. Shifting production from West Europe to lower-cost Eastern European countries and investments in replacement of labour with capital (machinery) helped increase productivity and value added of the industries.

Table 38: Forestry (ISIC/NACE 02) output value and value added

Region	Output (billion EUR)			Gross value added (billion EUR)			Contribution to GDP (%)		
	2000	2005	2008	2000	2005	2008	2000	2005	2008
Russian Federation	-	3.1	4.3	-	1.7	2.1	-	0.3	0.3
North Europe	8.1	7.5	11.3	6.0	4.6	7.8	0.9	0.6	0.8
Central-West Europe	11.7	12.2	14.8	7.5	7.2	8.6	0.1	0.1	0.1
Central-East Europe	3.2	4.7	7.2	1.6	2.0	2.9	0.4	0.3	0.4
South-West Europe	3.0	2.9	2.9	2.6	2.5	2.6	0.1	0.1	0.1
South-East Europe	2.6	3.1	3.6	1.3	1.6	1.8	0.4	0.2	0.2
Europe	-	33.5	44.1	-	19.6	25.9	-	0.2	0.2
Europe without the Russian Federation	28.6	30.4	39.8	19.0	17.9	23.8	0.2	0.2	0.2
EU-27	24.8	26.0	34.8	16.8	15.6	21.0	0.2	0.2	0.2

Table 39: Wood industry (ISIC/NACE 20) output value and value added

Region	Output (billion EUR)			Gross value added (billion EUR)			Contribution to GDP (%)		
	2000	2005	2008	2000	2005	2008	2000	2005	2008
Russian Federation	-	5.8	9.9	-	2.2	3.5	...	0.4	0.4
North Europe	18.6	22.2	23.8	5.1	6.4	6.0	0.8	0.8	0.6
Central-West Europe	57.2	62.1	66.0	21.0	20.9	21.6	0.4	0.3	0.3
Central-East Europe	8.8	13.6	19.4	2.9	4.4	6.3	0.8	0.7	0.8
South-West Europe	29.7	31.5	31.8	9.1	9.7	9.9	0.5	0.4	0.4
South-East Europe	4.3	5.2	7.0	1.3	1.5	1.8	0.4	0.2	0.2
Europe	-	140.4	157.9	-	45.1	49.2	-	0.4	0.4
Europe without the Russian Federation	118.6	134.6	148.0	39.3	42.8	45.7	0.4	0.4	0.4
EU-27	108.9	121.9	131.6	36.1	38.4	40.7	0.4	0.4	0.4

Table 40: Pulp and paper industry (ISIC/NACE 21) output value and value added

Region	Output (billion EUR)			Gross value added (billion EUR)			Contribution to GDP (%)		
	2000	2005	2008	2000	2005	2008	2000	2005	2008
Russian Federation	-	5.2	8.7	-	1.5	2.2	-	0.3	0.3
North Europe	33.6	28.8	31.1	12.1	8.1	7.0	1.8	1.0	0.7
Central-West Europe	90.6	85.5	90.3	33.4	30.9	29.6	0.6	0.5	0.4
Central-East Europe	6.3	9.2	13.2	1.7	2.3	3.2	0.5	0.4	0.4
South-West Europe	32.0	32.8	37.7	8.8	8.9	8.5	0.5	0.4	0.3
South-East Europe	4.8	5.8	7.1	1.6	1.4	1.6	0.4	0.2	0.2
Europe	-	167.3	188.1	-	53.2	52.2	-	0.5	0.4
Europe without the Russian Federation	167.3	162.1	179.4	57.6	51.7	50.0	0.7	0.5	0.4
EU-27	158.6	151.7	167.2	54.7	49.0	47.2	0.7	0.5	0.4

Indicator 6.3 Net revenue

Net revenue of forest enterprises.

Introduction

The net revenue of forestry is an important indicator of the degree of economic sustainability of forest management. The net revenue of forest enterprises includes all sources of income of the forest owner directly related to forestry, including subsidies and excluding taxes. From the national viewpoint, increasing net revenue from forestry indicates the financial health of forestry business, which is necessary for the economic sustainability of forests.

Two variables for net revenue are used here, based on statistics from Eurostat's economic accounts for forestry (according to ISIC/NACE) and reports from individual countries: net value added and net entrepreneurial income. They are reported at constant 2005 prices, adjusted for inflation using GDP deflators.

Status and trends

The net value added at factor cost (factor income) of forestry measures the remuneration at market prices generated by the forestry activities (including subsidies and excluding taxes), and equals the sum of labour costs and profit. Table 41 shows that the net value added per ha varies greatly among regions: in 2010, Central-West Europe had the highest figure (171 EUR/ha), followed (in declining order) by Central-East Europe, North Europe, South-West Europe, South-East Europe and the Russian Federation. The latter region has a low figure because of its very large area of forest available for wood supply (FAWS). One should interpret the figures in Table 41 with care, because the share of FAWS with data on net revenue varies greatly among regions (in 2005 from 18 percent for Central-East Europe to 98 percent for Central-West Europe) and because of varying quality of the national statistics. The trend is even more difficult to interpret, because the number of countries included in the statistics for each region varies over time. But it seems that in the 2005-2010 period, all regions except Central-East Europe and South-West Europe had an average annual increase in net value added (varying from 1.2 to 18.8 percent).

Net entrepreneurial income is the net operating surplus in forestry before taxes and including subsidies, and equals net value added minus labour costs. The statistics for net entrepreneurial income in

Table 42 indicate a similar picture as the net value added figures in Table 41. In the last period, this income per ha was highest in South-West and Central-West Europe (respectively 239 and 97 EUR/ha), followed by North Europe and Central-East Europe. The high value for South-West Europe was due to Portugal, the only country to report on this variable in 2005 and 2010 in this region. The trend, corrected for the inclusion of different countries over time, shows the same patterns as for net value added.

Table 41: Trends in net value added at factor costs in forestry 1990-2010

Region	Information availability of FAWS			Net value added*				Annual change rate					
	Nos. of countries reporting	Regional forest area of reporting countries in 2005 (1000 ha)	Area of reporting countries in % of total regional forest area in 2005	EUR/ha forest area				1990 - 2000		2000 - 2005		2005 - 2010	
				1990	2000	2005	2010**	EUR/ha	%	EUR/ha	%	EUR/ha	%
Russian Federation	1	690 978	100	-	0.19	0.45	0.49	-	-	0.05	15.6	0.01	2.8
North Europe	4-5[3])	51 428	94	100	104	90	107	0.4	0.4	-2.8	-2.9	5.7	5.8
Central-West Europe	5-7[2])	32 502	98	241	169	165	171	-7.2	3.5	-0.8	-0.5	2.0	1.2
Central-East Europe	2 (3)[1])	5 953	18	-	69	126	110	-	-	11.4	11.7	-5.3	-4.5
South-West Europe	2-3[5])	9 543	40	141	101	101	91	-4.0	-3.3	0.0	0.0	-3.3	-3.4
South-East Europe	1-3[4])	7 138	32	124	38	23	41	-8.6	-10.6	-3.0	9.8	6.0	8.8

* At constant 2005-prices.
** Data from most recent available year, on average 2008.
[1] In 2000: Hungary and Slovakia. In 2005 and 2010: Hungary, Slovakia and Czech Republic.
[2] In 1990: Austria, France, Netherlands, Switzerland and UK. From 2000: Austria, France, Netherlands, Switzerland, UK, Belgium and Germany.
[3] In 1990 and 2000: Denmark, Finland, Norway and Sweden. In 2005 and 2010: Denmark, Finland, Norway, Sweden and Lithuania.
[4] In 1990: Greece. In 2000: Greece and Slovenia. In 2005: Greece, Slovenia and Bulgaria. In 2010: Bulgaria and Slovenia.
[5] In 1990 and 2000: Italy, Portugal and Spain. In 2005 and 2010: Italy and Portugal.

Table 42: Trends in net entrepreneurial income of forestry 1990-2010

Region	Information availability of FAWS			Net value added*				Annual change rate					
	Nos. of countries reporting	Regional forest area of reporting countries in 2005 (1000 ha)	Area of reporting countries in % of total regional forest area in 2005	EUR/ha forest area				1990 - 2000		2000 - 2005		2005 - 2010	
				1990	2000	2005	2010**	EUR/ha	%	EUR/ha	%	EUR/ha	%
Russian Federation	1	-	-	-	-	-	-	-	-	-	-	-	-
North Europe	4-5[3])	50 883	93	62	77	62	89	1.5	2.2	-3.0	-4.3	9.0	11.9
Central-West Europe	5-7[2])	32 502	98	156	82	68	97	-7.4	-6.2	2.8	3.7	9.7	11.8
Central-East Europe	3-4[1])	14 370	42	-	12	29	26	-	-	3.4	16.6	-1.0	-3.6
South-West Europe	1-2[5])	1 802	8	137	87	272	239	5.0	-4.45	37	20.6	-11.0	-4.3
South-East Europe	2-3[4])	7 183	32	-	-	10	24	-	-	-	-	4.7	27.6

* At constant 2005 prices
** Data from most recent available year, on average 2008.
[1] In 2000: Hungary and Slovakia. In 2005 and 2010: Czech Republic, Hungary, Poland and Slovakia.
[2] In 1990: Austria, France, Netherlands, Switzerland and UK. From 2000: Austria, France, Netherlands, Switzerland, UK, Belgium and Germany.
[3] In 1990 and 2000: Denmark, Finland, Norway and Sweden. In 2005 and 2010: Denmark, Finland, Norway, Sweden and Lithuania.
[4] In 2005: Bulgaria, Greece and Slovakia. In 2010: Bulgaria and Slovenia.
[5] In 1990 and 2000: Portugal and Spain. In 2005 and 2010: Only Portugal.

Indicator 6.4 Expenditures for services

Total expenditures for long-term sustainable services from forests.

Introduction

Information about government expenditure on forest services was collected from countries for four years (1990, 2000, 2005 and 2010), divided into expenditure on four different types of services: ecological services; biospheric services; social and amenity services; and other services. These figures were converted into a common currency unit (EUR) for aggregation at the European and regional level[21]. The analysis here describes the quality of the data collected, then presents the current status and trends in this indicator. It finishes with a few conclusions about these results.

Data coverage and data quality

In total, 176 figures were provided for this indicator out of a possible total of 736, so countries were able to provide just under one-quarter (24 percent) of the detailed information requested. Out of the 46 European countries, four provided this information for all types of service and all four years, another six provided information for all types of service for some of the years (usually the more recent years) and another 21 countries provided partial information. A summary of the responses to this part of the enquiry is given in Table 43 below. In general, there were three main deficiencies in the data:

- very few countries provided any information for the year 1990;
- many countries provided information for some (but not all) services in any given year; and
- 15 countries did not supply any information at all.

The second problem above was the most important. Excluding countries in such cases would reduce the response rate significantly. Therefore, to take advantage of the large amount of partial data provided, countries were included in the analysis even if they did not include data for all four types of forest service in any given year[22].

Status

The current status of government expenditure on forest services in Europe is given in Table 44 and Figure 73. The countries that provided this data reported total expenditure of EUR 3.2 billion, with expenditure of about EUR 2.5 billion in the EU and EUR 0.7 billion in the Russian Federation.

Expenditure at the regional level cannot really be interpreted because of the very small number of countries reporting information in each region. For example, almost half of the total expenditure in Europe appears in Spain and this was the only country reporting data for 2010 in the South-West Europe region. However, looking at the expenditure per hectare, the data broadly reflect the different levels of wealth across Europe, showing that this is an important factor affecting expenditure on forest services.

The information about expenditure on different types of forest service is given in Table 44 and Figure 73. It shows that almost 60 percent of all public expenditure on forest services is spent on supporting ecological and biospheric services. About 3 percent is spent on social and amenity services and the remaining nearly 40 percent is spent on other services.

Again, these figures may give a very poor indication of the true levels of expenditure on different types of forest service because of missing data. Furthermore, in many cases, countries reported most of their expenditure on just one type of forest service. For example, most of the expenditure on social and amenity services appears in the United Kingdom (and most of the United Kingdom's expenditure is devoted to this type of forest service). Three countries (France, Sweden and Spain) account for most of the expenditure on ecological and biospheric services and, again, in the case of France and Sweden, most of their expenditure falls under these categories.

This high level of variability, both in terms of how much is spent and its focus, makes it very difficult to generalize about the priority given to public expenditure on forestry at the European and regional level and the relative importance of the different forest services.

Figure 73: Government expenditure in 2010, by type of service (million EUR)

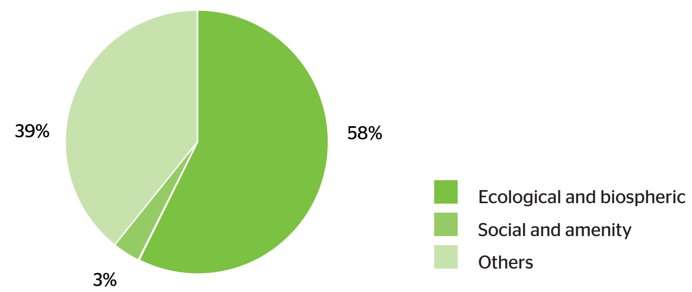


Table 43: Amount of data collected on government expenditure on forest services, by year and region

Region	Countries providing figures (by number of countries)				Countries providing figures (% of total forest area)			
	1990	2000	2005	2010	1990	2000	2005	2010
Russian Federation	0	1	1	1	0	100	100	100
North Europe	1	3	3	2	42	45	45	44
Central-West Europe	2	5	7	5	19	95	98	67
Central-East Europe	1	3	3	4	5	15	15	36
South-West Europe	0	1	2	1	0	29	88	59
South-East Europe	2	3	4	4	2	7	19	19
Europe	6	16	20	17	4	88	90	89
Europe without the Russian Federation	6	15	19	16	19	40	51	45
EU-27	5	13	17	14	25	53	67	60

Table 44: Government expenditure on forest services in 2010, by type of service and region

Region	Total expenditure (million EUR)				Expenditure per ha (EUR/ha)
	Type of service			Total	
	Ecological and biospheric	Social and amenity	Others		
Russian Federation	0	0	672	672	0.83
North Europe	496	3	-	499	16.22
Central-West Europe	267	75	15	357	14.45
Central-East Europe	87	1	-	87	5.47
South-West Europe	961	28	568	1 557	85.66
South-East Europe	32	2	3	36	6.21
Europe	1 841	108	1 258	3 208	3.55
Europe without the Russian Federation	1 841	108	586	2 536	26.59
EU-27	1 761	108	585	2 455	26.20

[21] Note that none of the figures presented here have been adjusted for inflation (i.e. they are presented in nominal rather than real terms), unless indicated otherwise in the text.
[22] Implicitly, this is the same as assuming that the missing values are zero, so the results give a minimum estimate of expenditure on each type of forest service.

Trends

The trends in government expenditure on forest services from 2000 to 2010 are shown in Table 45 below. These figures only include data from the 13 countries that provided information for all three years. As the table shows, expenditure at the regional level increased significantly from 2000 to 2005 then declined slightly by 2010. All of the regions display similar trends although, in many cases, the difference between 2005 and 2010 is more of a levelling-off in expenditure rather than a decline. However, if inflation is taken into account, expenditure in 2010 has fallen (in real terms) compared to 2005 in all regions.

Results and conclusions

The main result of this analysis is that there is a large amount of variability in expenditure on forest services across Europe. This result is very similar to that reported in the Global Forest Resource Assessment (FAO, 2010) in that a small number of countries account for most of the expenditure at the regional level. For example, four countries with over EUR 100 million in expenditure in 2010 (France, Sweden, the Russian Federation and Spain) account for 90 percent of the total for all countries reporting expenditure in that year. Considering the large amount of missing data, the conclusions presented here at the regional level are likely to have a high margin of error and it is impossible to draw any reliable conclusions at the regional level.

Another conclusion about the data concerns the requirement to provide detailed expenditure data divided into different types of forest service. The amount of expenditure on different forest services appears to be very location-specific and it is unclear if or how this can be interpreted and whether this level of detail is necessary in the future.

In very broad terms, the wealthier countries in Europe (i.e. Western Europe) appear to spend about EUR 15 per ha on forest services and countries in Eastern Europe spend roughly EUR 5 per ha. Expenditure in the Russian Federation is around EUR 1 per ha, but over a much larger forest area. Thus, the level of income in countries appears to be the main determinant of how much their governments spend on forest services rather than any differences in their forest resources or their production of forest services (e.g. there is no obvious reason other than this why Western Europe spends three times as much per ha as Eastern Europe). Again, this result mirrors that found at the global level in the Global Forest Resource Assessment.

The trend in public expenditure on forest services shows a significant increase from 2000 to 2005, then a slight decline to the year 2010. Although this trend is likely to have a high margin of error, a similar trend appears in all of the regions. Considering that many countries are currently facing severe constraints on public expenditure, it is possible that the figure for 2010 is a short-term reduction and that the underlying long-term trend is one of a gradual increase over time. Furthermore, this trend appears to be slightly above the rate of inflation in all of the regions, suggesting that public expenditure is increasing slightly in real terms.

Table 45: Government expenditure on forest services in 2000 - 2010, by year and region

	Government expenditure			Government expenditure		
	Total (million EUR)			EUR per ha		
Region	**2000**	**2005**	**2010**	**2000**	**2005**	**2010**
Russian Federation	346	823	672	0.43	1.02	0.83
North Europe	299	497	499	9.78	16.21	16.22
Central-West Europe	236	385	355	10.20	16.27	14.83
Central-East Europe	49	76	77	7.58	11.64	11.61
South-West Europe	-	-	-	-	-	-
South-East Europe	19	23	26	10.28	12.06	13.93
Europe	949	1 803	1 630	1.09	2.07	1.87
Europe without the Russian Federation	603	980	958	9.72	15.63	15.14
EU-27	543	921	876	8.99	15.09	14.25

Indicator 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.

Introduction

Employment in the forest sector has always been and continues to be an important contributor to rural economies and to the livelihood of rural areas. Almost four million people in Europe still earn their living from working in forestry and forest-based industries, out of which about 750 000 work in forestry. Even if the number of people directly employed in forestry is undergoing a steady decline, forestry and forest-based production still are an important basis for value chains in rural areas.

Employment as an indicator for sustainability has several dimensions. On the one hand, the numbers of people employed provide an indication about the role the forestry sector plays for income and employment, what again is a major source for social welfare. On the other hand, a sufficient number of working people with adequate skills and competences is a prerequisite not only for forest management and forest-based production but also for the achievement of social and ecological functions of forests.

Status

The forest sector continues to be an important factor for employment in rural areas. Even if the absolute employment figures for some regions like North Europe are very low compared to the level of forest production, the relevance of employment is particularly high in rural areas with a low density of population like in the North Europe region Table 46).

The highest number of forestry workers can still be found in Central-East Europe. This coincides with a rather low level of mechanization of forest operations in these countries.

The wood and paper industries show that these sectors play a very high role in employment in all regions. Comparatively low industrial employment rates can be found in North Europe, which is a clear indication of the very high level of productivity of these industries, mainly in Finland and Sweden.

Employment in wood manufacturing and paper industries is about four times higher than in forestry. Considerable differences can be found among the regions. Whereas the proportion of wood industries as a share of total forest sector employment is in a wide range between 40 and 60 percent, the proportion of industrial employment in Central-West Europe is nearly 90 percent of the total forest sector employment. This shows on the one hand the high importance of wood manufacturing and on the other hand the rather high level of productivity in forestry in this region. The high proportion of forestry employment in Central-East Europe reflects the very high labour intensity in this region.

The biggest difference among countries concerning forestry employment can be observed in labour intensity

Table 46: Employment in the forest sector in Europe

Region	Employment (1 000 persons) by sector (2010)			
	Forestry (ISIC/ NACE 02)	Manufacture of wood and articles in wood (ISIC/ NACE 20)	Manufacture of paper and paper products (ISIC/ NACE 21)	Total
Russian Federation	74	341	399	814
North Europe	97	175	74	346
Central-West Europe	107	450	368	925
Central-East Europe	267	443	169	879
South-West Europe	93	343	146	582
South-East Europe	101	227	78	406
Europe	739	1 979	1 234	3952
Europe without the Russian Federation	665	1 638	834	3 138
EU-27	478	1 397	701	2 576

which can be described by the number of persons per 1 000 ha (Figure 74). The average number of people employed per ha in all Europe is about three. With six workers per 1 000 ha, Central-East Europe still shows a very high labour intensity in forestry. Although North Europe has reached an average level of 1.4 workers, even within this region the intensity varies. In Sweden and Finland, which are noted for their advancement in mechanization of forest operations, there remains only about one employee, while in Lithuania (5.5) and Latvia (7) the labour intensity is on the same level as in Central-East Europe.

A very low labour intensity is reported for the Russian Federation where only about one person per 10 000 ha is registered in public statistics. This might be explained by a very low intensity of timber utilization in large parts of forest in the Russian Federation, but it can also be assumed that private harvesting enterprises are not yet completely integrated in labour statistics.

Demographic change and an ageing work-force are a critical threat for sustainable development in all economic sectors. 25 percent of the overall forestry work-force in Europe is 50 years and older. In the wood manufacturing industry only 20 percent of the employees are 50 years and older. The most severe ageing of the work-force can be observed in North Europe where 37 percent of the employed are 50 years and older whereas in South-East Europe only 22 percent are in this age group. South-East Europe is also the region where the work-force slightly increased over the last five years.

Across Europe, women only account for 25 percent of the overall work-force employed in forestry. In wood industries it is not even 20 percent, while in paper industries it is about 30 percent. There are only small differences between 1990 and 2010.

However, in forestry there are considerable differences among regions. When only the EU-27 countries are observed, female employment only accounts for 14 percent of the total employment. Among the Western countries only the Netherlands reports a considerably higher than average figure with 33 percent of the work-force being female. In Bulgaria, the figure is 26 percent while in North Europe only 11 percent of those employed in forestry are women.

The available data only provide the proportion of male and female people in the work-force.

Unfortunately the data do not allow any analysis of the tasks women carry out and their proportion in the reported qualification levels. Notwithstanding this lack of possibilities for cross-analysis of the data, it can be assumed that, particularly in the regions and countries with a very low level of mechanization, lower productivity and a very high labour per forest area ratio, many more women are still working in forestry than, e.g. in the Nordic countries where machine work is supposed to be a male domain.

Trends and explanations

Compared to the employment numbers in the year 2005, employment in all sectors continues to decline (Figure 75).

At first sight it seems to be a continuing trend that labour in forestry is declining in Europe. A closer look into the data for countries and regions shows that there are considerably different trends among regions and countries (Table 47). Particularly in Central-East Europe a decline seems to continue at a rather steady pace after stocking up the work-force in the period from 1990 to 2000. The development is remarkable in all other European regions where the decline of work-force seems to come to a halt or is even turned back into employing workers again. For example, in Central-West Europe a slight increase can be observed for the last five years after a sharp decline from 1990 to 2005. The sharpest decline was reported for the Russian Federation where in 2005 still 170 000 workers were registered and the latest number is 74 000 workers.

Even if the figures only provide tentative information because some data in the time series are missing and discrepancies in statistical methodologies cannot be precluded, they indicate that the reduction of the forestry work-force has reached or even overcome a bottom line which was achieved as a result of organization reforms in forest management and even more from increased productivity mainly due to mechanization of forest operations. In countries where an ongoing decrease of employment can be observed, particularly in Central-East Europe and the Russian Federation, this goes along with a slow but steady introduction of mechanization.

Figure 74: Employment in forestry per area of forest (persons/1000 ha) in Europe in 2010

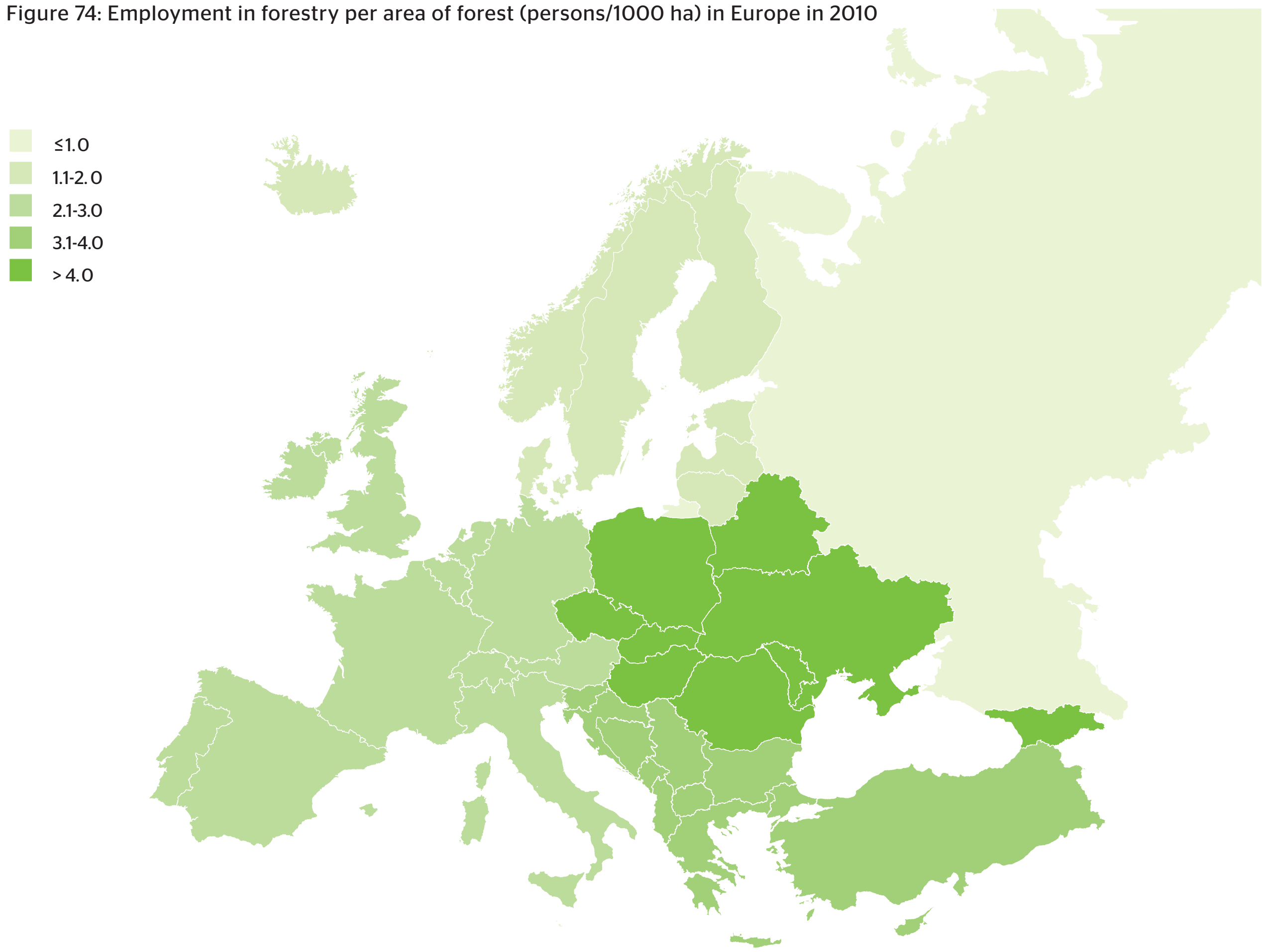
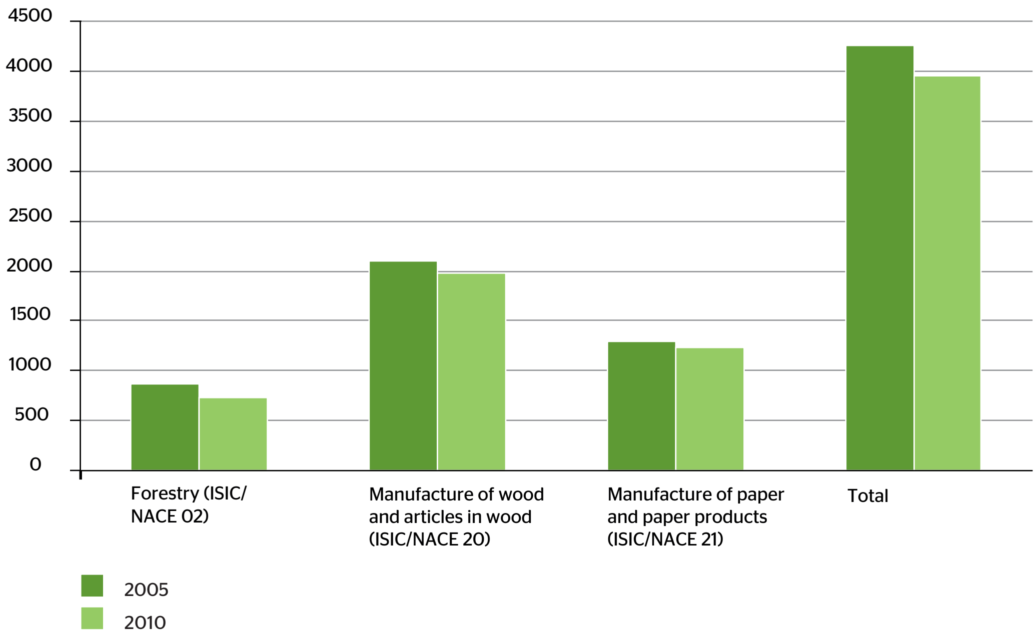


Figure 75: Employment (1 000 persons) by sector data for 2005 and 2010 in Europe



Trend series for those countries where figures are available show that the proportion of the age group 50 and older was decreasing in the period from 2000 to 2005, and that over the last five years the proportion of older employees has increased again by more than 3 percent annually. This should be considered as an alarm for the sector, because it implies that forestry over the next ten years will have to put a huge effort into the recruitment of young entrants to maintain the necessary capacities. Some countries (e.g. Finland) even highlight that the recruitment of new entrants is one of the most crucial challenges for forest labour policy in the future.

As an overall trend it can be observed that the proportion of un- and low-qualified workers among the total workforce has decreased over the last 20 years whereas the highly-qualified employees proportionally have increased. Unfortunately the available statistics do not provide a specification of qualification levels according to tasks. A slight increase of higher education compared to 2000 and 2005 might be explained by a reform in the work-force in general, where personnel reduction was affecting mainly the operational parts of enterprises, while professional staff (managers and foresters) was much less affected.

The comparison of the employment figures and their development in the past 10 years shows that the trend of reduction continues. The figures do not directly provide the reason, but it is obvious that increased productivity by mechanization accounts for the majority of job reductions. While in some countries, like Finland and Sweden, the numbers provide an indication that the labour market in forestry and in wood industries has more or less stabilized at a rather low level over the last five years, countries in Central-East Europe observed a rather sharp reduction of the work-force.

From a sustainability perspective, in addition to the numbers of people employed, the quality of work is an important criterion. The EU Lisbon strategy has summed this up under the slogan "more and *better* jobs". From the actual data collection and analysis, only conclusions about the quantity of work provided by forestry and forest-based sectors can be drawn. An equally important sustainability criterion, of course, is the quality of work which could be assessed by a number of indicators such as workers' rights, job security, career opportunities and investment in human resources (recruitment, training, participation).

However, it can be assumed from looking, for example, into the qualification development, that there is a slight indication that the remaining jobs are on a higher qualification level, and that more productive work processes with higher mechanized support will also improve working conditions. The following analysis of health and safety might provide an indication if at least "better jobs" could be achieved in the past 10 years.

Table 47: Annual change rate of forestry employment by region for European countries (data calculated only for in total 18 countries where a full time series was available)

Region	Annual Change rate (%)		
	1990-2000	2000-2005	2005-2010
Russian Federation	0.83	-3.29	-15.32
North Europe	-3.05	-2.70	-0.73
Central-West Europe	-2.33	-4.23	0.16
Central-East Europe	5.07	-0.87	-3.70
South-West Europe	0.21	0.33	0.72
South-East Europe	-0.02	-13.16	4.35
Europe without the Russian Federation	0.33	-1.91	-1.10
EU-27	-1.54	-2.50	0.35

Indicator 6.6 Occupational health and safety

Frequency of occupational accidents and occupational diseases in forestry.

Introduction

Health and safety is a very important indicator for social sustainability because protecting health and safety in work places is a fundamental objective for responsible management. Furthermore, statistical data on accidents are the only at least partly reliable quantitative information available about working conditions. Even if the number of accidents only provides a limited insight into the quality of work, it can be considered as a key indicator for enterprise culture with respect to caring for the well-being of workers and investment in human resources.

The following analysis is only based on accident statistics. It needs to be pointed out that health and safety is more than just prevention of accidents. It is about maintaining the physical and mental well-being of people in their work-places. Non-accidental injuries and work-related diseases can be as debilitating for peoples´ health as accidents can be.

Particularly in forestry, which always has taken and continues to take a sad lead position in accident statistics, health and safety requires a very high level of attention both from a political and a management point of view. This is reflected in the qualitative inquiry which has been carried out for this report: Nearly all country respondents name the improvement of health and safety as one of their prominent political goals in the field of social activities.

Status

Forestry remains a very dangerous occupation. The reported data show clearly that even if considerable success could be achieved in many countries to reduce accidents, the frequency is generally still too high throughout Europe. About one out of ten workers suffers from an accident annually.

About 200 people are killed annually in forestry work in the European countries, not including the Russian Federation where over 300 fatalities were reported for 2005.

Using the example of some countries, where it can be assumed that accident statistics are quite reliable, it can be shown that the situation described by the available statistical data is disillusioning (see Table 48). However, interpretation and comparison of accident statistics can only be undertaken in rather general terms since the statistical basis is very different among countries. In some countries self-employed forestry workers and private forest owners are included in reported data, like in Austria. In other countries, the data provided for this report only include employees, as is the case for Finland. Furthermore, it can be assumed that some countries still do not have an effective accident reporting scheme in place which would allow a reliable follow-up of the health and safety situation.

Table 48: Accident frequency per year in selected European countries

	Forestry (ISIC/NACE 02)											
	Fatal occupational accidents				Non-fatal occupational accidents							
	Number				Number				Annual rate per 1000 workers			
Region	1990	2000	2005	2010	1990	2000	2005	2010	1990	2000	2005	2010
Austria	30	23	28	39	4668	2015	1867	1966	-	112	107	186
Finland	1	2	4	2	416	416	433	553	25	26	28	35
Slovenia	1	1	1	1	439	211	182	177	76	108	91	93
Spain	-	13	7	7	-	4401	3329	3077	-	496	284	133
Switzerland	8	4	3	3	1843	888	814	774	228	131	131	126
Sweden	1	5	5	1	1196	185	171	89	41	11	8	6
United Kingdom	10	4	3	0	242	177	111	106	14	11	7	6

Trends and explanations

The reported data show that the accident frequency in forestry generally has not considerably improved over the last decade. Of course, the level of accident frequencies is very different among countries and regions. When comparing Sweden and Switzerland, for example, it is obvious that different work environments, characterized by mainly mechanized operations in rather homogeneous conditions vs. lower mechanization in mainly mountainous sites, lead to considerable differences in accident risks.

The absolute accident frequency was reduced particularly in Central-East (by about 15 percent), South-East (by about 25 percent) and South-West Europe (5 percent) but this coincides with a decline in employment.

Considerable success in improving safety was achieved in South-West Europe, here shown using the example of Spain where the absolute numbers of accidents (both fatal and non-fatal) were reduced by30 percent from 2000 to 2010. But the relative figure of 133 non-fatal accidents annually per 1000 workers is still very high. A similar picture can be provided for Switzerland, where remarkable initiatives were taken in the last decade to improve health and safety, but where still one out of seven workers suffers from an accident annually.

And even in the countries which are known for high attention to improving conditions, there is no real decrease in accidents. This is the case in Finland which is characterized as being advanced in mechanization and as having a well-advanced health policy. Even there, accident frequency has not been further reduced over the last decade.

Particularly in Central-West Europe where a lot of efforts to improve safety (e.g. by training, work organization and the raising of awareness) were taken, the relative frequency of accidents, which can be expressed by accidents per 1 000 workers, has stabilized at a level that is still too high. For Austria, for example, it is reported that 186 accidents per 1 000 workers occurred in the recent period, whereas the rate was 107 in 2005. Every sixth worker suffers from an accident annually. The high accident rate in Austria in the last five years is mainly attributed to clearing storm damage in 2008, which is the most dangerous activity in forestry work. This illustrates well that general trends in the development of working conditions are often overlapped by natural conditions.

That forestry work can be carried out with rather low accident risks is shown by the figures from North Europe. The use of mechanized systems (which is, at least in parts of this region, the rule today) bears much less risks for accidents than does motor-manual systems. This is particularly apparent in Sweden and in the United Kingdom. Therefore, further investment in technology will help improve working conditions. However, it needs to be mentioned also that mechanized systems bear health risks, like muscle skeletal disorders, which are known to cause severe health problems including disabilities to those who continue working in forestry. It is therefore of major importance to further invest in work organization and education to plan and organize operations with the objective of reducing health risks.

Health and safety is a key indicator for social sustainability since it the only recently available quantitative indicator which provides information about working conditions. Therefore it is of high relevance that accident statistics which include all people who carry out forestry work, like employees, self-employed entrepreneurs and private forest owners, should be kept in all countries.

Indicator 6.7 Wood consumption

Consumption per head of wood and products derived from wood.

Sustainable forest management in Europe is directly dependent on sustainable forest products markets, and vice versa. Consumption of roundwood and all of its products and by-products is a factor in the sustainable development of the forest sector. Profitability in most forests is contingent on sales of roundwood and, to a growing extent, on sales of forest residues for energy. Revenues from sales of wood support most activities and treatments in forests. For example, timber stand improvement (TSI) is often unprofitable, despite sales of small-diameter roundwood for either products such as panel manufacturing or energy production, but the costs of TSI are regained in final harvests of better quality roundwood.

Consumption of forest products increased in most regions of Europe from 1990 to 2010 – but not all (Table 49). The global economic crisis in 2008-2009, the years upon which the 2010 estimate is based, had a negative impact on Europe's forest products consumption trends. However, forecasts by the UNECE Timber Committee in October 2010 predicted a return to positive growth in consumption in 2010 and 2011, as well as its underlying factors of production and trade[23]. Given the general economic improvement in Europe in 2010, and its forecast to continue in 2011, the growth in consumption could continue in 2011. However, consumption was not forecast to recover fully in 2011 to its pre-crisis level. The greatest increases in consumption are occurring in the eastern regions of Europe, indicating greater prosperity as these countries move rapidly from transition economies and ascend to the European Union.

Consumption of wood and wood products varies widely across Europe, mainly because of cultural differences in building with wood (Figure 76). Wood-framed residential and non-residential construction is much more common in the Nordic countries than in south-east Europe. These cultural differences exist not only among countries, but also within countries, for example in wooden chalet and barn construction in mountains where wood is plentiful. Recognition of the environmental benefits of using wood in construction is slowly gaining popularity throughout Europe and could result in much higher consumption in the future. Green building, often promoted by governments as well as the forest sector, is based on greater use of renewable wood in structural applications, as well as insulation and decorative applications. For example, in the Russian Federation, the percentage of wood-based residential construction rose to 10.7 percent in 2009, doubling over five years. The federal government's strategy is to double the production of pre-fabricated wooden houses by 2020. These consumption calculations are based on primary forest products production and trade, and thus exclude secondary or added-value production, which if exported will decrease the region's consumption.

Table 49: Consumption of forest products, 1990-2010

	Cubic metres of roundwood equivalent per 1 000 population				Annual change
Region	**1990**	**2000**	**2005**	**2010**	**2005-2010**
Russian Federation	1 132	683	906	957	1.6%
North Europe	1 894	2 634	2 941	3 040	1.0%
Central-West Europe	1 429	1 532	1 591	1 509	-1.5%
Central-East Europe	444	493	700	797	3.8%
South-West Europe	886	1 183	1 235	1 050	-4.5%
South-East Europe	474	515	628	716	3.8%
Europe	994	1 028	1 167	1 160	-0.2%
Europe without the Russian Federation	961	1 106	1 223	1 203	-0.5%
EU-27	1 151	1 134	1 115	1 102	-0.3%

Notes: Based on roundwood, sawnwood, panels, pulp and paper. "1990" is actually 1992. "2000" is an average of 1998-2002. "2005" is an average of 2003-2007. "2010" is an average of 2008 and 2009. Russian Federation consumption includes a UNECE/FAO secretariat estimation of growth in sawn softwood consumption equivalent to changes in residential construction from 1998.

Source: UNECE/FAO TIMBER Database, 2010, based on national statistical correspondents annual responses to the Joint Forest Sector Questionnaire, which is not same basis as statistics elsewhere in this publication.

[23] UNECE Timber Committee forecasts: http://timber.unece.org/index.php?id=42

Figure 76: Wood consumption per capita, 2010 (cubic metres/1000 inhibitatants)

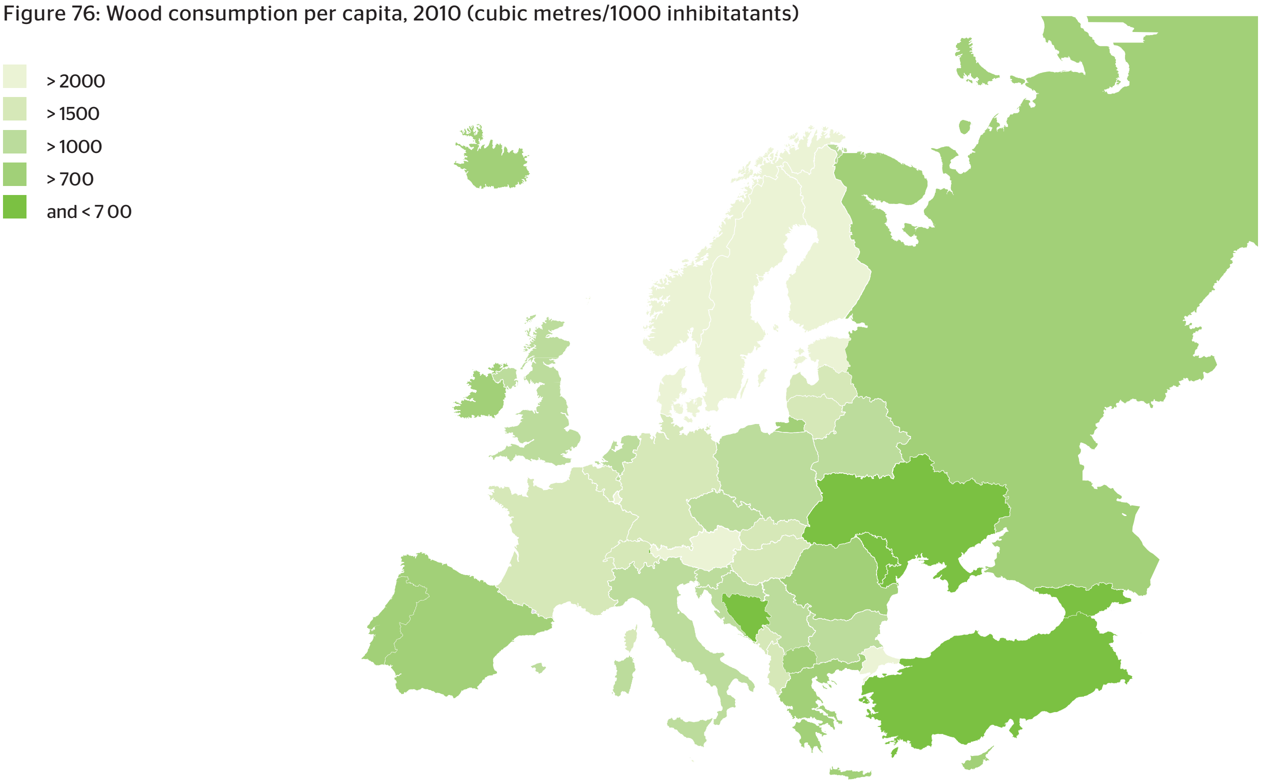
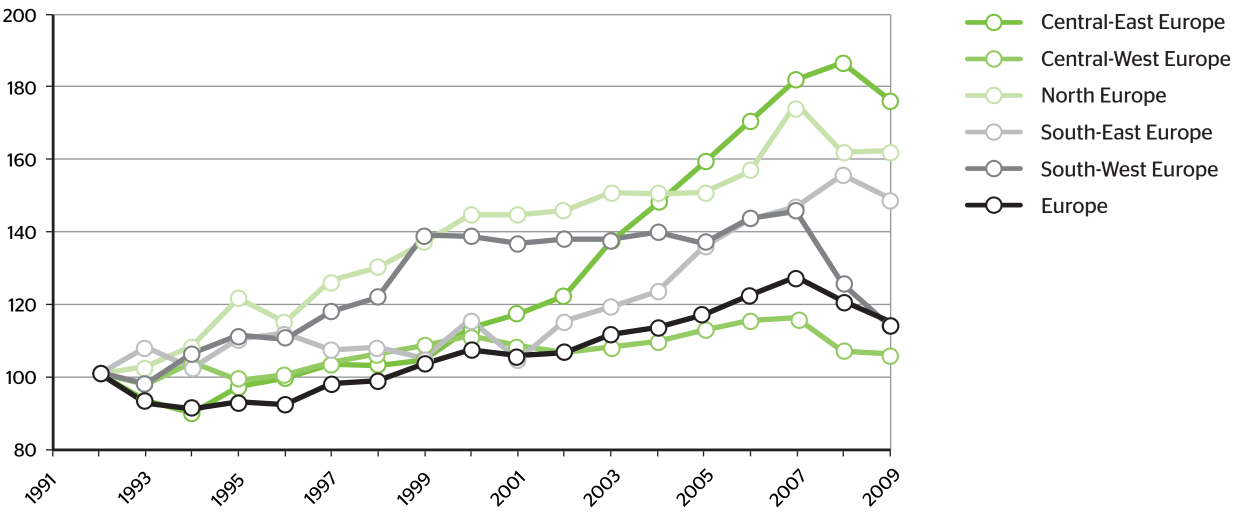


Figure 77: Wood consumption by region, 1990-2009 (1992 = 100%)



Rapidly rising consumption of wood-based energy is responsible for higher wood consumption in Europe. Governments have implemented policies to meet the European Union's 2020 goal of 20 percent of total energy consumption from renewable energy sources (currently approximately half of renewable energy comes from woody biomass). These policies are not only for the environmental benefits of using renewable energy sources, but also for energy security through a reduction of imported fossil fuels. The economic downturn in 2008-2009 resulted in decreased consumption in all forest products sectors except one -- wood energy. Wood-based energy consumption, combined with wood and paper products consumption, is rising in Europe, but at uneven rates in the different regions (Figure 77).

Wood consumption in Europe remains well below the growth of timber. Annual allowable cuts ensure that Europe's wood fibre needs are met, but harvests fall short of annual growth, by approximately 36 percent. This means that one-third of the annual growth is added to forest growing stock every year. Therefore with continued sustainable forest management, Europe will continue to have the possibilities of supporting increasing rates of consumption for wood and paper products and wood energy. It should be noted that not all growth may be harvestable if uneconomical, set-aside for environmental reasons, etc.

Indicator 6.8 Trade in wood

Imports and exports of wood and products derived from wood.

Trade of roundwood and all of its products had been rising within Europe and with its trading partners until the 2008-2009 global economic and financial crisis[24]. With many European countries in recession during that period, upon which the 2010 trade estimation is based, trade decreased in volume; value of trade remained steady from 2005 when adjusted for currency movements.

The volume of exports of wood and wood products in most regions, and overall in Europe, suffered a downturn during the crisis as construction activity slowed dramatically (Table 50). After having doubled from 1990 to 2005, exports stagnated in the 2010 period. As with consumption, the South-East region weathered the storm best and had positive export growth, albeit at lower volumes.

A vibrant forest products trade is essential for sustainable forest management as it enables renewable wood and paper products to meet the needs of consumers in Europe and elsewhere. While the figures shown for the 2005-2010 period often lack growth, the UNECE Timber Committee in October 2010 forecast improving trade in 2010 and 2011[25].

Forestry often suffers from low profitability, which has had a negative impact on the sector's sustained development. It is a positive sign for the sector that export values rose in all regions over the roughly 20 years of this analysis (Table 51). A commodity not included in the export value table is wood for energy in the form of chips and pellets. While a relatively low-value product on a unit basis, the trade of wood for energy has increased dramatically as European countries strive to meet the EU targets of 20 percent renewable energy in 2020. Wood is the greatest component of renewable energy in Europe now and will likely be so in 2020 as well.

Table 50: Exports of primary wood and paper products, 1990, 2000, 2005 and 2010, million m^3 roundwood equivalent

Region	1990	2000	2005	2010	Annual change 2005-2010
Russian Federation	26	59	92	79	-4.2
North Europe	106	164	178	159	-3.1
Central-West Europe	109	157	203	203	0.0
Central-East Europe	13	36	51	52	0.5
South-West Europe	20	30	39	44	3.4
South-East Europe	6	9	14	17	4.4
Europe	279	455	578	555	-1.2
Europe without the Russian Federation	253	395	486	476	-0.6
EU-27	235	365	448	440	-0.5

Notes: Based on roundwood, sawnwood, panels, pulp and paper. "1990" is actually 1992. "2000" is an average of 1998-2002. "2005" is an average of 2003-2007. "2010" is an average of 2008 and 2009. These same periods are the same in the other tables in this section.
Source: UNECE/FAO TIMBER Database, 2010, based on national statistical correspondents annual responses to the

Table 51: Exports of primary wood and paper products, 1990, 2000, 2005 and 2010 (million EUR)

Region	1990	2000	2005	2010	Change 2005 to 2010 (%)
Russian Federation	26	59	92	79	-4.2
North Europe	106	164	178	159	-3.1
Central-West Europe	109	157	203	203	0.0
Central-East Europe	13	36	51	52	0.5
South-West Europe	20	30	39	44	3.4
South-East Europe	6	9	14	17	4.4
Europe	279	455	578	555	-1.2
Europe without the Russian Federation	253	395	486	476	-0.6
EU-27	235	365	448	440	-0.5

Notes: Primary forest products only consisting of roundwood, sawnwood, panels, pulp and paper. Export values are as reported annually by national statistical correspondents, and are not adjusted for inflation.
Source: UNECE/FAO TIMBER Database, 2010.

[24] Statistics in this section include trade between European countries as well as trade outside Europe. Joint Forest Sector Questionnaire, which is not same basis as statistics elsewhere in this publication.
[25] UNECE Timber Committee forecasts: http://timber.unece.org/index.php?id=42

Europe is a net exporter of wood products, though trading patterns vary between countries. The relative values of imports and exports of wood products for the ten biggest trading countries are presented in Figure 78. Exports dominate trade in North Europe, while in other regions the picture is more balanced, though the UK in particular is a major net importer.

Taxes on roundwood exported from the Russian Federation were increased significantly in 2007 and again in 2008, with the intention of developing the domestic processing of wood and paper products. However, the taxes changed trade patterns for roundwood and resulted in severe export reductions, especially to the two major importers, neighbouring Finland and China (Figure 79). At the time of writing, the Russian government was still considering the possibility of increasing the taxes to €50 per m^3, which could make importing Russian roundwood unprofitable for most roundwood assortments.

Concern about deforestation of tropical forests has reduced demand for tropical timber products and their import volumes into Europe since 2000.

Former import levels of tropical wood have been partly replaced by wood from Europe's well-managed temperate and boreal forests. Certification of sustainable forest management has enabled traders, buyers and consumers to have assurance of the original source of certified forest products. The European Union has instituted policies to stop the trade of illegal timber through the Forest Law Enforcement, Governance and Trade programme and its Timber Regulation. These policies have the goal of increasing the legal trade of sustainably produced forest products.

Since 1990, Europe has evolved into a net exporter of wood and paper products (Figure 80). Although always well-endowed in forests, Europe's processing capacity was limited. With greater profitability and government incentives, investments into producing primary and secondary wood and paper products have grown to the point where Europe exports more volume and value than it imports. However, since the 2008-2009 economic crisis, capacity rationalizations have led to investments abroad, both in know-how and in processing.

Figure 78: Trade in wood and wood products in the ten main trading European countries (million EUR)

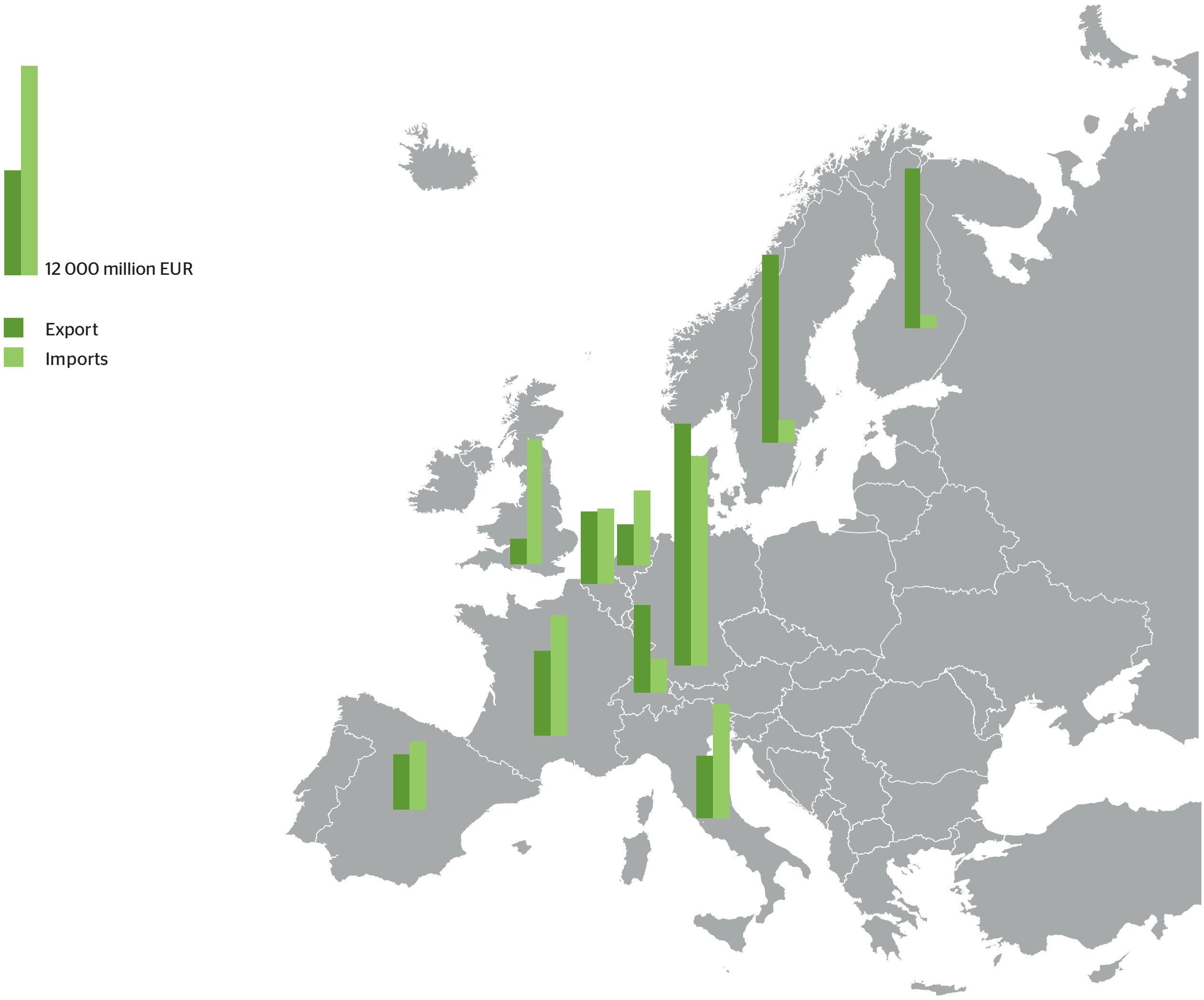
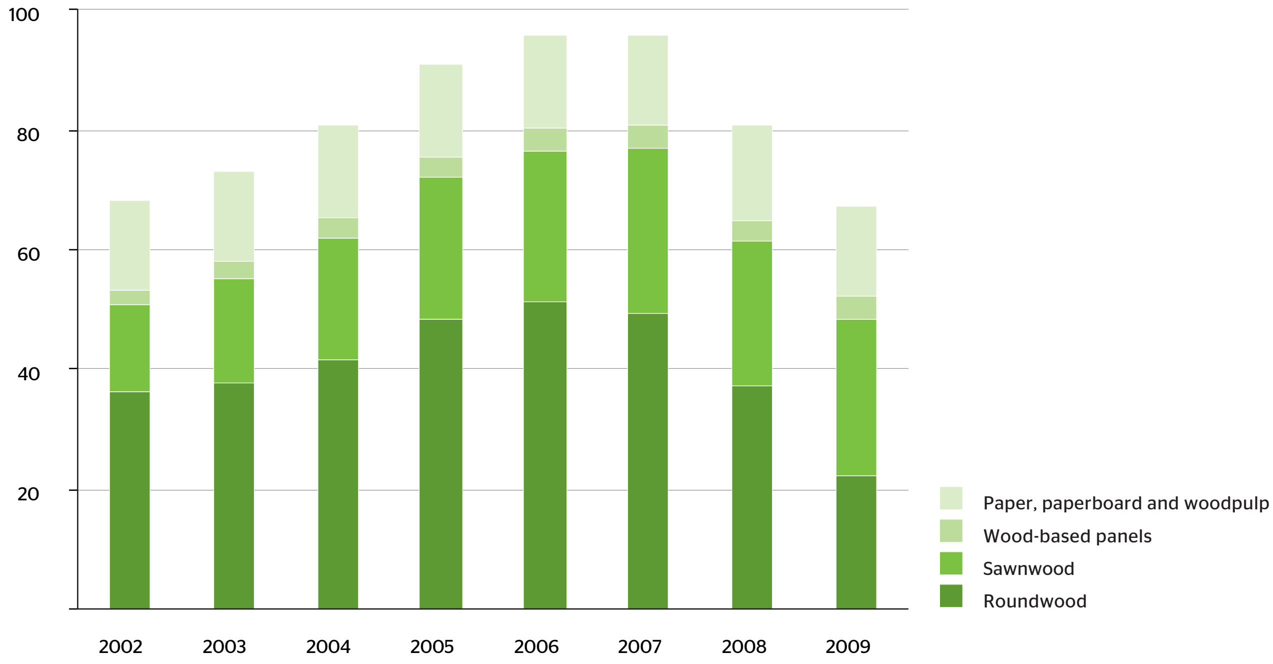


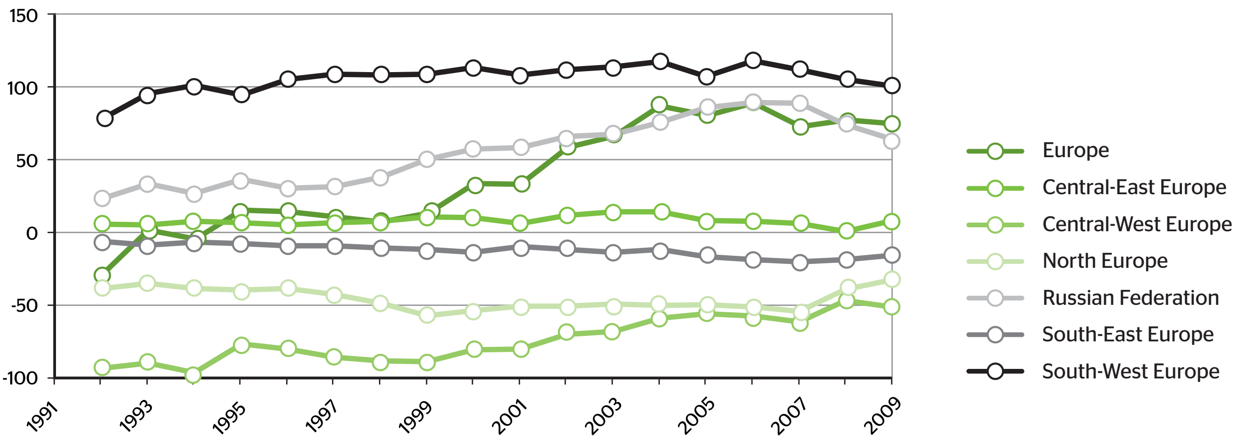
Figure 79: Russian forest products exports, 2002-2009 (million m³)



Notes: Based on roundwood equivalent for sawnwood, panels, pulp and paper and paperboard.
Source: UNECE/FAO TIMBER Database, 2011.

Paper, paperboard and woodpulp
Wood-based panels
Sawnwood
Roundwood

Figure 80: Net trade of primary wood and paper products by region of Europe, 1992-2009 (million EUR)



Similar to exports, following significant increases through 2005, imports were negatively affected by the 2008-2009 economic crisis in most regions and overall, as indicated by the 2010 estimation which is based on 2008 and 2009 (Table 52). The eastern region countries performed better on a percentage basis of their smaller volumes which is a sign of improving trade patterns in Europe.

The value of imports of primary products was increasing in every region until the economic downturn at the end of this reporting period (Table 53). Imports of primary- and secondary-processed wood products from Asia have increased tremendously, by over 30 percent in value (since 2005). Most of that increase comes from China which increased exports to Europe by over 60 percent since 2005[26]. Some of these exports to Europe were based on roundwood and sawnwood imported from Europe and the Russian Federation.

Table 52: Imports of primary wood and paper products, 1990, 2000, 2005 and 2010 (million m^3 roundwood equivalent)

Region	1990	2000	2005	2010	Change 2005 to 2010 (%)
Russian Federation	0	3	7	7	0.8
North Europe	28	53	64	56	-3.5
Central-West Europe	205	241	264	252	-1.3
Central-East Europe	6	25	40	47	4.6
South-West Europe	58	83	91	80	-3.6
South-East Europe	11	20	30	33	2.9
Europe	308	423	495	475	-1.2
Europe without the Russian Federation	307	420	488	468	-1.2
EU-27	290	389	447	426	-1.4

Notes: Based on roundwood, sawnwood, panels, pulp and paper. Import values are as reported annually by national statistical correspondents, and are not adjusted for inflation.
Source: UNECE/FAO TIMBER Database, 2010.

Table 53: Imports of primary wood and paper products, 1990, 2000, 2005 and 2010 (million EUR)

Region	1990	2000	2005	2010	Change 2005 to 2010 (%)
Russian Federation	55	493	1 178	1 671	10.5
North Europe	3 185	5 453	6 758	6 313	-1.9
Central-West Europe	31 073	41 219	42 826	39 879	-2.0
Central-East Europe	551	3 798	6 118	7 426	5.7
South-West Europe	7 852	12 370	13 299	11 981	-2.9
South-East Europe	1 604	3 228	4 382	5 000	3.8
Europe	44 320	66 562	74 561	72 271	-0.9
Europe without the Russian Federation	44 265	66 069	73 384	70 599	-1.1
EU-27	41 353	60 973	67 182	64 074	-1.3

Notes: Primary forest products only consisting of roundwood, sawnwood, panels, pulp and paper.

Indicator 6.9 Energy from wood resources

Share of wood energy in total energy consumption, classified by origin of wood.

Wood energy reported under indicator 6.9 may have many different forms and origins. Modern wood fuels can be solid or liquid and can be derived from many different sources and be of very varying sizes. Forests are only one source amongst many others, such as other wooded land and trees outside forests, residues from wood processing, from post consumer recovered wood or from specially prepared processed wood-based fuels, such as pellets, briquettes or charcoal.

Indicator 6.9 helps to bridge the information gap between energy and forestry statistics. The objective of this indicator is to measure the relative importance of wood energy for both, the energy as well as the forestry sector. Information for indicator 6.9 cannot be drawn directly from international energy statistics, as these include woody biomass under the general definitions of solid biomass. Details on wood energy sources complement energy statistics further, as these focus on energy consumption and transformation rather than the underlying supply patterns and origins of fuels. Some countries seem to have been required to report energy data from official energy statistics and thus may not be fully consistent with forest sector data presented in other indicators.

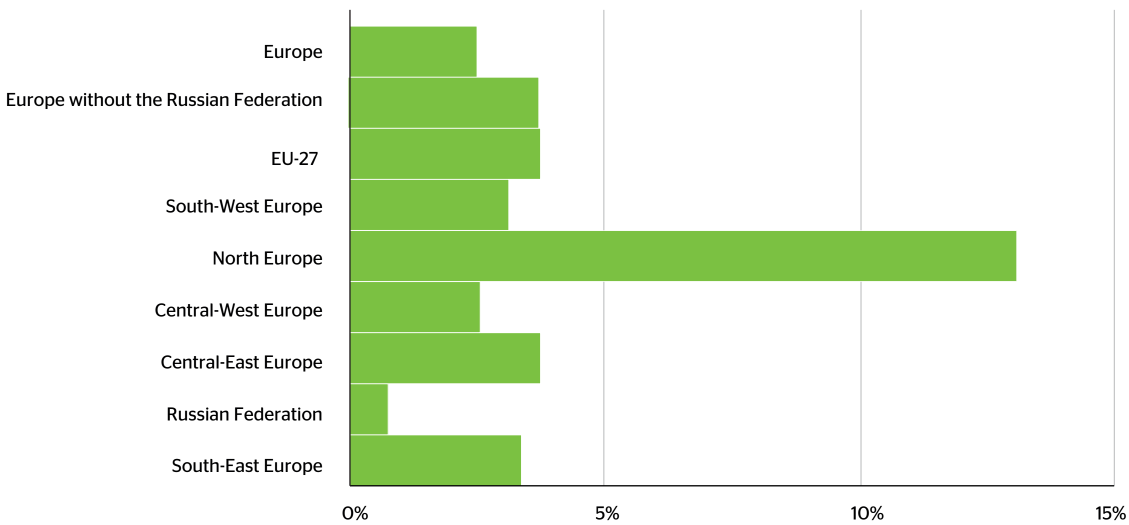
In the reference year 2007, wood energy contributed 3.7 percent of the final energy consumed in Europe without the Russian Federation (see Figure 81) and 2.5 percent of the total final energy consumption in all Europe (where data are available). Woody biomass is the most important single source of renewable energy in Europe. Wood accounts for almost as much energy as hydro, wind, solar, geothermal, municipal and industrial waste and other biomass altogether. The importance of wood energy to the national total energy supply varies greatly from country to country.

The situation for wood energy is developing rapidly, so there may have been substantial changes since the 2007 data reported for this indicator. It is likely that the generally reduced activity of the forest based sector constrained wood energy production from wood processing co-products in 2008-2009. The UNECE/FAO Joint Wood Energy Enquiry (JWEE 2009) data collection for the reference year 2009 was carried out in the first half of 2011, but results were too late for inclusion in the State of Europe's Forests report. Results of this activity will be published by the UNECE/FAO Forestry and Timber Section, Geneva (http://timber.unece.org).

The number of responses to indicator 6.9 doubled since the last State of Europe's Forests. 33 countries, representing over 82 percent of the forest area, provided general wood energy information. The forest area represented increases to 96 percent when including Russian Federation as 34th country. 20 countries reported wood energy data under indicator 6.9 for the first time ever. 15 of these (Belarus, Bulgaria, Czech Republic, Croatia, Lithuania, Estonia, Iceland, Montenegro, Poland, Romania, Russian Federation, Serbia, Slovenia and the former Yugoslav Republic of Macedonia) participated in wood energy activities (wood energy workshops, Joint Wood Energy Enquiry) organized by the UNECE and FAO in the past three years.

Fourteen out of the 46 FOREST EUROPE countries (representing 46 percent of the forest area in Europe, without the Russian Federation) provided wood energy data to the previous State of Europe's Forests report. Their dataset (Austria, Belgium, Finland, France, Germany, Hungary, Italy, Latvia, Netherlands, Norway, Slovakia, Switzerland, Turkey, and United Kingdom) indicates that wood energy increased by 22 percent between 2000 and 2007. This observation is well in line with other wood energy assessments and studies and confirms an already ongoing general trend of increased use of wood for energy proposes in the entire region. Turkey and Hungary are the only two exceptions, reporting decreasing wood energy consumption.

Figure 81: Share of wood energy in total primary energy supply (percent), 2007



[26] UN COMTRADE database, accessed January 2011

The most important producers of wood energy in absolute terms are Germany, France, the Russian Federation, Sweden and Finland. In Sweden and Finland wood energy is mostly used in large scale district heating and Combined Heat and Power plants in urban areas and also in industrial energy applications, but in many countries wood energy is still the fuel of rural or semi-urban areas. Thus wood energy consumption divided by capita rural population provides a useful indicator of the relative importance of wood energy in countries. This relative indicator is by far the highest in Finland, followed by Sweden, Latvia, Austria and Estonia (see Figure 82).

Countries reporting under indicator 6.9 on average used a conversion factor of 18.9 GJ/metric tonne dry matter to convert mass units to energy units. This conversion factor varies slightly by country as well as by source of wood fibre. 12 countries have not been able to provide any information on wood energy. The regional averages of wood energy consumption per capita rural population might facilitate first estimates on the order of magnitude of wood energy consumption (see Table 54).

Wood energy consumption per capita rural population has proven to be a useful and suitable indicator for comparing countries or regions[27]. In terms of wood energy consumption per capita rural inhabitant, Northern Europe with 1.45 m^3 is by far the leading region, whereas South-East Europe and the Russian Federation with 0.09 m^3 and 0.14 m^3, respectively, are lagging behind (Table 54). However, this indicator does not provide any information on how wood energy relates to the forestry and wood processing sectors.

Generally economic and political framework conditions should seek to maximize the socio-economic benefit of wood energy applications. Using wood fibres from forests and outside forests for direct energy generation may be justified and the most economical in rural, remote areas or in case of modest purchasing power of the local population. The overall economic benefit could be increased if fresh fibres are used, re-used and recycled for material purposes before finishing their life cycle in an efficient energy application – this principle is also referred to as "cascaded use". A vertically integrated forest-based sector would increase wood fibres' share from co-products and post-consumer recovered wood, reducing the share of wood from fresh sources.

Twenty-three FOREST EUROPE countries provided a complete set of responses on the origin of wood fibres for wood energy generation. Wood fibres from forest, other wooded land and trees outside forests remain the most important source for wood energy providing almost 50 percent of woody biomass used for energy generation. Residues from wood processing industries rank second, accounting for almost 35 percent. Post consumer recovered wood follows in third place with almost 10 percent of wood fibres for energy use. Processed wood-based fuels, comprising pellets, briquettes, charcoal, wood-based ethanol and wood-based biodiesel rank fourth place, contributing close to 6 percent of wood energy. The share of fibre origins varies from region to region (see Figure 83).

Currently it is not possible to assess wood energy dynamics by sources due to a lack of historical information. However, it is very likely that current and future energy policies might favour the application of processed wood-based fuels as well as wood chips. Future editions of the State of Europe's Forests might be able to report on this detail under indicator 6.9.

Wood fibre patterns for energy production differ greatly among regions but also vary between countries in a region.

Direct wood fibre supply is the most important (>66 percent) in Serbia, Belarus, the Russian Federation, France and Slovenia. Co-products and residues from the wood processing industries account for more than 55 percent of the wood energy supply patterns in Finland, Sweden, Slovakia, Austria and Lithuania. The biggest relative share of processed wood-based fuels is reported by Cyprus, the Netherlands, United Kingdom, Ireland and Latvia. Post-consumer recovered wood achieves the highest shares in Germany, Ireland, Switzerland, Norway and United Kingdom (see Figure 84).

Table 54: Annual wood energy consumption per capita rural population

Region	Average annual wood energy consumption	
	GJ/rural capita	metric tonne/rural capita
Russian Federation	2.66	0.14
North Europe	27.45	1.45
Central-West Europe	4.60	0.24
Central-East Europe	3.81	0.20
South-West Europe	3.82	0.20
South-East Europe	1.72	0.09
Europe	4.64	0.25
EU-27	5.87	0.31
Europe without the Russian Federation	5.14	0.27

Figure 82: Annual wood energy consumption per capita rural population

GJ/rural capita	Metric tonne/rural capita
0 - 0.75	0 - 0.09
1.75 -3.5	0.09 - 0.19
3.5 - 7	0.19 - 0.37
7 - 14	0.37 - 0.74
14 - 28	0.74 - 1.48
> 28	> 1.48
No data	No data

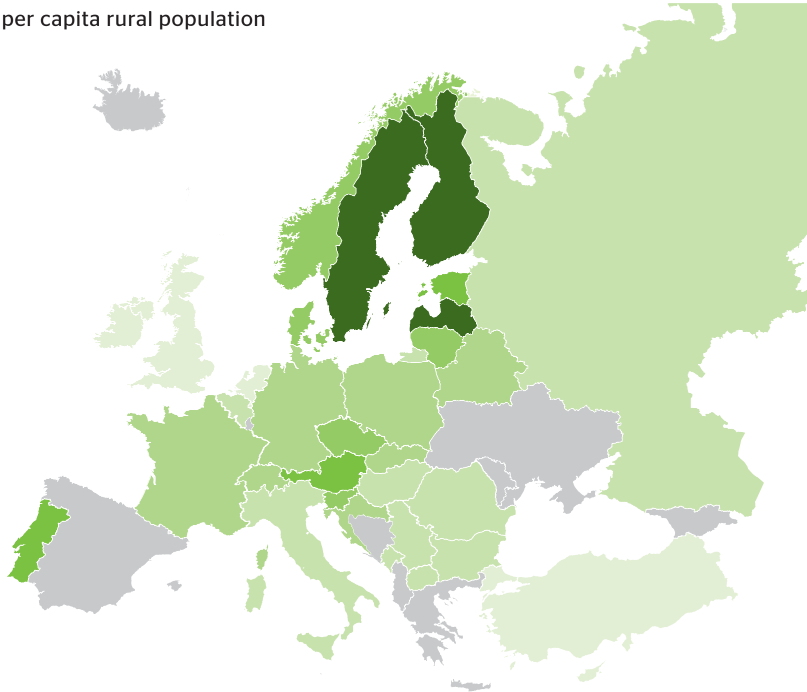


Figure 83: Wood fibre patterns for energy production by regions (percent)

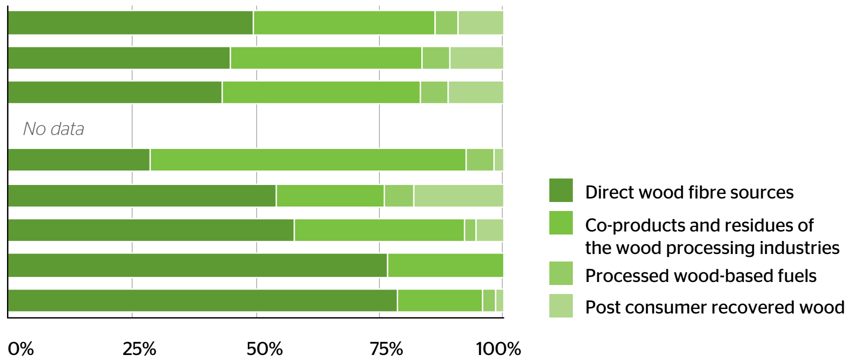
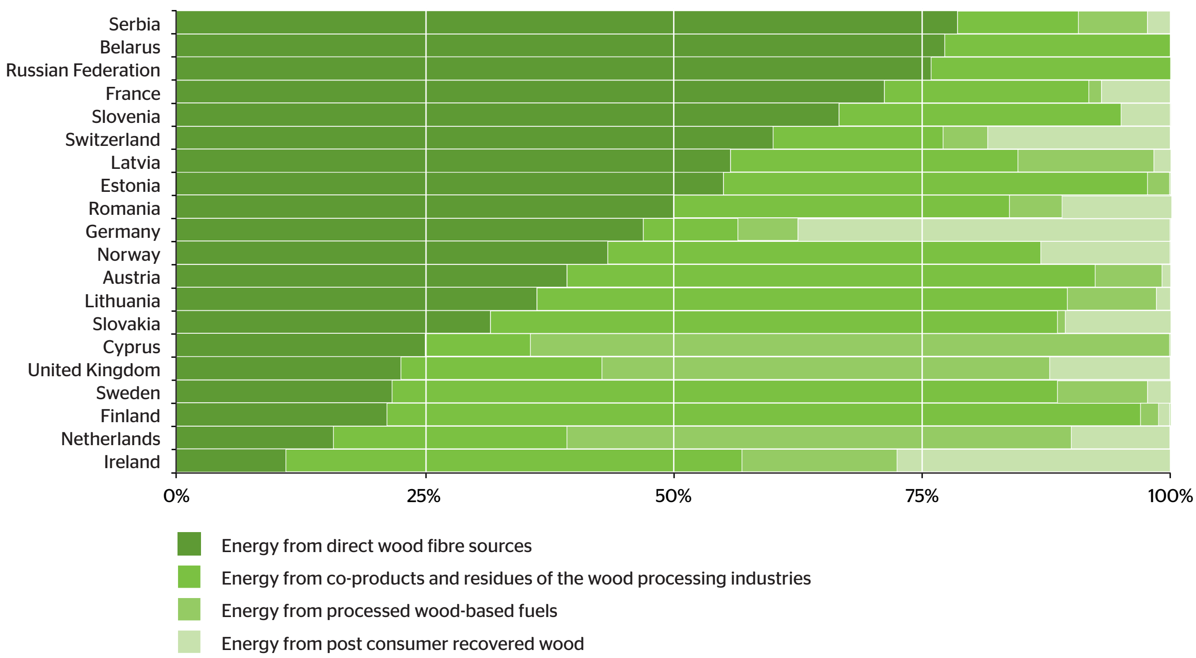


Figure 84: Wood fibre patterns for energy production by countries (percent)



[27] See Joint Wood Energy Enquiry 2008 Background Data Analysis
http://timber.unece.org/fileadmin/DAM/meetings/jwee2-data-report-24march.pdf

Indicator 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.

Introduction

Access to forests enables people to benefit from the recreational value of forests, which contributes to the quality of life (see Table 55). These non-market benefits can include benefits to health (physical and mental) as well as enjoyment of the recreational activity. The intensity of use (measured in million visits) can give an indication of the value of these benefits, but the value may also depend on the nature and duration of these visits.

Status

Most countries (27 out of the 34 that responded on this aspect) reported that at least 90 percent of their forest and other wooded land area had access available to the public for recreational purposes in 2005. Most countries (23 out of the 26 that responded on this aspect) reported that 10 percent or less of their forest and other wooded land area had recreational use as one main management goal in 2005.

Only 17 countries were able to report quantitative estimates of intensity of use (number of visits) for 2005 or 2000, and some of them had partial coverage. The most comprehensive data were for the Central-West region, where six countries reported a total of over 3 billion visits for 2005. Five countries in North Europe reported numbers for 2005 or 2000, totalling around 1 billion visits. Expressed as annual number of visits per capita of population, the country figures ranged from less than 1 to over 100, with a median around 10. There was no clear relationship between extent of forest cover and visits/capita; it has been suggested that countries with large rural populations and extensive forests may see forest visiting as part of everyday life, rather than an activity capable of being monitored.

Trends and explanations

Access available to the public for recreational purposes has increased since 1990 in most countries. The area with access already exceeded 90 percent of forest and other wooded land (FOWL) area in 1990, so the increase has generally been small, around 0.5 percent a year. The largest increases were in the United Kingdom, where new countryside access legislation was introduced after 2000, and in Ireland, where it followed from increasing FOWL area.

The area with recreational use as one main management goal has increased since 1990 in most countries. An exception was Latvia, where some protection was removed in 2000 by new legislation, but areas have increased since then.

Few countries had data for more than one year on intensity of use (number of visits), although some countries repeated the same figure commenting that there was no information to justify a changed estimate. Based on the available data, it is not possible to draw reliable conclusions about whether intensity of use has increased or decreased since 1990.

Table 55: Area with public access and area managed for recreation use, by region (percent)

Region	Percent of forest and other wooded land area with access available to the public for recreational purposes in 2005	Percent of forest and other wooded land area with recreational use as one main management goal in 2005
Russian Federation	98	2
North Europe	99	2
Central-West Europe	85	2
Central-East Europe	88	8
South-West Europe	78	-
South-East Europe	93	5
Europe	97	2
Europe without the Russian Federation	92	3
EU-27	92	3

Note: Percent of FOWL area: averaged over countries that reported data for 2005.

Indicator 6.11 Cultural and spiritual values

Number of sites within forest and other wooded land designated as having cultural or spiritual values.

Introduction

A diverse range of cultural and spiritual values is associated with forested landscapes, individual forests, and particular sites and features within forests. Forests can provide a sense of connectedness to the natural world and a symbolic link between past, present and future. They are a source of artistic inspiration and a backdrop for myths and stories that have become embedded within the regional cultures of Europe. Local people may value forests and trees for the contributions they make to a community's 'sense of place', helping to engender a shared feeling of ownership and belonging. The structural diversity of forests helps to lend them the qualities of mystery, complexity and wildness, providing environments where children can play and learn about nature and themselves. They may also be seen as restorative environments that allow people to relax and unwind. Many of these benefits are intangible and difficult to define and quantify, yet they may be expressed in tangible ways; for example, their aesthetic contribution to the landscape can encourage recreation and tourism, helping to support local economies especially in remote and rural areas.

The Fourth Ministerial Conference (Vienna Summit, 2003) fully recognized the importance of the cultural and spiritual values of forests and specified the means of preserving and enhancing them through sustainable forest management (Resolution V3). Indicator 6.11 quantifies one aspect of these diverse benefits by reporting the number of sites within forest and other wooded land that are officially recognized for their cultural or spiritual values. Four categories are used: 'Cultural heritage', 'Forested landscapes', 'Trees' and 'Other sites'.

The category 'Cultural heritage' includes archaeological sites and features associated with human artefacts, and historical sites and features such as the remains of old buildings and monuments and also locations of historical importance (e.g. battle sites) even if no remains are present. Cultural heritage sites located in forests can be divided further into sites 'of the forest' that are associated with historic forest management, and sites 'in the forest', where the forest itself is not an important aspect of its heritage value.

Sites 'of the forest', that are associated with historical forest management, include boundary banks and dykes, charcoal-burning platforms, saw pits, some bloomery and blast furnace sites, tar production sites, kilns, water mills and lades, features associated with game management and for transporting forest products. The forest was an essential component in their use, and they would not have been created if the forest had not existed. The kinds of historic forest management that these sites were associated with may include ancient wood pastures, historic planted forests, and stands of old industrial or pre-industrial coppice, coppice with standards, pollards, shredded or other 'working trees' for the production of acorns, fodder, tar, resins and other products. Evidence of such management may be found in 'organically evolved landscapes' within the category 'Forested landscapes'.

Cultural heritage sites 'in the forest' include all other archaeological and historical sites, where the forest itself is not an important aspect of its heritage value. Often, such sites may predate the forest, which has subsequently grown up around it. Examples include: ancient settlements, fortifications, burial mounds, earthworks, field systems and other evidence of historic farming practices, standing stones, and military, funerary, industrial and domestic monuments, churchyards, crosses and memorials, battle sites, historic places of assembly or ceremony, castles, bridges, roads and transport structures.

The category 'Forested landscapes with cultural and spiritual values' may also be termed 'cultural landscapes' where forest or other wooded land is the primary component. The term embraces a diversity of manifestations of the interaction between humankind and its natural environment. Such landscapes fall into three main types:

i) Landscape designed and created intentionally by humans, often for aesthetic reasons, including historic and contemporary designed forested landscapes;
ii) Organically evolved landscape, either 'relict' (or fossil), in which an evolutionary process came to an end at some point in the past, or 'continuing', which retains an active social role in contemporary society closely associated with the traditional way of life, and in which the evolutionary process is still in progress; and
iii) Associative cultural landscape, which is recognized primarily for its religious, artistic or cultural associations with the natural element rather than any material cultural evidence (UNESCO, 2008. Operational Guidelines for the Implementation of the World Heritage Convention, Annex 3).

All three types may be recognized for their contemporary aesthetic, amenity or recreational values. This category includes sites with geological and other non-biological natural elements such as mountains or waterfalls of recognized cultural and spiritual value.

The category 'Trees with cultural and spiritual values' includes individual veteran trees, heritage trees, champion trees and trees associated with religious and spiritual practices and beliefs. It also includes groups of trees that are too small to be classed as 'Forested landscapes' such as hedges, avenues and groves. Veteran (or ancient) trees can be defined as trees that are old relative to others of the same species, and are of interest biologically, aesthetically or culturally because of their age. For example, a birch tree may be considered to be a veteran at 200 years old, while a yew may have to survive for at least 1000 years before it can be considered ancient. Veteran 'working trees' include those that were coppiced, pollarded, shredded, etc, as part of historic management practices. Heritage trees can be defined as trees that are revered for their historical, cultural or botanical significance, for example because they are very old, have interesting historical associations such as 'witness trees' that were present at the scene of notable historic events, or are 'champion trees' of record dimensions (girth, height, amount of timber, etc).

'Other sites with cultural and spiritual values' include sites of contemporary cultural and spiritual importance, such as venues for cultural performances, ceremonies or gatherings, sites of sculptures and other installation art, and sites of recent woodland burial. Such sites may have historical associations, but they are recorded under this category rather than under 'Cultural heritage' if their current use is recognized as more important than their historic use.

Status and trends

Overall, 29 countries provided data on at least one category of site. This is an increase on the number four years ago when 22 countries provided data for the same reporting year, i.e. 2005 (MCPFE/UNECE/FAO, 2007).

In total, around one million sites were reported, of which around three-quarters were classed as 'Cultural heritage'. There was considerable variation between countries and regions in the figures for each category (Table 56). Sweden recorded the highest total number, including the highest number of both 'Cultural heritage' sites (600 000) and 'Trees with cultural and spiritual values' (150 000). Germany recorded the highest number of 'Other sites' (97 500). The number of forested landscapes in each country ranged from one (Portugal) to 500 (Germany and Ireland). On average, for each country that provided data, around one-quarter of the total number of cultural heritage sites was associated with historic forest management.

The data are incomplete for every European region and should be treated with caution. In some countries, no data have been provided even though thousands of sites are thought to exist, because no surveys have been conducted, or the survey results have not yet been analysed to identify those that are located within forests. There may also be inconsistencies in how different countries have interpreted the definitions for each category of site. Differences in the figures for a given category may reflect the wealth of the cultural resources present in forests in each country, but they may also reflect levels of investment in identifying, recording and protecting sites within forests, and hence the relative importance attached to them.

Key conclusions and recommendations

This indicator quantifies one aspect of the rich diversity of cultural and spiritual values associated with forests. The number of sites can only provide a rough estimate of their importance to society because of differences in the value likely to be attached to different sites within the same category (some of which may be enjoyed by thousands of visitors a year while others may only be known to a handful of experts) and the subjectivity around the notion of value (which may vary greatly between individuals). Despite these problems, the inclusion of this indicator is important because it reinforces the message that cultural and spiritual values must be acknowledged as part of the definition and operation of sustainable forest management alongside the more tangible functions and services that forests provide.

The quality of the data has improved over the last four years. If this improvement reflects an increase in official recognition of the importance of this group of values, then it also represents a small step towards more sustainable forest management. Nevertheless, a concerted effort is still required to improve the quality of inventories across Europe and to use this as a means to enhance public understanding, recognition and protection of the range of sites and associated values covered by this indicator.

Table 56: Number of sites by region

	Cultural heritage		Forested landscapes	Trees	Other sites
	Total	of which: associated with historic forest management			
Russian Federation	145	107	107	1 584	-
North Europe	622 148	63 521	687	153 777	4 305
Central-West Europe	112 115	1 102	1 347	46 498	97 708
Central-East Europe	5 344	142	681	33174	156
South-West Europe	24	6	85	1400	-
South-East Europe	8 432	150	607	1494	18
Europe	748 208	65 028	3 541	237 927	102 187
Europe without the Russian Federation	748 063	64 921	3 434	236 343	102 187
EU-27	747 814	64 698	2 865	235 785	102 167

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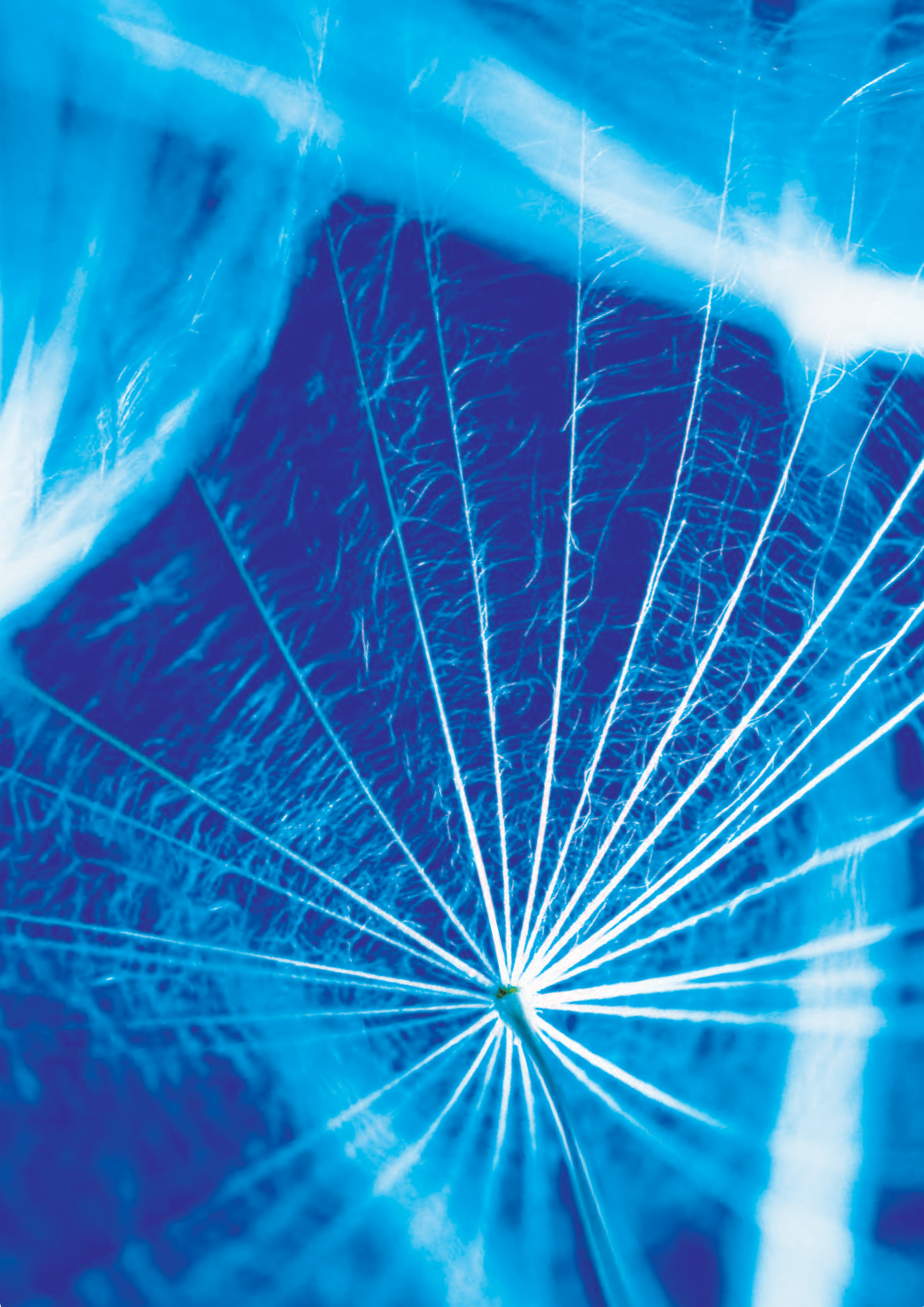

Part II

Pan-European **Qualitative Indicators** for Sustainable Forest Management

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Data collection, review and processing **Marion Briens and Tanya Baycheva**

Part II: Introduction

In addition to the quantitative indicators, qualitative indicators for Sustainable Forest Management (SFM) have been elaborated and endorsed. Qualitative indicators enable monitoring of the status and changes in policies, institutions and instruments, enhance accountability and transparency of policy-making, and allow a better understanding of the interplay between the state of forests and policy-making. They also support the strategic orientation of policies and, over time, help create more efficient and effective policies and institutional arrangements to govern SFM. Changes reported indicate the responses of policy makers to challenges and opportunities related to forests and the implementation of SFM.

The current set of qualitative indicators is in two parts. The first, Part A, describes the overall policies, institutions and instruments for SFM, covered through five indicators. These provide general information about the way forests are governed in a country. The second, Part B, is to inform about policies, institutions and instruments used to address specific topics, which correspond with the quantitative indicators for SFM. These are covered by 12 indicators.

In all, 37 countries (and the European Commission), which together account for more than 99 percent of total forest and other wooded land in the FOREST EUROPE region, have reported on the qualitative indicators. Compared with 2007, the response rate and data completeness and quality have significantly improved. As response rates differed for individual indicators, reflecting the availability of data in different countries, the number of responses is usually mentioned for the respective indicators. The report includes tables and boxes with examples from countries and supplementary information about particular policy activities that are quoted from the national reports.

A: Overall Policies, Institutions and Instruments for Sustainable Forest Management

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Chapter reviewer **Gerhard Weiss**

Data sources **All data reported in national reports on qualitative indicators**

Key findings by indicator

A1. National forest programmes (NFP) or similar and related forest policies

All 37 reporting countries stated that they have a NFP or a similar process in place, with 27 of these countries saying that these were formal NFPs or processes guided explicitly by NFP principles. Compared to 2007, NFP principles such as participation were more commonly applied in 2010. About half (17) of the main forest policy documents in FOREST EUROPE countries were developed in NFP processes. “National forest programme”, “forest policy”, or “forest strategy” documents existed in 33 countries and were on average around five years of age. Countries of the FOREST EUROPE region have strengthened significantly their mechanisms for participatory policy development over the past decade, and formal policies were comparatively well up-to-date.

A2. Institutional frameworks

Almost two-thirds (23) of reporting countries stated that significant changes were made in their institutional frameworks since 2007. This mainly took the form of merging previously separate bodies with forest competencies or integrating them into other existing bodies. The second most frequent change was measures to establish forest services and/or private forest owner associations, particularly in South-East Europe. Some 31 countries reported a total of around 350 000 public administration staff, of which around 71 percent were employed to manage public forests. Staffing levels hardly changed since 2007, except in the Russian Federation.

A3. Legal/regulatory frameworks and international commitments

Close to 80 percent (29 out of 37) of countries changed their legal/regulatory framework since 2007, with most affecting silvicultural practice (often related to regeneration/tending, biodiversity provisions), enshrining institutional reorganization, and reorganizing financing arrangements. The most directly relevant international commitments for many FOREST EUROPE countries were the European Union (EU) Regulations and Directives on forests, which have heavily influenced a range of national regulations in EU Member States.

A4. Financial instruments and economic policy

Around two-thirds of FOREST EUROPE countries changed economic policies since 2007, and even more their financial instruments, mainly stimulated by the EU Rural Development programme 2007-2013. Total government spending on forest-related activities, as reported by 24 countries, was EUR 4 346 billion in the last reporting year available. This amounted to an annual average of roughly EUR 18.4 of public spending per hectare of forest and other wooded land. Financial support for sustainable forest management across the FOREST EUROPE region appeared to have been fairly stable, with any increases occurring mainly in those Eastern European countries that became EU members since 2007.

A5. Informational means

Improvements in information provision - ranging across data collection systems, easier access to data and providing targeted information to different groups - were reported by 24 out of 35 countries. The most frequently reported significant changes were the introduction of communication strategies, improved public participation and consultation, and the integration of communication as part of a NFP or similar policy process. Close to one-third of countries had a written (governmental) forest-related outreach and communication strategy. It was clear that communication was gaining in importance and political relevance across all countries, especially in Eastern Europe.

Indicator A1. National forest programmes (NFP) or similar and related forest policies

Introduction

National forest programmes are a participatory process of policy planning, implementation, monitoring and evaluation at the national and/or sub-national level geared at further improving sustainable forest management and its contribution to sustainable development. Annex 1 of the Vienna Resolution 1 on NFPs, adopted in 2003, specifies the "MCPFE[1] Approach to National Forest Programmes in Europe". This Resolution emphasizes the fact that NFPs and NFP processes are key in order to strengthen coherence and synergies among policies that support sustainable forest management and other relevant policies, programmes and strategies. The UN "Non-legally Binding Instrument on All Types of Forests" adopted in 2007 specifies NFPs as a key means to achieve the purpose of this so-called "Forest Instrument".

Status

All reporting countries stated that an NFP or similar process existed, half of which were "formal NFP processes".

NFP or similar processes existed in all 37 countries that reported with just under half (17) recording that a "formal NFP process" existed, i.e. the process was explicitly acknowledged and referred to as a "NFP process". Among the other 20 countries, half reported that their NFP process was "explicitly guided by NFP principles" and half that a "similar process" was in use. "Similar processes" tended to be featured most in South and South-East Europe, but have also were reported by Belgium, Germany, Sweden and the United Kingdom. Several countries in East and South-East Europe made specific efforts to establish and run formal processes or processes explicitly guided by NFP principles over the last decade. In just over two-thirds of the countries (25), the ministry with responsibility for forestry was the main formal decision-making body in the process. Nine countries reported that bodies with members other than the ministry responsible for forestry had the main formal decision in the NFP process. In a small number of cases, the formal body was at a high political level, e.g. the Parliament in both Latvia and Slovenia, and the Council of Ministers in Portugal.

With regard to the implementation of core principles of the NFP approach:

- ***Stakeholder participation:*** in practically all countries, forest owners, environmental and social groups, the forest industry as well as education and research bodies took part in the process to differing extents, along with the administration responsible for forestry, as shown in Figure 1. Involvement was formal in about two-thirds of cases and rather more informal in the remaining third, mostly in East and South-East Europe. Typically, the most common form of involvement was through NFP workshops, followed by consultation.
- ***Iterative process:*** rather more than half of the countries (20) reported a commitment to an iterative process with a further quarter reporting that they were "partly committed". In a few cases, the commitment to an iterative process was either unclear or not stated. This indicates that the process of iterative planning and policy making, as promoted by NFPs, had become more mainstream. Iterative processes took different forms, often comprising the joint development of longer-term visions or goals and subsequent related periodic work or action plans.
- ***Holistic and inter-sectoral approach:*** in around 90 percent of NFP processes, representatives from other sectors were reported to have been involved in different forms and to different degrees (see Figure 85). In about half of the responding countries, the main sectors to have actively participated were environment, agriculture, energy, followed by tourism. Links between national development policies/strategies and international commitments were reported to be fully taken into account in just over half of countries (20), and partly in the remaining ones (15). Apart from EU Policies, countries mostly referred to UN Convention on Biological Diversity (UNCBD) and United Nations Framework Convention on Climate Change (UNFCCC) as key international commitments.

Denmark

The Danish NFP of 2002 stimulated informed discussions on important forest policy issues, with a broad involvement of stakeholders. It generated a positive momentum and raised awareness of forest policy issues at many levels, including the political level. It formed the basis for a major change in the Danish Forest Act in 2004. It also ensured that forest policy aspects of other sector policies, such as energy, climate change and biodiversity were taken into account. This positive momentum has, however, faded a bit over the years, in part due to new or changed political priorities.

Czech Republic

During preparation of NFP II, it became clear that most of key actions from NFP I had not been implemented. The first NFP was more formal in its process. NFP II was based on a "bottom up" approach with all relevant institutions, including non-governmental organizations. Based on more general NFP specifications, groups of experts for every key action have proposed relevant solutions. Both responsible ministries established the NFP Coordination Board as their advisory body, which made final recommendations to every key action for policy makers.

The majority of countries stated that they monitor the implementation of NFPs periodically. In the case of 17 countries, the period was specified, whereas in another 16 countries, while there is a commitment to undertake periodic monitoring, the period was not pre-determined. Very few countries did not specify what monitoring should take place. Practically all countries that conduct monitoring reported that they use the pan-European Criteria and Indicators (C&I) for Sustainable Forest Management (SFM). Close to two-thirds (25 countries) used them "partly". However, from the reports received, it seemed that few countries had developed specific, solid and participatory monitoring or review mechanisms in the context of NFP processes.

A forest policy document existed in 90 percent of FOREST EUROPE countries, and about half were under three years old.

Of the 37 reporting countries, 33 (including the EU Commission) stated that a forest policy document (other than law) existed. Twelve countries reported their main forest policy document to be a (national forest) "Programme", with a similar number reporting their document to be a "Policy" or a "Strategy". A very few countries reported that their main forest policy was contained in their forest law. More than 80 percent of responding countries provided an internet link, giving the public easy access to information about the written forest policy of the country. Rather less than half (17) of the main forest policy document had been developed as part of a formal NFP process or process explicitly guided by NFP principles. In most cases, the ministry responsible for forests endorsed forest policy documents (Table 57). In five countries, the document was endorsed at the level of the Council of Ministers, and in four by the Parliament, i.e. at a higher level with wider legitimacy than the ministry responsible for forestry. With some exceptions, higher political level endorsement was more often secured in Northern and Eastern European countries. Eight countries reported the existence of formally endorsed sub-national forest policy documents (Belgium, Switzerland, Germany, Spain, Italy, Norway, Russian Federation and United Kingdom).

Figure 85: Degree of participation by main stakeholder groups in NFP processes (% of 37 reporting countries)

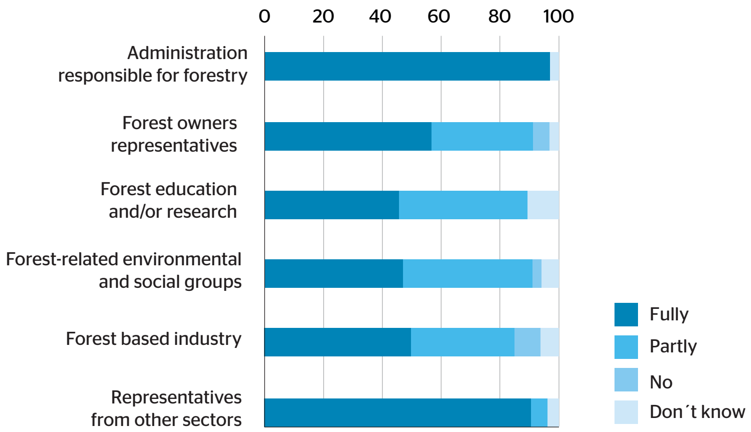


Table 57: Endorsing bodies for main forest policy documents in FOREST EUROPE countries

Endorsed by	Country
Parliament	Estonia, Norway, Sweden, Slovenia
Council of Ministers	Cyprus, Latvia, Poland, Portugal, Slovakia
"The government"(unspecified)	Belgium, Belarus, Czech Republic, Spain, Finland, Croatia, Hungary, Montenegro, Ukraine
Ministry responsible for forests	Austria, France, Germany, Denmark, Lithuania, the former Yugoslav Republic of Macedonia, Netherlands, Romania, Russian Federation
Forest Department or similar	Albania, Switzerland, Greece, Ireland, Turkey, United Kingdom

[1]The Ministerial Conference on the Protection of Forests in Europe has changed its brand name from MCPFE to FOREST EUROPE.

The main forest policy documents of most countries in Europe were reasonably up-to-date. On average, the main forest policy documents in effect were endorsed more than 5 years ago, though almost half of all documents were less than 3 years old. Eight countries updated their policy documents in 2008, the year after the 5th Ministerial Conference in 2007. There were only six countries, mainly in East and South-East Europe, where the main forest policy documents were more than 10 years old (Belarus Greece, Ireland, Poland, Latvia and Romania) in 2010 (see Figure 86).

According to the national reports, the FOREST EUROPE definition of SFM was taken into account fully or partly in the main forest policy documents of 31 reporting countries (86 percent) and was "fully taken into account" by two-thirds. A large percentage (80 percent) of countries also took pan-European C&I for SFM into account in their forest policy. The definition and operational concept of SFM has thus been among the most successful and lasting political impacts of the FOREST EUROPE process: no other single FOREST EUROPE instrument has achieved this level of uptake (Figure 87).

Forest and forest industry policies are not one of the common EU policy areas defined by the EU's underlying treaties. Many EU policies have relevance for forestry or may affect forests. With this in mind, the European Council adopted an EU Forestry Strategy in 1998. Subsequently, in 2006, the EU Commission proposed an EU Forest Action Plan that contained 18 key actions to be implemented jointly with Member States over a period of five years (2007–2011). Implementation is on-going.

Figure 86: Year of endorsement of main forest policy document (number of countries)

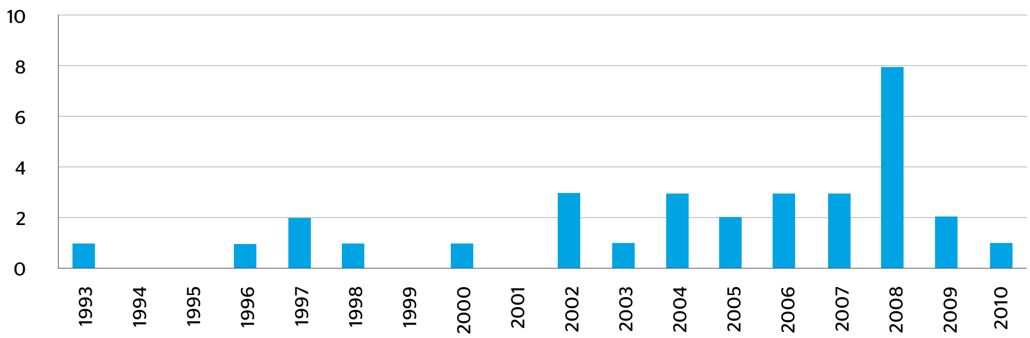
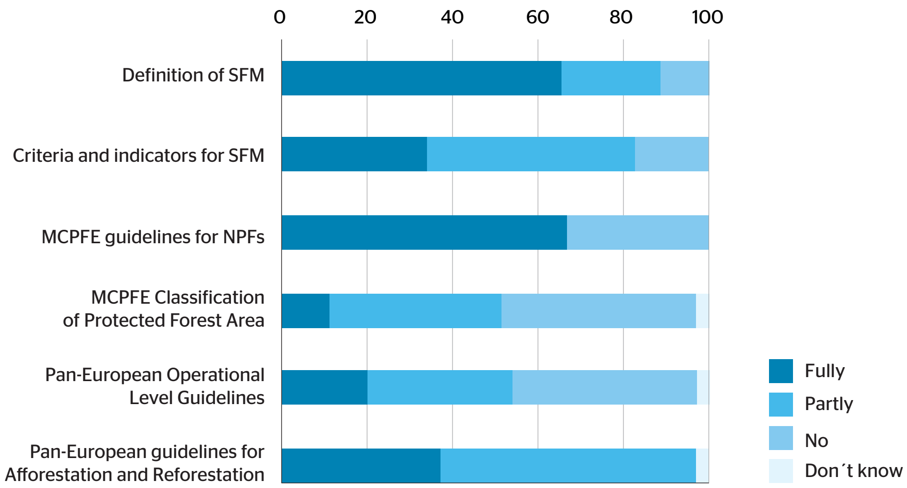


Figure 87: Explicit reference to/uptake of FOREST EUROPE instruments in forest policy documents (percent of 36 reporting countries)[2]



Trends and explanations

A "formal NFP process" existed in substantially more countries in 2010 than in 2007. More attention was placed on issues of effective implementation.

All 37 reporting countries reported that they had a NFP or similar process in place in 2010, up from around two-thirds of countries in 2007. There were substantially more countries with a "formal NFP process" in place in 2010 (17 countries) than in 2007, when only seven reported having a formal NFP process.

Some 27 of the 37 reporting entities (countries including the EU Commission) reported significant changes in NFP processes since 2007. The most common change was the further development of policy and legal frameworks, mentioned by 11 countries. This mainly included the initiation, conclusion or on-going process of revisions of policies, strategies and programmes, as well as alignment with forest legislation. Next in prominence were changes in participation arrangements (reported by nine countries): taking the form of an expanded process including more actors and, in addition, strengthening participation in the implementation of policies and strategies. Similarly, many countries had initiated or were working towards revised institutional arrangements, especially in Eastern and Southern European countries. This included establishing national coordination boards (Czech Republic, Italy) or structures for the representation of private forest owners. Many countries recognized the need for a stronger focus on implementation or had already reinforced implementation of planned policies and strategies. They approached this issue through fewer, simpler and clearer actions, clearer responsibilities and stronger alignment of actions with available budgets. Monitoring and evaluation, including reference to on-going evaluations or reviews of past programmes, were also frequently mentioned.

Finland

[The] Forestry sector is currently in the middle of structural changes, which is why new actors have been involved in the NFP-process, e.g. environmental researchers, forestry students, and actors outside the forest sector, like the Parliament, pharmaceutical and food industry, technology organizations and Finnpro (association of Finnish companies promoting growth & competitiveness through internationalization supported by the government). The structural changes and the worldwide economic crisis activated the Government to develop public forest organizations.

Italy

A new national forest programme, called "Framework Program for the Forest Sector" (PQSF) has been prepared to coordinate and streamline the local implementation of the international agreements related to forests. This programme, shaped mainly around the EU Forest Action Plan, was officially agreed on December 2008, launched on 1 January 2009 and will last ten years until end 2018. The first activity was the establishment of a National Coordination Board – Tavolo di Coordinamento Forestale (TCF) – similar to the EU Standing Forestry Committee.

Montenegro

Montenegro: From 2007, the NFP development process is ongoing, based on internationally recognized principles and with international technical assistance. A first result of the NFP process is a new National Forest and Land Administration Policy (adopted by Government in 2008), which is also the main NFP document.

Cyprus

There is a need for more intensive monitoring of the implementation of the Programme, on an annual basis. The use of the national C&I and the reporting tool of the Annual Departmental Report are the best available means to this end. This approach has been taken into consideration for the preparation of the new NFP.

Switzerland

Findings in the mid-term review 2009: a) NFP is useful tool at national level for overall coordination and strategic guidance; b) political willingness for changing the legislation at national level (coherent with NFP goals) was lacking; c) financial support for implementing the NFP was less than expected due to reduction of national forest budget. Revision for a NFPplus is in progress. It will include new topics as e.g. climate change, biodiversity, wood mobilization.

Slovenia

The goals, content and procedure for adopting the NFP are laid down in the Law on Forests. The first national forest programme was adopted in 1996. The second NFP from 2007 is based on a broad participation ptrocess of stakeholders, while the first was not so widely discussed.

Turkey

The [NFP] implementation process will be monitored regularly. Reporting on implementation of forest policies in the NFP for Turkey has been recently established by the ministry via a dedicated monitoring unit.

[2] The Ministerial Conference on the Protection of Forests in Europe has changed its brand name from MCPFE to FOREST EUROPE

While continuing to strengthen principles of NFPs, many countries also explored ways to adapt the NFP process to better fit needs and be efficient and responsive.

Many countries made good progress in further strengthening principles of NFPs by involving many more actors than before and engaging them more in implementation of policies, strategies and programmes. Even so, in many countries the range of stakeholders still was largely limited to forestry professional associations.

Among the major lessons that countries reported were the importance of realistic planning and timetables and of having adequate financing arrangements in place, and the need for sound monitoring. If NFP processes are to be successful, they need to be dynamic, flexible and able to respond quickly to emerging needs and issues. This also requires efficient ways of organizing participation. Some countries observed that, for the NFP process to remain relevant and strong, maintaining and strengthening the commitment of key actors is important. Surprisingly few countries explicitly mentioned progress in or issues arising from the need for inter-sectoral co-ordination or integration. Further challenges mentioned were:

- keeping momentum and political commitment for this type of planning.
- developing operational planning routines that are consistent with the agreed longer-term visions and goals in shorter term, politics-driven operating environments.
- further improving ways to implement policies and programmes jointly under shared responsibilities among different stakeholders, including the private sector.
- keeping the policy and strategy processes open and flexible enough to be responsive to new opportunities and challenges.

Compared to 2007, more countries had a forest policy document that was discussed with stakeholders and formally adopted.

Some 24 out of 32 reporting entities (countries and the EU Commission) reported significant changes in their main forest policy document since 2007. The most common change was the review and/or revision of the forest policy document, in particular the uptake of new issues such as bio-energy and climate change. Some countries were preparing for accession to the EU or further integrated EU policies into their existing policies (e.g. Cyprus, Latvia, the former Yugoslav Republic of Macedonia and Slovenia). The next most reported change was in improvements to specifications of operational implementation and follow-up of the specified policies.

Compared to 2007, more FOREST EUROPE countries had a forest policy document that was formally adopted, following discussions and negotiations with stakeholders. While a majority of these policies were adopted at the level of the ministry responsible for forestry, in about a quarter of countries, higher level bodies endorsed or adopted the forest policy, raising the political profile of the policy. There were indications that many countries focused work on ways to strengthen implementation and follow-up monitoring - evidently in an effort to increase relevance, added value and effectiveness of agreed policies/strategies and programmes.

Denmark

The Danish NFP of 2002 as such has remained unchanged. However, three new policy documents in related sectors have emerged. These are: 1. "Green Growth" of 2009 – a government plan that aims to ensure better conditions for the country's nature and environment while allowing agriculture to develop. The plan includes increased funding for afforestation and for the protection of forests in NATURA 2000 areas. 2. Action Plan on Renewable Energy, 2010. 3. Action plans for forest protection in NATURA 2000 areas.

Finland

The new NFP accentuates three aspects: 1) new competitive products and services, 2) increment in the use of domestic wood, and 3) forest biodiversity. The programme is based on appreciation of nature in all actions, recognition of customer-orientation as a key precondition for profitable and competitive operations, high-standard and diverse expertise and collaboration that is based on transparency and trust between the various actors. The Forest Biodiversity Programme METSO 2008–2016 was drawn up to complement NFP in the conservation of forest biodiversity. The Strategic Programme for the Forest Sector, prepared by the Ministry of Employment and the Economy in 2009, supports the implementation of the NFP.

Indicator A2. Institutional frameworks

Introduction

The "institutional framework" refers to the organizational and administrative set-up of forest policy and its implementation in a country. It determines responsibilities and competences of different bodies, public and private, at various levels. Institutional frameworks provide the structure for national, regional and local politics and for developing forest-related public policies and their implementation. The prevailing institutional framework shows how countries organize the protection and sustainable use of forests. Changes in these frameworks indicate changes in political goals and culture.

Status

Administering forest policy implementation and legislative enforcement was usually part of a ministry's responsibility. Public forest management and general support for forest management were often carried out by another body.

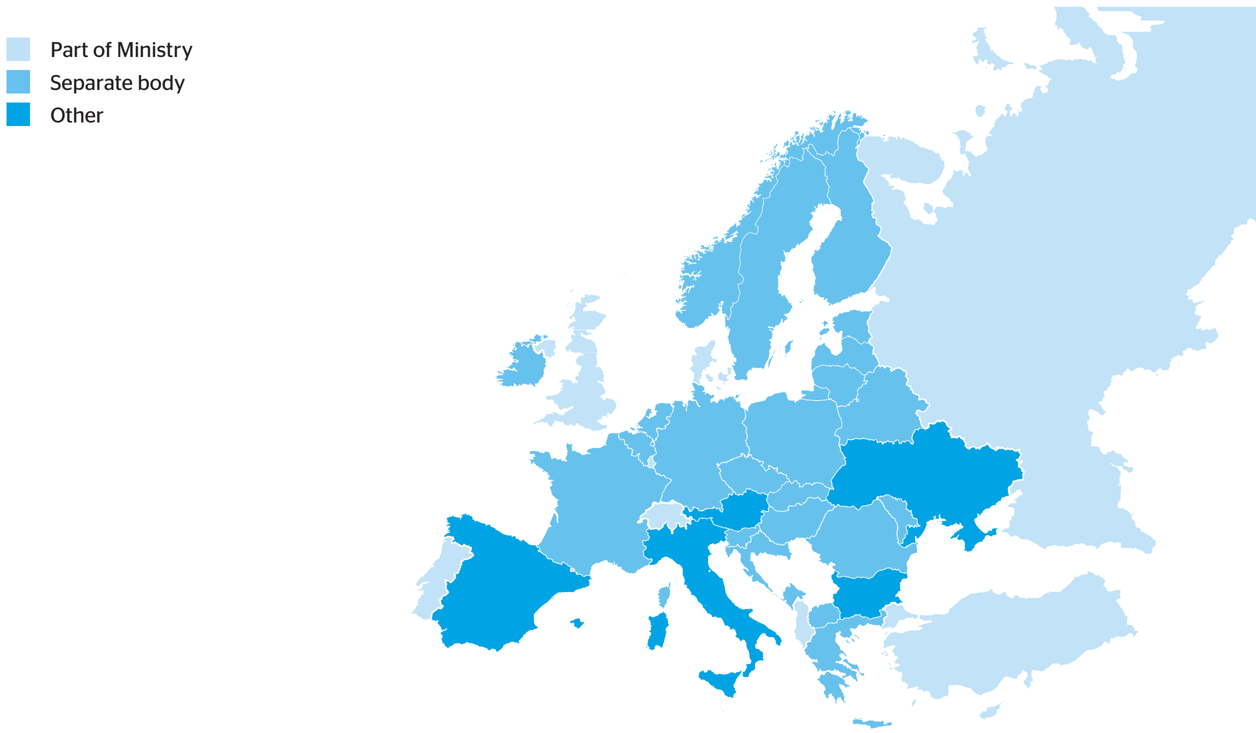
Administering the development and implementation of forest policy was the responsibility of a ministry in 31 of the 37 reporting countries. In six countries, forest policy administration was partly or fully within the competence of a separate entity (Bulgaria, Republic of Moldova, Netherlands, Sweden, Slovenia, Ukraine), while in some it was split between the ministry and other bodies. In 28 countries, the responsibility for administration of forest policy rested with central government. In five countries, responsibility was divided between national and sub-national levels (Switzerland, Italy, Spain, Russian Federation, United Kingdom), and in three countries, responsibility lay at the sub-national level (Belgium, Germany, Netherlands).

Legislative supervision and enforcement was part of a ministry at central government level in 27 countries. In nine countries (Bulgaria, Estonia, Finland, Greece, Latvia, Portugal, Russian Federation, Sweden, Ukraine) these functions were the sole responsibility of a separate body, while in six countries the ministry shared responsibility with a separate body. In three countries competence was shared between central and sub-national levels (Spain, France, Russian Federation), and in six countries it rested at the sub-national level (Austria, Belgium, Switzerland, Germany, Lithuania, Netherlands).

General support for forest management was provided by separate bodies, such as forest extension services, in about half of all reporting countries. The other countries provided support as part of the responsibility of the ministry. In two-thirds of countries (24), the main responsibility for providing support lay at central government level, while in the other third (12) it was at the sub-national government level.

Management of public forests was in the hands of a separate body, such as publicly-owned forest enterprises, in 23 of 36 reporting countries (Figure 88). In ten countries, the management of public forests was fully or partly the responsibility of the ministry (Albania, Belgium, Cyprus, Denmark, Luxembourg, Montenegro, Portugal, Russian Federation, Turkey, United Kingdom). In 16 countries, responsibility lay with central government, in 11 countries at sub-national level, with different arrangements in the remaining countries.

Figure 88: Institutional set-up for management of public forests in Europe (percent of 37 countries reporting)



"Traditional" forestry associations were seen as by far the most relevant private sector organizations in forest policy development.

Forest owners' associations and other forestry associations, such as societies of professional foresters, were seen as relevant for forest policy development in a large majority of the 36 countries that reported on the main private sector stakeholder organizations: interest groups, associations and non-governmental organizations (NGOs) etc. Environmental NGOs as well as forest industry and trade organizations were reported as important by only half of reporting countries. While they might be involved in the NFP process, it seemed that they were not seen as ranking as highly in importance as were stakeholders from traditional forestry associations. Five countries (Denmark, Finland, Hungary, Ireland, Sweden) regarded recreational or cultural heritage organizations as important stakeholders. Almost half of all countries (17) reported only one or two private sector organizations – usually forestry or forest owners' associations – as being highly relevant for forest policy (see Figure 89). Five countries, all from Eastern Europe (Belarus, Croatia, Poland, Russian Federation, Turkey), viewed only one type of private body as relevant. Only six countries reported that five or more different private sector stakeholder organizations were relevant (Switzerland, Finland, Hungary, Norway, Portugal, Sweden).

Around 350 000 people worked in forest-related public organizations in Europe, mostly in public forest management.

Some 31 countries reported a total of around 350 000 forest-related staff directly employed in public organizations related to forests (all figures are full-time equivalent, FTE, 2008 estimates). The Russian Federation employed the largest number (93 000), followed by Ukraine (59 797), Turkey, Poland, and Romania. The largest employer in Western Europe was France (11 350) (Figure 90).

Public forest management staff was by far the largest group of public staff (71 percent of total estimate). Where a significant amount of forests was under state forest management, around 80 - 95 percent of all staff was reported to work in managing the public forests. More than half of all public forest-related staff in the FOREST EUROPE region were working to manage forests. There was, on average, one person per 430 ha of public forests (equivalent to 2.3 staff per 1 000 ha). However, the figure varied widely across Europe, from 20 767 ha/staff member (0.05 staff per 1 000 ha of public forests) in Slovenia, to less than 200 ha/staff (more than 5 staff per 1 000 ha) in Croatia, Cyprus, Luxembourg, Romania and Slovakia (there were no specific figures for the Russian Federation). Higher numbers of public staff per hectare tended to be employed in countries where citizens expected high levels of social and environmental services, particularly recreation, and in the former planned economy countries of Eastern Europe (Figure 91).

Figure 89: Number of non-governmental organization categories reported to be of main relevance in forest policy (percent of 36 countries reporting)

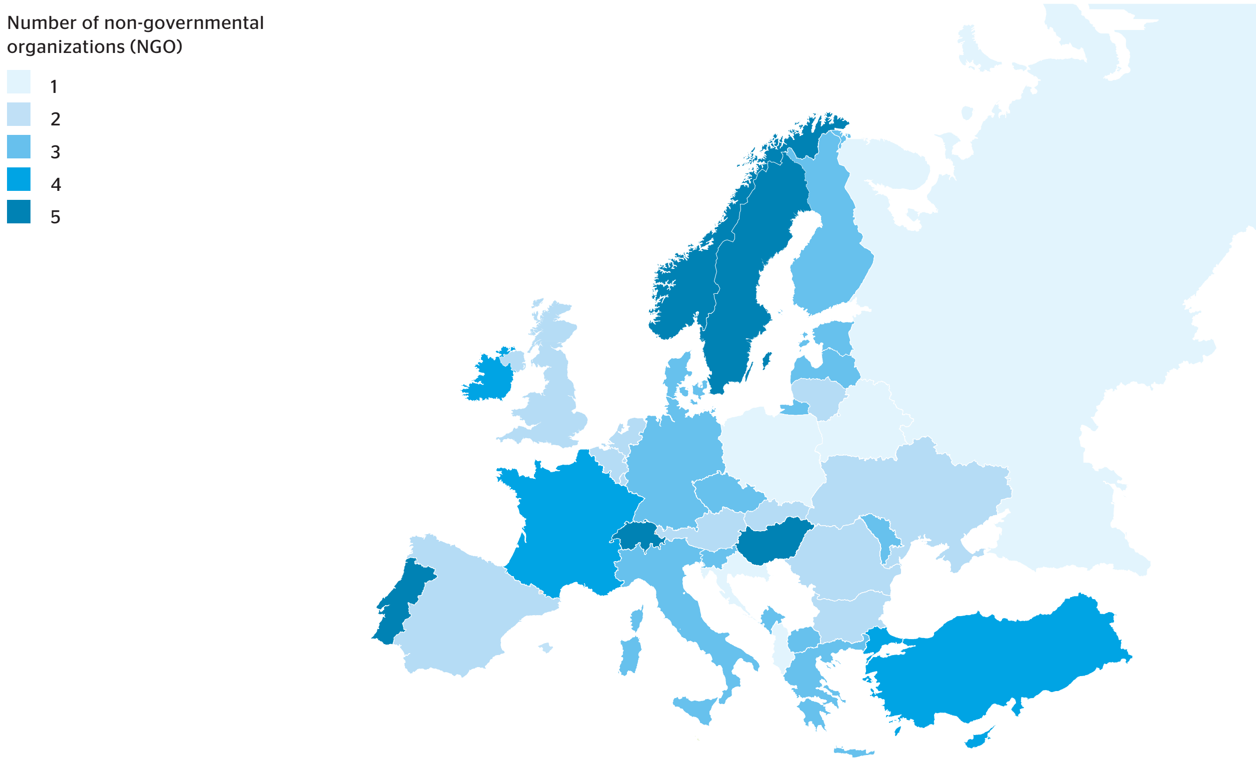


Figure 90: Total forest-related staff 2008 full-time equivalent (1 000, reported by 32 countries)

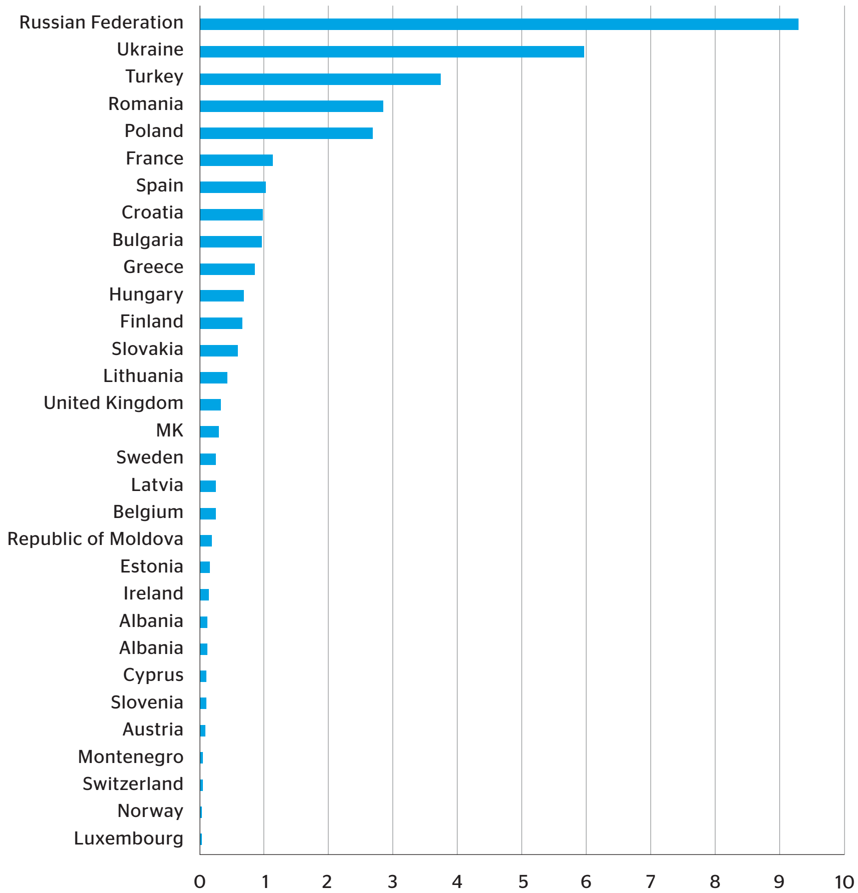
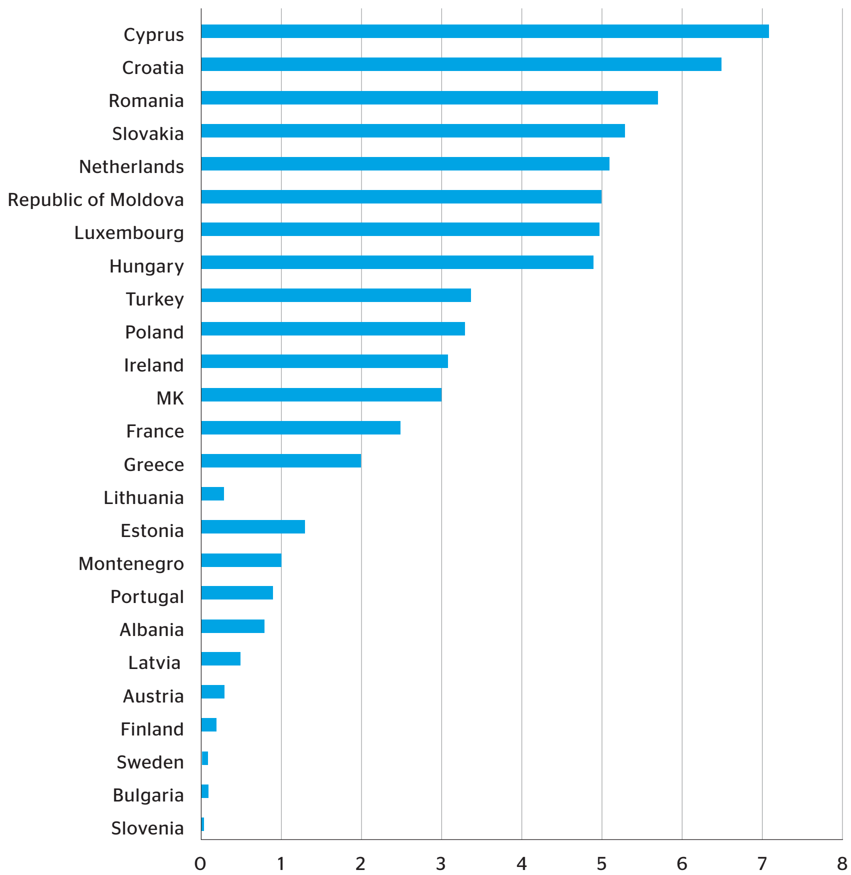


Figure 91: Public forest management staff (full-time equivalent) per 1 000 ha of public forests



Public forest administration staff totalled around 32 080, as reported by 30 countries that represented 75 percent of Europe's forest and other wooded land area, without the Russian Federation. On average, one person administered some 5 700 ha, in the countries that reported (without the Russian Federation). This average varied widely, from 0.7 staff per 100 000 ha in public administration in Norway to more than 100 staff per 100 000 ha in Belgium, Bulgaria and Republic of Moldova. This variation could be explained by many factors, including the balance between public and privately-owned forests, the public services that forests and/or the public entity provided, different strategies on outsourcing work to other than strictly public bodies and differing degrees of service efficiency.

Public research, education and training institution staff related to forests was reported to be 17 366 (reported by 29 countries, representing 82 percent of Europe's forest and other wooded land area, without the Russian Federation). Six countries employed 1 000 or more people in these professions, led by Finland, where 3 972 staff were employed in this area. This was followed by Greece (2 457 staff), Ukraine (1 861 staff), Spain (1 152 staff), and Romania (1 000 staff). On average there was one reported staff employed in research, education and training per 11 883 hectares of forests or other wooded land in FOREST EUROPE (without the Russian Federation, where one staff was employed per 1 482 874 ha). Data from countries such as Montenegro, Norway, Sweden and Turkey showed that they employed considerably fewer staff in research, education and training than the FOREST EUROPE average per ha (without the Russia Federation).

Trends and explanations

Many countries aimed at higher efficiency by merging previously separate bodies and separating administrative from management functions.

Since 2007, significant changes were reported in 23 of 35 countries related to institutional frameworks. The change reported most often was reorganization of administrative structures: either by merging previously separate bodies or separating administrative and management functions. This suggests there has been a focus on improving the efficiency of forest governance. Several countries shifted competence for forest matters to parent bodies, which were more environmentally focused. In some cases there was a shift in the opposite direction, to more agriculture or industry focused bodies, suggesting a desire to search for a balance between nature protection and wood production. By comparison, in 2007, the most often reported change was in the arrangements for forest research.

The second most frequently reported change was in measures to improve representation and participation of specific interest groups in policy processes. Private forest associations were formed or improved in South-East Europe (Croatia, the former Yugoslav Republic Macedonia, and Montenegro) and Belgium, with a view to improving the coordination of fragmented forest management, and representation in policy contexts. Three countries in Eastern Europe (Bulgaria, Estonia, and the Russian Federation) reported changed arrangement in State forest management. Comparing the relevance of private sector stakeholders with data reported in 2007 shows that the range of stakeholders considered being of main relevance in forest policy remained usually quite restricted to professional forestry as well as forest owner associations.

The number of forest-related public staff remained about the same between 2007 and 2010.

Three countries reported that the most significant change was a decrease in staff (Czech Republic, Estonia, Greece). The total size of the public workforce remained about the same between 2007 and 2010, if comparing FTE staff reported by countries for both years. However, the Russian Federation reported a decrease of staffing levels by some 50 percent, probably due to decentralization of authority to regional levels. While some countries reduced staff, about the same number increased personnel. The number of staff in public forest management changed by roughly 5 percent or less over the period. In comparison, data reported to FAO FRA 2010 indicated a decline of 5.6 percent in total human resources within public forest institutions in reporting countries over the period 2000-2008. There were indications that more staff were employed in research, education and training in 2010 as compared to 2007, although data reported were not always directly comparable between these two years.

Croatia

Forest Extension Service, founded in 2006, started work in 2007. It is a public institution for improving management of forests and other wooded lands in private forests. The Croatian Union of Private Forest Owners, founded in 2008, promotes and protects the interest of private forest owners, and stimulates forest management through modern methods with a view to increase competitiveness in wood production.

Denmark

Responsibility for Climate change mitigation and adaptation was moved from the Ministry of the Environment to a new Ministry, Ministry for Climate and Energy, in 2008. Responsibility for sustainable use and conservation of biodiversity was moved to a separate Agency under the Ministry of the Environment in 2008 (formerly under the Forest and Nature Agency). In 2011, the two agencies merged into one, The Nature Agency, so that biodiversity and forests will again be dealt with by one agency.

Italy

The new [NFP?] programme started with the establishment of a National Coordination Board (Tavolo di Coordinamento Forestale, TCF) in 2010. The TCF will coordinate forest policies and activities carried out by the interested Ministries (mainly Agriculture and Environment) and the 20 Regions.

Lithuania

Since 2010 four public forest agencies (State Forest Survey Service, Service of Sanitary Forest Protection, Forest Genetic Resources Seed and Plant Service and part of State Environment Protection inspection) were merged into one public institution called “State Forest Service”. The aim of consolidation is to optimize and improve the country’s state forest management system.

Bulgaria

In 2007 the National Forestry Board (NFB) at the Ministry of Agriculture and Forests was transferred into a State Forestry Agency (SFA) directly under the Council of Ministers. In 2008, the state forestry units were transformed into State Forest Enterprises (SFE), and the state hunting areas into State Hunting Enterprises (SHE), enterprises according to the Trade Law. In 2009 the SFA was transformed into the Executive Forest Agency (EFA) at the Ministry of Agriculture and Food.

Estonia

In 2009 County Environmental Departments and State Nature Conservation Centre were merged and the number of regional forest officers decreased. The structure and operating principles of State Forest Management Centre (RMK) were reorganized and 17 forest districts were established instead of 62 before. A Forest Council, comprising representatives of forestry institutions and NGOs, was established to facilitate implementation of Forestry Development Plan.

Netherlands

Since 2010 the Ministry of Agriculture, Nature and Food Quality, which has the primary responsibility for forest policy, has been merged with the Ministry of Economic Affairs. The new Ministry is now Ministry of Economic Affairs, Agriculture and Innovation.

Indicator A3. Legal/regulatory frameworks and international commitments

Introduction

At the core of the legal/regulatory framework of a country related to forests is the forest-related legislation including the forest law and its complementary regulations, nature or forest protection regulations, hunting and wildlife management legislation as well as land use and related planning acts and, in some cases, the constitution. Increasingly, over recent decades, forest laws have expanded in scope so that they cover more consistently the incremental social, economic and political aspects of sustainable forest management, as understood and defined by FOREST EUROPE. Forestry-related international legal instruments adopted, in particular during and after the United Nations Conference on Environment and Development (UNCED) in 1992, have led to a substantial expansion of international conventions and multilateral agreements. Together with regional conventions and agreements pertaining to forests, these directly influence or determine national forest-related legislation. In addition, a range of EU regulations and directives address forest matters and are legally binding for EU Member States.

Status

Forest laws in force in 2010 were usually less than five years old.

Legal authority over the main forest matters was laid down in legislation enacted by Parliament in 36 out of 38 reporting countries and in some cases by the EU. In 14 of these countries, forest matters were also covered in the constitution. In 31 countries, the authority on main forest matters was at the central government level. In several countries (e.g. Austria, Switzerland, Germany, Spain, Italy, Netherlands) the competence was shared between central and sub-national levels (federal, provincial, autonomous region, cantonal level). In the United Kingdom, administration was devolved. In Belgium, the formal authority lay at the level of the regions.

The main forest -and SFM- related legal/regulatory acts with national scope (e.g. forest law, act or code) were on average some 15 years old (32 countries reported). The oldest principal legislation still in force in the FOREST EUROPE region was reported by Ireland, whose main forest law was enacted in 1946, followed by Turkey (1956), the Netherlands (1962), the United Kingdom and Cyprus, whose main legislation had been in force since 1967. Apart from six countries (Belarus, Montenegro, Netherlands, Portugal, Turkey) all the forest laws reported to be in force in 2010 in the FOREST EUROPE region were less than five years old or had been amended in the previous five years. On average, around two countries enacted a new forest law every year in the last years. In all, 24 countries reported on amendments of the main law that took place within the last four years. Every year on average since 2007, around five to six countries amended their forest legislation (Table 58).

Forestry-related international legal instruments, adopted in particular during and after the United Nations Conference on Environment and Development (UNCED) in 1992, have led to a substantial expansion of international conventions and multilateral agreements that influence national forest policies. European states have made international commitments in the context of the United Nations Forum on Forests (UNFF); the UN Convention on Biological Diversity (UNCBD) and its Cartagena Protocols on Bio-safety; the UN Framework Convention on Climate Change (UNFCCC) and the related Kyoto Protocol; the UN Convention to Combat Desertification (UNCCD); as well as many other topical or regional conventions and agreements related to forests, particularly the International Tropical Timber Agreement (ITTA); the Convention in International Trade in Endangered Species of Wild Fauna and Flora (CITES); the Convention on Wetlands of International Importance especially the Waterfowl Habitat (Ramsar Convention); and the World Heritage Convention.

In Europe, FOREST EUROPE has adopted a total of two Ministerial Declarations and 19 Resolutions in five Ministerial Conferences since 1990. A majority of countries participating in FOREST EUROPE are also EU Member States and must comply with a number of Regulations and Directives related to forests. A number of further conventions and political processes relating to forests address specific topics or regions within Europe, for example, the "Environment for Europe" process; the Convention on Long-Range Transboundary Air Pollution; the Alpine Convention; the Carparthian Convention; and the European Landscape Convention.

EU instruments address a wide range of forest-related topics.

Forest and forest industry policy does not constitute a common EU policy area as defined by the EU treaties. It remains an explicit Member State competence. Yet the EU has legal competence in a range of areas that are forest-related (Table 59).

While no specific data were available on whether or not and to what degree FOREST EUROPE Resolutions were integrated into national forest legislative frameworks, several countries explicitly stated that legislative amendments were made to better include the definition and/or principles of sustainable forest management and/or made reference to the criteria and indicators for sustainable forest management in their reports to the Ministerial Conferences in 2003, 2007 and 2011. Submission of implementation reports is one proxy indicator of international commitment implementation. FOREST EUROPE requested national reports on the implementation of individual commitments at the Ministerial Conferences of 2003, 2007 and 2011. Only slightly more than half of all countries submitted reports in both 2003 and 2007, while for 2011, 32 of 38 countries reporting on qualitative indicators also reported on national implementation of FOREST EUROPE commitments since 2007.

Trends and explanations

Eighty percent of countries amended legal and regulatory frameworks between 2007 and 2010. Changes mainly concerned silvicultural practices and administrative re-arrangements.

Significant change in legal/regulatory frameworks occurred in 29 out of 37 countries since 2007. Eight countries reported no change (Belarus, Germany, Italy, Latvia, Netherlands, Sweden, Turkey, United Kingdom) and four only minor changes (Austria, Denmark, Montenegro, Poland). Seven countries reported that such legislative review and revisions were currently on-going (Cyprus, Finland, Ireland, Latvia, Montenegro, the former Yugoslav Republic of Macedonia, Portugal).

The most frequently reported change in legal/regulatory frameworks concerned changes in silvicultural practice prescriptions, including on regeneration/tending (Cyprus, Spain, Ukraine), biodiversity/close to nature forestry provisions (Spain, Hungary, Lithuania, Romania, Slovenia, Ukraine) and cutting of timber (Lithuania, Ukraine). Amendments in legislation to enshrine institutional reorganizations were reported by some eight countries (Austria, Bulgaria, Switzerland, Croatia, Hungary, Luxembourg, Slovenia, Russian Federation) – see chapter on institutional frameworks. Equally frequent changes were reported on the reorganization of financing aspects, including the revision of income tax provision, fees, or state taxes (e.g. in France, Hungary, Lithuania), changes in arrangements to finance environmental services provision (e.g. in Republic of Moldova, Montenegro, Romania, Slovenia), or co-finance arrangements between different entities (Switzerland, Slovenia). Some seven countries reported on legal changes related to reorganization of forest management administration (Albania, France, Greece, the former Yugoslav Republic of Macedonia, Portugal, Russian Federation, Ukraine). These included licensing arrangements for forest-related activities and forest management planning requirements.

A range of other changes were reported, including amending legislation to re-define "forests" (e.g. Greece, Slovenia), including better the concept of SFM and its principles in legislation (e.g. Belgium, Luxembourg, Romania), reorganizing data and information systems, including cadastres (e.g. Germany, Spain, Romania, Ukraine), or including better FOREST EUROPE commitments (e.g. Belgium, Croatia, the former Yugoslav Republic of Macedonia, Norway).

Few changes were reported on international commitments. Significant changes in implementation of international commitments related to forests were reported by 23 of 34 reporting countries. Some 11 countries reported no or minor changes. The most frequently reported change concerned climate-change-related commitments under UNFCCC/Kyoto Protocol (Albania, Belgium, Finland) or the Convention on Biological Diversity (Belgium, Finland, Italy). Several countries referred to the signing of FOREST EUROPE Resolutions in 2007 and the consideration of these commitments in forest legislation or policy. Many countries indicated that no significant changes had occurred after the State of Europe's Forests report 2007 as the UN Conventions more closely related to forestry (UNFCCC, UNCBD and UNCCD) had been ratified before 2007. Two countries reported on the ratification of the new ITTA (Finland, Ireland), making progress in the ratification of the EFI Convention (Switzerland, Ireland), action related to the ENA-FLEG/FLEGT initiative (Montenegro, EU), or the OECD scheme of the Control of Forest Reproductive Material (Germany, Croatia). Few countries made reference to the UNFF Non-legally binding instrument on forests, adopted in 2007.

Table 58: Year of enactment of forest legislation in force and latest amendments since 2000

Year	Countries – date of *enactment* of forest legislation in force	Countries – date of *latest amendments* of forest legislation in force
2000	Belarus, Latvia, Montenegro	
2001	Italy	
2002		
2003	Greece, Spain	
2004	Denmark	
2005	Croatia, Slovakia	
2006	Norway, Ukraine	Spain, United Kingdom
2007	Estonia, Russian Federation	Albania, Slovakia, Slovenia,
2008	Belgium, France, Romania	Croatia, Estonia, Latvia, Switzerland
2009	Hungary, Luxembourg, the former Yugoslav Republic of Macedonia	Bulgaria, Czech Republic, Finland, Lithuania, Luxembourg, Romania, Sweden, Ukraine
2010		Austria, Cyprus, Georgia, Greece, Republic of Moldova, Poland, Russian Federation

Table 59: Areas of EU activities related to forests, respective legal and regulatory and key non-legally binding instruments

Area of EU activity related to forests	Legal / regulatory instruments of the EU and further non-legally binding instruments used
EU Forestry strategy and EU Forest Action Plan	Council Resolution of 15 December 1998 on a Forestry Strategy for the European Union (non-legally binding) Communication from the Commission to the Council and the European Parliament on an EU Forest Action Plan, COM(2006) 302 final; (non-legally binding)
Forestry in rural development	Council Regulation (EC) No 1698/2005 of 20 September 2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) (legally binding) Commission Regulation (EC) No 1857/2006 of 15 December 2006 on the application of Articles 87 and 88 of the Treaty to State aid to small and medium-sized enterprises active in the production of agricultural products and amending Regulation (EC) No 70/2001 (legally binding)
Forest-based and related industries	Communication from the Commission to the Council and the European Parliament on innovative and sustainable forest-based industries in the EU: A contribution to the EU's Growth and Jobs Strategy; COM(2008) 113 final (non-legally binding)
EU forest monitoring and protecting measures	Regulation (EC) No 2152/2003 of the European Parliament and of the Council of 17 November 2003 concerning monitoring of forests and environmental interactions in the Community (Forest Focus) (legally binding) Regulation (EC) No 614/2007 of the European Parliament and of the Council of 23 May 2007 concerning the Financial Instrument for the Environment (LIFE+) (legally binding)
Forests and energy	Communication from the Commission of 7 December 2005 - Biomass Action Plan [COM(2005) 628 final] (non-legally binding) Communication from the Commission - 20 20 by 2020 - Europe's climate change opportunity [COM(2008) 30 final] (non-legally binding) Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (legally binding) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Energy 2020 A strategy for competitive, sustainable and secure energy [COM/2010/0639 final] (non-legally binding)
Forest fire	Regulation (EEC) No 2158/92 of 23 July 1992 on protection of the Community's forests against fire (legally binding) Regulation (EC) No 2152/2003 of 17 November 2003 on the monitoring of forests and environmental interactions in the European Union (Forest Focus) (legally binding) Commission Communication (COM(2008)130 final) on reinforcing the Union's disaster response capacity (non-legally binding) Regulation (EC) No. 614/2007 on the Financial Instrument for the Environment (LIFE+) (legally binding)
Forests and biodiversity	Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (legally binding) Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (legally binding) Communication from the Commission to the Council and the European Parliament of 4 February 1998 on a European Community biodiversity strategy [COM(1998) 42] (non-legally binding) Commission Communication of 27 March 2001 on Biodiversity Action Plans in the areas of Conservation of Natural Resources, Agriculture, Fisheries, and Development and Economic Cooperation [COM(2001) 142 final] (non-legally binding)
Forest Plant Health and Forest Reproductive Material	Council Directive of 15 July 1991 concerning the placing of plant protection products on the market (91/414/EEC) (legally binding) Council Directive 2000/29/EC of 8 May 2000 on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community (legally binding) Council Directive 1999/105/EC of 22 December 1999 on the marketing of forest reproductive material (legally binding)
Forest and water policy	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (legally binding)
Forest law enforcement and trade	Regulation (EC) No 2173/2005 of 20 December 2005 on the establishment of a FLEGT licensing scheme for imports of timber into the European Community. (legally binding) Regulation (EU) No 995/2010 of the European Parliament and of the Council of 20 October 2010 laying down the obligations of operators who place timber and timber products on the market (legally binding)
Forestry within the EU research policy	Regulation (EC) No 1906/2006 of the European Parliament and of the Council of 18 December 2006 laying down the rules for the participation of undertakings, research centres and universities in actions under the Seventh Framework Programme and for the dissemination of research results (2007-2013) (legally binding)
Green public procurement	Directive 2004/18/EC of the European Parliament and of the Council of 31 March 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts (legally binding)

Ireland

A review of the Forestry Act 1946 was completed in 2007 and a new Forestry Act is currently being prepared to replace the Act of 1946. The new Act will, inter alia, update the legislative framework to take account of current policy objectives, in order to ensure the future development of the forestry sector in line with the principles of sustainable forest management.

Russian Federation

The main innovations of the new Code [of 2007] are: decentralization of forest management system, civil legal base of forest use, expansion of the allowed forms of forest use, responsibility of forest businesses for their activities, elimination of unreasonable limitations on forest use and formation of forest infrastructure, providing access to forest resources on the base of investment contracts related to large projects of high-level processing of wood connected with forest infrastructure development.

The former Yugoslav Republic of Macedonia

In 2007, the former Yugoslav Republic of Macedonia is signatory to the 5th Ministerial Conference for Protection of Forests (FOREST EUROPE) and its Declaration and Resolutions are incorporated at national level in the Law on forests.

Belgium

Sustainable and multifunctional forest management is included in the forest law, as a general principle. In Wallonia, a new Forest law has been voted by the regional parliament [in 2008]. Some pan-European guidelines are included as mandatory in the Walloon forest law, both for public and private owners.

Indicator A4. Financial instruments and economic policy

Introduction

The indicator "Financial instruments/economic policy" addresses two distinct areas. Financial instruments are applied to pursue a diversity of public goals by providing financial incentives or disincentives for the target group. Private forest holdings are subject to tax regimes and receive financial incentives, e.g. in the form of grants, loans or compensation. In the case of state forest agencies, funding is distributed through budget allocation as per legislation. "Economic policy" addresses the economic dimension of sustainable forest management more broadly. The following section will first address the broader aspect of "economic policy", and then deal with the more specific financial instruments.

Status

Sustainable forest management and multiple-use forestry remained the bases of economic policy.

Economic policy objectives and instruments on forests were focused on sustainable forest management. Many of the reported policies aimed at a balanced implementation of multiple-use forestry. The most frequently reported policy objectives were strengthening the competitiveness of the forest sector, including forest management, and improving the economic viability of forestry, including reducing the inefficiencies resulting from fragmented forest management. Four countries (Spain, Lithuania, Montenegro, Sweden) aimed to achieve forest sectors that can be self-sustaining. Only one country, France, had an objective of making forestry a source of economic growth and employment. Countries usually employed a complex of instruments and measures to achieve their aims. Overall, many countries reported that they focused on direct, supply-side support for economic activities, e.g. through R&D (e.g. Finland, Portugal, Slovakia); information provision; support to maintain or enhance the resource base and wood supply (e.g. Austria, Cyprus, Finland, Ireland); investment support; or support for infrastructure maintenance. No country indicated direct support for human resource development as a main approach. A few countries reported direct measures on the demand side, including wood use promotion (Belgium, Switzerland, France). Many countries reported measures that support economic viability and competitiveness through supporting or compensating for the provision of environmental and social services, i.e. biodiversity protection, ecosystem management, protective functions and forest health.

Many state forest management bodies were expected to be financially self-sufficient. In many, if not most, they received compensation for providing different services.

The financial arrangements related to public forests and their management were diverse. In the majority of FOREST EUROPE countries, public forests were managed by a separate body. In some countries, these bodies were asked to contribute financially to state budgets, and some countries reported that they did so (Finland, Latvia, Lithuania). Several other countries expected the state forest management to operate as a commercial enterprise and to be financially self-supporting (e.g. Estonia, Hungary, Norway). Several countries (e.g. Austria, France, Croatia, Luxembourg, Norway, Poland, Portugal, Romania, Slovakia) reported having financial mechanisms in place to compensate the state forest management body for environmental and social services or for services they provided to other forest owners, such as private owners, communities and municipalities. Some countries (Montenegro, Slovenia) used concession systems to manage state forests, collecting concession fees.

In countries where state forest management was undertaken as part of the government responsibility (e.g. Belarus, Cyprus, Russian Federation, Romania, United Kingdom, Turkey), different budget allocation and revenue collection arrangements were in place to ensure funding from and distribution of revenues between central government and regional government budgets. In some cases, grants were given to regional public authorities for forest management. Where public forests were owned by communities or municipalities, these were often managed independently, and arrangements were made about taxes or fees to pay.

In privately managed forests, subsidies were frequently used for promoting afforestation, tending young stands, enhancing biodiversity, or improving management efficiency.

Governments employed a variety of financial instruments to direct and influence private forest owners and their forest management. A mix of financial instruments was commonly used to promote specific aims. Incentives or subsidies were financial instruments employed most frequently by a large majority of countries with private forests in the FOREST EUROPE region. These often supported afforestation (e.g. Denmark, Poland, United Kingdom); tending young stands; measures to enhance biodiversity; or the development of individual or group forest management plans (e.g. Bulgaria). Many countries (e.g. Finland, Montenegro, Romania) offered different forms of compensation to private forest owners to encourage provision of environmental and social services. The respective national Rural Development Programmes, co-financed by the EU, were most frequently cited as the framework for support to private forest management through subsidies and incentives.

A range of countries used tax measures to influence private forest owner behaviour, including reducing taxes or offering tax breaks for specific measures, such as afforestation (e.g. Republic of Moldova, Poland), or encouraging active management (e.g. Belgium, Netherlands) or other kinds of investment (e.g. Norway). Several countries (e.g. Croatia, Hungary) provided public extension services to private forest owners, which were supported and financed from public funds. Some countries (e.g. Estonia, Finland, Norway) provided investment support, loans or trust funds, or the financing of extension services provision to private forest owners.

Total public expenditure by government on all forest related activities was around EUR 18.4 per hectare and year.

Total public expenditure[3] by government on all forest related activities was EUR 4 346 billion in the last reporting year available, as reported by 24 countries (representing 74.2 percent of forest and other wooded land area in the FOREST EUROPE region, without the Russian Federation). Some 91 percent of spending came from domestic funding and only EUR 261 million/year from external sources. Some countries reported domestic expenditures as including EU funds. Considerably more in-depth studies would be required to provide a more substantive result. Based on data provided, on average, this total sum would amount to around EUR 18.4/ha of total public expenditures on forest and other wooded land per year (without the Russian Federation). According to these figures, the Netherlands spent around EUR 283.8/ha per year, followed by Ireland (EUR 148/ha/year), Italy (EUR 103/ha/year) and the United Kingdom (EUR 93/ha/year) (Figure 92). Nordic countries tended to spend about EUR 10/ha year, or less. Depending on the size of public forest estate and arrangements for their management, the shares of expenditure tended to vary significantly. Where state forest management was undertaken by a separate body, total public expenditure for the forest administration tended to have a share of some 40-60 percent of all spending, with an allocation of between 5 percent and 20 percent for public forest research, education and training institutions, followed by support for different types of forest associations. Where state forest management was part of government expenditure, the share tended to be higher than 50 percent of total spending.

Lithuania

In 2009 the Lithuanian Parliament has arranged additional taxes for State Forest Enterprises to support general state budget needs The State Forest Enterprises are charged 5% on the sale of round wood and standing forest.

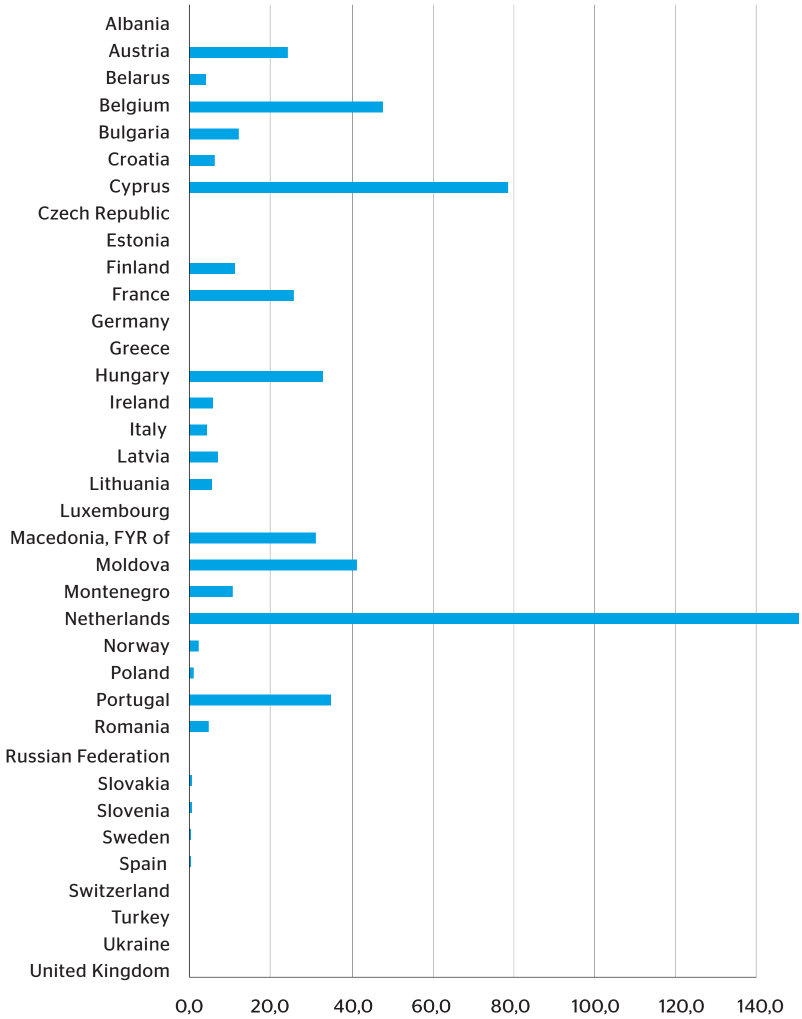
Finland

Metsähallitus is a governmental enterprise that manages, uses and protects natural resources and other State land property. It must be efficient in its work and follow the principles of sustainability. Metsähallitus contributes 50-90 million EUR annually as to the State budget.

Spain

Communal forests pay no taxes if the incomes are reinvested in the forest or in communal services. They are managed by Forest Services and receive public investments.

Figure 92: Total public expenditure per year per ha forest and other wooded land (EUR/year/hectare)



EU Commission

The total amount of financial resources allocated to the eight forestry measures of the EU Rural Development Regulation (with separate budget) during the period 2007-2013 is EUR 12 billion. This constitutes about 7 % of overall intended European Agricultural Fund for Rural Development (EAFRD) spending. The one forestry-specific measure ("Improvement of the economic value of forests") under Axis 1, "Improving the competitiveness of the agricultural and forestry sector" has an intended total expenditure of EUR 2 billion. The total amount of intended spending for forestry measures under Axis 2, "Improving the environment and the countryside" is around EUR 10 billion. In addition to the forestry-specific measures, substantial funding is directed to forestry through those Axis 1 measures, which can cover both agricultural and forestry activities. Based on indications in the programmes and experience from the previous programming period, it can be estimated that the financial resources available from the EARFD to forestry activities are around EUR 8 billion for the period 2007-2013.

Norway

Some 4%-40% of the gross value of timber sold has to be placed in the forest property's National Trust Fund. The money is to be used for investments. Using the fund results in tax advantages. State budget-supported schemes for value creation: The Wood-based Innovation scheme has an annual budget of around EUR 4.2 million (2010) to increase the use of wood and value creation in the entire value chain. The Bioenergy Scheme has an annual budget of around EUR 7 million.

Croatia

All legal and physical persons who conduct economic activity in the Republic of Croatia pay a fee for utilization of forest functions of general benefit ("green tax") in the amount of 0,07% of the total income. The funds are placed directly into a special "Hrvatske šume" Ltd. account for the purposes of regeneration of forests, forest protection, management of karst forests, recovery and rehabilitation of stands endangered by desiccation and other hazards, construction of forest roads, demining of forest etc. "Hrvatske šume" Ltd revenues from wood trading are invested in forest biological reproduction.

[3] Figures may differ from those reported for criteria 6.4 owing to different expenditure classification.

Total operating expenditure, i.e. government spending on public institutions solely engaged in the forest sector, was reported by 24 countries as close to EUR 3 billion (EUR 2.935 million) per year. Some 97.3 percent of this spending was reported to come from domestic funding, with only EUR 132 million per year from external sources. On average, this amounted to around EUR 11.5/ha of forest and other wooded land per year on operational expenditures.

Transfer payments (support to private forest management) were EUR 1 697 billion (29 countries reported), averaging EUR 16.6/ha per year of payments to private forest management. Based on the reported data, Ireland supported private forest management to the extent of EUR 295/ha/year, followed by the Netherlands (EUR 105/ha/year), the Czech Republic (EUR 80/ha/year), and Italy (EUR 78/ha/year). In comparison, Latvia reported only EUR 2.6/ha/year. Figures in Sweden, Estonia and Finland were somewhat higher. For the FOREST EUROPE region as a whole, around 92.4 percent of spending was reported as funded from domestic sources, with only 7.6 percent from external sources. In those countries that reported EU Rural Development Programme funds as "external", this support was usually of a magnitude between 30 and 60 percent. Transfer payments to support private forest management targeted a wide range of relevant issues. In many countries these were related to protective services (e.g. Austria, Bulgaria, Denmark, Ireland, the former Yugoslav Republic of Macedonia); biodiversity protection/NATURA 2000 (e.g. Austria, Estonia, Hungary, Sweden); afforestation and regeneration (e.g. Austria, Bulgaria, Denmark, Estonia, Ireland, the former Yugoslav Republic of Macedonia); infrastructure maintenance and improvement (Austria, Estonia, France, Ireland); individual and group forest management planning (Bulgaria, Ireland, Estonia); as well as other specific measures.

Trends and explanations

The EU Rural Development Programme 2007-2013 was the most frequent driver of change in economic policies as well as in changes in financial instruments.

Since 2007, economic policies have been changed in 21 of 34 reporting entities (countries and the EU Commission). The most frequently reported change was in amendments to economic policy introduced following accession to the EU or changes made as a result of new EU Rural Development Programme support 2007-2013. Many changes in economic policies were effected through changes in financial instruments, such as reductions in taxes (Denmark, France, Hungary, Latvia), increases in tax (Lithuania, Latvia), increases in financial support for specific measures (Denmark, the former Yugoslav Republic of Macedonia, Malta), or decreases (Belgium). Some countries (Czech Republic, Finland, Norway) have reported shifts in objectives or support as a consequence of the world economic crisis, climate change or storm damage. Increasing domestic wood use and supporting forest and bioenergy sector development were explicit objectives in a number of countries (e.g. Finland, France, Malta, United Kingdom).

Financing arrangement changes since 2007 were reported by 24 of 33 countries. Many reported on the national Rural Development Programme 2007-2013 as the main change in financial instruments. Eight countries reported an increase in *financial support* compared with seven that reported a reduction in support. Some countries reported that more funds were raised due to better access to EU co-financing mechanisms (Cyprus, Estonia, Spain, Latvia, Portugal, Sweden, Slovenia, Slovakia, United Kingdom), or improved support from domestic sources (e.g. France). One country reported on new external funding through a Carbon Fund project (Moldova). A range of countries reported on decreasing funds overall (e.g. Switzerland, Latvia, Slovakia), decreases in taxes (e.g. Belgium, Finland), or subsidies provided (Belgium, Czech Republic, Greece). Three countries (Czech Republic, Netherlands, Russian Federation) reported that economic and/or financial competence shifted from central to subnational levels.

Montenegro

Supportive economic policy adopted for the development of domestic wood processing industry - through preferred granting of state forestry concessions to vertically integrated forestry and wood industry companies, partly subsidizing their concession prices, and introducing prohibition of round wood export from state forests. Introduction of public financial support to private forest owners.

United Kingdom

The overall effect [of changes in economic policy since 2007] is that forestry's contribution to United Kingdom gross value-added industry is increased, and commitments made to reduce greenhouse gas emissions are met whilst also seeking to stimulate growth by shifting to a lower-carbon economy.

Finland

The operating environment of forest industry has changed rapidly since 2008. The demand for domestic wood is expected to increase, so the volume of annual fellings should be increased sustainably. The production conditions of forests will improve, as should the profitability of private forestry. There is demand for competent forest workers, and for lateral thinking in entrepreneurship. Education must respond to the demand, creating new kinds of know-how and ensure high level expertise. The main objectives of economic policy will be revaluated and, if necessary, updated.

Hungary

EU financial means were introduced into the forestry-related financial system as a main source of subsidies for specified measures. The tax-like, compulsory forest maintenance fee, calculated from the harvested timber volume, as main source of forestry finances got abolished in 2008. Afforestation is now the financial and legal responsibility of the forest management unit and a EU co-financed activity.

France

The political process «Grenelle de l'environnement» has defined a target of increasing annual wood harvests to 21 Million m3 per year by 2020. Forest tax policy has been changed. "DEFI forêt" specifies an income tax reduction that encourages the owners to actively manage their forest. With the “Loi de Finance Initiale” (2009) "DEFI" is further strengthened. "DEFI contract" is established to encourage owners to establish contracts with forest managers as well as with timber industry.

Indicator A5. Informational means

Introduction

Informational means comprise a wide range of tools and approaches. These include research and development; education and training; advisory and extension services; and regular monitoring and assessment systems that provide information about the state of forests and the effectiveness and efficiency of sustainable forest management practices. Informational means are an essential aid to informing the public and to establishing a dialogue on forest-related issues and priorities. They also contribute to increasing the transparency of forest policy and to holding forest policy-makers accountable.

Status

Improving data collection, access to and dissemination of information is pursued in many countries.

Close to one-third (11) of the 35 reporting countries stated that they had a written (governmental) forest-related outreach and communication strategy (Figure 93).

In constructing forest policy, the overwhelming need is for good quality information. Many countries (e.g. Austria, Belgium, Czech Republic, Germany, Greece, Poland, Russian Federation, Switzerland) put emphasis on reports, either annual or periodic, on the status of forests and sustainable forest management. A number of countries used the pan-European C&I for SFM as the basis for such reports. Several countries and the EU Commission underlined the fundamental role of their data collection systems / national forest inventories (e.g. Estonia, Finland, Hungary) and well-functioning information systems (Austria, Finland, Hungary, Slovakia) or information centres (e.g. Finland, Luxembourg, Norway, Portugal, Slovenia). A range of countries in Eastern Europe reported work on improving access to information through legislative or technical means and improving communication overall (e.g. Bulgaria, Montenegro, Romania, Russian Federation, Ukraine). Several countries have undertaken new inventories or set up new monitoring systems (e.g. Montenegro, Slovakia, United Kingdom).

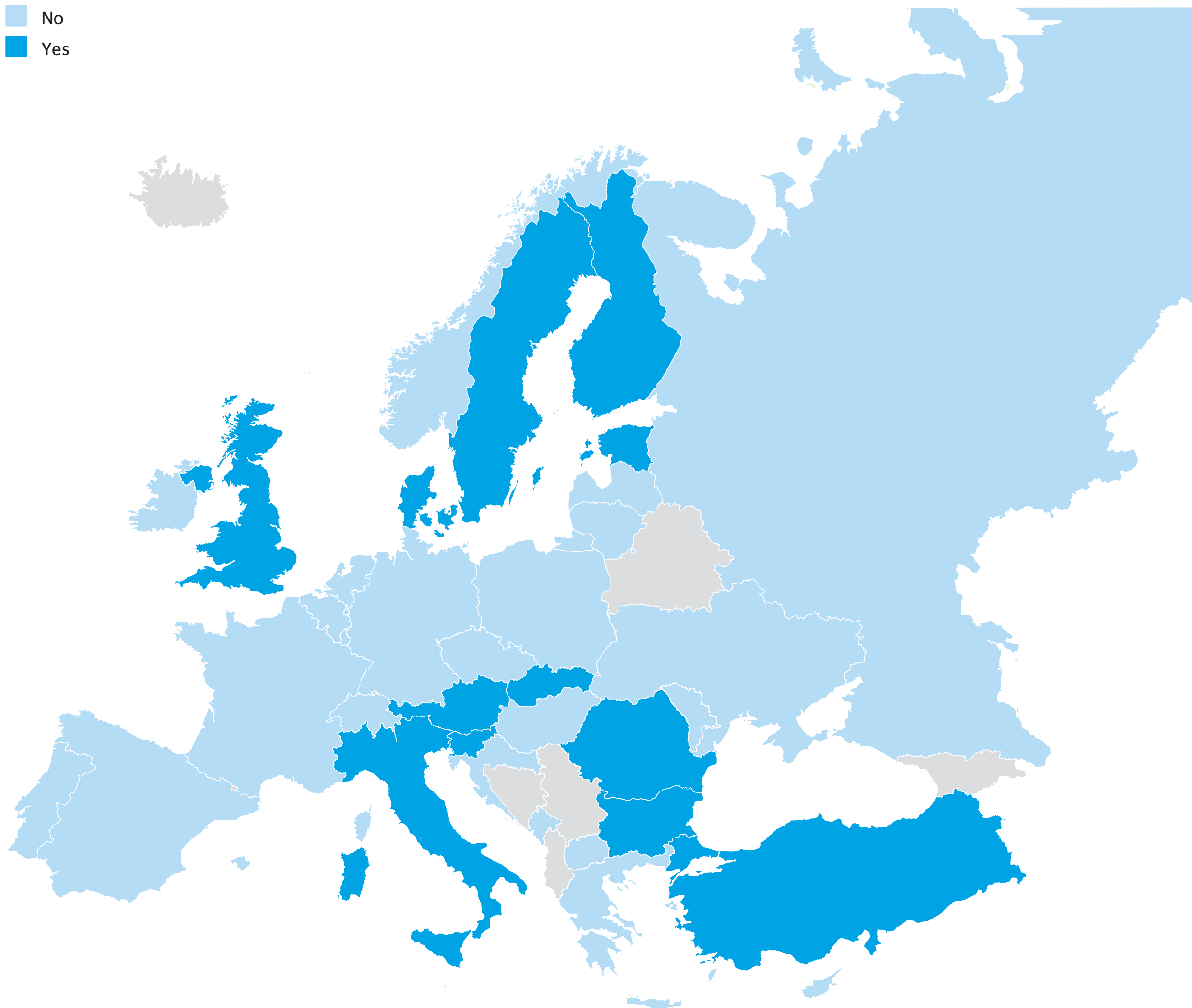
Many countries put emphasis on working with schools to reach the young (e.g. Austria, Cyprus, Czech Republic, France, Latvia, Netherlands, Portugal), running public relations campaigns (Austria, Romania, Ukraine, Switzerland) organizing specific events to communicate to a wider interested public (e.g. Belgium, Czech Republic, Ireland, Latvia, Portugal, United Kingdom), or having better integrated communication as a key part of policy processes (Finland, Czech Republic, Austria).

Trends and explanations

Many countries strengthened forest communication.

In all, 24 of 35 countries reported significant changes in informational means or forest-related communication since 2007, while 11 countries reported none. The most frequently reported significant change was the introduction of a communication strategy (Bulgaria, Czech Republic, the former Yugoslav Republic of Macedonia, Sweden, Slovakia, EU), improvements in public participation and consultation (Montenegro, Slovenia, Ukraine), and the integration of communication as part of a NFP or similar policy process (Austria, Czech Republic, Finland). The existence of a written (governmental) forest-related outreach and communication strategy in 11 countries indicates a considerably higher sensitivity to communication than in 2007, when considerably fewer strategies existed. Many reporting entities (countries and EU) also reported on upgrading their communication systems, particularly by improving internet and e-service function and media presence (Belgium, Estonia, Hungary, Montenegro, Romania, Turkey, United Kingdom, EU).

Figure 93: Existence of a written (governmental) forest-related outreach and communication strategy



EU Commission

Establishment of a European Forest Data Centre (EFDAC) has been initiated by the JRC. The EFDAC site includes data on forest fires from the European Forest Fire Information System (EFFIS); forest extent; forest fragmentation; and forest condition (from the Forest Focus database), the Global Monitoring for Environment & Security (GMES) Land and Climate Change components. The Green Paper on Forest Protection and Information in EU gave indications on directions for a possible update of EU forest information systems.

Austria

Main goals are ensuring transparency and openness in activities of the State Forestry Committee and its branches; involving general public to decision making, providing consultations with the public in identifying priorities in forest management, and ensuring public access to reliable information concerning forests and forest management. Another priority remains increasing public confidence in forest management activities. Forestry campaign: "The future forest is in your hand", round tables, open house days, pre-conferences, etc.

Czech Republic

New NFP II has 4 key actions in the communication pillar: a) To improve the weak position of forestry within public administration; b) To enhance public awareness about the actual condition of forests and forestry needs (including forest pedagogy); c) To resolve the institutional relation of the state to forests and forestry; d) State forests. "Forest pedagogy" is increasing also thanks to the activity of the Czech Forestry Society.

Latvia

Ministry of Agriculture coordinates forest sector internal and external communication. Communication within the sector going on in Forest Advisory Board discussions and through joint events like conferences, seminars. Forest sector has special event each year - Golden Cone Awards Ceremony. Forest sector external communication: Forest Days; competitions for youth and school children; promotion of Wood and Sustainable Building „Zaļās mājas" http://zalasmajas.lv/par-mums/.

Ukraine

The Federal Ministry of Agriculture, Forestry, Environment and Water Management hosts the Austrian Platform for Forest Communications, which helps to generate coherence in forest communication by coordinating strategies, programs and activities of public and private sector players at different level. Waldzeit': (Forest Times), a broad forest communication campaign in the context of rural development policies (www.waldzeit.at)

Bulgaria

A Communication strategy of EFA/2010-2013 has been adopted in order to secure transparency and information provided to the citizens and business. The aim of this Strategy is to support EFA in establishing and maintaining scrupulosity, mutual understanding and cooperation between the organization and the interested parties in its activity, media, societal groups and people. The main communication tool is the Annual Media Plan.

EU Commission

A study: "Shaping Forest Communication in the European Union: public perceptions of forests and forestry" was finalized in 2009. Ad hoc SFC working group was established with the aim to develop a communication strategy, expected by 2011.

United Kingdom

The Government now uses much more multimedia such as video in communications and is beginning to embrace social media in depth.

Sweden

The 2009 Communication Strategy is new and seeks to specify the Agency's target group oriented communication goals and methods.

Estonia

During recent years a number of public web-services have been developed and implemented (e-forest notification, public forest register, GIS platform for regional forest officers etc)

Denmark

More focus on hands on experience, attracting people to use the forest for several purposes; slightly less on paper, folders etc.

B: Policies, Institutions and Instruments by Policy Area

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Chapter reviewer **Gerhard Weiss**

Data sources **All data reported in national reports on qualitative indicators**

Key findings by indicator

B1. Land use and forest area

Information on land use and forest area reflects on various aspects of sustainable development, national forest policy and management in general. About 45 percent of the reporting countries aim to increase their forest area within the next decades. A few countries explicitly stated that forest expansion should not be allowed in areas with profitable agriculture or significant biodiversity. Sustainable forest and land use management was reported as the overall objective, aiming at a more balanced and sustainable use of multiple forest functions. Interest in short-rotation forestry was growing: about 25 percent of countries reported that they aimed to increase the area of short rotation crops but, for the most part, quantified targets were not defined. The main legal basis for land use and forest area was the forest law. A number of countries reported institutional changes affecting implementation and enforcement of forest policies and laws, relevant to land use and forest area management.

B2. Carbon balance

Policies on carbon balance addressed climate change mitigation and adaptation. Emphasis was put on carbon sequestration by forests and wood products and the adaptation of forests to climate change impacts. The vital role of forests in mitigating the effects of climate change was not only put forward in national climate and energy policies, but partly also in NFPs and forest laws. Sustainable forest management was often reported as a key element contributing to climate change mitigation. Most countries had established specialized entities responsible for implementing regulations and programmes on climate change, renewable energy and energy efficiency. Newly developed and adopted national instruments were influenced by recent international climate change debates, agreements and targets.

B3. Health and vitality

Health and vitality policies encompassed general forest management and monitoring programmes as well as specific measures to prevent, mitigate and/or control the factors that contribute to forest decline. The overall reported objective was the maintenance of forest health and vitality and the various functions that vital forests provide. Most of the countries referred to rather common forest preservation and control measures, like against biotic and abiotic agents in general. Only a few countries highlighted particular instruments that make reference to invasive species, game, illegal logging, forests and soils, or forests and water. About half the countries underlined the importance of proper forest condition monitoring and the need for financial support mechanisms. A few countries emphasized the need to improve and conduct more forest research in order to gain more information and a better understanding of the complex factors that affect forest health and vitality, in particular climate change-related developments and impacts. Most of the EU Member States referred to EU financial support mechanisms as provided under the Common Agricultural Policy (CAP) or the LIFE+ programme or to the deliberations on the Green Paper on Forest Protection and Information: Preparing forests for Climate Change (COM(2010)66) in 2010.

B4. Production and use of wood

Policy objectives on the production and use of wood reflected current and future potential availability of timber, increasing demand for wood as a renewable and environmentally-friendly raw material or energy source, and the contribution that the forest and wood sector makes to economic sustainability. Most countries aimed to secure adequate domestic wood supplies for industry and, therefore, for wood mobilization. One-third of the responding countries aimed to increase annual harvests, and two-thirds aimed to increase the use of wood for energy. A few countries mentioned elements of uncertainty, e.g. the on-going financial crisis and economic downturn, changes in imports of wood or unplanned felling resulting from wind throw and consequent damage. The term 'innovation' was frequently mentioned in relation, for example, to new technology, products, services or marketing strategies to promote the use of wood and strengthen the sustainable development of the forest sector in general. In addition to the forest law, several countries referred to bioenergy, climate change or public procurement-related regulations. Furthermore, demand-side measures were mentioned, such as certification and public procurement rules, renewable energy targets or building standards as a means of promoting the use of wood.

B5. Production and use of non-wood goods and services

There was increased recognition of the value and contribution of non-wood goods (NWGs) and forest ecosystem services to economic viability; recreational use, in particular, was highlighted. Most countries aimed to maintain the diversity of goods and services that forests provide and to balance the multiple demands placed on forests. Generally, countries indicated strengthened efforts towards better promoting and marketing NWGs and forest ecosystem services. Several countries underlined the need for improved assessments and methods to allow the value of NWGs and services to be better determined. To better manage various forest goods and services, several countries support cross-sectoral governance and a multi-stakeholder dialogue. Ministries directly responsible for forest and/or environment were most frequently mentioned as the main responsible institutions. However, some countries specified other ministries, such as tourism or economy. Within the EU, NWGs and services have been addressed, for example, in the EU Forest Action Plan 2007-2009.

B6. Biodiversity

Compared to 2007, a significant number of countries reported new and more ambitious targets for forest biodiversity. Forest management practices in Europe increasingly promoted biodiversity, notably through the use of natural regeneration and mixed-species stands. Measures were also being taken to encourage higher proportions of deadwood in forests. The area of protected forests in Europe had expanded, e.g. through Natura 2000 or other protected areas. Although several countries did quantify targets for protected forest areas, the term 'protection' remained vague in most cases. Information whether, for example, forest management practice was included or not, was usually lacking. Several countries highlighted integrated management, or the concept of SFM, as the overall approach to better contribute to forest biodiversity conservation and management. Countries with important forest sectors highlighted programmes to promote the conservation and use of forest genetic resources. While the institutional frameworks have remained stable, the legal frameworks related to biodiversity have been subject to amendment in several countries and financial instruments seem to be of higher importance than before. In particular, private forest owners were asking for adequate incentives or voluntary compensation schemes to conserve biodiversity.

B7. Protective forests

Forests fulfil important protective functions for soils, water resources, infrastructure, managed natural resources or, directly, humans. Compared to 2007, there has been a slight trend towards more emphasis on protecting soils. Twenty-four countries reported soil protection as a main policy objective, with particular focus on preventing and controlling soil erosion and degradation. Some respondents highlighted policies on water management and protection and, in particular, the role of forests in regulating natural water cycles, maintaining water reservoirs and preventing flooding. In addition, ten countries indicated actions on protecting biological diversity, managing landscape integrity and mitigating climate change effects. Few countries emphasized forest fire management, game and wildlife management or tourism and recreation. In addition to the forest law, a number of countries referred to NFPs as the main relevant policy framework to regulate protective services.

B8. Economic viability

Economic viability is a key pillar of SFM and of particular importance for maintaining forests and their multiple benefits for society, contributing to sustainable development and to human livelihood especially in rural areas (Vienna Resolution 2). The main objectives reported were to strengthen economic viability, increase profitability and enhance cost-efficiency of wood production. Several countries focused on technological innovation and related research and development, enhancement of competitiveness as well as increased raw material supply, in particular for renewable energy. A few countries referred to the multifunctional role of forests and the need for increased valuation and marketing of NWGs and services. In addition, especially in eastern Europe, countries mentioned objectives on strengthening forest owner cooperation and enhancing education and training. The most frequently used instrument was financial support. Most of the EU Member States referred to the EU Rural Development funds 2007-2013 as the main means for enhancing forest sector economic viability. In addition, reference was made to the Communication on Innovative and Sustainable Forest-based Industries in the EU (COM(2008)113).

B9. Employment (including health and safety)

Employment in the forest and forest-based sector is an important indicator for the social benefits generated by forests, especially for sustainable rural development. At the same time, having an adequate workforce, not only in terms of numbers but also skills and qualifications, with high occupational and health standards, is critical to achieving SFM. Improving forest labour skills and raising qualifications as well as enhancing the forest sector contribution to rural development were widely emphasized. Compared with the situation in 2007, aspects of social inclusion of forest workers seemed to be more in focus. About 40 percent of the responding countries mentioned specific regulatory instruments, such as labour protection laws, health and safety regulations, or various programmes to increase employment and improve working conditions, employee welfare and work capacity. Observed objectives on increasing employment appeared to be in potential conflict with the general trend of rationalization, especially the restructuring of state forest enterprises, with workers either laid off or forest operations outsourced to private contractors. Several countries indicated changes to their regulatory frameworks to comply with international standards, such as EU Directives and/or the International Labour Organization (ILO).

B10. Public awareness and participation

Raising awareness in the society of the multi-functional role of forests, particularly drawing attention to their protective and socio-economic functions, and the contribution of forests to quality of life in general was a widely declared target. Common means to achieve this in most countries were increased and improved public relations, knowledge exchange and multi-stakeholder participation. Accelerating efforts to improve institutional cooperation and communication, as well as to ensure transparency in forest management and decision making have been indicated. Compared to 2007, more countries highlighted public and multi-stakeholder participation as a crucial development in forest policy, management and decision making processes. In addition, a few countries specified the objective to ensure and/or improve transparency as a principal of good forest governance. Increased attention was also paid to forest pedagogic activities to educate children and raise awareness about forests among young generations. About one-third of the responding countries reported changes in the characteristics of their regulatory frameworks. Since 2007, a few countries have established special entities coordinating and implementing public awareness and participation strategies for the forest sector.

B11. Research, training and education

More than half the responding countries mentioned adjustments to research, training and education programmes, often resulting in institutional reform. Main reasons were the common orientation towards more interdisciplinary education and international reform processes like the Bologna process of modernization of content and practice in higher education. Although interdisciplinary education and training was a common goal, the different disciplines and topics to be included varied. General objectives were further demand-oriented training and education and more practice-relevant research – taking into account global developments as well as the specific requirements of the forest and timber industry sector. Even though research in Europe relied heavily upon national/sub-national research programmes and policies, the European Commission through its three joint European research initiatives (COST, EUREKA and the EU Framework Programme) played a crucial role in the coordination and definition of research priorities across EU Member States.

B12. Cultural and spiritual values

Forests have many cultural and spiritual values for societies and individuals, notably for religious, aesthetic and historical reasons. Although frequently intangible and/or personal, these values are often manifested in particular sites, which are increasingly being identified, listed and protected. A common goal among FOREST EUROPE signatories was to maintain and preserve the international and national heritage of cultural and historical sites and monuments. Several countries highlighted the integration of cultural and spiritual forest values into different land uses, such as forestry, recreation and tourism, as well as the enhancement of their contribution to rural development as a main policy objective. Cultural and spiritual forest values were mainly regulated by specific laws on cultural heritage and nature protection. National forest laws were gaining more relevance. However, the majority of the responding countries reported no change in their respective legal frameworks. Public funds (like national and/or EU funds) were considered highly important by at least a few countries. In many countries, the protection of cultural and spiritual forest values was coordinated between different state authorities, like ministries and/or executive agencies responsible for culture, education, environment, spatial planning, public works and tourism, as well as state forest services and/or enterprises.

Indicator B1. Land use and forest area

Forty-five percent of the responding countries aimed to further increase their forest area.

Increasing the area of forest was a main policy objective for 16 of the 35 countries (45 percent) that reported. This was particularly true of Eastern European countries, such as the Czech Republic, Hungary, Latvia, Lithuania, Poland, Romania, Russian Federation, Slovakia, and the former Yugoslav Republic of Macedonia, but it applied also to some countries with low forest cover, like Denmark, Ireland, the Netherlands, and the United Kingdom. In most cases, countries expressed only a general ambition to enlarge their forest area or to expand forest land over the next decades, without setting specific targets. However, about 30 percent of countries reported clear targets, with precise thresholds and timeframes defined (see Table 60). Afforestation and reforestation measures were often implemented on small scaled, unmanaged abandoned agricultural land (Sweden), on areas with high sensitivity for soil erosion (Slovenia) or on burnt areas (Cyprus).

Forty-two percent of the responding countries reported no changes in their policy objectives on land use and forest area since the last Ministerial Conference in 2007.

A few countries indicated the desire not to increase forest area because of specific country or local conditions. Montenegro, for example, stated that forest land should not be expanded in certain areas to allow profitable agriculture or to preserve biodiversity of other ecosystem lands (like of natural grass or shrub lands). Switzerland reported that in some mountain regions afforestation measures were kept to a minimum and natural regeneration was combated, in order to preserve specific cultural landscapes or maintain traditional agricultural use and land.

Countries, like Slovenia, with a high percentage of existing forest cover (60 percent), intended to maintain but not to increase their forest area, mainly because high coverage already had been achieved and remaining land with its different use and structure had to be sustained. Finland, for example, reported that, in view of its existing forest cover (72 percent), it did not consider it necessary to set a specific national target for forest area. Several countries mentioned sustainable forest management and land use as an important overall objective, aiming to achieve sustainable use of various forest functions. Often, protective and recreational functions as well as the relevance of forest for biodiversity were highlighted. In terms of forest area changes, Slovenia pointed out the issue of reducing fragmentation.

Some country-specific objectives for land use and forest area were:

- Bulgaria – increasing multi-purpose use by amending the national forest act in terms of contractual (renting, leasing) or other land use rights.
- Croatia – improving forest management in deserted karst regions, and include forests affected by landmines under regular management plans (both objectives reflect particular regional forest land conditions and historical background).
- Estonia – selling public forest under the land reform process.

There was growing interest in short rotation forestry. Of the 35 reporting countries, nine (just over 25 percent) proposed to increase short rotation forestry in the next several years, mainly for energy purposes (Hungary, Croatia and Italy) or to compensate for a shortfall in roundwood production (Spain). In general, no specific policy objectives or quantified targets have been reported, mainly because short rotation forestry was not part of the national or sub-national forest policy but of the agricultural and/or renewable energy policy.

A few countries pointed out that short rotation forestry was not an issue for them or was considered to be a negligible small-scale activity (Cyprus, Estonia, Finland, Montenegro, Norway and Slovenia) or that, in the case of Latvia, specific national policy objectives had not yet been formulated.

The main legal basis for land use and forest area was the forest law.

Nineteen countries referred to an explicit national forest act, code or law, whereas others referred to other types of laws, regulations or programmes to regulate land use and forest area. In several countries, land use was regulated by general territorial land use and land use planning laws. Poland and Greece were the only countries which reported that, in addition to the forest law, the constitution was the legal basis. Fourteen countries reported either no major change, or none since the Ministerial Conference of 2007.

To adapt their national situations to changes taking place in global and European economic and political developments, several countries (like Bulgaria, Hungary, Greece and Romania) adopted new forest acts (see Table 61 and Indicator A3). These have led to changes, particularly in forest land use, rights, ownership structures,

Italy: Growing interest in short rotation forestry, but stagnation in increase observed

Italy has observed a growing interest in short rotation forestry, especially for bio-energy purposes. However, the new National Forest Inventory from 2007 shows a reduced rate of establishment of poplar plantations, with only 66 000 ha planted between 1993 and 2005. This decrease in poplar planting is explained mainly by increasing competition of low-priced imports of poplar wood from other countries, especially China and by the increasing interest in using agricultural land to grow more profitable crops, such as soya. Moreover, the requirement of the EU Rural Development Regulation (1698/2005) for a gap of two years between harvesting and replanting a plantation, has limited the potential of the short rotation forestry sector.

forest definition and the definition and enhancement of multiple forest uses and sustainable forest management. Greece, for example, adopted a new forest law and changed its definition of forest and other wooded lands in 2010, in reaction to the devastating forest fires in 2007, so that more land could be brought under the protection of forest legislation and rapid land use change could be prevented. In addition, the Greek Constitution prohibits land use change when the forest is destroyed. Romania underlined the importance of amended forest law and stricter regulatory mechanisms, to regulate or prohibit change of land use from forest, and the enforcement of compensations, like through afforestation.

Some countries, while not referring explicitly to the forest act, highlighted other relevant programmes and legislation that regulate forest land, such as the NFPs (Portugal, Slovakia and Spain); a regional forest strategy (the United Kingdom); a spatial planning act (the Netherlands, the former Yugoslav Republic of Macedonia); a national action plan on afforestation and reforestation (Turkey); or so-called land use and building acts (Finland and Norway).

A number of countries reported institutional changes in the implementation and enforcement of national and/or regional forest policies and laws, linked to land use and forest area.

Table 60: Countries which reported clearly defined targets for increasing forest area

Denmark	To expand the forest area by 20-25 percent within the next 80 to 100 years
Hungary	To increase forest cover to 27 percent by 2040, with an annual afforestation rate of 15 000 ha
Ireland	To increase forest cover to 17 percent by 2030
Netherlands	To increase forest area by 400 000 ha by 2020
Poland	To expand the forest area by up to 30 percent by 2010, and up to 33 percent by 2050
Romania	To increase forest area by 2 million ha by 2035
Russian Federation	To increase forest area by 180 000 ha within next 3 years
Spain	To increase forest area by 45 000 ha between 2008 and 2012
MK	To increase forest area by 70 780 ha by 2020
United Kingdom (Scotland)	To expand the forest area by afforestation at an annual rate of 10 000 ha

Table 61: Main legal basis for land use and forest policies

Forest law, but no changes since 2006/2007	Austria, Belgium, Cyprus, Czech Republic, Ireland, Latvia, Norway, Poland, Sweden, Switzerland, Ukraine
Forest law, with amendments since 2007	Russian Federation (2007), Croatia (2008), Germany (2010)
New forest law, adopted since 2007	Bulgaria (2008), Romania (2008), Hungary (2009), Greece (2010)
New forest law, forthcoming	Montenegro (new act proposed in 2010)

The main institutions with legal authority to implement legislation at the national level, affecting forest land use and related policies, were the Ministries of Agriculture and Environment. At the sub-national or local level, they included forest departments, state forest authorities and regional administrations. In about 30 percent of countries, forest area and general forest matters fell within the competency of ministries related to agriculture, forestry, rural development or natural resources. Ministries for the Environment were mainly responsible for environmental or nature conservation related matters, such as the designation and management of protected forest areas (Czech Republic). Main institutions implementing general land use legislation were national or regional land use planning departments or agencies, including national or regional cadastre services. A number of countries reported institutional and administrative changes regarding the implementation and enforcement of national and/or regional forest policies and laws linked to land use and forest area (see Table 62). See also Indicator A2.

A few countries referred to explicit national public forest agencies, which were responsible for implementing and monitoring national regulations and programmes related to land use and forest area: the Forest Extension Service in Croatia; the State Forest Service in Italy; the Swedish Forest Agency in Sweden; and the Forestry Commission in the United Kingdom.

Legal regulations and financial support programmes were the most frequently used instruments to maintain and enhance forest area.

Countries reported a wide range of instruments relating to forest land use. The main legal instruments that ensured implementation of objectives were legal restrictions and procedures for changing land use, such as forest acts, management regulations, afforestation/reforestation regulations and general land use acts. Several countries emphasized the importance of economic instruments, in particular, subsidies, taxation schemes or public funds to maintain and enhance forest area and support forest management planning. EU Member States often referred to the Rural Development Regulation (1698/2005/EC) and the European Agricultural Fund for Rural Development (EAFRD), providing financial support for afforestation and reforestation measures. The most commonly reported instruments that provide information on land use and forest area were national forest inventories and monitoring programmes, forest management plans and guidelines. There have been no changes since 2007 in about 35 percent of the reporting countries.

Table 62: Country examples with institutional changes, respective legal responsibility on land use and forest area

Bulgaria	In 2007, the National Forestry Board at the Ministry of Agriculture and Forests became part of the State Forestry Agency at the Council of Ministers. In 2009, the State Forestry Agency became the Executive Forest Agency at the Ministry of Agriculture and Food.
Croatia	Within the reorganization process of the Croatian Government in 2007, the Forestry Department was transferred from the Ministry of Agriculture, Forestry and Water Management to the newly established Ministry of Regional Development, Forestry and Water Management.
Demark	A new Danish Ministry responsible for Climate and Energy was established in 2007, taking over responsibilities on forest's contribution to climate change mitigation as well as adaptation to climate change (formerly falling under the responsibility for Ministry of Environment). From 1 January 2007, Denmark moved from a three-level to a two-level governance structure. County councils were abolished, moving key responsibilities on nature protection and forest to central government and local governments.
Romania	The Forest Public Authority moved from the Ministry of Agriculture, Forests and Rural Development to the Ministry of Environment and Forests in December 2009. The Ministry of Environment and Forests is now the legal authority for land use and forests.
Russian Federation	In 2008, the Federal Agency of Forestry was removed from the control of the Ministry of Natural Resources to the Ministry of Agriculture. In 2010, the Russian Agency of Forestry was finally placed under the direct command of the Russian Federation Government. All forest districts are subordinated to local authorities.
Spain	New ministerial structure. The Ministry of Agriculture and the Ministry of Environment were merged, to form the Ministry of Environment, Rural Development and Marine. The former General Directorate for Biodiversity has been re-named the Directorate General of the Environment and Forestry Policy.

Indicator B2. Carbon balance

Increasing carbon sequestration by forests and adapting forests to climate change were the most frequently mentioned objectives.

In 2007, objectives were focused primarily on promoting bio-energy and reducing greenhouse gas (GHG) emissions. In 2010, in line with international commitments (see also Indicator A3) and debates on the mitigation of and adaptation to climate change, many countries reported a stronger focus on carbon sequestration by forests and adapting forests to climate change (see Figure 94). In addition, several countries mentioned the importance of increasing the use of wood as a raw material and a source of renewable energy (Austria, Bulgaria, Estonia, Finland, France, Hungary, Lithuania, Latvia, Montenegro, Norway and Sweden) and reducing national GHG emissions (Austria, Bulgaria, Croatia, Cyprus, France, Hungary, Italy, Latvia, Poland, Portugal, Switzerland and the former Yugoslav Republic of Macedonia). EU Member States consistently reported policy objectives that were in line with the three principal objectives of the EU Climate and Energy Package 2008[4], which are to achieve by 2020: a) 20 percent reduction of GHG emissions, below 1990 levels, b) 20 percent of EU energy production and consumption from renewable energy sources, and c) 20 percent reduction in primary energy use, by improving energy efficiency.

Sustainable forest management, as defined by the FOREST EUROPE process, plays a vital role in maintaining healthy and resilient forests. Sustainable forest management was reported as a key concept in mitigating climate change by several countries (Bulgaria, Croatia, Estonia, Latvia, Lithuania, Montenegro, Norway and Turkey). Both the Czech Republic and Ukraine saw the improvement of forest monitoring and national information systems as a key aim to get more reliable information about carbon stocks held in forests. Few EU Member States reported that the recent (2010) EU Green Paper, Forest Protection and Information in the EU: preparing forests for climate change[5], as a follow-up to the White Paper on Adapting to climate change[6], was expected to have a strong bearing on national forest policies and information systems developed by EU Member States in the coming years.
Close to a half of the 36 responding countries aimed to increase or maintain carbon stocks in forests, mainly through afforestation (see Table 63).

Figure 94: Main policy objectives on carbon balance (number of countries)

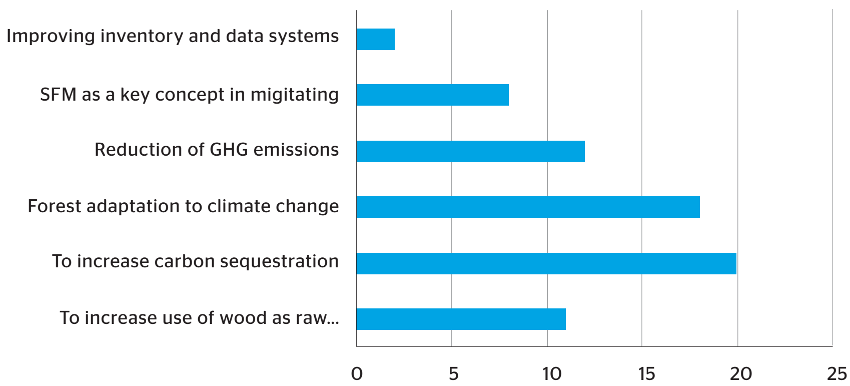


Table 63: Country examples of policy objectives on sequestration and storage of carbon by forests

Belgium	Stabilization of the carbon stock in forests; production of long-term wood products.
Czech Republic	To optimize carbon cycling in soil horizons, growing stocks, and wood products, and to improve forest monitoring to obtain more reliable information about carbon stocks.
Finland	Carbon sequestration (growing stock and soil) target: at least 10-20 million tonnes of CO_2.
Hungary	To maintain or increase carbon sequestration by afforestation and improved management methods.
Russian Federation	Carbon accumulation by specially created forest plantations amounting to 28 500 ha.
Slovenia	Carbon sequestration target: at least 1.3 million tonnes of CO_2 annually.
Turkey	To enhance forests carbon stocks: 181 million tonnes of CO_2 sequestered within 5 years (2008-2012), as supported by the National Afforestation and Rehabilitation Plan.

[4] In January 2008, the European Commission published the EU Climate Change and Energy Package which was agreed by the European Parliament and Council in December 2008 and became law in June 2009. The package includes: a) EU Emissions Trading System (EU ETS) Directive, b) Greenhouse Gas Effort Sharing Decision, c) Renewables Directive setting out binding targets for the EU Member States, and d) Directive on the Geological Storage of Carbon Dioxide.
[5] European Commission, COM (2010)66 final. Green paper on Forest Protection and Information in the EU: Preparing forests for climate change. See at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0066:FIN:EN:PDF
[6] European Commission, COM(2009) 147 final. White Paper on Adapting to climate change: towards a European framework for action. See at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0147:FIN:EN:PDF

Table 64: Country examples of policy objectives related to forests adaptation to climate change

Belgium	Improving biodiversity at all levels, as a means to improve ecosystem resilience; avoiding soil and game damage; silvicultural practices; managing water resources; monitoring and adopting crisis management plans (for storms, fires and biotic damage).
Germany	To reduce the vulnerability and to maintain and improve the adaptability of natural, social and economic systems.
Ireland	To specify and use species in afforestation and reforestation that are well adapted to current sites and climate and which will have better resilience to a changing climate.
Norway	Measures for adaptation to climate change were under development. Measures for sustainable forest management were to be the basis for a strategy for forest adaptation to climate change.
Slovenia	Measures for forest adaptation to climate change: conservation of high growing stocks, favouring native species that are adapted to various sites, ensuring natural regeneration, prevention of forest fires, continuous cover of forest soils with vegetation, and prevention of litter gathering, prompt harvesting of wood from forests damaged by natural disasters to reduce the incidence of bark beetle outbreaks.
Spain	The National Forest Plan took into account the adaptability and resilience of the Spanish forests to climate change.
Ukraine	Assessment of forest vulnerability to climate change and the development of adaptation strategy in forestry.

Table 65: Country examples with institutional changes since 2007

Belgium	Climate Agency (Walloon) established, in order to coordinate and implement the UNFCCC and the Kyoto Protocol, as well as national air quality policy.
Croatia	The Department for Climate and Ozone Layer Protection established in 2009.
Denmark	A new Danish Ministry responsible for Climate and Energy was established in 2007, taking over responsibilities on forests' contribution to climate change mitigation as well as adaptation to climate change (formerly falling under the responsibility for Ministry of Environment).
Norway	The Climate and Pollution Agency as an executive institution established, with emphasis on climate change, including forests and climate change.
Switzerland	Climate Division at the Swiss Federal Office for the Environment established, to manage and implement the Kyoto Protocol as well as the national climate policy.
Turkey	The Coordination Board on Climate Change established, in order to fulfil UNFCCC and Kyoto Protocol requirements.
United Kingdom	Department for Energy and Climate Change established, responsible for the United Kingdom GHG inventory, including Land Use, Land Use Change and Forestry (LULUCF).[7]

Results from UNFCCC Conference of Parties (COP) in Copenhagen (2009) and Cancun (2010)

Copenhagen, 2009
In the run-up to Copenhagen, the potential to reduce emissions from deforestation and forest degradation (known as REDD and REDD+) received considerable attention (see Copenhagen Accords). REDD+ goes beyond deforestation and forest degradation, and includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks. The principal question has been whether to finance REDD from public funds or by providing carbon credits. "Positive incentives" need to be provided for such actions and this can be achieved by the "immediate establishment of a mechanism including REDD/REDD+, to enable the mobilization of financial resources from developed countries".

Cancun, 2010
The main outcomes from COP16 have collectively been called "The Cancun Agreements". The Decision that is relevant to REDD, forest conservation and sustainable forest management in developing countries is included in the Outcome of the Work of the Ad-hoc Working Group on long-term Cooperative Action under the Convention. All the parties to the Convention "should collectively aim to slow, halt and reverse forest cover and carbon loss, according to national circumstances" and "to find effective ways to reduce the human pressure on forests that results in greenhouse gas emissions, including actions to address drivers of deforestation". Developing country Parties are encouraged to contribute to mitigation actions in the forest sector by undertaking the following activities: a) reducing emissions from deforestation; b) reducing emissions from forest degradation; c) conservation of forest carbon stocks; d) sustainable management of forest; e) enhancement of forest carbon stocks. Developing country Parties are also encouraged to develop a) national strategies or action plans, b) a national forest reference emission level/s, and c) a robust and transparent national forest monitoring system.

Many countries (16 out of 36 reporting)[8] have drawn attention to the need to develop measures and programmes for the adaptation of forests to changing climatic conditions and the increased frequency of extreme weather events such as heat waves, droughts, storms, fires and floods (see Table 64). Other countries highlighted recent international climate negotiations which led to national debates and processes on developing specific policies for forest adaptation to climate change (e.g. Hungary, Luxembourg and the Netherlands).

Carbon balance policies were mainly supported by specific laws and regulations related to climate change, renewable energy sources and energy efficiency.

In almost all FOREST EUROPE signatory countries, the legal basis for forests and their relevance for carbon balance was a set of laws and regulations, which related mainly to climate change, renewable energy and energy efficiency. Half of the reporting countries (18 out of 36 reporting) referred to changes in their regulatory frameworks, which had been influenced by recent developments in international and European climate change policy.

Austria, Finland, Ireland and the United Kingdom reported that their current climate and energy policies include specific forest sector measures, in recognition of the key role of forests in mitigating and adapting to climate change. Finland's National Climate and Energy Strategy 2008 includes a National Strategy for Adaptation to Climate Change, outlining adaptation measures for 15 different sectors, including the forest sector. Similarly, Ireland, in its National Climate Change Strategy for 2008-2012, has defined a target for three million tonnes CO_2 to be sequestered annually by forest carbon sinks. In April 2010, Austria adopted a new Energy Strategy and a new National Renewable Energy Action Plan, which specified measures for mobilizing forest biomass harvest, to meet the targets set in the EU Climate Change and Energy Package 2008.

The vital role of forests in reducing the impact of GHG emissions through carbon sequestration and storage and adapting to climate change was emphasized not only in national climate and energy strategies and policies but also in NFPs (e.g. Czech Republic, Slovakia and Slovenia) and forest laws (e.g. Croatia and Romania). The new NFP of the Czech Republic, for instance, takes into account the challenges of climate change and outlines measures for carbon sequestration by forests and forest adaptation to climate change. The Forestry Act of Croatia (amended in 2008) recognizes the importance of forest carbon sequestration in mitigating climate change and outlines specific measures to increase carbon sequestration by forests. Croatia also established a National System for Calculation and Reporting on Anthropogenic Emissions of Greenhouse Gases by Sources and Sinks, based on the Regulation on Monitoring Greenhouse Gas Emissions in the Republic of Croatia (OG1/07), which includes forests. In this context, Italy adopted a Decree on the establishment of the National Register of forest carbon sinks in 2008.

Specialized entities on climate and carbon-related policies have been established in many countries.

Several countries reported the establishment, since 2007, of new national specialized coordination and executive authorities/entities (such as climate agencies, national coordination boards, climate divisions or departments) (see Table 65), with an emphasis on climate change in general, as well as on forests and climate change. The most commonly cited reason was the urgent need to better coordinate and implement national and international climate and air quality policies. The European Commission established a new Directorate General (DG) on Climate Action in February 2010.

Most countries referred to legal/regulatory instruments, often in combination with economic and/or informational means to support national policies on carbon balance.

Most of the common financial mechanisms, used between 2007 and 2010 to support carbon and climate change-related policies, included transfer payments mainly for afforestation and regeneration, renewable energy and energy efficiency measures. Several EU Member States referred to the EU co-financing of forestry measures as part of national Rural Development Programmes (see also A4 Financial instruments). Bulgaria, Croatia and France, on the other hand, established national funds for financing investment projects in the field of renewable energy and energy efficiency. Only three countries (Germany, Montenegro and Norway) reported the increased use and improvement of informational instruments, such as forest monitoring to get better information on carbon sink and source effects.

[7] The current EU GHG reduction commitment does not include emissions and removals of CO_2 in the LULUCF sector. In case no international agreement is reached on LULUCF, the EU Effort Sharing Decision (ESD) requires the Commission to assess possible modalities for including emissions and removals related to LULUCF in the EU's GHG reduction commitment by mid 2011.

[8] Including the European Commission.

Indicator B3. Health and vitality

Several countries highlighted the importance of general forest protection measures, in particular against pests and diseases, but also improved forest condition monitoring. Half the responding countries (17 out of 34) reported no change to their objectives. Almost all countries had as their overall principal objective the maintenance of forest health and vitality and the multiple benefits that forests provide. Most countries clearly distinguished between objectives about forest management and silvicultural measures and objectives related to forest condition monitoring and information. Some countries wished to undertake more and better forest research, to have a better understanding of forest health and vitality complexities. Belgium pointed out the need to improve communication and information flow among scientists, forest managers and forest owners, in order to develop more effective prevention and mitigation measures, particularly in cases when quick response mechanisms are necessary, like in the situation of large-scale storm damage or aggressive pests and diseases outbreaks.

About half of reporting countries expressed the importance of continuing to undertake and improve forest condition monitoring. However, most of the countries referred to common forest preservation and control measures, specifically on pests and diseases (15 out of 34 reporting) and/or biotic and abiotic agents in general (6 out of 34 reporting), rather than on any specific threat (see Figure 95). Only three countries (Hungary, Sweden and the Former Yugoslav Republic of Macedonia) highlighted climate change as an issue – referring mainly to the resilience and adaptability of forests to climate change. Five countries (Austria, Cyprus, Germany, Italy and the Netherlands) cited a need for reductions in air pollution and improved monitoring. Seven countries, mostly from the Mediterranean and Eastern Europe (Cyprus, Italy, Lithuania, Portugal, the Russian Federation, Turkey and Ukraine) underlined the importance of proper forest fire control and mitigation measures.

Protecting forest soils to maintain their productive potential and the vitality of forests was mentioned only by Austria, Estonia and Lithuania. Still with reference to forest soils, the Netherlands referred also to the relationship among healthy forests, soils and water. It is worth pointing out, however, that many more countries (than in 2007) reported the importance of protecting forest soils as part of ecosystem services (see indicator B7 Protective services).

Only the Czech Republic underlined the requirement to achieve a balance between forest and game. Two countries addressed the issue of invasive species (Estonia and Slovakia) and two others addressed illegal logging (Montenegro and Ukraine). There was no mention of objectives related to storms, drought, snow or the damage resulting from forest operations and/or farm livestock (see Indicator 2.4 Forest damage).

In addition to the Forestry Acts, a large variety of legal frameworks regulated forest health and vitality issues. The forest law was specified as the principal regulating instrument by eleven countries. Compared to 2007, most of the countries that reported also referred to various specific regulations on prevention, mitigation and/or forest health control measures. Several of the EU Member States provided links to specific EU regulations or programmes, in particular to the Financial Instrument for the Environment LIFE+ (1614/2007/EC), the Plant Health Directive (2000/29/EC)[9] and the Directive on importing wood packaging material into the EU (2004/102/EC)[10].

In most countries, forest health and vitality policy was based on general forest protection (Bulgaria, Hungary and the Russian Federation) or plant health (sanitary and phytosanitary) regulations (Bulgaria, Lithuania and Slovakia). A few countries also referred to specific regulations, such as the ordinance against the introduction and spread of harmful organisms in Croatia, the Forest Insect and Fungi Damage Prevention Act in Finland, the national action plan on combating illegal logging in Montenegro and the national prevention plan on pine wood nematodes in Spain.

Only Germany highlighted air quality and emission control acts, and only Switzerland referred to its hunting act. NFPs (Austria and Czech Republic) and general nature or environmental laws (Slovakia, Switzerland and the former Yugoslav Republic of Macedonia), providing an overall framework for regulation, seemed to be of minor relevance in terms of forest protection.

In most countries forest health and vitality matters were controlled by specialized institutions/departments. Though half of the reporting countries (17 out of 34) indicated no major change in institutional structure, a few countries (see Table 66) reported changes related mainly to the integration of competent institutional bodies/units into existing bodies.

Most countries had specialized bodies that deal with forest health at all levels of forest administration. At the ministerial level, France had the Department of Forest Health under the Ministry of Food, Agriculture and Fisheries, while in Turkey, the Department of Forest Protection and Fire operated under the General Directorate of Forestry of the Ministry of Environment and Forestry. In addition to the ministries, state forest services, specific institutions/bodies, expert panels and the forest owner itself may have responsibility for coordinating or providing administrative and/or information support on forest health-related issues. Among such bodies listed by countries were the Plant Protection Agency in Hungary, the Team of Specialists on Forest Protection in Poland, the Forest Protection Service in Slovakia and the Forest Protection Association in Ukraine. A very few countries highlighted the role that national or regional forest research institutions play, particularly in respect to providing better data and information about the health

Figure 95: Addressed threats and topics related to forest health and vitality

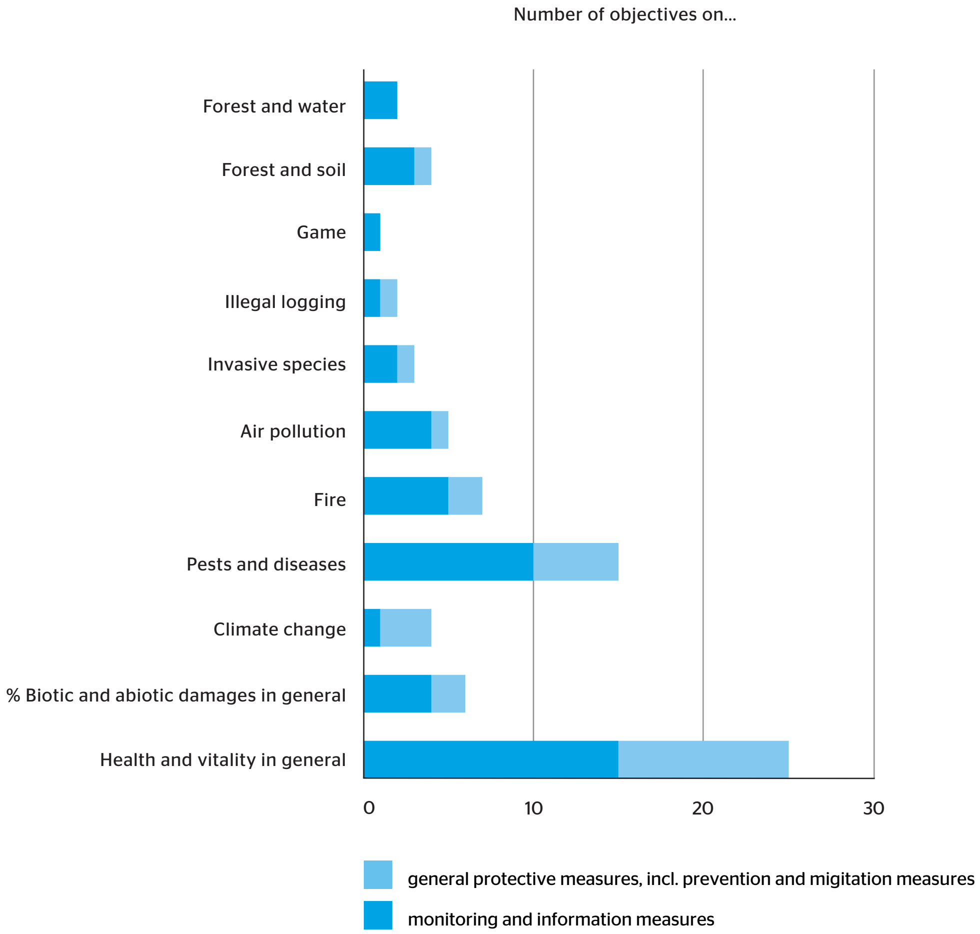


Table 66: Countries reporting changes in the institutional framework

Germany	The former "Biologische Bundesanstalt (BBA)" has been merged with other national research institutes. Since 2008, it has become part of the Federal Research Centre for Cultivated Plants, Julius-Kühn-Institute (JKI). The JKI provides information and advice to the federal government, in particular to the Ministry of Food, Agriculture and Consumer Protection (BMELV). It evaluates the resistance of plants to pathogens and abiotic stress, analyses plant protection products and contributes to national and international standards on plant health.
Hungary	The Plant Protection Agency was integrated into the Central Agriculture Agency in 2007, in particular to improve the cooperation between forest and plant protection authorities within the same organization.
Portugal	New coordination structures were adopted at regional/forest management unit level for improved implementation of forest fire control and mitigation measures.
Spain	In 2008, the Ministry for Environment and Rural and Marine Affairs was created, by merging the former Ministry for Environment and the Ministry for Agriculture. As a result, coordination between the national plant health service and the national forest health service has been improved.

[9] The Council Directive 2000/29/EC lays out protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community.
[10] The Commission Directive 2004/102/EC and the amended Council Directive 2005/15/EC introduced new requirements for the import of wood packaging material and for dunnage into the EU.

and vitality of forest ecosystems. Two countries, Belgium and Finland, referred to the national food security authority as the responsible body for the control of general plant health and plant trade and imports, including timber.

Monitoring was the most frequently reported instrument. Half of the 34 reporting countries[11] (17 out of 34) underlined the importance of proper forest condition monitoring systems, backed up with adequate financial support. EU Member States, for example, often referred to the EU Financial Instrument for the Environment LIFE+ and the current FutMon project[12] , which provided financial support for forest condition monitoring on Level I and II plots in 2009 and 2010[13]. However, many EU Member States pointed to potential shortfalls in long-term financial support for forest condition monitoring and for maintaining long-term time series. A few countries referred, in this respect, to recent debates and EU communications, such as the Green Paper on Forest Protection and Information (COM(2010)66) (please see box for more information).

Most countries employed a broad range of regulatory, financial and information instruments (see Table 67). Finance for these various mitigation, prevention and control measures came from both national and European Union sources. EU Member States often made reference to the EU Rural Development Regulation (1257/1999/EC and 1698/2005/EC) as the main instrument providing financial support for, e.g., reforestation or prevention measures. Austria, the Netherlands and Poland, for example, highlighted research and education as one of the relevant instruments. Poland in particular cited the importance of good education of local forest managers, who monitor the state and development of forest and propose and implement necessary measures to maintain a healthy and vital forest.

European Commission documents and studies related to EU forest protection policy, published between 2007 and 2010

- Green Paper on Forest Protection and Information: Preparing forests for Climate Change (COM(2010)66), Council Conclusions CC 10973/10 of 11th June 2010.
- EU policy options for the protection of forests against harmful impacts (2009)
- Mid-term evaluation of the implementation of the EU Forest Action Plan (2009)
- Impacts of climate change on European forests and options for adaptation (2008)
- Feasibility study on means of combating forest dieback in the European Union (2007)

Table 67: Country examples highlighting different forest health and vitality related instruments in place

Croatia	The Forest Fire Register, operative since January 2009, is harmonized with the European Forest Fire Information System; and the Register about damage to forest ecosystems in the Republic of Croatia, operative since 2007, is harmonized with ICP Forests standards. Preparation of the new ordinance on monitoring forest damages was in progress in 2011.
Hungary	Financial support for reconstruction of forests was introduced in 2008 after abiotic damage, but there were no subsidies for prevention of biotic damage and reconstruction after damage. Careful reconsideration of the European and the national forest condition monitoring system (see also Green paper of the EU on climate change and monitoring) was deemed to be urgent and the maintenance and further development of the monitoring system with more attention to climate change effects was considered necessary.
Ireland	The favourable health status of Ireland's forests was recognized under the EU Plant Health Directive (Council Directive 2000/29/EC), under which Ireland was granted Protected Zone Status for the forest pests and diseases and for which national surveys were conducted annually.
Romania	There were no changes in political instruments related to forest health and vitality. The Forest Code contained several provisions on maintaining forest health and vitality. In addition, specific "Norms and Technical Guidelines on Forest Protection" had been developed.
Russian Federation	The Forest Fire Monitoring controlled all the territory covered by the Forest Fund in the Russian Federation by means of ground, aerial photographs, and satellites assessments.
Turkey	Within the scope of International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests, operating under the UNECE Convention on Long-range Transboundary Air Pollution, a project titled "Forest Ecosystems Monitoring Level I and Level II Programmes in Turkey" started in 2006, in collaboration between Ministry of Environment and Forestry (MEF)-Directorate General of Forestry (GDF) and MEF-Research and Development Department.
United Kingdom	The United Kingdom has expanded and continued a programme of containment and eradication of *Phytophthora ramorum* and *P. kernoviae*, sometimes referred to as "Sudden Oak Death". In response, the Forestry Commission, with private sector support, has set up a Bio-security Programme, which aims to "Preserve the health and vitality of our forests, trees and woodlands through strategies, which exclude, detect, and respond to, existing and new pests and pathogens of trees, whether of native or exotic origin." The Programme was to be directed by the Bio-security Programme Board, which would include representatives from the Forestry Commission, Forest Research and the forestry and wood-using sectors.

Indicator B4. Production and use of wood

Two-thirds of the reporting countries had targets for increasing the use of wood for energy, and one-third of countries reported that they aimed to increase annual wood harvests.

Several countries reported that a main current objective was to undertake measures to enhance the productivity of forests and the efficiency of their utilization, while others emphasized maintaining or increasing the diversity of uses (e.g. NWGs). One-third of countries (13) reported the aim to increase both the harvests and the rate of utilization of the annual increment, whereas 16 countries defined the target for harvests to remain the same. Five countries reported that they had no quantified target for harvests (Czech Republic, Germany, Italy, Romania and Spain).

A clearly visible trend in the 2010 reports compared with those from 2007 is the increased use of wood to meet renewable energy targets (see Figure 96).

Almost two-thirds of the reporting countries (23 out of 36) aimed to increase their use of wood for energy. Only Belgium and Latvia reported that they aimed to keep the use of wood for energy at present levels. There were 17 countries that stated targets to increase wood's contribution to meeting energy needs with 12 of them set for the time horizon 2020 (see Tables 68 and 69). Furthermore, 13 countries reported targets for increasing use of wood for construction (see Figure 96)[14]. In addition, some countries indicated targets for other uses, such as furniture (Slovakia and Croatia) other wood products (Ireland) and non-timber products (Bulgaria).

In addition to the increased use of wood for energy, countries also reported the aim of securing the domestic supply of wood for industries and increasing wood mobilization (e.g. Austria and Norway). But there were also reports on elements of uncertainty, e.g. due to financial crisis, economic downturn, changes in imports of wood (Latvia) or incidental fellings caused by wind throws

Figure 96: Countries reporting targets for use of wood

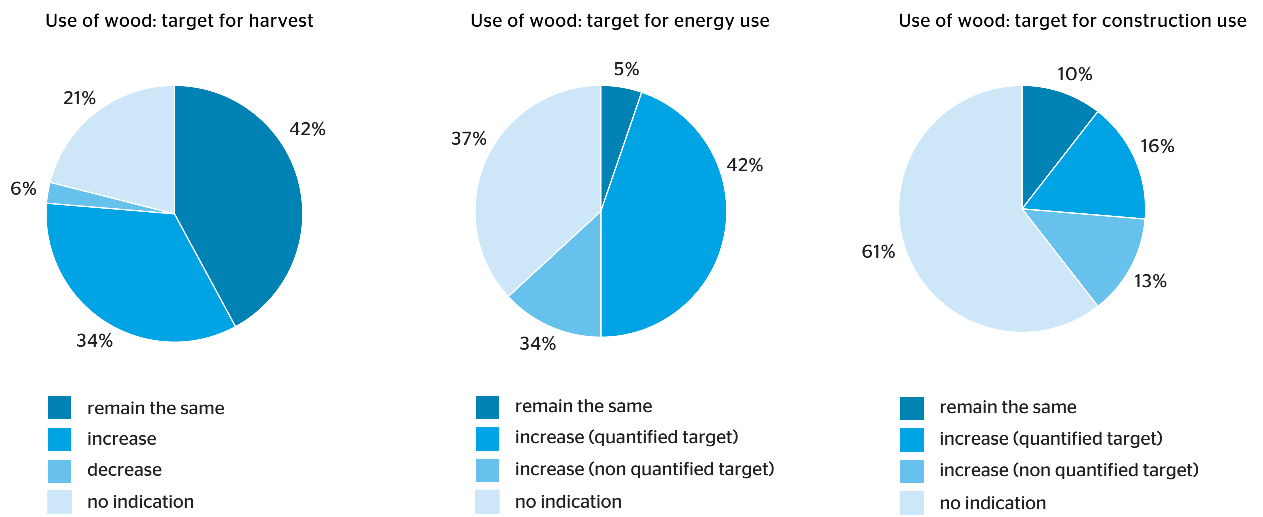


Table 68: Country targets for increased energy consumption from wood, expressed as % or respective energy units

Croatia	by 26 PJ (petajoule) by 2020
Czech Republic	by 25 percent by 2020
Denmark	60 percent by 2020
France	by 40 percent (+4 mil TOE), tonne Oil Equivalent by 2020
Italy	by 20 percent by 2020
Norway	by 14 twh (Terra watt hours) by 2020
Slovakia	by 35 percent. In the period 2010-2013 consumption of energy from wood shall increase approximately 5-8 percent per year first of all from harvesting residues.

Table 69: Country targets for increased energy consumption from wood, in m^3 or tonnes

Finland	by 13.5 million m3 per year until 2020
Hungary	by 1.0-1.5 million m3 per year (of which half shall be based on energy plantations and not forests) until 2020
Ireland	by 1.9 million tonnes by 2020
Romania	by 2 million m3 by 2020
Switzerland	by 1.5 million m3 by 2020
MK	by 955 000 m3 per year by 2010
United Kingdom	by 2-3 million m3 within five years

[11] Hungary, Poland, Switzerland, the Russian Federation, Finland, Latvia, Sweden, Belgium, France, Turkey, Italy, Germany, Bulgaria, Croatia, Cyprus, Greece, the former Yugoslav Republic of Macedonia.

[12] "Further Development and Implementation of an EU-level Forest Monitoring System" project

[13] FutMon is being carried out by 38 beneficiaries from nearly all EU Member States. The project has a total budget of EUR 34.44 million. Under the funding of LIFE+ the EU contributes EUR 16.14 million to the total budget. The remaining budget is provided by national authorities of the respective beneficiaries.

[14] Quantified objectives: CH, FI, DE, MC, SL, UK; non-quantified objectives: AT, BE, BG, CY, FR, LU, SE

and consequent damage (Czech Republic). For example, in Latvia, the Amendment to the Decision of Cabinet of Ministers "Maximum amount of timber harvest 2006-2010" (2008) increased harvesting from state-owned forests in the years 2009 and 2010 to stabilize wood supplies from domestic sources.

The main legal basis or policy document for the production and use of wood was the forest law but, in addition, several countries referred to specific regulations dealing with bioenergy, climate change and public procurement.

As in 2007, almost all reporting countries cited their forest law as the main legal and operational basis for policies on the production and use of wood: in particular, for harvesting, thinning and regeneration. These policies were supported by NFPs (e.g. Czech Republic, Slovakia, Slovenia and Turkey), forest sector development plans (e.g. Ireland and the United Kingdom) or other forest policy documents. With regard to roundwood production and use, changes in regulations for roundwood sale were reported. In Lithuania, a rule change by the Ministry of Environment (2009) allowed for the sale of wood remaining on site after harvesting, to be sold in the same way as roundwood, and for a trade in fuel wood to develop. Slovenia also reported a specific objective to establish a market for low quality wood and wood residues for energy production.

Compared to 2007, more countries (Croatia, Estonia, Ireland, Norway and Ukraine) referred to climate change and bioenergy-related legislation. Estonia and Ireland, for instance, mentioned bioenergy action plans specifically, in relation to the EU RES Directive[15] and related national Action Plans developed in 2010. The United Kingdom (e.g. England and Scotland) referred explicitly to climate change acts. Demand-side measures, such as public procurement rules and targets, were mentioned by Belgium, Latvia, Luxembourg, the Netherlands and Slovenia. Austria referred to building regulations and Croatia to the harmonization of standards.

The majority of countries reported no change in institutional structures.

Though most countries reported no major change, there were some administrative/re-structuring changes reported, especially in Central and Eastern Europe (Bulgaria, Croatia, Hungary, Slovakia and Slovenia). Slovakia created a Section of forest management and wood processing as a common unit at the Ministry of Agriculture, and Hungary established a new Ministry of Rural Development and a new state asset management holding company. Furthermore, two other countries, Finland and Portugal, reported administrative and institutional changes related to their responsible ministries. Portugal, for example, has established a unit more focused on industry-related clusters. The United Kingdom reported that an expected decrease in resources would affect the organizations in the future.

The most important instruments were forest management and development plans, but several countries reported demand-side measures.

As in 2007, most countries, in particular those in Central and Eastern Europe, referred to forest management and/or regional development plans as the main instruments to secure sustainable use of wood. Compared to 2007, however, several more countries (including Belgium, France, Germany, Latvia, the Netherlands, Switzerland and Slovenia) reported measures to promote the use of wood by creating demand through public procurement (or green public procurement), certification schemes, as well as building standards and regulations. The term "Innovation" (which may include new or improved technologies, products, services and marketing strategies aimed at strengthening the sustainable development of the forest sector and promoting the use of wood) was frequently mentioned.

The EU Rural Development Programmes 2007-2013 were mentioned (e.g. by Cyprus, Czech Republic, Poland, Portugal, Slovenia and the United Kingdom)[18] as providing both financial and informational means, and supporting activities such as funding equipment or forest owners' advisory services.

Switzerland: Wood promotion

To implement the objectives of the National Forest Programme, the Swiss Federal Office of the Environment (FOEN) formulated a wood resource policy in 2008, which is coordinated with other relevant sectoral policies (e.g. energy policy, regional development policy). This policy defines the direction to be taken by federal policy in relation to wood promotion on completion of the "Wood 21" promotion programme. Under this programme, based on the national forest law, Art. 31 (research/innovations) and 38a (financial support to promotion of wood), a wood action plan was drawn up in 2009. The main focus of the action plan is the ecologically and economically effective use of wood. The plan prioritizes the cascaded use of wood to achieve more efficient wood utilization.

Austria: Praxisplan Waldwirtschaft

In 2008, the Federal Ministry of Agriculture, Forestry, Environment and Water Management presented a free software tool for small forest owners to support sustainable forest management ("Praxisplan Waldwirtschaft"). The software allows forest owners to draw up basic management plans. It is hoped that this will help to encourage active forest management and motivate forest owners to increase their production of wood.

Belgium: Example of promoting timber and timber procurement policies

In Belgium, the Flemish Government recently updated its timber procurement policy. FSC[16] and PEFC[17] are now both accepted as sustainable wood certificates, and the Flemish authorities (regional, provincial and local) are asking for sustainable wood in their public contracts. Forest groupings (cooperative structures between forest owners and managers), as well as FSC group certification are promoted by providing a "bonus" in financial incentives for forest operations. Furthermore, certified products are recommended for public procurement policies at national, regional and local levels.

Indicator B5. Production and use of non-wood goods and services

There was a steadily growing interest in the promotion and better marketing of non-wood goods and forest ecosystem services, especially in the use of forests for recreation.

The overall objective reported by most countries was to maintain the diversity of forest goods and services and to achieve balance among multiple uses of forest. More than half the responding countries (21 out of 35) reported that promoting the use of forests for recreation was among the principal goals for non-wood goods (NWGs) and services. Other stated goals (for 17 out of 35 reporting countries) were to enhance the variety and production and improve management for NWGs and services (see Figure 97). Finland, for example, planned to promote entrepreneurship based on ecotourism as well as new business sectors based on the processing of NWGs. In the former Yugoslav Republic of Macedonia, the national forest strategy clearly prescribed the promotion and support of small and medium enterprises based on non-wood forest products and services, with a focus on providing new job opportunities and income for rural households. A general observation, highlighted by several countries, was the need for better forest products marketing and increased recognition of multiple forest ecosystem services and values.

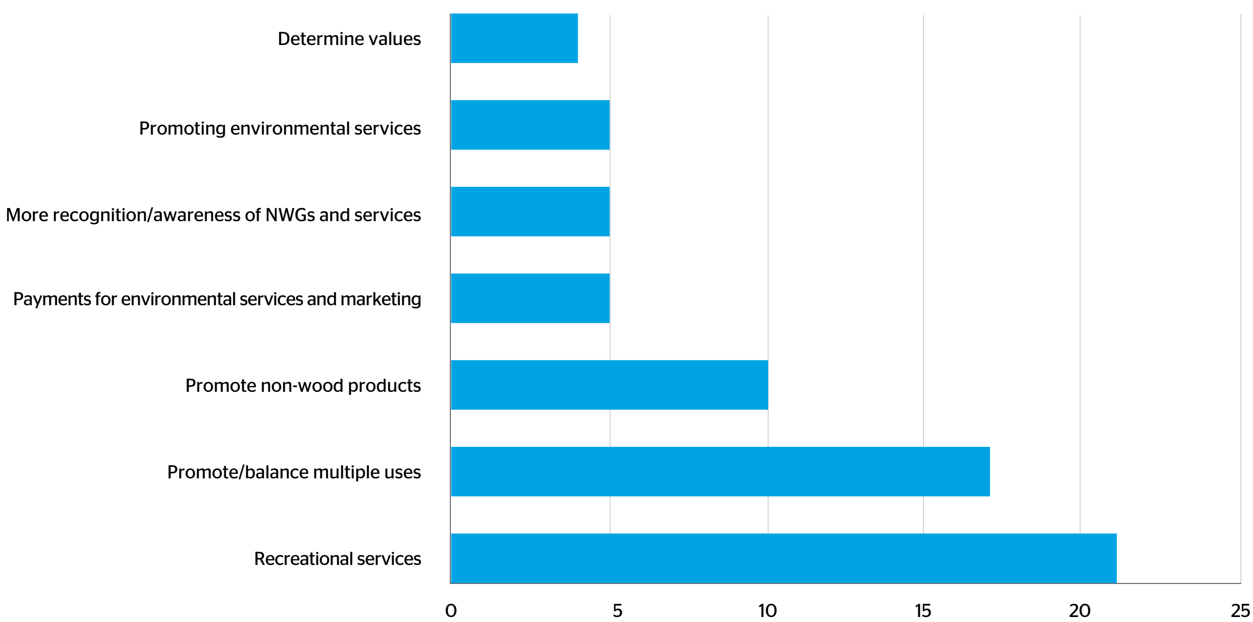
Several countries, including the Czech Republic, Estonia, Slovakia and the former Yugoslav Republic of Macedonia, underlined the need for improved approaches and methods to better assess the value of NWGs and services. Czech Republic, Slovakia and the Russian Federation reported that they were actively supporting the development of new approaches like payments for environmental services. Compared with 2007, more countries reported on NWGs and services specifically also under indicator B8 Economic viability (e.g. Austria, Bulgaria, Croatia, Cyprus and Czech Republic) – indicating a growing awareness of the economic importance of NWGs and services.

Non-wood goods and services were regulated mainly by the forest law.

One-third of countries reported that their forest law was the main regulatory instrument for NWGs. To a lesser extent, countries mentioned other legislation as having relevance, in particular acts about nature conservation and environmental protection. Some countries (Austria, Cyprus, Czech Republic, Finland, Slovakia, Slovenia and Turkey) mentioned their NFPs or forest strategy, as well as rural development programmes, as further regulating instruments. Two countries (Estonia and the Russian Federation) referred to game or hunting regulations. Estonia, for example, approved a new development plan for hunting for 2008-2013 and the Russian Federation adopted a new law on hunting in 2009.

A few countries highlighted specific regulations, such as those on mushrooms and berries (Italy, the Russian Federation and Slovenia) or on outdoor recreation

Figure 97: Main policy objectives for production and use of non-wood goods and services (number of countries)



[15] Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources Directive 2009/28/EC
[16] Forest Stewardship Council http://www.fsc.org/
[17] Programme for the Endorsement of Forest Certification http://www.pefc.org/
[18] For further information please see DG AGRI report on forestry measures in 2007-2013 Rural Development Plans Report on implementation of Forestry Measures under the Rural Development Regulation 1698/2005/EC for the period 2007-2013 – Executive Summary: http://ec.europa.eu/agriculture/fore/publi/index_en.htm

(Finland, Norway and Slovenia). Several countries (9 out of 35 reporting) referred to free access rights to forests, often regulated by the national forest law or other laws, like the National Civil Code in Switzerland. In some countries, specific restrictions or amendments to forest access rights were described (see Table 70 and also Indicator B12 Cultural and Spiritual values).

To manage various forest goods and services, several countries support cross-sectoral governance and a multi-stakeholder dialogue.

Along with the growing recognition of the value and importance of different goods and services from forests and of the key role of stakeholder groups, there was a growing awareness of the need for a more cross-sectoral and multi-level (national, regional and local) approach to forest management. Ministries with direct responsibility for forests were frequently mentioned in relation to managing forest goods and services (examples are ministries for agriculture and rural development, for forests and for environment). However, some countries specified other ministries, such as the Ministry for Commerce, Tourism, Interior and Town Planning and Housing in Cyprus, the Ministry for Tourism in Ireland and the Ministry for Economy in the Netherlands.

A few countries (7 out of 38 reporting) underlined the relevance of sub-national and local administrative level authorities to manage the production and use of NWGs and services on the ground: in Switzerland, the cantonal forest service and, in Ukraine, the regional forest management service. Some countries mentioned also the role of private forest owners, municipalities or national/regional tourist associations.

In the Russian Federation, the new Forest Codex requests and clearly supports the participation of citizens and public associations in forest management decisions. In Switzerland, forest owners' associations have increasingly tried to change legal provisions in recent years, allowing compensation (transfer) payments for NWGs and services, like close to nature management and other biodiversity-related provisions, such as increasing the amount of deadwood in forests.

Most countries referred to financial or informational instruments to support and coordinate the marketing of non-wood goods and services.

About one-third of countries reported the use of financial instruments (usually subsidies or specific tax reductions) to promote the provision of NWGs and services. Several countries highlighted financial support to maintain or build infrastructure for forest recreation.

Most countries used various informational means to increase knowledge or to raise awareness about multiple forest functions, goods and ecosystem services. Latvia and Lithuania, for example, included NWGs and services as a new indicator in their national forest inventory. Austria organized a national symposium in 2010 to address the topic "Sport and Recreation in Forests and Nature", and Switzerland highlighted vocational training courses for forest owners on how to raise revenue by the sale of non-wood products.

The EU Forest Action Plan 2007-2008 gives emphasis to NWGs and services. To support the implementation of its Key Action 3, "exchange and assess experiences on the valuation and marketing of non-wood forest goods and services", the Standing Forestry Committee set up an ad hoc Working Group in June 2007 and published a final report in 2008[20]. In addition, the European Commission has financed the following studies: a) Economic value of groundwater and biodiversity in European forests (conducted by IUCN and CEPF, 2009)[21] and b) Development and Marketing of Non-Market Forest Products and Services (conducted by EFIMED, 2009)[22]. Furthermore, the Standing Forestry Committee adopted and published an opinion paper in 2009 on the valuation and financing methods for non-marketed forest goods and services[23]. The Green Paper on Forest Protection and Information – Preparing forests for Climate Change (COM(2010)66), published in 2010, gives additional support to the topic of NWGs and services.

Table 70: Countries reporting about restrictions or amendments to forest access rights

Hungary	Access restrictions partly given due to danger from forest operations or hunting.
Slovenia	National Decree on prohibition of the use of motor vehicles in natural environment.
Switzerland	The public has free access to pick mushrooms (up to certain quantities defined by the cantons).
Sweden	The right of public access is amended by the phrase "Do not disturb, do not destroy".

Ireland: Promotion of recreational activities in forests

The Forest Service in Ireland employs various instruments to promote recreation as a key non-timber function, which includes sports and outdoor activities, public health, environmental education, and related enterprises and tourism. For example, the Neighbour Wood Scheme provides financial support to local authorities, private landowners and others to develop attractive local woodland amenities in and around villages and towns, specifically for public access and enjoyment (currently 10 forest parks and more than 150 recreation sites established). In 2006, the *Comhairle na Tuaithe*[19], a countryside forum, comprising farming organizations, recreational users and state bodies, published a National Countryside Recreation Strategy. It sets out the broad principles under which sustainable countryside recreation should be managed over the coming five years.

Indicator B6. Biodiversity

Increasing efforts were being made to conserve forest biodiversity, in particular through protected forest areas. Compared to 2007, a significant number of countries reported new and more ambitious targets related to forest biodiversity. While eight of 37 countries reported no change to their main policy objectives on forest biodiversity, several countries have developed new objectives and related instruments, or have further developed existing policies.

Protected forest areas (Natura 2000 as well as strictly protected areas) have been increased or will be increased in several countries. In Central and Eastern Europe, Bulgaria and Romania, for instance, have put measures in place to identify stands with high conservation value together with the designation of Natura 2000 areas. Several countries have reported their efforts to include biodiversity conservation in sustainable forest management practice by, for example, aiming for greater natural species composition and diversity in their forests, or by integrating islands of old wood/dead wood in managed forest (reported Belgium and Latvia).

Some countries (Croatia, France and Romania) reported specific programmes to improve ecological connectivity between protected areas. Programmes to control invasive species were seldom mentioned, except by Austria. Countries with important forestry sectors (such as Austria, Spain and Sweden) frequently mentioned specific strategies focussing on the conservation and enhancement of forest genetic diversity, including gene banks.

In most cases, objectives were rather general (like to stop the loss of biodiversity) or instrument-oriented targets (like to increase protected forest areas). No country reported quantified forest biodiversity targets that related directly to specific biodiversity indicators. A significant number of countries (18 out of 37 reporting) emphasized a general (political) goal to increase the protected forest area, with about one-third (12 out of 37 reporting) setting quantified goals for this objective (see Table 71).

Several countries had quantified targets for protected forest area but, in most cases, the term 'protection' remained vague: information about forest management practice and whether or not, for instance, wood production might be allowed in protected areas, was missing.

Table 71: Countries with clearly defined targets to increase their protected forest areas

Albania	To increase the network of protected forest areas by 25 percent of the total forest area by 2020.
Belgium	To increase forest protected areas by 7 500 ha by 2011.
Denmark	To increase forest protected area by 2 000 ha from 2004 area.
Finland	To increase forest protected areas by 188 000-282 000 ha by 2016.
France	To increase forest protected areas by 350 000 ha (general objective not specific to forest areas) ha by 2020.
Germany	To protect 5 percent of forest area by 2020 (objective still under discussion).
Luxembourg	Target to protect 5 percent of public forests as a total forest reserve.
Montenegro	To increase protected areas (including forest areas) by 11 percent (150 000 ha) of national territory by 2020.
Netherlands	To increase forest protected areas by 400 000 ha by2020.
Russian Federation	To increase forest protected area by 752 000 ha over the period 2007-2010.
MK	To increase forest protected areas by 298 566 ha by 2020.
Ukraine	To increase forest protected area by 20 percent by 2015.

[19] http://www.pobail.ie/en/RuralDevelopment/NationalRuralDevelopment/ComhairlenaTuaithe/
[20] http://ec.europa.eu/agriculture/fore/publi/sfc_wgi_final_report_112008_en.pdf
[21] http://ec.europa.eu/environment/forests/pdf/grounwater_report.pdf
[22] http://ec.europa.eu/agriculture/analysis/external/forest_products/index_en.htm
[23] http://ec.europa.eu/agriculture/fore/opinion_on_valution_en.pdf

While the institutional (organizational) framework remained as in 2007, the legal framework had been subject to change in several countries.

In the majority of countries (22 out of 37 reporting), the institutional framework remained stable compared to the last reporting in 2007. In most cases, responsibility for forest biodiversity was either assigned to ministries or agencies of agriculture/forestry/natural resources or the environment. In some cases, responsibilities were shared.

There has been reorganization in 10 of 37 countries, some minor in their impact while others have been more fundamental in nature. Most restructuring took place in Central and Eastern Europe. In Poland, for example, a new General Directorate for Environmental Protection has now centralized biodiversity-related activities which formerly were shared between the Ministry of Environment and regional governance authorities.

Most countries reported that amendments had taken place to the legal framework between 2007 and 2010. Some reports explicitly mentioned new and additional requirements about forest biodiversity. For instance Lithuania and Poland reported new acts on information about the environment, environmental protection, social participation in protection of the environment and environmental impact assessment.

Biodiversity conservation was mostly addressed by regulatory instruments, and voluntary financing schemes grew in importance.

Regulatory instruments on forest biodiversity included laws on forest and nature conservation; biodiversity strategies (e.g., the German National Biodiversity Strategy); the implementation of the Habitats and Birds Directives; environmental and forest planning (e.g. forest inventories and management plans in protected areas) or action plans e.g. on invasive species. This focus on regulatory instruments remained unchanged from the last reporting period.

Most EU Member States referred to EU-funded programmes, such as measures under the Rural Development regulation or LIFE+. Financial incentives related mainly to establishing protected areas in EU Member States, first and foremost Natura 2000 areas.

In Ireland, for instance, a Forest and Rural Environment Protection Scheme provided incentives for forest owners to conserve biodiversity. The Nordic countries like Finland, Norway and Sweden had developed voluntary protection programmes for private forest owners, such as the Forest Biodiversity Programme for Southern Finland METSO 2008–2016. In Switzerland, the National Financial Adjustment mechanism provided the basis for addressing biodiversity protection measures in a federal system. In France, tax exemptions on non-used agricultural land in areas with high importance for biodiversity conservation were provided. A few countries, particularly from Central and Eastern Europe, mentioned biodiversity-related updates in their NFPs. The Russian Federation reported the establishment of a Russian National Forest Stewardship Council Standard, to strengthen forest biodiversity activity. Moreover, a variety of informational instruments, including habitat mapping and Red Lists, were implemented across Europe.

While forest biodiversity conservation was, as a rule, addressed predominately by regulatory (and voluntary/informational) policy approaches, financial instruments seemed to be of greater importance than before. In addition, regional differences could be seen in the 'mode' by which forest biodiversity was addressed by instruments. Most Eastern and Southern European countries focused almost exclusively on regulatory policy instruments, whereas voluntary and financial instruments tended to be dominant in the Nordic countries (Finland, Norway and Sweden). EU biodiversity, agriculture and rural development policies had led, however, to a convergence of approaches: for instance, Natura 2000 as a basically regulatory policy approach had to be implemented by EU Member States – and was often implemented by candidate and accession countries, too.

Ecological networks in Europe (EEA, 2007)

- Pan-European Ecological Network (PEEN): aims to enhance ecological connectivity across Europe by promoting synergies between nature policies, land use planning and rural and urban development
- Natura 2000: a network of Special Protection Areas for birds and Special Areas of Conservation for other species and habitats, established by European Union legislation and involving up to 20 percent of the European Union's land area
- Emerald Network: initiated under the Convention on the Conservation of European Wildlife and Natural Habitats (also known as the Bern Convention), extends a common approach to the designation and management of protected areas to European countries (non-European Union) not covered by Natura 2000, as well as to Africa
- European Green Belt: is an IUCN-driven initiative, aiming to create an ecological network that runs from the Barents to the Black Sea, spanning 23 countries and some of the most important habitats for biodiversity and distinct bio-geographical regions in Europe.

Indicator B7. Protective services

While the main focus was on soil and water protection, as in 2007, the protection of other environmental services, like biodiversity, was gaining in importance.

Nearly half of the 34 countries reporting on protective services stated that no significant changes had occurred in their main policy objectives for forest protective services. Water protection and flood prevention were highlighted by most countries (18 out of 34 reporting) with 11 out of 34 countries placing emphasis on the protection of human lives and health, as well as infrastructure and the prevention of natural hazards in general.

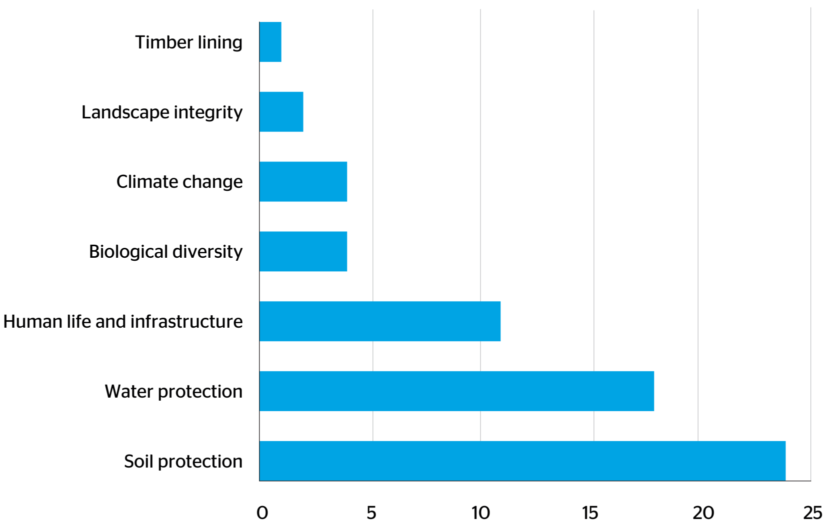
However, compared to 2007, a slight trend towards greater emphasis on protecting soils could be observed. Many FOREST EUROPE countries (24 out of 34 reporting) reported soil protection as a main policy objective, in particular preventing and controlling soil erosion and degradation, sand erosion and drifting, landslide and mudflows, rock falls and avalanches (see Figure 98).

Ten out of thirty-four countries reported significant changes in their policy objectives, to take account of new environmental issues and cross-sectoral complexities, as these examples show:

- protecting biodiversity (Croatia, Hungary, Slovakia and the Russian Federation)
- mitigating the effects of climate change (Croatia, Czech Republic, Slovenia and the United Kingdom)
- landscape integrity (Hungary and Turkey)
- protecting the treeline, between forest and unwooded land (Finland)

France, Poland, Portugal, Slovakia and Turkey emphasized forest fire management. Hungary and Turkey cited game and wildlife management, and Croatia referred to tourism and recreation as relevant for maintaining forest protective functions.

Figure 98: Issues considered in main policy objectives related to forest protective services for the period 2007-2010 (number of countries)



Public benefits from forest protective functions

Protective forests are used primarily for the protection of land, water, settlements, buildings and other property. Public benefits from forest protective functions for example are:

- protection of soil from water and wind erosion;
- balancing water supply and preventing floods;
- purification of water through percolation into forest soil and the supply of underground streams and water sources with drinking water;
- creation of favourable influence on climate and agricultural activities;
- purification of polluted air;
- creation of favourable conditions for human health;
- mitigating the «greenhouse effect» through carbon sequestration and oxygen enrichment of the environment.

Protective forest services were mainly regulated by the forest law. National Forest Programmes as well as EU legislation and support programmes were gaining more relevance.

In most countries, forest law regulated forest protective services. The following countries in Eastern Europe placed their main emphasis on forest regulatory frameworks as a basis for securing protective forest functions: Bulgaria, Croatia, Latvia, Poland, Romania, the Russian Federation and the former Yugoslav Republic of Macedonia. Supplementing forest law, NFPs were cited as a main relevant policy framework by Austria, Cyprus, Czech Republic, Lithuania, Slovakia, Slovenia, Sweden and Switzerland.

Finland, Italy, Montenegro and the United Kingdom highlighted nature and/or environmental protection as well as rural development and plant health regulations. Three EU Member States (Ireland, Luxembourg and Portugal) referred to specific EU legislation and policy initiatives as the main policy and legal framework for maintaining forest protective services: the EU Water Framework Directive (2000/60/EC), the EU Green Paper on Forest Protection and Communication (COM (2010)66 final), and the EU approach on reinforcing the EU Disaster Response Capacity (COM (2008) 130 final).

Almost half of FOREST EUROPE countries (16 out of 34 reporting) stated that there had been no significant change in their legal/ regulatory frameworks, whereas several countries (13 out of 34 reporting) and the European Commission reported significant changes. Eastern European countries, including Bulgaria, Croatia, Russian Federation, the former Yugoslav Republic of Macedonia and Turkey, together with Ireland and Finland amended their forest laws or other specific legislation to cover the provision of forest protective services, particularly biodiversity conservation and water protection. Other countries, Austria for example, adopted soft law mechanisms and signed a new declaration on mountain forests. The Czech Republic and Slovenia incorporated objectives on forest protective functions into their NFPs.

In most countries, the State forest administrations played a crucial role in implementing and coordinating forest legislation about forest protective services.

The majority of countries (26 out of 34 reporting) reported either no change, or no significant change, in their institutional frameworks related to forest protective services. Several countries (Austria, Bulgaria, Croatia, Estonia, Finland, Hungary and the Russian Federation) reported institutional changes or specific programmes or entities that had been established to coordinate and promote forest protective services.

Strict regulatory instruments were applied in most countries to secure forest protective services.

While under half of reporting countries (15 out of 34) indicated no change to the policy instruments they used to secure protective forest services, some countries (7 out of 34 reporting) had changed their policy means marginally and several others (8 out of 34 reporting) reported larger changes.

The majority of the reporting countries (20 out of 34) stated that they used regulatory instruments based on forest-relevant legislation to secure forest protective services. These included three sub-groups of interlinked policy instruments:

- legal requirements, bans, rules and procedures;
- management regulations, standards, guidelines and plans; and
- forest function zoning and/or categorization.

To illustrate, Slovenia issued a governmental decree on protective forests and forests, in particular to better regulate forest land use change and to provide management guidelines. The Russian Federation has established the following legal categories of protective forests:

- forests located in protected areas;
- forests located in water protection zones; and
- forests providing protection to natural and other objects.

The United Kingdom provided another example of the application of regulatory instruments, where standards and guidelines for forest, soil and water management were drafted and have been implemented recently.

Some countries (7 out of 34 reporting) used economic instruments such as national or international (EU) subsidies and public funds as well as transfer (compensation) payments to support various forest protection services. For example, Bulgaria and Ukraine provided state support for shelter belts on eroded lands and for planting protective forests, respectively. Croatia collected so-called "green taxes" to fund measures to secure forest protective functions, and Montenegro and Romania paid financial compensation from national funds to forest owners to cover reduced timber revenues in protected or protective forests (see also Indicator B5 NWGs and services).

Several countries (11 out of 34 reporting) indicated that they applied a range of informational instruments, such as research and education. For example, France set in place a training programme for forest fire management and prescribed burning, and Poland started a research project on small water bodies, like fire dams, in forests, intending to store and retain 31 million m^3 of water in 3 300 small hydrological appliances.

Austria: Forest Protection Strategy

Within the framework of the Austrian Forest Protection Strategy, stakeholder platforms on forest protective functions (Schutzwaldplattformen) were established. The main objective is to strengthen cooperation, information exchange between different stakeholders and improve forest protective function related measures. Creating awareness within the local population, balancing between different interests and providing conflict solving solutions are in focus. Furthermore, the Federal Ministry of Agriculture, Forestry, Environment and Water Management issued topic related publications. The Austrian Service for Torrent and Avalanche Control is currently working on a new strategy, which will contain major guidelines and objectives until the year 2015.

Indicator B8. Economic viability

No major changes to the principle objectives on economic viability were reported, but more references were made to adding value to forest production.

Approximately half of the 34 responding countries, including the European Commission, reported no changes since 2007 to objectives for economic viability. Overall, countries reported objectives that touched on two fundamental issues:

- to enhance economic viability or profitability; and
- to enhance the cost-efficiency of production.

Many of the objectives reported were specific. Several countries focussed on technological innovation and related research and development, to enhance competitiveness and to increase raw material supply.

Multiple use and multifunctional utilization of forest benefits were specifically highlighted by Bulgaria and Cyprus. NWGs and services related objectives were also reported by the following countries:

- Austria – study carried out on potential assessment of NWGs and services, including guidelines for creating new fields of business.
- Croatia – to enhance economic potential of NWGs and services and valorization of the benefits.
- Czech Republic – to enhance valuation and marketing of NWGs and services.

Forest sector development was frequently reported as part of the rural and/or economic development goals, e.g. securing investments in processing and aiming to increase the sector contribution to GDP, to increase value-added production or to increase economic and social well-being. Finland, France and Montenegro reported on objectives related to forest-based industry, e.g. sawmilling and wood processing. Finland also pointed out the objective to create new forms of business operations and new technology and service enterprises.

Forest owner cooperation and increased organization were reported as aims by the Czech Republic, Poland and Slovenia, but several other countries referred to improving services to forest owners to strengthen economic viability.

With no major institutional change, forest law remained the legal basis in most cases, but a number of references were made to specific rural development programmes and strategies.

Most countries based their main policies on the economic viability of forestry on their forest law. The European Commission referred in this case to Objective 1 of the Forest Action Plan, "Improving long-term competitiveness" and the Communication on Innovative and Sustainable Forest-based Industries in the EU (COM(2008)113).

Half the countries (17 out of 34 reporting) reported no change in legal frameworks on economic viability since 2007. The other half reported amendments to key legal documents regulating forest sector economic viability, such as the forest law (e.g. Belgium [Wallonia], Hungary, Montenegro and the former Yugoslav Republic of Macedonia), the NFP or respective Action Plan (e.g. the Czech Republic, Slovakia, Slovenia and Ukraine) or specific regulations about financial support (e.g. the Russian Federation and Turkey). Several countries mentioned updates of their rural development programmes and related strategies and policies. The EU Rural Development regulation 2007-2013 and its national implementation were specifically mentioned by Central and Eastern European countries (e.g. Estonia, Lithuania, Slovakia and Slovenia) and also by Portugal and the United Kingdom. Some countries reported crucial on-going revision and amendment processes: Montenegro was preparing a new National Forestry Strategy and Plan and renewing its Wood-processing Development Programme, while Italy was engaged in a forthcoming update of the Government Decree on the Modernization of the National Forest Sector.

The most frequently used instrument was economic support, such as EU rural development funds provided to EU Member States.

The most commonly used instrument for strengthening the economic viability of forestry was financial support, followed by providing advice and training to forest owners. Most countries employed instruments to support forestry measures and to enhance economic viability, competitiveness and/or rural development. These often comprised investment support measures to promote innovation, upgrade technology or to support forest owner co-operation. The EU Member States often reported using the EU Rural Development Programme 2007-2013 as a co-financing instrument. (see Table 72.)

Table 72: Countries and instruments and means to promote economic development

France	"Sawmill Plan" 2007-2009 comprising measures aimed at stimulating investments to encourage sawmill modernization and to better respond to the requests of the markets. The plan financed a total of 284 projects and supported EUR 227 million of investment over three years.
Poland	State forests' wood auction web portal established in 2006, with the aim of promoting stronger competition between wood users and increasing wood prices.
Ukraine	To attract investment in wood processing and create favourable conditions for development of wood processing, there has been a gradual separation of wood processing facilities of State Forestry Committee enterprises from forest management, through liquidation of inefficient production, restructuring, sale or lease. The expected result is a more effective use of forest resources in the country, increasing the flow of investment in the wood industry, increasing wood processing production and improving quality.

Compared with the 2007 report, most countries' support focused more on cost-reduction measures. In addition, investigations on new opportunities to increase value-added production and exploit new income streams were highlighted by Austria, Croatia and Finland, for example. Countries also indicated bioenergy plans and support schemes related to these. Norway, for example, mentioned two state budget schemes for value creation: the Wood-based Innovation Scheme with an annual budget of 34 million NOK[24] (2010), and the Bioenergy Scheme with an annual budget of 56 million NOK. Furthermore, certification schemes and encouraging forest certification were reported by Belgium and Turkey as ways to increase the value of forest products.

Some countries also reported measures to support the sector when facing economic crises (see also B4 Production and Use of Wood). For example, in Latvia, the Amendment to the Decision of Cabinet of Ministers "Maximum amount of timber harvest 2006-2010" (2008) increased harvesting from state-owned forests in the years 2009 and 2010 to stabilize wood supplies from domestic sources.

Indicator B9. Employment (including safety and health)

Ensuring occupational health and safety, and increasing employment in the forest sector were of increasing importance.

As in 2007, most countries focused their employment policy efforts on improving work conditions in the forest sector. Just over one-third of the countries (12 out of 34 reporting) and the European Commission aimed to ensure occupational health and safety for forest workers. Occupational health and safety in the forest sector and especially in terms of technical operations require a well-trained, educated and motivated labour force. Reflecting this, for 7 of 34 countries (i.e. Austria, Bulgaria, Finland, Lithuania, Netherlands, Portugal, and Romania, and the European Commission), the main objective was to improve forest labour skills and to raise qualifications in the forest sector. Finland stated that labour marketing and recruitment would be targeted on young people, women, the urban population and immigrants and foreign labour.

Compared to the 2007 report, more countries (25 percent) focused on increasing and/or maintaining the employment rate in the forest sector (see Figure 99). This partly reflected the impact of the global economic crisis of recent years. In Hungary, for example, the government provided support for seasonal job opportunities in the state forest service, mainly addressed to unemployed and rural population[25]. In addition, policies that promote increased biomass use and increased harvesting of wood for energy were expected to have positive effects on employment in the forest sector, with France, for instance, expecting several thousand new jobs to be created between 2010 and 2020). Five countries (out of 37 reporting) from Central and South-East Europe (Cyprus, Croatia, Czech Republic, Montenegro and Slovenia) stated the wish to increase employment and to enhance the contribution of the forest sector to rural development. However, there was an apparent contradiction between this objective and the general trend towards restructuring state forest enterprises, with workers laid off and forest operations being outsourced to private contractors (see 2007 report).

The number of countries reporting support for social inclusion of forest workers has significantly increased (Czech Republic, Latvia, the Russian Federation, Slovakia and the United Kingdom). Social inclusion refers to the equitable provision of rights, such as employment, health care, education and training, among all individuals and groups in society.

Slovakia: Increasing employment, strengthening social inclusion and building capacities

Slovakia aims to increase the employment rate, strengthening social inclusion (i.e. incorporation) and employment of people, who are most sensitive to changes in the labour market, through the Operational Programme on Employment and Social Inclusion covering the period of 2007 to 2013, which was approved in 2007. This includes the forest and timber sector. The programme is supported by the EU European Social Fund (ESF).

Almost all countries had specific regulations and policies on employment, occupational safety and health, training and education for forest workers in place.
In several countries, employment, occupational safety and health policies were mainly based on labour protection legislation such as labour/work protection acts or laws (Belarus, Finland, Latvia, Lithuania and Norway). Forest law and other forest policy related documents provided an important legal reference basis in several other countries (9 out of 34 reporting), including Austria, Croatia, Lithuania, the former Yugoslav Republic of Macedonia, Ukraine and the United Kingdom.

Several countries indicated changes to their regulatory frameworks to meet international standards, such as EU Directives and/or the International Labour Organization (ILO) (see Table 73). Only a few countries reported amendments to existing forest laws (Austria, Slovakia and the former Yugoslav Republic of Macedonia) and NFPs (Czech Republic and Slovenia). Specific regulations and policies on forest-related employment have been newly adopted (or amended) by just over 40 percent of the reporting countries (14 out of 34). The most frequent changes related to specific regulations on occupational health and safety (Bulgaria, Ireland and Poland), and regulations on employment, social inclusion, education and training (Estonia, Russian Federation, Sweden, Switzerland and Turkey). The Health and Safety Authority of Ireland, for example, published a Code of Practice for Managing Safety and Health in Forestry Operations in 2009, and Switzerland revised its ordinance on professional basic education for forest workers in 2010[26].

Only a few countries reported changes in the institutional structures and frameworks related to forest sector employment.
In a range of countries (10 out of 34 reporting), the main responsible institutions at the national level were the ministries of employment and economy, labour, agriculture, rural development or environment. Implementing organizations included regional and national work and labour authorities, such as regional governments, forest agencies and private enterprises. Few of the 34 countries reported significant change to their institutional structures and frameworks concerned with forest sector employment. Cyprus, for example, reported that, since 2007, the Department of Forests has put more emphasis on the implementation of occupational health and safety legislation focussed on risk assessment for all forest activities. In the

Figure 99: Employment – main policy objectives for the period 2007-2010

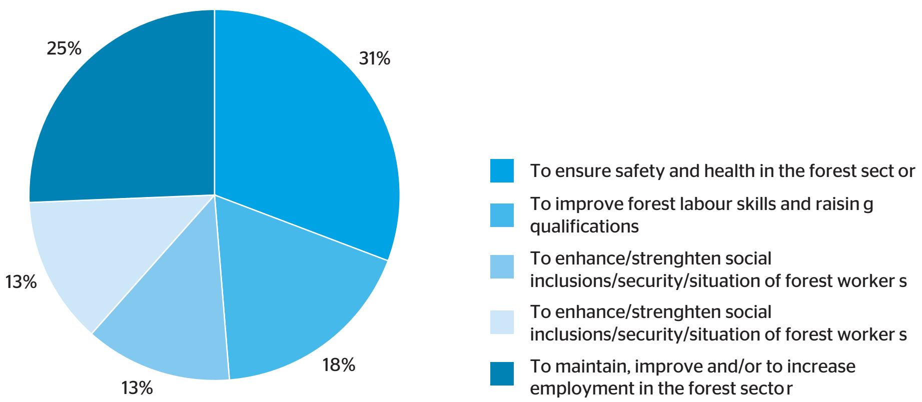


Table 73: Countries reporting changes to legal/regulatory frameworks for forest sector employment (incl. safety and health issues)

Austria	Amendment of the Forest Act, to comply with the EU Directive 2005/36/EC on the recognition of professional qualifications in the forest sector.
Bulgaria	Amendment of the law on health and safety labour conditions in 2010.
Poland	Amendment of the Instruction on Occupational Safety and Health in forest operations (in force since 1996).
Slovakia	Operational Programme Employment and Social Inclusion adopted for 2007-2013.
Sweden	Implementation of the EU Directive 2006/42/EC on machinery (particular relevance for forest operations).
Switzerland	Ordinance on professional basic education for forest workers and federal work certificate, revised 2010.

[24] 31 Dec.2009 1 EURO = 8.300 NOK, i.e. wood-based innovation scheme approximately EUR 4 million, and Bioenergy scheme approximately EUR 6 million.
[25] In 2009 about 5 000 people were employed, and this number was expected to increase in 2010.
[26] Verordnung über die berufliche Grundbildung Forstwartin/Forstwart mit eidgenössischem Fähigkeitszeugnis (EFZ), adopted 2006, revised 2010.

Russian Federation, the entire forest management system was reformed in line with new forest legislation and administration and executive agencies were established. (See also Indicator A2.) Poland provides another example, where a national association was established with the objective of integrating more women into the forest and timber sector and promoting women to leading positions, as well as protecting and educating about women's rights.

Employment policies were supported by regulatory instruments, often in combination with specific informational means for better workforce education and training.

Many reporting countries (14 out of 34) used specific regulatory instruments such as labour protection laws, health and safety regulations, or various programmes to increase employment and improve working conditions, employee welfare and work capacity. For example, in 2009, the Ministry of Employment and Economy in Finland launched the HYVÄ project[27], with its focus on the social and health care services and improving employee welfare, productivity and working conditions in each industrial sector, including the forest sector (towards better labour and industrial policy). In 2007, Belgium enacted a mutual recognition regulation for wood buyers and contractors for working more closely with the Flemish public forest sector, and through forest owner groupings, employment opportunities were better promoted, in particular to rural and unemployed people.

Several countries (9 out of 34 reporting) emphasized the importance of informational means such as education and training courses, workshops, and campaigns designed:

- to improve forest labour skills and qualifications;
- to decrease the number of accidents in technical forest operations; and
- to promote the forest and timber sector as a working place.

Only a few countries (4 out of 34 reporting) reported on financial instruments (mainly national funds and subsidies). For example, Switzerland established a national fund, into which all forest enterprises have to pay, to support education and training for forest workers. In Ireland, the Department of Agriculture, Fisheries and Food provided funding to an organization named Forestry Training and Education Ireland (FTEI), to support training for forestry operatives, including health and safety training.

Sweden: Information campaigns with clear targets

Two information campaigns have started in Sweden. The first one, running from 2007 to 2009, focussed on safety in forestry operations among private forest owners and aimed at decreasing the number of accidents in private forestry by 15 %. The second programme, which is still running, is directed towards small agricultural and forestry enterprises (farmers) and aims to reduce the number of accidents by 50 % by 2013.

Indicator B10. Public awareness and participation

Raising public awareness, improving institutional cooperation and communication, as well as ensuring transparency in forest management were policy objectives in most countries.

Several countries (14 out of 33 reporting) reported no change to their policy objectives since the Ministerial Conference of 2007. According to the data submitted by the 33 responding countries, the most frequently stated policy objective was to raise public awareness about sustainable forest management, particularly the protective and socio-economic functions of forests. Two countries (Hungary and the United Kingdom) explicitly emphasized the link between climate change and the forest sector: both aimed to raise public awareness about the role of forests in reducing GHG emissions and in renewable energy supply.

Committed to the principle that public access to forest-related and/or environmental information is crucial for managing national forest resources, several countries (Belgium, Estonia, Lithuania, Montenegro and Portugal) specified policy objectives in this context. Montenegro, for example, followed guidelines, outlined in the National Forest and Forest Land Administration Policy, on how to establish a forestry information system and how to ensure public access to information about the forest sector and forests. Belgium referred to the Walloon Decree on the Access to Environmental Information (1991), intended to ensure regular public access to environmental and forest-related information.

In terms of public participation, and in comparison to 2007, more countries highlighted public and multi-stakeholder participation as a crucial component in forest policy, management and planning processes (Finland, Montenegro, the Russian Federation, Slovenia and Turkey). This underlines the increasing complexity but also consideration of various stakeholder views, values and objectives in forest governance and the decision-making process.

Bulgaria, Finland, Hungary and the former Yugoslav Republic of Macedonia specified an objective to ensure and/or improve transparency as an important principle of good forest governance and public participation. In Hungary, for example, the new Forest Act (2009) includes provisions on transparency in forest management, which specify that forest authorities must provide information to the public on activities like road construction, forest cuttings, recreation and changes in forest management plans. Good forest governance and the attainment of sustainable forest management depend also on good institutional collaboration. This was highlighted particularly by those countries which aimed to improve cooperation and communication amongst various state and public authorities (Table 74).

Several countries reported significant changes to their regulatory frameworks, including forest laws and National Forest Programmes.

One-third of reporting countries (11 out of 33) identified the forest law as the main reference document for public awareness and participation policies (see Figure 100). Many countries reported significant changes to their regulatory frameworks since the Ministerial Conference of 2007. Romania, for example, included a new chapter on public awareness in the Forest Code in 2008. However, several countries, in particular from Central and Eastern Europe, reported that policies related to public awareness and participation were further specified and guided by NFPs and/or strategies, most of which were adopted and implemented after the Ministerial Conference of 2007. In two countries (Bulgaria and Estonia) public awareness and participation policies were based on specific national communication strategies.

A few countries established special units/entities responsible for coordinating and implementing public awareness and participation policies.
Since 2007, Belgium, Luxembourg, Slovenia and Ukraine have established special units/entities responsible for public awareness and participation matters. For instance, Slovenia created a special organization responsible for public hearings in the adoption process of forest management and hunting plans, forest education contributions and workshops. Ukraine created Public Councils to support and enhance public participation in forest management and planning. Similarly, the Federal Agency of Forestry in the Russian Federation established a unit of Public Ecological Advice with the aim of increasing public participation and strengthening cooperation between state and public forest authorities.

Increased attention was paid to education to raise awareness about forests among young generations.
Nearly all countries reported the use of a wide range of informational instruments, often combined with regulatory and/or economic means, to increase public awareness and participation. Apparently, the most common approach to increase awareness and disseminate information was through the media (TV, radio, internet), information systems and databases, printed educational materials and scientific publications. About 30 percent of countries mentioned the organization and conduct of various events (e.g. forest weeks, forest days, forest campaigns, public hearings and consultations, and workshops and conferences) to strengthen communication within and outside the forest sector.

Figure 100: Main legal documents regulating public awareness and participation (percent of total legal documents reported)

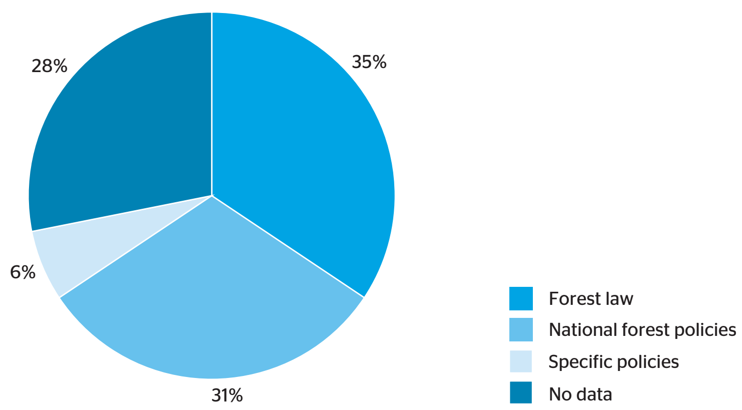


Table 74: Countries specifying objectives related to institutional cooperation, communication and transparency in forest management and planning

Bulgaria	To secure transparency of the Executive Forest Agency (EFA) and its activities, and to promote its role as a national authority aiming for and securing common wealth.
Czech Republic	To utilize the potential of state forest authorities in communicating with the public.
Finland	To increase cooperation between forest sector companies and schools as well as other educational institutions in the forest sector.
Slovakia	To improve coordination and cooperation between forest and non-forest public organizations.

[27] http://www.tem.fi/?l=en&s=3124

Several countries (Austria, Czech Republic, Ireland, Italy, Norway, Poland, Portugal, Sweden and Switzerland) and the European Commission acknowledged the importance of forest education programmes, providing basic knowledge about forest ecosystems, values and sustainable forest management to children. Austria, for example, organized a Forest Opera for children in 2008 and nearly 30 000 attended. Ireland launched a forest education programme, which focused on the threat of the non-native grey squirrel (Sciurus carolinensis) to broadleaved forests. The Czech Republic adopted a Strategy on Forest Pedagogy, and in 2009 the EU launched a project on forest pedagogy under its Leonardo da Vinci programme, called PAWS-Med.

PAWS-Med – a European project on forest pedagogy in the Mediterranean region

PAWS-Med (2009-2011) is a European project on forest pedagogy directed mainly towards Mediterranean countries. Guided by training and research institutes based in Germany and Austria, it gathers partners from six Mediterranean countries (Cyprus, Greece, Italy, Portugal, Spain and Slovenia) to accomplish a common concept of forest pedagogy and a common base of training methods, activities and materials for training foresters. For further information see: http://www.paws-europe.org

United Kingdom: Increasing public awareness on forests´ vital role in tackling climate change

The United Kingdom Forestry Commission embarked on a partnership project (with the News of the World and the Royal Mail) to communicate forests´ role in mitigating climate change and to help get more than a million trees planted across the country. The campaign started in 2009 and will encourage schoolchildren, late primary and early secondary years, to grow tree seeds to a stage where they can be planted. The main objective of the programme is to increase awareness amongst the general public, business and politicians that forestry offers one of the most cost-effective ways to achieve GHG reduction targets.

Indicator B11. Research, training and education

More demand-oriented education and training as well as practice-relevant research were the main objectives.

As in 2007, the majority of the FOREST EUROPE signatories reporting on research, training and education reported explicit support for forest-related research. Nearly half of the countries (16 out of 34 reporting) put emphasis on specific research needs. The most frequently mentioned topics for research were:

- the competitiveness of the forest sector
- forests and climate change
- sustainable forest management
- forest modelling and management tools
- support to the timber industry
- bioenergy
- ecological and/or biological aspects

Few countries stated an urgent need for more demand-oriented research, linked to recent policy processes and debates and the specific requirements of the forest and timber sector.

The main objective for some countries (8 out of 34 reporting) was to adjust education and training towards the specific needs of the forest sector, a similar situation to the one described in the 2007 report. The most frequently mentioned goals were the provision of well-trained workers (reported by Finland, Latvia, Russian Federation, Switzerland, the former Yugoslav Republic of Macedonia and Ukraine), with a special focus on safety conditions (Switzerland and the former Yugoslav Republic of Macedonia) and the provision of well-trained forest managers (Austria, the Russian Federation and Slovenia).

The objective of providing comprehensive education and training for forest workers and other professionals, and the increasing recognition of the various forest functions, has led to a need for cross-sectoral education and training programmes. The new inter-disciplinary orientation often means that education and training is more policy- and economic-oriented and is likely to include topics such as marketing, communication, participatory planning and industrial design. Although interdisciplinary education and training was a common goal, the disciplines and topics to be included differed among countries (see Table 75). Croatia, Czech Republic, Finland, Switzerland and Ukraine stated changes to their universities and the degrees they offer.

Forest research, training and education policies were often based on specific policy programmes.

In line with the trend of defining and prioritizing new research areas (see above), several countries (14 out of 34 reporting) reported changes to their regulatory frameworks.

The most common changes related to the improvement of specific forest educational and training programmes:

- Bulgaria – amended its Law on Professional Education and Training and the Law on High Education.
- Finland – adopted a new University Act.
- Romania – referred to its Sectoral Plan for Research and Development for the period 2006-2010.
- Switzerland – specified the Ordinance on professions, basic education of forest workers and federal work certificate, revised in 2010.
- United Kingdom – adopted a new Science and Innovation Strategy for British Forestry for the period 2010-2013.

Organizational and structural changes were observed in universities and research institutions in most countries. Forest research and education was mainly conducted by national/regional forest research centres, universities and technical forestry schools (see also Indicator A2 Institutional frameworks), of which some experienced crucial reforms in recent years. Universities were engaged in changing their structure and education systems to fit with the Bologna process[28].

Even though research in Europe relies heavily upon national/sub-national research programmes and policies, the European Commission through its three joint European research initiatives (COST, EUREKA and the EU Framework Programme) plays a crucial role in the coordination and definition of research priorities across the EU Member States. In this context, Slovakia and Slovenia emphasized the influence of the EU research agenda in the definition of their national priorities for forest research.

A few countries reported about education programmes and facilities that were targeted particularly at the general public and children (see also indicator B10 Public awareness and participation). In Germany, for instance, the Association for the Protection of German Forests supported the education of children, and in Poland the States Forest Holding established a forest education web portal for children as well as forest education centres for the public.

A few countries mentioned the special committees or technological platforms which define and set up national or regional forest research agendas, e.g. Latvia, Lithuania and the United Kingdom. France stated the importance of good connections between research and companies, and instilled innovation into companies and improved transfer of knowledge via technical institutes.

Financing or co-financing research, education and training was the most frequently used instrument. Almost all countries reported that forest research was funded mainly by the state. In principle, state or federal forest organizations/boards established funds to support or co-finance forest research as well as education and training for forest workers. In Bulgaria, for instance, forest research was co-financed by the National Forestry Board (NFB), and in Latvia state support came from the Forest Sector Development Fund. In several countries, however, co-funding came partly from the private sector. For instance, the Federal Organization of Employment in Switzerland recently established a fund, co-financed by private forest enterprises, to support basic training and education of forest workers. In Sweden, the Forestry Research Institute was partly funded by the private forest sector and carried out research, mainly in applied sciences.

A few countries reported possible reductions in state budgets for research. In Latvia, for example, due to the economic crisis, public financing had been decreased in all public sectors, including forest research, education and training. More specifically, the financial resources of the

Table 75: Countries reporting on new subjects in education and training programmes for the period 2007-2011

Belgium	The scope of the Forestry Educational and Training Centre was revised in 2004-2005, with the aim of expanding its activities and integrating other disciplines, e.g. more emphasis on nature conservation, landscape, and management of public green areas and parks.
Croatia	To adapt forest education system programmes to meet changing needs, such as information technology, language capacity and marketing.
Hungary	Besides classic wood engineering, the faculty of wood sciences offers art studies, industrial products design and IT graphics and mechatronics.
Slovakia	To improve education and technical training in the forest sector about the requirements of the labour market and increasing knowledge in economics.
Sweden	Some measures have been undertaken to further address forest policy issues and needs in research programmes. One example is the establishment of the forest policy institute at the Swedish University of Agricultural Sciences (SLU). This could be seen as the starting point for improvement in forest education.
Switzerland	The basic education for forest workers was reformed. Different measures (campaigns, training courses, establishing of a trainings concept) were undertaken and should help to improve safety in the private forest sector.
MK	Participatory management as a new subject in education and training programmes. Forest policy in the Faculty Curricula introduced and Forest Policy and Economics International Master courses started in 2007.

[28] The Bologna Process aimed to create a European Higher Education Area by 2010, in which students can choose from a wide and transparent range of high quality courses and benefit from smooth recognition procedures. The Bologna Declaration of June 1999 has put in motion a series of reforms needed to make European Higher Education more compatible and comparable, more competitive and more attractive for Europeans and for students and scholars from other continents. The Bologna process is named after the Bologna Declaration, signed in Bologna, Italy June 1999. See at: http://ec.europa.eu/education/higher-education/doc1290_en.htm

Forest Sector Development Fund were reduced by 60-80 percent between 2008 and 2010. The United Kingdom also reported that the state budget for all public sectors, including forest research, might be reduced.

The role of the European Commission in defining priorities and funding research through the 7th Framework Programme[29] is widely recognized by most of the EU Member States. The 7th Framework Programme for research and technological development (FP7) is the EU's main instrument for funding research in Europe over the period 2007-2013. The biggest specific programme within FP7 is the Cooperation programme, where forest-related research is supported in four of the ten FP7 thematic areas.

International cooperation was highlighted by a few countries (Montenegro, Luxembourg, Slovenia and the former Yugoslav Republic of Macedonia) as an important mechanism to support forest research, education and training. Luxembourg, for example, established new partnerships with research organizations in Belgium and Germany, whereas Montenegro emphasized its international collaboration with Luxembourg in providing forestry education and training for forest professionals and forest owners. In this context, the former Yugoslav Republic of Macedonia referred to the international programme of Forest Policy and Economics Education and Research FOPER (see box below).

EFI Forest Policy and Economics Education and Research programme (FOPER)

FOPER (Forest Policy and Economics Education and Research) is the international programme, coordinated by the European Forest Institute (EFI) and financed by the Ministry of Foreign Affairs of Finland, which is intended to enhance forest policy and economics in the Western Balkans region. The goal of FOPER is to institutionalize the capacity for sustaining and expanding the capacities in education and research in forest policy and economics in the South-East Europe. The two main educational components of FOPER are the Regional International Masters of Science Programme and the Graduate College and Support Programme for Doctoral/PhD students on Forest Policy and Economics.

EFI Mediterranean Forest Research Agenda

The Mediterranean Forest Research Agenda (MFRA), coordinated and developed by EFIMED, and published in 2009, presents a joint vision on the challenges that Mediterranean forests and forestry face as well as the main research priorities for the period 2009-2020 within the Mediterranean region. The MFRA is an integral part of the Strategic Research Agenda (SRA) of the European Forest-Based Sector Technology Platform (FTP) and included an intensive consultation process, gaining input from established National Support Groups, Focal Points and other stakeholders (like private and public forest owners) and relevant organizations (like FAO and Silva Mediterranea). The implementation of MFRA will support the creation of a triangle of Mediterranean forestry knowledge of research, education and innovation, as well as a geographic triangle with its cooperation between Mediterranean Europe, North Africa and the Middle East.

Indicator B12. Cultural and spiritual values

The maintenance of national and international heritage of cultural and historical sites and monuments was an objective in most countries.

Compared to 2007, more than half of the responding countries reported either no (18 out of 37) or no substantial (4 out of 37) change to their policy objectives on cultural and spiritual values. However, some countries (Bulgaria, Hungary, Italy, Russian Federation and the United Kingdom) indicated significant changes, like the adoption of new or the revision of existing objectives.

Following the Vienna Resolution from April 2003 on preserving and enhancing the social and cultural dimensions of sustainable forest management in Europe, the majority of countries (20 out of 37 reporting) stated that their main policy objectives were to maintain and preserve national cultural and historical sites, natural monuments, monumental trees, important landscapes and memorial territories. Several countries (Cyprus, Czech Republic, Estonia, Poland, Netherlands, Slovakia, Slovenia, Switzerland and the United Kingdom) highlighted their commitment to the protection of national and international cultural and historical heritage through sustainable forest management. Estonia, for example, emphasized the maintenance of traditional craftsmanship. Finland sought to better preserve local culture and the reindeer herding practices of the Sami local population and to promote traditional wooden housing. Other countries (such as Bulgaria, Ireland and Latvia) were trying to find a balance between the socio-cultural interests of society and forest owners.

Some countries (Austria, France, Hungary and Sweden) reported that they aimed to raise awareness among the public, and in particular among forest managers, about numerous cultural and spiritual values that forests have for society and various groups, which might be different for religious, aesthetic and historical reasons. This objective was often supported by various forest education programmes, communication activities and the objective of strengthening cooperation between different stakeholders and authorities. The integration of cultural and spiritual forest values into different land uses, such as forestry, recreation and tourism, as well as the enhancement of its contribution to rural development was highlighted as a main policy objective by several countries (Austria, Cyprus, Hungary, Ireland, Lithuania, Netherlands, Poland and Slovenia).

Cultural and spiritual forest values were mainly regulated by specific laws on cultural heritage and nature protection. National forest laws were gaining more relevance.

In most FOREST EUROPE countries (24 out of 37 reporting), cultural and spiritual values were mainly regulated by specific laws such as cultural heritage protection (14 out of 37) and/or nature protection laws (10 out of 37). Finland and the Netherlands referred to land use and spatial planning laws as the legal reference for protecting forest cultural and historical sites. In several countries, the maintenance of cultural and spiritual forest values was subject to regulations of the Forest Law (12 out of 37 reporting) and/or was part of the NFP (3 out of 37 reporting). Only two countries (Austria and Ireland) made reference to the UNESCO convention on cultural heritage, the FOREST EUROPE Vienna Resolution 3 on social and cultural dimensions of sustainable forest management in Europe, as well as to the European Landscape Convention of the Council of Europe[30] and the EU Environmental Impact Assessment (EIA) Directive (85/337/EEC)[31].

The majority of the responding countries (23 out of 37) reported no change to their respective legal frameworks since the Ministerial Conference of 2007. Yet several countries indicated that they adopted new legal provisions or changed existing provisions in their forest and specific laws to provide for better protection of cultural and spiritual forest values. Changes were reported mainly from Central and Eastern Europe (Bulgaria, Hungary, Montenegro, the Russian Federation and Slovakia) and by Italy. The former Yugoslav Republic of Macedonia indicated that the policy objective of protecting the cultural and historical heritage was not the subject of any legislation.

In most countries, state authorities played a key role in protecting and managing cultural and spiritual forest values.

In many countries, the protection of cultural and spiritual forest values was coordinated among different state authorities, like ministries and/or executive agencies responsible for culture, education, environment, spatial planning, public works, and tourism as well as state forest services and/or state forest enterprises. In most countries, research institutes, regional (county) administrations and local authorities (municipalities) and museums, as well as non-governmental organizations and forest owners, were involved in coordination and cooperation on cultural and spiritual forest and landscape values.

The majority of the reporting countries (23 out of 37) reported no change to the institutional framework since the Ministerial Conference of 2007. Only three countries reported that they changed their existing and/or created new institutions and structures. For example, Austria established a network (Netzwerk Land) relevant for all stakeholders related to landscape and rural development. Bulgaria closed its state agency on tourism and transferred its responsibilities to the Ministry of Economy, Energy and Tourism. Italy transferred the responsibility for designating and managing protected natural landscapes with high cultural and spiritual values, to the regional administrative level.

Regulatory and informational instruments were applied in most countries to manage forest sites designated as representing high cultural and spiritual values.

A considerable number of countries (18 out of 37 reporting) stated that they used regulatory instruments to identify, assess and protect cultural and spiritual forest values. The policy means particularly included a) legal requirements, rules and procedures as well as b) protection and management regulations, standards, guidelines and plans. Countries frequently reported the application of informational instruments. The most common communication tools used by countries were publications and workshops (Austria and Latvia), education and training activities (Czech Republic, Norway, Romania and Sweden) and awareness raising and public relations activities such as forestry days and/or cultural events. Efforts were also undertaken to further establish and improve advisory services (Austria, Italy, Latvia, Norway and Slovakia), information systems (France, Luxembourg, Norway, Romania and Sweden) and/or inventories and listings of cultural and spiritual heritage sites (Finland, Italy, Latvia, Lithuania, Poland, Slovakia and Slovenia).

In terms of the application of financial instruments, several countries (Austria, Cyprus, Czech Republic, the Netherlands and Switzerland) reported using public funds (national and/or EU funds and subsidy systems) to promote the protection of cultural and spiritual values. Belgium, for example, applied both public funds and fiscal incentives to support and implement forest-related sociocultural programmes and objectives.

Finland: Policy objectives on cultural and spiritual values

Culture associated with forests will be honoured, cherished and developed further. The programme on the cultural heritage of forests will be drawn up, and Sámi culture and reindeer herding will be developed on the terms of the Sámi people themselves and by means of community support. Traditional wood building will be enhanced, and operating conditions of the Finnish forest museum Lusto will be ensured.

[29] http://cordis.europa.eu/fp7/home_en.html
[30] http://www.coe.int/t/dg4/cultureheritage/heritage/landscape/default_en.asp
[31] http://ec.europa.eu/environment/eia/eia-legalcontext.htm

Part III

Sustainability Assessment & Policy Challenges

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Data sources **Chapter prepared on the basis of information provided for Part I. Quantitative Indicators for Sustainable Forest Management (SFM) and Part II. Qualitative Indicators for SFM**

Part III: Introduction

Parts I and II of the *State of Europe's Forests 2011* (SoEF 2011) have described, in a highly structured and documented way, the status and trends of Europe's forests, essentially using information supplied by governments and international data providers, organised in accordance with the pan-European criteria and indicators for Sustainable Forest Management (SFM). Within this rigorous structure, it has not been possible to address two important questions:

- Is forest management in Europe sustainable?
- What are the main policy challenges and opportunities facing the European forest sector in 2011?

Part III addresses these two questions. First, this part presents an experimental method to assess the sustainability of forest management in Europe, with preliminary results, at the country group level. It is hoped that this approach will stimulate a widespread discussion on the nature of SFM and how to assess it, which will make further improvements possible in the future.

Second, this part identifies four major challenges and opportunities for the forest sector, all of which are highly complex, inter-sectoral and uncertain: climate change, energy, biodiversity and the green economy. For each, it synthesizes the relevant data made available for parts I and II and briefly summarises the main challenges facing policy makers.

It is hoped that these sections will serve to stimulate informed discussion and sound policy making at national and pan-European levels.

Assessing the Sustainability of Forest Management in Europe

1. Introduction

Policy makers, inside and outside the forest sector, and the general public should know whether forest management in Europe is sustainable and, if not, which aspects are unsustainable. Parts I and II of this study have presented the best available information on sustainable forest management (SFM) in Europe but have not attempted to answer this core question, as a number of serious conceptual and methodological difficulties make an objective assessment of sustainability rather complex and difficult. Furthermore, these parts of the study were organised taking one indicator at a time, while sustainability must take into account the balance among all the indicators in the set.

This chapter proposes a tentative answer to the question of the sustainability of Europe's forest management, but it must be made clear from the start that the methods used are still experimental and need to be refined and improved in the light of experience with the *State of Europe's Forests 2011*. They have been developed by the secretariats and the Advisory Group, which are responsible for the content of the assessment, but given their experimental nature have not been presented to governments. National correspondents have been informed of the process but have not been asked to endorse the results, as this is still a work in progress. It is hoped that this approach will encourage further methodological development, after consultation of academic, policy and stakeholder circles, enabling an improved assessment for the future. It is the hope of the authors of this chapter that this assessment will stimulate debate around its further refinement as well as the identification of additional ways and means to evaluate SFM and thus contribute to its better implementation.

To develop the approach for assessing sustainability of forest management, the authors started from the widely accepted definition of SFM agreed in Helsinki resolution H1[1]. The assessment is based on a few basic principles.

The authors have attempted to prepare an assessment which would:

- Be based on the pan-European criteria and indicators for sustainable forest management (SFM), as endorsed by the Vienna Ministerial Conference in 2003.
- Assess the sustainability of forest management according to a common, standardized and transparent methodology, while not being distorted by specific national situations, notably size, ecology, demography, economy and history.
- Be comprehensive and balanced, covering all criteria, and all indicators, quantitative and qualitative, and give equal weight to each criterion. All Forest Europe countries were covered, even those with very poor data.
- Take account of trends and the temporal dimension, as the definition of SFM refers to "now and in the future." In this context, a description of the situation in 2011 is not, by itself, sufficient.
- Be based essentially on the data supplied by governments, presented in Parts I and II of the study, which have been carefully validated.
- Use a rigorous and transparent methodology, with a minimum input of subjective assessment, beyond the initial setting of threshold levels for different categories.
- Present its results in a clear way, giving policy makers and the general public a clear overview of a complex situation. This should facilitate balanced, strategic and operational forest-related decision-making by different stakeholders. It should also help to improve communication inside the forest sector, with the general public and with other relevant sectors.
- Be accompanied by explanatory text which puts the data and assessments in context.

[1] "Stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems" (Helsinki Resolution 1, 1993).

2. Concepts and methodology

The approach contains the following elements:

- For each quantitative indicator, one "key parameter" was chosen which focuses on the main purpose of the indicator but is independent of the size of the country, typically a ratio, a percentage change over time, or an index of data availability, so that countries or country groups can be compared without excessive distortion. The key parameters for the quantitative indicators are listed in Table 85, with a short rationale for the choice of each key parameter.
- Countries' performance for each key parameter was assessed on a scale from one "tree" (🌲) to five "trees" (🌲🌲🌲🌲🌲), or "No Data" (ND). The thresholds for the assessment are presented and explained in Table 85. Given the sensitivity of making this assessment, especially of fixing the thresholds, these assessments by country are not being published, although the data on each key parameter, which are mostly objective data derived from official sources, are presented in the annex tables (Tables 87-92).
- An assessment was prepared for each indicator, by country group, based on an average of the countries' assessments, weighted by land area, and counting "No data" (ND) as 🌲[2]. These were then combined to produce overview tables, by country group (Tables 76-78), which are the basis for the commentary in this part of SoEF 2011.
- A similar process was followed for the qualitative indicators. It is not the role of the study authors to judge the appropriateness of particular policies, laws or institutions: the focus was on establishing, from country responses on qualitative indicators, whether objectives had been identified and whether policies, institutions, and policy instruments were in place to address the issues identified as being of importance. It should be pointed out that it has not been possible to develop as rigorous a method to assess the information on qualitative indicators as for the quantitative indicators. The aspects assessed are listed in Table 86.
- As they were for the quantitative indicators, countries were assessed on a five-"tree" scale for the qualitative indicators and the results were aggregated to the country group level.

The results are presented below, providing an assessment of the sustainability of forest management, by country group, on the basis of the quantitative and qualitative indicators, alongside comments drawing attention to the special features of each region and the reasons for the assessment.

This approach is a new one and, although based exclusively on official data and reliable scientific data, must be considered exploratory and experimental. It is strongly recommended that this method and these first results should be discussed and reviewed after the issue of the study to enable an improvement in the future.

Two warning remarks are necessary:

- In many cases, low assessments (🌲🌲 at the country group level) result from the failure of several large[3] countries to provide information on that particular indicator, as "No Data" has been considered equivalent to 🌲 – the lowest ranking. In the authors' view this is necessary as there is no evidence to support any other ranking. Assessing SFM is not possible if there are no data to monitor performance. Furthermore, it could be said that management decisions based on insufficient information are not really sustainable.
- For several indicators, despite the best efforts of correspondents and reviewers, it is clear that the data received are not fully comparable among countries[4]. Rather than abandon the effort to assess these dimensions of SFM, which would have seriously distorted the overall result by omitting relevant aspects, the authors have preferred to include these data in the tables and to take account of the lack of comparability in the comments.

The process outlined above provides the core of the analysis in this part of the study which is presented in the next section. Section 4 addresses the question of whether enough information is available for policy development and whether policies and institutions for SFM are in place, while section 5 contains conclusions and recommendations on sustainability of forest management in Europe.

Table 76: Assessment by indicator and country group, quantitative indicators

Indicator	Title	Russian Federation	North Europe	Central-West Europe	Central-East Europe	South-West Europe	South-East Europe
1.1	Forest area	🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲
1.2	Growing stock	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲
1.3	Age structure and/or diameter distribution	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲
1.4	Carbon stock	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲🌲	🌲🌲🌲
C1 average	Forest resource and carbon stock	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲
2.1	Deposition of air pollutants	🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲	🌲	🌲
2.2	Soil condition	🌲	🌲🌲🌲	🌲🌲	🌲🌲	🌲	🌲
2.3	Defoliation	🌲🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲
2.4	Forest damage	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲
C2 average	Health and vitality	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲
3.1	Increment and fellings	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲
3.2	Roundwood	🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲	🌲🌲🌲🌲	🌲🌲🌲
3.3	Non-wood goods	🌲🌲	🌲🌲	🌲🌲🌲🌲	🌲🌲	🌲🌲🌲🌲	🌲🌲
3.4	Services	🌲🌲🌲	🌲🌲	🌲🌲🌲	🌲	🌲	🌲
3.5	Forests under management plans	🌲🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲
C3 average	Productive functions	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲
4.1	Tree species composition	🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲
4.2	Regeneration	🌲🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲🌲
4.3	Naturalness	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲
4.4	Introduced tree species	🌲🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲
4.5	Deadwood	🌲🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲
4.6	Genetic resources	🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲
4.7	Landscape pattern	🌲	🌲🌲🌲🌲	🌲🌲	🌲🌲	🌲🌲🌲	🌲🌲🌲
4.8	Threatened forest species	🌲🌲🌲	🌲🌲	🌲🌲	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲
4.9	Protected forests	🌲🌲	🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲
C4 average	Biodiversity in forest ecosystems	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲
5.1	Protective functions: soil and water	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲
5.2	Protective functions: infrastructure etc.	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲
C5 average	Protective functions	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲
6.1	Forest holdings	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲
6.2	Contribution of forest sector to GDP	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲

[2] The authors believe that it is not possible to manage forests sustainably in the long run without adequate information on the real status and trends (so that any outcome is essentially the result of chance and intuition rather than fact-based policy making): lack of information on an indicator means that the indicator is not being addressed properly. Furthermore, there are no objective reasons to assign any specific rating if no data are available. If "No data" had been given an "average" assessment, say 🌲🌲🌲, a misleading picture of the situation would have been created.
[3] Lack of data for small countries that have negligible forest areas have little influence on the assessment as all the results are weighted by land area to obtain country group data.
[4] Indicators for which the key parameters present a serious problem of lack of comparability of data supplied include 2.4 (forest damage), 3.3 (marketed non-wood goods), 3.4 (marketed services), 4.5 (deadwood), 6.4 (expenditure for services), 6.6 (occupational safety and health) and 6.10 (accessibility for recreation).

6.3	Net revenue	🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲	🌲🌲🌲	🌲
6.4	Expenditure for services	🌲🌲🌲	🌲🌲	🌲🌲🌲🌲	🌲🌲	🌲🌲🌲🌲🌲	🌲
6.5	Forest sector workforce	🌲🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲	🌲🌲	🌲🌲🌲	🌲🌲
6.6	Occupational safety and health	🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲
6.7	Wood consumption	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲	🌲🌲🌲	🌲🌲
6.8	Trade in wood	🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲
6.9	Energy from wood resources	🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲	🌲🌲🌲
6.10	Accessibility for recreation	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲	🌲🌲	🌲
6.11	Cultural and spiritual values	🌲🌲🌲	🌲🌲	🌲🌲🌲🌲	🌲🌲	🌲🌲🌲	🌲
C6 average	Socio-economic functions	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲🌲	🌲🌲

Table 77: Assessment by indicator and country group, qualitative indicators

Indicator	Title	Russian Federation	North Europe	Central-West Europe	Central-East Europe	South-West Europe	South-East Europe
A1	National Forest Programmes (NFPs)	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲
A2	Institutions	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲
A3	Legal/regulatory framework and international commitments	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲
A4	Financial instruments/ economic policy	🌲	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲	🌲🌲🌲	🌲
A5	Informational means	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲
Part A average	Overall policies, institutions and instruments for sustainable forest management	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲
B1	Land use	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲	🌲🌲🌲	🌲🌲🌲
B2	Carbon balance	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲🌲
B3	Health and vitality	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲
B4	Production and use of wood	🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲🌲
B5	Production and use of non-wood goods and services, particularly recreation	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲
B6	Biodiversity	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲
B7	Protective forests and other wooded land (OWL)	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲🌲🌲
B8	Economic viability	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲🌲🌲
B9	Employment, including safety and health	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲🌲🌲
B10	Public awareness and participation	🌲🌲🌲🌲	🌲🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲🌲🌲
B11	Research, training and education	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲🌲
B12	Cultural and spiritual values	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲
Part B average	Policies, institutions and instruments by policy area	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲🌲

3. Results and commentary, by country group

Overview of results

Detailed information by quantitative indicator is in Table 76, and by qualitative indicator in Table 77. The same data are summarised for each country group in the appropriate section. The data by country for the key parameters are in Tables 87-92. For the rest of this chapter, references in brackets are to the data for the quantitative or qualitative indicator which is being addressed, for instance (1.1) or (B.11). The background to these indicators has been described in more detail elsewhere in this study and is not repeated here. The basic data are exactly the same as those in parts I and II of SoEF 2011. Any information not collected through the SoEF process is referenced. The important question of availability of data for assessment of SFM is addressed through maps which show the percentage of key parameters for which data are available[5].

Russian Federation

This is the only "country group" with a single member[6], because of the size and special characteristics of the Russian forest resource, which is the largest in the world, with a much higher share of forest untouched by man than all other European countries. The Russian forest is predominantly boreal in nature, although many other forest types are represented across its huge extent. Intensive management, of the sort common in many other parts of Europe, is simply not possible on the scale of the Russian Federation, which has 5.6 ha of forest per capita and covers eight time zones. The process of transition from a centrally planned economy is on-going, and a new Forest Code was approved in 2006 after intense discussion. Russian forests have enormous economic and biodiversity significance at the global level, but the problems of monitoring them are immense. Data were available for over 90 percent of the key parameters (Figure 101).

Forest resources and global carbon stock

The reported area of Russia's forests has been stable over the past 20 years, although the area of other wooded land has declined slightly (1.1). Growing stock per hectare of forest available for wood supply has been rising steadily, at just less than 0.1 m³/ha/year (1.2). The age class structure is balanced, apart from a "gap" in the 60-80 year class, due to overfelling during the Second World War (1.3). The reported data on carbon stock show a very small decrease over the 20-year period, but the correspondent points out that this is well within the margin of error of the estimate and cannot be taken as a firm trend (1.4).

New forms of access to forest, through leasing and other means, have been introduced in the Forest Code 2006. The policy objective is to increase forest area by 180 000 ha/year for 3 years (B.1). Preparatory measures are in hand to establish carbon sequestration plantations in the Russian Federation, and pilot plantations are being put in place (B.2).

Health and vitality

Over 24 percent of the land area of North-West Russia[7], nitrogen depositions exceed the critical load established under the ECE Convention on Long Range Transboundary Air Pollution (2.1). There are no data available here on soil condition (2.2) as the Russian Federation is not a member of the Biosoil programme. In North-West Russia, only 6.2 percent of the sample trees were in defoliation classes 2+3+4, with no comparable data for the rest of the country (2.3). The Russian Federation reports forest damage from biotic and abiotic causes at 0.5 percent of the forest area and from fire at 0.12 percent (2.4). The extensive fires in 2010 were not covered as the reference year for damage was 2005.

The Russian Federation has policy instruments and institutions in place to monitor forest damage (including from radioactivity) and to protect forests from these dangers (B.3), which is particularly challenging given the vast extent and remoteness of the forests in question.

Productive functions

Reported fellings are around 20 percent of net annual increment (NAI) (3.1), considerably less than the 40 percent recorded around 1990, before the significant drop in harvest associated with the "transition recession" of the mid-1990s. The value of marketed roundwood per 1 000 m³ growing stock (3.2) is about EUR 25, much lower than the European median value of EUR 713, and a clear indication that the resource could, in theory, be more intensively used. The value of marketed non-wood goods and marketed services is also considerably below the European average, which is not surprising given the large areas and relatively small populations, as well as the remoteness of many forests (3.3, 3.4). All Russian forests are publicly owned, and 100 percent are reported as being under a management plan or an equivalent (3.5).

No specific objectives for wood production (B.4) were reported although the policy instruments to control harvesting are in place. For the first time, the non-wood goods and services are defined and objectives set out in the new Forest Code (B.5).

Biodiversity in forest ecosystems

The share of single species stands in the Russian Federation is 60 percent (4.1), but in conditions of the boreal forest this is a natural proportion and not a result of silvicultural practice. Almost all regeneration is natural (4.2), and less than 2 percent of forest and other wooded land is plantations (4.3) while 36 percent is "undisturbed by man", by far the highest proportion in Europe. Areas dominated by introduced tree species are

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[5] Calculated as the number of key parameters for which data were in fact available as a percentage of the maximum possible. To avoid excessive weighting of criteria with many component indicators, the national aggregate is calculated as the average percentage of the criteria, rather than the total of all indicators. Both quantitative and qualitative indicators are included.

[6] One consequence of this is that the results for the Russian Federation are more "extreme" than for other "country groups" (more than any other group, and a high number of). This happens because, in multi-country groups, extreme values at the country level are attenuated by the process of averaging and weighting. This has not happened in the single member "country group" Russian Federation.

[7] The study under the ECE Convention covered 1.8 million km² of North-West Russia, not the whole country.

negligible (4.4). Deadwood is reported at about 21 m³/ha (4.5). Approximately 0.003 percent of the forest area is managed for *in situ* and *ex situ* gene conservation (4.6). This is a small percentage compared to other countries; in view of the size and homogeneity of the Russian forest resource, it may be inevitable that a relatively small share is devoted to gene conservation. The Russian Federation was not covered in the research project on landscape pattern used by SoEF 2011 (4.7), so information on fragmentation and connectivity is not available here. Data on most threatened forest species were supplied (4.8). Less than 2 percent of the area of forest and other wooded land is protected (4.9), but this is still a total protected area of about 17 million ha.

Russian policy on forest biodiversity (B.6) is to expand the area of protected forests and develop networks of virgin forest and high conservation value forests.

Protective functions

8.5 percent of Russia's forest has been designated for the protection of soil and water and 8.1 percent for protection of infrastructure, etc.

A regulation of 2008 sets down the procedures for forest with protective functions (B.7).

Socio-economic functions

All Russia's forests are publicly owned (6.1), although it is now possible for non-public enterprises to lease and manage forests, with concessions over long periods. The forest sector accounts for just less than 2 percent of gross value added in the Russian Federation (6.2). Factor income (i.e. net entrepreneurial revenue, but not taking labour costs into account) (6.3) is low, at around EUR 0.4/ha. This is not surprising in view of the many millions of hectares of forest which are inaccessible or untouched by man. Government expenditure for forest services (6.4) was also low on a per hectare basis (EUR 0.8/ha). The forest sector workforce has been declining but is still 0.6 percent of the total population (6.5). Data were received for non-fatal accidents for the forestry workforce (6.6), but the figure supplied (1.4 accidents per 1 000 workers) seems implausibly low, compared to countries with comparable conditions. Consumption of wood and wood products in the Russian Federation, at about 0.7 m³/capita/year, is just below the European average, while it is a strong exporter as net exports account for over 40 percent of consumption (6.8). The Russian Federation reports that only 0.8 percent of its energy production is from wood (6.9). Nearly all Russian forests are accessible for recreation, but a very small number of forest visits (0.01 visits/ha/year) was reported. The Russian Federation provided partial data on sites of cultural and spiritual value (6.11).

The forest tenure and management system in the Russian Federation was profoundly modified by the Forest Code in 2006, which addresses in particular the framework conditions for economic viability (B.8). The new enterprise structure gives full attention to achieving the objectives of protecting jobs and the social security of workers (B.9). The moulding of public opinion is recognised as a primary objective in the Forest Code, which also creates the necessary instruments (B.10). There are clear objectives regarding education, training and research and a number of policy instruments and institutions (B.11). Sites of cultural and spiritual value have special protected status (B.12).

Overall policies, institutions, and instruments for sustainable forest management

The Russian Federation has several processes similar to an NFP, such as a "federal target program" for forest and several strategies, which are mostly iterative and consultative (A1). It provided full information about its institutions and legal instruments (A.2, A.3). The main legal instruments are decrees and orders of the government of the Russian Federation, although the Forest Code was approved by the Parliament. The Russian Federation provided some information about financial instruments and economic policy for the forest sector (A.4), but very little quantitative information on public expenditure per hectare of forest. It also provided information about forest-related informational strategy (A.5), although there is no formal communication and outreach strategy.

Figure 101: Russian Federation – percent of key parameters for which data are available

North Europe

The high level of forest cover in North Europe naturally gives all forest-related questions high importance in the region. In most cases the forest sector is well organised and focused on wood production, with a sophisticated institutional structure. Most of the forest is boreal forest. In all countries of the region, except Iceland, data were available for 80 percent or more of the key parameters.

Forest resources and global carbon stock

Forest cover (1.1) is on average rather high in most countries of the region, including the European record levels of 76 percent in Finland and 75 percent in Sweden. As there is little scope to increase forest cover, forest area has remained stable in most countries, although it has expanded strongly in Iceland (where forest cover is low) and, more slowly, in Latvia and Lithuania. Growing stock (1.2) has been rising steadily, although expressed in per hectare terms it has dropped in those countries where area has been increasing fast, as newly planted forest has little growing stock per hectare. Silviculture in the region is based on even-age stands and the age structure (1.3) is mostly balanced. There has been a steady build up of carbon in woody biomass (1.4) over the period, except in Estonia, where it has been stable. The carbon build up has been particularly rapid in Denmark, Iceland, Latvia and Norway.

Most countries in the region aim to preserve, not increase, the forest area, with the exception of Denmark which aims for a significant increase (B.1). Almost all countries in the region have comprehensive policies for climate change mitigation including carbon sequestration in forests, but also use of wood energy, substitution for non-renewable materials, etc. (B.2).

Health and vitality

In the Baltic countries and Denmark, nearly all the land area is considered at risk of eutrophication from nitrogen deposition (2.1), although the percentage is lower in Finland and Sweden, and much lower in Norway. The C/N ratio (2.2) is approaching the warning level in Latvia and Denmark but is significantly above it elsewhere. The percentage of dead or damaged trees (2.3) is around or below 20 percent in all countries of the region. In general the percentage of forest damage (2.4) appears rather low, although there may be problems of comparability.

The countries of North Europe have in place systems to monitor forest damage and protect forests from damage (B.3).

Productive functions

Productive functions, especially for wood, play a major role in North Europe. Despite this, the fellings/NAI ratio is less than 100 percent throughout the region (3.1), ranging from 41 percent in Denmark to 87 percent in Lithuania (no data for Iceland). In Estonia, the fellings/NAI ratio exceeded 105 percent in 2000, but since then has been maintained around 55 percent. In major North Europe countries, the value of marketed roundwood relative to growing stock (3.2) is exceptionally high, indicating intensive use of the resource to produce wood. This is particularly true for Finland (values around EUR 900/1 000 m^3 of growing stock) and Sweden (around EUR 1 000/1 000 m^3), far more than the European median of EUR 713/1 000 m^3. Data are much weaker for the value of non-wood goods (3.3), with no data for Latvia and Sweden, and generally low values, compared to the European average, in other countries of the region, no doubt because of the lower population pressure on the forests, as well as the traditional rights of free access to non-wood goods such as berries and mushrooms. A major exception to this is Denmark, where the Christmas tree industry generates very high revenues. For the value of marketed services (3.4), only Iceland, Lithuania, Norway and Sweden were able to provide information. Iceland had especially high per hectare values for marketed services, including many not mentioned by other countries such as carbon sequestration, land rental for summerhouses, payments for gravel extraction and passage of power lines and for land reclamation. Finland, Lithuania and Sweden report that all their forests are under a management plan or an equivalent (3.5), but the comparability problems of this indicator are well known, and there is certainly no reason to believe that the forests in other countries of the region are unmanaged, even if, especially for private forests, the management plan is not explicit.

The North Europe countries mostly have policy objectives for the production and use of wood (B.4) including, in some countries, quantitative targets for increased production. For non-wood goods and services (B.5), objectives are less clearly stated and are mostly of a "framework" nature, without quantified goals.

Biodiversity in forest ecosystems

In North Europe, natural tree stands have fewer species than in other parts of Europe, so it is not surprising that most countries have quite high proportions of single species stands (4.1). In North Europe, a high proportion of single species stands does not indicate a preponderance of artificial "monocultures". Standard silvicultural practice in the region, mimicking natural processes, is natural regeneration, often with seed trees, and most countries have 50-80 percent natural regeneration (4.2), with more in Norway (86 percent) and Estonia (93 percent). Exceptions are Iceland, where most forests are recently established plantations, and Denmark, where natural regeneration is around 20 percent. In Finland and Iceland, there is a downward trend in the share of natural regeneration. Most countries in North Europe have less than 5 percent plantations (4.4), often much less. Exceptions are Iceland (26 percent) and, above all, Denmark, which has 76 percent plantations. The amount of deadwood per hectare in northern Europe is mostly above the European average, although it is not yet possible to say what "appropriate" levels of deadwood (4.5) are. Latvia pointed out that deadwood had increased after a major storm. Finland and Sweden manage a relatively small proportion of their forest for gene conservation, but elsewhere in the region, this share is 0.15 percent or more (4.6). In most countries of the region the forest is not very fragmented (with the exception of Denmark and, to a lesser extent, Lithuania), and the trends are positive (4.7). Only Estonia, Finland and Sweden have nearly complete data on threatened forest species (4.8), and even then for only one year, so it is not possible, because of data limitations described in the main chapter, to say what is the situation in North Europe, still less to identify trends. Denmark, Estonia, Finland, Latvia and Lithuania have 15-20 percent of their forest and other wooded land area protected for the conservation of biodiversity (4.9), but Iceland, Norway and Sweden have between 2 and 8 percent. This discrepancy between apparently similar countries may arise from differing conceptions of "protection", rather than real differences in practice.

Conservation of biodiversity is fully integrated in the forest institutions and instruments in the region (B.6), although few countries have quantified targets in this area.

Protective functions

All countries in North Europe were able to supply information on the area of forest with protective functions (soil and water) (5.1), although only Estonia had a system to designate this area formally. Only Lithuania was able to provide this information for protective forests (infrastructure) (5.2); for many countries 5.2 was included in 5.1.

Protective functions are usually included in the main forest law (B.7).

Socio-economic functions

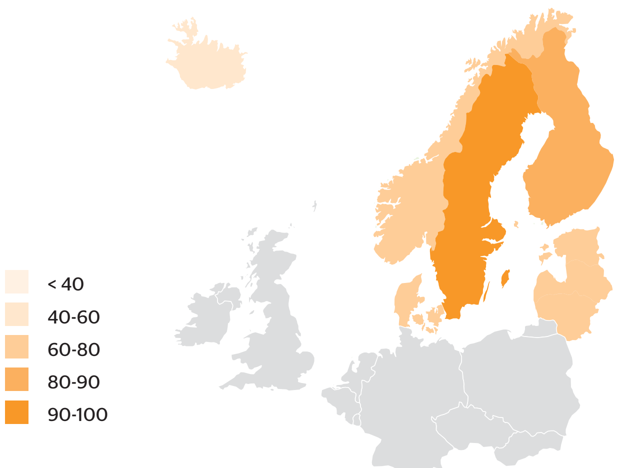
Forests are very important to the society and economy of North Europe, more than in other, less-forested, more urban regions. There are very many private forest owners in North Europe. In Finland, Latvia, Lithuania and Sweden, the number of private forest holdings (a proxy for the number of private forest owners, which is not known) is between 17 and 24 percent of the rural population (6.1). In contrast, private forest holdings in Denmark and Iceland were only about 3 percent of rural population. The forest sector accounts for more than 1 percent of the national gross value added (6.2) in five countries: Finland (5.1 percent), Latvia (3.3 percent), Sweden (3.2 percent), Estonia (2.8 percent) and Lithuania (2.0 percent). The region's forests provide significant income for their owners, with net entrepreneurial revenue (6.3) around EUR 75/ha in Finland and EUR 50/ha in Sweden, less elsewhere[8]. Only fragmentary information was available on government expenditure for forest services (6.4), although in Sweden there is a clear upward trend, reaching EUR 17.4/ha in 2010. The forestry workforce (6.5) is also significant, accounting for more than 1 percent of the population in five countries: Latvia (2.4 percent), Estonia (1.8 percent), Lithuania (1.4 percent), Finland (1.3 percent) and Sweden (1.1 percent). The data supplied on occupational safety and health (6.6) seem to indicate that the number of accidents per 1 000 workers is relatively low in this region, but there are still too many anomalies in the data for country comparisons. The consumption of forest products (6.7) in North Europe is at very high levels, in part because some of the material "consumed" is later exported as value added products. Four countries in the region (Denmark, Estonia, Finland and Sweden) are among the highest per capita consumers of forest products in Europe, with over 3 m^3 roundwood equivalent/capita/year. Four countries in the region are strong net exporters (Finland, Latvia, Norway and Sweden), while Denmark is a strong net importer (6.8). Energy from wood (6.9) plays a big role in most North Europe countries, especially those which have high forest cover and no domestic fossil fuel resources. In four countries (Finland, Latvia, Lithuania and Sweden) wood energy accounts for more than 20 percent of national energy production. In North Europe, practically all forests are accessible to the public, typically by an ancient common law right of free access (6.10), and three countries (Finland, Latvia and Norway) report high levels of forest visits per capita. Five of the eight countries of North Europe have at least partial data on cultural and spiritual sites (6.11). Sweden has identified over 600 000 cultural heritage sites in forests.

All countries have policy objectives for economic viability (B.8), but these are mostly general in nature. Only Finland reported a quantified objective (to increase value of production by 20 percent by 2015). For employment (B.9), many countries reported objectives in the area of safety and health/working environment, while Finland also stated that the attractiveness of the sector should be enhanced. Most countries in the region reported policy objectives in the field of public awareness (B.10), as well as for research, training and education (B.11). Five countries reported on arrangements for protection of cultural and spiritual values (B.12).

Overall policies, institutions, and instruments for sustainable forest management

Seven of the eight countries in North Europe reported NFPs or similar (A.1), which were almost all iterative, participatory and involved other sectors, although three dated from 2003 or earlier. The same seven provided full information on the institutional and legal/regulatory frameworks (A.2, A.3). In all seven, the fundamental forest legal framework is at the level of Parliament or the constitution, and forest legislation recently has been amended. They provided information on the economic policy and financial instruments related to the forest sector (A.4), but only four supplied quantitative information on public expenditure for forests. Six provided information, sometimes partial, on informational means used to promote sector policy objectives (A.5): four of these had a formal communication and outreach strategy.

Figure 102: North Europe – percentage of key parameters for which data are available



Central-West Europe

Central-West Europe contains many densely populated and highly prosperous urban countries, although there are significant rural and mountainous areas. This strongly influences the trends for forests and management priorities. In general forest issues are not central to these countries' economies or societies, although populations have tended to react strongly to threats to their forests. Data were available for more than 80 percent of key parameters in all countries of the region except Ireland, Netherlands, Liechtenstein and Luxembourg (Figure 103).

Forest resources and global carbon stock

In most countries, forest cover (1.1) has been expanding steadily over the last 20 years, with above average rates in Ireland and Switzerland. Growing stock (1.2) has also been accumulating in all countries of the region. Growing stock per hectare has increased by more than 1 m^3/ha/year on average over the past 20 years in all countries except Switzerland, which is taking measures to reduce its very high stocking levels, and Ireland, where the rapid increase in forest area through afforestation has brought down average growing stock per hectare. The age class structure (1.3) is generally balanced, although strongly influenced by past afforestation[9]. Carbon stock in forests (1.4) has been increasing in all countries over the past 20 years, at rates between 0.8 percent/year (Austria) and 2.2 percent/year (Germany).

Most countries in Central-West Europe have an objective to maintain forest cover, or even prevent unwelcome increases, as in Switzerland. However, Ireland, the Netherlands and the UK have quantified targets for forest expansion (B.1). All countries are signatories to the Kyoto protocol and most are members of the EU and therefore have specific climate change mitigation policy objectives, which were reported in some detail (B.2).

Health and vitality

All of the countries of Central-West Europe, except the UK, have a rather high percentage of their land area at risk of eutrophication because of nitrogen depositions (2.1). In four countries (Belgium, France, Germany and Ireland) the C/N ratio is approaching the warning level, which indicates a possible imbalance possibly induced by excessive nitrogen input. The share of trees in defoliation classes 2+3+4 (2.3) is below 35 percent in all countries, and below 15 percent in Austria and Ireland. Of the five countries which reported forest damage by abiotic and biotic causes (2.4), Ireland and the UK reported damage under 0.5 percent, Austria and Germany just over 2 percent and Liechtenstein over 10 percent. France reported an average of 0.1 percent of its total forest area damaged by fire every year, although most of the French forest is not in the fire-vulnerable Mediterranean zone.

All countries have institutions to monitor and combat forest damage to maintain its health and vitality, also from external threats such as pollution or climate change (B.3).

Productive functions

Fellings are between 50 and 95 percent of NAI (3.1), except for Ireland and Luxembourg which have no data on NAI. In Switzerland, however, fellings have been allowed to rise to just under NAI because of a steep rise in natural losses, attributed to excessive stocking levels. Five of the ten countries in the region have exceptionally high values of marketed roundwood in relation to growing stock (3.2) (Austria, France, Ireland, Switzerland and the United Kingdom), indicating an intensive use of the resource. Countries reported mostly average values of marketed non-wood goods per hectare (3.3). Germany, however, reported a value eight times the European median value (game, ornamental plants and Christmas trees). Only five countries were able to report on the value of marketed services (3.4), with rather high values per hectare for Austria and Luxembourg. The share of forests under a management plan or equivalent (3.5) ranged from 57 percent to 100 percent, but several of the higher figures are based on assumptions, notably as regards management plans for private forests.

Almost all countries in the region reported policy objectives to increase wood supply and mobilisation, including for energy and, in some cases wood consumption, with associated policy instruments (B.4). In contrast the policy objectives for non-wood goods and services (B.5) are mostly concerned with regulation, and there are no specific objectives to increase supply of these goods and services.

Biodiversity in forest ecosystems

In Central-West Europe, the share of single species stands (4.1) varies widely, from 6 to 56 percent, chiefly as a function of silvicultural choices. The share of single species stands is falling in Austria, France and the Netherlands. In Switzerland and Liechtenstein the share of natural regeneration is over 95 percent but very low in Ireland (11 percent) and the UK (24 percent), both of which have a share of plantations (4.3) over 75 percent. Belgium and Luxembourg also have 30-40 percent plantations, but elsewhere this share is below 10 percent, even negligible. This pattern is also reflected in the share of introduced species (4.4) which is over 40 percent in Belgium, Ireland and the UK, but much less elsewhere. Levels of deadwood (4.5) are high, especially in Austria, Germany and Switzerland, all of which have high stocking levels, but low, as would be expected, in the countries with much plantation silviculture. Most countries (except France and Switzerland) have about 0.08 percent of forest managed for gene conservation, with this percentage rather higher in some of the smaller countries (Belgium, Liechtenstein and Luxembourg) (4.6). In all of the countries in the region, except Austria and Liechtenstein, the forest landscape is rather fragmented, and the trends are negative in all countries except Ireland and Luxembourg (4.7). Austria and Switzerland were able to provide nearly complete information on threatened forest species (4.8), with weaker data elsewhere. All countries in the region except Belgium, Ireland and Luxembourg reported that protected areas were over 15 percent of forest and other wooded land (4.9).

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[8] The very high figure for Denmark (EUR 320/ha) is not comparable as it was not possible to deduct labour costs – which are significant.

[9] In Ireland, nearly all stands are under 40 years old, and in the UK there is a strong peak of stands between 20 and 40 years old, with less both before and after.

All countries in Central-West Europe report detailed and specific objectives, with appropriate policy instruments, in the field of forest biodiversity (B.6), often linked to national biodiversity strategies and various EU instruments, such as Natura 2000.

Protective functions

All countries in Central-West Europe except Ireland, Liechtenstein, Netherlands and the UK were able to supply information on the area of forest with protective functions (soil and water) (5.1). Austria and Belgium have systems to designate this area formally. Only Austria and Switzerland were able to provide this information for protective forests (infrastructure) (5.2), Austria with specific formal designation; for many countries, 5.2 was included in 5.1.

Protective functions are usually included in the main forest law (B7). In Switzerland, the objective is that, by 2020, 70 percent of the forests protecting against natural hazards comply with the target profiles of the national standard.

Socio-economic functions

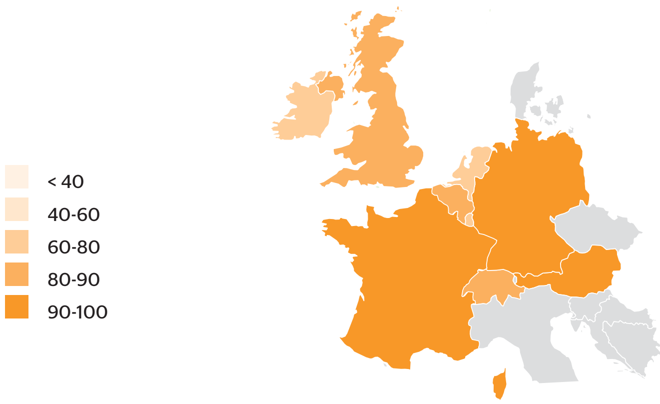
The number of private holdings (used as a proxy for the number of private forest owners) (6.1) is less than 2 percent of the rural population, except in Austria (5 percent), Luxembourg (16 percent) and France (23 percent)[10], reflecting the relatively minor socio-economic importance of forest issues in most parts of Central-West Europe. Likewise in four of the countries of the region (Ireland, Luxembourg, Netherlands and the UK), the forest sector as a whole (including the forest industries) counted for less than 0.7 percent of national gross value added (6.2), although in Austria this share reaches 2 percent. In Belgium, France and, especially, Austria, net entrepreneurial revenue of forest owners (6.3) exceeded EUR 120/ha. However, in the Netherlands, Switzerland and the UK, net entrepreneurial revenue has been negative since 2000 at least. In other words, on average in those countries owning and running a forest will reduce the wealth of the forest owner (setting aside any fiscal advantages which may exist). Government expenditure for forest services (6.4) in those countries which supplied information was among the highest in Europe, notably in France (EUR 11/ha), Germany (EUR 14/ha), the UK (EUR 23/ha) and Switzerland (EUR 55/ha), although it is not clear to what extent these figures are comparable. In five countries of the region, the forest sector workforce (6.5) was less than 0.4 percent of the population, and between 0.4 percent and 0.9 percent in four. Non-fatal accidents (6.6) were below 35/1 000 workers in France, Ireland and the UK, with a strong downward trend in the latter two, although the information is still not comparable for this indicator and is strongly influenced by circumstances (slopes, storm damage). Levels of wood consumption (6.7) are very high in this country group, with Austria at nearly 3 m^3 wood equivalent/capita/year. For trade in wood products (6.8), Austria is a strong net exporter and the Netherlands and the UK are strong net importers. In the 20-year period, Germany made a structural shift, from net imports being 22 percent of consumption to net exports being 5 percent of consumption. In many countries of the region, wood accounted for a negligible share of national energy supply (6.9), but in Austria and Liechtenstein, this share exceeded 30 percent. In almost all countries of the region, the forest is very accessible to the public (6.10), with particularly high levels of visits per hectare in the Netherlands and Switzerland. France, Germany and the UK were able to provide nearly complete data on sites with cultural and spiritual values (6.11), but others supplied partial or no data.

Countries in the region have incorporated objectives of economic viability (B.8) into their broader forest policy, mostly with the aim of maximising forests' contribution to economic growth. The importance of workforce issues, including training and safety and health, is also recognised (B.9), in most cases without specific policy objectives or programmes (these are often the responsibility of other ministries). Countries also describe the importance of improving public awareness of forest issues (B.10). Switzerland's NFP has an objective to make 80 percent of the population aware of forests. All countries described significant efforts by governments in the field of research, education and training (B.11). Countries which reported on cultural and spiritual values (B.12) mentioned policies and institutions to protect these (often not specifically forest-based) and a number of research programmes, but few specific policy objectives.

Overall policies, institutions, and instruments for sustainable forest management

All countries in Central-West Europe have NFPs or similar[11] and, according to the partial information supplied, these are iterative, participatory and involve other sectors (A.1). Information was provided on the institutions responsible for forest policy (A.2), although sometimes this was not complete, notably in the case of countries where the major responsibility for forests is at a sub-national level, including Belgium, Germany, Switzerland and the UK. In all countries of the region the main forest instruments are in the constitution or at the level of laws passed by Parliament, and recently amended, with two exceptions (Ireland and the Netherlands) (A.3). All reporting countries provided information on the economic policy and financial instruments related to the forest sector (A.4), but only France and the UK were able to provide quantitative information on public expenditure for the forest sector. Most reported on informational means used to promote sector policy objectives (A.5), but only the UK reported an official outreach and communication strategy.

Figure 103: Central-West Europe – percentage of key parameters for which data are available



Central-East Europe

This country group is very heterogeneous, running from Alpine states to the Caucasus and Volga basin. All countries in the group were centrally planned economies before 1989, but the transition process has moved faster in some (five of the nine countries are in the EU) than others. Most have strong traditional forest sector institutions. The five EU members all have data for more than 80 percent of the key parameters, but in Belarus and Ukraine this share is in the 60-70 percent range and in Georgia and Moldova, data are only available for about 30 percent of the key parameters (Figure 104).

Forest resources and global carbon stock

Forest cover (1.1) has been expanding in most countries in Central-East Europe. This has been very fast in Belarus, where forest cover has expanded by 0.2 percentage points every year for the past 20 years through plantation and natural extension, and slightly more slowly in Hungary and Moldova (0.13 and 0.16 percentage points, respectively). In Georgia, forest cover declined from 40 percent to 39.5 percent over the past 20 years. Growing stock (1.2) has been accumulating strongly, at a rate of more than 3 m^3/ha/year in the Czech Republic, Slovakia and Ukraine. The only exception is Hungary where average growing stock per hectare has fallen because of forest expansion. The age class structure of the region's forests (1.3) appears fairly balanced. Carbon in biomass (i.e. excluding carbon in soil, deadwood or litter) (1.4) increased by more than 1 percent/year in seven of the nine countries in the region.

Several countries in the region have a policy objective to increase forest area (B.1). In particular, Hungary aims to reach 27 percent forest cover by 2040, Slovakia to afforest marginal agricultural land, and Romania to add 2 million ha of forest. All reporting countries had detailed and specific policy objectives in the field of carbon balance (B.2).

Health and vitality

The entire land area of Central-East Europe, with the exception of Romania, is considered at risk of eutrophication by excessive nitrogen deposition (2.1). The C/N ratio (2.2), which indicates the possibility of soil imbalance due to nitrogen input in forests, is near the warning level in the Czech Republic but not in the other countries in this region covered by the Biosoil project. In most countries of the region, the share of trees in defoliation classes 2+3+4 (2.3) is around or below 20 percent, but in Slovakia it is around 33 percent and in the Czech Republic over 50 percent. Hungary, Poland and Romania reported rather high levels of forest damage from biotic and abiotic causes (2.4), but there are doubts about how comparable these data are. Elsewhere in the region, low damage percentages were reported.

On the policy level, all reporting countries have institutions to monitor forest condition and damage (B.3) and measures to compensate for the damage done.

Productive functions

In Central-East Europe the ratio of fellings to NAI (3.1) is between 35 percent and 78 percent (weak data from Georgia and no data from Moldova). In Slovakia this ratio rose from 57 percent to 79 percent between 2000 and 2010. In the Czech Republic and Hungary, the value of marketed roundwood (3.2) was at a very high level, over EUR 900/1 000 m^3 growing stock, indicating rather intense use of the resource, but was considerably lower in other reporting countries. In all reporting countries this ratio was much higher in 2010 than in 1990: this is a clear indication of increased intensity of use of the resource after the transition. Only three countries in the region supplied data on value per hectare of marketed non-wood goods (3.3), and for these three, the values were at the low end of the range. In this country group, only Slovakia supplied data on value of marketed services (3.4), but in that country, the value per hectare of these services was quite high (nearly EUR 120/ha). Five of the nine countries in the region reported that 100 percent of their forests were under a management plan or an equivalent (3.5), and in all eight reporting countries this percentage was over 85 percent.

The six countries which reported on policies for the use of wood (B.4) described balanced and detailed objectives. Three of them (Czech Republic, Hungary and Slovakia) mentioned objectives to increase wood production and consumption, notably for energy. For non-wood goods and services (B.5), the same six countries reported policy objectives which focused on regulating supply of non-wood goods and access to forests, mostly without quantified objectives.

Biodiversity in forest ecosystems

The Czech Republic and Slovakia have less than 15 percent single species stands (4.1), but in the other four countries reporting on this indicator, this type of stand accounted for around 20-50 percent of the area. In most countries of the region, natural regeneration (4.2) accounts for most regeneration (over 95 percent in Georgia and Moldova), but is below 5 percent in the Czech Republic and Poland. Most countries reported a low share of plantations (below 6 percent, sometimes negligible), but Belarus and Romania recorded more than 20% plantations (4.3). Introduced tree species (4.4) account for less than 2 percent of the area of forest and other wooded land, except for Hungary, where introduced species (mostly Robinia pseudoacacia which is considered invasive in many circumstances) account for about 35 percent. Six countries reported on levels of deadwood (4.5), with very high levels in Ukraine and, especially, Slovakia. The Czech Republic, Moldova, Slovakia and Ukraine have an above average percentage of their forests managed for gene conservation, but others (Georgia and Hungary) have a rather low share (4.6). Of the six countries in the region with data on landscape pattern (4.7), Moldova's forest is very fragmented, while in Poland and Slovakia, fragmentation is

[10] The figure for Belgium – 53 percent - seems anomalous, either because of an underestimation of the rural population, or from a large number of urban forest owners in this densely populated country.
[11] Germany is at present developing a strategy for forests (Waldstrategie) which, however, is not yet complete, so the specific information provided to SoEF refers to an NFP which is now outdated.

decreasing. Six countries were able to provide some data on threatened forest species (4.8) with nearly complete data in the Czech Republic and Slovakia. Six countries reported protected areas over 12 percent of area of forest and other wooded land (4.9), with a very high share of protected forest in the Czech Republic (25 percent) and Slovakia (43 percent).

Six countries provided information on their policies in the field of forest biodiversity (B.6). These objectives are usually incorporated into the National Forest Programme and refer to international commitments, such as Natura 2000 and the Convention on Biodiversity. Ukraine reported the objective of increasing the share of forest protected for biodiversity.

Protective functions

All countries in the region, except Moldova, provided information on the area of forest with protective functions (soil and water) (5.1). Belarus and the Czech Republic have a formal designation of these areas. Six of the nine countries provided similar information for protective forest (infrastructure) (5.2), again with formal designation in Belarus and the Czech Republic.

Protective functions are usually included in the main forest law (B7) with specific, but non-quantified, objectives incorporated into many national forest programmes.

Socio-economic functions

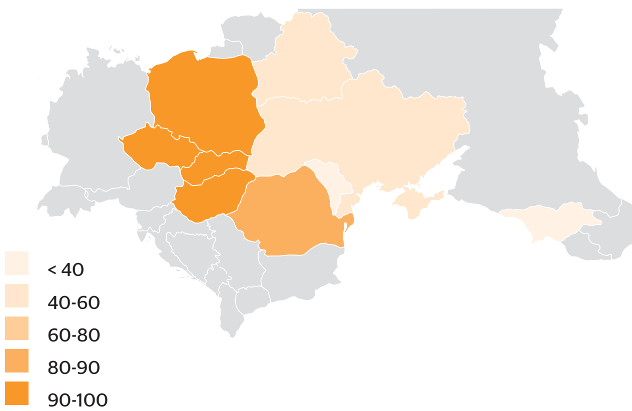
In only two countries of the region, Czech Republic and Poland, is the number of private holdings (6.1) more than five percent of the rural population, despite programmes to restore and privatise forests. In Belarus, Georgia, Moldova and Ukraine, there are practically no private forests. In all reporting countries except Hungary, the forest sector contributes more than 1.5 percent of national gross value added (6.2), a relatively large share. In Slovakia, this share has dropped sharply, from 2.8 percent in 2000 to 1.1 percent in 2010, because of rapid growth in non-forest sectors. Most countries in the region were not able to provide data on net entrepreneurial income (6.3), and in two of those which did (Poland and Slovakia), the revenue was quite low (less than EUR 20/ha). Only four countries responded on government expenditure for forest services (6.4), but in two of these (Czech Republic and Hungary) government expenditure was more than EUR 10/ha. The forest sector is a significant job provider in the region: in two countries (Czech Republic and Slovakia), the forest sector workforce (6.5) was 1.2 percent of the population, and elsewhere in the 0.5-1.0 percent range. As regards occupational safety and health, most countries in the region report quite low rates of accidents (6.6), often below five per 1 000 workers. Comparison, among countries within the group and with countries in other groups, indicates that these data are not comparable and therefore should not be used for assessment purposes. Per capita consumption of wood (6.7) is around the European average in five countries, but in Georgia, Moldova, Romania and Ukraine, it is rather low, below 0.8 m^3/capita/year. Two countries in the region are heavy net importers of wood and forest products (Hungary and Moldova) while two are strong net exporters (Belarus and Slovakia) (6.8). In Belarus, wood accounts for over 30 percent of national energy production (6.9), but elsewhere in the region, the reported share is quite low (although under-reporting of wood energy may still exist). Over 95 percent of forests are accessible to the forests in almost all the countries in the region (6.10), but there is very little information on intensity of use (visits/ha). Only two of the nine countries (Belarus and Slovakia) were able to provide near complete information on the number of cultural and spiritual sites and another (Hungary) partial data (6.11).

The importance of economic viability (B.8) is recognised by reporting countries and features in national forest programmes. Although most countries recognise the importance of employment aspects (B.9), there is very little formulation of specific policy objectives[12]. Some recognise that size of the forest sector workforce is declining through higher labour productivity. Increasing public awareness and understanding of forest issues (B.10) features in many national forest programmes. Countries reported on the structure of forest sector research and education (B.11). The responses on cultural and spiritual values (B.12) show that while all countries accept the importance of this dimension, there are many different views of what is meant by it.

Overall policies, institutions, and instruments for sustainable forest management

Seven of the nine countries in Central-East Europe have NFPs or similar and, according to the partial information supplied, these are iterative, participatory and involve other sectors (A.1). Information was provided on the institutions responsible for forest policy (A.2), although sometimes this was not complete. In the seven reporting countries the main legal instruments for forests are recent and in the constitution or at the level of laws passed by Parliament (A.3). All except Belarus and Georgia provided information on the economic policy and financial instruments related to the forest sector (A.4). Hungary, Moldova, Romania and Slovakia provided quantitative data on public expenditure for the forest sector. Six reported on informational means used to promote sector policy objectives (A.5), but only Romania stated that it had a formal outreach and communication strategy.

Figure 104: Central-East Europe – percentage of key parameters for which data are available



South-West Europe

This country group includes four countries with very small or negligible forest resources (Andorra, Holy See, Malta and Monaco) which have very weak information on almost all the indicators. The analysis, therefore, focuses on the remaining countries: Italy, Portugal and Spain, which have a distinctive Mediterranean forest on much, but not all, of their territory. Portugal has a major pulp and cork industry and intensive wood supply, strongly influencing the structure of the sector, while Italy and Spain, both very large countries, have a wide range of regional specificities. All are severely affected by forest fires. In Italy and Portugal, data are available on about 90 percent of key parameters, while in Spain the percentage is just under 80 percent (Figure 105).

Forest resources and global carbon stock

Forest cover (1.1) is about 35 percent, with significant growth in all three countries. Forest cover in Italy increased from 31 percent to 37 percent in the 20 years from 1990 to 2010. Growing stock (1.2) also accumulated by 1.5 m^3/ha/year in Italy and by 0.5 m^3/ha/year in Spain over the period as a whole (there was a reduction in average growing stock per hectare in Spain over the last decade as the forest area expanded through afforestation). In Portugal, however, growing stock per hectare has been dropping steadily, by 0.6 m^3/ha/year. This is attributed to forest fires, although intensive forest management which maintains low stocking levels through short rotations may also have been a factor. The age class structure (1.3), where data are available, reflects the silvicultural history and practice of each country. In Portugal, for instance, there is a high proportion of young stands, because of afforestation after fire and the widespread use of short rotation eucalyptus coppice. Carbon stocks in living biomass (1.4) grew by over 2 percent per year in Italy and Spain, but only slightly in Portugal

As regards policy objectives (B.1), in Italy the main objective is to protect the current forest area, while in Spain a further expansion (by 45 000 ha, with emphasis on short rotation coppice) is planned. With regard to carbon stocks and flows (B.2), the objectives are in accordance with Kyoto Protocol commitments, notably as regards increasing the sink capacity and maintaining the carbon pools.

Health and vitality

Over 80 percent of land area in Portugal and Spain is considered at risk of eutrophication (2.1), with about 60 percent in Italy. However, the C/N index is relatively high in all three countries, indicating little danger of soil imbalance due to nitrogen input. Less than 20 percent of trees in Portugal and Spain are in defoliation classes 2+3+4, while in Italy about 36 percent are in those classes. All three countries are subject to serious fires, although the area burned varies widely from year to year. On average about 0.5 percent of the forest area is burnt every year in Italy and Spain, but over 2 percent in Portugal.

For policy (B.3), Portugal has established a target for controlling forest fires (less than 100 000 ha by 2012), and all three countries have monitoring systems in place.

Productive functions

The ratio between fellings and NAI (3.1) in Italy and Spain is in the 35-40 percent range, whereas in Portugal, it reaches 75 percent. The value of marketed roundwood (3.2) varies widely. In Italy it is around EUR 400/1 000 m^3 of growing stock, but about EUR 1 000 in Spain and EUR 2 000 in Portugal, demonstrating the highly intensive use of the Portuguese resource. Likewise, the value of marketed non-wood goods (3.3) in Portugal reaches nearly EUR 100/ha, the highest in Europe, chiefly because of the cork industry, with values nearer the European average in Italy and Spain. No country in South West-Europe supplied data on value of marketed forest services (3.4). About ninety percent of Italy's forests are reported as being under a management plan or an equivalent (3.5). The corresponding figure in Portugal is 45 percent, but this includes only formally approved plans in a central data base, while in Spain, this information is at the level of the autonomous regions and only partial data were submitted.

As regards policy objectives, there are no quantified production targets except in the field of wood energy (B.4). There are few specific policy objectives about the supply of non-wood goods in South-West Europe (B.5).

Biodiversity in forest ecosystems

In Italy and Spain the share of single species stands (4.1) is between 18 and 26 percent, but in Portugal it reaches 72 percent (pine and eucalyptus stands). In Italy, the share of natural regeneration (4.2) is around 93 percent, while it is about 75 percent, with a slight downward trend, for Portugal. In Italy and Spain the share of plantations (4.3) is below 10 percent, but in Portugal it is around 26 percent. Likewise, the share of introduced species (4.4) in Italy and Spain is under five percent but about 29 percent in Portugal because of the very significant eucalyptus plantations supplying material for the pulp industry. Only Italy and Portugal were able to supply data on deadwood (4.5), reporting low to medium levels, although it should be stressed that not enough evidence is yet available to say what levels of deadwood are normal or desirable in specific types of forest. In Italy 0.66 percent of the forest is managed for gene conservation, but in Portugal and Spain, this share is rather low (4.6). In Spain and, especially, Portugal, there are high levels of forest fragmentation and negative trends for forest landscape pattern (4.7). Italy and Portugal were able to supply data on most of the threatened forest species (4.8), while Spain provided nearly complete data. Spain reported that over 18 percent of forest and other wooded land is protected (4.9), while Italy and Portugal reported a very high percentage of protected forest, around 45 percent.

All three countries reported forest biodiversity conservation policies in line with commitments in the framework of CBD and the EU, and coordinated with national biodiversity strategies (B.6).

[12] Poland states that "there are no specific policy objectives related to employment in the forest sector in Poland".

Protective functions
Italy reported that over 80 percent of its forest had protective functions (soil and water) (5.1), and Portugal reported 7 percent. Spain reported that 24 percent of its forest had protective functions and that they had been formally designated "Montes de utilidad publica" (includes also protective forest under 5.2). Data supplied on forest with protective functions (infrastructure) (5.2) were fragmentary or included under 5.1.

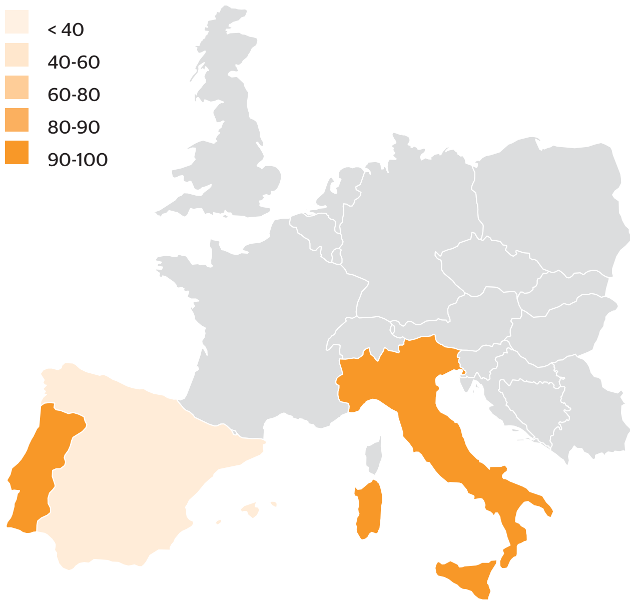
Italy reported that national policy aims at the hydrogeological protection of mountainsides in order to prevent landslides, erosion and similar hazards, and that for this reason about 90 percent of forest land has been legally defined and cannot change use. Furthermore, about 500 000 ha of forest resources have been specially bound by means of regional laws and other provisions such as watershed management plans (B.7).

Socio-economic functions
No data were supplied on private forest holdings (6.1) in South-West Europe, except for Spain which reported more than 21 million private forest holdings, mostly extremely small. It is likely that there are also very many private forest holdings in Italy and Portugal (although in the latter there are also large scale holdings of the forest industry). In Portugal the forest sector accounts for about 1.6 percent of national gross value added (6.2), one of the highest shares in Europe. In Italy, this share is 0.9 percent and trending downward. Portugal also has one of the highest average net entrepreneurial revenues (6.3) per hectare of forest (EUR 156), but this revenue is much lower in Italy and Spain. Both Italy and Spain report very high levels of government expenditure for services (6.4) per hectare, at EUR 34 and EUR 72, respectively. In Portugal, the forest sector workforce (6.5) is about 0.9 percent of the population, and in Italy and Spain around 0.45 percent. Both Italy and Spain reported quite high levels of accidents in the forest workforce (6.6) (no data from Portugal). Levels of consumption of wood and its products (6.7) in South-West Europe are around the European average. Portuguese net exports of wood and its products (6.8) are about 70 percent of national consumption, while the other countries in the region are moderate net importers. Wood accounts for just under 15 percent of national energy production (6.9) in Italy, and much more in Portugal[13]. Only Italy supplied information on accessibility (82 percent of the forest area) and visits (2.9 visits/capita/year) (6.10), both around the European average. All three countries provided data on cultural and spiritual values (6.11).

Only Italy provided information on policy objectives for economic viability (B.8), setting the framework for economic development. For employment (B.9), rather general policy objectives were reported. For public awareness (B.10), Italy and Portugal recognised the importance of communication and forest pedagogics, and listed some policy instruments. For research, education and training (B.11), Italy provided information on the major institutions. For cultural and spiritual values (B.12), Italy reported some arrangements made to identify relevant sites, but mentioned no policy objectives.

Overall policies, institutions, and instruments for sustainable forest management
Italy, Spain and Portugal all have NFPs or similar and, according to the partial information supplied, these are iterative, participatory, recent and involve other sectors (A.1). Information was provided on the institutions responsible for forest policy (A.2), although sometimes this was not complete. In the three countries the main legal instruments for forests are in the constitution or at the level of laws passed by Parliament (A.3). All provided some information on the economic policy and financial instruments related to the forest sector (A.4), but only Portugal was able to supply quantitative information on financial flows to support the sector. The three countries reported on informational means used to promote sector policy objectives (A.5), but only Italy reported a written governmental outreach and communication strategy.

Figure 105: South-West Europe – percentage of key parameters for which data are available



South-East Europe

Most of the countries of the region are on the Balkan Peninsula which has a relatively high forest cover. However, over 60 percent of the region's surface area is in Turkey, which has extensive areas with very little forest cover. Most of the countries have rather large rural populations and low per capita income by European standards. Some have new institutions emerging from the conflicts in former Yugoslavia (so that data on trends are sometimes difficult to calculate). Fire is an issue all over the region. Data availability is a major problem in this country group. Only three countries (Bulgaria, Croatia and Slovenia) have information on more than 80 percent of the key parameters, with Cyprus and Turkey over 70 percent (Figure 106). To a certain extent, therefore, assessment of the sustainability of forest management in this country group is rather uncertain.

Forest resources and global carbon stock

Forest cover is expanding all over South-East Europe, with particularly fast rates in Serbia, Croatia and Bulgaria. The exception is Albania, where forest cover shrank from 38.1 percent in 1990 to 37.6 percent in 2010, as a result of overgrazing and population pressure, also from displaced people. Growing stock has also been increasing, by 5 m^3/ha/year in Slovenia, and 1-2 m^3/ha/year in Bosnia and Herzegovina, Bulgaria and Croatia. In Albania, growing stock per hectare fell by 0.2 m^3/ha/year, as a result of overcutting. Only two countries, Bulgaria and Croatia, supplied information on age class structure: in these countries it was balanced. Carbon stocks of living biomass grew in all countries, except Albania, and by about 1 percent a year or more in eight countries.

Six of the countries reported on their policy objectives as regards forest area (B.1) and on carbon balance (B.2) linking forest policies with climate change mitigation objectives.

Health and vitality

Nearly all the land area in the region is at risk of eutrophication due to nitrogen depositions (2.1) (except for Cyprus where the percentage is lower, and Turkey for which there are no data). For soil condition (2.2), only two countries (Slovenia and Cyprus) participated in the Biosoil project: for them the C/N ratio is not a cause of concern. For others, no data are available on soil condition. The percentage of sample trees in defoliation classes 2+3+4 (2.3) is below 26 percent in all countries in the region, and around 20 percent for many. Fire damage (2.4) is significant in many countries, ranging up to 0.67 percent.

Most of the responses concerning policy instruments (B.3) focused on monitoring arrangements, often within the context of international projects. Fire receives high political emphasis. In Turkey, most of the resources of the state forest organisation are devoted to managing fires (preventing and fighting fires).

Productive functions

Only four countries supplied information on the ratio between fellings and NAI(3.1), but it is possible to estimate the ratio for all except Turkey and the former Yugoslav Republic of Macedonia. In all of these the ratio was below 60 percent, except in Albania, where fellings were more than five timesNAI in 2005. In Cyprus, the fellings/NAI ratio was over 110 percent in 1990, but fellings since then have been drastically reduced to reach 25 percent of increment. Seven countries reported on the value of marketed roundwood as compared to growing stock (3.2), and in all of these except Croatia the values were at or below the European average, indicating that the forest owners in the region have difficulty in recovering sufficient value from their silvicultural investment. For the value of marketed non-wood goods (3.3), only three countries (Montenegro, Slovenia and the former Yugoslav Republic of Macedonia) were near the European average while the others were well below it, reporting values less than EUR 1/ha/year. Only Croatia, Cyprus and Slovenia reported on the value of marketed forest services (3.4). Six countries in the region report that 100 percent of their forests are under a management plan or an equivalent (3.5), and two others report percentages of 62 percent and 83 percent.

Countries reported on their wood production policies (B.4). Bulgaria intends to raise wood harvest to 8 million m^3 by 2013. Cyprus, however, has decided that harvest should be reduced and all fellings from the public forest should only be undertaken to improve the forest's structure and vitality. Policies for the supply of non-wood goods and services (B.5) stress the necessity of balance and of sustainability.

Biodiversity in forest ecosystems

Albania, Bulgaria, Cyprus and Montenegro all have more than 40 percent of the forests in single species stands (4.1), but in Slovenia, this share is less than 5 percent. Natural regeneration is the dominant mode in South-East Europe, with a share above 50 percent everywhere, often around 90 percent (4.2). The share of natural regeneration rose over the past 20 years in Bosnia and Herzegovina and in Bulgaria, but fell in Turkey. There are significant variations in the importance of plantation forestry (4.3) in the region. Two countries have more than 20 percent plantations: Bulgaria (21 percent with a strong downward trend) and Turkey (33 percent with a strong upward trend). Five countries (Bosnia and Herzegovina, Croatia, Greece, Montenegro and Serbia) have less than 6 percent plantations, while Slovenia reports no plantations at all. Introduced species (4.4) play a negligible role in the region, not exceeding 5.8 percent in any country. Only four countries provided information on deadwood in forest stands (4.5), and the levels reported were higher than average. A rather high percentage of forests is managed for gene conservation in Turkey and, especially, Bulgaria, but this share is low in Croatia and Serbia (4.6). Forest landscape

[13] The figure reported – 62 percent of national energy supply – seems implausible, but certainly there is a large volume of wood energy supplied, both from traditional and modern wood burning and from black liquor in the pulp mills.

patterns are generally satisfactory in the region, as regards both status and trend (4.7). Only Croatia and Slovenia were able to provide nearly complete data on threatened forest species (4.8), while the other countries did not respond or provided partial data. In Albania and Slovenia, forests protected for biodiversity conservation (4.9) account for over 20 percent of the area of forest and other wooded land, and in Serbia for nearly 15 percent. However, in other parts of the region, the share of protected forest is quite low, ranging from 4 to 11 percent.

Eight countries reported on their policies to conserve forest biodiversity (B.6). Only Albania mentioned a specific goal to increase the area protected.

Protective functions

Seven countries in the region were able to provide information on the area of protective forest (soil and water) (5.1), of which two (Serbia and Turkey) have a system of formal designation of these forests. Five provided information on protective forests (infrastructure) (5.2), with the same two countries reporting formal designation systems.

Protective functions are usually included in the main forest law (B7) with specific, but non-quantified, objectives incorporated into many national forest programmes.

Socio-economic functions

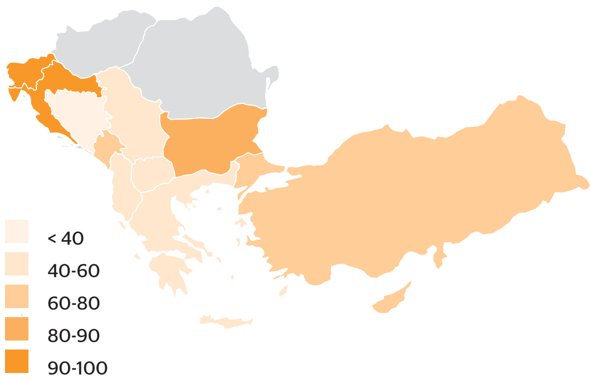
Most countries in the region supplied no information on the number of private holdings (6.1), but the four which did reported rather high numbers. In particular, the number of private forest holdings in Croatia and Slovenia is more than 30 percent of the rural population. In most countries of the region, the forest sector contributed less than 1.5 percent of national gross value added (Slovenia 1.8 percent) (6.2). Only three countries provided information on net entrepreneurial income of forest owners (6.3), with Slovenia near the European average with EUR 36/ha, but much less in Bulgaria and Greece. Three countries provided data on government expenditure for forest services (6.4): both Cyprus and Slovenia had an average over the period of about EUR 20/ha, but in Cyprus there has been a strong downward trend and in Slovenia a strong upward trend. In Slovenia, the forest sector labour force (6.5) is 1.2 percent of the population but in other countries of the region this share is less than 0.8 percent. Accidents for the workforce (6.6) were near the European average in the three countries which reported, but these data cannot yet be considered comparable. In seven of the 11 countries in the region, wood consumption per capita (6.7) was rather low, below 0.8 m^3/capita. Slovenia, Bosnia and Herzegovina and Montenegro are net exporters of wood and wood products (6.8), but the other countries are self-sufficient or net importers. In three countries of the region (Slovenia, Bosnia and Herzegovina, and the former Yugoslav Republic of Macedonia), wood accounted for more than 10 percent of national energy supply (6.9), and in the others for between three and nine percent. In almost all countries in the region, practically all forests are accessible for recreation (6.10), with the exception of Cyprus where only 40 percent is accessible. There are very few data on number of visits, so it is not possible to monitor the intensity of forest use for recreation. Five countries supplied at least partial data on the number of sites with cultural and spiritual values, and Slovenia was able to provide nearly complete information on this parameter.

All responding countries mentioned policy objectives and instruments in place to ensure economic viability (B.8) alongside other aspects of SFM. Most, but not all, responding countries made similar provisions for employment (B9) and public awareness (B.10). Six countries provided information on research, training and education framework and institutions (B.11). Fragmentary information on arrangements for cultural and spiritual values was provided (B12). In Bulgaria, this was linked to the national tourism strategy.

Overall policies, institutions, and instruments for sustainable forest management

Nine of the 11 countries have a national forest programme (A.1) and, according to the partial information supplied, these are mostly iterative, participatory and involve other sectors, although in Greece and Turkey the NFPs or similar do not satisfy all the MCPFE criteria for NFPs. Nine of the 11 countries provided full information about their institutional frameworks (A.2). The nine all report that the basic legal framework for the forest sector is at the level of the constitution or an act of Parliament (A.3) and is up to date. Eight countries provided information on financial instruments and economic policy for the sector (A.4), but only Bulgaria, Montenegro, Slovenia and the former Yugoslav Republic of Macedonia were able to report on financial flows in support of the sector. Eight countries provided information on forest-related informational strategy. Bulgaria, Slovenia and Turkey have a formal communication and outreach strategy (A.5).

Figure 106: South East Europe – percentage of key parameters for which data are available



4. Issues about policy development and implementation

The previous section has addressed the content of policies, but for a country to achieve sustainable forest management, it must have an adequate policy framework and institutions, such as a national forest programme or an equivalent, a forest law and adequately resourced institutions to prepare and implement policy, etc. These have been covered under Part A of the qualitative indicators and summarised at the country group level above. There are, nevertheless, two broad questions about policy development which are of great importance, although it is hard to provide objective answers to them. These are briefly discussed below.

Are the available data adequate for sound policy making?

All rational policy making depends on the availability of reliable information, which should cover the present situation, recent trends, likely developments and the possible consequences of decisions. Is the information on sustainable forest management in Europe sufficient for rational policy making at the national level, and for reliable assessment of trends at the European level? This section addresses mostly the situation at the European level, for the purposes of this assessment, but it is likely that data shortcomings at the European level reflect problems at the national level.

Based on the data reported by countries for State of Europe's Forests (SoEF) 2011[14], it appears that the quality, comparability and coverage has increased significantly since the previous report, SoEF 2007, thanks to constant efforts by national correspondents and international partners. The authors believe that the information base available for SOEF 2011 is adequate to describe and analyse in broad terms the trends in the European forest sector. Enough information is available to provide a broad picture for all criteria and all country groups.

However, there remain several important gaps and weaknesses, for particular indicators and particular countries:

- Indicators where data are missing for many countries: of the thirty-five key parameters used for the assessment (see list in Table 85), eight[15] had "No data" supplied by 20 or more countries. Five of the eight weak indicators were in Criterion 6 Socio-economic factors.
- Countries with significant problems of data availability: seven countries (setting aside the five countries with very small forest resources) had no data for 15 or more of the 35 key parameters[16]. Two of these countries are in Central-East Europe and five in South-East Europe.
- Indicators for which there are major problems of comparability: eight indicators present a serious problem of lack of comparability of the data which were supplied. These are 2.4 (forest damage), 3.3 (marketed non-wood goods), 3.4 (marketed services), 4.5 (deadwood), 4.8 (threatened forest species), 6.4 (expenditure for services), 6.6 (occupational safety and health) and 6.10 (accessibility for recreation).

There are also weaknesses with regard to the qualitative indicators, in particular those in Part B, where many respondents did not succeed in formulating the specific policy objectives or linking the instruments in place to the policy objectives.

Policy making also requires analysis of the outlook, of the type undertaken by European Forest Sector Outlook Studies (EFSOS). Experience with this study, at present in preparation, indicates that several useful and robust models, working together, will be able to construct relevant policy scenarios, outlining the consequences of certain strategic policy decisions. However, this analysis will not be complete before the Ministerial Conference in June 2011. In the future, sustainability assessments should deal simultaneously with the current situation, past trends and the future outlook.

To summarise, the situation as regards information has improved significantly, but there are still weaknesses. If countries wish to have reliable information on which to base their policy formulation, they should make the necessary investment in data collection and analysis to a minimum standard, exchanging experience with other countries in the region. To keep expense within an acceptable limit, they should follow the framework of the criteria and indicator set and the analysis of SoEF 2011, participating in on-going international cooperation wherever possible.

A special effort is needed in the following areas:

- Those countries, mostly in Central-East and South-East Europe, which are unable to supply data on many indicators should ensure that their data collection is suitably reinforced. The major consequence of this investment would be better policy formulation in those countries which at present are, in effect, allowing their policy choices to be influenced by empirical evidence from other countries, as they have no independent fact finding capacity.
- Research should be undertaken to strengthen the coverage of Criterion 6 Socio-economic functions, as that is the least well documented,and disseminate the knowledge and experience of leading countries to others through international cooperation.
- The structure of data collection on the qualitative indicators needs to be reviewed with a view to further strengthen monitoring of changes in policies, and to enable better assessments of links between policy actions and empirical data "on the ground".

[14] An assessment of data quality and availability for State of Europe's Forests 2011 is available on www.foresteurope.org and www.unece.org/timber

[15] Indicators 2.2, 3.4, 5.2, 6.3, 6.4, 6.6, 6.10, 6.11. It should be borne in mind that five countries have very small forest resources and naturally cannot provide statistical information beyond the barest minimum.

[16] Central-East Europe: Georgia, Republic of Moldova. South-East Europe: Albania, Bosnia and Herzegovina, Greece, Montenegro, the former Yugoslav Republic of Macedonia.

Are policies, institutions and policy instruments in place to address the main issues related to sustainable forest management?

Countries described their policies, institutions and instruments for sustainable forest management in Part A of the enquiry on qualitative indicators. These have been summarised at the country group level above. This information might be summarised at the European level (setting aside the five countries with very small forest resources) as follows:

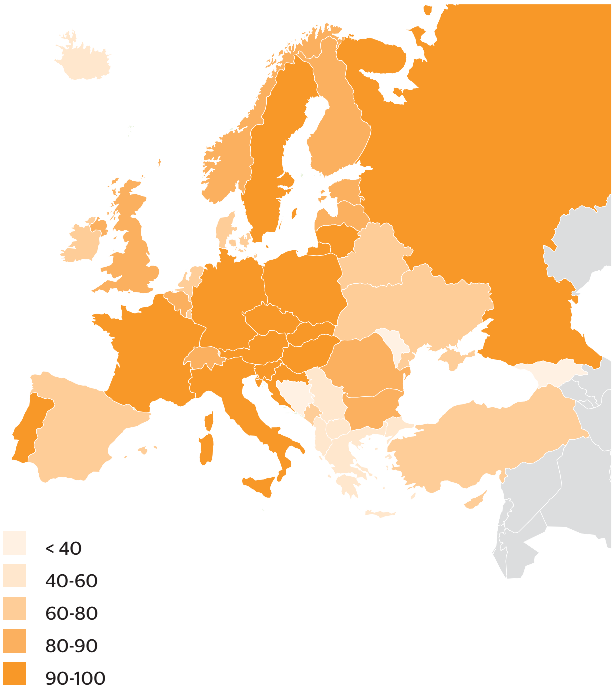
- All countries in Europe, except five[17], have national forest programmes, mostly in conformity with the MCPFE guidelines for NFPs. These lay down a clear basis for a consistent and comprehensive forest policy framework, elaborated through a consultative, participatory process.
- All countries reported institutions (ministries, state forest agencies) and legal and regulatory frameworks (forest law, and related regulations) for sustainable forest management, although the format did not make it possible to verify the effectiveness and efficiency of these institutions.
- Although it appears that all countries have economic and financial instruments to promote sustainable forest management and significant sums are transferred in the context of numerous subsidy and incentive schemes as well as by fiscal measures, only 25 countries were able to provide quantitative information on public support to forestry, and this information was often partial and not comparable. In the absence of this type of information, it is not possible to say how effective these instruments are in achieving their objectives, and whether they are the most efficient means of promoting sustainable forest management. In the present situation of extreme pressure on all public expenditure, all sectors are being called on to justify any expenditure of public funds in their area of competence. It must be considered a weakness that the forest sector cannot demonstrate objectively that the economic instruments in place are the most efficient means of reaching the stated policy goals.
- Almost all countries reported that informational means are in place to support sustainable forest management, including forest pedagogic, information campaigns, research institutes, support to forest owners, etc. However, only ten countries[18] have a formal governmental outreach and communication strategy.

A major question is whether the forest sector institutions are able to handle the increasingly important relations with other sectors to produce genuinely integrated policy making. Most countries reported participation of other sectors in NFP processes, and some reported that there are links with, for example, renewable energy, rural development or biodiversity action plans. However, insufficient information is available on this important aspect.

It appears, therefore, that in most countries of the region, the basic framework and institutions are, in fact, in place and adapted to present circumstances. This basic framework includes a national forest programme, institutions with clear mandates and sufficient resources, an effective forest law and regulations, financial, economic and informational instruments for policy.

The main concern is about the "solidity" of forest policy making: is it strategic enough, sufficiently integrated in/coordinated with wider national development goals and strategies, and inclusive enough – involving other sectors and different stakeholders adequately? There are also concerns about the resources available for economic support and the efficiency of the policy instruments. More countries could formulate an official outreach and communication strategy.

Figure 107: Europe – percentage of key parameters for which data are available



5. Conclusions and recommendations

Overview of the sustainability of forest management in Europe

This chapter has proposed a method for the objective and transparent assessment of progress towards sustainable forest management. This method is based on the FOREST EUROPE criteria and indicators for sustainable forest management, and uses the data supplied by countries, presented elsewhere in this report. Despite shortcomings, this method has produced results which appear sufficiently robust to be used for the broad picture of developments at the country group level. The data and method are not yet robust enough to assess individual countries, or to provide a single overall assessment for sustainability, which must be seen as the balance among all the criteria and the qualitative indicators. It is hoped that the method will be reviewed in detail and improved for future use.

An overview, by criterion and country group, is presented in Table 78. The detailed results by indicator have been presented and commented in section 3.

At the level of Europe, of the 48 assessments (6 country groups, 6 quantitative and 2 qualitative criteria), all except seven are at the level of 🌲🌲🌲 or 🌲🌲🌲🌲 (on a scale from 🌲 to 🌲🌲🌲🌲🌲), a result which may be considered satisfactory. Furthermore, most of the 🌲🌲 assessments at the country group/criterion level are due to lack of data, especially in South-East Europe, rather than the result of a situation or trend which causes concern. There is no evidence of systematic imbalance at the European level (such as systematically prioritising production over biodiversity or *vice versa*), which the indicator set is designed to detect. However, at the level of particular indicators, there are many situations assessed at 🌲🌲 and these "areas of concern" are highlighted below. The availability of data for the key parameters is summarised in Figure 107.

Sustainability of forest management, by country group

The situation by country group is summarised below, drawing attention to any major challenges for the country group. In the interest of prudence, the comments focus on areas of concern, without repeating the positive trends described in section 3.

Russian Federation

The Russian forest resource is the largest in the world, with a much higher share of forest untouched by man than any other European country. Most of the area west of the Urals is managed in a more intensive way, but to the east there is a huge expanse of remote forest with difficult and expensive access. The process of transition is ongoing, but all forests will remain in public ownership, with arrangements for long-term leases. A new Forest Code was approved in 2006 after intense discussion. The Russian forest has enormous economic and biodiversity significance, at the global level, but the problems of monitoring it are immense. There is concern about illegal logging in some parts of the Russian Federation, as well as about vulnerability of the boreal forest ecosystem to climate change (fires, melting of permafrost).

The assessment for the Russian Federation is 🌲🌲🌲 for criteria 1 (forest resource and carbon stocks), 2 (health and vitality), 3 (productive functions), 4 (biodiversity) and 6 (socio-economic functions) and Part A of the qualitative indicators, and 🌲🌲🌲🌲 for criterion 5 (protective functions) and Part B of the qualitative indicators (Table 79).

The more specific challenges for forest management in the Russian Federation can be identified by examining those indicators for which the assessment was 🌲🌲 or less.

Table 78: Assessment by country group and criterion, quantitative and qualitative indicators

	C1	C2	C3	C4	C5	C6	Part A	Part B
	Forest resources and global carbon stock	Health and vitality	Productive functions	Biodiversity	Protective functions	Socio-economic functions	Overall policies, institutions and instruments for sustainable forest management	Policies, institutions and instruments by policy area
Russian Federation	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲
North Europe	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲
Central-West Europe	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲🌲
Central-East Europe	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲🌲	🌲🌲🌲
South-West Europe	🌲🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲🌲	🌲🌲
South-East Europe	🌲🌲🌲	🌲🌲	🌲🌲	🌲🌲	🌲🌲🌲	🌲🌲	🌲🌲🌲	🌲🌲🌲

[17] Belarus reported it has no NFP. Bosnia and Herzegovina, Georgia, Montenegro and Serbia did not report on this question, so it is assumed they have no NFP.

[18] Bulgaria, Denmark, Estonia, Finland, Italy, Romania, Slovenia, Sweden, Turkey, UK,

These challenges are:

- To prevent reduction in the area of forest and other wooded land (1.1)
- To obtain information on soil condition, in particular the C/N ratio (2.2).
- To address the issue of major forest fires like those which occurred in 2010 (2.4)[19].
- To improve the value of marketed roundwood and marketed non-wood goods, as well as to collect information on the latter (3.2, 3.3).
- To examine the status and trends of landscape pattern, fragmentation and connectivity (4.7).
- To review what percentage of its forest species is threatened and, if necessary, take corrective action (4.8).
- To continue to increase the area of forest protected for biodiversity (4.9).
- To collect information on net entrepreneurial revenue of forest holdings (including publicly owned holdings) and ensure that it is at a sustainable level (6.3).
- To promote an increase in the consumption of wood and wood products (6.7).
- To generate more energy from wood, and monitor these developments (6.9).
- To collect information on forest use for recreation and develop this service (6.10).
- To collect and make available data on public expenditure for the administration, management and support of the forest sector, and take this into account in policy making (A.4).

North Europe

In most of North Europe, the boreal forest is at the centre of the landscape (exceptions are Iceland and, to a lesser extent, Denmark). The forest sector is mostly privately owned, well organised, and focused on wood production, with an intensive use of the resource and a sophisticated and well resourced institutional structure. There is a strong commitment throughout society to achieving environmental objectives. Forest-related questions have a high policy importance in the region.

The regional average assessment is 🌲🌲🌲 for all quantitative indicators and Part A of the qualitative indicators, and 🌲🌲🌲🌲 for Part B of the qualitative indicators (Table 80).

The more specific challenges at the country group level can be identified by examining those indicators for which the country group assessment was 🌲🌲.

These are:

- To collect better information on marketed non-wood goods (3.3) and services (3.4).
- To gain a better understanding of the status of threatened forest species, monitor trends and take action if necessary (4.8).
- In a few countries, to increase the area of forests protected for the conservation of biodiversity, to meet the CBD target (4.9).
- To separate information on areas with protective functions (soil and water) (5.1) from those with protective functions (infrastructure) (5.2) and, if appropriate, formally designate these areas.
- To collect better information on government expenditure for services (6.4), in order to understand better forests' contribution to the public good and how it is financed.
- To improve understanding and measurement of the cultural and spiritual functions of forests (6.11).

Central-West Europe

Central-West Europe contains many densely populated and highly prosperous urban countries, although there are significant rural and mountainous areas, which is where most of the forests are. As a result, forest-related issues are not central to these countries' economy or society, although populations have tended to react strongly to threats to their forests. Forest institutions are stable and well resourced, even if they lack political weight relative to other sections of society which can mobilise more financial and human resources.

The regional average assessment is 🌲🌲🌲 for quantitative indicators, except for protective functions (🌲🌲) and productive functions (🌲🌲🌲🌲), 🌲🌲🌲 for Part A and 🌲🌲🌲🌲 for Part B of the qualitative indicators (Table 81). As regards protective functions, this reflects the fact that some countries where the protective function is relatively unimportant (notably because there are no or few mountains) have not made specific arrangements in this area.

The more specific challenges at the country group level can be identified by examining those indicators for which the country group assessment was 🌲, or for which in individual countries it was 🌲.

These are:

- To reduce nitrogen deposition as it may be exceeding critical limits for forest ecosystems (2.1).
- To take measures to conserve forest soils, which are in danger of imbalance in some areas (2.2).
- To reverse the trend towards forest landscape fragmentation (4.7).
- To gain a better understanding of the status of threatened forest species, monitor trends and take action if necessary (4.8).
- To separate information on areas with protective functions (soil and water) (5.1) from those with protective functions (infrastructure) (5.2) and, if appropriate, formally designate these areas.
- To consider whether forest management can be sustainable if net entrepreneurial revenue is consistently negative and to consider taking policy action in the few countries where this is the case (6.4).
- To consider the employment implications of forest sector developments (including forestry and the forest industries) although, because of the size of the non-forest economy, the forest sector in Central-West Europe will never be a major employer at the national level, even though it is important in several regions (6.5).

Table 79: Russian Federation – overall assessment

		Assessment	Areas of concern (some indicators at 🌲🌲 or below)
C1	**Forest resources and global carbon stock**	🌲🌲🌲	Decline in area of other wooded land, possible decrease in carbon stock.
C2	**Health and vitality**	🌲🌲🌲	Lack of data on soil condition and on defoliation outside North-West Russia.
C3	**Productive functions**	🌲🌲🌲	Low value of marketed roundwood compared to volume of resource. Low per hectare values for marketed non-wood goods and services.
C4	**Biodiversity**	🌲🌲🌲	Relatively small percentage of protected forest, and of area managed for gene conservation. No information on landscape pattern.
C5	**Protective functions**	🌲🌲🌲🌲	All indicators positive.
C6	**Socio-economic functions**	🌲🌲🌲	Low revenue and government expenditure per hectare. Small share of wood energy.
Part A	**Overall policies, institutions and instruments for sustainable forest management**	🌲🌲🌲	Little quantitative information on public expenditure.
Part B	**Policies, institutions and instruments by policy area**	🌲🌲🌲🌲	Objectives for wood consumption not clear.

Table 80: North Europe – overall assessment

		Assessment	Areas of concern (some indicators at 🌲🌲 or below)
C1	**Forest resources and global carbon stock**	🌲🌲🌲	All indicators positive at country group level.
C2	**Health and vitality**	🌲🌲🌲	Large area at risk from eutrophication, C/N ratio approaching warning level in two countries.
C3	**Productive functions**	🌲🌲🌲	Weak data on marketed non-wood goods, and marketed services.
C4	**Biodiversity**	🌲🌲🌲	Information gaps on threatened forest species, low percentage of forest protected for biodiversity in some countries.
C5	**Protective functions**	🌲🌲🌲	Inability to separate protective functions (soil and water) from those for infrastructure.
C6	**Socio-economic functions**	🌲🌲🌲	Only partial information on government expenditure for forest services and on sites with cultural and spiritual value.
Part A	**Overall policies, institutions and instruments for sustainable forest management**	🌲🌲🌲	All indicators positive at country group level.
Part B	**Policies, institutions and instruments by policy area**	🌲🌲🌲🌲	All indicators positive at country group level.

Table 81: Central-West Europe – overall assessment

		Assessment	Areas of concern (some indicators at 🌲🌲 or below)
C1	**Forest resources and global carbon stock**	🌲🌲🌲	All indicators positive at country group level.
C2	**Health and vitality**	🌲🌲🌲	High percentage of land area at risk of eutrophication from nitrogen deposition. Near warning level for soil imbalances in some countries.
C3	**Productive functions**	🌲🌲🌲🌲	All indicators positive at country group level.
C4	**Biodiversity**	🌲🌲🌲	Landscape pattern and fragmentation. Weak data on threatened forest species.
C5	**Protective functions**	🌲🌲	Inability to separate protective functions (soil and water) from protective functions (infrastructure).
C6	**Socio-economic functions**	🌲🌲🌲	Negative net entrepreneurial revenues in a few countries. Negligible share of wood energy in a few countries. Small share of total workforce in forest sector.
Part A	**Overall policies, institutions and instruments for sustainable forest management**	🌲🌲🌲	All indicators positive at country group level.
Part B	**Policies, institutions and instruments by policy area**	🌲🌲🌲🌲	All indicators positive at country group level.

[19] The overall reported percentage of forest damage in the Russian Federation is relatively low, but may be under-reported because of the remoteness of many forest areas, and does not include data for 2010, when wild fires caused major damage to settlements and agriculture as well as forests.

Central-East Europe

The countries in Central-East Europe were all centrally planned 25 years ago, but many have now been transformed and are increasingly prosperous. Five countries in this group are now members of the EU. The transition process has been a challenge to forest institutions, but in many countries these institutions have retained their basis of traditional silvicultural values. Ecologically the country group is very heterogeneous, running from the Alpine states to the Caucasus and the Volga basin.

The regional average assessment is for quantitative indicators, except for socio-economic functions ( ) and forest resources ( ), and for all qualitative indicators (Table 82). The result for socio-economic indicators reflects the fact that the region is not very prosperous on average, although the EU members in the region are developing rapidly in this respect. There are also significant weaknesses as regards information on socio-economic aspects. Several countries did not report on the qualitative indicators, bringing down the regional average.

The more specific challenges at the country group level can be identified by examining those indicators for which the country group assessment was .

These challenges are:

- To reduce nitrogen deposition as it may be exceeding critical limits in many areas (2.1).
- To take measures to conserve forest soils, which are in danger of imbalance from nitrogen input in some areas (2.2).
- To increase the value of marketed roundwood (3.2).
- To collect adequate information on marketed non-wood goods and marketed services, and use this information as a basis for policy making in the area. (3.3, 3.4).
- For those countries which do not have this information already, to participate in research work on landscape patterns to monitor trends and to take steps to reduce fragmentation where research shows this is necessary (4.7).
- To collect information on net entrepreneurial revenue of forest operations, private or public, and take policy measures, if it appears necessary, to ensure that net revenue from forest ownership or management is adequate (6.3).
- To collect information on government expenditure for forest services and, if necessary, consider adjusting it to society's needs (6.4).
- To monitor the number and characteristics of the forest sector workforce on a continuing basis to ensure that it is adequate to implement sustainable forest management (6.5).
- To ensure that wood makes a full contribution to national energy supply, and to put in place adequate monitoring systems for wood energy (6.9).
- To collect adequate information on use of forests for recreation, for instance the number of forest visits, and develop this function if the recorded levels are low or excessively concentrated (6.10).
- To collect adequate information on cultural and spiritual values of forests (6.11).
- To collect and make available adequate information on public expenditure on the forest sector (administration, regulation, management, support to private owners) and use it to develop efficient and effective forest sector support policies (A.4).

South-West Europe

In South-West Europe, most countries have a distinctively Mediterranean forest on much, but not all, of their territory. There are threats from fire, nitrogen deposition, changes in landscape pattern and rural depopulation, but some areas are managed intensively, sometimes with introduced species. There are serious information gaps.

The regional average assessment is for quantitative indicators, except forest resources ( ), and for Part A of qualitative indicators (overall policies and institutions), but for Part B Policies and instruments by policy area, chiefly because of non-reporting by large countries on several indicators (Table 83).

The more specific challenges at the country group level can be identified by examining those indicators for which the country group assessment was . In South-West Europe, most of these concern the lack of information, which makes it difficult to achieve truly sustainable forest management, or indeed to know when it has been achieved.

These specific challenges are:

- To improve information on age structure of forests (which is mostly missing) (1.3).
- To reduce nitrogen deposition as it may be exceeding critical limits in many areas (2.1).
- To collect and analyse information on marketed services from forests (no responses from South West Europe) (3.4).
- To collect more information on regeneration methods and consider whether the share of natural regeneration might be increased in some countries (4.2).
- To carry out surveys of the level of deadwood in forest stands (4.5).
- To develop strategies to improve the forest landscape pattern (4.7).
- To improve information on contribution of forest sector to GDP where this has not been supplied (6.2).
- To improve information on supply and consumption of wood energy (6.9).
- To carry out surveys on recreation use of the forests, especially number of visits (6.10).
- To analyse better the specific objectives of forest policy in certain areas, whether objectives have been clearly identified and whether policy instruments are in place, notably as regards carbon balance, production and use of non-wood goods and services, protective forests, economic viability, employment (including safety and health), public awareness and participation, research training and education and cultural and spiritual values (Part B).

Table 82: Central-East Europe – overall assessment

		Assessment	Areas of concern (some indicators at 🌲🌲 or below)
C1	**Forest resources and global carbon stock**	🌲🌲🌲🌲	Decline in forest cover in one country.
C2	**Health and vitality**	🌲🌲🌲	Entire land area at risk of eutrophication from nitrogen deposition. C/N ratio near warning level for soil imbalance in one country. Defoliation level also very high in one country.
C3	**Productive functions**	🌲🌲🌲	Weak data, and generally low per hectare values for marketed non-wood goods and services.
C4	**Biodiversity**	🌲🌲🌲	Landscape pattern: very fragmented forest in some countries and data missing on landscape pattern in others.
C5	**Protective functions**	🌲🌲🌲	All indicators positive at country group level.
C6	**Socio-economic functions**	🌲🌲	Weak data on net revenue (low values for those reporting) and government expenditure. Small share of total workforce in forest sector. Low levels of wood consumption. Reported share of wood energy low. Weak information on recreational use and sites with cultural and spiritual values.
Part A	**Overall policies, institutions and instruments for sustainable forest management**	🌲🌲🌲	Several countries provided little information on financial instruments for forests.
Part B	**Policies, institutions and instruments by policy area**	🌲🌲🌲	Several countries did not report on land use objectives.

Table 83: South-West Europe – overall assessment

		Assessment	Areas of concern (some indicators at 🌲🌲 or below)
C1	**Forest resources and global carbon stock**	🌲🌲🌲🌲	Missing data on age class structure.
C2	**Health and vitality**	🌲🌲🌲	High percentage of land at risk of eutrophication due to nitrogen input. Significant fire damage.
C3	**Productive functions**	🌲🌲🌲	No data on value of marketed forest services.
C4	**Biodiversity**	🌲🌲🌲	Data missing on share of natural regeneration and levels of deadwood in some countries. High fragmentation and negative trends for forest landscape pattern in some countries.
C5	**Protective functions**	🌲🌲🌲	All indicators positive at country group level.
C6	**Socio-economic functions**	🌲🌲🌲	Data missing in some countries on share of forest sector in GDP, wood energy and number of visits.
Part A	**Overall policies, institutions and instruments for sustainable forest management**	🌲🌲🌲	All indicators positive at country group level.
Part B	**Policies, institutions and instruments by policy area**	🌲🌲	Incomplete or missing data for many indicators in Part B.

South-East Europe

Most of the countries in South East Europe have rather large rural populations and low per capita income by European standards. Some have new institutions emerging from the conflicts in the former Yugoslavia. Fire is an issue all over the region. In one country, the forest itself is under severe pressure from overgrazing and overcutting (mostly for fuel) by the rural population. It appears that, in many areas, the forests are not intensively managed and not well protected for biodiversity, but information is very weak, so this cannot be demonstrated. The weakness of the information base is indeed a threat to sustainable forest management in South East Europe.

The regional average assessment is 🌲🌲🌲 for criteria 1 (forest resource and carbon) and 5 (protective functions), but only 🌲🌲 for criteria 2 (health and vitality), 3 (productive functions), 4 (biodiversity) and 6 (socio-economic functions). For ten of the indicators, the regional average was only 🌲. The regional average assessment was 🌲🌲🌲 for Part A and Part B of the qualitative indicators (Table 84). The main reason for these relatively unsatisfactory results is the fact that many of the countries in South-East Europe have not supplied adequate information on the forest sector (and probably do not dispose of that information at all): without this information, it is not possible to say with any objectivity whether or not forest management is sustainable.

The more specific challenges at the country group level can be identified by examining those indicators for which the country group assessment was 🌲🌲 or 🌲.

These are:

- To collect information on age class structure for even-aged forests, and use this for forest sector and wood supply planning (1.3).

- To reduce nitrogen deposition as it may be exceeding critical limits for forest ecosystems in many areas (2.1).
- To take measures to conserve forest soils, which are in danger of imbalance from nitrogen input in some areas (2.2).
- To collect reliable information on both increment and fellings, and ensure that there is an adequate balance between them, to prevent deterioration of the resource (3.1).
- To collect information on marketed non-wood goods and marketed services, and use this to formulate ambitious policies in these areas (3.3, 3.4).
- To collect information on the species composition of the forests in the region and to consider whether the share of single species forest is appropriate for the circumstances (4.1).
- To collect information on deadwood in forest stands, and consider whether this is the appropriate level and, if not, what should be changed (4.5).
- To collect and analyse information on threatened forest species, and use it in their biodiversity conservation policy (4.8).
- To consider, in countries where the share of protected forest is below the CBD target, whether this share should be increased (4.9).
- To collect information on private forest holdings and, in general, on the number and characteristics of private forest owners (6.1).
- To collect information on the contribution of the forest sector to national income, in those countries which have not done so already (6.2).

To collect information on the income of forest owners, public and private, and to examine whether it is adequate for sustainable forest management (6.3).

- To collect and analyse information on government expenditure for forest services, and consider whether it is adequate to ensure delivery of the services needed by society (6.4).
- To re-examine the potential of the forest sector as a source of rural employment, especially as many of the countries in South-East Europe are rural in nature (6.5).
- To set up systems to monitor the occupational safety and health of the forest workforce, and take appropriate action to improve it if necessary (6.6).
- To consider the promotion of consumption of wood and wood products (6.7).
- To collect information on how much of the forest is accessible for recreation and collect statistics on forest visits (6.10).
- To collect information on sites of cultural and spiritual value and, if necessary, take action to protect these sites (6.11).
- To ensure, where this is not already the case, that the NFP or similar in the country satisfies the agreed MCPFE guidance for NFPs (A.1).
- To collect adequate information on public expenditure on the forest sector (administration, regulation, management, support to private owners) and use it to develop efficient and effective forest sector support policies (A.4).

Table 84: South-East Europe – overall assessment

		Assessment	Areas of concern (some indicators at 🌲🌲 or below)
C1	**Forest resources and global carbon stock**	🌲🌲🌲	One country with steeply falling forest cover and growing stock. Data mostly missing on age class structure.
C2	**Health and vitality**	🌲🌲	Nearly all land area at risk of eutrophication due to nitrogen deposition. Data mostly missing on soil condition. Significant fire damage.
C3	**Productive functions**	🌲🌲	In one country fellings greatly exceed NAI . Rather low per hectare values for marketed non-wood goods and data missing on marketed forest services.
C4	**Biodiversity**	🌲🌲	Several countries with a high share of single species stands. Data mostly missing for levels of deadwood and on threatened forest species. In many countries, low share of forest protected for conservation of biodiversity.
C5	**Protective functions**	🌲🌲🌲	All indicators positive at country group level.
C6	**Socio-economic functions**	🌲🌲	Data missing for several countries on many key parameters, including forest holdings, contribution of forest sector to GDP, net revenue, government expenditure for services, forest sector workforce, occupational safety and health, number of visits and of sites with cultural and spiritual values. Low levels of wood consumption.
Part A	**Overall policies, institutions and instruments for sustainable forest management**	🌲🌲🌲	Only a few countries provided quantitative data on economic support for the forest sector.
Part B	**Policies, institutions and instruments by policy area**	🌲🌲🌲	Several large countries did not reply to Part B or did not formulate objectives and link them to specific instruments.

The Way Forward: Four Major Challenges to and Opportunities for Forest Sector Policy in Europe

Introduction

Parts I and II of the *State of Europe's Forests 2011* described the status and trends using the structure of the pan-European criteria and indicators of sustainable forest management (SFM). The first sections of Part III assessed progress towards SFM, focusing on the country group level and the balance among the criteria. However, there are some major cross sectoral challenges and opportunities for SFM in Europe, which cut across the structure of the indicators and which should be addressed in the light of the outlook for the sector as whole.

This chapter will review four major challenges for the sector: climate change, energy, biodiversity and the green economy. For each, it will outline the challenge, and then systematically present the information relevant to this challenge which has been supplied in the context of SoEF 2011, as a sound factual basis for policy making. It brings together relevant results from the quantitative and qualitative indicators, as well as analysis of other official studies, notably the forthcoming European Forest Sector Outlook Study (EFSOS) to build a picture of the major complex challenges facing the European forest sector. Finally, it will summarise the main challenges and opportunities for policy makers.

All four challenges are exceptionally complex and uncertain and involve actors and policy goals from outside the forest sector. All need analysis far more detailed than is possible in SoEF 2011 – and are indeed being analysed in many different fora. The objective of the present short chapter is to place these complex challenges in the context of broader information on the forest sector and to draw the attention of those responsible for forest sector policy to issues which do not fit well in the conventional policy framework.

The forest sector and climate change

The challenge of climate change

The forest is a major carbon store and sequesters carbon. Wood, which is carbon-neutral when sustainably produced, can replace non-renewable materials and energy, thus helping to mitigate climate change. However, the forest itself is vulnerable to climate change and will need to adapt to a changed climate in the future. The forest sector, therefore, has several potential roles for the mitigation of, and adaptation to, climate change. However, there are trade-offs among the various climate change-related functions, and between them and the many other functions of the forest. To take a very simple example, a single cubic metre of wood cannot be simultaneously a store of carbon and a source of renewable energy. The challenge for the forest sector as a whole is to make a major contribution to climate change mitigation and adaptation, without neglecting the other dimensions of SFM. The formulation of policy is complicated by uncertainty – about the mechanisms of climate change, about the future climate change regime, and about possible strategies for the forest sector.

Status and trends for the forest sector and climate change

From the quantitative and qualitative indicator data collected for this study it is possible to say the following (indicator reference in brackets):

- European forests are a significant carbon pool (1.4).
- This carbon pool has been increasing strongly as growing stock increases (1.2) because fellings are well below increment (3.1), and forest area has been expanding (1.1), although the latter has little

influence on growing stock for the early years of the rotation.

- There are a number of types of damage to the European forest (2.4) and defoliation occurs (2.3). Some of these types of damage (notably fires and storm, but also perhaps defoliation, and damage attributable to droughts) could be negatively affected by a changed climate, although at present knowledge on this is insufficient as a basis for adaptation strategies. The damage itself also results in carbon emissions to the atmosphere, as wood is burnt or decomposed.
- At present, there is significant revenue to forest owners, public and private, from marketed roundwood (3.2), non-wood goods (3.3) and forest services (3.4). In only a very few cases have countries reported revenue from carbon sequestration. If, under a future climate regime, there were significant payments for carbon sequestration by European forests, this would add an option for revenue flow to the present ones. The type of silviculture necessary to maximise carbon sequestration might, however, have a negative impact on other revenues. The changing price structure facing forest owners might influence their management decisions.
- Biodiversity (Criterion 4) is interlinked with climate change in many ways: plantations of single, often introduced, species (4.1, 4.3, 4.4) are said to be less resilient in the case of climate change, although they will probably form part of mitigation strategies as plantations are efficient means to sequester carbon and produce renewable materials and fuels. Adaptation strategies could well involve introducing species outside their natural range to forestall a changing climate. Climate change could raise the threat to species (4.8) and the ecosystems which justify the protection of forest for biodiversity (4.9).
- Climate change would threaten the ability of forest to perform their protective functions (Criterion 5).
- Europe consumes annually about 1 115 million m3 roundwood equivalent of forest products (6.7): to replace this by non-renewable materials would increase emissions of greenhouse gases and reduce climate change mitigation. Some of these lasting forest products serve as a carbon store ("harvested wood products" in the Kyoto Protocol terminology).
- As Europe is at present a net exporter of forest products (6.8), it is not at present exporting its "carbon footprint" to other regions, although the emerging results of EFSOS suggest that this could change if the high targets for wood energy are to be achieved. There is some uncertainty about the role of further processed wood products, such as furniture or joinery or paper products, as the carbon in these products is not included in the calculation.
- The use of wood as a renewable energy source makes an important contribution to climate change mitigation. At present wood provides about 3.7 percent of Europe's energy consumption, but much more in certain countries (6.9). Targets have been set, in the EU framework and elsewhere, to raise the share of renewables, as part of climate change policy, as well as for energy security. To achieve these targets would necessitate a significant mobilisation of wood from Europe's forests, trees outside the forest, industries and recovered wood products, as well as major efforts to develop other renewables and energy efficiency.
- There are in place important policies on carbon balance (B.2), which address both climate change mitigation and adaptation. Considerable emphasis is put on carbon sequestration by forests and wood products and the adaptation of forests to climate change impacts. The vital role of forests in reducing GHG emissions and in mitigating and adapting to climate change is not only put forward in national climate and energy policies, but partly also in National Forest Programmes and forest laws. SFM is often reported as a key concept contributing to climate change mitigation. Most countries established specialised entities responsible for implementing various regulations and programmes on climate change, renewable energy and energy efficiency. New national instruments are influenced by recent international climate change debates, agreements and targets.
- EFSOS is constructing a policy scenario outlining the silvicultural measures which would be necessary to maximise carbon stocks in Europe's forests, and the consequences of these assumptions for other parts of the sector.

Wood and energy

The challenge of wood and energy

The promotion of renewable energies, including wood, is a central part of energy and climate change policies all over the region. Evidence has accumulated in recent years that much more wood is being used for energy than previously thought, and that this volume has been increasing, under the influence of policy instruments and, above all, rising energy prices. Most countries, and the EU, have set ambitious targets for renewable energy. This is a positive development for forest owners who have welcomed the emergence of a "third market"[28], and higher revenue as global energy prices have in effect put a floor under the price for wood fibre, which can no longer fall below its energy value (at least long term, and in accessible regions). These developments have been less welcome to the traditional forest industries, which have to face increasing competition for their raw material.

The challenge to the sector as a whole is to expand strongly the supply of wood energy, from roundwood removals, but also from harvest residues, landscape care wood[29], industry residues and recovered wood, and to meet the ambitious targets for renewable energy without, however, undermining sustainability as regards wood supply and all other functions, in Europe and elsewhere. Furthermore, wood energy supply and use should be organised for maximum efficiency and minimum waste, notably using wood as raw material, and recycling it if possible, before energy use (the "cascade" approach), and the energy should be generated efficiently in modern clean plants, with high combustion efficiency (notably thorough combined heat and power) and minimum release of micro-particles, which carry significant risks for human health.

Status and trends of wood energy for the forest sector and climate change

From the quantitative and qualitative indicator data collected for this study, it is possible to say the following (indicator reference in brackets):

- Wood energy contributes 3.7 percent of the final energy consumed in Europe excluding the Russian Federation and 2.5 percent of the total final energy consumption in the region of Forest Europe, but much more in some countries (6.9).
- Wood fibres from forest, other wooded land and trees outside forests remain the most important source for wood energy, followed by residues from wood processing industries, post-consumer recovered wood and processed wood based fuels (6.9).
- The value of marketed woodfuel roundwood (from the forest) in 2010 was nearly EUR 120 million, about a quarter of the value of marketed industrial roundwood (3.2). This does not include the value of other woodfuels, marketed or not.
- Fellings, which include fellings of wood for energy, alongside other assortments, are still well below increment, at the current rate of wood energy supply, in all countries except one (3.1).
- Although the amount of deadwood (considered favourable to biodiversity) varies widely between forest types, data suggest that the amount of deadwood per hectare has slightly increased in most regions over the past 20 years (4.5). Increased use of forest residues and more intensive harvesting for energy could reverse this trend, possibly with negative consequences for biodiversity.
- For the millions of small private forest owners (6.1), local energy markets represent one of the few outlets available for the wood they grow.
- At the policy level (B.4) two-thirds of reporting countries, and the EU, have targets to increase the use of wood for energy. In addition to the forest law, several countries refer to bio-energy, related regulations with regard to the production and use of wood. Furthermore, demand-side measures are mentioned, including renewable energy targets, as means for promoting use of wood.

An important question, to which SoEF 2011 does not provide an answer, is how much wood could realistically be supplied, on a sustainable basis, for energy in Europe. Would this be enough to meet the renewable energy targets and what would be the consequences of higher wood energy supply for the sector as whole? These questions have been addressed in the EUwood project (Mantau, 2010), of which UNECE/FAO was a partner. In summary, it will probably be possible to meet the wood part of the renewable energy targets in 2020 without harming the wood supply of the traditional industries, if a number of conditions are fulfilled: energy efficiency targets must be met, other renewable energies must grow faster than wood, and there must be an exceptional mobilisation strategy, with long-term commitment and investment, a comprehensive approach, numerous specific policy measures and favourable framework conditions (Prins, 2010). For 2030, even with the high mobilisation described above, it would be difficult to meet the energy targets without affecting wood supply to the industries or importing large volumes from outside Europe. Such high mobilisation would be quite different from today's forest management, especially in areas where at present forest management is not very intensive. High mobilisation of wood to meet ambitious energy targets would certainly have multiple consequences, on rural income, on silviculture and on biodiversity.

Conservation of forest biodiversity

The challenge for conservation of forest biodiversity

The Convention on Biological Diversity's objective is to achieve a significant reduction in the rate of biodiversity loss, while the EU's target is to halt biodiversity loss in the EU by 2020. Forest Europe ministers made commitments in the field of biodiversity in 1993 and 2003. Many countries have similar objectives. These targets are usually translated into strategies and plans, which naturally include forest biodiversity alongside other biodiversity. Over the past decades in Europe, large areas of forest have been protected for the conservation of biodiversity; regulations and guidelines have influenced forestry practice to make it more friendly to biodiversity. However, biodiversity is very difficult to measure directly, so it is not clear, despite intense efforts to monitor trends, whether the measures taken have achieved their objectives and whether they are sufficient to halt the loss of Europe's forest biodiversity. The challenge is not only to conserve biodiversity but to do it in an efficient and flexible way, using sophisticated policy instruments, including payment for ecosystem services, informational means, certification, etc., in addition to regulation and the creation of protected areas.

Status and trends for forest biodiversity

From the quantitative and qualitative indicator data collected for this study, it is possible to say the following (indicator reference in brackets):

- Over the last 10 years, the area of Europe's forests designated for biodiversity and landscape protection (4.9) has increased by half a million ha annually. About 10 percent of European forests is

[28] In addition to sawlogs and pulpwood.

[29] Wood arising from operations like urban forestry, road maintenance, orchard tending, etc.

protected with the main objective of conserving biodiversity and about 9 percent with the main objective of protecting landscape, which accounts for an area of 39 million ha. The strictness of protection for biodiversity varies considerably within Europe.
- About 87 percent of the European forests, excluding the Russian Federation, is classified as semi-natural (4.3). In the Russian Federation, 32 percent of the forest is "undisturbed by man".
- Nearly 70 percent of the total forest area in Europe, excluding the Russian Federation, is regenerated naturally or through natural expansion (4.2). Natural regeneration is expanding in Central European regions, while in other European regions planting and afforestation are the most used annual regeneration types.
- The area dominated by introduced tree species (4.4) increased slightly in absolute numbers from 2005 to 2010 in Europe (excluding the Russian Federation, which has a negligible area of introduced tree species) and covers around 9 million ha or 4 percent of the forest area. No noticeable changes have been observed over the last 10 years. A small proportion of the total forest area, one million ha, is occupied by tree species considered invasive, notably Robinia pseudoacacia in central Europe.
- About 70 percent of the forests in Europe is dominated by two or more tree species, and the remaining 30 percent is dominated by one tree species alone, mainly coniferous (4.1). The area of forest that consists of a single tree species has decreased annually during the last 15-year period by around 0.6 percent. In some areas such as the boreal forest, single species stands are often the natural norm, while elsewhere they indicate more intensive, production-oriented silviculture.
- Data suggest that the amount of deadwood (4.5), particularly standing deadwood, has been slightly increasing in most of Europe's regions over the past 20 years. However, the amount of deadwood per hectare varies considerably. The SoEF results indicate that the change in forest practices towards more nature-oriented management can be observed in forest characteristics.
- In 2010, a total of 446 000 ha and 7 700 ha of forests were managed for in situ and ex situ gene conservation, respectively, and 860 000 ha for seed production in Europe excluding the Russian Federation (4.6). The areas managed for ex situ conservation and seed production increased during the period 1990- 2010.
- Trends in forest connectivity in the landscape context (4.7) have been assessed and are reported by country for the first time. It is possible to identify regions with large forest connectivity loss caused by fire and transport infrastructure construction. Results indicate that expansion of forest area after natural succession or restoration in a given region does not necessarily increase the connectivity.
- More information than before was supplied on threatened forest species, but the information is not yet comparable and it is not yet possible to identify trends (4.8).
- It is important to monitor trends for the biodiversity of specific forest types as these trends can be masked by overall average developments over all forest types. Between 7 and 10 countries are able to report on a pilot basis on three biodiversity indicators by forest type.
- Trends in health and vitality of forests (Criterion 2) may influence forest biodiversity, when they move beyond the range of naturally occurring damage, for instance because of climate change or pollution.
- Marketed forest services (3.4) include biodiversity-related services, marketed either to governments or to environmental organisations. However, little is known about this aspect as yet.
- Most European forests are under a management plan or an equivalent (3.5), which typically includes management of the biodiversity of the forest in question.
- The large number of small private holdings in Europe (6.1) makes it difficult to manage forests for conservation of biodiversity, through lack of resources and knowledge and because the scale of management is too small to correspond to biodiversity needs. However, lightly managed or unmanaged forests, which are common on small holdings, are often positive for biodiversity.
- Although data on forest visits (6.10) are weak, it is clear that recreation of all types is the major function for many forests near urban areas or where tourism is important. High intensity of recreation use can threaten biodiversity (e.g. through trampling vegetation and disturbing wildlife) but also can encourage managers to maintain "attractive" forests, with characteristics which are often biodiversity-friendly (varied species, old stands, openings etc.). It is often possible to provide recreation and biodiversity functions simultaneously.
- With regard to policy on biodiversity (B.6), measures are being taken to encourage deadwood accumulation. Although several countries have quantified targets regarding forest protected areas, in most cases, the level of protection remained unclear. Several countries highlight integrated management, or the concept of SFM, as the overall approach to better contribute to forest biodiversity conservation and management. Countries with important forest sectors highlighted programmes to promote the conservation and use of forest genetic resources. While the institutional framework remains stable, the legal frameworks towards biodiversity have been subject to amendments in several countries and financial instruments seem to be of higher importance than before. In particular private forest owners ask for adequate incentives or compensation schemes to conserve biodiversity.

Sustainable forest management in a green economy

Challenges for the forest sector in a green economy

According to UNEP (UNEP, 2011), a green economy is one that "*results in 'improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities'. In its simplest expression, a green economy is low carbon, resource efficient, and socially inclusive. In a green economy, growth in income and employment should be driven by public and private investments that reduce carbon emissions and pollutio n, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services.*" (UNEP, 2011) A green economy is considered one of several ways to achieve sustainable development, not the only way.

Many would consider that the European forest sector at present displays many of the characteristics of a green economy. The results of SoEF 2011 which are summarised below seem to confirm that the sector is indeed low carbon, resource efficient and, at least in part, socially inclusive. However, the European forest sector functions in an economy which is not "green"; economic incentives and mechanisms inside the sector, of necessity, follow the general rules, with many ecosystem services provided without explicit compensation and many distortions of price relationships. Agriculture, fossil fuels, and many non-renewable materials cause significant environmental, even social, damage, which are not reflected in their final cost, as they are borne by society as a whole. It is likely – although this still needs to be demonstrated – that the full life-cycle cost of sustainably produced wood products is less than that of competing materials and fuels.

The challenge for the European forest sector is to develop further those aspects which are part of the green economy, such as green jobs, sustainable consumption patterns, recycling and recovery, increased supply of renewable energy and ecosystem services. This will involve innovation as regards products, processes and services as well as business models, and much improved communication. In addition, it should promote these practices throughout the economy and society, both to share its experience and to work towards a more level playing field between the forest sector and its competitors for land capital and human resources.

Status and trends relevant to the forest sector in a green economy

From the available data for quantitative and qualitative indicators, it is possible to say in which ways the European forest sector has the characteristics of a green economy: carbon neutral, resource efficient and socially inclusive (references to indicators in brackets).

The European forest sector has the following characteristics which may be considered *carbon neutral* or tending in that direction:

- The carbon stock in forests has been increasing steadily (1.4).
- Fellings are below increment, so the European forest remains a carbon sink as growing stock increases (3.1, 1.2).
- Europe consumes large volumes of forest products (6.7). As these are mostly from renewable sources, if they were replaced by other materials, the emissions of greenhouse gases over the whole life-cycle would probably be much higher.
- As Europe is a net exporter of forest products (6.8), it does not export its carbon footprint for forest products to other regions.
- It produces and consumes large amounts of wood-based energy (6.9) which substitute for fossil fuels.
- At the policy level (B.2), considerable emphasis is put on mitigation of climate change, notably through carbon sequestration by forests and wood products, and on the adaptation of forests to climate change impacts. The vital role of forests in reducing greenhouse gas emissions and in mitigating and adapting to climate change is not only put forward in national climate and energy policies, but partly also in National Forest Programmes and forest laws. SFM is often reported as a key concept contributing to climate change mitigation.

The European forest sector has the following characteristics which may be considered *resource efficient*, in that all the wood is used, and there is practically no waste during processing or after consumption (most of the analysis is taken from the EUwood project):

- Most of the residues of the forest industries are used as raw material or source of energy (Saal, 2010; Steierer, 2010).
- Forest products (both paper and solid wood products) are recovered for use as raw material or energy (Leek, 2010). There is scope for expanding the collection of recovered wood products, which would otherwise enter the solid waste stream. Recovered paper is nearing the technical limits of recovery, although some improvement is considered possible.
- Large parts of the forest industries are energy self-sufficient or net energy suppliers through use of their own residues (black liquor, bark etc.) as sources of energy. Increasingly pulp mills work on a closed circuit principle, releasing minimum amounts of solid and liquid waste into the environment.
- Modern wood burning plants are very efficient, with high combustion efficiency and low release of pollutants. Older, smaller plants, however, are often less efficient and may release micro-particles which are harmful to health.

The European forest sector has the following characteristics which may be considered *socially inclusive*:

- There are many millions of private forest owners in Europe (6.1). About half the forests are publicly owned, sometimes by central government, but also by subnational and municipal governments. In this way, most of the European population is concerned, directly (as forest owners) or indirectly (as citizens),

with forest ownership and management and feel that the nation's forests are, in a real sense "their" forests.
- Nearly four million people work in the forest sector, although this number has been declining steadily (6.5).
- The forest sector contributes to the national income (about 1 percent on average, but much more in some countries) (6.2).
- Almost all forests are accessible for recreation (unlike most agricultural or urban areas) and some forests are intensive providers of recreation (6.10).
- Forest sites with cultural and spiritual values are increasingly being identified, listed and protected (6.11).
- At the policy level (B.9), employment in the forest and forest-based sector is an important indicator for the social benefits generated by forests, especially for sustainable rural development.
- At the policy level (B.10), raising the awareness of society about the multi-functional role of forests, particularly drawing attention to protection and socio-economic functions, and the contribution of forests to the quality of life in general is a widely declared target. Compared to 2007, more countries highlight public and multi stakeholder participation as a crucial tool in forest policy, management and decision making processes. In addition, a few countries specified the objective of ensuring and/or improving transparency as a principle of good forest governance.
- At the policy level (B.11), a common goal among Forest Europe signatories is to maintain and preserve the international and national heritage of cultural and historical sites and monuments. The integration of cultural and spiritual forest values into different land-uses such as forestry, recreation and tourism activities, as well as the enhancement of its contribution to rural development, is highlighted as a main policy objective by several countries.

A few examples are reported of mechanisms in the forest sector which may be considered to be characteristic of the green economy:

- Some forest ecosystem services are already marketed. The reported value of marketed forest services was nearly EUR 900 million: this includes biospheric services (e.g. for gene conservation or nature protection on a voluntary contractual basis or carbon sequestration-related afforestation projects). Even though data on marketed services are very limited, they represent at present a non-negligible income for forest owners and could probably be increased (3.4).
- Many European governments compensate forest owners for supplying ecosystem services, although often the link between the service provided and the payment (often a per hectare subsidy) is tenuous. 19 countries reported on government expenditure for forest services (6.4), which includes payment for biospheric or ecological services. However, the data are not very comparable and have not been fully analysed yet.

Conclusions and recommendations

The following conclusions and recommendations summarises policy challenges and opportunities on four thematic elements elaborated in more detail above.

Climate change

The forest sector has several potential roles for the mitigation of climate change, including carbon storage and sequestration, substitution of non-renewable materials and energy. The forest is also vulnerable to climate change and needs to adapt to a future changed climate. However, there are trade-offs among these climate change-related functions, and with the many other functions of the forest.

The main challenge is to map out, discuss, negotiate and then implement an agreed balance among the various forest functions in the context of a changing climate and thereby enable the forest sector to make the largest possible contribution to combating climate change, while maintaining the best possible combination of the other forest functions. This is made more challenging by the weakness of the knowledge base about forests and climate change, and low awareness of the main issues, so rational policy making is difficult. Topics on which research is urgently needed include development of strategies for climate change adaptation and proactive risk management, wood mobilisation, and the consequences of more intensive forest use for non-wood functions, life cycle analysis of all parts of the system (to compare wood to non-wood products, and to optimise the cascade approach to the sound use of wood).

However, the main challenge is institutional: to incorporate SFM issues into the climate change negotiations (which are already very complex) and to avoid legally-binding solutions which unduly favour one forest function (carbon sequestration) over all the others. Finding non-distorting price formation mechanisms for carbon, energy and forest ecosystem services should be an integral part of a rational and market-based solution. After these complex policy development challenges, it will be necessary to find effective and equitable ways of implementing the decisions.

Wood and energy

The report shows that wood energy plays a major role in the sector and in national energy supply, but that this role is expected to grow significantly in order to expand the share of renewable energies. The results from the EUwood project show that it will probably be possible to meet the wood part of the renewable energy targets in 2020 without harming the wood supply of the traditional industries, but only if a number of conditions are fulfilled, notably an exceptional mobilisation strategy. Such high mobilisation would be quite different from today's forest management, especially in areas where, at present, forest management is not very intensive. High mobilisation of wood to meet ambitious energy targets would certainly have multiple consequences, notably on rural income, on silviculture and on biodiversity.

If wood energy is to play a strong role in climate change mitigation and energy security, indeed in a broader sustainable development perspective, the supply of wood for energy must be brought to the centre of forest sector policy. This would enable a significantly higher mobilisation of wood supply than at present, from the forest (higher removals, more use of harvesting residues, possibly expansion of forest area and establishment of short rotation plantations), but also from industry residues, landscape care wood and recovered wood products. A higher energy price would facilitate this structural shift, but is not enough in itself. A series of policy measures and actions by all stakeholders have been identified (FOREST EUROPE Liaison Unit Oslo, DG Agriculture and Rural Development, UNECE/FAO, 2010; Prins, 2010) and would have to be implemented. Keyelements would be changing the behaviour of small forest owners, by modifying the institutional framework and by financial incentives, as well as significantly increasing the use of harvest residues, even, in some areas, stumps.

However, the single-minded pursuit of wood mobilisation for energy is not sufficient, and probably not truly sustainable, by itself. A major policy challenge, as with climate change, is to reconcile the objective of increased wood energy supply with the other dimensions of SFM. The positive effects of increased wood mobilisation on the carbon cycle, energy security and forest owners' income would have to be weighed against possible negative consequences for forest biodiversity and the wood supply for traditional forest industries, as well as the considerable economic and political cost of implementing the wood mobilisation measures. There are many specific and/or local win-win solutions, which must be identified and implemented. Nevertheless, some trade-offs are inevitable, especially if a high level of mobilisation is to be achieved. The challenge is to resolve these trade-offs while maintaining public support and thus help the forest sector to make a full contribution to sustainable development as a whole. This may require better ways of policy coordination, minimising conflict and competition between, for instance, energy policy and forest policy, or climate change policy and biodiversity policy.

Conservation of biodiversity

There is general agreement that biodiversity conservation is at the heart of SFM, and that it must be encouraged, within and outside protected forest areas. However there are problems with monitoring trends for biodiversity (as opposed to recording measures intended to promote biodiversity), and it is hard to say whether the objective of halting biodiversity loss is truly being achieved. It is also accepted that forest and biodiversity policy should be integrated. In this respect there has been progress: for instance, most national forest programmes refer to national biodiversity action plans. Nevertheless, the efficiency of these programmes is hard to measure, and while forest owners seek incentives to conserve biodiversity, public budgets are under intense pressure.

Setting aside temporarily the challenges of measuring progress in biodiversity conservation and of developing appropriate policy instruments, there remain major questions about long-term strategic objectives in the field of forest biodiversity:

- When biodiversity loss has been halted, should the status quo be maintained indefinitely, or should measures be taken to reverse the trend, for instance by increasing protected areas, creating transcontinental wild life corridors, reintroducing major predators, etc.? If so, there would be consequences for other parts of the forest sector.
- If the future is marked by more intensive silviculture, higher wood prices and higher harvests, notably for energy use, as foreseen in the previous section, would this halt, or even reverse, the improvement in the situation for biodiversity?

Both these questions require policy decisions which involve many actors outside the forest sector, and must weigh the importance of different policy objectives. They also require much better information than available at present on the long-term consequences of such policy decisions, as well as new policy instruments. There are many different approaches to explore further, including flexible incentives for biodiversity conservation, such as payment for ecosystem services, which deliver "more biodiversity for less public funds".

The European forest sector in a green economy

The European forest sector already displays many of the characteristics of a green economy. This study has shown that it is to a large extent low-carbon and resource efficient and, at least in part, socially inclusive. However, it must function in an economy which is not "green". For instance the negative externalities of sectors with which the forest sector must compete for land, capital and human resources, including agriculture and the supply of fossil fuels and non-renewable materials, are large and probably less included in their final cost than is the case for forest products and services.

The results mentioned above would seem to indicate that the European forest sector has the potential to play a major, even exemplary, role in the green economy, as it is fundamentally low carbon and resource efficient. To achieve this potential, its "green" features would need to be further developed by, for instance, promoting sustainable production and consumption patterns, green building, green jobs in the sector, and the supply of renewable energy. Payment for ecosystem services also should be developed, beyond the simple possibly inefficient systems in place at present. An Action Plan for the forest sector in the green economy is at present being developed by the UNECE Timber Committee and the FAO European Forestry Commission.

Finally the system of criteria and indicators for SFM, with regular monitoring, on which this report is based, is a good example of the type of monitoring system which will be necessary if a green economy is to be created. The experience from the forest sector in this respect should be shared with other sectors.

Annexed Tables for Part III

Table 85: Key parameters and thresholds for assessment of quantitative indicators

Ind.	Key parameter	Unit	Thresholds				
1.1	Annual change in forest cover 1990-2010	% points	<-0.2	-0.2-0.0	0.0-0.1	0.1-0.2	>0.2
	Measure of change has been preferred to a measure of present status in order to avoid comparing very different histories and situations. Implicitly assumes that increase in forest area is positive.						
1.2	Annual change in growing stock/ha, 1990-2010	m^3	<-1.0	-1.0 - 0	0-1.0 (or only one data point)	1.0-3.0	>3.0
	Growing stock per hectare may increase if cuttings are consistently below net increment. It may decrease if there is overcutting, but also (as is the case in several countries) when there is rapid expansion of forest onto non-forest land, which, when planted, has very low growing stock per hectare, bringing down the average.						
1.3	Percent of even-aged forest in age class 0-40 years	%	n.a.	<20 (gaps)	Balance	n.a.	n.a.
	An unbalanced age class structure (e.g. because of past overcutting or irregular planting activity) can perturb future wood supply. In practice, the age class structure reflects past silvicultural decisions and is a weak indicator of sustainability.						
1.4	Annual change in total living carbon stock on FOWL, 1990-2010	% p.a.	< -1.0	-1.0 - 0.0	0.0 - 1.0	1.0 - 2.0	> 2.0
	Build up of carbon in the forest ecosystem is a proof of success in carbon sequestration (and, as regards carbon in living trees, will be determined by trends for growing stock). Carbon in soil, deadwood and litter is ignored (despite the significance of these carbon stocks) as practically no data are available on change.						
2.1	Percentage of natural ecosystem area at risk of eutrophication for an emission scenario based on current legislation	%	>80	50-80	20-50	1-50	0
	Source: work under the ECE Convention on Transboundary Air Pollution (ICP Modelling and mapping). Derived from model data and based on principle of critical loads[1]. Applies to all land, not only forest land. Based on a grid of 25*25 km squares: if 5 percent of a square is over the critical limit for nitrogen deposition, which takes into account soil type as well as deposition, that square is considered "at risk". Cross checked against results of ICP Forest (as reported under indicator 2.1), which could not, however, be used at the country level because of small number of sample plots in many countries. The two methods are approximately in agreement.						
2.2	C/N index, median value for the country	Index	<1.0	1.0-1.2	1.2-1.3	1.3-1.5	>1.5
	From the Biosoil project. This index is the proportion of the ratio of carbon to nitrogen in the forest floor (C/N_{FF}) to the ratio of carbon to nitrogen in the mineral soil (C/N_{MIN}). It is a valuable indicator of the imbalance induced by excessive nitrogen input. If the index is below 1, the organic matter and nutrient cycling is probably disturbed, and forest health may be at risk. As this is a median value, it should be borne in mind that for each country, half the observations will be below the value shown, and half above, so that if the median value is near 1, it is likely that nearly half the individual observations are below 1, which is the warning level.						
2.3	Percent of sample trees in defoliation classes 2+3+4	%	>80	50-80	20-49	10-19	<9
	Result of annual crown condition survey under ICP Forests (in 2009, 7 193 plots in 30 countries), using standardised methodology. In some smaller countries the results may not be statistically representative of the national situation because of the insufficient number of sample plots.						
2.4	Percent of forest area damaged by biotic, abiotic and human-induced causes/ percent damaged by fire	%	>12/ >2	4-12/ 0.5-2.0	1-4/ 0.3-0.5	0.1-1/ <0.3	<0.1
	For most countries the total was taken of biotic (insects, pests, diseases), human-induced (harvesting) and abiotic (storm, wind and snow) damage, with non-reported damage and years ignored. Examination of the results shows that there are still some comparability problems. For countries in southern Europe, the percentage of damaged forest (biotic, abiotic, and human) was replaced by the percentage of forest damaged by fire (average of years reported).						
3.1	Ratio fellings/NAI, 2005	%	>100	95-100	n.a.	<95	n.a.
	Felling more than increment over a long period is clearly unsustainable although it may be necessary on a temporary basis either because of damage or to rejuvenate the resource. Every value of the ratio under 95 percent[2] is considered equally acceptable, as it is not appropriate to prefer one rate of resource use to another.						
3.2	Ratio value of marketed roundwood/ growing stock, 2005	EUR/ 1 000 m^3	<255	255-390	390-870	870-930	>930
	Measures the intensity of use of the wood resource, in economic terms (preferred to EUR/ha as it takes account of stocking levels).						
3.3	Value per hectare of marketed non-wood goods	EUR/ ha of FOWL	n.a.	<5	5-30	30-65	>65
	Measures the intensity of use of the forest to supply non-wood goods. The data supplied are clearly not fully comparable among countries but are the best available.						

[1] Source: (Hettelingh, Jean-Paul 2008)

[2] 95 percent is chosen to take account of harvesting losses, etc. and as a measure of prudence.

Ind.	Key parameter	Unit	Thresholds				
3.4	Value of marketed services per hectare	EUR/ ha of FOWL	n.a.	n.a.	<6	>6	n.a.
	Measures the intensity of use of the forest to supply services. The data supplied are clearly not fully comparable among countries but are the best available. As many countries did not respond, there are only two classes.						
3.5	Percentage of FOWL under management plan or equivalent	%	0-20	21-40	41-60	61-80	81-100
	Objective and explicit long-term planning is clearly a part of sustainable forest management. However, the data are not fully comparable without reference to the footnotes as countries vary in the way they have interpreted the instructions on treatment of informal plans for small forest owners.						
4.1	Share of single species stands in FOWL, 2005	%, adjusted for trend[3]	>70	40-70	20-40	15-20	<15
	A proxy for loss of biodiversity, as often single species stands have less biodiversity. In many parts of Europe, single species stands are less natural and have poorer biodiversity. However, this is not the case in other areas, notably the boreal regions where natural forests are often monospecific.						
4.2	Share of natural regeneration in total regeneration, 2005	%, adjusted for trend[4]	<15	15-50	51-80	81-95	>95
	Measures the extent to which naturally occurring genetic diversity is preserved over rotations. Higher rates of natural regeneration are considered more favourable to the protection of genetic diversity.						
4.3	Share of plantations in FOWL	%	>75	21-75	6-20	1-5	<1
	Approximates lack of "naturalness" (there are too few "undisturbed" areas in Europe to construct a credible direct indicator of naturalness). A higher share of plantations indicates a "less natural" forest resource overall. Their benefits for wood production will be covered in other indicators, not in the biodiversity criterion.						
4.4	Share of introduced species in FOWL	%	>45	21-45	1.5-20	0.2-1.5	<0.2
	An indicator of change in species diversity and a frequent biodiversity indicator. The higher the percentage of introduced species, the greater disturbance to native biodiversity (even if the introduced species make a significant contribution to wood production).						
4.5	Volume of deadwood per hectare of FOWL	m^3/ha	n.a.	n.a.	<7	7-15	>15
	An indicator of conditions and silvicultural practice favouring biodiversity. Insufficient knowledge is available to estimate what are "desirable" deadwood levels in different circumstances, or to measure change, so it has been assumed that more deadwood is correlated with higher biodiversity.						
4.6	Share of forest land managed for conservation of genetic resources	%	n.a.	0-0.08	0.08-0.25	0.25-1.35	>1.35
	Includes area managed for *in situ* and *ex situ* gene conservation (but not for seed production), as a share of total forest. Does not address the question of whether this is "enough" or whether the genetic diversity of particular species is adequately protected, but seems an adequate proxy for now.						
4.7	Landscape pattern index	Index 1-5	<1.49	1.5-2.49	2.5-3.49	3.5-4.49	>4.49
	See report on indicator 4.7 for background and methods. The index combines scales for state and trend for two parameters, both expressed as country average, and rated by frequency distribution[5]: 1. Normalised connectivity per landscape unit. 2. Average proportion of forest classified as "core natural", expressed as the maximum difference in the proportion.						
4.8	Availability of data on threatened forest species	Scale 1 to 4	n.a.	Insufficient data	Data for most of the categories	Full or near full data for one year	Evidence of improved situation
	Data are available for many countries on threatened species, but often not on total forest-related species. Furthermore it is hard to interpret the raw data: a high number of threatened species might mean a danger to biodiversity, but could also reflect diligent data gathering or a country with many species at the edge of their ranges. For that reason the parameter chosen for SoEF 2011 addresses only the availability of information.						
4.9	Area protected as percent of FOWL	%	n.a.	<15	15-20	>20	n.a.
	The definitions of "protected" forest have been harmonised by MCPFE. The threshold chosen for is around the agreed CBD target of 17 percent protected area (all ecosystems, not just forests). It is acknowledged that this is a simplification of the desirable percentage of protected forest which must be based on assessment of specific ecosystems.						
5.1	Protective function index: soil and water	Scale 2-4	n.a.	no data on area	data on area with protective functions	data on area designated	n.a.
	There is ambiguity in the responses about whether the data supplied refer to forests which have a protective function, sometimes measured by national forest inventory, or those which have a designated status (as intended by the enquiry). Many countries could not supply any information at all. Therefore an index was created, combining availability of information and status of designation.						
5.2	Protective function index: infrastructure etc.	Scale 2-4	n.a.	no data on area	data on area with protective functions	data on area designated	n.a.
	See 5.1. Often countries were unable to separate protective functions (soil and water) from protective functions (infrastructure). In this case, 5.2 was scored at .						

[3] One class extra if clear downward trend, one class less if clear upward trend, over the whole period.
[4] One class extra if clear upward trend, one class less if clear downward trend, over the whole period.
[5] Rating as follows: Lowest ten percentiles, next 20 percentiles, middle 40 percentiles, next 20 percentiles, top 10 percentiles.

Ind.	Key parameter	Unit	Thresholds				
6.1	Availability of information on ownership and private holdings	Scale 3-4	n.a.	n.a.	Data on ownership only	Data on ownership and hold-ings	n.a.
	Ownership and holding structures are clearly central to forest policy. The official rationale for indicator 6.1 refers to the important contribution of private forest holders to the rural economy. The number of private forest holdings could be taken as a proxy[6] for the number of forest owners and compared to the total rural population, but this ignores the problem of fragmentation (many small holdings hamper management and increase costs) and the importance of public forests. For the time being, the key parameter only measures availability of information, although ownership/holding structure is mentioned in the comments The pattern of ownership and holdings is mentioned in the comments.						
6.2	Share of GDP taken by forest sector, 2010	%	n.a.	<0.7	0.7-1.5	1.5-3.0	>3.0
	Measures the relative importance of the forest sector in the national economy. Includes the forest industries (sawmills, panel, pulp and paper plants) as well as forest management.						
6.3	Net entrepreneurial revenue per hectare, average of years reported	EUR/ha	negative	0-35	35-80	80-175	>175
	Measures the contribution of forest ownership to revenue of forest owners.						
6.4	Government expenditure for forest services per ha of forest, average of years supplied	EUR/ha	n.a.	<10	10-20	>20	n.a.
	Indicator intended to measure income from non-marketed services, but in practice few, if any, respondents were able to supply this. However, information was provided on government subsidy schemes and incentive programmes, even if not directly connected to specific services, which provides useful indications of the extent to which government contributes to the forest sector. However, the approach varies, even among the countries which reported, so data comparability is very weak.						
6.5	Forest sector labour force as percent of population	%	<0.2	0.2-0.4	0.4-0.9	0.9-1.3	>1.3
	Measures the relative importance of the forest sector as a provider of jobs.						
6.6	Non-fatal accidents per 1000 workers, 2010	No.	n.a.	n.a.	>35	5-35	<5
	Measures the safety and health of the forest workforce. Non-fatal accidents were used as they are more numerous than fatal accidents and thereby less subject to arbitrary variation. This rate is influenced not only by working practices but also by natural conditions (slopes, windblow). There seem to be variations in the data set which are difficult to explain.						
6.7	Consumption of wood products (roundwood equivalent), per head, 2007-2009,	m3	<0.45	0.45-0.8	0.8-1.6	1.6-2.9	>2.9
	As wood is a renewable raw material, and sound use of wood is an objective of many policies, this parameter measures (indirectly) sustainable consumption patterns, to the extent that forest products are consumed instead of non-renewable, less sustainable materials.						
6.8	Net imports as percent of apparent consumption, 2007-9	%	>65	20-65	-20 to +20	-20 to -70	< -70
	Measures the degree to which countries are dependent on external sources of forest products or, conversely, contribute to the sustainable consumption of other countries.						
6.9	Share of energy from wood in national energy production	%	n.a.	<5	5-20	20-50	>50
	Measures the extent to which wood contributes to national energy supply. Includes all types of wood energy, not only "fuelwood" from forests.						
6.10	Annual visits per hectare of FOWL	No.	n.a.	<50	50-150	151-500	>500
	Should measure the intensity of recreation use, as in all countries, nearly all forests are "accessible for recreation". Unfortunately, relatively few countries have data on number of visits or even on areas where recreation is a major management objective.						
6.11	Index of data availability on number of cultural and spiritual sites	Scale 3-4	n.a.	n.a.	Partial data	Complete data	n.a.
	There is no possible comparability among the number of cultural and spiritual sites (archaeological remains, exceptional trees, historic sites, etc.), so the availability of data on the different categories is used as a (weak) proxy for effective national recognition and management of these sites.						

[6] Because of owners with multiple holdings and holdings with multiple owners, the correlation is not direct, and the number of private holdings is not the same as the number of private owners.

Table 86: Key aspects for assessment of qualitative indicators

Ind.	Title	Aspects assessed on the basis of national reports
A.1	**National forest programmes or similar**	Is there an NFP or similar? What is the level of the decision making body (ministry alone or with others, e.g. parliament, or other level)? Was the process participatory? Were other sectors consulted (formally or informally)? Is there reference to national development strategy and international commitments? Is monitoring periodic and pre-specified? Is there a recent policy document?
A.2	**Institutional frameworks**	Was full information supplied on: Institutional arrangements? Level of responsibility for policy decisions? Administrative staffing for forest sector?
A.3	**Legal/regulatory frameworks and international commitments**	Is the formal authority on main forest matters in parliament, in the constitution or at the administrative level? Is the latest amendment or enactment recent (after 2003)? Is there international reporting on forest matters (CBD, UNCCD, UNFF, UNFCCC)?
A.4	**Financial instruments/ economic policy**	Public expenditure per hectare on: Transfer payments Forest administration Management of public forests Research, education and training.
A.5	**Informational means**	Are the instruments of a forest-related informational strategy described? Is there a formal communication and outreach strategy?
B.1 to B.12	**Policies, institutions and instruments by policy area**	For each indicator: Are the objectives clearly described? Is there an institutional framework in place to achieve these objectives? Are there legal/regulatory instruments in place to achieve these objectives?

Data for Key Parameters by Country and Indicator

Table 87: Criterion 1. Forest Resources and Global Carbon Stock

Country	1.1 Annual change in forest cover 1990-2010 (percentage points)	1.2 Annual change in growing stock/ha, 1990-2010 (m^3)	1.3 Percent of even aged forest in 0-40 age class	1.4 Annual change in total living carbon stock on forest, 1990-2010 (%)
Russian Federation	-0.01	0.09	24.5	0.00
North Europe				
Denmark	0.06	2.37	51.7	3.76
Estonia	0.00i	-0.24	41.1	0.90
Finland	0.05	0.57	34.8	0.77
Iceland	0.01	-0.54	93.7	6.92
Latvia	0.13	1.91	42.2	2.02
Lithuania	0.18	-0.54	31.9	0.80
Norway	0.06	1.60	44.9	2.13
Sweden	-0.01	1.51	44.0	0.33
Central-West Europe				
Austria	0.06	1.97	40.9	0.80
Belgium	0.01	2.81	44.4	1.39
France	0.09	1.06	22.8	1.26
Germany	0.05	2.50	27.7	2.16
Ireland	0.20	-1.58	94.6	2.15
Liechtenstein	0.13	-0.86	ND	0.31
Luxembourg	-0.01	3.08	43.1	1.37
Netherlands	0.03	2.02	39.1	1.76
Switzerland	0.13	0.24	27.6	0.67
United Kingdom	0.06	1.49	43.9	0.67
Central-East Europe				
Belarus	0.21	2.72	34.5	2.92
Czech Republic	0.02	3.91	31.3	1.19
Georgia	-0.03	0.95	ND	0.54
Hungary	0.13	-2.72	58.3	1.16
Poland	0.06	5.53	32.4	2.76
Republic of Moldova	0.16	0.41	ND	1.49
Romania	0.01	0.00	35.2	0.15
Slovakia	0.02	3.21	30.2	1.49
Ukraine	0.04	3.29	31.0	2.63
South-West Europe				
Andorra	0.00	ND	ND	ND
Holy See	0.00	ND	ND	ND
Italy	0.30	1.54	48.7	2.43
Malta	0.00	0.00	ND	0.00
Monaco	0.00	ND	ND	ND
Portugal	0.15	-0.59	79.2	0.12[ii]
Spain	0.19	0.48	ND	2.29

Country	1.1 Annual change in forest cover 1990-2010 (percentage points)	1.2 Annual change in growing stock/ha, 1990-2010 (m³)	1.3 Percent of even aged forest in 0-40 age class	1.4 Annual change in total living carbon stock on forest, 1990-2010 (%)
South-East Europe				
Albania	-0.02	-0.18	ND	-0.04
Bosnia and Herzegovina	0.30	2.12	ND	1.15
Bulgaria	0.24	2.54	36.5	2.98
Croatia	0.31	2.31	36.7	1.67
Cyprus	0.17	0.41	ND	0.96
Greece	0.01	0.01	ND	0.90
Montenegro	0.00[i]	0.00	ND	ND
Serbia	0.16[i]	2.57	ND	4.83
Slovenia	0.11	5.09	ND	2.69
The former Yugoslav Republic of Macedonia	0.17	0.00	ND	0.02
Turkey	0.07	0.78	ND	0.99

(i) 2000-2010
(ii) 2005-2010 only

Table 88: Criterion 2. Health and Vitality

Country	2.1 Percentage of natural ecosystem area at risk of eutrophication for an emission scenario based on current legislation (CLE) (% area at risk)	2.2 C/N index, median value	2.3 Percent of sample trees in defoliation classes 2+3+4	2.4 Share of forest damaged (exc. Fire) (%)	2.4 Share of forest damaged by fire, selected countries, %
Russian Federation	24	ND	6.2i	0.51	0.13
North Europe					
Denmark	100	1.09	5.5	3.5	
Estonia	57	1.70	7.2	0.8	
Finland	41	1.31	9.1	0.08	
Iceland	ND	ND	ND	ND	
Latvia	99	1.02	13.8	0.2	
Lithuania	100	1.72	17.7	4.8	
Norway	14	ND	21	1.2	
Sweden	47	1.28	15.1	12.3	
Central-West Europe					
Austria	94	1.40	15.1[ii]	4.3	
Belgium	99	1.01	20.2	ND	
France	95	1.12	33.5	ND	0.11
Germany	67	1.12	26.5	2.7	
Ireland	81	1.18	12.5	0.04	
Liechtenstein	ND	ND	ND	ND	
Luxembourg	100	ND	ND	ND	
Netherlands	88	ND	17.9[ii]	ND	
Switzerland	96	ND	18.3	ND	
United Kingdom	19	1.26	22.2[ii]	0.4	
Central-East Europe					
Belarus	99	ND	8.4	2.6	
Czech Republic	100	1.14	56,8[iii]	3.3	
Georgia	ND	ND	ND	ND	
Hungary	100	1.42	18.4	12.5	
Poland	100	1.26	17.7	5.2	
Republic of Moldova	100	ND	25.2	ND	
Romania	20	ND	18.9	24.4	
Slovakia	100	1.49	32.1	1.5	
Ukraine	100	ND	6.8	0.13	
South-West Europe					
Andorra	ND	ND	6.8	ND	
Holy See	ND	ND	ND	ND	
Italy	61	1.62	35.8	22.4	0.42
Malta	ND	ND	ND	ND	
Monaco	ND	ND	ND	ND	
Portugal	83	1.61	17.1[ii]	24.5	3.0
Spain	93	1.70	17.7	ND	0.3

Country	2.1 Percentage of natural ecosystem area at risk of eutrophication for an emission scenario based on current legislation (CLE) (% area at risk)	2.2 C/N index, median value	2.3 Percent of sample trees in defoliation classes 2+3+4	2.4 Share of forest damaged (exc. Fire) (%)	2.4 Share of forest damaged by fire, selected countries, %
South-East Europe					
Albania	99	ND	ND	13.2	0.79
Bosnia and Herzegovina	81	ND	ND	0.0	
Bulgaria	91	ND	21.1	3.6	
Croatia	100	ND	26.3	3.4	
Cyprus	68	1.87	36.2	5.8	0.20
Greece	97	ND	24.3	ND	ND
Montenegro	95	ND	ND	ND	1.03
Serbia	95	ND	10.3	4.8	
Slovenia	92	1.31	35.5	0.2	
The former Yugoslav Republic of Macedonia	100	ND	ND	4.9	
Turkey	ND	ND	18.7	1.9	

(i) North-West Russia only
(ii) 2005
(iii) Some differences in the level of damage across national borders may at least partly be due to differences in standards used. This restriction does not influence the reliability of trends over time.

Table 89: Criterion 3. Productive Functions

Country	3.1 Ratio fellings/ NAI, 2005 (%)	3.2 Ratio value of marketed roundwood/growing stock, 2005 (€/1000m³)	3.3 Value per hectare of marketed non-wood goods (€/ ha of FOWL)	3.4 Value per hectare of marketed services (€/ha of FOWL)	3.5 Percentage of FOWL under management plan or equivalent (%)
Russian Federation	21.91	24	0.3	0.18	100
North Europe					
Denmark	44.57	695	299.0	ND	69.4[i]
Estonia	58.64	423	2.2[ii]	ND	69
Finland	71.84	915	4.3	ND	100
Iceland	ND	202	5.2	242.86	30.39
Latvia	71.81	ND	ND	ND	89
Lithuania	89.33	439	7.4	0.40	100
Norway	48.39	460	1.7	5.59	48
Sweden	93.34	909	ND	2.73	100
Central-West Europe					
Austria	93.54	840	24.6	28.41	100
Belgium	84.61	831	5.3	ND	74
France	57.84	639	8.1	3.37	60.6[vi]
Germany	61.75	706	66.3	5.52	68
Ireland	ND	1696	ND	ND	77
Liechtenstein	81.90[i]	ND	ND	ND	100
Luxembourg	ND	279	ND	42.21	60[vii]
Netherlands	69.32	473	37.9	ND	100
Switzerland	94.79	881	22.4	ND	71[vii]
United Kingdom	51.01	1008	31.5	13.36	57
Central-East Europe					
Belarus	61.86	ND	ND	ND	100
Czech Republic	80.61	993	50.2iii	ND	100
Georgia	42.30[i]	ND	ND	ND	87
Hungary	71.15	839	ND	ND	100
Poland	56.68	607	5.0	ND	91
Republic of Moldova	ND	ND	ND	ND	ND
Romania	60.27	ND	1.7	ND	94
Slovakia	70.81	765	6.9	118.93	100
Ukraine	30.94	ND	ND	ND	100
South-West Europe					
Andorra	ND	ND	ND	ND	ND
Holy See	ND	ND	ND	ND	ND
Italy	37.07	371	30.2	ND	89[vii]
Malta	ND	ND	ND	ND	100
Monaco	ND	ND	ND	ND	ND
Portugal	75.41	2025	98.2[iv]	ND	45[vii]
Spain	39.57	1006	23.9[v]	ND	12.1[viii]

Country	3.1 Ratio fellings/ NAI, 2005 (%)	3.2 Ratio value of marketed roundwood/growing stock, 2005 (€/1000m³)	3.3 Value per hectare of marketed non-wood goods (€/ ha of FOWL)	3.4 Value per hectare of marketed services (€/ha of FOWL)	3.5 Percentage of FOWL under management plan or equivalent (%)
South-East Europe					
Albania	550.32	ND	ND	ND	100[vii]
Bosnia and Herzegovina	75.10[i]	ND	ND	ND	ND
Bulgaria	40.85	451	0.8	ND	100
Croatia	51.01	885	0.7	7.71	100
Cyprus	26.00	151	0.6	0.34	40.82[ix]
Greece	48.31	ND	ND	ND	ND
Montenegro	39.67	ND	17.6	ND	47
Serbia	55.97	519	ND	ND	83
Slovenia	39.20	232	7.8	1.09	100
The former Yugoslav Republic of Macedonia	ND	402	10.3	ND	92
Turkey	ND	749	1.9	ND	100

(i) 2000
(ii) ncludes value of all game meat, not only of meat which is marketed.
(iii) Value of all non-wood goods, not only of those which are marketed (which are considered "minor"). This is therefore an overestimate.
(iv) Mostly cork
(v) Total value, not just what is marketed. However all cork and resin is marketed.
(vi) Forest only, not FOWL
(vii) 2005
(viii) Percentage with "management plan". No data on "equivalents" as these are managed by the autonomous regions.
(ix) About 60% for "forest", but much less for OWL

Table 90: Criterion 4. Biodiversity in Forest Ecosystems

	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.7	4.8	4.9
	Share of single species stands, 2005 (%)	Share of natural regeneration in total regeneration (%)	Share of plantations in FOWL (%)	Share of introduced species in FOWL (%)	Volume of deadwood on FOWL (m^3/ha)	Share of forest land managed for conservation of genetic resources (in situ and ex situ only) (%)	Landscape pattern index (0-5)	Trend in country based average proportion of 'core natural' forest pattern 1990-2006	Availability of data on threatened forest species (scale 1-4)	Area protected (MCPFE classes 1,1, 1,2, 1,3 and 2) as % of FOWL
Russian Federation	60.00	98	1.9	0.00	21.2	0.003	ND	ND	3	1.9
North Europe										
Denmark	35.25	18	76.2	46.24	4.8	0.498	2.25	0.0058	1	15.7[vi]
Estonia	22.44	93	0.1	0.04	14.0	0.141	3.50	0.0024	3	22.2
Finland	41.47	72	0.1	0.15	5.5	0.034	4.00	0.0015	3	16.3
Iceland	87.37	10	28.4	19.85	ND	1.161	3.00	-0.0036	3	8.1
Latvia	16.83	81	0.1	0.04	17.7	0.162	3.00	0.0050	1	14.8[vi]
Lithuania	25.95	76	5.6	0.18	23.3	0.172	2.75	0.0056	2	17.3
Norway	36.47	86	2.8[iii]	1.93	6.8i	0.135	3.75	-0.0001	1	2.3
Sweden	25.39	62	2.0	1.76	7.9	0.002	4.00	-0.0043	3	6.7
Central-West Europe										
Austria	45.90	ND	7.0	1.50	20.3[vi]	0.240	2.75	-0.0307	4	16.5
Belgium	51.79	42	40.5	40.58	7.3[vi]	0.277	2.50	0.0023	3	6.2[vi]
France	24.33	77[ii]	9.3	6.99	7.0[vi]	0.072	2.00	-0.0076	2	24.1[iv]
Germany	ND	52	0.0	3.98	15.0	0.158	2.75	0.0001	3	83.6
Ireland	ND	11	88.8[iii]	69.60v	6.6[iv,vi]	0.097	2.75	0.0175	1	0.9
Liechtenstein	ND	96	4.1	0.00	ND	18.535	3.75	ND	1	27.6
Luxembourg	6.44	67	32.6	30.20v	11.6[iv,vi]	4.197	2.75	-0.0087	3	2.3i[v,x]
Netherlands	19.94	16	1.1	24.93	9.75	0.092	2.00	-0.0044	3	24.7
Switzerland	20.51	84	0.1	0.50iv	21.3[vi]	0.077	ND	ND	4	22.5[iv]
United Kingdom	55.78	23	76.5	48.64	3.9	0.621	ND	ND	1	15.7
Central-East Europe										
Belarus	21.37	79	21.1	0.01	1.2	0.093	ND	ND	3	13.9
Czech Republic	18.48	1	0.0	1.55	11.6	4.218	2.50	-0.0010	4	25.0
Georgia	ND	93	2.2[iii,iv]	0.00	ND	0.030	2.75	ND	1	19.7i
Hungary	35.58	21	6.4[iii]	34.94v	ND	0.002	2.00	-0.0090	3	21.9[vi]
Poland	49.90[i]	5	0.3	0.49	5.59[vi]	0.074	3.50	0.0100	3	17.3
Republic of Moldova	ND	99	0.5	ND	ND	0.579	1.50	ND	1	ND
Romania	ND	78	22.0	5.30iv,v	n.a.	0.173	1.50	-0.0039	1	8.4i[v,vi]
Slovakia	18.32	59	2.1	2.11	37.7	1.752	2.50	0.0349	4	42.5
Ukraine	36.76	50	4.1	4.12	27.0	0.266	ND	ND	3	11.7[iv]

	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.7	4.8	4.9
	Share of single species stands, 2005 (%)	Share of natural regeneration in total regeneration (%)	Share of plantations in FOWL (%)	Share of introduced species in FOWL (%)	Volume of deadwood on FOWL (m³/ha)	Share of forest land managed for conservation of genetic resources (in situ and ex situ only) (%)	Landscape pattern index (0-5)	Trend in country based average proportion of 'core natural' forest pattern 1990-2006	Availability of data on threatened forest species (scale 1-4)	Area protected (MCPFE classes 1,1, 1,2, 1,3 and 2) as % of FOWL
South-West Europe										
Andorra	ND	ND	ND	ND	ND	ND	3.00	ND	1	ND
Holy See	ND	ND	ND	ND	ND	ND	3.00	ND	1	ND
Italy	25.73	93	6.5	3.96	9.1[vi]	0.656	ND	-0.0071	3	43.1
Malta	ND	0	100.0	ND	ND	ND	2.75	0.0000	1	ND
Monaco	ND	ND	ND	ND	ND	ND	3.50	ND	1	ND
Portugal	72.18	75	26.0	29.22	2.8[iv,vii]	0.003	3.75	-0.0210	3	44.1[iv]
Spain	18.72	ND	9.9	4.88	ND	0.027	2.00	-0.0068	4	18.5
South-East Europe										
Albania	68.09	88	9.0[iv]	0.80iv	0.5iv	ND	3.25	-0.0173	1	25.1[iv]
Bosnia and Herzegovina	ND	59	4.2	ND	ND	0.120	3.25	0.0095	2	ND
Bulgaria	41.38	79	20.8	5.27	ND	1.551	3.75	-0.0021	2	8.8
Croatia	20.53	96	4.0	3.35	14.0[vi]	0.066	ND	0.0160	4	11.3
Cyprus	97.98	82	17.6	0.81v	0.9[viii]	3.146	3.00	0.0009	3	6.8
Greece	ND	96	2.1	ND	ND	0.789	3.50	0.0052	1	4.2[vi,xi]
Montenegro	41.69	50	1.3	ND	ND	ND	3.50	-0.0017	2	ND
Serbia	ND	93	5.8	0.10[iv]	1.6[iv,ix]	0.013	3.75	-0.0044	3	14.6[iv]
Slovenia	4.90	98	0.0	2.84	18.9	0.091	2.50	0.0002	4	21.9
The former Yugoslav Republic of Macedonia	ND	89	ND	ND	ND	0.109	3.75	0.0080	1	ND
Turkey	ND	70	33.0	0.64[v]	ND	0.306	3.25	0.0002	2	4.0[vi]

(i) 2000
(ii) FAWS only
(iii) Plantations' share of forest, not of FOWL
(iv) 2005
(v) Introduced species' share of forest only, not of FOWL
(vi) Forest only
(vii) Standing deadwood only
(viii) Standing deadwood on forest only
(ix) Lying deadwood only
(x) No data on class 1.3
(xi) Class 1.1 (strictly protected) only

Table 91: Criterion 5. Protective Functions

Country	5.1 Protective function index: soil and water (scale1-4)	5.2 Protective function index: infrastructure etc. (scale1-4)
Russian Federation	4	4
North Europe		
Denmark	3	2
Estonia	4	2
Finland	3	2
Iceland	3	3
Latvia	3	2
Lithuania	3	3
Norway	3	2
Sweden	3	2
Central-West Europe		
Austria	4	4
Belgium	4	2
France	3	2
Germany	3	2
Ireland	2	2
Liechtenstein	2	3
Luxembourg	3	2
Netherlands	2	2
Switzerland	3	3
United Kingdom	2	2
Central-East Europe		
Belarus	4	4
Czech Republic	4	4
Georgia	3	2
Hungary	3	3
Poland	3	3
Republic of Moldova	2	2
Romania	3	3
Slovakia	3	3
Ukraine	3	2
South-West Europe		
Andorra	2	2
Holy See	2	2
Italy	3	2
Malta	2	2
Monaco	2	2
Portugal	3	3
Spain	4	3
South-East Europe		
Albania	3	2
Bosnia and Herzegovina	2	2
Bulgaria	3	3
Croatia	3	3
Cyprus	2	2
Greece	2	2
Montenegro	3	2
Serbia	4	4
Slovenia	3	3
The former Yugoslav Republic of Macedonia	2	2
Turkey	4	4

Index 1: Evidence of loss of ability to perform protective functions
Index 2: No data available on area of protective forest
Index 3: Data available on area of protective forest, but no formal designation
Index 4: Data available on area designated as protective forest in a formal way

Table 92: Criterion 6. Socio-Economic Functions

Country	6.1 Availability of information on ownership and private holdings (3-4)	6.2 Share of GDP taken by forest sector, 2010 (%)	6.3 Net entrepreneurial revenue per hectare, average of years reported (EUR)	6.4 Government expenditure for forest services per ha of forest, EUR, average of years supplied	6.5 Forest sector labour force as % of population	6.6 Non-fatal accidents per 1000 workers, 2010	6.7 Consumption per head, 2007-2009, m3 roundwood equivalent	6.8 Net imports as % of apparent consumption, 2007-9vii	6.9 Share of energy from wood in national energy production (%)	6.10 Annual visits per hectare of FOWL	6.11 Index of data availability on number of cultural and spiritual sites (scale 3-4)[xi]
Russian Federation	4	2.0	0.4[iii]	0.76	0.6	1.4i	0.7	-42.6	0.8	0.0[ix]	3
North Europe											
Denmark	4	0.9	318.8[iii]	35.00	0.4	6.0	3.6	79.6	3.7	125.9	3
Estonia	3	2.8	22.1	ND	1.8	2.7	3.3	-11.7	12.8	0.3	3
Finland	4	5.1	73.1	ND	1.3	34.8	4.8	-233.0	63.1	27.0	ND
Iceland	4	0.3[i]	ND	ND	0.3	ND	1.1	100.1	0.0	ND	3
Latvia	4	3.3	ND	ND	2.4	0.8	2.1	-66.9	85.3	ND	ND
Lithuania	4	2.0	37.3	0.29	1.4	ND	1.6	7.6	20.7	61.5	3
Norway	3	0.9	38.8	ND	0.6	6.4	2.4	-41.3	4.3	11.3	ND
Sweden	4	3.2	50.3	12.05	1.1	6.3	3.4	-217.8	26.1	ND	3
Central-West Europe											
Austria	4	2.0	203.4	1.79	0.9	185.8[vi]	3.0	-91.1	33.0	ND	ND
Belgium	4	0.8	125.9	ND	0.4	38.5	1.7	6.7	5.9	ND	3
France	4	0.7	105.3	10.85	0.3	8.5[i]	1.7	14.7	7.4	28.7	4
Germany	4	1.0	35.5	14.40	0.4	65.6	1.8	-5.0	11.0	135.4	4
Ireland	4	0.5	ND	1.67	0.3	3.3	1.0	21.0	0.6	24.2	3
Liechtenstein	4	ND	ND	ND	ND	ND	1.0	ND	31.1	ND	ND
Luxembourg	4	0.1[ii]	ND	ND	0.1	ND	2.6	5.6	ND	0.0	ND
Netherlands	4	0.5	-9.8	ND	0.3	ND	1.3	57.5	1.1	750.0	3
Switzerland	4	1.1	-9.0	54.69[iv]	0.7	126.0	1.6	16.2	0.0	420.6	ND
United Kingdom	4	0.5	-10.4	23.21	0.3	6.4	1.2	64.1	0.3	124.4	4
Central-East Europe											
Belarus	4	2.7[i,ii]	ND	ND	0.0	0.6	0.8	-24.2	31.0	ND	4
Czech Republic	4	1.9	ND	11.93	1.2	34.6	1.5	-14.8	5.4	81.6	ND
Georgia	3	ND	ND	ND	ND	ND	0.2	14.8	ND	ND	ND
Hungary	4	0.8	42.0	17.46	0.7	8.4	0.9	29.4	ND	ND	3
Poland	4	1.8	4.9	1.10v	0.6	67.0	1.1	15.1	4.5	0.0	ND
Republic of Moldova	3	ND	ND	ND	ND	ND	0.3	37.2	ND	ND	ND
Romania	3	1.8	ND	ND	0.9	2.1	0.7	-18.7	4.4	ND	ND
Slovakia	4	1.1	18.2	0.79	1.2	4.3	1.5	-24.8	3.0	0.0	4
Ukraine	4	ND	ND	ND	0.4	2.0	0.5	1.3	ND	0.3	ND

Country	6.1 Availability of information on ownership and private holdings (3-4)	6.2 Share of GDP taken by forest sector, 2010 (%)	6.3 Net entrepreneurial revenue per hectare, average of years reported (EUR)	6.4 Government expenditure for forest services per ha of forest, EUR, average of years supplied	6.5 Forest sector labour force as % of population	6.6 Non-fatal accidents per 1000 workers, 2010	6.7 Consumption per head, 2007-2009, m3 roundwood equivalent	6.8 Net imports as % of apparent consumption, 2007-9vii	6.9 Share of energy from wood in national energy production (%)	6.10 Annual visits per hectare of FOWL	6.11 Index of data availability on number of cultural and spiritual sites (scale 3-4)[xi]
South-West Europe											
Andorra	3	ND	ND	ND	ND	ND		ND	ND	ND	ND
Holy See	3	ND	ND	ND	ND	ND		ND	ND	ND	ND
Italy	3	0.9	41.6[iii]	33.96	0.5	53.6	1.2	45.6	14.1	16.8	3
Malta	3	0.2	ND	ND	0.1	ND	0.5	100.0	ND	ND	ND
Monaco	3	ND	ND	ND	ND	ND		ND	ND	ND	ND
Portugal	3	1.6	156.2	ND	0.9	ND	0.8	-71.8	62.8[viii]	ND	4
Spain	4	ND	35.2	72.35	0.4	133.0	1.1	18.4	ND	ND	3
South-East Europe											
Albania	3	ND	ND	ND	ND	ND	0.2	37.9	ND	ND	3
Bosnia and Herzegovina	3	ND	ND	ND	ND	ND	0.6	-46.0	ND	ND	ND
Bulgaria	4	0.8[i]	8.5	2.25	0.8	ND	1.0	3.1	5.9	ND	3
Croatia	4	1.1	ND	ND	0.8	33.0	1.1	5.4	7.7	0.8[x]	3
Cyprus	3	0.9[i]	ND	20.03	0.6	12.7	0.8	96.9	4.5	1.7	3
Greece	3	0.3	0.7	ND	0.4	ND	0.8	52.5	ND	ND	ND
Montenegro	3	0.2	ND	ND	0.1	ND	0.4	-26.4	16.5	ND	3
Serbia	4	ND	ND	ND	ND	ND	0.7	36.2	3.3	ND	ND
Slovenia	4	1.8	36.1	16.30	1.2	92.6	1.7	-57.1	10.9	ND	4
The former Yugoslav Republic of Macedonia	3	0.9	ND	ND	0.3	ND	0.6	56.4	10.4	ND	ND
Turkey	3	ND	ND	ND	0.3	ND	0.6	23.3	8.6	ND	ND

(i) 2005
(ii) Pulp and paper not included
(iii) Factor income, not net entrepreneurial revenue. The difference is wage costs, so this figure is overestimated by the amount of the wage costs per hectare.
(iv) Expenditure on ecological and biospheric services only. Expenditure by Confederation only, expenditure by cantonal governments not included.
(v) "Total government expenditure for forestry"
(vi) Exceptionally high because of work on windblown timber. Average 2000-2005 was 110.
(vii) Therefore net importers have positive figures and net exporters negative figures.
(viii) Data for total energy production seem very low, so share of wood comes out very high.
(ix) 0.01 visits/ha
(x) Data supplied for "visits" are in fact sales of tickets for national parks, so are a significant underestimate.
(xi) 3: partial data availability - 4: data available for each type of site

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European Forest Types

The report includes results of pilot implementation of European Forest Types; we would like to recognise the contribution of the authors of the classification of forest types, notably Marco Marchetti and Anna Barbati. We are grateful to national correspondents, national forest inventory experts, in particular to Claude Vidal, for their magnificent cooperation in providing data and developing the classification. The participation of Tor Björn Larsson, Stein Tomter and the support received from Josef Herkendell and European Environment Agency were vital for successful completion of the process.

Finalization and layout

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Paola Deda and Arne Ivar Sletnes

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Acronyms and Abbreviations

- data not available
BA Bosnia and Herzegovina
Bioversity Int. International Plant Genetic Resources Institute
C carbon
CO_2 carbon dioxide
CBD Convention on Biological Diversity
CEC Cation Exchange Capacity
CEEC Central and Eastern European countries
CEI-Bois European Confederation of Woodworking Industries
CEPF Confederation of European Forest Owners (Confédération Européenne des Propriétaires Forestiers)
CEPI European Confederation of Paper Industries
C&I Criteria and Indicators
CIS Commonwealth of Independent States
CITES Convention in International Trade in Endangered Species of Wild Fauna and Flora
CLC CORINE Land Cover
C/N ratio carbon-to-nitrogen concentration
COP Conference of Parties
CORINE Coordinated Information on the European Environment
COST European Cooperation in Science and Technology
DG Directorate General
EAFRD European Agricultural Fund for Rural Development
EC European Commission
ECE Economic Commission for Europe
EEA European Environmental Agency
EFA Executive Forest Agency
EFDAC Establishment of a European Forest Data Centre
EFFIS European Forest Fire Information System
EFI European Forest Institute
EFSOS European Forest Sector Outlook Study
EFTA European Free Trade Association
EHS National Ecological Network (Ecologische Hoofdstructuur)
EIA Environmental Impact Assessment
EMEP International Cooperative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe
ENA-FLEG Europe and North Asia Forest Law Enforcement and Governance
EQ Wood equivalents
ESF European Social Fund
EU European Union
EUFGIS European Information System on Forest Genetic Resources
EUFORGEN European Forest Genetic Resources Programme
EUR euro
EUREKA European Research Coordination Agency
EUROSTAT Statistical Office of the European Communities
EUSTAFOR European State Forest Association
FAO Food and Agriculture Organization of the United Nations
FAOSTAT Food and Agriculture Organization of the United Nations Statistics Department
FAWS Forest available for wood supply
FLEGT Forest Law Enforcement, Governance and Trade
FMU Forest management unit
FOPER EFI Forest Policy and Economics Education and Research programme
FOWL Forest and other wooded land
FP-7 7th Framework Programme
FRA FAO Forest Resource Assessment
FSC Forest Stewardship Council
FSCC/ICP International Cooperative Programme Forests Soil Coordinating Centre
FTE Full-time equivalent
FTEI Forestry Training and Education Ireland
FTP European Forest-Based Sector Technology Platform
GDF Directorate General of Forestry
GDP Gross Domestic Product
GHG greenhouse gas
GIS Geographic Information System
GMES Global Monitoring for Environment & Security
ha hectare
ICP Forests International Cooperative Programme on Assessment and Monitoring of Air Pollution Effects on Forests
IDP International data provider
IEA International Energy Agency
IFF Intergovernmental Forum on Forests
ILO International Labour Organization
INBO Research Institute for Nature and Forest (Instituut voor Natuur- en Bosonderzoek)
IPCC Intergovernmental Panel on Climate Change
IPF Intergovernmental Panel on Forests
IPGRI International Plant Genetic Resources Institute
INIBAP International Network for Improvement of Banana and Plantain
ISIC International Standard Industrial Classification of all Economic Activities
ITTA International Tropical Timber Agreement
IUCN International Union for Conservation of Nature
IUSS International Union of Soil Sciences
JRC European Commission – Joint Research Centre
JWEE Joint Wood Energy Enquiry
LULUCF Land Use, Land Use Change and Forestry
LUO FOREST EUROPE Liaison Unit Oslo
MCPFE Former brandname of Ministerial Conference on the Protection of Forests in Europe, now FOREST EUROPE
m^3 cubic metre
MD Republic of Moldova
MEF Ministry of Environment and Forestry (Turkey)
METLA Finnish Forest Research Institute
METSO Forest Biodiversity Programme for Southern Finland
MFRA Mediterranean Forest Research Agenda
MK The former Yugoslav Republic of Macedonia
NACE General industrial classification of economic activities within the European communities (Nomenclature générale des activités économiques dans les communautés Européennes)
NAI Net annual increment
NATURA 2000 Natura 2000 Networking Programme
NFI National forest inventory
NFB National Forestry Board (Bulgaria, Latvia)
NFP National forest programme
NGO Non-governmental organization
NOK Norwegian krone
n.s. not significant, indicating a very small value
NWFP Non-wood forest product
NWGs Non-wood goods
NWGS Non-wood goods and services
NUTS The Nomenclature of Territorial Units for Statistics (Nomenclature des unités territoriales statistiques)
OC organic carbon
OWL Other wooded land
PAWS-Med Forest Pedagogic and Environmental Education
pcs pieces
PEEN Pan-European Ecological Network
PEFC Programme for the Endorsement of Forest Certification
pH logarithmic measure of hydrogen ion concentration
R&D Research and Development
PJ petajoule
REDD Reducing Emissions from Deforestation and Degradation
REFORGEN FAO global information system on forest genetic resources
SFC Shaping Forest Communication
SFE State Forest Enterprises
SFM Sustainable forest management
SHE State Hunting Enterprises
SME Small and medium-sized enterprise
SoEF State of Europe's Forests
SRA Strategic Research Agenda
TBFRA Temperate and Boreal Forest Resources Assessment
Tg teragram (Tg = 1012 g)
TOE tonne oil equivalent
TSI Timber stand improvement
UN COMTRADE United Nations Commodity Trade Statistics Database
UNCBD UN Convention on Biological Diversity
UNCCD UN Convention to Combat Desertification
UNCED United Nations Conference on Environment and Development
UNECE United Nations Economic Commission for Europe
UNEP United Nations Environmental Programme
UNESCO United Nations Educational, Scientific and Cultural Organization
UNFF United Nations Forum on Forests
UNFCCC United Nations Framework Convention on Climate Change
UNIDO United Nations Industrial Development Organization
WRB World Reference Base
VILMAT Programme for Developing Recreation and Nature Travel
yr year

Annex 1: Pilot Application of the European Forest Types

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European Forest Types: Background

In the Vienna Living Forest Summit Declaration, signed at the Fourth Ministerial Conference on the Protection of Forests in Europe (2003), the Signatory States and the European Community committed themselves to endorsing the use of the "Improved Pan-European Indicators for Sustainable Forest Management as adopted by the MCPFE Expert Level Meeting, 7-8 October 2002, Vienna, Austria". Following this set of improved criteria and indicators, the reporting for seven out of the total of 35 quantitative indicators is required to be by forest types. It was not possible in the course of this process to come to an agreement on a new classification system of forest types. Thus, it was recommended to keep the previously employed system based on three species groups (predominantly coniferous, predominantly broadleaved and mixed forest). However, the Vienna Resolution 4 contains a commitment to "...contribute to harmonised international classification systems through developing a pan-European understanding on forest classification systems including forest types, naturalness and introduced forest species".

In this framework the European Environment Agency (EEA) of the European Union, in cooperation with a consortium of forest experts from a number of European countries led by the Italian Academy of Forest Sciences, developed a proposal for the classification of forest types in European countries, presented in the EEA Technical Report (No 9/2006) "European Forest Types - categories and types for sustainable management reporting and policy"[1].

Since 2006 FOREST EUROPE together with UNECE/FAO and EEA has organized consultative activities with representatives from member countries to discuss the potential of applying the European Forest Types (EFTs) as a forest type framework for pan-European reporting, including a pilot test reporting for indicator 1.1 by EFTs.

Based on gained experience some improvements were introduced to refine the EFT classification in order to ensure that it is operational. The revised classification, hereafter referred to as the new European Forest Types, is briefly described in Annex Table A; within the Enquiry on the State of Forests and Sustainable Forest Management in Europe 2011, pilot reporting by EFTs has been conducted for six indicators (cf. §§ 2-3).

The EFT classification allows the breakdown of country forest area into a discrete number of smaller and more ecologically homogeneous units. This is expected to facilitate the analysis of data on pan-European indicators, as well as the interpretation of trends.

The 14 categories of the EFTs represent groups – of varying breadth – of ecologically distinct forest communities dominated by specific assemblages of trees. Notably, categories 1–10 and 13 correspond to forest communities dominated by specific assemblages of trees native to Europe. The forest physiognomy of categories 1–10 is mainly determined by the latitudinal/altitudinal zonation of European vegetation and by inner climatic and edaphic variation therein. Categories 11–12 include azonal forest communities. Category 14 identifies forest stands predominantly consisting of introduced tree species; these are mainly represented by forest plantations, but stands originating from natural regeneration also are included.

The classification is conceived to categorize stocked forest land, with the help of classification keys mainly based on forest dominant tree species. Operational guidelines for the application of the classification have been developed to allow countries to use a flexible approach to classify forest area by EFTs, based on best available data sources (NFIs ground plots and forest maps, forest management plans). Temporarily unstocked forest areas (e.g. burned forest areas, clearcut areas under regeneration, etc.) cannot be directly assigned to EFTs without the support of additional information.

[1] The report can be downloaded at http://reports.eea.europa.eu/technical_report_2006_9/en. The report currently available was revised in 2007. For further reference, see also: Barbati A., Corona P., Marchetti M., 2007 – A forest typology for monitoring sustainable forest management: the case of European forest types. Plant Biosystems, 141(1):93-103.a

Annex Table A: New European Forest Types

EFTs - Category level	Main characteristics
1. Boreal forest	Extensive boreal, species-poor forests, dominated by Picea abies and Pinus sylvestris. Deciduous trees including birches (Betula spp.), aspen (Populus tremula), rowan (Sorbus aucuparia) and willows (Salix spp.) tend to occur as early colonisers.
2. Hemiboreal and nemoral coniferous and mixed broadleaved-coniferous forest	Latitudinal mixed forests located in between the boreal and nemoral (or temperate) forest zones with similar characteristics to EFT 1, but a slightly higher tree species diversity, including also temperate deciduous trees like Tilia cordata, Fraxinus excelsior, Ulmus glabra and Quercus robur. Includes also: pure and mixed forests in the nemoral forest zone dominated by coniferous species native within the borders of individual FOREST EUROPE member states like Pinus sylvestris, pines of the Pinus nigra group, Pinus pinaster, Picea abies, Abies alba.
3. Alpine forest	High-altitude forest belts of central and southern European mountain ranges, covered by Picea abies, Abies alba, Pinus sylvestris, Pinus nigra, Larix decidua, Pinus cembra and Pinus mugo. Includes also the mountain forest dominated by birch of the boreal region.
4. Acidophilous oak and oak-birch forest	Scattered occurrence associated with less fertile soils of the nemoral forest zone; the tree species composition is poor and dominated by acidophilous oaks (Q. robur, Q. petraea) and birch (Betula pendula).
5. Mesophytic deciduous forest	Related to medium rich soils of the nemoral forest zone; forest composition is mixed and made up of a relatively large number of broadleaved deciduous trees: Carpinus betulus, Quercus petraea, Quercus robur, Fraxinus, Acer and Tilia cordata.
6. Beech forest	Widely distributed lowland to submountainous beech forest. Beech, Fagus sylvatica and F. orientalis (Balkan) dominate, locally important is Betula pendula.
7. Mountainous beech forest	Mixed broadleaved deciduous and coniferous vegetation belt in the main European mountain ranges. Species composition differs from EFT 6, including Picea abies, Abies alba, Betula pendula and mesophytic deciduous tree species. Includes also mountain fir dominated stands.
8. Thermophilous deciduous forest	Deciduous and semi-deciduous forests mainly of the Mediterranean region dominated by thermophilous species, mainly of Quercus; Acer, Ostrya, Fraxinus, Carpinus species are frequent as associated secondary trees. Includes also Castanea sativa dominated forest.
9. Broadleaved evergreen forest	Broadleaved evergreen forests of the Mediterranean and Macaronesian regions dominated by sclerophyllous or lauriphyllous trees, mainly Quercus species.
10. Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions	Varied group of coniferous forests in Mediterranean, Anatolian and Macaronesian regions, from the coast to high mountains. Dry and often poorly-developed soils limit tree growth. Several tree species, including a number of endemics, of Pinus, Abies and Juniperus species.
11. Mire and swamp forest	Wetland forests on peaty soils widely distributed in the boreal region. Water and nutrient regimes determine the dominant tree species: Pinus sylvestris, Picea abies or Alnus glutinosa.
12. Floodplain forest	Riparian and riverine species-rich forests characterised by different assemblages of species of Alnus, Betula, Populus, Salix, Fraxinus, Ulmus.
13. Non-riverine alder, birch or aspen forest	Pioneer forests dominated by Alnus, Betula or Populus.
14. Introduced tree species forest	Forests dominated by introduced tree s above categories. Introduced tree species can be identified at regional (recommended) or national level and comprise: • tree species that are not native to Europe (e.g. Eucalyptus spp., Robinia pseudoacacia, Acacia dealbata, Ailanthus altissima, Prunus serotina, Quercus rubra, Fraxinus alba, Picea sitkensis, Pinus contorta, Pinus banksiana, Pseudotsuga menziesii, Tsuga heterophylla); • tree species native to Europe, but not naturally occurring within the borders of individual FOREST EUROPE member states; • tree species native only in some regions of an individual FOREST EUROPE country.

Pilot reporting by European Forest Types

Goals

Pilot reporting according to new European Forest Types was:

- Mandatory for two indicators -- 1.1 (forest area) and 1.2 (growing stock).
- Voluntary for four indicators -- 1.3 (Age structure and/or diameter distribution), 4.1 (Tree species composition), 4.3 (Naturalness) and 4.5 (Deadwood).

Specific pilot reporting tables were developed sharing the same format as the main tables for mandatory indicators (all reporting years); for reporting on voluntary indicators, 2005 was taken as the reference year.

The pilot reporting experience was an opportunity for:

- Testing the possibilities of acquiring the data and getting feedback from countries on technical limitations/problems with regard to the application; and
- evaluating the usefulness and added value of the information on pan-European indicators, when reported by EFTs.

As matter of fact, the three forest types based on species groups represent a feasible system to standardize forest information on a global level, but hardly serve for the interpretation of sustainable forest management indicators. Within the vast European forest area, the information reported by pan-European indicators shows a considerable range of variation, due to natural conditions and past and present anthropogenic influences. Given this variability, it is very difficult to assess the state and trends of indicators for SFM when reducing reporting to only three forest types. The reporting of quantitative indicators by the 14 EFT categories is expected to be more ecologically sound to meet this goal. Thus, the pilot reporting aims at demonstrating this added value.

Response rate and data coverage

Many countries reported on mandatory indicators: 28 countries provided data on forest area and 26 on growing stock for at least one reporting year (Annex Table B). A complete time series (1990, 2000, 2005 and 2010) is available for 10 countries for forest area and for nine countries for growing stock.

Data available for these mandatory indicators have very good coverage across European regions: countries reporting on forest area account for 83 percent of European forest area, without the Russian Federation, while those reporting on growing stock account for 58 percent. In Central-West and North Europe there is full coverage of mandatory indicators; in South-West Europe the coverage is low only for growing stock. Thus data collected from pilot reporting for the mandatory indicators are regarded as sufficient to outline a set of key findings on EFTs (§§ 3.1 and 3.2).

A smaller number of countries, mainly northern and eastern European countries, reported also on voluntary indicators (Annex Table C).

For the remaining European countries (cf. Annex Table B).

- 12 countries did not provide national data on SFM indicators (only data based on Desktop Studies are available for these countries, compiled by UNECE/FAO but not including pilot reporting by EFTs).
- The Russian Federation delivered the Enquiry on pilot reporting, but only in a simplified form and was therefore not included in the further analysis of data.
- Five countries (the former Yugoslav Republic of Macedonia, Montenegro, Portugal, Romania and Turkey) explained that their not reporting was mainly due to a temporary lack of national data that will be collected in the future, or to the lack of time for processing national data to EFTs within the time frame of pilot reporting.

Unclassified forest area: reasons and options for the future

Various countries reporting on forest area indicated a proportion of the total forest area as unclassified. However the share of unclassified forest is, on average, 8 percent of the total forest area of the country, ranging from less than 0.1 (Hungary) to 27 (Spain).

Explanations provided by countries on unclassified forest area can be referred to three main situations:

- Permanently and temporarily unstocked forest areas (Austria, Italy, Latvia, Netherlands, Switzerland and the UK); this indicates that not all countries were able to assign unstocked forest area to EFTs.
- Stands not inventoried for different reasons (inaccessible, forest without timber production not covered by the inventory).
- Stands inventoried/mapped but characterized by species assemblages not matching EFT classes.

These cases might derive from different situations:

- forest types that are present in the country but not covered by the EFT classification -- this is the case for Slovakia that has indicated examples of species assemblages not reflected in the EFT nomenclature. This case can be fixed by adding new types within existing categories.
- national classes not directly comparable to EFTs -- this is the case, for instance, of Italy and Spain, that adopted the label-to-label approach to reclassify national data into the EFTs. Italy uses NFI forest type classification system and Spain uses the legend classes of the NFI Forest map.

  Difficulties are related to the following main reasons:

  - the national class is of "comprehensive" nature and cannot be linked to EFTs because of a lack of clearly identifiable dominant species (e.g. classes like "Other coniferous forest" or "Other evergreen forest" in the Italian NFI forest types).
  - the national class is characterized by mixtures of trees that are key diagnostic species of more than one category of EFTs. This case is frequent in Spain where the national forest map has a number of mixed classes that include a combination of species belonging to different categories; the most frequent are combinations of Pinus (EFT 10) and Quercus species (EFTs 8, 9) and of Quercus ilex (EFT 9) and Juniperus species (EFT 10). To further improve the feasibility of the classification, it would be useful to establish consultations with countries facing this kind of problem to find solutions for classifying stands composed of mixtures of trees that are key diagnostic of more than one category of EFTs.

Annex Table B: Data availability of mandatory indicators and coverage in the 46 countries of FOREST EUROPE. X = data available for 2010; X* = data available for 2005; X**=data available for 2000; - = data not available. Indicator coverage is quantified as percent of forest area of the country/countries with data available for the indicator out of total forest area of the region/ Europe

Country	Forest area (1000 ha)	1.1. Forest area		1.2 Growing stock	
		Data availability	Coverage (% forest area)	Data availability	Coverage (% forest area)
Belarus	8600	X	20	X	20
Czech Republic	2657	X	6	X	6
Georgia	2742	-	-	-	
Hungary	2039	X	5	X	5
Poland	9319	X	21	X	21
Republic of Moldova	386	-	-	-	-
Romania	6573	-	-	-	-
Slovakia	1938	X	4	X	4
Ukraine	9705	X	22	X	22
Central-East Europe	43959		78		78
Austria	3857	X	10	X	10
Belgium	678	X	2	X	2
France	15954	X	43	X	43
Germany	11076	X	30	X	30
Ireland	737	X	2	X	2
Liechtenstein	7	-	-	-	-
Luxembourg	87	-	-	-	-
Netherlands	365	X	1	X	1
Switzerland	1240	X*	3	X*	3
United Kingdom	2881	X**	8		8
Central-West Europe	36882		100		100
Denmark	587	X	1	X	1
Estonia	2203	X	3	X	3
Finland	22084	X	32	X	32
Iceland	30	X	0	X	0
Latvia	3354	X	5	X	5
Lithuania	2165	X	3	X	3
Norway	10250	X	15	X	15
Sweden	28605	X	41	X	41
North Europe	69278		100		100
Russian Federation	809090	-	-	-	-
Russian Federation	809090	-	0	-	0
Albania	776	-	-	-	-
Bosnia and Herzegovina	2472	-	-	-	-
Bulgaria	3927	X	13	X	13
Croatia	1920	X	6	X	6
Cyprus	173	X	1	X	1
Greece	3903	-	-	-	-
Montenegro	467	-	-	-	-
Serbia	2713	-	-	-	-
Slovenia	1253	X	4	X	4
The former Yugoslav Republic of Macedonia	998	-	3	-	3
Turkey	11334	-	38	-	38
South-East Europe	29936		65		65

Andorra	16	-		-	
Holy See	0	-		-	
Italy	9149	X	30	X*	30
Malta	n.s.	-		-	
Monaco	0	-		-	
Portugal	3456	-		-	
Spain	18173	X	59	-	
South-West Europe	30794		89		30
Europe	1019940		0		0
EU-27	157194		0		0
Europe without Russia	210850		0		0

Annex Table C: Countries reporting on voluntary indicators by EFTs (reference year: 2005). 1: data available; 0: data not available

Country	1.3 - Age class/ diameter distribution	4.1 - Tree species composition	4.3 - Naturalness	4.5 - Deadwood
Czech Republic	1	1	0	1
Hungary	1	1	1	0
Slovakia	1	1	0	1
Central-East Europe	3	3	1	2
Switzerland	1	1	1	1
Central-West Europe	1	1	1	1
Denmark	1	1	1	1
Estonia	1	1	1	1
Lithuania	1	1	1	0
Sweden	1	1	1	1
North Europe	4	4	4	3
Bulgaria	1	0	0	0
Croatia	1	1	1	0
Slovenia	1	1	1	1
South-East Europe	3	2	2	1
Total	11	10	8	7

Main results and key findings from pilot reporting

Indicator 1.1 Forest area

Area of forest classified by European Forest Types.

Key finding

In Europe, without the Russian Federation, forest area is highly variable as to forest types; seven forest types, dominated by assemblages of tree species native to Europe, cover more than 70 percent of the total forest area of countries reporting on this indicator (174 million ha), of which 2 forest types ("Boreal forest" and "Hemiboreal and nemoral coniferous and mixed broadleaved coniferous forest") make up more than 40 percent. The proportion of forest consisting of introduced tree species is 4 percent.

Status

Reporting forest area data by EFTs enables the attainment of better insights into the diversity that exists in European forests at different levels of spatial coverage: Europe, regional groups and countries.

The relative share of EFTs in Europe, without the Russian Federation, is shown in Annex Figure A. Not surprisingly, the EFTs with higher forest share (1, 2, 11 and 13) are mostly located in North Europe, the region with the largest forest area covered by this indicator (69 million ha); more than 10 percent of forest cover is made up by temperate deciduous forest communities (5 and 8), while coniferous forests of the Alpine region account for nearly 5 percent. Below the 5 percent threshold are: forests dominated by introduced tree species (14), pure and mixed beech forests (6 and 7), broadleaved evergreen and coniferous forests mainly located in southern Europe (9 and 10), acidophilous oakwoods (4) and rare habitats like floodplain forests (12).

When looking at the distribution of EFTs by region, differences can be observed in the main categories that build up the forest area. (Annex Table D). For instance, in Central-West and South-East Europe, the EFTs accounting for more than 5 percent of the total forest are classes 9 and 6, respectively, while in other regions it is class 4. There are visible differences among the four more widespread categories within regions:

- North: 1, 2, 11, 13
- Central-West: 2, 5, 14, 7
- Central-East: 2, 5, 13, 3
- South-West: 9, 10, 8, 3
- South-East: 8, 7, 6, 3

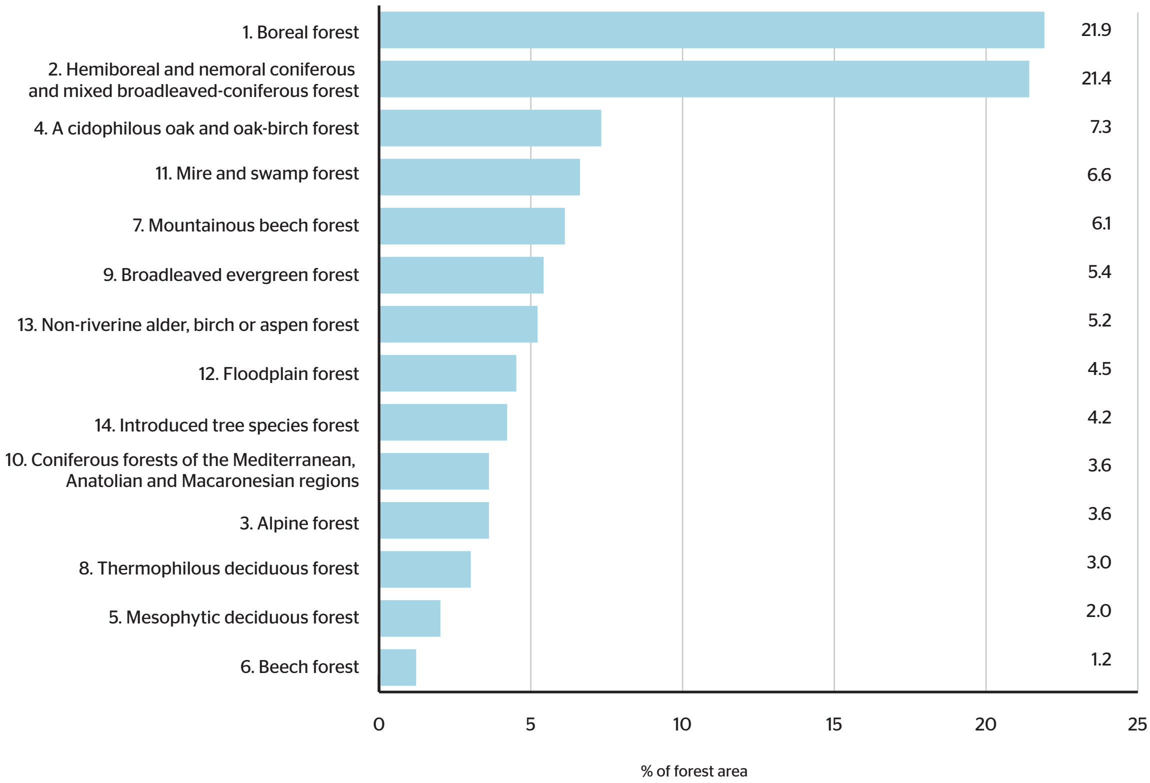
When data are presented by the three general forest types (coniferous, broadleaved and mixed), much of this information is lost and regional differences are obscured.

Trends

In all the European regions, forest area has increased since 1990. Although forest area by EFTs has been reported for a complete time series only by a subset of countries, this information allows a better understanding of which EFTs experience a forest area increase/loss at the country level (Annex Table E). Interestingly, despite a positive annual change in forest cover that has occurred since 1990 in most countries, most EFTs have either decreased (cf. min value Annex Table E) or gained area in this period since 1990, depending on the country. Thus, generalizing trends in the area of EFTs at the EU level could lead to misleading interpretations.

The analysis presented here, however, is not intended to provide an accurate picture of country trends, as data inconsistencies are to be expected (e.g. due to forecasts between reporting years); rather, it casts a new light on future perspectives for forest area trends analysis. If countries were able to reliably track changes in the area of EFTs by periodical update of national forest inventories/maps, this would enable question-driven monitoring at the country level (e.g. are forest gains due to extension of introduced tree species or expansion of native tree species? Is there any significant loss of valuable forest habitats?)

Annex Figure A: Relative share of European Forest Types in Europe. Processed from data reported by 28 countries for 2010, except for Switzerland (2005) and UK (2000)



Annex Table D: Distribution of forest area by EFTs and by forest types applied in SoEF2007 in different European regions. In bold, the four more widespread EFTs. Processed from data reported by 28 countries for 2010, except for Switzerland (2005) and UK (2000)

Region	Percent of European Forest Type area															Forest types as applied for SoEF2007		
	1. Boreal forest	**2. Hemiboreal and nemoral coniferous and mixed broadleaved-coniferous forest**	**3. Alpine forest**	**4. Acidophilous oak and oak-birch forest**	**5. Mesophytic deciduous forest**	**6. Beech forest**	**7. Mountainous beech forest**	**8. Thermophilous deciduous forest**	**9. Broadleaved evergreen forest**	**10. Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions**	**11. Mire and swamp forest**	**12. Floodplain forest**	**13. Non-riverine alder, birch or aspen forest**	**14. Introduced tree species forest**	**Unclassified forest**	**Predominantly coniferous forest**	**Predominantly broadleaved forest**	**Mixed forest**
Central-East Europe	2	47	5	1	13	3	3	1	0	0	4	3	10	4	2	45	30	25
Central-West Europe	0	27	6	7	16	7	8	6	2	1	1	1	3	10	4	42	49	9
North Europe	54	15	4	0	0	0	0	0	0	0	13	0	12	2	0	68	15	17
South-East Europe	0	6	12	1	12	15	15	28	1	3	0	3	0	4	0	17	63	20
South-West Europe	0	2	6	1	1	1	5	19	24	20	0	1	1	4	16	29	60	11

Annex Table E: Annual variation in forest area by European Forest Types in selected European countries (calculated on a compound interest basis)

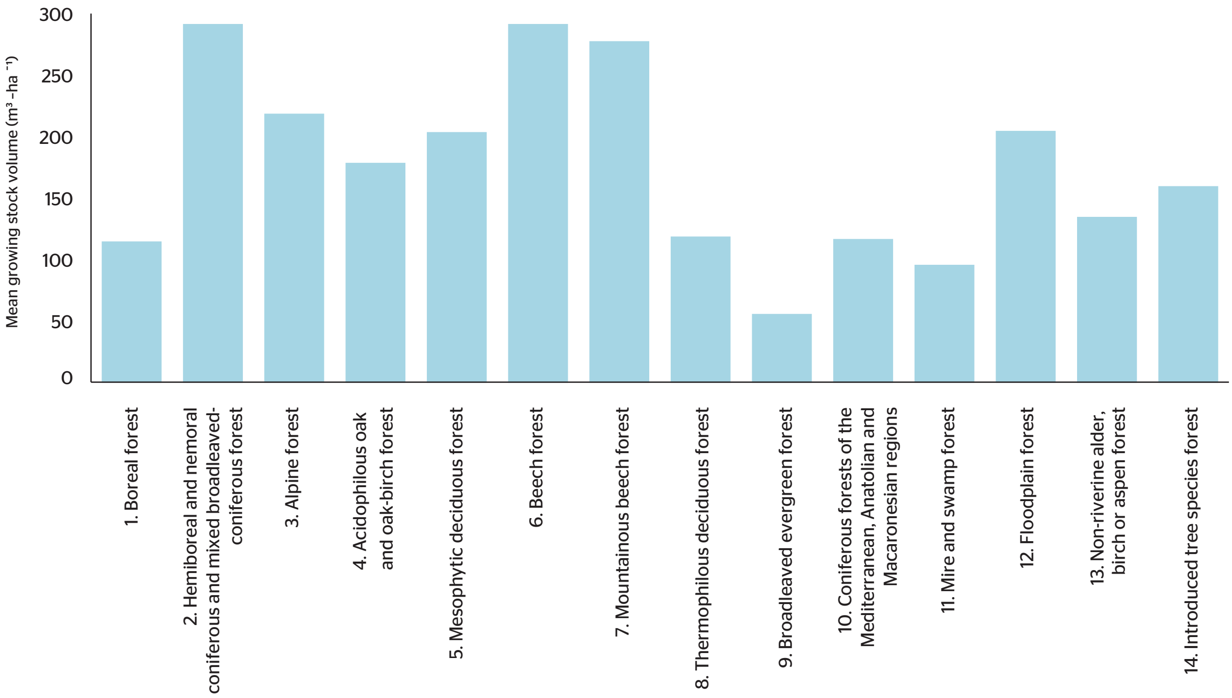
Country	Annual change in forest cover (percent, 1990-2010, except * 2000-2010)															
	1. Boreal forest	2. Hemiboreal and nemoral coniferous and mixed broadleaved-coniferous forest	3. Alpine forest	4. Acidophilous oak and oak-birch forest	5. Mesophytic deciduous forest	6. Beech forest	7. Mountainous beech forest	8. Thermophilous deciduous forest	9. Broadleaved evergreen forest	10. Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions	11. Mire and swamp forest	12. Floodplain forest	13. Non-riverine alder, birch or aspen forest	14. Introduced tree species forest	Unclassified forest	TOTAL
Belarus	0.50	0.50	-	0.50	0.50	-	-	-	-	-	0.50	0.50	0.50	-	-	0.50
Slovakia*	-	-2.20	-0.49	-0.33	0.61	23.50	-9.77	1.08	-	-	1.13	3.92	-2.05	-0.19	0.78	0.08
Ukraine	-	0.06	0.23	0.16	0.23	0.22	0.23	0.00	-	0.34	0.18	0.24	0.70	0.24	0.24	0.23
Central-East Europe																
Belgium*	-	-	-	-0.10	0.80	0.96	-	-	-	-	1.18	0.74	-	0.00	-1.51	0.16
Ireland	-	-	-	2.66	2.75	-	-	-	-	-	2.32	3.50	2.69	2.27	-	2.33
Central-West Europe																
Estonia*	0.22	1.55	-	-	-	-	-	-	-	-	-1.49	-	-0.18	-3.31	-	-0.18
Finland	-0.10	-0.92	-0.98	-	-	-	-	-	-	-	0.58	-	0.65	2.45	-	0.04
Iceland	-	-	0.00	-	-	-	-	-	-	-	-	-	0.00	0.00	-	0.00
Lithuania*	-	0.00	-	-	0.00	-	-	-	-	-	0.00	0.00	0.00	0.00	-	1
North Europe																
Bulgaria	-	-0.37	-0.13	-	2.19	0.36	2.28	1.32	-	-3.67	-	-	-	2.24	-	0.83
Croatia	-	0.20	0.30	0.17	0.20	0.17	0.19	0.20	0.19	0.19	-	0.18	-	0.06	-	0.19
Cyprus	-	-	-	-	-	-	-	0.61	-	0.36	-	-	-	0.00	-	0.36
Slovenia	-	0.26	0.31	0.27	0.28	0.26	0.26	0.24	-	-	-	0.00	-	-	-	0.27
South-East Europe																
Italy*	-	0.90	0.90	-	0.90	0.90	0.90	0.90	0.90	0.90	-	0.90	0.90	0.90	0.90	0.90
Spain*	-	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	-	0.68	0.68	0.68	0.68	0.68
South-West Europe																
Average	0.21	0.07	0.09	0.50	0.75	3.38	-0.75	0.63	0.59	-0.20	0.71	1.14	1.44	1.02	0.21	0.90
Min	-0.10	-2.20	-0.98	-0.33	-0.85	0.17	-9.77	0.00	0.19	-3.67	-1.49	0.00	-2.05	-3.31	-1.51	-0.18
Max	0.50	1.55	0.90	2.66	2.75	23.50	2.28	1.32	0.90	0.90	2.32	3.92	8.38	7.98	0.90	6.37

Indicator 1.2 Growing stock
Growing stock density (m³/ha) by European Forest Types.

Key finding
The mean volume of growing stock varies among European forest types. On average, beech dominated forest types present the highest growing stock density (> 250 m³/ ha), while broadleaved evergreen forest present the lowest (< 50 m³/ha1). This wide range of values can be explained by noticeable differences among forest types in ecological conditions affecting tree growth, forest cover (closed vs. open) and rotation length.

Status
There is a high variability in the mean volume of growing stock in Europe: the mean value for aEurope is 112 m³/ha, but stocking densities found at the country level vary considerably (15-350 m³/ha). Differentiating growing stock by EFTs gives a more diversified picture and allows for additional interpretation of the values (Annex Figure B, Annex Table F).

Annex Figure B: Mean growing stock density by European Forest Types (processed from data of 26 countries, see Annex Table J at the end of the annex).



Annex Table F: Variability in mean growing stock density by European Forest Types (processed from data of 26 countries, see Table J at the end of the annex)

	Growing stock (m³ ha-1)		
	Country level		European level
EFTs	Min	Max	Mean
1. Boreal forest	105	237	114
2. Hemiboreal and nemoral coniferous and mixed broadleaved-coniferous forest	142	438	291
3. Alpine forest	21	375	218
4. Acidophilous oak and oak-birch forest	96	250	178
5. Mesophytic deciduous forest	74	281	203
6. Beech forest	138	370	291
7. Mountainous beech forest	120	370	277
8. Thermophilous deciduous forest	45	245	118
9. Broadleaved evergreen forest	42	67	55
10. Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions	50	172	116
11. Mire and swamp forest	42	259	95
12. Floodplain forest	52	695	204
13. Non-riverine alder, birch or aspen forest	14	202	134
14. Introduced tree species forest	10	609	159

It is interesting to note that reporting growing stock data by previous species groups (i.e. coniferous, broadleaved and mixed) could lead to misleading interpretations of the available data in countries with high ecological variability. For example, in countries like France, Croatia or Italy there are significantly different stocking densities in beech forests (EFT 6) and broadleaved evergreen forest (EFT 9) that would be averaged within the same species group, i.e. broadleaved forest. The same consideration holds for Alpine forest (EFT 3) and Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions (EFT 10).

Voluntary indicators

Available data on voluntary indicators are useful to demonstrate how reporting by EFTs would make information on these indicators more meaningful when contextualized by EFTs. This is particularly true from the perspective of assessing long-term sustainability of forest management at the regional or country level.

Due to the more complex reporting format of voluntary indicators (more than one figure for each EFT), data reported by countries must be further processed to present information in a clear and understandable way. Thus, appropriate question-setting to effectively utilize information on these indicators is critical. Below are presented examples of data processed for indicators "4.1 Tree species composition" and "4.5 Deadwood".

Tree species composition

Data from this indicator have been summarized on the basis of the mean number of tree species per EFT calculated as a weighted average from area data reported at the country level (Annex Table G). The EFTs that appear to be the most diversified (with at least three species) in the countries with available information are broadleaved forests of the temperate vegetation zones (EFTs 4, 5 and 8). Species richness is lower in forest types associated with more limiting growing conditions in the boreal, alpine or dry Mediterranean vegetation zones (EFTs 1, 3, 9 and 10). Within these ecological constraints, forest management can contribute to decreasing the share of single species stands to the benefit of mixed stands in all forest types. Thus, monitoring the trends using EFTs will allow for a more detailed insight into terms of development of tree species composition.

Deadwood

The weighted average volume of total deadwood (sum of standing and lying components) is about 10 m3/ha in Europe, excluding the Russian Federation (cf. indicator 4.5, main report). Reporting data by EFTs reveals variability in the amount of deadwood associated with different vegetation zones (Annex Table H). In all countries the highest perhectare deadwood levels are observed in EFTs associated with mountainous regions: Alpine (EFT 3) and Mountainous beech forests (EFT 7). This can be explained not solely by favorable growing conditions; it is likely linked to poor accessibility and thus low intensity of harvesting, resulting in a higher amount of deadwood accumulation.

Reporting the indicator 'Deadwood' by EFTs is relevant in particular for evaluating progress at the country/regional level in implementing silvicultural measures that promote biodiversity conservation in both protected forest areas and forest under active management.

Annex Table G: Country variability in tree species composition by EFTs; "-" indicates that EFTs are not present in the country

"Category (Year: 2005)"	North				Cent-West	Cent-East			South-East		Range
	Denmark	Estonia	Lithuania	Sweden	Switzer-land	Czech Rep.	Hungary	Slovakia	Croatia	Slovenia	
1. Boreal forest	-	2	-	2	-	-	-	-	-	-	2
2. Hemiboreal and nemoral coniferous and mixed broadleaved-coniferous forest	3	3	2	3	3	3	-	3	2	3	2-3
3. Alpine forest	-	-	-	1	2	2	-	3	2	3	1-3
4. Acidophilous oak and oak-birch forest	3	-	-	3	4	3	3	3	3	4	3-4
5. Mesophytic deciduous forest	3	-	4	3	4	4	3	4	3	4	3-4
6. Beech forest	2	-	-	2	3	5	4	3	3	4	2-5
7. Mountainous beech forest	-	-	-	-	3	3	-	3	2	3	2-3
8. Thermophilous deciduous forest	-	-	-	-	3	6	3	3	3	4	3-6
9. Broadleaved evergreen forest	-	-	-	-	-	-	-	-	1	-	1
10. Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions	-	-	-	-	-	-	-	-	2	-	2
11. Mire and swamp forest	2	2	3	2	2	2	2	2	-	-	2-3
12. Floodplain forest	3	-	2	2	4	4	3	3	3	4	2-4
13. Non-riverine alder, birch or aspen forest	-	3	3	3	3	3	2	4	-	-	2-4
14. Introduced tree species forest	2	3	2	3	4	3	2	2	2	-	2-4

Annex Table H: Total deadwood amount by EFTs; "-" indicates that EFTs are not present in the country; "na" indicates that EFTs are present in the country but data are not available

Country	Total volume of deadwood m³ ha-1														
	1. Boreal forest	2. Hemiboreal and nemoral coniferous and mixed broadleaved-coniferous forest	3. Alpine forest	4. Acidophilous oak and oak-birch forest	5. Mesophytic deciduous forest	6. Beech forest	7. Mountainous beech forest	8. Thermophilous deciduous forest	9. Broadleaved evergreen forest	10. Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions	11. Mire and swamp forest	12. Floodplain forest	13. Non-riverine alder, birch or aspen forest	14. Introduced tree species forest	Unclassified stocked forests
Czech Republic	-	8.5	22.6	11.4	9.7	9.1	16.4	na	-	-	21.3	13.9	11.6	10.0	11.9
Slovakia	-	28.0	31.7	19.2	14.8	24.5	51.1	7.3	-	-	9.9	12.2	14.0	17.6	18.2
Switzerland															
Denmark	-	4.6	-	4.6	5.5	4.7	-	-	-	-	11.7	8.6	-	4.5	8.4
Estonia	-	13.3	23.2	12.0	12.8	13.5	24.0	18.8	-	-	12.6	8.3	7.2	13.0	n.a.
Sweden	9.0	7.2	na	8.5	13,5	14.4	-	-	-	-	4.2	9.1	7.5	4.8	0.0
Slovenia	-	8.6	16.0	14.2	11.6	11.6	13.2	11.1	-	-	-	10.9	-	-	0.0
Average	9.0	11.7	23.4	11.6	11.3	13.0	26.2	12.4	-	-	11.9	10.5	10.1	10.0	7.7
Min	9.0	4.6	16.0	4.6	5.5	4.7	13.2	7.3	0,0	0,0	4.2	8.3	7.2	4.5	0.0
Max	9.0	28.0	31.7	19.2	14.8	24.5	51.1	18.8	0,0	0,0	21.3	13.9	14.0	17.6	18.2

Concluding remarks

Findings from pilot reporting on EFTs overall are encouraging. The feasibility of the system has been demonstrated in the following ways:

- by the high share of the response rate on compulsory indicators: 28 countries, accounting for 83 percent of forest area in Europe (without the Russian Federation), presented forest area based on the 14 EFTs while 26 countries, accounting for 58 percent of forest area in Europe (without the Russian Federation), provided information on growing stock.
- by the availability of a complete time series (1990, 2000, 2005, 2010) for a consistent number of countries.
- by the fact that the main reason for a few countries to not report by EFTs was the lack of NFIs; countries declared that as soon as NFIs are implemented, reporting by EFTs is expected to be feasible.
- by the relatively moderate share of unclassified forest area; various countries indicated that the forest areas that were unclassified were only small proportions of their total forest share. Unclassified forest area derives partly from factors not related to the classification in itself (permanently and temporarily unstocked areas or stands not inventoried for different reasons). Further reporting of unclassified forest area was associated with species assemblages that are not reflected in the EFTs. These can be addressed in the future, based on further improvement of the EFT scheme.

The added value of the new EFTs in conveying new meaningful information on forest resources in Europe was demonstrated as well in this pilot report. Reporting data by EFTs allows countries:

- to gain insights into the large variability of forest communities that build up the European forest cover and their distribution across different countries and regions. When data are presented by previous forest types (coniferous, broadleaved and mixed), most of this information is lost and regional differences are obscured.
- to enhance the interpretation of trends in forest area development, facilitating question-driven monitoring at the country/regional level (e.g. are forest gains due to extension of introduced tree species or expansion of native tree species? Is there any significant loss of valuable forest habitats?)
- to better embed indicators (including also those currently reported on a voluntary basis, i.e. age distribution, species richness, levels of naturalness and amount of deadwood) into ecologically relevant contexts. This helps to reveal the variability in the value taken by the indicators across different EFTs. It is helpful, knowing these environmental constraints, to evaluate progress toward more sustainable forest management conditions in individual EFTs (e.g. increase in growing stock levels, promotion of multispecies stands and accumulation of deadwood).

In conclusion, the additional effort made by countries to provide information on selected indicators by EFTs seems to be largely outweighed by the valuable information provided by the new system of reporting.

Annex Table I: Extent of forest by European Forest Types. (Reference year 2010, except: * =2005; **=2010)

Country	European Forest Types Area (1000 ha)															
	1. Boreal forest	2. Hemiboreal and nemoral coniferous and mixed broadleaved-coniferous forest	3. Alpine forest	4. Acidophilous oak and oak-birch forest	5. Mesophytic deciduous forest	6. Beech forest	7. Mountainous beech forest	8. Thermophilous deciduous forest	9. Broadleaved evergreen forest	10. Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions	11. Mire and swamp forest	12. Floodplain forest	13. Non-riverine alder, birch or aspen forest	14. Introduced tree species forest	Unclassified forest	TOTAL
Belarus	688	5332	0	86	86	0	0	0	0	0	1118	86	1204	0	0	8600
Czech Republic	0	1626	399	7	158	185	79	0	0	0	67	41	47	41	6	2657
Hungary	0	0	0	140	488	131	0	156	0	0	4	38	51	906	0	1913
Poland	0	5964	303	107	868	263	372	43	0	0	113	283	917	46	40	9319
Slovakia	0	143	447	6	310	475	216	31	0	0	8	29	13	41	220	1938
Ukraine	0	3133	641	31	2448	71	375	22	0	61	138	557	1279	402	588	9746
Central-East Europe	688	16199	1790	377	4357	1125	1041	252	0	61	1448	1034	3511	1436	854	34173
Austria	0	1231	1100	6	203	294	401	3	0	0	4	61	44	35	475	3857
Belgium	0	0	0	100	143	77	0	0	0	0	9	14	0	286	49	678
France	0	1797	430	2228	3092	585	1913	2009	827	392	76	381	341	744	332	15147
Germany	0	6210	133	0	1637	1474	390	0	0	0	306	0	485	441	0	11076
Ireland	0	0	0	19	47	0	0	0	0	0	16	4	21	629	0	737
Netherlands	0	111	0	39	80	13	0	0	0	0	0	0	28	91	3	365
Switzerland*	0	256	487	3	127	167	59	34	0	0	5	11	22	6	40	1217
United Kingdom**	0	91	0	271	310	48	0	0	0	0	0	56	47	1452	518	2793
Central-West Europe	0	9696	2150	2666	5639	2658	2763	2046	827	392	416	527	988	3685	1416	35870
Denmark	0	28	0	28	95	83	0	0	0	0	2	34	0	286	30	587
Estonia	950	39	0	0	0	0	0	0	0	0	304	0	909	1	0	2203
Finland	15462	451	316	0	0	0	0	0	0	0	4360	0	1462	34	0	22085
Iceland	0	0	3	0	0	0	0	0	0	0	0	0	6	21	0	30
Latvia	411	1229	0	0	0	0	0	0	0	0	267	0	1192	1	253	3354
Lithuania	0	1108	0	0	134	0	0	0	0	0	370	28	521	4	0	2165
Norway	5415	1147	1038	21	5	8	0	0	0	0	653	5	1719	239	0	10250
Sweden	15211	6380	1095	125	38	79	0	0	0	0	2860	25	2253	539	0	28605
North Europe	37449	10383	2452	174	272	170	0	0	0	0	8816	92	8062	1126	283	69279
Bulgaria	0	326	815	0	353	414	113	1690	0	9	0	0	0	207	0	3927
Croatia	0	25	34	59	415	181	564	225	80	53	0	201	0	83	0	1920
Cyprus	0	0	0	0	0	0	0	1	0	171	0	0	0	1	0	173
Slovenia	0	79	33	19	112	489	431	86	0	0	0	3	0	0	0	1252
South-East Europe	0	430	882	78	880	1084	1108	2002	80	233	0	204	0	291	0	7272
Italy	0	81	1240	0	161	63	1018	3553	913	393	0	113	131	341	1143	9149
Spain	0	400	490	146	103	89	264	1555	5565	5207	0	182	16	886	3269	18173
South-West Europe	0	481	1729	146	264	152	1281	5108	6478	5600	0	295	147	1228	4412	27322

Annex Table J: Growing stock (volume) in forests by European Forest Types

Country	European Forest Types growing stock (1000 m³ o.b.)							
	Boreal forest	Hemiboreal and nemoral coniferous and mixed broad-leaved-coniferous forest	Alpine forest	Acidophilous oak and oak-birch forest	Mesophytic deciduous forest	Beech forest	Mountainous beech forest	Thermophilous deciduous forest
Belarus	125288	970982	0	15661	15661	0	0	0
Czech Republic	0	508635	119845	1406	34550	46865	20952	35
Hungary	0	0	0	31626	105929	43201	0	25030
Poland	0	1508095	94525	18373	207086	71572	125027	10520
Slovakia	0	40451	124371	1408	77747	141072	60764	7662
Ukraine	0	788000	212000	4000	477000	22000	124000	1000
Central-East Europe	125288	3816163	550741	72474	917974	324710	330743	44247
Austria	0	455813	361003	1393	42950	99017	135521	416
Belgium	0	0	0	20332	28476	17987	0	0
France	0	296114	78985	384451	529597	120323	466996	223379
Germany	0	2108465	49935	0	407865	508434	144219	0
Ireland	0	0	0	1855	3490	0	0	0
Netherlands	0	20200	0	6500	14200	3300	0	0
Switzerland*	0	112244	172707	667	34687	58912	14564	7290
Central-West Europe	0	2992836	662630	415198	1061265	807973	761299	231085
Denmark	0	4149	0	3443	15619	30674	0	0
Estonia	225376	5922	0	0	0	0	0	0
Finland	1625023	64254	6609	0	0	0	0	0
Iceland	0	0	168	0	0	0	0	0
Latvia	84070	295770	0	0	0	0	0	0
Lithuania	0	276791	0	0	28084	0	0	0
Norway	595118	169120	37285	3121	1318	1348	0	0
Sweden	1706161	1071655	n.a.	25338	8001	21268	0	0
North Europe	4235748	1887662	44062	31902	53022	53290	0	0
Bulgaria	0	66500	219800	0	46800	57000	13600	228700
Croatia	0	3820	8430	14748	104786	49022	143196	14538
Cyprus	0	0	0	0	0	0	0	226
Slovenia	0	32231	9423	3878	31480	169703	152941	15219
South-East Europe	0	102551	237653	18626	183066	275725	309737	258683
Italy*	0	19799	346352	0	21348	9749	230261	372132
South-West Europe	0,0	19799	346352	0	21348	9749	230261	372132

Annex Table J: Growing stock (volume) in forests by European Forest Types (cont.)

Country	European Forest Types growing stock (1000 m³ o.b.)							
	Broad-leaved evergreen forest	Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions	Mire and swamp forest	Floodplain forest	Non-riverine alder, birch or aspen forest	Introduced tree species forest	Unclassified forest	TOTAL
Belarus	0	0	203593	15661	219254	0	0	1566100
Czech Republic	0	0	13723	10967	6248	5264	858	769348
Hungary	0	0	632	8564	10260	130468	1	355709
Poland	0	0	18375	67733	165420	9353	7889	2303968
Slovakia	0	0	1596	6736	1782	6287	44217	514093
Ukraine	0	9000	14000	125000	182000	44000	117000	2119000
Central-East Europe	0	9000	251919	234660	584964	195371	169965	7628218
Austria	0	0	541	12918	8898	9749	11718	1139937
Belgium	0	0	985	2998	0	78698	18424	167900
France**	34742	34322	11205	56463	38609	152966	25042	2453193
Germany	0	0	79268	0	75776	118029	0	3491991
Ireland	0	0	741	218	1303	66693	0	74300
Netherlands	0	0	0	0	3500	22300	30	70030
Switzerland*	0	0	1259	2014	2564	1922	n.a.	408830
Central-West Europe	34742	34322	93999	74612	130650	450357	55214	7806182
Denmark	0	0	368	7658	0	51445	0	113355
Estonia	0	0	42738	0	166783	609	0	441427
Finland	0	0	358052	0	149858	3436	0	2207232
Iceland	0	0	0	0	82	200	0	450
Latvia	0	0	33810	0	210200	258	8722	632830
Lithuania	0	0	66959	5077	101932	535	0	479378
Norway	0	0	27707	873	108403	53458	0	997751
Sweden	0	0	144105	3392	228473	34203	0	3242596
North Europe	0	0	673738	17000	965731	144143	8722	8115020
Bulgaria	0	1000	0	0	0	23000	0	656400
Croatia	5147	5162	0	48290	0	12758	0	409897
Cyprus	0	8603	0	0	0	n.a.	0	8829
Slovenia	0	0	0	2085	0	0	0	416960
South-East Europe	5147	14765	0	50375	0	35758	0	1492086
Italy*	58519	64941	0	12735	14404	32959	86218	1269416
South-West Europe	58519	64941	0	12735	14404	32959	86218	1269416

Reference year 2010, except *: 2005, **: data available only for forest area available for wood supply

Annex 2: Materials and Methods

The FOREST EUROPE State of Europe's Forests 2011 report is based on the six pan-European criteria, and 35 quantitative and 17 qualitative indicators for sustainable forest management (SFM).

The report on quantitative indicators has been prepared on the basis of the data and information received from countries (National Correspondents), as well as from UNECE/FAO and FAO databases and from other International Data Providers (IDPs) (see Annex Table K). The main instrument for the data collection has been a common questionnaire, as well as information received from IDPs prepared according to agreed Technical Specifications.

The Main Questionnaire addressed all the pan-European criteria and indicators, taking into account that the data/information on Indicators 2.1, 2.2, 2.3, 4.6, 4.7, 6.7, and 6.8 was provided by the International Data Providers *(EC JRC, ICP Forests, Bioversity International, EUROSTAT, FAO, UNECE - JFSQ and JWEE, and others)*. The set of Terms and Definitions supporting the Enquiry and its Reporting Forms were included.

A major reason to use data collected and assessed at the national level and to combine these with data from other sources was to capitalise on the experience and utilise investments into national forest resources assessments to the maximum extent.

Data on the 17 pan-European qualitative indicators for SFM was covered through a separate enquiry addressed to FOREST EUROPE national focal points. UNECE/FAO and the FOREST EUROPE Liaison Unit Oslo jointly prepared the 2011 enquiry on Pan-European Qualitative Indicators for Sustainable Forest Management (SFM), including reporting on National Implementation of commitments from former Ministerial Conferences. The questionnaire was drafted on the basis of pan-European qualitative indicators as approved at the Vienna Ministerial Conference in 2003, as well as lessons learned through previous enquiries (State of Europe's Forests 2007, FRA 2010). The enquiry on Part A, "Overall policies, institutions and instruments for SFM" and Part B, "Policies, institutions and instruments by policy area", contains twelve indicators aiming to provide information in addition to the information provided in Part A. This concerns the specific policy objectives, the main institutions relevant to achieve the objective as well as the main policy instruments used. The questionnaire was sent to FOREST EUROPE correspondents in early March 2010, asking for submission of national reports by mid-May 2010.

Data on quantitative indicators was compiled, checked and verified with national correspondents where necessary and stored in the FAO database through well-established routines for forest resources assessment at both UNECE/FAO and FAO. The qualitative data was collected, reviewed, validated and analysed by UNECE/FAO and the European Forest Institute (EFI) in collaboration with the FOREST EUROPE Liaison Unit Oslo, and stored in a specifically designed database.

The reviewed data were subsequently made available to coordinating lead authors, lead authors and authors of individual chapters of the report.

Information on materials and methods applied for assessing the sustainability of forest management is available in Part III.

Annex Table K: Data providers for reporting on Pan-European Quantitative Indicators

No.	Indicator	Data provider
1.1	Forest area	FRA2010 (pre-filled); National Data Reporting Forms
1.2	Growing stock	FRA2010 (pre-filled); National Data Reporting Forms
1.3	Age structure and/or diameter distribution	National Data Reporting Forms
1.4	Carbon stock	FRA2010 (pre-filled); National Data Reporting Forms
2.1	Deposition of air pollutants	ICP Forests/EC JRC
2.2	Soil condition	ICP Forests/EC JRC
2.3	Defoliation	ICP Forests/EC JRC
2.4	Forest damage	FRA2010 (pre-filled); National Data Reporting Forms
3.1	Increment and fellings	National Data Reporting Forms
3.2	Roundwood	UNECE–JFSQ (pre-filled); National Data Reporting Forms
3.3	Non-wood goods	FRA2010 (pre-filled); National Data Reporting Forms
3.4	Services	National Data Reporting Forms
3.5	Forests under management plans	National Data Reporting Forms
4.1	Tree species composition	National Data Reporting Forms
4.2	Regeneration	FRA2010 (pre-filled); National Data Reporting Forms
4.3	Naturalness	FRA2010 (pre-filled); National Data Reporting Forms
4.4	Introduced tree species	National Data Reporting Forms
4.5	Deadwood	National Data Reporting Forms
4.6	Genetic resources	Bioversity International
4.7	Landscape pattern	EC JRC
4.8	Threatened forest species	National Data Reporting Forms
4.9	Protected forests	National Data Reporting Forms
5.1	Protective forests – soil, water and other ecosystem functions	National Data Reporting Forms
5.2	Protective forests – infrastructure and managed natural resources	National Data Reporting Forms
6.1	Forest holdings	FRA2010 (pre-filled); National Data Reporting Forms
6.2	Contribution of forest sector to GDP	EUROSTAT/FAO (pre-filled); National Data Reporting Forms
6.3	Net revenue	EUROSTAT (pre-filled); National Data Reporting Forms
6.4	Expenditures for services	National Data Reporting Forms
6.5	Forest sector workforce	EUROSTAT (pre-filled); National Data Reporting Forms
6.6	Occupational safety and health	National Data Reporting Forms
6.7	Wood consumption	UNECE–JFSQ
6.8	Trade in wood	UNECE–JFSQ
6.9	Energy from wood resources	UNECE-JWEE (pre-filled); National Data Reporting Forms
6.10	Accessibility for recreation	National Data Reporting Forms
6.11	Cultural and spiritual values	National Data Reporting Forms

Annex 3: FOREST EUROPE Signatories[2]

FOREST EUROPE Signatories assigned to Country Groups in State of Europe's Forests 2011

Country Groups	Countries
Russian Federation	Russian Federation
North Europe	Denmark
	Estonia
	Finland
	Iceland
	Latvia
	Lithuania
	Norway
	Sweden
Central-West Europe	Austria
	Belgium
	France
	Germany
	Ireland
	Liechtenstein
	Luxembourg
	Netherlands
	Switzerland
	United Kingdom
Central-East Europe	Belarus
	Czech Republic
	Georgia
	Hungary
	Poland
	Republic of Moldova
	Romania
	Slovakia
	Ukraine
South-West Europe	Andorra
	Holy See
	Italy
	Malta
	Monaco
	Portugal
	Spain
South-East Europe	Albania
	Bosnia and Herzegovina
	Bulgaria
	Croatia
	Cyprus
	Greece
	Montenegro
	Serbia
	Slovenia
	The former Yugoslav Republic of Macedonia
	Turkey

[2] In addition to the 46 European countries assigned to country groups, the European Union is also a Signatory to FOREST EUROPE. The European Commission has provided input to the Quantitative Indicators.

Annex 4: Pan-European Quantitative and Qualitative Indicators for Sustainable Forest Management

Pan-European Quantitative Indicators for Sustainable Forest Management

No	Indicator name	Full text
Criterion 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
1.2	Growing stock	Growing stock on forest and other wooded land, classified by forest type and by availability for wood supply
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
1.4	Carbon stock	Carbon stock of woody biomass and of soils on forest and other wooded land
Criterion 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
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
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”
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
Criterion 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
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
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
Criterion 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
4.2	Regeneration	Area of regeneration within even-aged stands and uneven-aged stands, classified by regeneration type
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
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
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 Red List categories in relation to total number of forest species
4.9	Protected forests	Area of forest and other wooded land protected to conserve biodiversity, landscapes and specific natural elements, according to MCPFE[3] Assessment Guidelines

[3] The Ministerial Conference on the Protection of Forests in Europe has changed its brand name from MCPFE to FOREST EUROPE

Pan-European Quantitative Indicators for Sustainable Forest Management (cont.)

Criterion 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 Class "Protective Functions"
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 Class "Protective Functions"
Criterion 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
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
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
6.11	**Cultural and spiritual values**	Number of sites within forest and other wooded land designated as having cultural or spiritual values

Pan-European Quantitative Indicators for Sustainable Forest Management

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**
B.1	Land use and forest area and other wooded land (Criterion 1)
B.2	Carbon balance (Criterion 1)
B.3	Health and vitality (Criterion 2)
B.4	Production and use of wood (Criterion 3)
B.5	Production and use of non-wood goods and services, provision of especially recreation (Criterion 3)
B.6	Biodiversity (Criterion 4)
B.7	Protective forests and other wooded land (Criterion 5)
B.8	Economic viability (Criterion 6)
B.9	Employment (incl. safety and health) (Criterion 6)
B.10	Research, training and education (Criterion 6)
B.11	Public awareness and participation (Criterion 6)
B.12	Cultural and spiritual values (Criterion 6)

Annex 5: National Correspondents who Supplied Data on Quantitative Indicators for Sustainable Forest Management[4]

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[4] Countries which did not supply information are not included in this list. National representatives were asked to comment on data sets estimated by the secretariat.

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E - Language Editor

Chapters:
P - Part e.g. PI
C - Criterion e.g. C1
A,B - group of QL indicators, e.g. B.2
I - QN indicator e.g. I-1.1
EFT - chapter on European Forest Types

Annex 8: Output Tables

Table A1.1: Basic data on countries, 2010

Country	Land area [1000 ha]	Forest & OWL			Population				GDP (2009)		
		1000 ha	% of land area	Forest & OWL per inha-bitant [ha]	Total [1000]	Density [inha-bitants per km²]	Rural [1000]	Density rural [inha-bitants per km²]	GDP total [billion Euro]	Per in-habitant [Euro PPS]	Real growth rate [%]
Albania	2740	1032	38	0.3	3169	116	1524	56	9	6000	2.8
Andorra	45	16	36	0.2	85	189	10	23	3	-	3.0
Austria	8245	3991	48	0.5	8387	102	2721	33	274	29300	-3.9
Belarus	20748	9126	44	1.0	9588	46	2426	12	35	8900	2.5
Belgium	3028	706	23	0.1	10698	353	277	9	339	27400	-2.8
BA	5120	3021	59	0.8	3760	73	1932	38	12	5400	4.3
Bulgaria	10864	3927	36	0.5	7497	69	2140	20	35	10400	-5.5
Croatia	5592	2474	44	0.6	4410	79	1864	33	46	15100	-6.0
Cyprus	924	387	42	0.4	880	95	261	28	17	23200	-1.7
Czech Republic	7726	2657	34	0.3	10411	135	2755	36	137	19200	-4.1
Denmark	4242	635	15	0.1	5481	129	720	17	222	28400	-5.2
Estonia	4239	2337	55	1.7	1339	32	409	10	14	15000	-13.9
Finland	30408	23116	76	4.3	5346	18	797	3	171	26600	-8.2
France	55010	17572	32	0.3	62637	114	9238	17	1907	25400	-2.6
Georgia	6949	2793	40	0.7	4219	61	1994	29	8	3400	-3.9
Germany	34877	11076	32	0.1	82057	235	21459	62	2397	27400	-4.7
Greece	12890	6539	51	0.6	11183	87	4315	33	235	22100	-2.0
Holy See	0.04	0	0	0.0	1	2273	0	0	-	-	-
Hungary	8961	2039	23	0.2	9973	111	3182	36	93	15300	-6.7
Iceland	10025	116	1	0.4	329	3	22	0	9	27600	-6.9
Ireland	6889	788	11	0.2	4589	67	1747	25	160	29800	-7.6
Italy	29411	10916	37	0.2	60098	204	19015	65	1520	24400	-5.2
Latvia	6229	3467	56	1.5	2240	36	723	12	19	12200	-18.0
Liechtenstein	16	7	46	0.2	35	222	30	190	3	101200	-1.2
Lithuania	6268	2249	36	0.7	3255	52	1075	17	27	12900	-14.7
Luxembourg	259	88	34	0.2	492	190	73	28	38	64000	-3.6
Malta	32	0.35	1	n.s.	410	1281	22	68	6	19000	-3.4
Monaco	0.20	0	0	0.0	33	16923	0	0	4	-	-2.6
Montenegro	1382	744	54	1.2	626	45	241	17	3	9300	-7.0
Netherlands	3388	365	11	0.0	16653	492	2854	84	572	30800	-3.9
Norway	30427	12384	41	2.6	4855	16	1000	3	273	42000	-1.4
Poland	30633	9319	30	0.2	38038	124	14851	48	310	14300	1.7
Portugal	9068	3611	40	0.3	10732	118	4217	47	169	18900	-2.5
MD	3288	456	14	0.1	3576	109	1897	58	4	2000	-6.5
Romania	22998	6733	29	0.3	21190	92	9013	39	117	10900	-7.1
Russian Federation	1638139	882310	54	6.3	140367	9	37665	2	883	10700	-7.9
Serbia	8746	3123	36	0.3	9856	113	4331	50	30	8200	-3.1
Slovakia	4810	1938	40	0.4	5412	113	2437	51	63	17200	-4.8
Slovenia	2014	1274	63	0.6	2025	101	1022	51	35	20700	-8.1
Spain	49919	27748	56	0.6	45317	91	10243	21	1054	24300	-3.7
Sweden	41031	30625	75	3.3	9293	23	1424	3	291	28000	-5.3

Table A1.1: Basic data on countries, 2010 (cont.)

Country	Land area [1000 ha]	Forest & OWL			Population				GDP (2009)		
		1000 ha	% of land area	Forest & OWL per inha-bitant [ha]	Total [1000]	Density [inha-bitants per km²]	Rural [1000]	Density rural [inha-bitants per km²]	GDP total [billion Euro]	Per in-habitant [Euro PPS]	Real growth rate [%]
Switzerland	4000	1311	33	0.2	7595	190	2003	50	354	34000	-1.9
MK	2543	1141	45	0.6	2043	80	831	33	7	8000	-0.9
Turkey	76963	21702	28	0.3	75705	98	22977	30	440	10200	-4.5
Ukraine	**57938**	9746	17	0.2	45433	78	14181	24	114	4500	-15.1
United Kingdom	**24250**	2901	12	0.0	61899	255	12604	52	1566	26500	-4.9

Sources: *Land, Forest, Other Wodded Land:* FOREST EUROPE/UNECE/FAO enquiry on pan-European quantitative indicators
Total population: http://unstats.un.org/unsd/demographic/products/socind/population.htm; searched February 2011
Rural population share: http://unstats.un.org/unsd/demographic/products/socind/hum-sets.htm; searched February 2011

GDP: Central Intelligence Agency (CIA). 2010. *The world fact book* (Available at: https://www.cia.gov/library/publications/the-world-factbook-/index.html).
United Nations Economic Commission for Europe (UNECE)
United Nations Statistics Division (UNSD). 2010. *National accounts data.* (Available at: http://data.un.org/Explorer aspx?d=SNAAMA). World Bank. 2010. *World Development Indicators database.* Data for 2008. (Available at: http://databank.worldbank.org/ddp/home.do?Step=12&id=4&CNO=2).

Note: GDP growth calculate in relation to 2008

Table A1.2: Extent of forest and other wooded land, 2010

Country	Land area					
	Forest		Other wooded land		Other land	Total
	1000 ha	% of land area	1000 ha	% of land area	1000 ha	
Albania	776	28	255	9	1709	2740
Andorra	16	36	0	0	29	45
Austria	3857	47	134	2	4254	8245
Belarus	8600	41	526	3	11622	20748
Belgium	678	22	28	1	2322	3028
BA	2472	48	549	11	2099	5120
Bulgaria	3927	36	0	0	6937	10864
Croatia	1920	34	554	10	3118	5592
Cyprus	173	19	214	23	537	924
Czech Republic	2657	34	0	0	5069	7726
Denmark	587	14	48	1	3607	4242
Estonia	2203	52	134	3	1902	4239
Finland	22084	73	1032	3	7293	30408
France	15954	29	1618	3	37438	55010
Georgia	2742	39	51	1	4156	6949
Germany	11076	32	0	0	23801	34877
Greece	3903	30	2636	20	6351	12890
Holy See	0	0	0	0	0.04	0.04
Hungary	2039	23	0	0	6922	8961
Iceland	30	n.s.	86	1	9909	10025
Ireland	737	11	50	1	6101	6889
Italy	9149	31	1767	6	18495	29411
Latvia	3354	54	113	2	2762	6229
Liechtenstein	7	43	1	3	9	16
Lithuania	2165	35	84	1	4019	6268
Luxembourg	87	33	1	1	171	259
Malta	0.35	1	0	0	31.65	32
Monaco	0	0	0	0	0.20	0.20
Montenegro	467	34	277	20	638	1382
Netherlands	365	11	0	0	3023	3388
Norway	10250	34	2134	7	18043	30427
Poland	9319	30	0	0	21314	30633
Portugal	3456	38	155	2	5457	9068
MD	386	12	70	2	2832	3288
Romania	6573	29	160	1	16265	22998
Russian Federation	809090	49	73220	4	755829	1638139
Serbia	2713	31	410	5	5623	8746
Slovakia	1938	40	0	0	2872	4810
Slovenia	1253	62	21	1	740	2014
Spain	18173	36	9574	19	22171	49919
Sweden	28605	70	2020	5	10406	41031
Switzerland	1240	31	71	2	2689	4000
MK	998	39	143	6	1402	2543
Turkey	11334	15	10368	13	55261	76963
Ukraine	9705	17	41	n.s.	48192	57938
United Kingdom	2881	12	20	n.s.	21349	24250

Sources: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A1.3: Change in extent of forest, 1990-2010

Country	Forest									
	Area [1000 ha]				Annual change rate					
					1990-2000		2000-2005		2005-2010	
	1990	2000	2005	2010	1000 ha/yr	%	1000 ha/yr	%	1000 ha/yr	%
Albania	789	769	782	776	-2.0	-0.26	2.6	0.34	-1.1	-0.15
Andorra	16	16	16	16	0.0	0.0	0.0	0.0	0.0	0.0
Austria	3776	3838	3851	3857	6.2	0.16	2.6	0.07	1.2	0.03
Belarus	7780	8273	8436	8600	49.3	0.62	32.6	0.39	32.8	0.39
Belgium	677	667	673	678	-1.0	-0.15	1.1	0.16	1.0	0.15
BA	2210	2185	2365	2472	-2.5	-0.11	36.0	1.60	21.4	0.89
Bulgaria	3327	3375	3651	3927	4.8	0.14	55.2	1.58	55.2	1.47
Croatia	1850	1885	1903	1920	3.5	0.19	3.6	0.19	3.4	0.18
Cyprus	161	172	173	173	1.1	0.63	0.2	0.14	0.1	0.04
Czech Republic	2629	2637	2647	2657	0.8	0.03	2.0	0.08	2.0	0.08
Denmark	445	486	552	587	4.1	0.89	13.1	2.57	7.0	1.25
Estonia	2090	2243	2252	2203	15.3	0.71	1.9	0.08	-9.8	-0.44
Finland	21897	22459	22162	22084	56.2	0.25	-59.3	-0.27	-15.6	-0.07
France	14537	15353	15714	15954	81.6	0.55	72.2	0.47	48.0	0.30
Georgia	2779	2768	2755	2742	-1.1	-0.04	-2.6	-0.09	-2.6	-0.09
Germany	10741	11076	11076	11076	33.5	0.31	0.0	0.0	0.0	0.0
Greece	3299	3601	3752	3903	30.2	0.88	30.2	0.82	30.2	0.79
Holy See	0	0	0	0	0.0	-	0.0	-	0.0	-
Hungary	1801	1907	1983	2039	10.6	0.57	15.2	0.78	11.2	0.56
Iceland	9	18	25	30	1.0	7.78	1.4	6.66	0.9	3.32
Ireland	465	635	695	737	17.0	3.16	12.0	1.82	8.5	1.20
Italy	7590	8369	8759	9149	77.9	0.98	78.0	0.92	78.0	0.88
Latvia	3173	3241	3297	3354	6.8	0.21	11.2	0.34	11.4	0.34
Liechtenstein	7	7	7	7	n.s.	0.60	0.0	0.0	0.0	0.0
Lithuania	1945	2020	2121	2165	7.5	0.38	20.2	0.98	8.8	0.41
Luxembourg	86	87	87	87	0.1	0.11	0.0	0.0	0.0	0.0
Malta	0.35	0.35	0.35	0.35	0.0	0.0	0.0	0.0	0.0	0.0
Monaco	0	0	0	0	0.0	-	0.0	-	0.0	-
Montenegro	467	467	467	467	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands	345	360	365	365	1.5	0.43	1.0	0.28	0.0	0.0
Norway	9130	9301	9683	10250	17.1	0.19	76.4	0.81	113.4	1.14
Poland	8881	9059	9200	9319	17.8	0.20	28.2	0.31	23.8	0.26
Portugal	3327	3420	3437	3456	9.3	0.28	3.4	0.10	3.8	0.11
MD	319	324	363	386	0.5	0.16	7.8	2.30	4.6	1.24
Romania	6371	6366	6391	6573	-0.5	-0.01	5.0	0.08	36.4	0.56
Russian Federation	808950	809269	808790	809090	31.9	n.s.	-95.7	-0.01	60.0	0.01
Serbia	2313	2460	2476	2713	14.7	0.62	3.2	0.13	47.4	1.85
Slovakia	1922	1921	1932	1938	-0.1	-0.01	2.2	0.11	1.2	0.06
Slovenia	1188	1233	1243	1253	4.5	0.37	2.0	0.16	2.0	0.16
Spain	13818	16988	17293	18173	316.9	2.09	61.1	0.36	176.0	1.0
Sweden	28512	28512	28512	28605	0.0	0.0	0.0	0.0	18.6	0.07
Switzerland	1151	1194	1217	1240	4.3	0.37	4.6	0.38	4.6	0.38
MK	912	958	975	998	4.6	0.49	3.4	0.35	4.6	0.47
Turkey	9680	10146	10740	11334	46.6	0.47	118.8	1.14	118.8	1.08
Ukraine	9274	9510	9575	9705	23.6	0.25	13.0	0.14	26.0	0.27
United Kingdom	2611	2793	2845	2881	18.2	0.68	10.4	0.37	7.2	0.25

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A1.4: Change in extent of forest available for wood supply, 1990-2010

Country	Forest available for wood supply									
	Area [1000 ha]				Annual change rate					
					1990-2000		2000-2005		2005-2010	
	1990	2000	2005	2010	1000 ha/yr	%	1000 ha/yr	%	1000 ha/yr	%
Albania	685	620	611	-	-6.5	-0.99	-1.7	-0.28	-	-
Andorra	-	-	-	-	-	-	-	-	-	-
Austria	3310	3341	3343	3343	3.1	0.09	0.4	0.01	0.0	0.0
Belarus	5925	6350	6376	6441	42.5	0.70	5.2	0.08	13.0	0.20
Belgium	673	663	667	672	-1.0	-0.15	0.8	0.12	1.0	0.16
BA	1266	1252	1252	1252	-1.4	-0.11	0.0	0.0	0.0	0.0
Bulgaria	2365	2258	2561	2864	-10.7	-0.46	60.6	2.55	60.6	2.26
Croatia	1758	1749	1745	1741	-0.9	-0.05	-0.8	-0.05	-0.8	-0.05
Cyprus	43	43	41	41	n.s.	-0.01	-0.4	-0.84	0.0	0.0
Czech Republic	2575	2561	2518	2330	-1.4	-0.05	-8.6	-0.34	-37.6	-1.54
Denmark	-	-	545	581	-	-	-	-	7.0	1.26
Estonia	1737	2103	2074	2013	36.6	1.93	-5.7	-0.27	-12.2	-0.59
Finland	20448	20317	20051	19869	-13.1	-0.06	-53.3	-0.26	-36.4	-0.18
France	13911	14645	14743	15147	73.4	0.52	19.6	0.13	80.7	0.54
Georgia	-	-	2344	-	-	-	-	-	-	-
Germany	9968	10568	10568	10568	60.0	0.59	0.0	0.0	0.0	0.0
Greece	3038	3317	3456	3595	27.8	0.88	27.8	0.82	27.8	0.79
Holy See	0	0	0	0	0.0	-	0.0	-	0.0	-
Hungary	1531	1622	1684	1726	9.1	0.58	12.4	0.75	8.4	0.49
Iceland	8	18	25	29	1.0	8.08	1.4	6.81	0.9	3.37
Ireland	-	-	-	-	-	-	-	-	-	-
Italy	6708	7396	7741	8086	68.8	0.98	68.9	0.92	68.9	0.88
Latvia	2824	3024	3088	3138	20.0	0.68	13.0	0.43	9.9	0.32
Liechtenstein	4	4	4	4	n.s.	1.06	0.0	0.0	0.0	0.0
Lithuania	1695	1756	1835	1875	6.1	0.35	15.8	0.88	8.0	0.43
Luxembourg	86	87	86	86	0.1	0.11	-0.1	-0.15	0.0	0.0
Malta	-	-	-	-	-	-	-	-	-	-
Monaco	0	0	0	0	0.0	-	0.0	-	0.0	-
Montenegro	386	386	386	386	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands	281	290	295	295	0.9	0.32	1.0	0.34	0.0	0.0
Norway	6559	6519	6291	6419	-4.0	-0.06	-45.6	-0.71	25.6	0.40
Poland	8323	8342	8417	8532	1.9	0.02	15.0	0.18	23.0	0.27
Portugal	1722	1782	1802	1822	6.0	0.34	4.0	0.22	4.0	0.22
MD	-	-	-	-	-	-	-	-	-	-
Romania	5617	5029	5049	5193	-58.8	-1.10	4.0	0.08	28.8	0.56
Russian Federation	698527	703781	690978	677204	525.4	0.07	-2560.5	-0.37	-2754.9	-0.40
Serbia	-	-	-	-	-	-	-	-	-	-
Slovakia	1772	1767	1751	1775	-0.5	-0.03	-3.2	-0.18	4.8	0.27
Slovenia	1114	1157	1166	1175	4.3	0.38	1.8	0.16	1.8	0.15
Spain	12485	13942	14193	14915	145.7	1.11	50.1	0.36	144.5	1.0
Sweden	22384	20947	20632	20554	-143.7	-0.66	-63.0	-0.30	-15.6	-0.08
Switzerland	1117	1156	1178	1200	3.9	0.34	4.4	0.38	4.4	0.37
MK	804	804	804	804	0.0	0.0	0.0	0.0	0.0	0.0
Turkey	8659	8648	7854	7313	-1.1	-0.01	-158.8	-1.91	-108.2	-1.42
Ukraine	6368	5768	5468	5368	-60.0	-0.98	-60.0	-1.06	-20.0	-0.37
United Kingdom	2141	2323	2375	2411	18.2	0.82	10.4	0.44	7.2	0.30

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A1.5: Growing stock (volume) on forest, 2010

Country	Growing stock [million m3]			
	Forest	of which available for wood supply	Other wooded land	Forest and other wooded land
Albania	75	-	7	82
Andorra	-	-	-	-
Austria	1140	1107	0	1140
Belarus	1566	1276	24	1591
Belgium	168	164	-	-
BA	358	205	-	-
Bulgaria	656	435	0	656
Croatia	410	371	6	416
Cyprus	9	3	-	-
Czech Republic	769	738	0	769
Denmark	113	112	1	114
Estonia	441	398	6	447
Finland	2207	2024	9	2216
France	2584	2453	-	-
Georgia	467	-	-	-
Germany	3492	3466	0	3492
Greece	185	170	-	-
Holy See	0	0	0	0
Hungary	356	259	-	-
Iceland	0.45	0.43	0.74	1.19
Ireland	74	74	-	-
Italy	1384	1285	64	1448
Latvia	633	584	2	635
Liechtenstein	2	1	-	-
Lithuania	479	408	3	482
Luxembourg	26	-	-	-
Malta	0.08	-	0	0.08
Monaco	0	0	0	0
Montenegro	73	68	2	74
Netherlands	70	56	0	70
Norway	997	797	25	1022
Poland	2304	2092	0	2304
Portugal	186	154	2	188
MD	48	-	4	51
Romania	1390	-	-	-
Russian Federation	81523	68234	1775	83298
Serbia	415	-	3	418
Slovakia	514	478	0	514
Slovenia	416	390	1	417
Spain	914	784	2	915
Sweden	3243	2651	10	3252
Switzerland	429	415	1	430
MK	76	66	-	-
Turkey	1526	1085	91	1617
Ukraine	2119	1172	1	2120
United Kingdom	379	340	1	380

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A1.6: Change in growing stock on forest, 1990-2010

Country	Forest									
	Growing stock [Million m3]				Annual change rate					
					1990-2000		2000-2005		2005-2010	
	1990	2000	2005	2010	1000 m³/yr	%	1000 m³/yr	%	1000 m³/yr	%
Albania	75	76	74	75	0.1	0.08	-0.3	-0.37	0.1	0.16
Andorra	-	-	-	-	-	-	-	-	-	-
Austria	995	1089	1125	1140	9.3	0.90	7.3	0.66	3.0	0.26
Belarus	1093	1339	1435	1566	24.6	2.05	19.1	1.39	26.3	1.77
Belgium	128	157	164	168	2.9	2.09	1.3	0.84	0.8	0.46
BA	291	358	358	358	6.7	2.09	0.0	0.0	0.0	0.0
Bulgaria	405	526	591	656	12.1	2.65	13.0	2.36	13.0	2.11
Croatia	310	360	385	410	5.0	1.50	5.0	1.35	5.0	1.26
Cyprus	7	8	8	9	0.1	0.69	0.1	1.12	0.1	1.04
Czech Republic	625	699	735	769	7.4	1.12	7.2	1.02	6.9	0.92
Denmark	65	74	109	113	0.9	1.36	6.9	7.96	0.9	0.79
Estonia	375	458	455	441	8.3	2.03	-0.7	-0.14	-2.7	-0.61
Finland	1881	2085	2181	2207	20.4	1.03	19.2	0.90	5.2	0.24
France	2077	2254	2512	2584	17.7	0.82	51.6	2.19	14.4	0.57
Georgia	420	445	456	467	2.6	0.59	2.1	0.47	2.1	0.46
Germany	2815	3381	3458	3492	56.6	1.85	15.4	0.45	6.8	0.20
Greece	156	170	177	185	1.4	0.86	1.4	0.81	1.6	0.89
Holy See	0	0	0	0	0.0	-	0.0	-	0.0	-
Hungary	288	325	341	356	3.7	1.22	3.2	0.97	2.9	0.83
Iceland	0.23	0.31	0.37	0.45	n.s.	3.03	n.s.	3.71	n.s.	3.88
Ireland	62	70	71	74	0.8	1.24	0.2	0.29	0.7	1.03
Italy	926	1155	1269	1384	22.9	2.23	22.9	1.91	22.9	1.74
Latvia	451	546	569	633	9.5	1.93	4.6	0.83	12.8	2.15
Liechtenstein	2	2	2	2	n.s.	0.59	0.0	0.0	0.0	0.0
Lithuania	413	450	465	479	3.7	0.85	3.0	0.66	3.0	0.63
Luxembourg	20	26	26	26	0.6	2.45	0.0	0.0	0.0	0.0
Malta	0.08	0.08	0.08	0.08	0.0	0.0	0.0	0.0	0.0	0.0
Monaco	0	0	0	0	0.0	-	0.0	-	0.0	-
Montenegro	-	73	73	73	-	-	0.0	0.0	0.0	0.0
Netherlands	52	61	65	70	0.9	1.61	0.8	1.28	1.0	1.49
Norway	701	809	898	997	10.8	1.44	17.8	2.11	19.8	2.11
Poland	1485	1736	1909	2304	25.1	1.57	34.6	1.92	79.0	3.83
Portugal	203	197	185	186	-0.6	-0.30	-2.4	-1.25	0.2	0.11
MD	37	43	45	48	0.6	1.60	0.5	1.05	0.5	1.0
Romania	1348	1346	1352	1390	-0.1	-0.01	1.1	0.08	7.7	0.56
Russian Federation	80040	80270	80479	81523	23.1	0.03	41.7	0.05	208.8	0.26
Serbia	235	250	298	415	1.5	0.62	9.6	3.58	23.4	6.85
Slovakia	402	463	495	514	6.2	1.44	6.3	1.32	3.9	0.78
Slovenia	273	333	374	416	6.0	2.0	8.2	2.36	8.3	2.14
Spain	593	870	877	914	27.7	3.91	1.5	0.17	7.3	0.82
Sweden	2816	3087	3215	3243	27.1	0.92	25.6	0.81	5.6	0.17
Switzerland	393	416	422	429	2.3	0.57	1.2	0.29	1.4	0.33
MK	76	79	76	76	0.3	0.34	-0.5	-0.64	n.s.	0.01
Turkey	1273	1381	1453	1526	10.8	0.82	14.5	1.03	14.5	0.98
Ukraine	1414	1884	2004	2119	47.0	2.91	24.0	1.24	23.0	1.12
United Kingdom	282	309	340	379	2.7	0.92	6.2	1.93	7.8	2.20

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A1.7: Growing stock on forest available for wood supply, 1990-2010

Country	Forest									
	Growing stock [Million m³]				Annual change rate					
					1990-2000		2000-2005		2005-2010	
	1990	2000	2005	2010	1000 m³/yr	%	1000 m³/yr	%	1000 m³/yr	%
Albania	66	59	57	-	-0.7	-1.08	-0.4	-0.67	-	-
Andorra	-	-	-	-	-	-	-	-	-	-
Austria	966	1060	1093	1107	9.4	0.93	6.6	0.61	2.8	0.25
Belarus	851	1093	1174	1276	24.2	2.53	16.3	1.45	20.2	1.67
Belgium	127	157	163	164	3.0	2.14	1.3	0.83	0.2	0.13
BA	167	205	205	205	3.8	2.07	0.0	0.0	0.0	0.0
Bulgaria	259	321	378	435	6.2	2.17	11.4	3.32	11.4	2.85
Croatia	294	333	352	371	3.9	1.25	3.9	1.14	3.9	1.08
Cyprus	3	3	3	3	n.s.	0.11	n.s.	0.23	n.s.	0.91
Czech Republic	614	678	706	738	6.4	1.0	5.4	0.79	6.4	0.90
Denmark	-	-	107	112	-	-	-	-	0.9	0.81
Estonia	352	428	414	398	7.6	1.96	-2.6	-0.62	-3.2	-0.79
Finland	1850	1927	2005	2024	7.7	0.41	15.6	0.80	3.8	0.19
France	1984	2119	2356	2453	13.6	0.66	47.3	2.14	19.4	0.81
Georgia	-	-	-	-	-	-	-	-	-	-
Germany	2770	3356	3432	3466	58.6	1.94	15.3	0.45	6.7	0.20
Greece	144	157	163	170	1.3	0.86	1.3	0.81	1.5	0.89
Holy See	0	0	0	0	0.0	-	0.0	-	0.0	-
Hungary	313	303	291	259	-1.0	-0.33	-2.3	-0.79	-6.4	-2.31
Iceland	0.21	0.29	0.35	0.43	n.s.	3.29	n.s.	3.96	n.s.	4.09
Ireland	62	70	71	74	0.8	1.24	0.2	0.29	0.7	1.03
Italy	860	1073	1179	1285	21.3	2.23	21.3	1.91	21.3	1.74
Latvia	418	507	527	584	8.9	1.95	4.0	0.78	11.4	2.08
Liechtenstein	1	1	1	1	n.s.	0.58	0.0	0.0	0.0	0.0
Lithuania	-	392	398	408	-	-	1.3	0.32	2.0	0.50
Luxembourg	-	-	-	-	-	-	-	-	-	-
Malta	-	-	-	-	-	-	-	-	-	-
Monaco	0	0	0	0	0.0	-	0.0	-	0.0	-
Montenegro	-	68	68	68	-	-	0.0	0.0	0.0	0.0
Netherlands	42	49	52	56	0.7	1.55	0.6	1.20	0.8	1.49
Norway	605	685	725	797	8.0	1.25	8.0	1.14	14.4	1.91
Poland	-	1584	1724	2092	-	-	28.0	1.71	73.6	3.95
Portugal	166	163	152	154	-0.3	-0.18	-2.2	-1.39	0.4	0.26
MD	-	-	-	-	-	-	-	-	-	-
Romania	-	-	-	-	-	-	-	-	-	-
Russian Federation	69114	69807	68756	68234	69.3	0.10	-210.2	-0.30	-104.4	-0.15
Serbia	-	-	-	-	-	-	-	-	-	-
Slovakia	363	437	455	478	7.4	1.86	3.7	0.83	4.5	0.96
Slovenia	256	312	351	390	5.6	2.0	7.7	2.36	7.8	2.14
Spain	535	746	753	784	21.1	3.38	1.3	0.17	6.2	0.82
Sweden	2211	2268	2635	2651	5.7	0.25	73.5	3.05	3.1	0.12
Switzerland	381	403	409	415	2.2	0.56	1.2	0.30	1.2	0.29
MK	66	66	66	66	0.0	0.0	0.0	0.0	0.0	0.0
Turkey	1149	1198	1135	1085	5.0	0.43	-12.7	-1.08	-10.1	-0.90
Ukraine	971	1143	1144	1172	17.2	1.64	0.2	0.02	5.6	0.48
United Kingdom	238	268	300	340	3.0	1.19	6.4	2.28	8.0	2.53

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A1.8: Age-class distribution - total of all even-aged forest stands, 2010

Country	Forest: even-aged stands [1000 ha]										
	Total	Age class									
		<10 yrs	11-20	21-40	41-60	61-80	81-100	101-120	121-140	>140	Unspec.
Albania	-	-	-	-	-	-	-	-	-	-	-
Andorra	-	-	-	-	-	-	-	-	-	-	-
Austria	-	-	-	-	-	-	-	-	-	-	-
Belarus	7348.5	319.4	600.5	1612.2	2574.3	1570.2	490.6	120.3	33.4	27.6	0.0
Belgium	511.7	43.9	55.5	128.0	83.9	34.9	13.0	2.4	0.7	0.0	149.3
BA	-	-	-	-	-	-	-	-	-	-	-
Bulgaria	3927.0	0.0	526.0	909.0	1268.0	548.0	260.0	187.0	129.0	100.0	0.0
Croatia	1556.0	68.0	157.0	346.0	312.0	363.0	159.0	114.0	31.0	6.0	0.0
Cyprus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Czech Republic	2657.0	214.7	230.9	385.1	366.9	477.6	417.7	305.3	118.6	57.7	82.5
Denmark	470.4	47.8	74.3	120.9	109.5	37.0	17.0	10.9	5.1	5.7	42.2
Estonia	1716.8	258.2	119.3	327.8	508.1	325.9	123.8	34.3	13.1	6.2	0.0
Finland	22084.0	2087.0	1701.7	3887.0	3948.0	3739.0	2706.4	1249.7	714.9	2049.6	0.0
France	10128.6	87.5	570.7	1650.2	1865.7	1632.1	1158.5	923.8	623.0	775.5	841.6
Georgia	-	-	-	-	-	-	-	-	-	-	-
Germany	11076.0	643.0	643.0	1778.0	2160.0	1541.0	1391.0	981.0	597.0	587.0	755.0
Greece	-	-	-	-	-	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-	-	-	-
Hungary	1616.3	163.7	285.6	492.5	274.9	216.3	121.1	42.1	7.4	3.9	8.7
Iceland	26.9	12.8	9.2	3.1	1.5	0.1	n.s.	n.s.	0.0	0.0	0.0
Ireland	573.3	169.7	207.6	165.3	21.8	4.9	2.2	1.2	0.2	0.4	0.0
Italy	5435.7	-	227.1	2088.5	1151.3	729.4	177.0	148.1	76.5	-	725.0
Latvia	3162.4	369.5	251.5	712.0	782.8	560.1	274.5	125.7	86.4	-	-
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-
Lithuania	2165.0	206.0	146.0	338.0	583.0	452.0	233.0	74.0	17.0	11.0	105.0
Luxembourg	-	-	-	-	-	-	-	-	-	-	-
Malta	-	-	-	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-	-	-	-
Montenegro	-	-	-	-	-	-	-	-	-	-	-
Netherlands	305.0	-	-	-	-	-	-	-	-	-	0.0
Norway	4438.0	706.0	568.0	718.0	672.0	367.0	355.0	370.0	378.0	304.0	0.0
Poland	9116.0	803.0	632.0	1523.0	2565.0	1705.0	1153.0	524.0	139.0	71.0	0.0
Portugal	-	-	-	-	-	-	-	-	-	-	-
MD	-	-	-	-	-	-	-	-	-	-	-
Romania	-	-	-	-	-	-	-	-	-	-	-
Russian Federation	809090.0	32767.2	53654.9	112166.7	145457.1	92350.4	155429.8	111433.5	71454.6	34575.9	-
Serbia	-	-	-	-	-	-	-	-	-	-	-
Slovakia	1938.0	142.9	148.4	294.9	295.7	393.7	345.8	183.7	65.4	56.5	10.7
Slovenia	-	-	-	-	-	-	-	-	-	-	-
Spain	-	-	-	-	-	-	-	-	-	-	-
Sweden	22839.0	2863.0	2272.0	4911.0	3929.0	2590.0	2110.0	1482.0	1226.0	1456.0	0.0
Switzerland	978.0	63.0	70.0	137.0	82.0	93.0	125.0	130.0	96.0	182.0	0.0
MK	-	-	-	-	-	-	-	-	-	-	-
Turkey	-	-	-	-	-	-	-	-	-	-	-
Ukraine	9495.0	314.0	593.0	2040.0	3133.0	1933.0	1014.0	310.0	98.0	60.0	0.0
United Kingdom	2881.0	251.0	282.0	733.0	546.0	331.0	170.0	102.0	82.0	91.0	293.0

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A1.9: Carbon stock on forest, 1990-2010

Country	Forest [million metric tonnes]											
	Biomass				Deadwood				Soil and litter			
	1990	2000	2005	2010	1990	2000	2005	2010	1990	2000	2005	2010
Albania	49.2	49.3	48.3	48.8	-	-	-	-	80.9	78.8	80.6	79.6
Andorra	-	-	-	-	-	-	-	-	-	-	-	-
Austria	339.0	375.0	399.0	393.0	3.0	4.0	5.0	5.0	-	-	-	-
Belarus	385.6	481.6	540.4	610.7	1.9	2.7	2.9	3.1	683.4	726.9	741.1	758.3
Belgium	50.4	60.8	63.1	64.4	1.4	1.4	1.5	1.6	61.8	61.1	61.7	62.2
BA	95.9	117.9	117.9	117.9	-	-	-	-	-	-	-	-
Bulgaria	126.6	161.2	181.9	202.1	-	-	-	-	322.5	327.4	353.9	380.3
Croatia	189.7	221.4	237.2	253.1	-	-	-	-	-	-	-	-
Cyprus	2.6	2.7	2.9	3.0	-	-	-	-	-	-	-	-
Czech Republic	287.3	322.3	339.2	355.5	16.6	16.6	16.7	16.8	181.9	184.0	185.4	186.8
Denmark	22.0	25.5	37.1	38.5	0.4	0.4	0.6	0.6	-	-	-	79.2
Estonia	137.6	168.3	167.3	162.5	6.8	8.3	10.4	11.8	-	-	-	-
Finland	720.8	802.4	832.4	832.4	15.1	15.1	15.9	15.9	3844.0	4200.0	4099.0	4111.0
France	965.0	1049.0	1165.0	1208.0	-	-	-	-	1148.0	1212.0	1242.0	1258.0
Georgia	191.6	202.6	207.5	212.3	-	-	-	-	244.8	244.7	244.7	244.7
Germany	981.0	1193.0	1283.0	1405.0	-	27.0	27.0	35.0	-	-	-	-
Greece	67.0	73.0	76.0	79.0	-	-	-	-	-	-	-	-
Holy See	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hungary	95.0	107.0	110.0	117.0	-	-	-	-	-	-	-	-
Iceland	0.1	0.2	0.2	0.3	-	-	-	-	0.8	1.8	2.5	2.9
Ireland	15.8	18.2	19.9	22.6	1.4	1.4	1.4	1.4	284.2	282.7	281.8	280.6
Italy	375.3	466.6	512.3	557.9	11.7	14.5	15.9	17.3	703.0	775.2	811.2	847.4
Latvia	193.5	234.2	244.1	271.6	5.1	5.4	16.1	16.8	297.4	304.0	309.4	317.8
Liechtenstein	0.5	0.5	0.5	0.5	-	-	-	-	-	-	-	-
Lithuania	134.1	145.6	150.8	155.6	9.8	10.2	10.6	10.8	186.7	193.9	203.6	207.8
Luxembourg	7.4	9.4	9.4	9.4	-	-	-	-	9.0	9.1	9.1	9.1
Malta	0.1	0.1	0.1	0.1	-	-	-	-	-	-	-	-
Monaco	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montenegro	-	33.6	33.6	33.6	-	5.4	5.4	5.4	-	-	-	-
Netherlands	20.5	24.0	25.6	27.7	0.5	0.6	1.2	1.5	46.0	48.0	49.0	49.0
Norway	280.0	323.0	360.0	399.0	19.0	19.0	19.0	19.0	-	-	-	-
Poland	691.0	807.0	887.0	1073.0	8.0	5.0	6.0	26.0	-	-	-	-
Portugal	-	-	101.8	102.4	-	-	-	-	-	-	-	-
MD	22.3	26.1	27.5	28.9	-	-	-	-	-	-	-	-
Romania	599.7	599.3	601.1	618.1	-	-	-	-	722.6	721.9	724.7	745.5
Russian Federation	32504.0	32157.0	32210.0	32500.0	7317.0	7228.0	7198.0	7400.0	87600.0	87500.0	87500.0	87600.0
Serbia	122.0	138.2	146.7	239.9	17.1	19.4	20.5	7.7	-	-	-	211.6
Slovakia	162.7	189.8	202.4	211.2	12.5	14.5	15.3	15.3	287.2	290.0	290.9	292.9
Slovenia	116.0	140.6	159.3	178.3	3.6	4.4	5.1	5.8	123.7	128.4	129.4	130.4
Spain	289.2	396.1	399.6	421.8	-	-	-	-	-	-	-	-
Sweden	1178.1	1182.7	1219.0	1255.3	27.4	27.5	28.3	29.2	3044.7	3033.7	3034.5	3029.9
Switzerland	126.0	136.0	139.0	143.0	3.0	6.0	8.0	9.0	114.0	117.0	120.0	122.0
MK	60.1	62.1	60.4	60.4	-	0.1	0.1	0.4	-	-	-	-
Turkey	686.1	742.6	782.2	821.8	5.4	5.8	6.2	6.5	513.0	537.8	568.4	600.7
Ukraine	499.0	662.0	711.5	761.0	3.5	4.5	4.8	5.0	280.9	288.1	289.1	290.0
United Kingdom	120.0	119.0	128.0	136.0	2.0	2.0	2.0	2.0	681.0	727.0	743.0	755.0

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A2.1: Area of damage to forests by selected type of damage, 1990-2005

Country	Insects & disease			Wildlife & grazing			Storm, wind, snow, etc.		
	1990	2000	2005	1990	2000	2005	1990	2000	2005
	1000 ha								
Albania	-	1.4	1.7	222.9	140.8	101.2	-	0.2	0.2
Andorra	-	-	-	-	-	-	-	-	-
Austria	-	-	-	-	-	-	-	-	-
Belarus	-	243.6	204.7	-	0.0	0.0	-	0.0	11.4
Belgium	-	-	-	-	-	-	4.0	-	-
BA	3.8	11.2	-	-	-	-	1.1	1.1	-
Bulgaria	156.0	222.0	114.0	0.4	0.3	1.0	9.0	23.0	6.7
Croatia	-	22.4	37.6	-	19.8	8.2	-	25.4	19.1
Cyprus	-	-	6.3	-	-	3.8	0.0	0.0	0.0
Czech Republic	27.0	35.7	61.1	-	3.1	1.2	23.1	11.8	24.3
Denmark	-	-	3.7	-	-	3.3	3.0	20.0	7.2
Estonia	-	-	5.2	32.5	6.5	2.0	-	7.0	11.2
Finland	8.0	2.7	2.6	5.8	5.7	10.4	10.2	1.8	5.0
France	-	-	-	-	-	-	13.0	229.0	0.2
Georgia	0.8	1.2	-	-	-	-	-	-	-
Germany	-	164.0	269.0	-	-	-	25.0	25.0	26.0
Greece	-	-	-	-	-	-	-	-	-
Holy See	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0
Hungary	87.4	84.8	179.9	26.1	23.8	35.5	18.3	21.1	29.9
Iceland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ireland	-	-	-	-	-	-	0.4	1.9	0.3
Italy	-	943.2	938.1	-	-	322.7	-	587.5	584.3
Latvia	0.2	0.4	0.5	0.2	0.2	0.1	0.4	1.3	4.6
Liechtenstein	0.1	0.1	0.1	-	-	-	-	-	-
Lithuania	19.0	44.7	52.2	25.3	17.4	12.2	37.1	58.7	37.8
Luxembourg	-	-	0.3	-	-	-	-	-	-
Malta	-	-	-	-	-	-	-	-	-
Monaco	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0
Montenegro	-	-	-	-	-	-	-	-	-
Netherlands	-	-	-	0.0	0.0	0.0	-	-	-
Norway	-	41.0	31.0	21.0	56.0	49.0	122.0	58.0	35.0
Poland	197.0	194.0	167.0	-	-	61.0	-	-	248.0
Portugal	452.8	259.8	747.0	26.9	15.4	44.4	36.5	20.9	51.2
MD	-	-	-	0.0	-	-	0.0	-	-
Romania	1833.4	1290.8	1322.1	25.6	12.9	9.5	151.5	136.5	230.9
Russian Federation	-	-	-	-	-	-	-	-	-
Serbia	1.0	85.0	118.0	1.0	0.0	0.0	0.0	0.0	0.0
Slovakia	25.6	15.2	12.3	1.3	0.8	1.0	4.8	6.0	10.9
Slovenia	-	0.5	1.0	-	0.0	0.0	-	0.5	0.4
Spain	-	-	-	-	-	-	-	-	-
Sweden	207.0	338.0	381.0	611.0	654.0	1777.0	553.0	541.0	1233.0
Switzerland	-	-	-	-	-	-	1.0	4.0	0.0
MK	27.2	58.3	47.3	-	-	-	-	-	-
Turkey	250.0	333.0	184.0	-	-	-	-	34.0	11.0
Ukraine	0.4	1.7	4.3	-	-	-	2.0	6.4	7.7
United Kingdom	1.0	1.0	1.0	3.0	3.0	3.0	6.0	6.0	6.0

Table A2.1: Area of damage to forests by selected type of damage, 1990-2005 (cont.)

Country	Forest operations			Fires					
	1990	2000	2005	1990	2000	2005	1990	2000	2005
	1000 ha								
Albania	-	-	-	-	3.2	6.2	-	-	-
Andorra	-	-	-	-	-	-	-	-	-
Austria	-	-	-	-	-	-	-	-	-
Belarus	-	0.0	0.0	5.8	6.3	1.7	3167.0	2758.0	1719.0
Belgium	-	-	-	0.0	0.0	0.0	-	-	-
BA	-	-	-	1.1	12.5	-	-	-	-
Bulgaria	0.0	0.0	0.0	1.3	14.4	10.8	210.0	768.0	572.0
Croatia	-	-	-	1.2	5.8	6.6	-	-	-
Cyprus	-	-	0.0	0.6	1.0	0.4	16.0	28.0	22.0
Czech Republic	-	-	-	0.7	0.4	0.5	1556.0	1310.0	949.0
Denmark	-	-	2.7	-	0.0	0.0	-	4.0	3.0
Estonia	-	-	0.0	0.4	0.8	0.8	152.6	159.2	117.8
Finland	0.6	0.5	0.2	1.0	0.0	1.0	587.0	1198.0	1535.0
France	-	-	-	-	-	-	-	-	-
Georgia	-	-	-	-	-	-	-	-	-
Germany	-	-	-	1.4	0.3	0.5	1445.0	904.0	1071.0
Greece	-	-	-	18.5	12.6	-	-	-	-
Holy See	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0
Hungary	-	-	-	-	1.2	1.8	1549.0	539.0	202.0
Iceland	0.0	0.0	0.0	-	-	0.0	-	-	0.0
Ireland	-	-	-	0.3	0.3	0.5	-	-	-
Italy	-	27.0	28.3	47.0	38.0	37.0	-	-	-
Latvia	0.0	0.0	0.0	1.8	0.8	1.0	621.0	587.0	870.0
Liechtenstein	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0
Lithuania	0.0	0.0	0.0	0.3	0.4	0.4	366.0	747.0	690.0
Luxembourg	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0
Malta	-	-	-	0.0	0.0	0.0	0.0	-	0.0
Monaco	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0
Montenegro	-	-	-	-	-	-	-	-	-
Netherlands	-	-	-	0.0	0.0	0.0	52.0	0.0	0.0
Norway	-	-	-	0.2	0.1	0.5	-	-	-
Poland	-	-	-	12.5	5.6	8.1	5587.0	7994.0	11038.0
Portugal	-	-	-	63.6	53.7	104.0	-	-	-
MD	-	-	-	0.0	0.0	0.2	-	9.0	22.0
Romania	-	-	-	0.3	1.7	0.9	84.0	334.0	176.0
Russian Federation	-	-	-	-	-	-	-	-	-
Serbia	-	-	-	0.3	0.7	3.5	-	-	-
Slovakia	-	-	-	0.5	0.5	0.1	720.0	570.0	398.0
Slovenia	-	0.1	0.1	0.4	0.3	0.6	-	85.0	119.0
Spain	-	-	-	90.5	31.5	55.1	-	-	-
Sweden	90.0	90.0	90.0	-	0.6	1.6	-	529.0	643.0
Switzerland	-	-	-	0.3	0.1	0.2	138.0	55.0	93.0
MK	-	-	-	5.8	37.9	4.0	241.0	1187.0	58.0
Turkey	-	-	-	13.1	7.9	5.2	1671.0	2092.0	2105.0
Ukraine	0.0	0.0	0.0	2.4	1.6	5.2	2714.0	3696.0	4010.2
United Kingdom	0.0	0.0	0.0	1.0	1.0	1.0	660.0	360.0	400.0

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A3.1: Increment and fellings on forest available for wood supply, 1990-2010

Country	Net annual increment (over bark)							
	1990		2000		2005		2010	
	1000 m³	m³/ha	1000 m³	m³/ha	1000 m³	m³/ha	1000 m³	m³/ha
Albania	835	1.2	875	1.4	470	0.8	-	-
Andorra	-	-	-	-	-	-	-	-
Austria	23799	7.2	28918	8.7	25136	7.5	25136	7.5
Belarus	19570	3.3	22796	3.6	22809	3.6	29975	4.7
Belgium	5176	7.7	5289	8.0	5289	7.9	5289	7.9
BA	5480	4.3	5480	4.4	-	-	-	-
Bulgaria	11239	4.8	13563	6.0	14120	5.5	14677	5.1
Croatia	-	-	-	-	-	-	-	-
Cyprus	47	1.1	42	1.0	40	1.0	38	0.9
Czech Republic	18841	7.3	21548	8.4	22669	9.0	23086	9.9
Denmark	4552	-	4849	-	5176	9.5	5796	10.0
Estonia	10530	6.1	11768	5.6	11361	5.5	11201	5.6
Finland	73607	3.6	80335	4.0	89587	4.5	91038	4.6
France	84050	6.0	97578	6.7	102456	6.9	94367	6.2
Georgia	-	-	800	-	-	-	-	-
Germany	122000	12.2	122000	11.5	122000	11.5	107000	10.1
Greece	3813	1.3	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-
Hungary	10585	6.9	9288	5.7	9827	5.8	11099	6.4
Iceland	-	-	-	-	-	-	-	-
Ireland	-	-	-	-	-	-	-	-
Italy	27779	4.1	30162	4.1	31352	4.1	32543	4.0
Latvia	16500	5.8	16500	5.5	-	-	-	-
Liechtenstein	25	6.9	25	6.3	-	-	-	-
Lithuania	-	-	-	-	10870	5.9	10750	5.7
Luxembourg	650	7.6	650	7.5	650	7.5	-	-
Malta	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-
Montenegro	-	-	-	-	-	-	-	-
Netherlands	2204	7.8	2227	7.7	2239	7.6	2250	7.6
Norway	20121	3.1	22676	3.5	23256	3.7	21878	3.4
Poland	-	-	-	-	67595	8.0	-	-
Portugal	18564	10.8	19054	10.7	18870	10.5	-	-
MD	-	-	-	-	-	-	-	-
Romania	-	-	-	-	-	-	-	-
Russian Federation	832700	1.2	841050	1.2	848841	1.2	852927	1.3
Serbia	5643	-	5232	-	5232	-	-	-
Slovakia	10155	5.7	11748	6.6	12916	7.4	13193	7.4
Slovenia	6023	5.4	7339	6.3	8245	7.1	9165	7.8
Spain	30088	2.4	43795	3.1	43889	3.1	45842	3.1
Sweden	91951	4.1	86683	4.1	92564	4.5	96486	4.7
Switzerland	9080	8.1	7656	6.6	6944	5.9	6232	5.2
MK	-	-	-	-	-	-	-	-
Turkey	-	-	-	-	-	-	-	-
Ukraine	24835	3.9	22495	3.9	21325	3.9	20935	3.9
United Kingdom	18000	8.4	20700	8.9	20700	8.7	20700	8.6

Table A3.1: Increment and fellings on forest available for wood supply, 1990-2010 (cont.)

Country	Fellings								Fellings as percent of net annual increment [%]			
	1990		2000		2005		2010					
	1000 m³	m³/ha	1000 m³	m³/ha	1000 m³	m³/ha	1000 m³	m³/ha	1990	2000	2005	2010
Albania	1950	2.8	2600	4.2	2589	4.2	-	-	233.5	297.2	550.3	-
Andorra	-	-	-	-	-	-	-	-	-	-	-	-
Austria	17925	5.4	17490	5.2	23511	7.0	23511	7.0	75.3	60.5	93.5	93.5
Belarus	11002	1.9	10787	1.7	14109	2.2	14136	2.2	56.2	47.3	61.9	47.2
Belgium	4352	6.5	3457	5.2	4475	6.7	3852	5.7	84.1	65.4	84.6	72.8
BA	-	-	-	-	-	-	-	-	-	-	-	-
Bulgaria	3918	1.7	3755	1.7	5768	2.3	7781	2.7	34.9	27.7	40.8	53.0
Croatia	4446	2.5	4267	2.4	4931	2.8	5186	3.0	-	-	-	-
Cyprus	52	1.2	24	0.6	10	0.3	10	0.2	110.8	57.6	26.0	25.4
Czech Republic	14775	5.7	15860	6.2	18273	7.3	17940	7.7	78.4	73.6	80.6	77.7
Denmark	1949	-	2099	-	2307	4.2	2371	4.1	42.8	43.3	44.6	40.9
Estonia	3770	2.2	12412	5.9	6662	3.2	5714	2.8	35.8	105.5	58.6	51.0
Finland	50554	2.5	66268	3.3	64356	3.2	59447	3.0	68.7	82.5	71.8	65.3
France	67340	4.8	67385	4.6	59262	4.0	64316	4.2	80.1	69.1	57.8	68.2
Georgia	-	-	-	-	-	-	-	-	-	-	-	-
Germany	44689	4.5	59762	5.7	75336	7.1	59610	5.6	36.6	49.0	61.8	55.7
Greece	2979	1.0	2221	0.7	1842	0.5	-	-	78.1	-	-	-
Holy See	-	-	-	-	-	-	-	-	-	-	-	-
Hungary	7450	4.9	6957	4.3	6992	4.2	6899	4.0	70.4	74.9	71.2	62.2
Iceland	-	-	-	-	-	-	-	-	-	-	-	-
Ireland	1668	-	2767	-	2915	-	2826	-	-	-	-	-
Italy	13337	2.0	14327	1.9	13298	1.7	12755	1.6	48.0	47.5	42.4	39.2
Latvia	5299	1.9	15516	5.1	16359	5.3	12421	4.0	32.1	94.0	-	-
Liechtenstein	18	5.1	20	5.1	27	6.7	29	7.2	73.6	81.9	-	-
Lithuania	-	-	-	-	9040	4.9	8600	4.6	-	-	83.2	80.0
Luxembourg	-	-	-	-	-	-	-	-	-	-	-	-
Malta	-	-	-	-	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-	-	-	-	-
Montenegro	694	1.8	570	1.5	553	1.4	520	1.3	-	-	-	-
Netherlands	1715	6.1	1312	4.5	1552	5.3	1552	5.3	77.8	58.9	69.3	69.0
Norway	13414	2.0	11080	1.7	11253	1.8	11004	1.7	66.7	48.9	48.4	50.3
Poland	24814	3.0	31389	3.8	38316	4.6	40693	4.8	-	-	56.7	-
Portugal	13852	8.0	12650	7.1	14229	7.9	-	-	74.6	66.4	75.4	-
MD	-	-	-	-	-	-	-	-	-	-	-	-
Romania	17226	3.1	14088	2.8	16473	3.3	17232	3.3	-	-	-	-
Russian Federation	340000	0.5	166000	0.2	186000	0.3	170000	0.3	40.8	19.7	21.9	19.9
Serbia	-	-	-	-	-	-	-	-	-	-	-	-
Slovakia	5454	3.1	6683	3.8	9146	5.2	10418	5.9	53.7	56.9	70.8	79.0
Slovenia	2099	1.9	2547	2.2	3232	2.8	3401	2.9	34.8	34.7	39.2	37.1
Spain	17741	1.4	16873	1.2	17369	1.2	16577	1.1	59.0	38.5	39.6	36.2
Sweden	60400	2.7	71200	3.4	86400	4.2	80900	3.9	65.7	82.1	93.3	83.8
Switzerland	5786	5.2	7182	6.2	6582	5.6	6176	5.1	63.7	93.8	94.8	99.1
MK	-	-	-	-	-	-	-	-	-	-	-	-
Turkey	-	-	-	-	-	-	-	-	-	-	-	-
Ukraine	6255	1.0	5309	0.9	6597	1.2	6851	1.3	25.2	23.6	30.9	32.7
United Kingdom	7950	3.7	9680	4.2	10560	4.4	10500	4.4	44.2	46.8	51.0	50.7

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A3.2: Quantity and value of total roundwood removals, 1990-2010

Country	Total roundwood							
	Volume [1000 m³]				Volume [m³/ha FAWS]			
	1990	2000	2005	2010	1990	2000	2005	2010
Albania	2347	255	323	430	3.4	0.4	0.5	-
Andorra	-	-	-	-	-	-	-	-
Austria	13215	13941	18092	19261	4.0	4.2	5.4	5.8
Belarus	11396	6406	8475	8267	1.9	1.0	1.3	1.3
Belgium	3899	3098	4010	3451	5.8	4.7	6.0	5.1
BA	4151	4117	3951	4011	3.3	3.3	3.2	3.2
Bulgaria	3785	4238	5674	6071	1.6	1.9	2.2	2.1
Croatia	1989	3532	4074	4306	1.1	2.0	2.3	2.5
Cyprus	-	-	-	-	-	-	-	-
Czech Republic	11737	14310	16487	16187	4.6	5.6	6.5	6.9
Denmark	-	-	-	-	-	-	-	-
Estonia	-	9797	5399	4348	-	4.7	2.6	2.2
Finland	41727	53432	53663	46512	2.0	2.6	2.7	2.3
France	66948	63637	57498	61677	4.8	4.3	3.9	4.1
Georgia	351	389	388	-	-	-	0.2	-
Germany	35744	47810	60268	47688	3.6	4.5	5.7	4.5
Greece	2562	1932	1639	1743	0.8	0.6	0.5	0.5
Holy See	-	-	-	-	-	-	-	-
Hungary	6744	6183	6415	6496	4.4	3.8	3.8	3.8
Iceland	-	-	-	-	-	-	-	-
Ireland	1626	2525	2655	2591	-	-	-	-
Italy	-	-	-	-	-	-	-	-
Latvia	4416	12930	14606	11091	1.6	4.3	4.7	3.5
Liechtenstein	16	18	23	25	4.4	4.5	5.8	6.3
Lithuania	-	5424	6101	5515	-	3.1	3.3	2.9
Luxembourg	-	261	268	353	-	3.0	3.1	4.1
Malta	0	0	0	0	-	-	-	-
Monaco	-	-	-	-	-	-	-	-
Montenegro	590	485	472	425	1.5	1.3	1.2	1.1
Netherlands	1286	962	1064	1118	4.6	3.3	3.6	3.8
Norway	-	-	-	-	-	-	-	-
Poland	22601	27483	33506	35281	2.7	3.3	4.0	4.1
Portugal	10367	9209	10583	10866	6.0	5.2	5.9	6.0
MD	-	164	259	352	-	-	-	-
Romania	14221	13016	15012	13667	2.5	2.6	3.0	2.6
Russian Federation	-	-	-	-	-	-	-	-
Serbia	-	-	2929	3186	-	-	-	-
Slovakia	4972	5810	7780	9027	2.8	3.3	4.4	5.1
Slovenia	2582	2199	2787	3236	2.3	1.9	2.4	2.8
Spain	15471	14995	15641	13980	1.2	1.1	1.1	0.9
Sweden	55809	65929	79179	74285	2.5	3.1	3.8	3.6
Switzerland	5524	6784	6243	5876	4.9	5.9	5.3	4.9
MK	-	806	787	709	-	1.0	1.0	0.9
Turkey	18085	16879	18072	20931	2.1	2.0	2.3	2.9
Ukraine	12026	10824	14758	14224	1.9	1.9	2.7	2.6
United Kingdom	6374	7766	8476	8432	3.0	3.3	3.6	3.5

Table A3.2: Quantity and value of total roundwood removals, 1990-2010 (cont.)

Country	Total roundwood							
	Value [million €]				Value [€/ha FAWS]			
	1990	2000	2005	2010	1990	2000	2005	2010
Albania	-	-	-	-	-	-	-	-
Andorra	-	-	-	-	-	-	-	-
Austria	891	871	1125	1173	269.2	260.7	336.6	350.8
Belarus	-	-	-	-	-	-	-	-
Belgium	137	105	136	-	204.2	158.3	203.3	-
BA	-	-	-	-	-	-	-	-
Bulgaria	-	36	170	201	-	15.8	66.6	70.0
Croatia	-	274	315	343	-	156.6	180.8	196.9
Cyprus	-	-	-	-	-	-	-	-
Czech Republic	173	601	701	682	67.2	234.8	278.3	292.8
Denmark	-	-	-	-	-	-	-	-
Estonia	-	287	194	196	-	136.4	93.5	97.3
Finland	1380	1839	1923	1858	67.5	90.5	95.9	93.5
France	2832	2587	2601	2980	203.6	176.7	176.4	196.7
Georgia	-	-	-	-	-	-	-	-
Germany	1719	1894	2422	3003	172.5	179.2	229.2	284.2
Greece	-	-	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-
Hungary	198	192	244	266	129.4	118.4	145.1	154.1
Iceland	-	-	-	-	-	-	-	-
Ireland	40	82	120	-	-	-	-	-
Italy	-	-	-	-	-	-	-	-
Latvia	-	-	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-
Lithuania	-	137	179	181	-	77.8	97.6	96.3
Luxembourg	-	6	7	-	-	64.2	83.4	-
Malta	0	0	0	0	-	-	-	-
Monaco	-	-	-	-	-	-	-	-
Montenegro	-	-	-	-	-	-	-	-
Netherlands	30	22	25	29	105.3	75.7	83.3	98.8
Norway	-	-	-	-	-	-	-	-
Poland	448	833	1046	1291	53.9	99.8	124.3	151.3
Portugal	-	-	-	-	-	-	-	-
MD	-	-	-	-	-	-	-	-
Romania	-	-	-	-	-	-	-	-
Russian Federation	-	-	-	-	-	-	-	-
Serbia	-	-	155	-	-	-	-	-
Slovakia	113	258	350	356	64.0	145.9	199.9	200.7
Slovenia	105	81	104	145	94.5	69.8	89.5	123.8
Spain	539	689	757	703	43.1	49.4	53.4	47.1
Sweden	2243	2379	2518	2656	100.2	113.6	122.1	129.2
Switzerland	473	414	406	488	423.1	357.7	344.3	406.8
MK	-	27	27	25	-	33.6	33.0	31.3
Turkey	1218	937	922	810	140.7	108.3	117.3	110.8
Ukraine	-	-	-	-	-	-	-	-
United Kingdom	277	318	304	269	129.2	136.8	127.9	111.4

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A3.3: Quantity and value of marketed non-wood forest goods, marketed plant product/raw material, 2005

	Christmas trees		Mushrooms and truffles		Fruits, berries and edible nuts		Cork	
	1		2		3		4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Country	1000 pcs	1000 €	tonnes	1000 €	tonnes	1000 €	tonnes	1000 €
Albania	-	-	-	-	-	-	-	-
Andorra	-	-	-	-	-	-	-	-
Austria	2000.0	36900.0	200.0	2600.0	123.0	460.0	-	-
Belarus	-	-	-	-	-	-	-	-
Belgium	-	-	-	-	-	-	-	-
BA	-	-	-	-	-	-	-	-
Bulgaria	43.0	51.0	7937.0	794.0	1869.0	49.0	-	-
Croatia	28.7	126.0	-	-	-	-	-	-
Cyprus	1.6	11.9	-	-	-	-	-	-
Czech Republic	-	-	-	-	-	-	-	-
Denmark	11550.0	106697.1	-	-	-	-	-	-
Estonia	-	1917.0	-	-	-	-	-	-
Finland	500.0	10000.0	426.0	1019.0	12027.0	11862.0	-	-
France	4800.0	106000.0	4032.0	20000.0	-	-	1550.0	775.0
Georgia	-	-	-	-	-	-	-	-
Germany	24000.0	500000.0	-	-	-	-	-	-
Greece	500.0	-	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-
Hungary	-	-	-	-	-	-	-	-
Iceland	7.8	131.3	-	-	-	-	-	-
Ireland	-	-	-	-	-	-	-	-
Italy	-	-	356632.0	65737.0	116111.0	187359.0	6161.0	9029.0
Latvia	-	-	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-
Lithuania	300.0	869.0	2302.9	9599.0	939.1	2720.0	-	-
Luxembourg	-	-	-	-	-	-	-	-
Malta	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-
Montenegro	-	-	565.0	2203.5	390.2	1919.8	-	-
Netherlands	750.0	12000.0	-	-	-	-	-	-
Norway	900.0	12490.0	500.0	1875.0	350.0	525.0	-	-
Poland	49.0	-	4186.0	9716.5	19138.0	23254.2	-	-
Portugal	-	-	6500.0	16250.0	53669.0	33591.0	100000.0	203993.0
MD	-	-	-	-	-	-	-	-
Romania	471.9	988.2	1667.7	732.3	6348.0	4334.1	-	-
Russian Federation	5.7	3.5	9332.4	21006.3	49052.5	105500.7	-	-
Serbia	-	-	-	-	-	-	-	-
Slovakia	370.0	1842.0	85.0	138.0	406.0	647.0	-	-
Slovenia	10.0	200.0	100.0	100.0	112.5	56.3	-	-
Spain	-	-	3740.7	42173.6	70431.1	59785.0	61504.0	110828.0
Sweden	-	-	-	-	-	-	-	-
Switzerland	1000.0	3000.0	450.0	5400.0	12.0	37.0	-	-
MK	-	-	-	6348.0	-	1011.0	-	-
Turkey	-	-	748.0	987.9	2684.0	8272.2	-	-
Ukraine	-	-	-	-	-	-	-	-
United Kingdom	6500.0	76000.0	50.0	550.0	4.0	6.0	-	-

Table A3.3: Quantity and value of marketed non-wood forest goods, marketed plant product/raw material, 2005 (cont.)

Country	Resins, raw material- medicine, aromatic products, colorants, dyes		Decorative foliage, incl. ornamental plants (mosses,..)		Other plant products
	5		6		7
	Quantity	Value	Quantity	Value	Value
	tonnes	1000 €	tonnes	1000 €	1000 €
Albania	-	-	-	-	-
Andorra	-	-	-	-	-
Austria	184.0	221.0	-	-	13417.0
Belarus	-	-	-	-	-
Belgium	-	-	-	-	229.0
BA	-	-	-	-	-
Bulgaria	-	-	-	34.0	68.1
Croatia	-	-	-	-	404.9
Cyprus	0.2	0.2	-	-	88.6
Czech Republic	-	-	-	-	-
Denmark	-	-	-	58233.8	-
Estonia	-	-	-	-	-
Finland	-	-	217.0	1060.0	-
France	-	-	-	-	910.0
Georgia	-	-	-	-	-
Germany	-	-	-	-	54000.0
Greece	-	-	-	-	-
Holy See	-	-	-	-	-
Hungary	-	-	-	-	-
Iceland	-	-	-	-	-
Ireland	-	-	-	-	-
Italy	-	-	-	-	2665.0
Latvia	-	-	-	-	-
Liechtenstein	-	-	-	-	-
Lithuania	-	-	-	-	-
Luxembourg	-	-	-	-	-
Malta	-	-	-	-	-
Monaco	-	-	-	-	-
Montenegro	-	-	-	-	-
Netherlands	-	-	-	-	-
Norway	-	-	400.0	590.0	-
Poland	-	-	-	-	-
Portugal	4644.0	1416.0	-	-	26000.0
MD	-	-	-	-	-
Romania	793.2	505.8	-	2265.3	879.2
Russian Federation	5058.6	7860.7	-	-	-
Serbia	-	-	-	-	-
Slovakia	160.0	1115.0	250.0	1802.0	869.0
Slovenia	-	-	-	-	-
Spain	3511.0	948.1	-	-	5332.0
Sweden	-	-	-	-	-
Switzerland	-	-	36.0	220.0	60.0
MK	-	-	-	887.0	-
Turkey	9634.0	10598.1	-	-	-
Ukraine	-	-	-	-	-
United Kingdom	15.0	7.0	45.0	6000.0	632.0

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A3.4: Quantity and value of marketed non-wood forest goods, marketed animal product/raw material, 2005

Country	Game meat		Living animals		Pelts, hides, skins and trophies		Wild honey and bee-wax		Raw material for medicine, colorants		Other animal products
	8		9		10		11		12		13
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Value
	tonnes	1000 €	1000 pcs	1000 €	1000 pcs	1000	tonnes	1000 €	tonnes	1000 €	1000 €
Albania	-	-	-	-	-	-	-	-	-	-	-
Andorra	-	-	-	-	-	-	-	-	-	-	-
Austria	7080,5	15666,0	-	-	287,0	6738,0	3050,0	17416,0	-	-	1340,0
Belarus	-	-	-	-	-	-	-	-	-	-	-
Belgium	1357,0	3315,0	-	-	-	-	-	-	-	-	-
BA	-	-	-	-	-	-	-	-	-	-	-
Bulgaria	1208,0	1240,0	-	-	2,5	640,0	-	-	-	-	-
Croatia	150,3	360,5	-	-	2,5	375,2	-	-	-	-	-
Cyprus	-	-	-	-	-	-	-	-	-	-	-
Czech Republic	-	-	-	-	-	-	-	-	-	-	-
Denmark	-	-	-	-	-	-	-	-	-	-	-
Estonia	-	3014,0	-	-	-	1,5	-	-	-	-	-
Finland	-	-	-	-	-	-	-	-	-	-	-
France	-	-	-	-	-	-	-	-	-	-	-
Georgia	-	-	-	-	-	-	-	-	-	-	-
Germany	-	180300,0	-	-	-	-	-	-	-	-	-
Greece	-	-	-	-	-	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-	-	-	-
Hungary	6770,0	-	-	-	50,0	-	-	-	-	-	-
Iceland	-	-	-	-	-	-	-	-	-	-	-
Ireland	-	-	-	-	-	-	-	-	-	-	-
Italy	-	-	-	-	-	-	-	-	-	-	-
Latvia	-	-	-	-	-	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-
Lithuania	1632,0	2052,0	-	-	29,0	204,0	-	-	25,1	182,0	-
Luxembourg	-	-	-	-	-	-	-	-	-	-	-
Malta	-	-	-	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-	-	-	-
Montenegro	101,0	288,0	-	-	3,2	159,0	610,0	3660,0	-	-	-
Netherlands	456,0	1824,0	-	-	-	-	-	-	-	-	-
Norway	370,0	3625,0	-	-	9,0	140,0	-	-	-	-	-
Poland	-	13322,4	-	-	-	-	-	-	-	-	-
Portugal	2634,0	36835,0	-	-	-	-	5686,0	19332,0	-	-	-
MD	-	-	-	-	-	-	-	-	-	-	-
Romania	263,4	421,8	98,9	838,9	-	-	-	-	-	-	24,0
Russian Federation	16945,1	2240,1	-	-	181,6	622,8	85000,0	112500,0	-	-	-
Serbia	-	-	-	-	-	-	-	-	-	-	-
Slovakia	1050,0	1373,0	7,0	930,0	15,0	2136,0	-	-	-	-	2435,0
Slovenia	-	2377,6	-	-	8,2	6959,2	-	-	-	-	-
Spain	-	112702,6	-	-	-	-	32183,4	81756,3	-	-	-
Sweden	-	-	-	-	-	-	-	-	-	-	-
Switzerland	1700,0	11300,0	-	-	45,0	200,0	550,0	7000,0	-	-	-
MK	-	-	-	-	-	-	-	-	-	1813,0	-
Turkey	-	-	-	-	0,8	305,9	-	-	-	-	-
Ukraine	-	-	-	-	-	-	-	-	-	-	-
United Kingdom	3500,0	5100,0	-	-	-	-	200,0	1200,0	-	-	-

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative indicators

Table A3.5: Proportion of forest under a management plan or equivalent, 1990-2010

Country	Forest [% of forest area]							
	Total				Management plans			
	1990	2000	2005	2010	1990	2000	2005	2010
Albania	100	100	100	100	-	-	57	-
Andorra	-	-	-	-	-	-	-	-
Austria	100	100	100	100	50	50	50	51
Belarus	100	100	100	100	100	95	100	100
Belgium	-	-	74	74	-	48	48	50
BA	-	-	-	-	-	-	-	-
Bulgaria	100	100	100	100	100	100	100	100
Croatia	100	100	100	100	68	73	75	78
Cyprus	66	62	62	62	0	0	0	0
Czech Republic	100	100	100	100	100	100	100	100
Denmark	-	69	-	-	-	52	-	-
Estonia	100	55	69	69	100	55	69	69
Finland	100	100	100	100	71	65	64	68
France	64	67	64	61	64	67	64	61
Georgia	-	100	90	87	-	-	-	-
Germany	68	68	68	68	68	68	68	68
Greece	-	-	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-
Hungary	100	100	100	100	98	98	98	98
Iceland	1	1	1	1	1	1	1	1
Ireland	-	-	-	-	88	81	79	77
Italy	95	-	94	-	12	-	18	-
Latvia	-	-	92	92	-	-	92	92
Liechtenstein	100	100	100	100	100	100	100	100
Lithuania	100	100	100	100	100	100	57	59
Luxembourg	-	-	-	-	-	-	-	-
Malta	-	-	-	-	100	100	100	100
Monaco	-	-	-	-	-	-	-	-
Montenegro	-	-	-	-	-	-	-	-
Netherlands	100	100	100	100	56	62	62	62
Norway	54	60	50	48	42	49	40	38
Poland	-	-	92	91	-	-	81	81
Portugal	-	-	35	-	-	-	35	-
MD	-	-	-	-	-	-	-	-
Romania	100	94	94	95	97	90	90	95
Russian Federation	-	-	-	-	-	-	-	-
Serbia	100	81	80	83	-	-	-	-
Slovakia	100	100	100	100	100	100	100	100
Slovenia	100	100	100	100	100	100	100	100
Spain	-	-	-	-	19	19	20	19
Sweden	-	-	100	100	-	-	68	67
Switzerland	-	-	72	72	-	-	58	58
MK	-	-	-	-	-	-	-	-
Turkey	100	100	100	100	100	100	100	100
Ukraine	100	100	100	100	80	85	87	90
United Kingdom	45	56	50	58	6	45	40	44

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative indicators

Table A3.5: Proportion of forest under a management plan or equivalent, 1990-2010 (cont.)

Country	Forest [% of forest area]			
	Equivalents			
	1990	2000	2005	2010
Albania	-	-	43	-
Andorra	-	-	-	-
Austria	100	100	100	100
Belarus	0	5	n.s.	n.s.
Belgium	-	-	26	24
BA	-	-	-	-
Bulgaria	0	0	0	0
Croatia	32	27	25	22
Cyprus	66	62	62	62
Czech Republic	0	0	0	0
Denmark	-	17	-	-
Estonia	0	0	0	0
Finland	29	35	36	32
France	0	0	0	0
Georgia	-	-	-	-
Germany	0	0	0	0
Greece	-	-	-	-
Holy See	-	-	-	-
Hungary	3	3	3	3
Iceland	n.s.	n.s.	n.s.	n.s.
Ireland	-	-	-	-
Italy	83	-	76	-
Latvia	-	-	0	0
Liechtenstein	0	0	0	0
Lithuania	0	0	43	41
Luxembourg	-	-	-	-
Malta	-	-	-	-
Monaco	-	-	-	-
Montenegro	-	-	-	-
Netherlands	44	38	38	37
Norway	12	11	10	10
Poland	-	-	11	10
Portugal	-	-	0	-
MD	-	-	-	-
Romania	3	4	4	0
Russian Federation	-	-	-	-
Serbia	-	-	-	-
Slovakia	-	-	-	-
Slovenia	-	-	-	-
Spain	-	-	-	-
Sweden	-	-	32	33
Switzerland	-	-	14	14
MK	0	0	0	0
Turkey	0	0	0	0
Ukraine	20	15	13	10
United Kingdom	38	11	10	14

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A4.1: Forest classified by number of tree species occurring, 1990-2005

Country	Forest [1000 ha]								
	Number of tree species occuring								
	1990			2000			2005		
	1	2-5	>6	1	2-5	>6	1	2-5	>6
Albania	636	153	0	605	164	0	593	189	0
Andorra	-	-	-	-	-	-	-	-	-
Austria	1603	1697	9	1542	1790	11	1535	1798	11
Belarus	1368	5835	119	1344	6366	138	1464	6243	128
Belgium	-	-	-	356	312	4	351	322	5
BA	-	-	-	-	-	-	-	-	-
Bulgaria	1564	1763	0	1403	1972	0	1499	2152	0
Croatia	455	1378	17	414	1453	18	393	1492	18
Cyprus	159	3	0	169	3	0	169	4	0
Czech Republic	-	-	-	-	-	-	474	1827	263
Denmark	-	-	-	-	-	-	167	311	15
Estonia	-	-	-	511	1723	9	489	1754	10
Finland	10449	-	0	9554	-	0	8945	13217	0
France	4027	10057	453	3916	10898	539	3824	11301	589
Georgia	-	-	-	-	-	-	-	-	-
Germany	-	-	-	-	-	-	-	-	-
Greece	-	-	-	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-	-
Hungary	593	1033	49	622	1084	67	659	1125	68
Iceland	6	3	n.s.	11	8	n.s.	14	11	n.s.
Ireland	-	-	-	-	-	-	317	361	16
Italy	-	-	-	2339	5879	152	2448	6152	159
Latvia	-	-	-	-	-	-	555	2671	72
Liechtenstein	-	-	-	-	-	-	-	-	-
Lithuania	-	-	-	525	1378	25	523	1461	31
Luxembourg	-	-	-	6	53	29	6	53	29
Malta	-	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-	-
Montenegro	-	-	-	-	-	-	-	-	-
Netherlands	-	-	-	70	276	14	70	281	14
Norway	4401	4727	2	3390	5900	11	3531	6140	12
Poland	-	-	-	4518	4484	57	4134	5043	23
Portugal	-	-	-	-	-	-	2662	1026	0
MD	-	-	-	-	-	-	-	-	-
Romania	-	-	-	-	-	-	-	-	-
Russian Federation	-	-	-	-	-	-	-	-	-
Serbia	-	-	-	-	-	-	-	-	-
Slovakia	390	1416	116	366	1434	121	354	1445	134
Slovenia	-	-	-	68	1094	71	61	1103	79
Spain	-	-	-	3180	9797	4010	3237	9973	4083
Sweden	-	-	-	-	-	-	5823	22597	91
Switzerland	222	879	50	229	912	53	236	930	51
MK	-	-	-	-	-	-	-	-	-
Turkey	-	-	-	-	-	-	-	-	-
Ukraine	3392	4914	968	3479	5038	993	3503	5072	1000
United Kingdom	1612	973	26	1622	1143	28	1598	1214	33

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A4.2: Forest, share of types of annual afforestation and regeneration, 2005

	Annual afforestation and natural expansion				Annual regeneration				
	Afforestation		Natural expansion		Natural regeneration		Regeneration by planting and/or seeding		of which from coppice sprouting
	Area	Share	Area	Share	Area	Share	Area	Share	Area
Country	1000 ha	%	1000 ha	%	1000 ha	%	1000 ha	%	1000 ha
Albania	-	-	-	-	-	-	n.s.	-	-
Andorra	-	-	-	-	-	-	-	-	-
Austria	-	-	-	-	-	-	-	-	-
Belarus	-	-	7	-	-	-	31	-	-
Belgium	n.s.	5	n.s.	3	3	34	5	59	0
BA	-	-	-	-	-	-	-	-	-
Bulgaria	6	-	37	-	-	-	3	-	-
Croatia	1	-	-	-	6	-	5	-	-
Cyprus	n.s.	-	-	-	n.s.	-	n.s.	-	-
Czech Republic	1	-	-	-	3	-	18	-	-
Denmark	2	-	n.s.	-	-	-	2	-	-
Estonia	n.s.	1	3	5	43	78	9	17	0
Finland	3	-	1	-	33	-	134	-	-
France	0	0	48	23	97	47	41	20	20
Georgia	n.s.	-	n.s.	-	-	-	-	-	-
Germany	4	12	2	6	13	39	12	36	2
Greece	-	-	-	-	-	-	-	-	-
Holy See	0	-	0	-	0	-	0	-	0
Hungary	12	-	-	-	3	-	23	-	7
Iceland	2	-	-	-	-	-	0	-	0
Ireland	9	-	n.s.	-	-	-	9	-	-
Italy	7	-	71	-	-	-	3	-	-
Latvia	2	4	7	16	22	53	11	27	0
Liechtenstein	-	-	-	-	n.s.	-	n.s.	-	-
Lithuania	2	-	5	-	10	-	8	-	-
Luxembourg	-	-	-	-	-	-	-	-	-
Malta	-	-	0	-	0	-	-	-	-
Monaco	0	-	0	-	-	-	0	-	-
Montenegro	1	-	-	-	-	-	n.s.	-	-
Netherlands	1	-	-	-	-	-	-	-	-
Norway	n.s.	-	-	-	28	-	11	-	0
Poland	16	-	n.s.	-	5	-	42	-	-
Portugal	11	-	-	-	-	-	-	-	-
MD	n.s.	-	-	-	-	-	-	-	-
Romania	4	-	-	-	-	-	10	-	-
Russian Federation	12	-	58	-	748	-	251	-	-
Serbia	1	-	-	-	-	-	-	-	-
Slovakia	n.s.	n.s.	1	5	4	28	10	63	1
Slovenia	0	0	2	15	10	74	1	8	n.s.
Spain	31	-	48	-	-	-	19	-	-
Sweden	1	n.s.	n.s.	n.s.	52	26	145	73	0
Switzerland	n.s.	1	5	34	7	55	1	9	n.s.
MK	-	-	-	-	-	-	1	-	-
Turkey	87	-	-	-	-	-	16	-	-
Ukraine	13	-	-	-	-	-	37	-	-
United Kingdom	9	34	1	3	1	3	16	58	n.s.

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A4.3: Forest area, by types of origin, 1990-2010

Country	Forest, total							
	Forest area [1000 ha]							
	Natural regeneration and natural expansion				Afforestation and regeneration by planting, seeding or coppice			
	1990	2000	2005	2010	1990	2000	2005	2010
Albania	686	673	684	682	103	96	98	94
Andorra	-	-	-	-	-	-	-	-
Austria	-	-	-	-	-	-	-	-
Belarus	6262	6581	6679	6762	1518	1692	1757	1838
Belgium	231	259	277	282	446	408	395	396
BA	1163	1186	1366	1469	1047	999	999	1003
Bulgaria	2295	2442	2777	3112	1032	933	874	815
Croatia	1758	1804	1827	1850	92	81	76	70
Cyprus	137	144	143	143	24	28	29	31
Czech Republic	-	-	-	-	-	-	-	-
Denmark	114	125	92	107	331	361	451	472
Estonia	-	2073	2094	2048	-	170	158	155
Finland	17748	17346	16581	15974	4149	5112	5581	6110
France	-	-	-	11642	-	-	-	3505
Georgia	2725	2708	2695	2559	54	60	61	184
Germany	5620	5793	5793	5793	5121	5283	5283	5283
Greece	3181	3472	3618	3763	118	129	134	140
Holy See	0	0	0	0	0	0	0	0
Hungary	-	-	-	-	-	-	-	-
Iceland	3	3	3	3	6	15	22	27
Ireland	82	82	82	82	383	553	612	655
Italy	7043	7785	8157	8528	547	584	602	621
Latvia	2449	2532	2606	2726	724	709	691	628
Liechtenstein	6	7	7	7	n.s.	n.s.	n.s.	n.s.
Lithuania	-	1554	1624	1644	-	466	497	521
Luxembourg	58	59	59	59	28	28	28	28
Malta	0	0	0	0	n.s.	n.s.	n.s.	n.s.
Monaco	0	0	0	0	0	0	0	0
Montenegro	-	-	311	311	-	-	315	315
Netherlands	56	58	58	58	289	302	307	307
Norway	8041	7976	8283	8788	1089	1325	1400	1462
Poland	370	414	433	448	8511	8645	8767	8871
Portugal	-	2644	2624	2607	-	776	812	849
MD	318	323	362	384	1	1	1	2
Romania	4969	4965	4985	5127	1402	1401	1406	1446
Russian Federation	796299	793908	791828	792099	12651	15360	16963	16991
Serbia	2274	2421	2437	2533	39	39	39	180
Slovakia	1101	1133	1156	1153	821	788	776	785
Slovenia	1151	1193	1202	1217	34	36	37	31
Spain	-	-	-	-	-	-	-	-
Sweden	17867	17567	17417	17622	10645	10945	11095	10983
Switzerland	935	989	1014	1038	216	205	203	202
MK	807	853	870	893	105	105	105	105
Turkey	7902	7802	8120	7916	1778	2344	2620	3418
Ukraine	4637	4755	4788	4859	4637	4755	4787	4846
United Kingdom	646	648	656	662	1965	2145	2189	2219

Table A4.3: Forest area, by types of origin, 1990-2010 (cont.)

Country	Forest, total					
	Natural, annual change rate					
	1990-2000		2000-2005		2005-2010	
	1000 ha/yr	%	1000 ha/yr	%	1000 ha/yr	%
Albania	-1.3	-0.19	2.3	0.34	-0.4	-0.06
Andorra	-	-	-	-	-	-
Austria	-	-	-	-	-	-
Belarus	31.9	0.50	19.6	0.30	16.6	0.25
Belgium	2.8	1.16	3.6	1.34	1.0	0.37
BA	2.3	0.20	36.0	2.87	20.6	1.46
Bulgaria	14.7	0.62	67.0	2.60	67.0	2.30
Croatia	4.6	0.26	4.6	0.25	4.6	0.25
Cyprus	0.7	0.52	-0.1	-0.09	-0.2	-0.11
Czech Republic	-	-	-	-	-	-
Denmark	1.1	0.93	-6.6	-5.93	2.9	2.96
Estonia	-	-	4.2	0.20	-9.1	-0.44
Finland	-40.2	-0.23	-153.0	-0.90	-121.4	-0.74
France	-	-	-	-	-	-
Georgia	-1.7	-0.06	-2.7	-0.10	-27.2	-1.03
Germany	17.3	0.30	0.0	0.0	0.0	0.0
Greece	29.1	0.88	29.2	0.83	29.0	0.79
Holy See	0.0	-	0.0	-	0.0	-
Hungary	-	-	-	-	-	-
Iceland	0.0	0.0	0.0	0.0	0.0	0.0
Ireland	0.0	0.0	0.0	0.0	0.0	0.0
Italy	74.2	1.01	74.4	0.94	74.2	0.89
Latvia	8.3	0.33	14.8	0.58	24.0	0.90
Liechtenstein	n.s.	0.47	0.0	0.0	0.0	0.0
Lithuania	-	-	14.0	0.89	4.0	0.25
Luxembourg	0.1	0.17	0.0	0.0	0.0	0.0
Malta	0.0	-	0.0	-	0.0	-
Monaco	0.0	-	0.0	-	0.0	-
Montenegro	-	-	-	-	0.0	0.0
Netherlands	0.2	0.35	0.0	0.0	0.0	0.0
Norway	-6.5	-0.08	61.4	0.76	101.0	1.19
Poland	4.4	1.13	3.8	0.90	3.0	0.68
Portugal	-	-	-4.0	-0.15	-3.4	-0.13
MD	0.5	0.16	7.8	2.31	4.4	1.19
Romania	-0.4	-0.01	4.0	0.08	28.4	0.56
Russian Federation	-239.1	-0.03	-416.1	-0.05	54.3	0.01
Serbia	14.7	0.63	3.2	0.13	19.2	0.78
Slovakia	3.2	0.29	4.7	0.41	-0.7	-0.06
Slovenia	4.2	0.36	1.8	0.15	3.0	0.25
Spain	-	-	-	-	-	-
Sweden	-30.0	-0.17	-30.0	-0.17	41.0	0.23
Switzerland	5.4	0.56	5.0	0.50	4.8	0.47
MK	4.6	0.56	3.4	0.40	4.6	0.52
Turkey	-10.0	-0.13	63.6	0.80	-40.8	-0.51
Ukraine	11.8	0.25	6.6	0.14	14.2	0.29
United Kingdom	0.2	0.03	1.6	0.25	1.2	0.18

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A4.4: Forest by classes of naturalness, 1990-2010

Country	Forest [1000 ha]											
	Undisturbed by man				Semi-natural				Plantations			
	1990	2000	2005	2010	1990	2000	2005	2010	1990	2000	2005	2010
Albania	85	85	85	85	601	588	605	-	103	96	93	-
Andorra	-	-	-	-	-	-	-	-	-	-	-	-
Austria	62	64	60	57	3443	3498	3514	3522	271	276	278	278
Belarus	400	400	400	400	5862	6181	6279	6362	1518	1692	1757	1838
Belgium	0	0	0	0	374	384	386	392	303	284	287	286
BA	2	2	2	2	2084	2059	2239	2342	124	124	124	128
Bulgaria	157	270	304	338	2138	2172	2473	2774	1032	933	874	815
Croatia	7	7	7	7	1736	1775	1794	1813	107	103	102	100
Cyprus	13	13	13	13	124	131	130	129	24	28	29	31
Czech Republic	9	9	9	9	2620	2628	2638	2648	0	0	0	0
Denmark	21	23	38	40	154	181	88	91	291	305	426	455
Estonia	-	976	987	965	-	1264	1263	1235	-	3	3	3
Finland	-	-	-	-	21876	22438	22138	22050	21	21	24	34
France	30	30	30	30	12968	13730	14076	14291	1539	1593	1608	1633
Georgia	500	500	500	500	2197	2210	2210	-	54	60	61	-
Germany	0	0	0	0	10741	11076	11076	11076	0	0	0	0
Greece	0	0	0	0	3181	3472	3618	3763	118	129	134	140
Holy See	0	0	0	0	-	-	-	-	-	-	-	-
Hungary	0	n.s.	n.s.	n.s.	1571	1671	1738	1791	103	102	116	122
Iceland	0	0	0	0	3	3	3	3	6	15	22	27
Ireland	0	0	0	0	82	82	82	82	383	553	612	655
Italy	93	93	93	93	6950	7692	8064	8435	547	584	602	621
Latvia	17	17	16	15	3155	3223	3278	3336	1	1	3	3
Liechtenstein	2	2	2	2	5	5	5	5	n.s.	n.s.	n.s.	n.s.
Lithuania	20	21	26	26	1925	1999	2095	2139	0	0	0	0
Luxembourg	0	0	0	0	58	59	59	59	28	28	28	28
Malta	0	0	0	0	0	0	0	0	n.s.	n.s.	n.s.	n.s.
Monaco	0	0	0	0	-	-	-	-	-	-	-	-
Montenegro	-	-	-	-	-	-	-	-	-	-	-	-
Netherlands	0	0	0	0	341	356	361	361	4	4	4	4
Norway	171	171	171	171	8726	8876	9245	9799	233	254	267	280
Poland	30	51	54	55	8819	8982	9118	9214	32	26	28	50
Portugal	-	24	24	24	-	2457	2435	2417	-	776	812	849
MD	0	0	0	0	318	323	362	384	1	1	1	2
Romania	233	300	300	300	4736	4665	4685	4827	1402	1401	1406	1446
Russian Federation	241726	258131	255470	256482	554573	535777	536358	535618	12651	15360	16963	16991
Serbia	1	1	1	1	2273	2420	2436	2532	39	39	39	180
Slovakia	24	24	24	24	1854	1855	1865	1873	44	43	42	41
Slovenia	63	95	111	109	1125	1138	1132	1144	0	0	0	0
Spain	0	0	0	0	11776	14477	14738	15488	2042	2510	2556	2686
Sweden	2636	2636	2636	2788	25412	25359	25338	25279	464	517	540	539
Switzerland	40	40	40	40	1110	1153	1176	1199	1	1	1	1
MK	0	0	0	0	-	-	-	-	-	-	-	-
Turkey	739	897	922	973	7163	6950	7198	6943	1778	2344	2620	3418
Ukraine	59	59	59	59	8890	9084	9128	9244	325	367	388	402
United Kingdom	0	0	0	0	646	648	656	662	1965	2145	2189	2219

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A4.5: Area of forest dominated by introduced tree species, 1990-2010 and share of forest area dominated by introduced tree species, 2010

Country	Introduced tree species					of which invasive			
	1990	2000	2005	2010		1990	2000	2005	2010
	[1000 ha]				%	[1000 ha]			
Albania	15	7	8	7	1	3	3	3	-
Andorra	-	-	-	-	-	-	-	-	-
Austria	36	43	53	60	2	15	19	25	29
Belarus	1	1	1	1	n.s.	0	0	0	0
Belgium	-	286	286	286	42	-	-	15	-
BA	-	-	-	-	-	-	-	-	-
Bulgaria	135	139	173	207	5	0	0	0	0
Croatia	82	82	83	83	4	54	55	56	56
Cyprus	1	1	1	1	1	1	1	1	1
Czech Republic	-	-	41	41	2	0	0	0	0
Denmark	291	305	282	286	49	0	0	36	35
Estonia	-	1	1	1	n.s.	0	0	0	0
Finland	25	21	24	34	n.s.	0	0	0	0
France	865	993	1051	1115	7	-	-	-	190
Georgia	0	0	0	0	0	0	0	0	0
Germany	-	441	441	441	4	0	0	0	0
Greece	-	-	-	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-	-
Hungary	554	619	683	712	35	262	315	368	407
Iceland	5	12	17	21	70	0	0	0	0
Ireland	306	435	481	513	70	-	-	-	-
Italy	-	312	327	341	4	124	104	93	93
Latvia	1	1	1	1	n.s.	0	0	0	0
Liechtenstein	0	0	0	0	0	0	0	0	0
Lithuania	-	4	4	4	n.s.	-	0	0	0
Luxembourg	-	26	26	26	30	0	0	0	0
Malta	-	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-	-
Montenegro	-	-	-	-	-	-	-	-	-
Netherlands	94	93	93	91	25	0	0	0	0
Norway	192	213	226	239	2	0	0	0	0
Poland	-	20	28	46	n.s.	-	-	-	39
Portugal	-	924	967	1010	29	-	28	29	30
MD	-	-	-	-	-	-	-	-	-
Romania	-	340	-	-	-	-	-	-	-
Russian Federation	-	-	-	-	-	-	-	-	-
Serbia	2	1	2	2	n.s.	0	0	0	-
Slovakia	44	42	42	41	2	26	26	26	29
Slovenia	-	12	16	36	3	-	9	11	9
Spain	589	829	844	886	5	-	2	2	2
Sweden	464	517	540	539	2	0	0	0	0
Switzerland	-	-	6	6	n.s.	-	-	0	0
MK	-	-	-	-	-	-	-	-	-
Turkey	-	-	74	73	1	0	0	0	0
Ukraine	383	393	396	402	4	30	31	31	32
United Kingdom	1406	1453	1435	1411	49	0	0	0	0

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A4.6: Average volume of standing and lying deadwood in forest, 1990-2010

Country	Volume of deadwood [m³/ha]											
	1990			2000			2005			2010		
	total	stan-ding	lying	total	stan-ding	lying	total	stan-ding	lying	total	stan-ding	lying
Albania	-	-	-	n.s.	n.s.	-	0.5	0.5	-	-	-	-
Andorra	-	-	-	-	-	-	-	-	-	-	-	-
Austria	-	3.9	-	13.7	5.3	8.4	17.4	6.6	10.8	20.3	7.5	12.8
Belarus	-	-	-	2.1	1.2	0.8	1.0	0.7	0.3	1.2	0.8	0.4
Belgium	-	-	-	7.1	2.8	4.3	7.0	2.8	4.1	7.3	2.9	4.4
BA	-	-	-	-	-	-	-	-	-	-	-	-
Bulgaria	-	-	-	-	-	-	-	-	-	-	-	-
Croatia	-	-	-	-	-	-	-	-	-	14.0	6.0	8.0
Cyprus	-	0.7	-	-	0.9	-	-	0.9	-	-	0.9	-
Czech Republic	-	-	-	-	-	-	11.6	4.8	6.8	11.6	4.8	6.8
Denmark	-	-	-	-	-	-	4.9	3.0	1.9	5.1	3.5	1.6
Estonia	-	-	-	9.9	5.9	4.0	12.5	6.9	5.6	14.6	7.6	6.9
Finland	-	-	-	5.6	1.3	4.3	5.7	1.6	4.0	5.7	1.6	4.1
France	-	-	-	-	-	-	-	-	-	-	7.0	-
Georgia	-	-	-	-	-	-	-	-	-	-	-	-
Germany	-	-	-	11.5	2.4	9.1	11.5	2.4	9.1	15.0	-	-
Greece	-	-	-	-	-	-	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-	-	-	-	-
Hungary	-	5.1	-	-	6.3	-	-	7.2	-	-	-	-
Iceland	-	-	-	-	-	-	-	-	-	-	-	-
Ireland	-	-	-	-	-	-	6.6	2.7	4.0	6.3	2.6	3.8
Italy	7.4	4.5	2.9	8.3	5.1	3.3	8.7	5.3	3.4	9.1	5.5	3.6
Latvia	6.0	-	-	6.0	-	-	17.7	6.9	10.8	17.7	6.9	10.8
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-
Lithuania	23.0	-	-	23.0	-	-	23.0	-	-	23.0	-	-
Luxembourg	-	-	-	11.6	4.4	7.2	11.6	4.4	7.2	-	-	-
Malta	-	-	-	-	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-	-	-	-	-
Montenegro	-	-	-	-	-	-	-	-	-	-	-	-
Netherlands	3.5	1.9	1.5	4.5	2.8	1.7	8.1	3.7	4.4	9.8	4.5	5.3
Norway	-	-	-	6.8	2.3	4.5	-	-	-	-	-	-
Poland	-	-	-	-	-	-	-	-	-	5.6	2.3	3.3
Portugal	-	-	-	-	-	-	2.8	-	-	-	-	-
MD	-	-	-	-	-	-	-	-	-	-	-	-
Romania	-	-	-	-	-	-	-	-	-	-	-	-
Russian Federation	22.5	6.8	15.8	21.9	6.6	15.4	21.8	6.6	15.3	22.0	6.7	15.3
Serbia	-	-	1.4	-	-	1.2	-	-	1.2	-	-	-
Slovakia	-	-	-	-	-	-	26.2	6.8	19.4	26.2	6.8	19.4
Slovenia	12.7	3.6	9.1	14.9	4.2	10.7	17.0	4.8	12.2	19.1	5.4	13.7
Spain	-	-	-	-	-	-	-	-	-	-	-	-
Sweden	-	-	-	6.5	2.2	4.3	7.9	3.3	4.6	8.2	3.5	4.7
Switzerland	7.5	5.3	2.2	14.5	8.8	5.7	17.9	10.5	7.4	21.3	12.3	9.0
MK	-	-	-	-	-	-	-	-	-	-	-	-
Turkey	-	-	-	-	-	-	-	-	-	-	-	-
Ukraine	37.0	21.0	16.0	25.0	13.0	12.0	26.0	14.0	12.0	27.0	14.0	13.0
United Kingdom	3.9	0.8	3.1	3.9	0.8	3.1	3.9	0.8	3.1	3.9	0.8	3.1

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A4.7: Areas managed for conservation and utilisation of forest tree genetic resources (*in situ* and *ex situ* gene conservation) and areas managed for seed production by countries in 1990, 2000 and 2010

Country	Area managed for in situ gene conservation [ha]			Area managed for ex situ gene conservation [ha]			Area managed for ex situ gene conservation [ha]		
	Reference year			Reference year			Reference year		
	1990	2000	2010*	1990	2000	2010*	1990	2000	2010*
Albania	-	-	-	-	-	-	-	-	-
Andorra	-	-	-	-	-	-	-	-	-
Austria	1694	14364	9179	17	94	97	-	-	26020
Belarus	5248	5248	6224	1022	1824	1798	1434	2302	2112
Belgium	1004	1448	1695	66	89	181	1407	3579	3937
BA	3560	-	2906	11	-	67	1766	-	2973
Bulgaria	-	131744	60052	162	515	857	50036	52840	52081
Croatia	5162	5275	1216	76	81	48	23	27	5059
Cyprus	250	5445	-	-	-	3	19	19	3
Czech Republic	106002	106002	111794	339	358	291	149000	137361	217357
Denmark	-	-	2881	-	-	41	-	-	1550
Estonia	3551	3224	2878	222	256	231	-	-	2430
Finland	0	7030	7600	0	6	8	3041	2831	2935
France	-	9762	11451	-	28	32	75409	66254	63566
Georgia	-	-	809	-	-	-	-	-	1120
Germany	1891	11093	17087	268	1113	406	103	802	193974
Greece	30797	30797	-	3	4	-	-	-	-
Holy See	-	-	0	27	58	32	3774	4400	3889
Hungary	-	-	-	-	-	-	-	-	-
Iceland	0	0	292	0	14	55	0	9	10
Ireland	-	-	633	25	30	82	2282	-	4343
Italy	92914	92914	59787	50	34	185	13	14	286
Latvia	4950	5565	4888	238	328	540	7583	7452	1445
Liechtenstein	-	-	1279	-	-	-	-	51	51
Lithuania	3082	3145	3627	25	36	90	1311	1451	2548
Luxembourg	0	0	3624	0	0	17	107	-	144
Malta	-	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-	-
Montenegro	-	-	-	-	-	-	-	-	-
Netherlands	0	0	331	0	5	6	29	48	62
Norway	20	48	13764	-	78	78	207	217	217
Poland	0	4737	6071	0	45	865	13331	16028	16516
Portugal	0	0	42	0	92	50	-	23855	26349
MD	-	1992	2172	-	26	63	-	31	68
Romania	0	10703	11008	115	130	385	59059	59059	59776
Russian Federation	26622	25928	-	1	18	-	154	1970	-
Serbia	-	-	338	13	17	19	-	2060	1628
Slovakia	-	9631	33139	232	381	810	51860	59073	68401
Slovenia	0	0	1136	0	0	7	2399	2296	4081
Spain	0	0	4820	0	10	71	0	33560	17869
Sweden	520	520	520	0	26	21	0	4054	4081
Switzerland	-	-	952	-	-	0	-	2271	3623
MK	-	-	967	-	-	117	-	-	306
Turkey	-	20387	34616	25	28	119	35917	45377	43773
Ukraine	29075	30364	25812	122	398	0	1446	1490	16092
United Kingdom	-	17882	0	178	250	18	2372	2621	13867

* The 2010 data is reported based on the new pan-European minimum requirements for dynamic gene conservation units (see http://portal.eufgis.org).

Source: European Forest Genetic Resources Programme, Bioversity International

Table A4.8: Areas managed for conservation and utilisation of forest tree genetic resources (*in situ* and *ex situ* gene conservation) and areas managed for seed production by selected tree species in 1990, 2000 and 2010.

Species	Area managed for in situ gene conservation [ha]						Area managed for ex situ gene conservation [ha]						Area managed for ex situ gene conservation [ha]					
	Reference year						Reference year						Reference year					
	1990		2000		2010*		1990		2000		2010*		1990		2000		2010*	
Abies alba	33860	(9)	48545	(13)	36315	(15)	31	(8)	125	(12)	307	(12)	33018	(12)	27741	(14)	64292	(20)
Abies cepha-lonica	0	(0)	0	(0)	0	(0)	1	(1)	1	(1)	6	(1)	0	(1)	2	(1)	2	(0)
Abies grandis	0	(0)	4	(1)	19	(2)	8	(3)	9	(4)	23	(2)	9	(3)	14	(4)	80	(2)
Abies pinsapo	0	(0)	0	(0)	100	(1)	0	(0)	0	(0)	0	(1)	0	(1)	0	(0)	0	(2)
Acer camp-estre	20	(1)	152	(3)	834	(8)	0	(0)	0	(1)	6	(7)	68	(1)	50	(2)	15	(6)
Acer platan-oides	235	(2)	250	(4)	1025	(10)	0	(0)	1	(1)	12	(9)	46	(5)	78	(9)	401	(10)
Acer pseudo-platanus	22559	(4)	22856	(9)	4886	(10)	23	(3)	36	(7)	32	(8)	345	(9)	657	(14)	25666	(9)
Alnus glutinosa	735	(8)	1232	(14)	1441	(13)	6	(5)	20	(7)	38	(12)	1448	(10)	1958	(15)	3728	(13)
Alnus incana	10	(1)	115	(2)	83	(6)	3	(2)	2	(2)	2	(6)	1	(1)	7	(3)	60	(6)
Betula pendula	4970	(5)	6452	(10)	2043	(13)	8	(2)	95	(3)	169	(12)	1026	(9)	1485	(16)	1346	(13)
Betula pube-scens	74	(2)	743	(5)	1423	(6)	1	(1)	5	(2)	10	(6)	2	(3)	136	(8)	138	(6)
Carpinus betulus	4808	(6)	6481	(10)	3045	(15)	0	(0)	8	(2)	6	(13)	558	(3)	789	(8)	5586	(14)
Castanea sativa	25	(2)	902	(3)	1024	(6)	0	(0)	10	(1)	19	(7)	538	(4)	548	(6)	1285	(7)
Cedrus atlantica	0	(0)	0	(0)	0	(0)	5	(1)	5	(1)	7	(1)	1442	(2)	808	(4)	763	(1)
Cedrus libani	0	(0)	0	(0)	2736	(1)	3	(1)	3	(1)	5	(2)	2861	(1)	3643	(1)	3652	(2)
Fagus sylvatica	105106	(8)	149785	(13)	77991	(20)	75	(2)	233	(6)	300	(19)	68893	(14)	80057	(17)	208756	(19)
Fraxinus angust-ifolia	352	(2)	746	(4)	947	(7)	0	(0)	0	(1)	1	(6)	102	(3)	626	(7)	494	(6)
Fraxinus excelsior	8064	(6)	10374	(12)	5444	(19)	6	(1)	27	(11)	65	(17)	2628	(12)	3214	(20)	14901	(18)
Junglas regia	41	(2)	54	(2)	43	(2)	8	(2)	11	(2)	34	(3)	1	(1)	13	(3)	74	(3)
Larix decidua	28478	(8)	29902	(11)	13052	(10)	247	(12)	303	(12)	275	(11)	6873	(14)	7061	(18)	17211	(10)
Larix x eurolepis	20	(2)	30	(2)	6	(2)	5	(2)	15	(3)	44	(2)	111	(5)	125	(7)	156	(2)
Larix kaemp-feri	16	(2)	11	(1)	71	(2)	2	(2)	3	(2)	2	(2)	202	(7)	172	(7)	839	(2)
Larix sibirica	1924	(1)	1924	(1)	1	(1)	0	(0)	4	(1)	5	(1)	49	(2)	184	(3)	140	(1)
Picea abies	85482	(14)	126804	(18)	127699	(22)	619	(14)	957	(18)	1338	(18)	163798	(22)	153203	(21)	150917	(25)
Picea sitchen-sis	0	(0)	2	(1)	7	(1)	85	(5)	132	(7)	47	(6)	1030	(6)	404	(8)	1134	(10)
Pinus brutia	26	(1)	7863	(2)	8697	(2)	10	(2)	10	(2)	103	(2)	8039	(2)	12092	(2)	12708	(3)
Pinus canar-iensis	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	146	(1)

Table A4.8: Areas managed for conservation and utilisation of forest tree genetic resources (*in situ* and *ex situ* gene conservation) and areas managed for seed production by selected tree species in 1990, 2000 and 2010 (cont.)

Species	Area managed for in situ gene conservation [ha]						Area managed for ex situ gene conservation [ha]						Area managed for ex situ gene conservation [ha]					
	Reference year						Reference year						Reference year					
	1990		2000		2010*		1990		2000		2010*		1990		2000		2010*	
Pinus cembra	1206	(3)	2106	(6)	3299	(5)	22	(4)	33	(4)	17	(2)	13	(3)	203	(6)	2188	(7)
Pinus contorta	0	(0)	0	(0)	0	(0)	38	(3)	39	(4)	27	(0)	192	(2)	950	(3)	2048	(0)
Pinus hale-pensis	1982	(2)	1898	(2)	4660	(3)	23	(2)	17	(2)	10	(3)	332	(4)	477	(4)	959	(2)
Pinus heldrei-chii/ leuco-dermis	3160	(2)	3355	(2)	2334	(3)	0	(0)	0	(0)	2	(2)	61	(1)	78	(2)	48	(2)
Pinus nigra	636	(4)	13464	(8)	11293	(13)	56	(8)	79	(8)	291	(12)	20374	(15)	38593	(18)	26719	(12)
Pinus pinaster	2923	(2)	2922	(2)	5827	(5)	6	(1)	58	(2)	26	(5)	1506	(3)	5731	(4)	15001	(5)
Pinus pinea	589	(2)	904	(3)	4255	(1)	9	(1)	9	(1)	2	(1)	1497	(2)	4215	(3)	5641	(0)
Pinus radiata	0	(0)	0	(0)	0	(0)	9	(2)	9	(2)	10	(0)	40	(3)	5	(2)	129	(0)
Pinus sylve-stris	27826	(13)	77990	(19)	42759	(20)	1608	(17)	2443	(18)	2580	(20)	63133	(23)	77189	(25)	80666	(19)
Populus alba	0	(0)	43	(2)	155	(5)	2	(1)	2	(1)	13	(5)	34	(4)	32	(4)	155	(5)
Populus nigra	637	(1)	684	(4)	1136	(6)	3	(2)	115	(6)	44	(6)	5	(1)	106	(4)	7	(5)
Populus tremula	298	(3)	1011	(7)	1330	(9)	3	(2)	4	(4)	53	(7)	220	(4)	184	(7)	379	(7)
Prunus avium	2329	(4)	2395	(6)	1223	(11)	3	(2)	25	(7)	67	(11)	316	(7)	644	(11)	3884	(12)
Pyrus pyraster	0	(1)	9	(2)	17	(2)	0	(0)	6	(3)	4	(2)	5	(1)	15	(3)	21	(2)
Pseudotsuga menziesii	248	(4)	707	(5)	538	(3)	109	(9)	664	(9)	318	(5)	1835	(15)	2140	(19)	5674	(5)
Quercus cerris	2392	(2)	4959	(5)	1811	(8)	0	(0)	0	(0)	6	(7)	2451	(3)	3143	(7)	5192	(7)
Quercus frainetto	38	(1)	5017	(3)	639	(6)	0	(0)	0	(0)	3	(4)	4770	(2)	5078	(5)	5933	(5)
Quercus ilex	2542	(1)	2608	(2)	749	(2)	0	(0)	0	(0)	2	(2)	0	(0)	1856	(1)	2158	(1)
Quercus petraea	15177	(8)	32208	(14)	14286	(23)	50	(5)	43	(9)	141	(22)	40609	(15)	41450	(17)	93945	(22)
Quercus pubescens	2993	(2)	3332	(5)	959	(7)	4	(1)	5	(3)	1	(6)	42	(2)	58	(4)	241	(7)
Quercus robur	20472	(10)	23940	(14)	13747	(21)	90	(9)	481	(16)	481	(22)	18050	(18)	19186	(23)	32499	(21)
Quercus rubra	28	(3)	49	(3)	342	(5)	0	(0)	8	(3)	82	(5)	1021	(8)	1516	(17)	2390	(5)
Quercus suber	0	(0)	0	(0)	101	(2)	0	(0)	49	(2)	38	(3)	11	(1)	16481	(2)	19819	(2)
Robinia pseudo-acacia	14	(2)	194	(3)	195	(3)	0	(0)	76	(2)	186	(5)	1426	(5)	1715	(7)	1917	(4)
Sorbus aucuparia	31	(2)	255	(3)	1238	(5)	4	(1)	6	(1)	4	(5)	15	(1)	31	(6)	34	(5)
Sorbus domestica	0	(0)	2	(2)	1	(1)	0	(1)	3	(3)	10	(1)	0	(0)	5	(2)	48	(2)
Sorbus torminalis	1867	(3)	1876	(6)	572	(9)	1	(1)	10	(4)	31	(10)	63	(4)	35	(7)	1974	(9)
Taxus baccata	132	(3)	219	(3)	697	(7)	2	(1)	50	(1)	56	(6)	0	(1)	12	(4)	57	(7)
Tilia cordata	6216	(6)	6533	(11)	1391	(14)	2	(1)	13	(4)	20	(13)	743	(6)	1048	(15)	8585	(14)
Tilia platyphyllos	233	(2)	906	(4)	270	(6)	0	(0)	2	(1)	0	(5)	155	(3)	737	(6)	732	(6)
Ulmus glabra	3080	(4)	3072	(5)	1741	(7)	11	(3)	17	(5)	10	(7)	10	(3)	78	(7)	3017	(7)
Ulmus laevis	450	(1)	517	(2)	1873	(4)	4	(1)	11	(5)	12	(5)	1	(1)	8	(3)	527	(5)

* The 2010 data is reported based on the new pan-European minimum requirements for dynamic gene conservation units (see http://portal.eufgis.org).

Source: European Forest Genetic Resources Programme, Bioversity International

Table A4.9: Number of threatened forest tree species, classified according to IUCN Red List categories and in relation to total number of forest species, 2010

Country	Vulnerable		Endangered		Critically endangered		Extinct in the wild	
	Number	% of total	Number	% of total	Number	% of total	Number	% of total
Albania	-	-	-	-	-	-	-	-
Andorra	-	-	-	-	-	-	-	-
Austria	6	12	5	10	0	0	0	0
Belarus	0	-	2	-	1	-	-	-
Belgium	1	2	0	0	1	2	2	4
BA	-	-	-	-	-	-	-	-
Bulgaria	0	-	0	-	0	-	0	-
Croatia	2	3	0	0	1	1	0	0
Cyprus	1	3	1	3	1	3	0	0
Czech Republic	1	n.s.	14	5	0	0	0	0
Denmark	-	-	-	-	-	-	-	-
Estonia	2	7	1	4	0	0	0	0
Finland	2	8	0	0	0	0	0	0
France	-	-	-	-	-	-	-	-
Georgia	-	-	-	-	-	-	-	-
Germany	1	1	5	6	1	1	0	0
Greece	-	-	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-
Hungary	3	-	2	-	3	-	1	-
Iceland	1	25	0	0	0	0	0	0
Ireland	1	-	-	-	-	-	-	-
Italy	0	0	0	0	2	2	0	0
Latvia	1	-	1	-	1	-	0	-
Liechtenstein	0	0	0	0	0	0	0	0
Lithuania	0	0	0	0	0	0	0	0
Luxembourg	-	-	-	-	-	-	-	-
Malta	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-
Montenegro	-	-	-	-	-	-	-	-
Netherlands	0	-	0	-	0	-	0	-
Norway	-	-	-	-	-	-	-	-
Poland	-	-	-	-	-	-	-	-
Portugal	-	-	-	-	-	-	-	-
MD	-	-	-	-	-	-	-	-
Romania	-	-	-	-	-	-	-	-
Russian Federation	12	44	10	37	5	19	0	0
Serbia	-	-	-	-	-	-	-	-
Slovakia	4	-	2	-	1	-	-	-
Slovenia	2	3	-	-	-	-	-	-
Spain	16	11	6	4	8	5	-	-
Sweden	2	7	1	3	4	13	0	0
Switzerland	2	4	1	2	0	0	0	0
MK	-	-	-	-	-	-	-	-
Turkey	-	-	-	-	-	-	-	-
Ukraine	60	55	34	31	15	14	1	1
United Kingdom	4	-	5	-	4	-	0	-

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A4.10: Area of forest protected, according to MCPFE Assessment Guidelines, 1990-2010

Country	Forest area [1000 ha]							
	MCPFE Class 1.1				MCPFE Class 1.2			
	1990	2000	2005	2010	1990	2000	2005	2010
Albania	-	8	8	-	-	55	89	-
Andorra	0	0	0	0	0	0	0	0
Austria	-	0	0	0	-	-	-	-
Belarus	286	135	135	85	-	133	134	74
Belgium	-	0	1	1	-	4	5	7
BA	-	-	-	-	-	-	-	-
Bulgaria	47	45	33	57	61	99	115	131
Croatia	22	33	38	44	3	7	8	10
Cyprus	1	3	3	3	2	11	13	13
Czech Republic	-	15	15	15	-	0	0	0
Denmark	-	6	6	6	-	5	5	5
Estonia	-	96	139	151	-	44	38	35
Finland	-	807	841	841	-	670	665	690
France	-	5	8	20	-	95	95	110
Georgia	-	-	-	-	-	-	-	-
Germany	0	0	0	0	-	91	117	220
Greece	139	152	159	164	-	-	-	-
Holy See	-	-	-	-	-	-	-	-
Hungary	0	0	3	4	0	0	8	9
Iceland	0	0	0	0	0	0	0	0
Ireland	-	-	-	-	-	-	-	-
Italy	-	238	254	270	-	1312	1398	1491
Latvia	-	5	9	9	-	153	173	181
Liechtenstein	-	1	1	1	-	1	1	1
Lithuania	-	20	24	24	-	2	2	2
Luxembourg	-	-	-	-	0	0	0	-
Malta	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-
Montenegro	-	-	-	-	-	-	-	-
Netherlands	-	3	3	3	-	24	28	31
Norway	0	0	0	0	78	121	159	183
Poland	30	51	54	55	0	0	0	0
Portugal	-	1	1	-	-	9	9	-
MD	-	-	-	-	-	-	-	-
Romania	-	-	136	-	-	-	84	-
Russian Federation	-	-	-	-	-	-	-	-
Serbia	-	0	7	-	-	0	111	-
Slovakia	-	85	82	69	-	10	16	13
Slovenia	10	10	10	10	59	74	100	100
Spain	-	-	0	0	-	-	136	139
Sweden	54	58	83	141	320	606	1049	1084
Switzerland	-	-	5	5	-	-	20	26
MK	-	-	-	-	-	-	-	-
Turkey	21	22	22	24	100	197	215	227
Ukraine	-	193	199	-	-	107	109	-
United Kingdom	0	0	0	0	18	22	27	30

Table A4.10: Area of forest protected, according to MCPFE Assessment Guidelines, 1990-2010 (cont.)

Country	Forest area [1000 ha]							
	MCPFE Class 1.3				MCPFE Class 2			
	1990	2000	2005	2010	1990	2000	2005	2010
Albania	-	48	64	-	-	30	94	-
Andorra	0	0	0	0	0	0	0	0
Austria	-	-	-	-	-	-	-	-
Belarus	-	443	498	435	207	628	649	673
Belgium	-	5	7	9	-	27	27	26
BA	-	-	-	-	-	-	-	-
Bulgaria	0	1	2	3	23	100	128	156
Croatia	138	156	165	173	1	3	3	4
Cyprus	0	0	0	0	0	0	0	0
Czech Republic	-	67	67	67	-	584	584	584
Denmark	-	81	81	81	-	0	0	0
Estonia	-	45	40	44	-	125	201	256
Finland	-	534	705	741	-	579	1026	932
France	-	75	84	73	-	2984	3171	-
Georgia	-	-	-	-	-	-	-	-
Germany	-	2048	2690	3086	-	4686	5273	5958
Greece	-	-	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-
Hungary	49	65	61	62	0	327	351	372
Iceland	0	0	0	0	n.s.	n.s.	n.s.	n.s.
Ireland	4	6	6	6	-	-	-	-
Italy	-	1324	1410	1504	-	-	898	898
Latvia	-	197	153	146	-	143	158	160
Liechtenstein	-	0	0	0	-	n.s.	n.s.	n.s.
Lithuania	-	145	167	171	-	155	177	178
Luxembourg	-	-	-	-	0	0	0	-
Malta	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-
Montenegro	-	-	-	-	-	-	-	-
Netherlands	-	23	23	23	-	33	33	33
Norway	0	0	0	0	-	-	-	-
Poland	-	226	226	244	-	1346	1403	1310
Portugal	-	606	606	-	-	938	938	-
MD	-	-	-	-	-	-	-	-
Romania	-	-	178	-	-	-	141	-
Russian Federation	-	-	-	-	-	-	-	-
Serbia	-	0	195	-	-	0	48	-
Slovakia	-	219	237	242	-	548	501	501
Slovenia	-	-	68	68	-	51	81	81
Spain	-	-	3065	3145	-	-	0	0
Sweden	5	15	26	55	2	42	44	45
Switzerland	-	-	8	11	-	-	254	-
MK	-	-	-	-	-	-	-	-
Turkey	452	465	577	609	0	0	0	0
Ukraine	-	55	57	-	-	743	751	-
United Kingdom	102	128	153	168	180	185	220	225

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A5.1: Protective forest, according to MCPFE Assessment Guidelines, 2000-2010

Country	Forest area in MCPFE Class 3 [1000 ha]							
	For soil, water and other forest ecosystem functions				For infrastructure and managed natural resources			
	1990	2000	2005	2010	1990	2000	2005	2010
Albania	87	97	131	131	-	-	-	-
Andorra	0	0	0	0	0	0	0	0
Austria	654	679	697	706	-	-	-	-
Belarus	622	1245	1287	1257	1988	2359	1547	1488
Belgium	-	168	172	176	0	0	0	0
BA	-	-	-	-	-	-	-	-
Bulgaria	430	328	424	520	200	232	146	-
Croatia	50	65	73	80	2	2	2	2
Cyprus	0	0	0	0	0	0	0	0
Czech Republic	-	167	224	246	-	180	252	282
Denmark	0	0	0	0	0	0	0	0
Estonia	-	267	165	99	-	0	0	0
Finland	-	654	497	466	-	-	-	-
France	758	872	961	964	-	-	-	-
Georgia	-	-	-	-	-	-	-	-
Germany	-	2981	3737	4616	-	-	-	-
Greece	-	-	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-
Hungary	195	182	150	166	7	36	32	29
Iceland	n.s.	1	3	4	0	0	0	0
Ireland	-	-	-	-	-	-	-	-
Italy	6816	7375	7654	7933	61	61	61	61
Latvia	-	128	145	167	0	0	0	0
Liechtenstein	-	-	-	-	-	2	2	2
Lithuania	-	217	236	230	-	13	22	22
Luxembourg	-	1	1	1	0	0	0	0
Malta	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-
Montenegro	-	-	-	-	-	-	-	-
Netherlands	0	0	0	0	0	0	0	0
Norway	2585	2590	2676	2762	-	-	-	-
Poland	1356	1757	1938	1950	867	885	865	811
Portugal	-	216	232	232	-	1	1	1
MD	-	-	-	-	-	-	-	-
Romania	1879	2843	2847	2917	109	166	166	170
Russian Federation	-	-	-	-	-	-	-	-
Serbia	-	162	162	162	-	1	1	1
Slovakia	-	303	334	353	-	14	10	5
Slovenia	-	74	95	249	-	14	14	29
Spain	3260	4329	4407	4631	0	0	0	0
Sweden	-	-	4344	4514	0	0	0	0
Switzerland	-	-	18	18	-	-	442	442
MK	-	-	-	-	-	-	-	-
Turkey	932	1121	1693	1787	167	189	107	113
Ukraine	2870	3160	3160	2376	-	-	-	-
United Kingdom	0	0	0	0	0	0	0	0

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A5.2: Protective forest and OWL, according to MCPFE Assessment Guidelines, 2000-2010

Country	Forest and other wooded land in MCPFE Class 3 [1000 ha]							
	For soil, water and other forest ecosystem functions				For infrastructure and managed natural resources			
	1990	2000	2005	2010	1990	2000	2005	2010
Albania	-	134	168	-	-	-	-	-
Andorra	0	0	0	0	0	0	0	0
Austria	746	773	801	820	-	165	280	378
Belarus	622	1245	1287	1257	1988	2359	1547	1488
Belgium	-	177	181	185	0	0	0	0
BA	-	-	-	-	-	-	-	-
Bulgaria	430	433	451	520	200	232	146	-
Croatia	56	94	114	133	2	2	2	2
Cyprus	0	0	0	0	0	0	0	0
Czech Republic	-	167	224	246	-	180	252	282
Denmark	0	0	0	0	0	0	0	0
Estonia	-	270	182	121	-	0	0	0
Finland	-	727	583	549	-	-	-	-
France	949	1099	1209	1238	-	-	-	-
Georgia	1564	2180	2970	2960	-	-	-	-
Germany	-	2981	3737	4616	-	-	-	-
Greece	-	-	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-
Hungary	-	-	-	-	-	-	-	-
Iceland	1	2	4	5	0	0	0	0
Ireland	-	-	-	-	-	-	-	-
Italy	7957	8487	8751	9015	61	61	61	61
Latvia	-	-	-	-	0	0	0	0
Liechtenstein	-	-	-	-	-	2	2	2
Lithuania	-	-	-	-	-	-	-	-
Luxembourg	-	1	1	1	0	0	0	0
Malta	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-
Montenegro	-	52	66	66	-	-	-	-
Netherlands	0	0	0	0	0	0	0	0
Norway	4821	4821	4821	4821	-	-	-	-
Poland	1356	1757	1938	1950	-	885	865	811
Portugal	-	220	241	241	-	1	1	1
MD	-	-	-	-	-	-	-	-
Romania	-	-	-	-	-	-	-	-
Russian Federation	64079	70386	70556	74948	84865	99573	99398	71343
Serbia	-	179	179	-	-	2	2	-
Slovakia	-	303	334	353	-	14	10	5
Slovenia	-	74	95	249	-	-	14	29
Spain	5383	6510	6567	6646	0	0	0	0
Sweden	-	-	6365	6338	0	0	0	0
Switzerland	-	-	22	22	-	-	459	459
MK	-	-	-	-	-	-	-	-
Turkey	-	-	-	-	-	-	-	-
Ukraine	2898	3201	3201	2417	-	-	-	-
United Kingdom	0	0	0	0	0	0	0	0

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A6.1: Ownership of forest, 1990-2010

Country	Forest [1000 ha]							
	Public				Private			
	1990	2000	2005	2010	1990	2000	2005	2010
Albania	789	762	769	-	0	7	13	-
Andorra	-	-	-	-	-	-	-	-
Austria	874	928	906	858	2363	2332	2405	2482
Belarus	7780	8273	8436	8600	0	0	0	0
Belgium	294	290	299	301	383	377	374	377
BA	1807	1718	-	-	403	467	-	-
Bulgaria	3327	3041	3201	3408	0	272	395	423
Croatia	1400	1398	1397	1396	450	487	506	524
Cyprus	106	118	119	119	55	54	54	54
Czech Republic	2519	2023	1999	2041	110	614	648	616
Denmark	140	138	155	139	306	348	387	424
Estonia	2090	899	894	858	0	953	978	976
Finland	6726	7213	6860	6699	15163	15245	15306	15389
France	3782	3984	4026	4113	10755	11369	11688	11841
Georgia	2779	2768	2755	-	0	0	0	-
Germany	5694	5846	5846	5708	4368	4824	4824	5283
Greece	2557	2790	2907	-	742	811	845	-
Holy See	0	0	0	0	0	0	0	0
Hungary	1792	1155	1165	1178	0	751	814	849
Iceland	5	7	8	8	4	12	18	22
Ireland	353	399	400	400	112	236	295	337
Italy	2549	2811	2942	3073	5041	5558	5817	6076
Latvia	3132	1749	1781	1655	32	1464	1513	1635
Liechtenstein	6	6	6	6	1	1	1	1
Lithuania	1945	1562	1404	1366	0	458	717	784
Luxembourg	40	41	41	41	46	46	46	46
Malta	n.s.	n.s.	n.s.	n.s.	0	0	0	0
Monaco	0	0	0	0	0	0	0	0
Montenegro	-	337	337	337	-	130	130	130
Netherlands	176	184	184	184	169	176	181	181
Norway	1286	1299	1362	1450	7844	8002	8321	8800
Poland	7406	7535	7610	7661	1475	1524	1590	1658
Portugal	53	54	54	-	3274	3366	3382	-
MD	319	324	362	-	0	0	1	-
Romania	6371	6010	5090	4398	0	356	1301	2097
Russian Federation	884094	880875	881959	882310	0	0	-	-
Serbia	1143	1246	1252	-	1170	1214	1224	-
Slovakia	1922	1006	996	980	0	830	823	827
Slovenia	442	365	323	291	746	868	920	962
Spain	4332	4988	5077	5336	9486	11998	12214	12836
Sweden	-	-	7522	7664	-	-	20990	20941
Switzerland	-	-	885	889	-	-	-	-
MK	818	864	881	-	94	94	94	-
Turkey	9665	10131	10730	-	15	15	10	-
Ukraine	9274	9503	9568	-	0	7	7	-
United Kingdom	1081	1011	983	959	1530	1782	1862	1922

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A6.2: Ownership, number of holdings of forest in size classes, 2010

Country	Number of forest holdings in size classes									
	Public					Private				
	<10 ha	11 -100 ha	101 - 500 ha	501 - 10,000 ha	>10,000 ha	<10 ha	11 -100 ha	101 - 500 ha	501 - 10,000 ha	>10,000 ha
Albania	-	-	-	-	-	-	-	-	-	-
Andorra	-	-	-	-	-	-	-	-	-	-
Austria	619	1015	236	105	3	104634	36027	2420	434	4
Belarus	0	0	0	5	112	0	0	0	0	0
Belgium	-	-	-	-	-	-	-	-	-	-
BA	-	-	-	-	-	-	-	-	-	-
Bulgaria	36279	6850	1246	144	134	545692	2979	75	10	0
Croatia	6	43	88	542	2	599953	30	10	6	1
Cyprus	0	0	0	1	3	-	-	-	-	-
Czech Republic	74	876	848	222	78	-	-	441	312	1
Denmark	96	150	52	33	0	21496	4245	382	94	0
Estonia	-	-	-	-	-	-	-	-	-	-
Finland	-	-	-	-	-	205620	223280	14578	-	-
France	1547	7117	5954	2032	17	-	-	-	-	-
Georgia	-	-	-	-	-	-	-	-	-	-
Germany	0	-	-	1480	-	157530	-	-	657	-
Greece	-	-	-	-	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-	-	-
Hungary	622	374	88	144	30	22559	9925	1127	101	0
Iceland	89	112	41	19	0	112	415	85	1	0
Ireland	0	10	60	242	5	14190	6142	218	20	0
Italy	-	-	-	-	-	-	-	-	-	-
Latvia	-	-	-	-	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-	-	-
Lithuania	0	0	0	5	42	222573	13225	201	21	0
Luxembourg	118	33	77	14	1	12230	840	8	2	0
Malta	-	-	-	0	0	0	0	0	0	0
Monaco	-	-	-	-	-	-	-	-	-	-
Montenegro	0	0	0	3	15	-	-	-	-	-
Netherlands	1920	108	102	25	4	27694	905	103	22	0
Norway	-	-	-	-	-	-	-	-	-	-
Poland	980	716	115	98	396	-	-	-	-	-
Portugal	-	-	-	-	-	-	-	-	-	-
MD	-	-	-	-	-	-	-	-	-	0
Romania	-	-	-	-	-	-	-	-	-	-
Russian Federation	0	0	3	142	1592	-	-	-	-	-
Serbia	-	-	-	-	-	-	-	-	-	-
Slovakia	53	65	31	58	6	2813	2042	1221	268	2
Slovenia	4467	583	113	26	4	295925	17194	274	20	0
Spain	-	-	-	-	-	-	-	-	-	-
Sweden	94	199	257	328	65	82882	126377	27023	2032	126
Switzerland	-	1340	775	429	-	-	58	30	3	-
MK	-	-	-	-	-	-	-	-	-	-
Turkey	-	-	-	-	-	-	-	-	-	-
Ukraine	7	35	81	297	307	-	-	-	-	-
United Kingdom	0	380	101	128	37	80900	20500	3200	500	0

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A6.3: Contribution of forest sector to GVA (gross value added), 2000-2010

Country	Gross Value Added											
	Forestry (ISIC/NACE 02)						Manufacture of wood and articles in wood (ISIC/NACE 20)					
	million Euro/ECU			% of total GVA			million Euro/ECU			% of total GVA		
	2000	2005	2010	2000	2005	2010	2000	2005	2010	2000	2005	2010
Albania	-	-	-	-	-	-	-	-	-	-	-	-
Andorra	-	-	-	-	-	-	-	-	-	-	-	-
Austria	1008	1024	1137	0.5	0.5	0.5	1745	1880	2280	0.9	0.9	0.9
Belarus	42	132	158	0.6	0.6	0.5	127	441	-	1.9	2.1	-
Belgium	105	119	142	0.0	0.0	0.0	655	833	991	0.3	0.3	0.3
BA	-	-	-	-	-	-	-	-	-	-	-	-
Bulgaria	-	58	97	-	0.3	0.3	-	65	-	-	0.3	-
Croatia	126	144	157	0.6	0.4	0.4	126	165	176	0.5	0.5	0.4
Cyprus	2	2	-	0.0	0.0	-	57	79	-	0.6	0.7	-
Czech Republic	484	665	804	0.9	0.7	0.6	511	826	1126	0.9	0.9	0.8
Denmark	144	188	230	0.1	0.1	0.1	707	752	841	0.5	0.4	0.4
Estonia	94	116	104	1.7	1.2	0.9	128	244	195	2.3	2.5	1.6
Finland	2402	2422	3562	2.1	1.8	2.2	1379	1352	1248	1.2	1.0	0.8
France	3010	2921	3185	0.2	0.2	0.2	3590	3223	3556	0.3	0.2	0.2
Georgia	-	-	-	-	-	-	-	-	-	-	-	-
Germany	1810	1840	2650	0.1	0.1	0.1	8180	7020	7560	0.4	0.3	0.3
Greece	64	55	63	0.1	0.0	0.0	358	206	205	0.3	0.1	0.1
Holy See	-	-	-	-	-	-	-	-	-	-	-	-
Hungary	113	113	143	0.3	0.1	0.2	196	244	286	0.4	0.3	0.3
Iceland	1	n.s.	-	0.0	0.0	-	14	16	-	0.2	0.2	-
Ireland	90	142	163	0.1	0.1	0.1	352	451	454	0.3	0.3	0.3
Italy	385	364	387	0.0	0.0	0.0	5907	5989	6437	0.6	0.5	0.5
Latvia	120	159	266	1.6	1.4	1.3	200	286	384	2.6	2.5	1.8
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-
Lithuania	67	99	143	0.6	0.5	0.5	142	326	345	1.3	1.7	1.2
Luxembourg	14	11	8	0.1	0.0	0.0	38	47	32	0.2	0.2	0.1
Malta	-	0	0	-	0.0	0.0	3	4	5	0.1	0.1	0.1
Monaco	-	-	-	-	-	-	-	-	-	-	-	-
Montenegro	-	-	n.s.	-	-	0.0	-	-	6	-	-	0.2
Netherlands	42	46	54	0.0	0.0	0.0	904	1035	1233	0.2	0.2	0.2
Norway	586	528	501	0.4	0.2	0.2	680	924	1004	0.4	0.4	0.4
Poland	648	676	994	0.4	0.3	0.3	1441	1527	2172	0.9	0.7	0.7
Portugal	-	626	624	-	0.5	0.5	728	798	796	0.7	0.6	0.6
MD	-	-	-	-	-	-	-	-	-	-	-	-
Romania	192	314	442	0.5	0.4	0.4	367	723	1076	1.0	1.0	1.0
Russian Federation	1311	1690	1767	0.4	0.3	0.2	1087	2240	2343	0.3	0.4	0.3
Serbia	-	-	-	-	-	-	-	-	-	-	-	-
Slovakia	168	251	222	0.9	0.6	0.4	163	372	242	0.8	1.1	0.4
Slovenia	106	119	179	0.6	0.5	0.5	190	206	244	1.0	0.8	0.7
Spain	-	-	-	-	-	-	-	-	3247	-	-	0.3
Sweden	2804	1471	2707	1.2	0.6	0.9	1820	2384	2956	0.8	0.9	1.0
Switzerland	297	187	259	0.1	0.1	0.1	1679	1985	2206	0.7	0.7	0.7
MK	20	12	17	0.6	0.3	0.4	9	11	13	0.3	0.3	0.3
Turkey	-	-	-	-	-	-	-	-	-	-	-	-
Ukraine	-	-	-	-	-	-	-	-	-	-	-	-
United Kingdom	448	472	585	0.0	0.0	0.0	3779	4317	3810	0.3	0.3	0.2

Table A6.3: Contribution of forest sector to GVA (gross value added), 2000-2010 (cont.)

Country	Gross Value Added					
	Manufacture of paper and paper products (ISIC/NACE 21)					
	million Euro/ECU			% of total GVA		
	2000	2005	2010	2000	2005	2010
Albania	-	-	-	-	-	-
Andorra	-	-	-	-	-	-
Austria	1766	1620	1577	0.9	0.7	0.6
Belarus	-	-	-	-	-	-
Belgium	1240	1122	1125	0.6	0.4	0.4
BA	-	-	-	-	-	-
Bulgaria	-	52	-	-	0.2	-
Croatia	94	109	105	0.4	0.3	0.3
Cyprus	20	26	-	0.2	0.2	-
Czech Republic	365	459	570	0.7	0.5	0.4
Denmark	514	425	576	0.3	0.2	0.3
Estonia	18	24	35	0.3	0.2	0.3
Finland	5472	3548	3401	4.8	2.6	2.1
France	5323	4861	5065	0.4	0.3	0.3
Georgia	-	-	-	-	-	-
Germany	9810	10100	10560	0.5	0.5	0.5
Greece	371	322	359	0.3	0.2	0.2
Holy See	-	-	-	-	-	-
Hungary	160	231	251	0.4	0.3	0.3
Iceland	9	6	-	0.1	0.1	-
Ireland	267	227	194	0.2	0.2	0.1
Italy	5142	4999	5037	0.5	0.4	0.4
Latvia	15	18	28	0.2	0.2	0.1
Liechtenstein	-	-	-	-	-	-
Lithuania	31	49	74	0.3	0.3	0.3
Luxembourg	-	-	-	-	-	-
Malta	-	6	6	-	0.1	0.1
Monaco	-	-	-	-	-	-
Montenegro	-	-	-	-	-	-
Netherlands	1551	1593	1528	0.4	0.3	0.3
Norway	786	558	598	0.5	0.3	0.3
Poland	685	962	1270	0.4	0.4	0.4
Portugal	-	663	728	-	0.5	0.5
MD	-	-	-	-	-	-
Romania	145	219	453	0.4	0.3	0.4
Russian Federation	1128	1524	1631	0.3	0.3	0.2
Serbia	-	-	-	-	-	-
Slovakia	217	197	178	1.1	0.6	0.3
Slovenia	157	159	155	0.8	0.6	0.5
Spain	-	-	-	-	-	-
Sweden	5163	3390	3560	2.2	1.3	1.2
Switzerland	1051	1006	1028	0.4	0.4	0.3
MK	9	9	14	0.3	0.2	0.3
Turkey	-	-	-	-	-	-
Ukraine	-	-	-	-	-	-
United Kingdom	6135	4591	3502	0.4	0.3	0.2

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A6.4: Factor income and entrepreneurial income, 1990-2010

Country	Forestry (ISIC/NACE 02) [million Euro/ECU]							
	Factor income				Net entrepreneurial income			
	1990	2000	2005	2010	1990	2000	2005	2010
Albania	-	-	-	-	-	-	-	-
Andorra	-	-	-	-	-	-	-	-
Austria	1006	871	856	940	875	740	717	783
Belarus	-	-	-	-	-	-	-	-
Belgium	-	91	-	-	-	84	-	-
BA	-	-	-	-	-	-	-	-
Bulgaria	-	-	51	89	-	-	19	47
Croatia	-	-	-	-	-	-	-	-
Cyprus	-	-	-	-	-	-	-	-
Czech Republic	-	-	449	520	-	-	243	258
Denmark	148	158	162	190	-	-	-	-
Estonia	-	91	111	108	-	55	51	42
Finland	1687	1819	1679	2832	1276	1496	1288	2417
France	2158	2558	2356	2187	1593	1837	1623	1417
Georgia	-	-	-	-	-	-	-	-
Germany	-	1100	1700	2248	-	-131	51	1259
Greece	131	86	55	-	-	-	28	-
Holy See	-	-	-	-	-	-	-	-
Hungary	-	70	118	96	-	60	106	84
Iceland	-	-	-	-	-	-	-	-
Ireland	-	-	-	-	-	-	-	-
Italy	260	360	391	406	-	-	-	-
Latvia	-	-	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-
Lithuania	-	-	113	-	-	-	79	-
Luxembourg	-	-	-	-	-	-	-	-
Malta	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-
Montenegro	-	-	-	-	-	-	-	-
Netherlands	32	32	49	46	-3	-7	-1	-3
Norway	404	517	493	465	323	421	391	350
Poland	-	-	-	-	-	35	32	70
Portugal	559	746	576	564	511	659	490	470
MD	-	-	-	-	-	-	-	-
Romania	-	-	-	-	-	-	-	-
Russian Federation	-	84	315	500	-	-	-	-
Serbia	-	-	-	-	-	-	-	-
Slovakia	-	109	184	158	-	16	40	50
Slovenia	-	52	57	104	-	-	25	65
Spain	837	863	-	-	577	487	-	-
Sweden	1788	2514	2083	2046	841	1757	1351	1788
Switzerland	406	367	179	215	107	-14	-99	-44
MK	-	-	-	-	-	-	-	-
Turkey	-	-	-	-	-	-	-	-
Ukraine	-	-	-	-	-	-	-	-
United Kingdom	308	145	209	279	18	-41	-77	-19

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A6.5: Government expenditures for forest services, 2000-2010

Country	Government expenditures for forest services [million Euro/ECU]								
	Biospheric and Ecological services			Social and amenity services			Other services		
	2000	2005	2010	2000	2005	2010	2000	2005	2010
Albania	-	-	-	-	-	-	-	-	-
Andorra	-	-	-	-	-	-	-	-	-
Austria	2.2	5.4	18.4	0.1	0.2	0.3	0.0	0.0	0.1
Belarus	-	-	-	-	-	-	-	-	-
Belgium	-	-	-	-	-	-	-	-	-
BA	-	-	-	-	-	-	-	-	-
Bulgaria	-	5.9	6.4	-	0.2	0.8	-	1.3	2.6
Croatia	-	-	-	-	-	-	-	-	-
Cyprus	-	-	-	4.1	2.4	1.0	-	-	-
Czech Republic	32.1	23.1	39.5	-	-	-	-	-	-
Denmark	-	-	-	-	-	-	-	-	-
Estonia	-	-	-	-	-	-	-	-	-
Finland	-	-	-	-	-	-	-	-	-
France	119.7	224.5	167.1	-	-	-	-	-	-
Georgia	-	-	-	-	-	-	-	-	-
Germany	-	-	-	-	-	-	-	-	-
Greece	-	-	-	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-	-
Hungary	14.6	50.8	36.1	1.2	1.3	0.3	0.0	0.0	0.0
Iceland	-	-	-	-	-	-	-	-	-
Ireland	-	-	-	-	0.3	0.7	-	-	-
Italy	291.3	213.7	-	2.4	27.8	-	26.8	18.0	-
Latvia	-	-	-	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-	-
Lithuania	0.1	0.1	0.7	0.0	0.0	1.0	0.0	0.0	0.0
Luxembourg	-	-	-	-	-	-	-	-	-
Malta	-	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-	-
Montenegro	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands	-	9.0	-	-	3.0	-	-	-	-
Norway	-	-	-	-	-	-	-	-	-
Poland	-	-	-	-	-	-	-	-	-
Portugal	-	-	-	-	-	-	-	-	-
MD	-	-	-	-	-	-	-	-	-
Romania	-	-	-	-	-	-	-	-	-
Russian Federation	-	-	-	-	-	-	345.5	822.5	672.3
Serbia	-	-	-	-	-	-	-	-	-
Slovakia	0.7	0.7	0.7	0.3	0.3	0.3	0.1	0.1	0.1
Slovenia	15.1	20.3	25.4	-	-	-	-	-	-
Spain	-	531.4	960.6	-	34.1	27.7	-	455.6	568.5
Sweden	296.8	494.3	495.0	1.7	2.2	2.5	-	-	-
Switzerland	60.4	59.4	80.2	0.0	0.0	0.0	-	-	0.9
MK	-	-	-	-	-	-	-	-	-
Turkey	-	-	-	-	-	-	-	-	-
Ukraine	-	-	-	-	-	-	-	-	-
United Kingdom	0.0	0.0	0.0	37.0	74.0	74.0	17.0	21.0	14.0

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A6.6: Employment, total and by gender, 1990-2010

Country	Employment									
	Forestry (ISIC/NACE 02)					Manufacture of wood and articles in wood (ISIC/NACE 20				
	Total [thousand FTE]				Male [% of total]	Total [thousand FTE]				Male [% of total]
	1990	2000	2005	2010	2010	1990	2000	2005	2010	2010
Albania	2	n.s.	n.s.	-	-	-	-	-	-	-
Andorra	-	-	-	-	-	-	-	-	-	-
Austria	-	7	10	11	86	-	35	41	45	81
Belarus	22	33	33	36	84	-	-	-	-	-
Belgium	2	2	2	3	89	20	18	26	24	92
BA	-	-	-	-	-	-	-	-	-	-
Bulgaria	-	19	21	23	74	-	22	26	27	76
Croatia	-	-	12	14	80	-	-	17	19	76
Cyprus	-	1	1	1	89	-	3	3	4	91
Czech Republic	-	32	22	18	81	-	65	66	67	84
Denmark	4	4	4	3	86	13	18	13	14	77
Estonia	10	10	6	5	92	7	19	22	17	72
Finland	37	23	23	23	88	43	33	32	26	83
France	52	38	31	25	89	101	91	86	83	82
Georgia	-	-	-	-	-	-	-	-	-	-
Germany	65	51	41	43	86	-	240	162	147	82
Greece	9	9	4	5	82	29	32	34	28	94
Holy See	-	-	-	-	-	-	-	-	-	-
Hungary	-	18	15	14	85	-	39	38	38	83
Iceland	-	-	n.s.	n.s.	41	-	1	1	1	82
Ireland	2	3	2	2	92	7	8	8	8	89
Italy	50	43	43	43	87	207	182	173	166	84
Latvia	-	22	31	24	89	-	21	35	31	79
Liechtenstein	-	-	-	-	-	-	-	-	-	-
Lithuania	-	12	10	12	87	-	24	36	32	79
Luxembourg	n.s.	n.s.	n.s.	n.s.	96	n.s.	n.s.	n.s.	n.s.	69
Malta	-	-	-	-	-	-	n.s.	n.s.	n.s.	-
Monaco	-	-	-	-	-	-	-	-	-	-
Montenegro	-	-	n.s.	n.s.	84	-	n.s.	n.s.	n.s.	100
Netherlands	2	1	1	2	67	22	22	19	23	90
Norway	-	5	4	4	93	-	15	17	17	82
Poland	-	-	58	44	85	-	-	181	143	84
Portugal	8	11	10	13	87	60	78	71	66	77
MD	-	-	-	-	-	-	-	-	-	-
Romania	-	57	49	44	91	-	105	133	128	78
Russian Federation	185	201	170	74	-	-	390	358	341	-
Serbia	-	-	-	-	-	-	-	-	-	-
Slovakia	-	24	23	24	85	-	36	34	34	81
Slovenia	-	4	3	3	84	-	16	14	15	77
Spain	29	35	36	38	85	81	111	119	110	88
Sweden	-	19	22	26	91	-	40	38	39	83
Switzerland	-	6	5	5	80	-	36	35	37	87
MK	-	-	4	4	88	-	-	3	3	81
Turkey	-	-	49	51	85	-	-	132	130	95
Ukraine	62	105	98	73	82	215	90	37	33	69
United Kingdom	17	16	14	16	84	121	83	87	84	86

Table A6.6: Employment, total and by gender, 1990-2010 (cont.)

Country	Employment				
	Manufacture of paper and paper products (ISIC/NACE 21)				
	Total [thousand FTE]				Male [% of total]
	1990	2000	2005	2010	2010
Albania	-	-	-	-	-
Andorra	-	-	-	-	-
Austria	-	20	18	18	76
Belarus	-	-	-	-	-
Belgium	17	18	16	16	76
BA	-	-	-	-	-
Bulgaria	-	11	11	11	55
Croatia	-	-	5	5	71
Cyprus	-	n.s.	n.s.	n.s.	55
Czech Republic	-	25	26	25	54
Denmark	10	7	8	6	72
Estonia	3	2	2	2	59
Finland	47	38	35	21	74
France	106	85	78	68	71
Georgia	-	-	-	-	-
Germany	-	152	148	146	72
Greece	9	9	8	9	71
Holy See	-	-	-	-	-
Hungary	-	12	14	14	53
Iceland	-	n.s.	n.s.	n.s.	100
Ireland	3	4	3	2	71
Italy	90	101	90	88	73
Latvia	-	2	1	1	71
Liechtenstein	-	-	-	-	-
Lithuania	-	4	3	3	52
Luxembourg	-	-	n.s.	n.s.	-
Malta	-	1	n.s.	n.s.	-
Monaco	-	-	-	-	-
Montenegro	-	-	n.s.	n.s.	100
Netherlands	27	27	25	23	82
Norway	-	11	7	5	74
Poland	-	-	48	38	69
Portugal	17	15	15	14	71
MD	-	-	-	-	-
Romania	-	25	19	19	55
Russian Federation	-	415	393	399	-
Serbia	-	-	-	-	-
Slovakia	-	14	9	8	71
Slovenia	-	7	8	7	63
Spain	41	50	48	43	78
Sweden	-	42	36	35	78
Switzerland	-	14	12	12	69
MK	-	-	1	1	76
Turkey	-	-	42	44	87
Ukraine	29	22	66	65	51
United Kingdom	126	113	93	83	76

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A6.7: Occupational accidents, 1990-2010

Country	Forestry (ISIC/NACE 02) [million Euro/ECU]							
	Fatal occupational accidents							
	Number				Annual rate per 1000 workers			
	1990	2000	2005	2010	1990	2000	2005	2010
Albania	-	-	-	-	-	-	-	-
Andorra	-	-	-	-	-	-	-	-
Austria	30	23	28	39	-	1	1	2
Belarus	5	5	4	7	n.s.	n.s.	n.s.	n.s.
Belgium	-	0	0	0	-	0	0	0
BA	-	-	-	-	-	-	-	-
Bulgaria	-	-	-	-	-	-	-	-
Croatia	-	3	1	2	-	n.s.	n.s.	n.s.
Cyprus	-	0	n.s.	0	0	0	n.s.	0
Czech Republic	-	6	6	6	-	n.s.	n.s.	n.s.
Denmark	-	0	0	0	-	0	0	0
Estonia	-	3	0	0	-	n.s.	0	0
Finland	1	2	4	2	n.s.	0	n.s.	n.s.
France	9	12	6	-	n.s.	1	n.s.	-
Georgia	-	-	-	-	-	-	-	-
Germany	46	32	44	43	-	-	0	0
Greece	-	-	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-
Hungary	-	2	2	4	-	n.s.	n.s.	n.s.
Iceland	-	-	-	-	-	-	-	-
Ireland	-	0	1	1	-	0	n.s.	n.s.
Italy	-	9	4	8	-	n.s.	n.s.	n.s.
Latvia	-	-	2	2	-	-	n.s.	n.s.
Liechtenstein	-	-	-	-	-	-	-	-
Lithuania	-	-	4	2	-	-	1	n.s.
Luxembourg	-	-	-	-	-	-	-	-
Malta	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-
Montenegro	-	-	-	-	-	-	-	-
Netherlands	-	-	-	0	-	-	-	0
Norway	9	2	n.s.	0	-	n.s.	n.s.	0
Poland	-	5	8	14	-	1	1	2
Portugal	-	-	-	-	-	-	-	-
MD	-	-	-	-	-	-	-	-
Romania	-	30	36	28	-	1	1	1
Russian Federation	-	-	321	-	-	-	n.s.	-
Serbia	-	-	-	-	-	-	-	-
Slovakia	-	6	5	2	-	n.s.	n.s.	n.s.
Slovenia	1	1	1	1	n.s.	n.s.	1	1
Spain	-	13	7	7	-	2	1	n.s.
Sweden	1	5	5	1	0	n.s.	n.s.	0
Switzerland	8	4	3	3	1	1	1	1
MK	-	-	-	-	-	-	-	-
Turkey	-	-	-	-	-	-	-	-
Ukraine	-	-	29	23	-	-	n.s.	n.s.
United Kingdom	10	4	3	0	1	n.s.	n.s.	0

Table A6.7: Occupational accidents, 1990-2010 (cont.)

Country	Forestry (ISIC/NACE 02) [million Euro/ECU]							
	Non-fatal occupational accidents							
	Number				Annual rate per 1000 workers			
	1990	2000	2005	2010	1990	2000	2005	2010
Albania	-	-	-	-	-	-	-	-
Andorra	-	-	-	-	-	-	-	-
Austria	4668	2015	1867	1966	-	112	107	186
Belarus	90	47	34	21	4	1	1	1
Belgium	-	112	62	50	-	160	69	39
BA	-	-	-	-	-	-	-	-
Bulgaria	-	-	-	-	-	-	-	-
Croatia	-	592	464	307	-	64	48	33
Cyprus	-	6	13	12	-	9	16	13
Czech Republic	-	1228	850	621	-	40	39	35
Denmark	-	45	41	47	-	11	10	13
Estonia	-	78	25	17	-	9	4	3
Finland	416	416	433	553	25	26	28	35
France	3624	3148	2094	1791	175	170	129	118
Georgia	-	-	-	-	-	-	-	-
Germany	13502	10847	10463	11183	-	-	65	66
Greece	-	-	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-
Hungary	-	174	146	116	-	10	10	8
Iceland	-	-	-	-	-	-	-	-
Ireland	-	22	14	8	-	8	6	3
Italy	-	3331	2320	2308	-	78	54	54
Latvia	-	-	45	20	-	-	1	1
Liechtenstein	-	-	-	-	-	-	-	-
Lithuania	-	-	29	25	-	-	15	13
Luxembourg	-	-	-	-	-	-	-	-
Malta	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-
Montenegro	-	-	-	-	-	-	-	-
Netherlands	-	-	-	-	-	-	-	-
Norway	68	42	23	27	-	8	6	6
Poland	-	436	398	478	-	35	57	67
Portugal	-	-	-	-	-	-	-	-
MD	-	-	-	-	-	-	-	-
Romania	-	185	80	71	-	4	2	2
Russian Federation	-	-	1249	-	-	-	1	-
Serbia	-	-	-	-	-	-	-	-
Slovakia	-	516	157	104	-	21	7	4
Slovenia	439	211	182	177	76	108	91	93
Spain	-	4401	3329	3077	-	496	284	133
Sweden	1196	185	171	89	41	11	8	6
Switzerland	1843	888	814	774	228	131	131	126
MK	-	-	-	-	-	-	-	-
Turkey	-	-	-	-	-	-	-	-
Ukraine	-	-	196	161	-	-	2	2
United Kingdom	242	177	111	106	14	11	7	6

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A6.8: Consumption of forest products, 1990-2010

Country	Consumption of forest products						
	m³ RWE per 1000 inhabitants				Annual rate of change [%]		
	1990*	2000*	2005*	2010*	1990-2000	2000-2005	2005-2010
Albania	276	135	203	192	-8.6	8.6	-1.7
Andorra	-	-	-	-	-	-	-
Austria	2266	2813	2946	2845	2.7	0.9	-1.0
Belarus	1028	654	840	835	-5.5	5.1	-0.2
Belgium	1713	1652	1678	1619	-0.5	0.3	-1.0
BA	405	462	674	693	1.6	7.9	0.8
Bulgaria	390	405	756	1003	0.5	13.3	8.4
Croatia	239	845	1062	1090	17.1	4.7	0.7
Cyprus	823	649	916	742	-2.9	7.2	-5.9
Czech Republic	884	992	1369	1475	1.4	6.7	2.2
Denmark	1995	2676	2657	3506	3.7	-0.1	8.2
Estonia	653	2549	3912	2866	18.6	8.9	-8.5
Finland	3159	4213	4434	4681	3.7	1.0	1.6
France	1715	1706	1662	1613	-0.1	-0.5	-0.8
Georgia	64	101	133	241	5.8	5.7	18.5
Germany	1401	1529	1721	1691	1.1	2.4	-0.5
Greece	636	760	846	784	2.3	2.2	-2.1
Holy See	-	-	-	-	-	-	-
Hungary	597	832	971	810	4.2	3.1	-5.1
Iceland	695	968	1179	942	4.2	4.0	-6.2
Ireland	853	1221	1220	762	4.6	0.0	-12.6
Italy	967	1271	1322	1147	3.5	0.8	-4.0
Latvia	974	1890	2363	1796	8.6	4.6	-7.5
Liechtenstein	1165	1056	1000	363	-1.2	-1.1	-25.1
Lithuania	116	943	1440	1579	30.0	8.8	2.7
Luxembourg	1802	1467	1665	2909	-2.5	2.6	17.3
Malta	383	492	523	449	3.2	1.2	-4.3
Monaco	-	-	-	-	-	-	-
Montenegro	431	393	411	1688	-1.1	0.9	49.7
Netherlands	1329	1441	1302	1252	1.0	-2.0	-1.1
Norway	1861	2001	2353	2228	0.9	3.3	-1.6
Poland	410	634	924	1064	5.6	7.8	4.1
Portugal	628	855	773	770	3.9	-2.0	-0.1
MD	20	120	208	325	25.1	11.6	13.6
Romania	510	430	557	697	-2.1	5.3	6.6
Russian Federation	1132	683	906	957	-6.1	5.8	1.6
Serbia	557	541	571	645	-0.4	1.1	3.6
Slovakia	626	878	1184	1567	4.3	6.2	8.3
Slovenia	1266	1556	1909	1233	2.6	4.2	-11.7
Spain	840	1150	1240	995	4.0	1.5	-6.1
Sweden	2405	2944	3173	3168	2.6	1.5	-0.1
Switzerland	1532	1552	1493	1521	0.2	-0.8	0.5
MK	198	517	611	723	12.7	3.4	4.9
Turkey	458	451	541	665	-0.2	3.7	6.1
Ukraine	259	228	388	456	-1.6	11.3	4.7
United Kingdom	1070	1209	1259	1072	1.5	0.8	-4.5

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

*Data of following years were used for the following reference years:
1990 - 1992
2000 - average of 1998-2002
2005 - average of 2003-2007
2010 - average of 2008-2009

Table A6.9: Exports of forest products (volume), 1990-2010

Country	Imports of forest products									
	1990*	2000*	2005*	2010*	Annual rate of change					
							2000-2005		2005-2010	
	Million m³ RWE				Million m³	%	Million m³	%	Million m³	%
Albania	0.0	0.1	0.3	0.3	0.0	30.2	0.0	17.4	0.0	0.0
Andorra	-	-	-	-	-	-	-	-	-	-
Austria	10.9	17.4	20.1	19.4	0.8	6.0	0.5	2.9	-0.2	-1.0
Belarus	0.0	1.1	1.3	1.3	0.1	93.9	0.0	2.2	0.0	0.0
Belgium	23.9	24.9	27.7	27.7	0.1	0.5	0.6	2.2	0.0	0.0
BA	0.0	0.1	0.5	0.5	0.0	5.8	0.1	52.8	0.0	1.0
Bulgaria	0.2	0.7	1.8	2.4	0.1	14.7	0.2	21.4	0.2	9.0
Croatia	0.3	1.6	2.1	2.0	0.2	23.1	0.1	5.6	0.0	-0.6
Cyprus	0.5	0.5	0.8	0.6	0.0	-1.2	0.1	9.1	0.0	-5.5
Czech Republic	1.7	4.8	7.5	9.0	0.4	14.1	0.6	9.5	0.4	5.3
Denmark	8.6	13.2	13.8	17.8	0.6	5.5	0.1	0.9	1.1	7.4
Estonia	0.0	1.3	3.4	2.1	0.2	100.0	0.4	20.4	-0.4	-12.5
Finland	7.7	13.4	18.2	13.9	0.7	7.3	0.9	6.2	-1.2	-7.4
France	31.2	40.3	43.7	41.8	1.1	3.3	0.7	1.6	-0.6	-1.3
Georgia	0.0	0.0	0.1	0.3	0.0	0.0	0.0	49.8	0.0	30.6
Germany	59.0	68.4	77.6	81.8	1.2	1.9	1.8	2.6	1.2	1.5
Greece	3.4	5.0	6.0	6.0	0.2	4.9	0.2	3.7	0.0	0.3
Holy See	-	-	-	-	-	-	-	-	-	-
Hungary	3.0	5.0	6.2	5.0	0.2	6.3	0.3	4.7	-0.4	-6.3
Iceland	0.2	0.3	0.4	0.3	0.0	2.7	0.0	4.8	0.0	-4.0
Ireland	2.5	3.5	4.0	3.0	0.1	4.4	0.1	2.5	-0.3	-8.0
Italy	39.4	50.1	54.2	48.4	1.3	3.1	0.8	1.6	-1.6	-3.2
Latvia	0.0	0.7	2.8	1.3	0.1	64.2	0.4	30.4	-0.4	-19.3
Liechtenstein	0.0	-	-	-	-	-	-	-	-	-
Lithuania	0.0	1.1	2.4	2.1	0.1	102.4	0.3	17.2	-0.1	-3.7
Luxembourg	1.0	1.2	1.6	1.7	0.0	2.4	0.1	5.8	0.0	0.8
Malta	0.2	0.2	0.2	0.2	0.0	2.5	0.0	1.6	0.0	-3.3
Monaco	-	-	-	-	-	-	-	-	-	-
Montenegro	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	28.7
Netherlands	21.2	25.9	25.9	23.5	0.6	2.5	0.0	0.0	-0.7	-2.7
Norway	3.7	7.3	7.2	5.6	0.5	9.0	0.0	-0.3	-0.5	-7.0
Poland	0.8	7.9	14.8	17.9	0.9	34.0	1.4	13.4	0.9	5.6
Portugal	2.6	4.9	4.7	5.2	0.3	8.2	0.0	-1.0	0.2	3.3
MD	0.1	0.4	0.4	0.5	0.0	14.5	0.0	2.3	0.0	6.8
Romania	0.4	1.0	2.7	4.1	0.1	14.2	0.3	20.6	0.4	13.1
Russian Federation	0.4	2.8	6.8	7.0	0.3	28.9	0.8	19.5	0.1	0.8
Serbia	2.6	2.6	2.7	2.9	0.0	0.0	0.0	1.2	0.1	2.2
Slovakia	0.1	2.6	2.9	3.9	0.3	43.7	0.1	1.9	0.3	8.7
Slovenia	1.3	2.2	3.3	4.0	0.1	7.2	0.2	8.4	0.2	5.3
Spain	16.0	27.6	31.5	25.7	1.5	7.1	0.8	2.7	-1.7	-5.6
Sweden	7.5	15.3	15.5	13.0	1.0	9.3	0.0	0.2	-0.7	-4.9
Switzerland	6.6	7.6	7.9	7.2	0.1	1.7	0.1	0.8	-0.2	-2.4
MK	0.1	0.4	0.5	0.8	0.0	15.1	0.0	5.1	0.1	12.8
Turkey	2.2	6.5	12.3	13.7	0.5	14.6	1.1	13.4	0.4	3.3
Ukraine	0.0	2.0	4.0	4.7	0.2	77.2	0.4	14.7	0.2	5.0
United Kingdom	48.4	51.3	55.4	46.1	0.4	0.7	0.8	1.5	-2.6	-5.1

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

*Data of following years were used for the following reference years:
1990 - 1992
2000 - average of 1998-2002
2005 - average of 2003-2007
2010 - average of 2008-2009

Table A6.10: Imports of forest products (volume), 1990-2010

Country	Imports of forest products									
	1990*	2000*	2005*	2010*	Annual rate of change					
					1990-2000		2000-2005		2005-2010	
	Million m³ RWE				Million m³	%	Million m³	%	Million m³	%
Albania	0,0	0,1	0,3	0,3	0,0	30,2	0,0	17,4	0,0	0,0
Andorra	-	-	-	-	-	-	-	-	-	-
Austria	10,9	17,4	20,1	19,4	0,8	6,0	0,5	2,9	-0,2	-1,0
Belarus	0,0	1,1	1,3	1,3	0,1	93,9	0,0	2,2	0,0	0,0
Belgium	23,9	24,9	27,7	27,7	0,1	0,5	0,6	2,2	0,0	0,0
BA	0,0	0,1	0,5	0,5	0,0	5,8	0,1	52,8	0,0	1,0
Bulgaria	0,2	0,7	1,8	2,4	0,1	14,7	0,2	21,4	0,2	9,0
Croatia	0,3	1,6	2,1	2,0	0,2	23,1	0,1	5,6	0,0	-0,6
Cyprus	0,5	0,5	0,8	0,6	0,0	-1,2	0,1	9,1	0,0	-5,5
Czech Republic	1,7	4,8	7,5	9,0	0,4	14,1	0,6	9,5	0,4	5,3
Denmark	8,6	13,2	13,8	17,8	0,6	5,5	0,1	0,9	1,1	7,4
Estonia	0,0	1,3	3,4	2,1	0,2	100,0	0,4	20,4	-0,4	-12,5
Finland	7,7	13,4	18,2	13,9	0,7	7,3	0,9	6,2	-1,2	-7,4
France	31,2	40,3	43,7	41,8	1,1	3,3	0,7	1,6	-0,6	-1,3
Georgia	0,0	0,0	0,1	0,3	0,0	0,0	0,0	49,8	0,0	30,6
Germany	59,0	68,4	77,6	81,8	1,2	1,9	1,8	2,6	1,2	1,5
Greece	3,4	5,0	6,0	6,0	0,2	4,9	0,2	3,7	0,0	0,3
Holy See	-	-	-	-	-	-	-	-	-	-
Hungary	3,0	5,0	6,2	5,0	0,2	6,3	0,3	4,7	-0,4	-6,3
Iceland	0,2	0,3	0,4	0,3	0,0	2,7	0,0	4,8	0,0	-4,0
Ireland	2,5	3,5	4,0	3,0	0,1	4,4	0,1	2,5	-0,3	-8,0
Italy	39,4	50,1	54,2	48,4	1,3	3,1	0,8	1,6	-1,6	-3,2
Latvia	0,0	0,7	2,8	1,3	0,1	64,2	0,4	30,4	-0,4	-19,3
Liechtenstein	0,0	-	-	-	-	-	-	-	-	-
Lithuania	0,0	1,1	2,4	2,1	0,1	102,4	0,3	17,2	-0,1	-3,7
Luxembourg	1,0	1,2	1,6	1,7	0,0	2,4	0,1	5,8	0,0	0,8
Malta	0,2	0,2	0,2	0,2	0,0	2,5	0,0	1,6	0,0	-3,3
Monaco	-	-	-	-	-	-	-	-	-	-
Montenegro	0,0	0,0	0,0	0,1	0,0	0,0	0,0	0,0	0,0	28,7
Netherlands	21,2	25,9	25,9	23,5	0,6	2,5	0,0	0,0	-0,7	-2,7
Norway	3,7	7,3	7,2	5,6	0,5	9,0	0,0	-0,3	-0,5	-7,0
Poland	0,8	7,9	14,8	17,9	0,9	34,0	1,4	13,4	0,9	5,6
Portugal	2,6	4,9	4,7	5,2	0,3	8,2	0,0	-1,0	0,2	3,3
MD	0,1	0,4	0,4	0,5	0,0	14,5	0,0	2,3	0,0	6,8
Romania	0,4	1,0	2,7	4,1	0,1	14,2	0,3	20,6	0,4	13,1
Russian Federation	0,4	2,8	6,8	7,0	0,3	28,9	0,8	19,5	0,1	0,8
Serbia	2,6	2,6	2,7	2,9	0,0	0,0	0,0	1,2	0,1	2,2
Slovakia	0,1	2,6	2,9	3,9	0,3	43,7	0,1	1,9	0,3	8,7
Slovenia	1,3	2,2	3,3	4,0	0,1	7,2	0,2	8,4	0,2	5,3
Spain	16,0	27,6	31,5	25,7	1,5	7,1	0,8	2,7	-1,7	-5,6
Sweden	7,5	15,3	15,5	13,0	1,0	9,3	0,0	0,2	-0,7	-4,9
Switzerland	6,6	7,6	7,9	7,2	0,1	1,7	0,1	0,8	-0,2	-2,4
MK	0,1	0,4	0,5	0,8	0,0	15,1	0,0	5,1	0,1	12,8
Turkey	2,2	6,5	12,3	13,7	0,5	14,6	1,1	13,4	0,4	3,3
Ukraine	0,0	2,0	4,0	4,7	0,2	77,2	0,4	14,7	0,2	5,0
United Kingdom	48,4	51,3	55,4	46,1	0,4	0,7	0,8	1,5	-2,6	-5,1

Source: UNECE/FAO Geneva based on national reporting in the Joint Forest Sector Questionnaire (JFSQ)

*Data of following years were used for the following reference years:
1990 - 1992
2000 - average of 1998-2002
2005 - average of 2003-2007
2010 - average of 2008-2009

Table A6.11: Total energy production from wood, 2007 (million metric tonnes dry matter/yr)

Country	Total energy production from wood	Energy from direct wood fibre sources: Total	Forests & other wooded land	Other land	Energy from co-products and residues of the wood processing industries: Total	Solid residues	Liquid residues from pulp and paper industry	Energy from processed wood-based fuels	Energy from post consumer recovered wood
	million metric tonnes dry matter/yr								
Albania	-	-	-	-	-	-	-	-	-
Andorra	-	-	-	-	-	-	-	-	-
Austria	9.2	3.1	3.1	0.1	5.6	4.4	1.2	0.4	0.0
Belarus	-	-	-	-	-	-	-	-	-
Belgium	-	-	-	-	-	-	-	-	-
BA	-	-	-	-	-	-	-	-	-
Bulgaria	1.2	-	-	-	-	-	-	-	-
Croatia	-	-	-	-	1.8	1.7	0.0	0.1	0.0
Cyprus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Czech Republic	3.7	2.3	2.3	-	1.3	0.7	0.6	0.1	-
Denmark	-	-	-	-	-	-	-	-	-
Estonia	1.4	0.7	0.7	-	0.7	0.7	-	0.0	0.0
Finland	-	-	-	-	-	-	-	-	-
France	20.6	15.1	10.8	4.4	4.1	2.5	1.6	0.3	1.0
Georgia	-	-	-	-	-	-	-	-	-
Germany	22.6	10.4	8.6	1.9	2.4	0.5	2.0	1.4	8.4
Greece	-	-	-	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-	-
Hungary	-	-	2.0	-	-	-	-	-	-
Iceland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ireland	0.2	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1
Italy	14.8	-	10.3	-	-	4.0	-	0.6	-
Latvia	4.5	2.3	2.2	0.0	1.7	1.7	0.0	0.5	0.0
Liechtenstein	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lithuania	1.6	0.6	0.6	0.0	0.9	0.9	0.0	0.1	0.0
Luxembourg	-	0.1	-	-	0.0	-	-	-	-
Malta	-	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-	-
Montenegro	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	-
Netherlands	1.4	0.2	0.1	0.2	0.3	0.3	0.0	0.7	0.1
Norway	2.3	1.0	-	-	1.0	0.5	0.4	0.0	0.3
Poland	7.1	1.6	-	-	-	-	-	-	-
Portugal	10.5	4.8	-	-	5.7	3.0	2.7	-	-
MD	-	-	-	-	-	-	-	-	-
Romania	3.3	1.7	1.3	0.3	1.2	1.2	0.0	0.2	0.3
Russian Federation	18.0	13.8	0.0	0.0	4.2	0.0	4.2	0.0	0.0
Serbia	0.7	0.6	0.5	0.0	0.1	0.1	0.0	0.0	0.0
Slovakia	1.2	0.4	0.3	0.0	0.7	0.4	0.3	0.0	0.1
Slovenia	0.8	0.6	0.4	0.2	0.2	0.2	0.0	0.0	0.0
Spain	-	-	-	-	-	-	-	-	-
Sweden	17.4	4.1	-	-	11.5	4.6	6.9	1.4	0.3
Switzerland	2.6	1.6	0.0	0.0	0.4	0.4	0.0	0.1	0.4
MK	-	-	-	-	-	-	-	-	-
Turkey	7.3	3.1	2.4	-	-	-	-	-	-
Ukraine	-	-	-	-	-	-	-	-	-
United Kingdom	1.0	0.2	0.2	0.0	0.2	0.2	0.0	0.5	0.1

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A6.12: Accessibility for recreation and intensity of use, 2005

Country	Total forest and other wooded land				
	Area with access available to the public for recreational purposes		Area with recreational use as one main management goal		Intensity of use
	Total (1000 ha)	% of total	Total (1000 ha)	% of total	Annual number of visits (million)
Albania	1026	99	0	0	-
Andorra	-	-	-	-	-
Austria	3714	93	44	1	-
Belarus	8167	97	1333	16	-
Belgium	678	98	-	-	-
BA	2914	100	-	-	-
Bulgaria	3470	94	509	14	-
Croatia	2363	99	4	n.s.	2
Cyprus	157	41	16	4	1
Czech Republic	2518	95	21	4	216
Denmark	589	99	-	-	75
Estonia	2218	94	23	1	1
Finland	23209	100	752	3	-
France	13724	79	66	2	500
Georgia	-	-	-	-	-
Germany	10586	95	215	2	1500
Greece	-	-	-	-	-
Holy See	-	-	-	-	-
Hungary	1945	100	48	2	-
Iceland	111	100	39	n.s.	-
Ireland	548	79	27	5	18
Italy	8545	82	-	-	-
Latvia	3132	95	335	10	-
Liechtenstein	7	100	1	8	-
Lithuania	2168	99	66	3	135
Luxembourg	88	99	-	-	-
Malta	n.s.	100	-	-	-
Monaco	-	-	-	-	-
Montenegro	744	100	-	-	-
Netherlands	301	1	-	-	270
Norway	12384	100	-	-	140
Poland	7672	83	773	10	-
Portugal	-	-	-	-	-
MD	-	-	-	-	-
Romania	-	-	365	5	-
Russian Federation	867082	98	16022	2	1
Serbia	2997	100	5	n.s.	-
Slovakia	1819	94	39	2	-
Slovenia	1250	99	44	4	-
Spain	-	-	-	-	-
Sweden	30737	100	48	n.s.	-
Switzerland	1284	100	127	10	540
MK	-	-	-	-	-
Turkey	-	-	-	-	-
Ukraine	-	-	-	-	3
United Kingdom	2083	73	105	4	350

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Table A6.13: Sites with recognized cultural & spiritual values in forest and other wooded land, 2005

Country	Sites [number]				
	Cultural heirtage		Forested landscapes	Trees	Other sites
	Total	of which: associated with historic forest management			
Albania	1	-	455	348	-
Andorra	-	-	-	-	-
Austria	-	-	-	-	-
Belarus	144	142	96	46	2
Belgium	-	-	-	519	-
BA	-	-	-	-	-
Bulgaria	-	-	19	2	-
Croatia	-	81	-	71	18
Cyprus	34	-	45	41	-
Czech Republic	-	-	-	-	-
Denmark	14010	-	-	-	-
Estonia	5376	1021	-	119	4236
Finland	-	-	155	-	-
France	335	-	270	2000	113
Georgia	-	-	-	-	-
Germany	100000	1000	500	1000	97500
Greece	-	-	-	-	-
Holy See	-	-	-	-	-
Hungary	5200	-	371	-	-
Iceland	28	-	6	-	-
Ireland	4482	50	500	-	-
Italy	-	-	30	1255	-
Latvia	2230	-	78	3513	-
Liechtenstein	-	-	-	-	-
Lithuania	504	-	48	145	69
Luxembourg	-	-	-	-	-
Malta	-	-	-	-	-
Monaco	-	-	-	-	-
Montenegro	10	-	5	-	-
Netherlands	2846	-	-	-	-
Norway	-	-	-	-	-
Poland	-	-	188	33026	-
Portugal	24	6	1	84	-
MD	-	-	-	-	-
Romania	-	-	-	-	-
Russian Federation	145	107	107	1584	0
Serbia	66	-	-	-	-
Slovakia	-	-	26	102	154
Slovenia	8321	69	76	939	-
Spain	-	-	54	61	-
Sweden	600000	62500	400	150000	-
Switzerland	-	-	-	-	-
MK	-	-	-	-	-
Turkey	-	-	7	93	-
Ukraine	-	-	-	-	-
United Kingdom	4452	52	104	42979	95

Source: FOREST EUROPE/UNECE/FAO enquiry on Pan-European Quantitative Indicators

Notes

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Office for the Environment FOEN

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