COST - the acronym for European **CO**operation in the field of **S**cientific and **T**echnical Research - is the oldest and widest European intergovernmental network for cooperation in research. Established by the Ministerial Conference in November 1971, COST is presently used by the scientific communities of 35 European countries to cooperate in common research projects supported by national funds.

The funds provided by COST - less than 1% of the total value of the projects - support the COST cooperation networks (COST Actions) through which, with only around 20 million per year, more than 30.000 European scientists are involved in research having a total value which exceeds 2 billion per year. This is the financial worth of the European added value which COST achieves.

A "bottom up approach" (the initiative of launching a COST Action comes from the European scientists themselves), "à la carte participation" (only countries interested in the Action participate), "equality of access" (participation is open also to the scientific communities of countries not belonging to the European Union) and "flexible structure" (easy implementation and light management of the research initiatives) are the main characteristics of COST.

As precursor of advanced multidisciplinary research COST has a very important role for the realisation of the European Research Area (ERA) anticipating and complementing the activities of the Framework Programmes, constituting a "bridge" towards the scientific communities of emerging countries, increasing the mobility of researchers across Europe and fostering the establishment of "Networks of Excellence" in many key scientific domains such as: Biomedicine and Molecular Biosciences; Food and Agriculture; Forests, their Products and Services; Materials, Physics and Nanosciences; Chemistry and Molecular Sciences and Technologies; Earth System Science and Environmental Management; Information and Communication Technologies; Transport and Urban Development; Individuals, Society, Culture and Health. It covers basic and more applied research and also addresses issues of pre-normative nature or of societal importance.

COST
Action E27

Protected Forest Areas in Europe - Analysis and Harmonisation (PROFOR): Results, Conclusions and Recommendations

Editors

G. FRANK, J. PARVIAINEN, K. VANDEKERHOVE, J. LATHAM, A. SCHUCK, D. LITTLE

Vienna 2007

European Cooperation in the Field of Scientific and Technical Research

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Preface

COST Action E27 "Protected Forest Areas in Europe – Analysis and Harmonisation (PROFOR)" was launched in 2002 to provide a better understanding of the types and categories of protected forest areas throughout Europe. The main purpose of the Action was to contribute to the process of harmonising a wide range of protected forest area categories used in European countries within the context of existing international systems of protected areas.

About 100 experts, representing 25 European countries, have been contributing to the Action. A number of international organisations had official observer status or have been in direct co-operation with our team. The COST E27 Team consisted both of scientists from universities and research institutions and of specialists in charge of the selection, management and monitoring of various categories of protected forest areas. Specialists from forest inventories and administrative bodies completed the group.

With this report, the COST Action E27 Team would like to present the main results to individuals, organisations and interest groups which are either in charge of the selection and management of individual protected forest area sites, the development of national or regional networks, or the assessment of the state of protected forest areas in Europe. We would like to approach readers including both scientists and practitioners in the field of conservation of biodiversity of forests, biologists, foresters, environmental consultants, representatives of NGOs, policy makers and land owners. But we are also writing to elected officials and their staff, and to everyone else who might be interested in the current status of protected forest areas in Europe and their further development.

I express my special thanks to the Working Group Leaders James Latham, Kris Vandekerkhove and Andreas Schuck, who ensured continuous progress in their groups. Many members have contributed directly to the Action by organising meetings in a way which have guaranteed highly productive working conditions. When discussing protected forest areas of Europe, one should be aware of the very different site conditions, influences on forests and specific problems of various protection regimes in European biogeographic regions. I can say that each meeting of the Action was combined with a field excursion, where the participants learned about the huge diversity of forests and protected areas across Europe. I want to particularly thank all individual hosts and organisations for their contributions to the implementation of the idea to make our products and recommendations more practicable for the end-users.

In addition to the many people involved in the process of writing, editing, and producing this report I owe special thanks to the Action's Scientific Secretary, Günter Siegel, and his colleagues for providing the financial and administrative support, but also to Harald Mauser, Head of BFW, for publishing this volume in the publication series of the Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape. Many thanks go also to the Vice-Chairman Jari Parviainen for his consistant support and his wise advice and to the native speakers Declan Little, James Latham and their colleagues for stylistic improvement of the text. Last, but by no means least, I want to thank particularly my colleagues Petra Locsmandy and Johanna Kohl for laying out the text and producing this volume.

I personally hope that the work of COST Action E27 will improve the assessment of and reporting on protected forest areas but that this issue finds its way back to forest practice, and especially to those people who are directly involved in the process of protecting forest areas.

Dr Georg Frank

Chairman of COST Action E27 (PROFOR)

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Executive Summary

In order to get a reliable and comparable picture of the protection status of forests in European countries, common standards and harmonisation of protection categories with respect to one another are needed. The existing diversity of protected forest areas (PFA) in the different countries also has historical and socio-economic roots which must be understood and respected.

The COST Action E27 "Protected forest areas – analysis and harmonisation" (PROFOR, http://bfw.ac.at/020/profor/) has aimed to provide a better understanding of national and international distinctions of protected forest areas and tries to explain the reasons for this diversity. The main task of the action was to analyse and harmonise the whole range of PFA categories in Europe in compliance with existing international categories for protected areas (COST 2001). It is estimated that the total number of all designated areas in Europe amounts to approximately 65 000 to 70 000 sites.

Some 100 researchers and experts from 25 European countries participated in the Action. Major emphasis was placed on the cooperation between scientists and managers from both nature conservation and forest administration. Besides the 25 European signatory countries, the international organisations MCPFE and EEA had an official observer status and were fully involved in the work process with open access to all documents and data. COST E27 PROFOR also co-operated directly with the organisations IUCN, PEBLDS and UN-ECE.

Analysis of protected forest areas across Europe

A basic element for the analyses were the Country Reports (Latham et al., 2005)[1], which were written with a consistent content and structure to assist comparisons of information between countries.

There is a great variation in typology, restrictions on use and motivation for designation between PFA type and countries, and a superficial analysis of the data records may be misleading. An attempt was made to identify characteristics, similarities and differences between categories of protected forest areas and countries with respect to restrictions and motivation for designation by means of multivariate statistical methods.

The analyses shows a clear separation between restrictions which pertain to timber resources and silvicultural management and those relating to non-timber production and public access. These differences are in parallel with the differentiation between North and South: in Northern Europe with a high share of forested areas and relatively low population density the restrictions affect the harvesting of timber resources and the forest infrastructure. In the Mediterranean and Atlantic countries with high population density and low forest cover this applies to access restrictions and non-forest products (such as mushrooms and berries).

Data collected show that there are very seldom quantitative conservation targets and that design criteria are often not adequately defined, at least in the perspective of species and habitat conservation. On the other hand due to the ownership structure in Western and Northern European countries the forests and the forest unit distribution are very heterogeneous and scattered, and therefore influence that protected forest area networks are not possible to set according to the optimal biological/ ecological criteria. In conclusion, guidelines and criteria for PFA designation deserve to improved and sharpened in many European countries.

A direct monetary valuation of protected forest areas was not directly a target of COST Action E27, but the material allowed some assessment of direct and indirect benefits, restrictions and compensations differentiated according to the individual stakeholders (forest owners, visitors, hunters, fishermen, scientists, beneficial owners, communities). Taking into account the expected regional differences it could be shown that the actual beneficiaries of protected forest areas are local although not the forest owners themselves, whereas less strictly protected areas benefit a larger number of people.

Classification of protected forest areas in Europe

In Europe, two international classification systems are used for reporting on protected forests:

[1] Latham, J., Frank, G., Fahy, O., Kirby, K., Miller, H., Stiven, R., (Editors) 2005: COST Action E27, Protected Forest Areas in Europe – Analysis and Harmonisation (PROFOR): Reports of Signatory States. Federal Research and Training Centre for Forests, Natural Hazards and Landscape (BFW), Vienna, Austria. 413p.

1. IUCN developed in 1994 a set of Protected Area Management Categories for world wide use. It contains six protection categories. The Temperate and Boreal Forest Resources Assessment (TBFRA) in Europe has used the IUCN Management Category System for the reporting of protected forests areas in TBFRA 2000 and 2005.

2. MCPFE produced figures on protected forest area in its "State of Europe's forests 2003". For this purpose the MCPFE Assessment Guidelines for Protected and Protective Forest and Other Wooded Land were developed during 1999 – 2003 and endorsed by national governments during the MCPFE Conference in Vienna in 2003 (Annex 2 to the Vienna Resolution 4). As far as is possible these MCPFE classes were aligned with the respective Protected Area Management Categories of IUCN.

IUCN categories approach a global view, and have been applied to the description of vast untouched, continuous and state owned forest areas. IUCN categories include all types of ecosystems, and have not been especially well suited to classifying forest protection, while forests are often only a part of larger protection areas.

Because of the long historical use of forests which has led to altered forest ecosystems, forest fragmentation into the small, isolated areas inside other land use classes and heterogeneous forest ownership structure, the European concept of forest protection has become more complex and varied than in other continents. MCPFE classification is thus adjusted especially for European conditions.

Both the IUCN system of Management Categories and the MCPFE Assessment Guidelines are considered in the context of classification of protection management intentions. They do not evaluate the actual quality and conservation value of sites. Hence, a particular class may include a wide range of forest types, with different degrees of naturalness (i.e. from pristine virgin forests to plantations) and varying biodiversity quality.

Harmonisation and improvement of classification systems

Both classification systems IUCN and MCPFE were evaluated by the country experts of the COST Action E27 with means of comparing the statistics, and through the input from the country experts, gathered by means of questionnaires, country reports and plenary discussions. Results showed considerable variation. Even on quite strictly defined protection categories, reported figures are even sometimes of a different order of magnitude. There exists considerable confusion and, to date, no harmonised and comparable dataset on PFA in Europe was available.

Also the definition of forest varies quite considerably across Europe. It makes a clear difference for the assessment of protected forest areas if the national forest definition or the internationally agreed definition is applied. For international use of protected forest area statistics it is strongly recommended to use the relevant international definition of forest.

Based on the results of the evaluation, and on subsequent discussions within COST Action E27, a number of recommendations to improve the quality and comparability of the statistics that are produced have been compiled. The COST Action E27 has produced an extensive document pointing out sources of uncertainty in the existent reporting systems, and formulating concrete suggestions or clarifications that should help reduce the divergence in interpretation, thus leading to more harmonised and comparable datasets. On the basis of the recommendations of COST Action E 27 the Liaison Unit of MCPFE has developed an Information Note of MCPFE Assessment Guidelines for the use of TBFRA country correspondents for their data collection for the fifth MCPFE Conference in Warsaw 2007.

The COST Action E27 clearing house mechanism can be found on the Internet at http://www.efi.fi/projects/coste27/. Reports and other documents are available on http://bfw.ac.at/020/profor/.

COST Action E27

Protected Forest Areas in Europe - Analysis and Harmonisation (PROFOR)
Results, Conclusions and Recommendations

Introduction

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The specific attributes of European forests often reduces the possibilities for establishing protected forest areas, or forces specific approaches for selection, establishment and management of protected forest areas. Due to the continuous use of forests historically, large original forests can be found only in the boreal zone on the European side of the Russian Foundation (Parviainen et al., 2000, European Commission, 2000). The largest natural forests strictly protected in reserves are in Finland, Sweden and the remote areas of Central and Eastern Europe. Fragmented relics of native forests still persist in mountainous areas of the Balkan, Alpine and Carpathian Region (Diaci, 1999, Mayer et al., 1987, Diaci & Frank, 2001, Korpel, 1995). Because of the intensive

historical use of forests and the specific small scale of the ownership structure, the European concept of forest protection has become a more complex and varied one than in other countries with huge areas of untouched forests (Parviainen & Frank, 2003). A specific characteristic of forest protection in Europe is the necessity to include forest areas where use has been, or still is, limited to some degree and management linked with the aims of multiple use.

The first systematic analysis of strictly protected forest areas in Europe was in the COST Action E4 Forest Reserves Research Network, carried out in 1996-1999 (Parviainen et al., 2000, European Commission, 2000). One of the main results of COST Action E4 with respect to strict forest reserves,
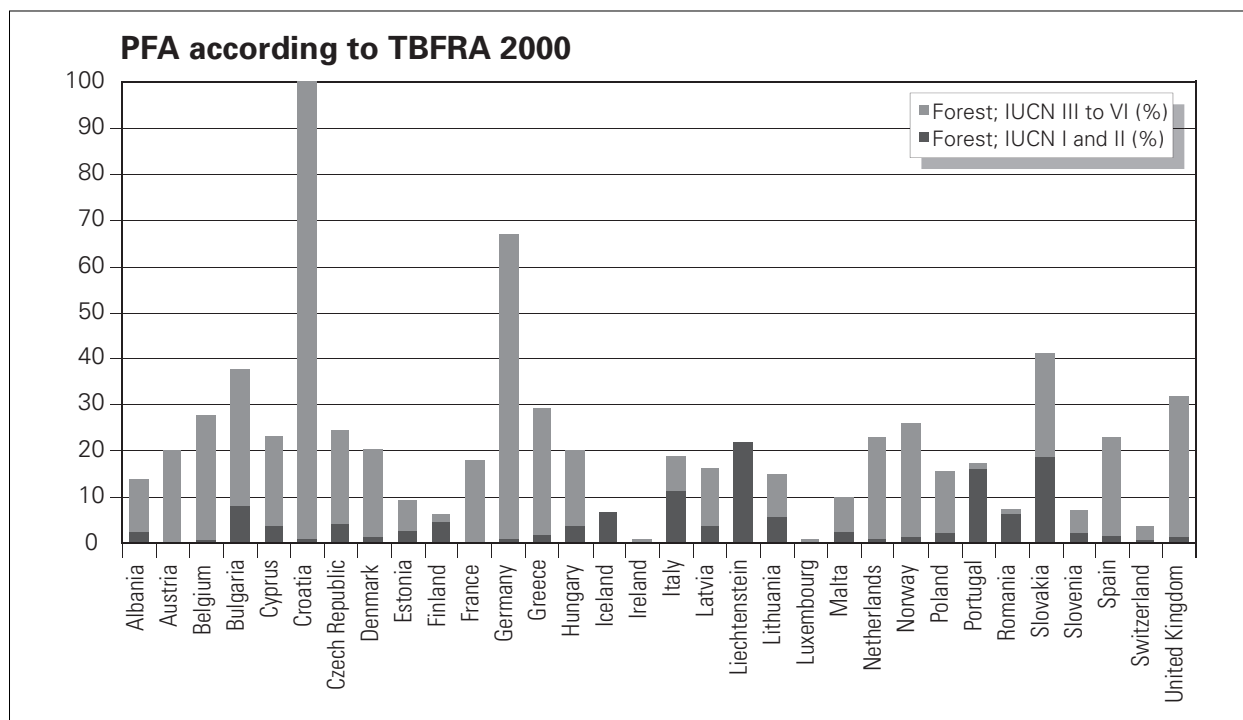

Figure 1:
Reported figures for protected forest area (relative to the total forest area), as reported in the Temperate and Boreal Forest Resource Assessment (UN-ECE/FAO) 2000.

was that the ideal non-intervention concept of developing appreciable areas of real untouched forests is not a realistic scenario for Europe.

Data on protected forest areas have been collected internationally in connection with other forest inventory data through Temperate and Boreal Forest Resource Assessment of UN-ECE/FAO (TBFRA, 2000, United Nations, 2000), using the "Protected Area Management Categories" of IUCN (1994). The IUCN classification system has been developed for worldwide use and includes 6 protection categories. It was intended to improve communication and understanding amongst experts and to provide international standards to help governments raise the quality of protected area management and international data collection. The IUCN classification system works ideally for the assessment of large, continuous forest areas, but is not so easily applied to the forests of Europe.

The European Environment Agency (EEA) and its European Topic Centre on Nature Conservation (ETC/NC) in Paris, the Council of Europe and the World Conservation Monitoring Centre (WCMC) started in 1995 to co-ordinate their activities related to a data basis on designated areas. The "Common Database on Designated Areas" (CDDA) includes the information from nationally designated areas, EU designations and international designations. The aim is to produce an overall database on all protection categories and a complete database of all protected sites in Europe. It collects all designation types by national names, numbers and surface area, and contains information on over 50 000 designated areas from 48 countries, covering more than 800 various national designation types. These numbers show that the comparison of protected forests is extremely difficult because of the numerous categories and definitions. CDDA, however, does not make any analysis of the harmonisation of national designations; it is neither designated nor used for reporting purposes.

The Ministerial Conference on the Protection of Forests in Europe (MCPFE) is a high-level process for forest policy dialogue and co-operation, that covers forest biodiversity issues. MCPFE developed the first set of Pan-European Indicators for Sustainable Forest Management within the so-called Helsinki-process (1993-1995). One of the indicators for the criterion "C4: Maintenance, conservation and appropriate enhancement of biological diversity in forest ecosystems" is "Area of forest and other wooded land protected to conserve biodiversity, landscape and specific natural elements, according to the MCPFE Assessment guidelines". This means that countries are requested to monitor, assess and report the Protected Forest Areas (PFA) that exist in the country (both in absolute and relative figures) (MCPFE, 2003a, b). MCPFE also collaborates with the ministerial process "Environment for Europe" and the Pan-European Biological and Landscape Diversity Strategy (PEBLDS).

Table 1:
MCPFE classes of protected and protective forest and other wooded land respective protected area management categories of IUCN and designation types used by EEA in its data base on designated areas (CDDA)

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

The MCPFE classes are congruent both to the Protected Area Management Categories of IUCN – The World Conservation Union and the Common Database on Designated Areas (CDDA) managed by the EEA.

The initiatives have produced very varied results on the state and numbers of types of forest protection in Europe. The reasons for the difficulties in comparison include the different definitions of forest, variation in the protection categories and in the activities permitted in protected areas, differences in the naturalness and continuity of forests, and differences in the protection objectives (Parviainen & Frank, 2003). A clarification of the state of forest protection in different countries is needed in order to achieve a harmonised discussion.

Both the IUCN and the MCPFE classification systems are unlikely to be altered - they are internationally accepted and endorsed. Clarifications and guidelines on the criteria to be used are, however, needed to prevent further differences in interpretation. COST E27 Working Group 2 gives some recommendations for interpretations to allow more harmonised assessments and reporting of PFA, and in order to avoid these interpretation-based differences. However, a harmonisation phase, bringing together the focal points responsible for national
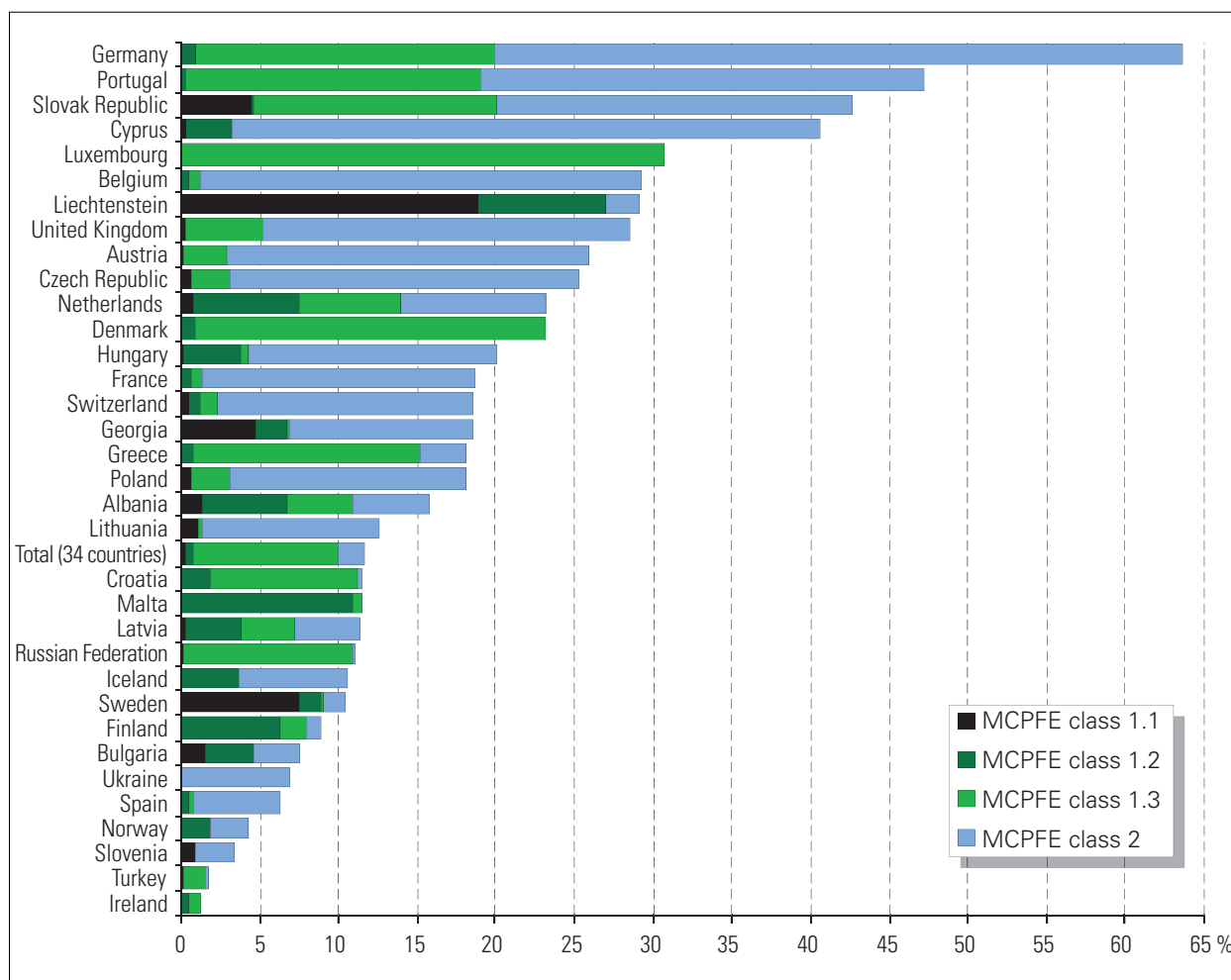
Figure 2:
Share of protected forest and other wooded land in 34 European countries. Source: MCPFE (2000 and 2002).
(Figure taken from MCPFE, 2003 b)
Note: Ukraine was provided data only on MCPFE class 2; information on MCPFE classes 1.1 to 1.3 is not available. In Germany and Portugal all Natura 2000 areas are under class 1.3

reporting, still will be necessary, as it is impossible to clear out all imaginable differences in interpretation.

To analyse the large number of PFA categories and classification systems at both the national and international level, the EU-COST action E27 "Protected Forest Areas - Analysis and Harmonisation" was launched in 2002 with a term of 4 years. The main objective of the action is to describe, analyse and harmonise the wide-range of PFA categories used in European countries within the context of existing international systems of protected forest areas. The scientific programme covers PFA definitions, national classifications and their historical and legal background, analysis of options for the integration of data collected in national forest inventory programmes, and harmonisation of definitions and identification of problem areas when using international classification systems and reporting to international organisations.

What is COST?

COST is an intergovernmental framework for European Co-operation in the field of Scientific and Technical Research, allowing the co-ordination of nationally funded research on a European level. COST is based on actions. These are networks of co-ordinated national research projects The Actions are defined by a Memorandum of Understanding (MoU, COST, 2001) signed by the Governments of the COST states wishing to participate in the Action. COST Actions cover basic and pre-competitive research as well as activities of public utility. COST has a geographical scope beyond the EU; most of the Central and Eastern European countries are members. COST also welcomes the participation of interested institutions from non-COST member states without any

geographical restriction. More information can be found at the COST-website: www.cordis.lu/cost

COST Action E27 objectives

The main aim of the action is to harmonise the wide-range of Protected Forest Area categories used in European countries within the context of existing international systems of protected areas.
The objectives of the action are:
· To enhance the quality and clarity of information on PFAs at both the national and the European level, to allow comparison of data and information on PFAs and serve as a basis for international data collection.
· To compile information on the historical back-ground and restrictions applied to different national PFA classifications. To collect all relevant definitions of all categories of PFAs including forests with protective functions.
· To make the reporting of national PFA informa-tion from national sources to international organi-sations transparent and comparable, such that this information can be used in the assessment of forest resources.
· To attempt a tentative description and quantifica-tion of the total economic value of PFAs.
· To seek the best options for the harmonisation of national data and definitions on PFAs within the context of international data collection processes.

The COST Action E27 structure

Member countries of COST Action E27 are Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Lithuania, Former Yugoslavian Repu-blic of Macedonia, The Netherlands, Norway, Poland, Portugal, Romania, Serbia and Montenegro, Slovenia, Spain, Sweden, Switzerland, United Kingdom. For further details please visit our project hompage: http://bfw.ac.at/020/profor/

Besides the 25 European signatory countries the following international organisations have an official observer status and are fully involved in the working process with full access to all documents and data:
· Ministerial Conference on the Protection of Forests in Europe (MCPFE) – Liaison Unit in Warsaw
· European Environment Agency (EEA) – European Topic Centre on Nature Protection and Biodiver-sity in Paris

COST E27 PROFOR further co-operates directly with the following organisations:
· International Union for the Conservation of Nature (IUCN)
· Environment for Europe – Pan European Biodiver-sity and Landscape Diversity Strategy (PEBLDS)
· United Nations Economic Commission for Europe (UN-ECE)

The COST Action E27 is based on 3 Working Groups, each covering specific working packages:

Management committee (MC)
One or two representatives from each member country
Chair: Georg Frank, Austria
Vice-Chair: Jari Parviainen, Finland

Steering committee (SC)
Chair, vice-chair, co-ordinators of the working groups, action secretary, scientific secretary

Working Group 1 (WG1) Jim Latham, U.K.	**Working Group 2 (WG2)** Kris Vandekerkhove, Belgium	**Working Group 3 (WG3)** Andreas Schuck, Germany
Description and Analysis of Protected Forest Areas – National Dimension	**Harmonisation and Improvement of Information on European Protected Forest Areas – International Dimension**	**A Clearing House Mechanism for European Protected Forest Areas**

Working Group 1:
Description and analysis of PFA – national dimension

Working Group 1 of COST E27 is charged with describing the national dimension of PFAs in Europe. That is, to describe the different sorts of PFAs that exist, to review their current state and historical development, and to provide an understanding what the differences are between them and why. The work involves the collection and analysis of detailed information about PFAs throughout Europe, investigation of key concepts such as 'naturalness', compilation of other essential or critical 'key terms', and tentative exploration of the economic aspects of PFAs. The results should support the work of Working Group 2, and help to formulate recommendations for the treatment of PFAs at the international level, as well as providing a general understanding and broad reference work on PFAs for scientists, foresters, policy makers and conservationists.

A major output of WG 1 are the Country Reports (Latham et al., 2005). They give a concise account of the main figures for each country participating in COST Action E27. The Country Reports have a consistent structure and content to allow comparisons to be easily made, although flexibility has been encouraged so as not to constrain genuine differences of approach between countries.

Working Group 2:
Harmonisation and improvement of information on European PFA – international dimension

The principal aim of the Working Group 2 is concentrated on Task 2 of the action: enhancement of the quality and clarity of information on PFA at the European level, by delivering input to the three following Work Packages:
· Clarifying and presenting options to harmonise „Protected Forest Area" terms in collaboration with the IUCN international system of protected area management categories
· Analysing the current procedure for reporting to international organisations and especially the procedures for PFA and identification of problem areas when using international classification systems.

· Clarifying the use of the UN-ECE Timber Committee „Temperate and Boreal Forest Resources Assessment (TBFRA)" classification of „forest" and „other wooded land" with focus on protected forest areas.

Working Group 2 has compared and evaluated both the MCPFE and IUCN categorisation system. In an internal discussion paper, which is the basis for section 3 in this publication and further conclusions and recommendations build up on it, both systems have been described, compared and evaluated, using the results of TBFRA, the MCPFE's State of Europe's Forests 2003, and the input from the country experts of COST Action E27, collected by means of a questionnaire and country reports.

Working Group 3:
A clearing house mechanism for European Protected Forest Areas

The description of the Action, its progress, and the preparation and presentation of the results to the user community is of major importance. The World Wide Web allows making information available in a cost-effective and pertinent fashion. Internet technology also allows for the production of interactive databases and discussion forums, which can be made open or closed to public use. The project website is used as an essential communication, management and dissemination tool for the Action. The website is established and maintained by the European Forest Institute in Joensuu, Finland. For further details see http://www.efi.fi/projects/coste27/

Legal notice
It must be emphasised that the material presented and any views and opinions expressed within this report, are those of the relevant authors and not necessarily those of any official body within the signatory states.

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COST Action E27

Protected Forest Areas in Europe - Analysis and Harmonisation (PROFOR)
Results, Conclusions and Recommendations

A General Analysis of
Protected Forest Area Types in Europe

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Summary. There are numerous types of Protected Forest Area in Europe. Most are protected for some natural aspect, but others exist for protective or social functions. There is much variation in restrictions and motivations, even within sites with common names (e.g. National Park) or international status, and there is frequently overlap between types. To give some understanding to this diversity, COST E27 participants from 25 countries gathered information within Country Reports and data tables that included international classification, motivations, restrictions and conservation management. Basic statistics, e.g. number per country were derived, and then the dataset analysed using a variety of mulitivariate statistical techniques, including Cluster Analysis and Principal Components Analysis.

Most countries reported up to ten PFA types, mainly placed within IUCN categories IV and V. Silvicultural treatments and physical disturbance were most restricted overall, including clearcutting, pesticide applications, construction, roads and drainage; those least restricted related to fire control, seed collection and access. The most frequent motivations were for habitat conservation, species conservation and 'forest protection'; the least frequent were socioeconomics, physical and chemical protection.

Multivariate analyses indicate two main axes of variation: a dominant primary axis of 'strength of restriction', and a second separating restrictions associated with woody resources and infrastructure from those associated with non-woody products and access. Placement within international classification schemes correlate well with the primary axis. There is some regional separation of mean PFA scores along the second axis of northern versus southern and western European countries. These axes correlate well with national forest data. These suggest that the strength of PFA restrictions is inversely related to the overall economic value of forestry across countries, and the degree to which restrictions are to do with resources and infrastructure reflects the total forest cover of countries.

This study has been able to identify some patterns across PFA types, and shows that national variation can often be interpreted in terms of underlying factors such as relative abundance of forest and economics.

1.   Introduction

There are very many types of Protected Forest Areas (PFAs) in Europe. The *Country Reports* produced for COST E27 (Latham, *et al.* 2005) provide descriptions of PFAs for 25 countries. Most PFAs are primarily for the protection of some aspect of biodiversity, expressed in terms of habitats or species conservation, naturalness, or simply as forest protection. But forests may also be protected for other reasons, such as for their protective function against avalanche, or for recreation or scenic values. There is much variation in the activities permitted in PFAs, such as type and extent of silvicultural operations, track construction, hunting regulation, scientific sampling, and collection of products such and berries and mushrooms. The names given to PFAs have some commonality in terminology and classification - for example, most countries have National Parks, nature

reserves, or Natura 2000 sites, and international classification systems (IUCN and MCPFE) are widely used - but it is not at all clear how similar these apparently equivalent types really are.

COST E27 aims to provide an understanding of the national and international variation of PFA types and, if possible, to explain this in terms of other independent factors such as the physical and economic characteristics of different countries. This is no easy task: the great variation of motivations, restrictions and terminology – even within individual countries – means that the overall pattern is hard to see, and early attempts within the COST E27 project to makes sense of them were frustrated.

Understanding PFA types across Europe requires a more elegant approach, such as through multivariate statistical analyses that allow overall trends in large datasets to be identified in an objective way. This is a rather novel approach in this field, and we are not aware of any equivalent studies. This paper attempts to identify the main characteristics, similarities and differences of PFAs between types and countries (in terms of restrictions, motivations and conservation management practices), and, where possible, to relate these to national variables such as forest cover and economic indices. An understanding of these sorts of relationships could be especially useful in applying the results to policy development.

2.   Methods

Data sources

The main source of data were the PFA tables produced as a task of Working Group 1 of COST E27. For each PFA type in each country, they provide data on the name, landscape context, brief description, ownership, area statistics, international classification, motivation for protection, restrictions and conservation management. These variables were selected by a COST E27 working group, and intended to include all obvious management practices and factors across the whole of Europe; some additional data collected by the COST E4 project (Bücking *at al.*, 2000) were also used. The tables are available through the COST E27 clearinghouse mechanism website (see Schuck, *et al.*, 2007, this volume).

The analyses presented hereafter will mainly focus on the restrictions to general forest management, the

motivations for protection as well as conservation management practices. Those data were rather complete and also had quasi-numeric scores to allow quantitative analyses. These are presented in Table 1. Restrictions were recorded on a scale of 1-4, where 1 = activity is allowed without restriction, 2 = activity usually allowed, 3 = activity usually not allowed, 4 = activity strictly prohibited. Motivations were scored on a three point scale of main, secondary, or not a motivation. This scoring system was intended to allow every sort of return to be accommodated, as these can often be ambiguous for these sort of data where the answer is 'in some cases'. Suitable data were available for 261 PFA types from 22 countries: AU, BE, BG, CH, CZ, DE, DK, ES, FI, FR, FY, GR, IE, LT, NL, NO, PT, RO, SE, SL, UK, YU.

It has to be noted that the area statistics, despite apparently being useful information, were limited as they were so incomplete and in variable format between countries.

Analytical methods

Basic statistics on numbers, total areas, main restrictions etc., were summarised from the PFA tables. These were then augmented by multivariate analyses (clustering and ordination techniques), with a focus on restrictions, motivations and conservation management.

Variable clustering analysis was used to identify groups of restriction types, conservation management practices and motivation types. Ward's method of hierarchical clustering (minimisation of within cluster variance) computed on a correlation matrix was used to this purpose.

Principle Components Analysis (PCA) was used to identify the main axes of variation within the dataset defined by PFA types x restrictions types (261 x 16). Ordination diagrams were used to explore the relationships between PFA types and to detect any regional groupings. The mean scores of the different countries and protection categories within the reduced space defined by the PCA was calculated on the basis of PFA coordinates in that space and of their assignation to the different countries/protection categories.

Relationships between country scores and independent national forestry variables were also examined to provide some interpretation (MCPFE, 2003). We searched for correlation with the share of forests and other wooded lands (FOWL) in country

Table 1:
Name and definition of variables from PFA tables and other sources and used in the analysis of PFA types across Europe

Table 1A: Restrictions to general forest management
(1 = allowed without restriction; 2 = usually allowed; 3 = usually prohibited; 4 = strictly prohibited)

Timber	Timber harvesting
Planting	Planting trees
Clearcut	Clearcutting (felling areas > 1 ha)
Firewood	Small scale wood extraction, for example for fire wood
Roads	Building forest roads
Constr	Constructions (e.g. building cabins or erecting radio masts)
Drainage	Drainage
Hunting	Recreational hunting
Game	Hunting for game control
Sampling	Scientific sampling
Collect	Collection of berries, mushrooms, etc.
Grazing	Livestock grazing
Seeds	Use of genetic resources (seed collection)
Access	Public access
Pesticide	Pesticide treatment
Fire control	Fire control

Table 1B: Conservation management practices
(0 = never used; 1 = rarely used; 2 = frequently used; 3 = very often used)

Grazing management	Livestock grazing
Fencing	Fencing to control wild ungulates
Locfell	Local tree felling to diversify structure
Coppice	Coppicing
Exotics	Control of allien species
Trees	Replanting potential natural tree species
Restoration	Restoration of ecosystems (afforestation, etc.)
Species	Direct species encouragement (digging ponds, etc.)
Mowing	Mowing to maintain glades and clearings
Fire management	Use of fire as a natural process

Table 1C: Motivations to create PFAs
(0 = not a motivation; 1 = secondary motivation; 2 = primary motivation)

Forest protection	Protection of forest cover
Habitat conservation	Conservation of rare or threatened habitats
Species conservatoin	Conservation of rare or threatened species
Gene conservation	In situ gene conservation of forest trees
Naturalness	Naturalness (valuing or restoration of natural processes and structures typical from old-growth and natural forest ecosystems)
Biocultural	Biocultural heritage (protection of forest landscape created by ancient practices which are particularly valuable for biodiversity).
Landscape	Landscape protection (cultural and aesthetic aspects)
Chemical protection	Environmental protection (chemical aspects)
Physical protection	Environmental protection (physical aspects)
Recreation	Amenity and recreation
Socioeconomics	Socio-economics

total area, the relative plantation area (plantation area divided by the forest area), the FOWL area per capita, the gross domestic product per capita, and the economic value of the national wood production (million €) from FOWL in 2000.

Finally, relationships between axes defined by the PCA on restriction types and motivations and management types in PFAs were finally searched for in plotting them as supplementary variables in the original PCA graph.

3.   Results

Basic statistics

Most countries have reported up to ten PFA types (Figure 1), although there is much variation. A few countries have reported over 20 types.

The majority of PFA types were placed within IUCN categories IV and V, although all categories were recorded (Figure 2). Likewise, all MCPFE categories were represented, but with majority of records from categories 1.2, 1.3 and 2.

Restrictions to general forest management

The mean restriction scores across all PFA types for each activity are shown in Figure 3. Silvicultural treatments and physical disturbance were most restricted overall, including clearcutting, pesticide applications, construction, roads and drainage; those least restricted related to fire control, seed collection and access.
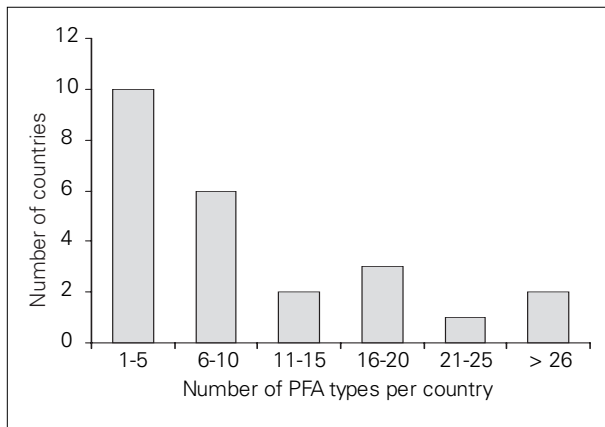
Figure 1:
Number of PFA types reported per country

Two main groups of restriction types were identified by the clustering algorithm (Figure 4). The first group mainly concerns silvicultural treatments and the construction of infrastructures; it relates to PFA types wherein forest management practices are strictly forbidden. The second group gathers restriction types linked to the harvesting of non woody forest products (seeds, berries, game, etc.), scientific sampling, public access and fire control.

The PCA produced notable results. The first axis of the analysis is very dominant and accounts for 48 % of the dataset variance. The scores of PFA types along axis 1 are inversely correlated to the strength of restriction: PFA types with numerous restrictions to
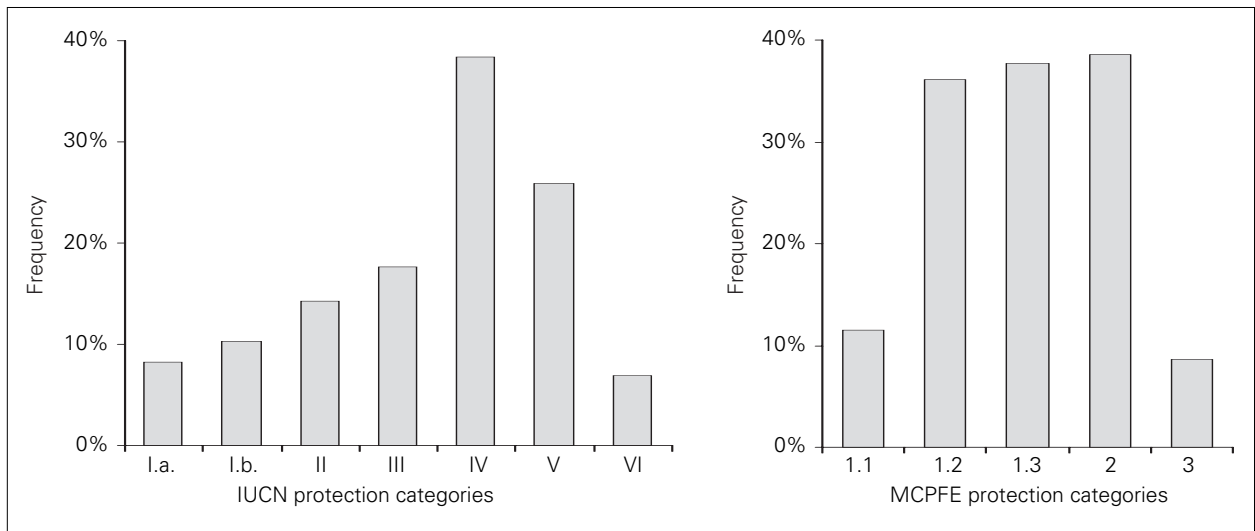
Figure 2:
Assignation of national PFA types to the different categories of IUCN and MCPFE classification system.

Figure 3:
Restrictions to conventional management practices in protected forest areas
(1 = no restriction, 2 = usually allowed, 3 = usually forbidden and 4 = strictly forbidden).
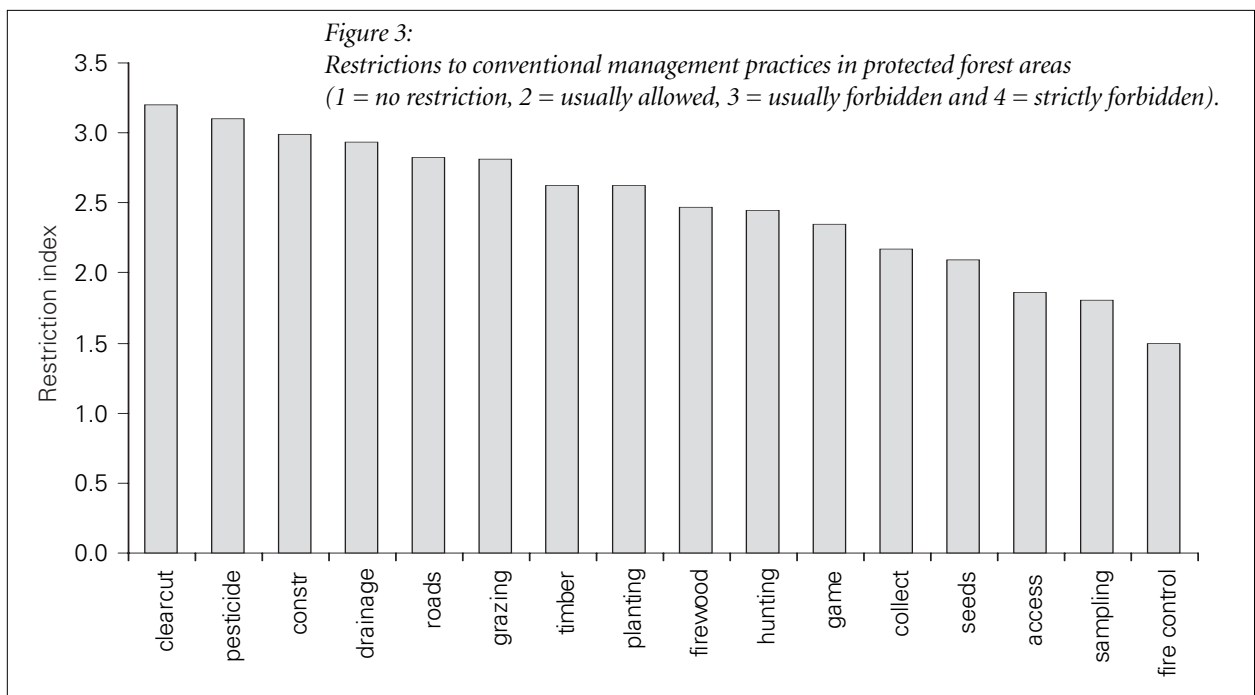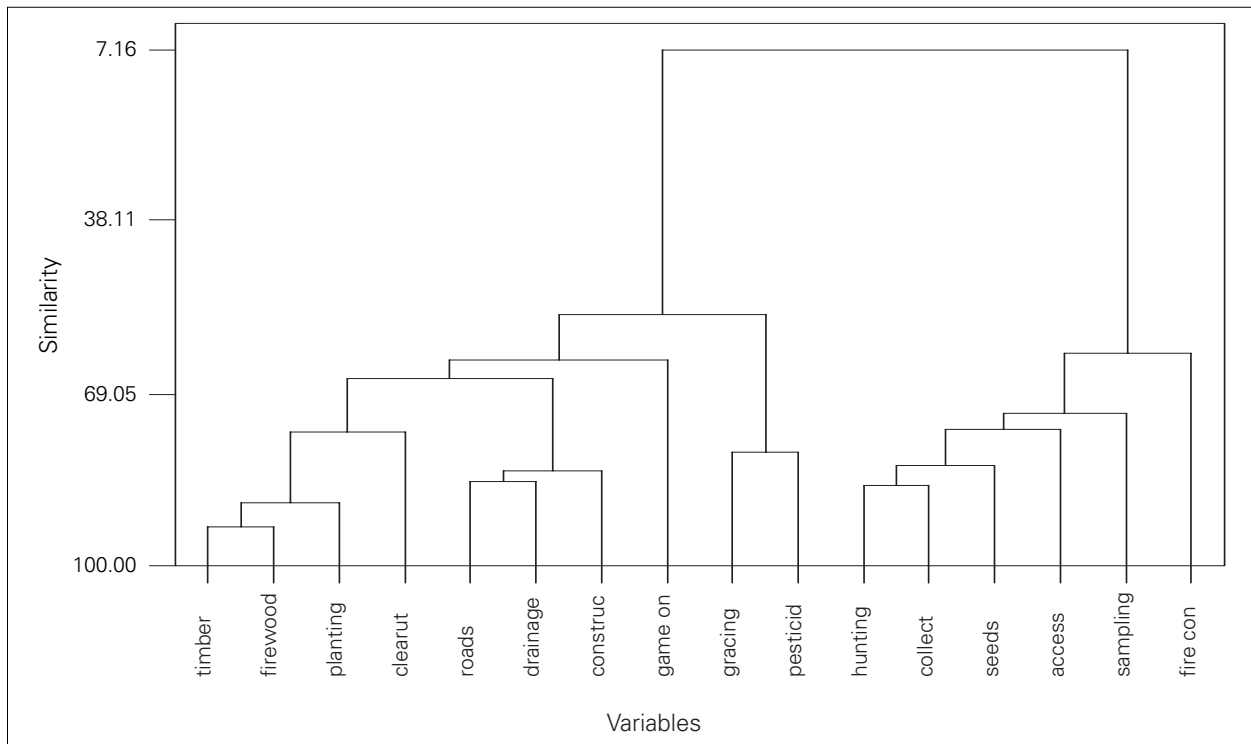
Figure 4:
Clustering of restriction types used in PFAs.

general forest management are plotted towards the negative end of axis 1 while PFA types with low restrictions are plotted in the opposite direction (Figure 5). This axis could be considered as a strictness gradient based on objective criteria, i.e. various types of restrictions in general forest management for PFA protection.

This strictness axis correlates well with placement within international classification schemes (Figure 6A). Strict protection categories (MCPFE 1.1 & 1.2, IUCN I & II) typically appear at the negative end of axis 1; other categories are plotted in the opposite direction. One may note however that only 43 % of the variance linked to PFA coordinates along axis 1 is explained by assignation to MCPFE or IUCN protection categories. As it is, PFAs corresponding to very different levels of restrictions are assigned to similar international protection categories.

Figure 6C show that the strength of PFA restrictions is inversely related to the overall economic
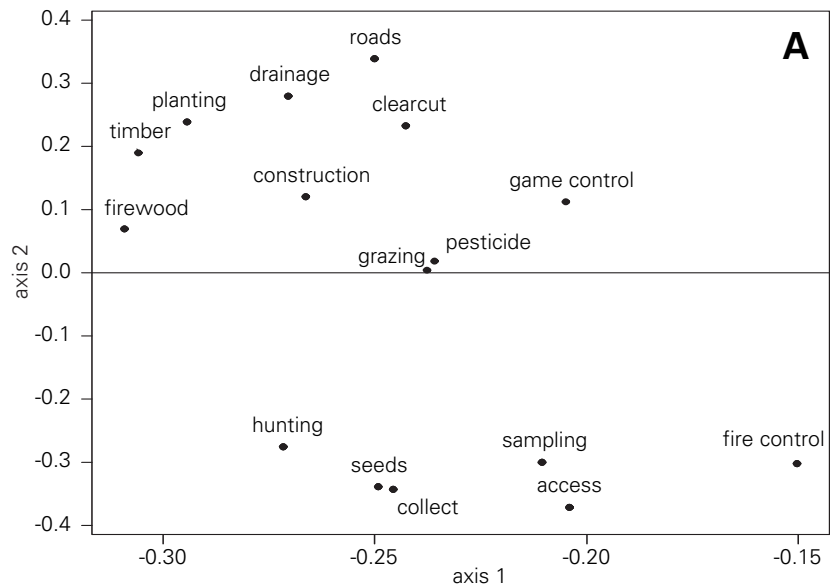
Figure 5:
Principal Component Analysis based on restrictions used in the different types of PFAs. Projection of restriction types in the space defined by axes 1 and 2.

value of forestry across countries. Those with a high GDP/capita and a high economic value of woody resources (e.g. AU, CH, DE, FR, NO and SE) impose less restrictions than other countries. We used analysis of variance to test for statistical differences in PFA scores on axis1 based on country membership, but no significant differences between countries were found (P= 0.105).
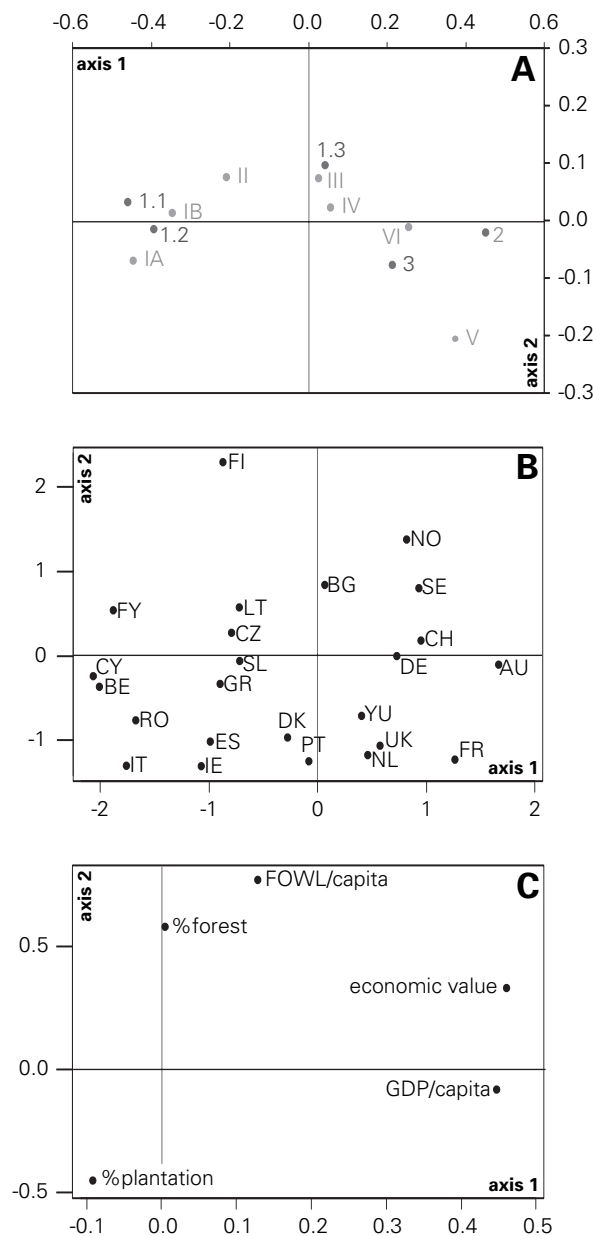
Figure 6:
Projection of (A) MCPFE and IUCN protection categories, (B) average country scores and (C) national forest statistics in the space defined by axes 1 and 2 of the PCA illustrated in Figure 5. Caption : % forest (share of FOWL in total country area), % plantation (plantation area divided by the forest area in country), FOWL/capita (area of FOWL per capita (ha)), GDP/capita (gross domestic product per capita) and economic value (economic value of the national wood production (million €) from FOWL in 2000).

The second axis of the PCA (13 % of the dataset variance) reflects the two groups of restrictions already identified through the clustering approach (see above). Wood harvesting and infrastructural building are strongly restricted in PFAs of northern and central European countries (positive end of axis 2). On the other hand, there are more constraints on public access and on the collection of non woody products in PFAs of southern and western European countries (negative end of axis 2) (Figure 6B).

Regional differences along axis 2 are also linked to national forest statistics. Emphasis on wood harvesting is typical for countries with a high total forest cover and large areas of forest per inhabitant (Figure 6C). Conversely, the other group of restrictions are linked to countries with a very low forest cover and a strong pressures on ecosystems due to high human population densities. It has to be noted that analysis of variance of the scores of PFA types along axis 2 reveals a strong effect of country membership (P < 0.001).

Motivations for protection
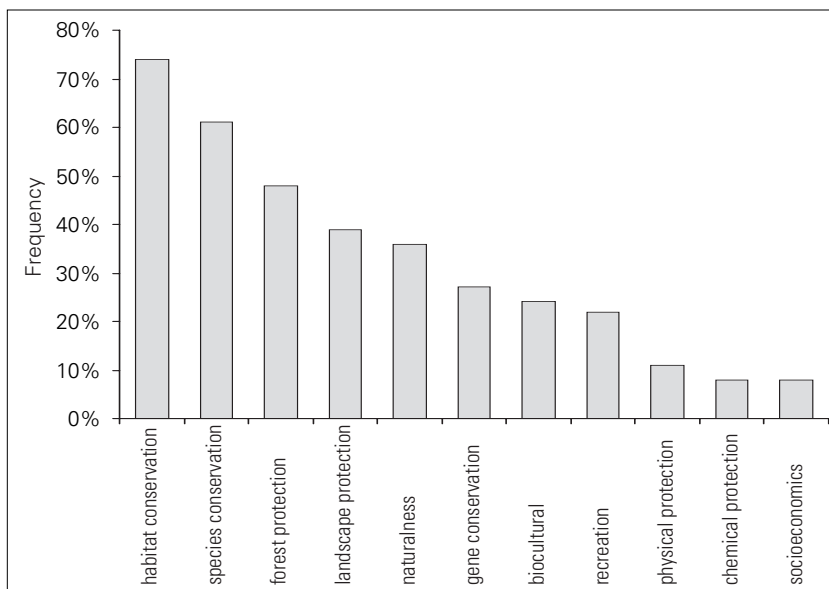
The frequency of prime motivations are shown in Figure 7. The most frequent were for habitat conservation, species conservation and 'forest protection'; the least frequent were socioeconomics, physical and chemical protection.

Two main groups of motivations were identified (Figure 8). The first group is linked to biodiversity conservation issues, including naturalness and forest

Figure 7:
Relative importance of the different motivation linked to PFA types
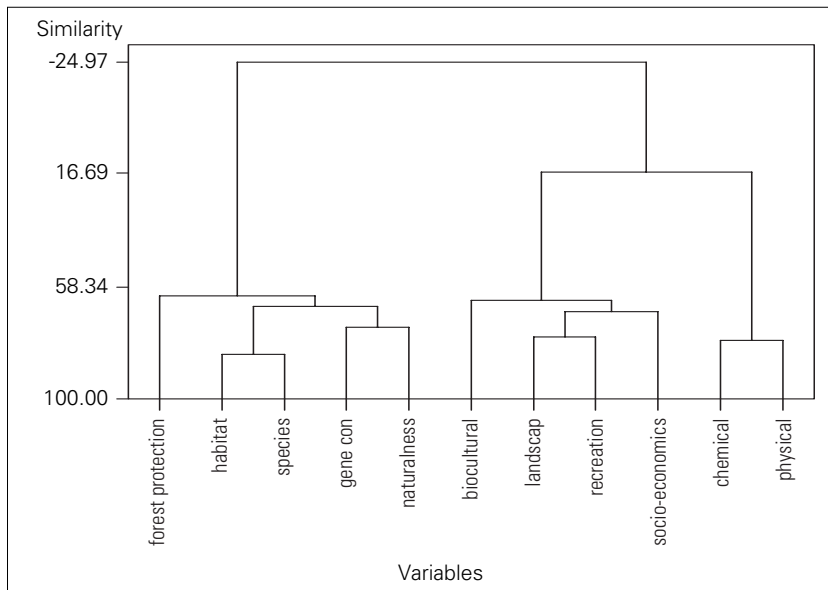
Figure 8:
Clustering of motivation types for PFAs.

protection in a general way. The second group refers to the protection of soil, water and landscapes as well as to the socio-economic functions of forests.

The different types of motivations were plotted as supplementary variables in the space defined by axes 1 and 2 of the PCA computed on restriction types (Figure 9A). The two groups we just identified through the clustering approach are well separated along axis 1 of the ordination diagram, which demonstrates a strong link between restriction types, motivation types and protection categories. Restrictions linked to conservation motivations (conservation of genes, species and habitats, naturalness, etc.) are stronger than those taken in consideration for landscape protection and protective functions.

Conservation management practices

The frequency of conservation management practices reported in PFAs are shown in Figure 10. The most frequent conservation management practices focus on tree composition of forest stands (eradication of exotic trees, planting trees, direct species encouragement, etc.). Traditional management practices (wood pastures, coppiced forests, etc.) are rarely used. Fire management is the least popular practice.

Clustering analysis performed on the dataset of conservation management practices did not reveal any clear structure. When plotted as supplementary variables in the original PCA diagram (Figure 9B), it is striking that all these management practices appear in the 4th quadrant of the graph. This means that they are mainly used in PFAs of higher categories of IUCN and MCPFE classification systems. Surprisingly, they are not specifically linked to the conservation management areas of IUCN (IV) or MCPFE (1.3) systems. Management practices as grazing, fire or coppicing are considered to be detrimental to the forest ecosystem in many European countries and are identified as a key drivers of biodiversity in a few countries only. They seem to be more popular in countries from Western Europe (FR, NL, SE, UK).
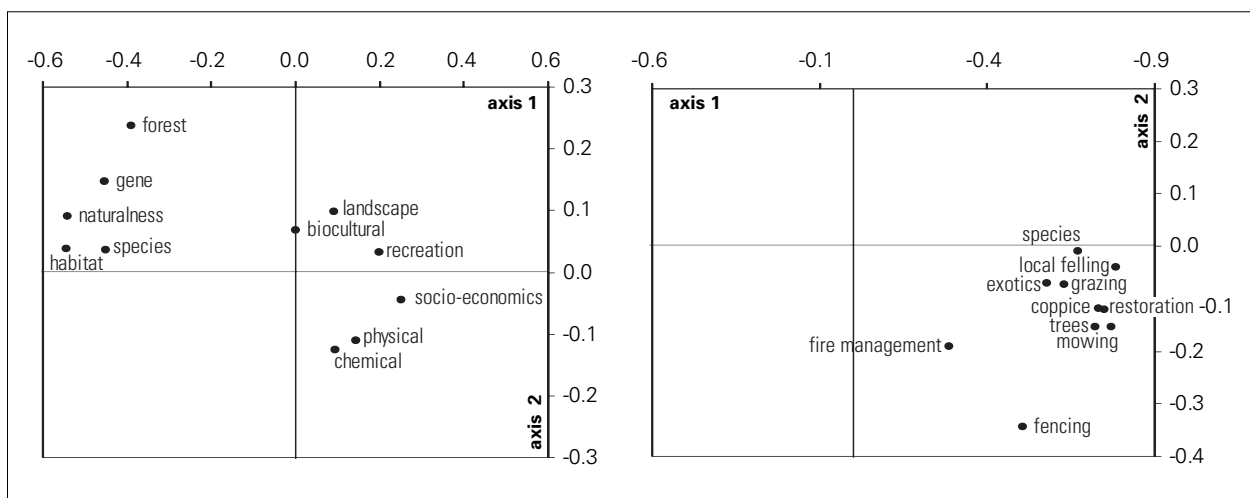
Figure 9:
Motivation types (A) and conservation management practices (B) for PFAs plotted as supplementary variables in the space defined by axes 1 & 2 of the PCA computed on restriction types.
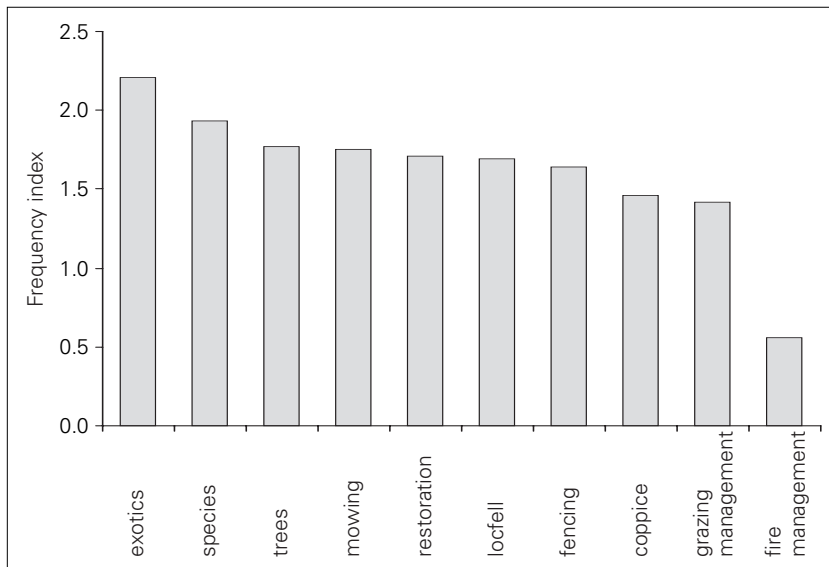
Figure 10:
Frequency of use of conservation management practices in protected forest areas
(0 = never used, 1 = rarely used, 2 = frequently used and 3 = very often used)

4.   Discussion

The diversity of PFA types across Europe means that that it is not easy to gain an overview of them. There is great variation in motivations, restrictions and nomenclature, and superficial examination of the datasets can be bewildering. The most obvious statistics – those of numbers of PFAs, areas and mean sizes – are perhaps the least complete of all. This is because in many countries there is overlap between PFA types and the figures are hard to disentangle, and federal countries may have different reporting systems in different constituent states. This negative result is actually important, and one that needs to be appreciated at the political level.

The number of PFAs reported by countries varies considerably. This probably reflects genuine variation, but also variation in interpretation of what PFAs are. The frequency of reported motivation types is instructive in this regard, as the bulk are to do with some aspect of nature conservation, with decreasing numbers relating to social and protective factors. There are gradations and overlaps between these types as well, so it may not be possible to construct a universal definition of what a PFA is.

The basic restriction data indicate the importance of activities that directly impact on forest structure. Multivariate analyses support this result, and furthermore indicate a fundamental separation between restrictions related to woody resources and

structure, and those related to non-woody products and access.

PCA indicates a dominant axis of high to low overall restriction. Both international classification schemes correlate closely with this axis if their codes are treated as ranked values. While intuitively obvious, it is interesting that the placement of PFAs within the classification scheme can be detected with independent data, thus endorsing these systems. However, this is only a statistical relationship with high residuals, showing that many PFA types do not fit well with their reported type: PFAs with very different levels of restrictions have been assigned to similar international protection categories. There is likely to be problems with definitions and interpretation of the classes by different countries, notably MCPFE 1.3 and IUCN VI. These inconsistencies suggest that refinements of the definitions of categories are needed. (See papers by Vanderkerkhove *et al.* (this volume) for more on these issues).

There is also some grouping of PFAs with the ordination diagrams that relates to geographic groups of countries. It is interesting that this pattern emerges for such a wide range of PFA types, and hints at some underlying differences between the countries themselves that follow through to the way that PFAs are treated. The 2nd PFA axis separates northern European countries from southern and Atlantic countries, the former tending to have restrictions relating to woody resources and general forest structure and infrastructure, the latter with restrictions relating to non-woody products and access. The pattern can be partly explained from the correlations of PCA axes with national forest statistics - there are strong positive relationships of this axis with percentage forest cover and the amount of forest or wooded land per capita, and strong negative relationships with the percentage of plantation. Overall, PFA restrictions relate to the basic biogeographic properties of countries: those with large proportions of forest and relatively low population density will have restrictions that tend to maintain already large forest areas intact; those with higher population density and relatively low and fragmented forest cover (typically augmented by plantation) tend to have restrictions

more oriented to social activities because these are more likely to be significant. Forest cover and population will be determined by a complex of other factors, including climate, geology, productivity, landform and social economic history, which therefore ultimately influence PFAs and their variation.

The main axis of the ordinations is of overall 'strictness' of PFAs, and doesn't separate countries by regional groups. Nonetheless, there are strong correlations with economic variables – those countries that have higher GDP per capita and obtain higher economic return from forestry will tend to have less severe restrictions within PFAs. This is interesting and not a little sobering, as it perhaps indicates a fundamental triumph of economic over nature conservation priorities.

5.　　Conclusions

There is an enormous diversity of PFA types across Europe. However, it is possible to discern trends in this variation that relate to underlying characteristics of the European countries themselves. Forest cover seems to be fundamental, influencing the types of restrictions developed for each country, and in particular, the balance between silvicultural and socially-based restrictions. The overall degree of restriction also varies, and is related to the contribution of forestry to GDP. The factors – forest cover and economic value – will themselves be a consequence of more fundamental factors such as climate, geology, social and political history. There are therefore quite deep-seated differences in the development, treatment and perception of PFAs across Europe, reflecting the underlying diversity of European countries. These differences have a real basis, and it is important that they are considered at the political level.

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COST Action E27
Protected Forest Areas in Europe - Analysis and Harmonisation (PROFOR)
Results, Conclusions and Recommendations

History of Protected Forest Areas in Europe

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1. Introduction

The state of biodiversity in European forests cannot be fully understood without taking into consideration both long-term forest succession, and the history of settlement and human impact. Different climatic and geographic conditions affect the growth and dispersal of tree species. However, the overall appearance of the present landscape is a vivid expression of the inner condition of human communities with regard to their inherent attitudes and social structure. Also, the current nature of the European forests has been influenced by economy and history. The influence of man has changed not only the extent but also the density, structure and species composition of woodlands.

In the past forests were much more intensively exploited by man than they are today. The outright dependence of the people on forests as a source of firewood, construction timber, fertilizer and animal food, as a place for multiple non-timber uses and as the sole energy source caused clearing and destruction. As a result of permanent pasturing and litter use over hundreds of years, the original forests were in many areas transformed into open, park-like landscapes. Many forest ecosystems have not recovered from that intensive agricultural exploitation.

State sovereigns often reacted by laying down 'forest regulations' to scotch further overuse. In many countries, customary rural law was written down between the 11th and the 16th centuries, and state forest regulations were issued after the 15th century. Most of these regulations were intended to secure the wood supply, and the multiple ecological functions of forests in the cultural landscape were rarely considered. However, some exceptions can be found in the alpine area of Europe, such as protection forests in Austria (1517 *Oberinntal*/Tyrol, 1518 *Mölltal*/Carinthia), where the cutting of wood and litter harvesting was prohibited to avoid avalanches and gully erosion on the steep slopes above the villages) or in Switzerland ("*Andermatt* - banning letter" from 1397, which prohibited any utilization of wood or litter to secure protection) (Bürger-Arndt & Welzholz 2005; Johann, 2004a).

For the above reasons, it is easily be seen that virgin forests without anthropogenic impacts have survived only in areas which are either absolutely inaccessible or unsuitable for agricultural use because of their difficult terrain and soil conditions. This historical land use development explains why reserves were formerly established mainly in remote areas such as at the montane and subalpine levels, and particularly in the Limestone Alps. Therefore untouched forests preserved within the Alpine region are limited to a few hundred hectares in unexploitable areas (Diaci & Frank, 2001). With the exception of the Alps and the inaccessible mountains of the Carpathians and the Balkan range, no true virgin forests have remained in Central Europe. Altogether only 6% of the forest area in Europe remains without any, or with a minimum of, direct human intervention (MCPFE class 1.1 and 1.2, MCPFE, 2003a). These are often primary forests and wilderness areas or core zones of national parks in Eastern and Northern Europe. The countries with the highest proportion of protected areas with no active intervention in relation to their overall forest area are *Liechtenstein, Sweden, Georgia, the Slovak Republic and Bulgaria.*

One specific goal of the COST Action E27 is to compile information on the historical background that has led to the today's set of protected areas in different countries.

2.   Material and methods

Figures for overall forest cover and the percentage of protected forest areas in Europe vary substantially, due to differences in databases, definitions of *forests*[1] and the objectives for their protection. Overlaps between types of protection areas further complicates the situtaion. Thus, forests have been estimated to cover between approximately one third (FAO, 1999 & UNEP, 2001) and 47% (MCPFE, 2003c) of Europe's total land area.

When speaking about protection of forests, different objectives and intensities have to be taken into consideration. Forests can be protected just as a land use type, to defend them against other demands like cultivation or construction developments. They can be fostered with respect to their protective functions for roads, supply lines, buildings or settlements against natural hazards (avalanches, falling rocks) or to use their mitigating effects for annoyances like noise and negative visual impacts. They are safeguarded because of their ecological functions for natural resources like water, soil and fresh air, or for their social and cultural benefits, like recreation. The main target however, which has been at the focus of European forest conservation over the past two decades, is forest biodiversity, i.e. the diversity of genes and species in forests and the diversity of forest ecosystems. But here also, various categories of different protected areas for different priorities and protection intensities are used throughout Europe, the same names for a category not necessarily representing the same purpose. Hence, several initiatives have started to harmonize the definitions and objectives of Protected Forest Areas in Europe, to collect comparable data and to present comprehensive information on the amount and status of protected forests in Europe.

The history of protected forest areas in Europe reflects peoples' attitude towards forests throughout the centuries. All over the continent protected forest areas have their origins in pre-Christian holy groves or spiritual places, in medieval hunting reserves for nobility, in the early forest legislation of modern times and in the upcoming bourgeois nature conservation movements which opposed industrialisation in the 19th and 20th century. The history of protected forest areas thus also demonstrates the religious and cultural importance of forests in Europe which has to be taken in consideration, apart from their economic and energetic key position.

With regard to the assessment of the history of protected forest areas the following questions turned out to be of main importance particularly in the context of the aim of COST Action E27 "Analysis and Harmonisation of Protected Forest Areas in Europe"
· Varying motivations for protection
· ranking of the importance of the different kinds of motivations concerning the protection in the course of centuries
· regional distribution of the importance of the varying motivations for protection

The study mainly relies on three sources: chapter 2 of the individual country reports of COST Action E27 (Latham et al., 2005), an extensive enquiry among the delegates of the 25 countries participating in this action (Welzholz, 2006), and additional information from (Bürger-Arndt & Welzholz, 2005).

The history chapters of the country reports provide much information on the historical development of protected forest areas in particular, but also on the development of forest and nature protection in general. Although countries from diverse geographical and cultural regions of Europe participated in COST Action E27, the developments they describe show several clear similarities. The following results are based on the assumption that these similarities derive from a small set of motivations (driving forces) that led to similar active measures for the protection of forests across Europe. In fact, a set of nine motivation complexes were identified that account for nearly all the historical development described in the country reports. These are structured as follows:
· Spiritual and religious motivations
· Hunting interests
· Protection of forests as a production resource (wood production and other utilisation)

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1 Definitions of forest types vary between countries and international organisations. The FAO Forest Resource Assessment defines forests as having at least 10% crown cover per area unit (FAO, 1995). In contrast, CORINE land cover forest classes define forests as having 30% crown cover. Another question is, wether "other wooded land" like bushy sclerophyllous vegetation, including *maquis* and *garrigue* is encompassed (SMITH, G. & GILLET, H, 2000) or not.

- Aesthetic motivation, recreation, public health and nature experience
- Safeguard of the living place, water and soil (protective forest functions)
- Biodiversity and natural value of landscapes, ecosystems, fauna and flora
- General protection for the maintenance and increase of the country's forest area
- Research, education and knowledge about nature
- Military and political motivations

After identifying this set of motivations, further analysis consisted of two steps:

First, facts from the history chapters were classified according to their relevance to each motivation and tabulated with dates, where available.

Second, facts were placed in chronological order for each motivation or motivation complex. Two timelines were produced: for the 15th century B.C. until the 20th century A.D. and for 1789 until 2000, using centuries and decades as timelines respectively. The goal was to show the frequency of measures driven by each motivation over history. To do this a standardised transformation of the facts and their dates into countable points was necessary. The number of these countable points – hereafter called transformation points - per century and decade respectively were used to depict the frequency of the protection measures driven by each motivation for protection per century or decade.

Two examples illustrate the method. The first, is a fact from the Bulgarian country report: "*6th century B.C. - 19th century A.D. consecrated ground usually existed around settlements known in Bulgarian as obrochiste*". This is transformed and assigned to the complex "Spiritual and religious motivations", giving points in the timeline for each century from 6th century B.C. to the 19th century A.D., and in each decade for the timeline 1789-1900. The second, from the Spanish country report, is "*Between 1917 and 1936, two National Parks were declared (high Atlantic mountain) with 18.977 ha, and 16 Nature Sites of National Interest (mostly mid-high Mediterranean mountain), with 14.285 ha*". This is transformed and assigned to the complex "Aesthetic motivation etc." and "Biodiversity etc."; giving points in the relevant century and decades between 1917 and 1936 for the two timelines.

The total amount of transformation points in one century or decade depends on the number of given facts, and the extension of the time periods that are affected by them. The more facts given in the country reports and the longer the relevant time periods are, the higher the total amount of transformation points and at the same time the higher the frequency of protection measures is within one century or decade.

This frequency can be used as an indicator of the importance of the several motivations for protection in different times.

The authors are aware that this evaluation approach is prone to misinterpretation as the recorded frequency of efforts and actions driven by motivations depends directly on the number of facts given. The basic assumption of the analysis was that the more facts related to a certain motivation that are mentioned in the country report, the more important this motivation was for the development of protected forest areas in the country. Of course, this frequency is also influenced by the intensity with which the authors of the country reports have described the national situations. This weakness of the method makes regional differentiation of the results very difficult and open to criticism. Nevertheless, the authors are convinced that the very extensive dataset of around one thousand facts from the country reports and the bespoke method are sufficient to reliably outline several trends in the historical development of protected forest areas in Europe, and to present some new profound facts on this topic. Results that seemed implausible were not included in this report.

A questionnaire was used to supplment data from the country reports and to improve consistency. This asked for the following key data:
- First Protected Forest Area of the modern times (since 1500 A.D.)
- Establishment of the first protected area categories
- First national park
- First nature protection law(s)
- First institution (s) responsible for Protected Forest Areas
- Nature protection movements
- First forest law(s)
- Beginning of the regular forest management

These were used not only to improve the country report analysis, but to provide important additional information that is fully included in the following. Additionally, some selected key data from the questionnaires are presented separately in table 1 in the annex.

3.   Results

3.1.   Motivations

3.1.1.   Spiritual and religious motivations

Myths and rites focusing on old trees have their roots in the close interrelationship of men and forests in pre-Christian times. This is the why the first regulations to protect woodland and trees were not been established to protect economic interests, but can be traced back to old myths. This holds true particularly for specific tree species such as oak, lime or yew that received special attention and protection until the Middle Ages. High stems symbolized old age, long life, strength and permanent growing: Oak and other trees bearing fruits were related to fertility, coniferous trees were also symbols of immortality. Even today. trees play an important role in traditional customs aournd Europe (e.g. 1st of May, solstice, Christmas).

Taboos not only concerned specific trees, but sometimes entire forests as the dwelling places of gods, deities and spirits are known from all over Europe's pre-Christian cultures. From ancient Greece and ancient Rome to the Celtic and Germanic tribes, the Baltic and Finno-Ugric peoples as well as the Slavs, the holy or sacred grove was considered a place of spiritual presence, where felling, hunting and fishing were strictly prohibited. This kind of respectful preservation for religious reasons is certainly the primary, intuitive motivation for protection of forests. To the present day, the term *sanctuary* is synonymous with *protected area*. During the Neolithic settlement about 6500 B.C. in Serbia and Montenegro "ecological" zones were recognized which were used only for certain periods so as not to overexploit natural resources. At the same time, in Ireland, trees and other parts of the landscape were held in reverence for their religious significance as abodes of gods, source of wisdom and knowledge. In Bulgaria some holy groves, of which evidence can be dated back to 1100 B.C., remained preserved up to the 19th century.

Tacitus noted, *"Woods and groves are the sacred depositories; and the spot being consecrated to those pious uses; they gave to that sacred recess the name of the divinity that fills the place which is never profaned by the steps of man. The gloom fills every mind with awe, revered at a distance, and never seen but with the eye of contemplation" (Tacitus 98 A.D., Germania).*

When Christianization took place, the new established monasteries became influential and powerful centres of mission, culture and cultivation in former wilderness areas. However Christianization did also meant getting rid of the former divinities and their close connection with nature. Thus, it tended to demonise nature, especially forests. Forest became the antithesis to the bright, guarding and promising aura of Christianity: Dark, hostile, threatening, uncultivated and heathenish. The Latin word *silvescere* was used in the sense of wicked wildness. However, some ancient habits and customs have been assimilated, others survived even though blurring of their original meaning. The medieval Gothic cathedrals for example have been considered as *"holy groves made of stone".*

3.1.2.   A symbol of royal power: Protection of forests for hunting interests

While Europe settled down and recovered after the extensive migrations of its peoples between the third and the sixth century, the nobilities developed and established their power. Usually, the royalties appropriated uncultivated land, i.e. the forests, to regulate and control its use and cultivation and to gain income. As a consequence, the original meaning of the Middle Latin term *forestes*, as wild, *uncultivated land or pristine forest* metamorphosed to *authenticated sovereign-owned forest.* Large areas where conceded as a fief to members of the nobility who thus became lords of the manors. Other parts however were entirely reserved for the sole royal hunting rights, where any use through common people, like felling, hunting, fishing or grazing, was strictly prohibited. The earliest evidence of this is in the 11th and 12th centuries A.D. (Germany, Ireland, United Kingdom), but the practice is also known from Austria, Lithuania, the Netherlands and Sweden. In the 14th century in Romania the first official measures for reserving forests for restricted access and use (the so called *"letter of the forbidden forests")* were established. In these forests called *branisti* nobody had the right to hunt, fish, cut trees, graze cattle, mow the hay, pick fruits and mushrooms, etc. without the owner's permission.

In some parts of Europe these early closed forests remained sovereign-owneds up to the 18th century and persisted as extended forest areas with relatively low human impact until today, and are often of specific interest as protected forest areas (i.e. Germany: *Reichswald* near Kleve, *Königsforst* near Köln, *Kottenforst* near Bonn, *Schönbuch* near Stuttgart, *Spessart, Nürnberger Reichswald;* Austria: *Prater* and *Lainzer Tiergarten,* two extended forests within

the boundary of *Vienna; Italy:* the later *Parco Nazionale del Gran Paradiso* derived from the royal hunting Reserve of King *Vittorio Emanuele II,* Poland*:* forests of *Niepolomice, Kozienice, Jaktorów* and *Bialowieza).* In Lithuania even after World War II a number of forest areas were designated as hunting reserves where hunting was forbidden or strongly restricted to restore population of game species that had noticeably declined during war. However the protection of selected species has a long tradition and dates back to the late Medieval times, when first reserves to protect specific wild animals were established such as specific game (Lithuania, Poland), bison (Lithuania), beaver, aurochs, falcons (Poland), ibex (Austria).

3.1.3. Protection of forests as a production resource (wood production and other utilisation)

From the first colonization till the middle of the 19th century forests served various branches of the economy like agriculture, manufacturing or hunting. An intensive utilisation of whole landscapes supported local human and animal populations. Amongst other resources, trees constituted an exceptionally important source for different uses. Woodlands were managed in order to provide fuel, food and building materials for people and their animals while they were systematically grazed by sheep and goats. Cultivation by burning over, forest farming, forest litter utilization and resin boxing were important forest rights to secure the livelihood of the rural people. For this reason trees and other parts of the landscape were held in reverence for the services they provided (food, shelter). In Portugal from the 7th century onwards cork oaks and pines received protection by the *Visigothic Code.* In Ireland the *Brehon Law* classified trees into four classes (chieftain trees, peasant trees, shrub trees, bramble trees), and included sanctions for damaging trees by the 8th century. Local management practices developed over centuries were regionally adapted to the prevailing environment (population density, climate, natural vegetation, multiple human demands etc.) in the specific region/country. This general behaviour can be observed in most European countries. From at least the early Middle Ages the various benefits trees offered to the people initiated the first protection laws for the regulation of the use of fruit bearing trees and pig foraging such as in Sweden, Austria, Germany, Belgium, Lithuania, Romania, Slovenia. Finland. Most of the ordinances had a repressive

character and tried to regulate the local rights of use like forest grazing, cutting of fire wood, charcoal burning.

The period from the 16th century to the beginning of the 19th century was characterized by intense forest use, sometimes even heavy exploitation. The reasons for over-utilization were multiple. The most important driving forces were the high demand of growing industry (glassworks, salt and other mineral mines, forges and furnaces), ship building, timber trade, concentrated forest grazing and litter harvesting. This was the reason why orders referring to the use of forest resources were defined not later than the 16th century in many European countries and primarily aimed to maximise firewood and timber production (Austria, Belgium, Cyprus, Germany, Lithuania, Poland, Slovenia). Most regulations (forest ordinances, mine ordinances) for forest use were applied in regions, where demands for timber were high (e.g. in mining districts, in the vicinity of the seaside and big cities). These forest regulations often prohibited further clearings or required reforestation, they regulated grazing and the collection of firewood and they were the predecessors of the later state forest laws, which were passed in during the 19th century in Central European countries (see table 1 in the annex).

In parallel, regular forest management was developed in practice. The first evidence for a precautious and planned forest management come from Wales (late 12th /early 13th century), German cities such as Erfurt (division of the forest into plots for recurrent forest use in the 14th century) and Nürnberg (reforestation activities in 1368), Switzerland (14th century onwards), Austria (14th century). In Romania the first official measures for forest protection were taken by means of so called "*carti de paduri oprite/letter of the forbidden forests*" by the 15th century.

In regulating and controlling the felling and management of coppice and high stand-forests the ordinances generally protected the forest area from changing land-use (into agricultural land) and preserved several tree species from extinction in some parts of Europe.

3.1.4. Protection of the entire landscape for aesthetic and humanistic reasons

The Age of Enlightenment during the 17th century pioneered the Modern Age. Rationalism, Economics, Natural Sciences and technical development arose. Also a new approach towards society and environment can be identified in early landscape architec-

ture, namely in the landscape garden, a concept which originated in England in the middle of the 18th century and which determined the European garden and park design for more than one century. Particularly picturesque and harmonious landscape sceneries as to be found in the cultural landscapes of that time were staged as an idealized image of "nature" for pleasure and enjoyment. Both, landscape gardens and the early movement of landscape architecture did include forests, even though not necessarily very natural ones. Their main interest, however, was focused on the design and management of the ideal cultural landscape as a whole. Therefore, the movement did not forward the protection of forests as such (nonetheless, the very first Protected Forest Area was established in 1718, namely the virgin forest of the *Brocken* in the *Harz* mountains).

At the turn of the 18th to the 19th century Romanticism developed. „Naturalness" became one important ideal of Romanticism (Zielonkowski, 1989) that again changed peoples' views on nature. The Biedermeier can be understood as an expression of middle class citizens ("petit bourgeous") at that period of time who had a more realistic and practical mind. Being confronted with progressing industrialisation and urbanisation, they searched for a simple, honest, harmonic and secure life. For them, nature was not an idealized, dreamful imagination but a treasure and a creation of God.

By the 18th century several foresters pointed out the non-economical obligation of forests while putting attention on the equivalence of its beauty and utility. At the beginning of the 19th century the epoch of forest aesthetics (ethical values of forests) was introduced in forestry and society by Wilhelm von der Borch in Germany and Guttenberg and Dimitz in Austria. It was not only a scientific and societal theory. It also included defined proposals to put the ideas into practice. The nature conservation movement dawned in the middle of the 19th century and it was Wilhelm Heinrich Riehl (1823-1897) who intellectually paved the way for it in Germany. In his work "Natural History of the German People" (Riehl, 1851-1854), he wrote: *"For centuries, it was a question of progress to assert the right of the farmland, now it is also a question of progress to assert the right of wilderness"*. He already demanded to preserve the natural and semi-natural remainders of the pre-industrial cultural landscape, including forests as an essential complement to the cultural land. In the second half of the 19th century foresters developed silvicultural methods following the concept of

nature. The protection of natural landscapes and the maintenance of artefacts and monuments of cultural heritage were only one part of societal demands. The most important ecological goal was the protection, maintenance, promotion and securing of nature in its own right. In pointing out the ethical, aesthetical and social values the forest itself was put into the foreground. In the 1880s the aesthetic aspects of forestry were introduced as an independent topic into literature. Forests were considered not only as an economic property, cultivated to produce a certain yield, but also as a source of pure enjoyment. Through the demands of society, silvicultural measures, expressed in the term "aesthetics of forestry", should protect the natural beauty of landscapes.

Nature and landscape protection as an important forest function (the organized preservation of nature and its monuments) was achieved in many parts of Europe (particularly in Austria, Belgium, Bulgaria, Finland, France, Germany, Netherlands, Norway, Romania) from the turn of the 19th/20th century onwards. Humans living in the industrial landscape defined forests as places of relaxation and leisure-time activities. It was regarded as a question of progress to assert the right of wilderness. Not only the forest, also dunes, fens, heath, rocks and glaciers, all wilderness and wasteland were considered an essential complement to the cultural land which should be protected and maintained. In the Czech Republic for instance the rapid disappearance of so far intact virgin forests even in less accessible mountainous regions, augmented by the strong wave of Romanticism, was a reason to declare the first forest reserves. The nature-loving Count *Jiří Augustin Langeval-Buquoy*, Goethe's friend and the landlord of the *Nové Hrady* estate in southern Bohemia, wrote a letter to his forester which has entered the history of nature protection and conservation in the Czech Republic: establishment of the *Žofín* virgin forest in the *Novohradské hory* Mts. as the first forest reserve in 1838. In Finland the first protected forest area was established in 1802 when the Russian Emperor Alexander I decided that the forest of the *esker* area in *Punkaharju* should not be cut because of its beauty. In France also, it was the beauty of the landscape which initiated the preservation of 623 ha of *Fontainebleau* forest.

The "return to nature" as proclaimed in art became apparent also in the spirit of the whole period and in the conduct of life. While on the one hand there was an increasing impact on nature caused by human

industrial activities, on the other extensive outdoor stays were considered necessary and beneficial for mind and body. Therefore it was thought that forests should be opened for recreational purposes to everybody. In the second half of the 19th century the substantial migration of rural people towards industrial sites contributed to the rapid expansion of industrial centres. People became separated from their former traditional way of living and lost the close relationship to nature. This alienation led to a remarkable social change resulting also in a rethinking of human attitudes towards nature. In the 1880s a social stratum living in urban areas not directly deriving economic advantage from forest utilisation nonetheless picked up the idea of nature protection. This movement was connected very closely to the development of Alpine tourist clubs (e.g. Switzerland 1863). Along with the appreciation of cultural, historical and scientific importance of natural phenomena, the idea of nature conservation was taken up by different social groups in Central European countries simultaneously. Both the individual and the state were seen to have a role, and in consequence, legislation and administrative mechanisms were developed to express this deeply-felt general need. Forests should be protected in their own right (see table 1). This idea spread all over Europe; examples are the declaration of two national parks and 16 Nature sites of national interest (protection of the aesthetic image of nature, wild areas and alpine forests) in Spain between 1917 and 1936. The first forest reserves wrer established in Norway at the end of the 19th century, primarily near urban settlements such as Oslo. The 19th "Revival Movement" in Bulgaria perceived forests, waters and mountains as sources of joy but also of patriotism. In Finland forests and trees had significance as national symbols in arts during the period of national romanticism at the turn of the 19th /20th century.

3.1.5. Safeguard of the living place, water and soil (protective forest functions)

In some European countries the priority of protection as the most important forest function had been acknowledged by resident farmers since the Middle Ages. Therefore certain forests became legally protected, particularly in the Alpine area e.g. Germany, Austria, Switzerland, mainly to avoid avalanches, rockfalls and torrents. In the second half of the 19th century at the latest it became obvious that maximisation of wood production could not be given priority everywhere. Therefore protection

became an important task of forest legislation in many European countries, which were concerned with this problem When the negative results of over-utilization such as torrents, landslides, avalanches, moving dunes and Karst increased and became apparent in many parts of Europe - particularly in vulnerable regions such as the Alps – society as well as legislation had to react. One of many examples is the so-called *Reichsforstgesetz* published by the Austrian government in 1852. It was also valid in Slovenia, Slovakia and Czech Republic and aimed at the maintenance of public welfare as a main function of the forest (private and state-owned). This task should be fulfilled by certain management regulations concerning forests which were dedicated to protect people and the landscape. In Romania some instructions that distinguished between protected forests and forests that protect themselves were adopted. In 1874 Transylvania approved a new (Hungarian) forest law, which proposed a conservative regime preventing massive clearings and promoting a restrictive treatment of those forests providing functions such as soil protection against erosion and avalanche control. In 1881 the later (since 1923) all-Romanian *Forest Code* was adopted: forests providing hydrological functions, soil protection against erosion, protection of roads and forests growing at the timber line were put under protection regime. The prevention of soil erosion was one of the main tasks of 19th century forest legislation in many European countries (e.g. Switzerland: 1834-1840, 1876, 1902; France: *Mountain Soil Restoration Code* 1882, 1922, Portugal: *Forest Regime* 1901, Finland: *Act on Protection Forest* 1922; Austria: 1852, 1884). From the middle of the 20th century onwards in several European countries according to their functions, the forests are subdivided to forests of "economic" purpose and "protection" purpose (e.g. Bulgaria, Romania, Slovenia).

3.1.6. Biodiversity and natural value of landscapes, ecosystems, fauna and flora

In 1992 within the frame of the "*Forest Resource Assessment of ECE/FAO*" (1992) an investigation has been carried out to quantify the multiple functions of forests on a national level. When looking at eight different categories of functions (nature protection, recreation, protection, water, wood, pasture, hunting and non-wood products) and its areas an overall Europe-wide distinct shift within the ranking of the importance of these functions can be perceived compared to wood production. Nature protection,

recreation, protection and water will increasingly receive more attention (Sekot, 1997). Within the last decades ecological functions such as biodiversity as part of the MCPFE-process in Europe and also environmental and social as well as cultural functions have gained in importance.

When towards the end of the 19th century the conflict between modern industrial society and nature became more marked, man's attitude to nature changed (Dimitz, 1907). The penetration of society into nature at the beginning of the 20th century was so intense that its protection was considered necessary. Therefore the representatives of the idea of nature conservation postulated respect for the beautiful and the sublime, for that which was scientifically valuable.

A transition to an organized preservation of nature and its monuments was achieved in many parts of Europe. This is the case of Germany and Austria where several laws were designed to save certain plants and plant communities and animals from extinction. Around the turn of the century the conviction was prevalent that the conservation of nature and its monuments should be precisely defined and should be protected by the state in the same way as historical monuments and monuments of art. The individual held the community responsible for the disadvantageous consequences of civilization (hectic states, impenetrable complexity, deadline-pressure) and liable for compensation.

When the traditional cultural landscape changed its face and familiar natural structures and characteristics disappeared one of the first who became aware of the loss of ecological and cultural values was Josef John, head of the *Vimperk* forest district on the Schwarzenberg estate in Bohemia. He realised that only virgin forests were able to give a clue to understanding natural processes uncontrolled by man, without which knowledge of the sustainable forest management would be impossible. Thanks to John's long-term efforts and to the intercession of the chief provincial wood-reeve in *Vratislav* von Pannewitz, Count Schwarzenber*g* decided that old-growth forests in some compartments in the *Zátoň* forest district to permanent reserves (*Boubín* virgin forests) in 1858. This model was an example for the exclusion of further privately-owned virgin forests from utilization such as 1888 forest reserve *Buky u Vysokého Chvojna* (eastern Bohemia), 1892 *Kocevje* region (Slovenia), 1903 forest reserve *Šerák-Keprník* (Silesia), 1904 forest reserve *Labský důl* (eastern Bohemia), 1909 forest reserve *Javorina* (southern

Moravia), 1910 Switzerland (virgin forest reserve at *Scattlé* near Brigles).

Hugo Conwentz´s memorandum "The Endangerment of the Natural Monuments and Suggestions for their Conservation" (Conwentz, 1904) prepared the ground for the foundation of the first office for nature conservation in Germany. Only two years after publication of this study about endangered natural habitats, the State Office for Natural Monument Management was founded based in Danzig, Prussia. Supported by provincial, regional, county and local committees its task was to find, examine and conserve natural monuments, and Hugo Conwentz (1855-1922) was appointed as the head of the institution (Stiftung Naturschutzgeschichte, 2002). In 1909 the Nature Conservation Park Society (Verein Naturschutzpark) was founded as a private initiative "to protect original and impressive landscapes and their natural communities of plants and animals against civilization". The State Nature Conservation in Germany was finally established in 1919 through article 150 of the German Constitution (*Reichsverfassung*), which stated that the monuments of art, history and nature are safeguarded and treasured by the state. In Bavaria and in Baden, laws to regulate the conservation of natural monuments were already passed in 1908 and in 1912 (Wolf, 1920). Similar developments occurred in many European countries, since a considerable number of state nature conservation authorities were established at the beginning of the 20th century, followed by the establishment of Protected Area Categories and the passing of the first nature conservation laws in the first half of the 20th century. These events had already partly taken place in the late 19th century, but sometimes only after World War II (see table 1 in the annex).

Motivations of defensive preservation of the pre-industrial landscape can be recognized with respect to the efforts to establish nature reserves. Thus the Old-growth *Slatioara Forest (Codrul Secular Slatioara)* set up in 1908 was one of the first anyway and the first in Romania. In Germany the first strict forest reserve was established in Württemberg in 1911. Particular attention to the protection of the alpine flora and fauna was paid by several protection laws (Poland 1868, France 1913, Austria 1886 to 1920) but it was in 1911, when a general appeal to launch nature reservations in the alpine region was made by several institutions. Thus the first National park in the Western Alps was set up in Switzerland in 1914. In the Eastern Alps it came into being when an
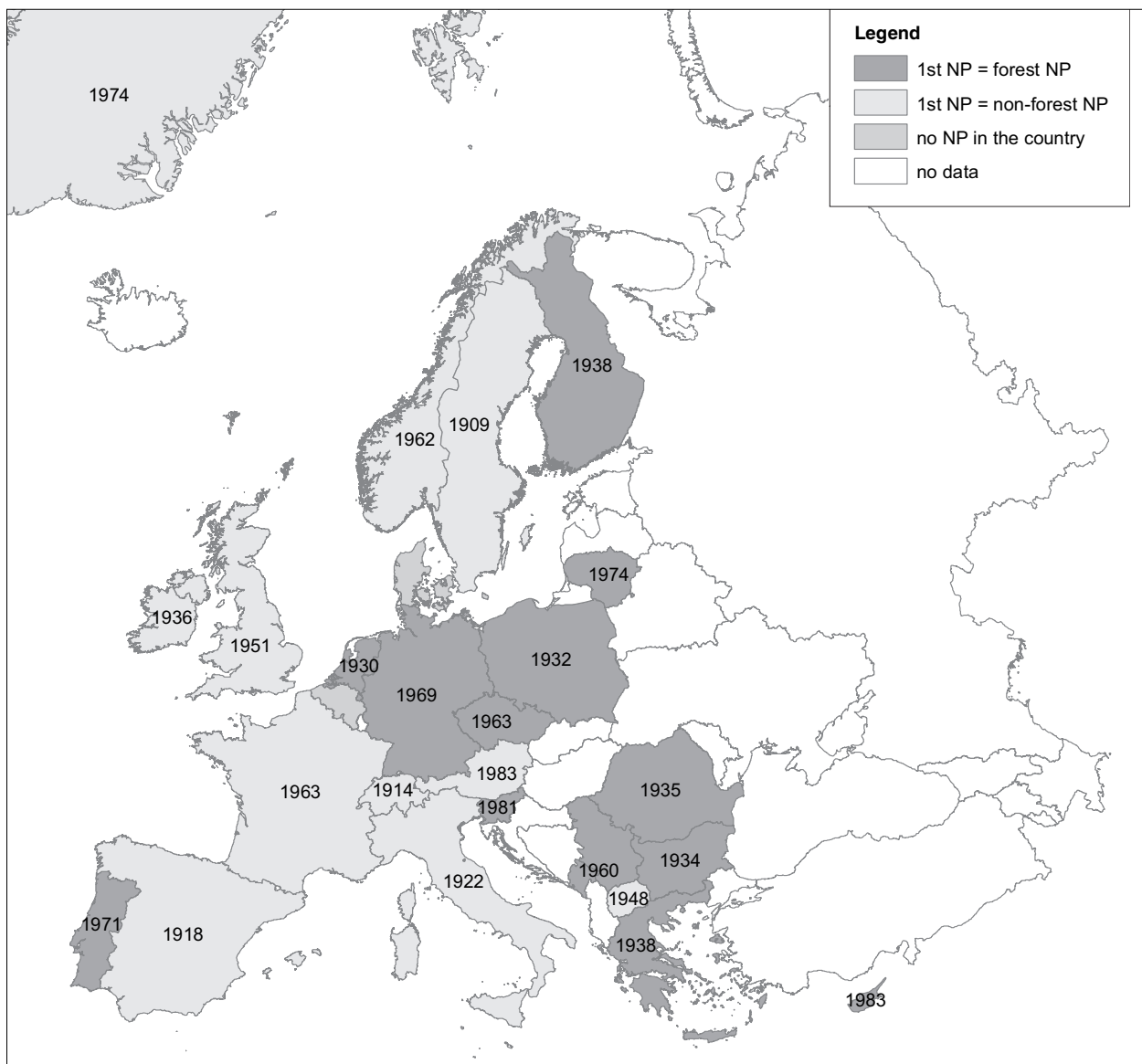
Figure 1:
The establishment of the first National Parks in Europe

area of 4000 ha was donated by a private forest owner to the German-Austrian Alpine Association for the purpose to establish a National Park in 1918, which is the core of the present National Park "*Hohe Tauern*" (set up in 1984). In Bulgaria in 1931 the *Strandzha* Mountain became the first reserve and in 1934 the *Vitosha* National Park became the first National Park of its kind in Bulgaria and the Balkan Peninsula. At present 16,53 % of the forest fund in Bulgaria are PFAs, thus Bulgaria is among the countries with the highest percentage of protected forest areas. The protection of the entire landscape became quite popular and well accepted by society between World Wars I and II, when National parks were established by several European countries (e.g. Greece 1938, Ireland 1936, Italy 1922, Poland 1932, Romania

1904, Spain 1917/1918) (see figure 1) or nature reserves to protect species and landscapes (i.e. Lithuania 1937, Portugal 1930, Romania 1927, Sweden 1910).

From the middle of the 20th century in remote European regions industrialization of agriculture introduced - in a temporal scale - mechanization, intensive farming, specialization and rationalization. The removal of trees and shrubs, the introduction of large scale machinery, the application of fertilizer inducing widespread of nutrient enrichment and the use of pesticides led to an escalating loss of the landscape's biodiversity from the fifties to the nineties of the 20th century.

In the first years of reconstruction after World War II, little attention was paid to the landscape and the

natural environment. But due to the rapid economic development, environmental problems quickly increased and the losses of special landscape characters and their species richness became obvious. Slowly but continuously, people's awareness of their natural environment increased, awakened and promoted by alarming publications like Rachel Carsons "Silent Spring" in 1965 or Daniel Meadows report "Our Common Future" in 1973 as well as by the first European Nature Protection Year in 1970.

The new development was also expressed in a considerable number of protection laws, published by various European governments particularly from the 1970s onwards. The responsible authorities for nature conservation started programmes for registration and assessment of all valuable and endangered natural habitats. Protection of biodiversity first became an issue of legislation in Greece (1960s and 1970s). In Slovenia, nature conservation areas were until the 1960s regulated through numerous legislative regulations. In Belgium the '*Law for Nature Protection*' published in 1973 provided the instrument of Forest Reserves in order to conserve rare and threatened forest ecosystems.

In the Czech Republic one of the first initiatives for nature protection within forests after World War II was drafted and then passed by Parliament in 1956. This law stipulated categories of protected areas and made the legal safeguard of the protection of old-growth forest stands possible, which up to that time had been declared only by their owners.

However there is a general change in the recognized and declared conception for nature conservation and in the understanding of its requirements not only in Germany. It was acknowledged that small, scattered nature reserves are insufficient to save the survival of the wildlife species. They are lost under the influence of the surrounding intensively used cultural landscape. Mitigation is only possible by accomplishing a respectable set of adequately large protected areas as optimum refuges and by connecting these reserves via semi-natural landscape areas and structures which could serve as trails for migration. One example of this holistic approach is Flanders where since 1997 a new law on nature conservation enables the creation of nature reserves for a total area of 50,000 ha, being part of a larger '*Ecological Network for Flanders*'. Nowadays more and more forest areas are included in the protection of nature reserves, whereas, in earlier times, nature reserves primarily focussed on the protection of open areas. Another example is from Bulgaria, where

in the *Protected Areas Act* 1998 the categories of areas protected for biodiversity and natural processes of ecosystems, as well as their regime of protection and usage, promulgation and management are defined.

In some European countries such as Greece (1986, 1999) the law on the protection of the environment provides several categories of Protected Areas, namely Strict Nature Conservation Areas, Nature Conservation Areas, National Parks, Protected Natural Formations, Protected Landscapes, Landscape Elements, and Ecodevelopment Areas.

Additionally, a nature and environment friendly land use management which respects the essential demands for the preservation of the natural environment is crucial. Therefore entire concepts for nature conservation with staggered intensities of protection and land use have been developed, for example in the Czech Republic (2004), Denmark (1992), Netherlands (2000). In several European countries, ecological protection is taken into consideration in forest management guidelines and activities (Finland 1980, Slovenia 2001, Spain from 1970 onwards, Sweden (early 1980s).

Similar ideas and initiatives can be recognized all over Europe. Concerning forests, the Ministerial Conference on the Protection of Forests - MCPFE was launched in 1990, as a high level political initiative for continuing cooperation between 40 European countries and the European Community in the field of protection and sustainable management of European forests. Thus the signatory states and the European Community are responsible for implementing the MCPFE decisions at regional, national and sub-national levels. Governments all over Europe have taken initiatives to ensure and improve the sustainable management and protection of their forests. The recent development in the field of forest and nature protection legislation has been distinctly influenced by these commitments.

3.1.7. General protection for the maintenance and increase of the country's forest area

In Central Europe, the period from the Middle Ages to the beginning of the 19th century is characterized by intense forest use. Development varied in time and region depending on the available resources and demographic evolution. The high demand for fuelwood triggered the first move towards more or less sustainable management practices and, in consequence, protected the forest in those regions. In contrast, the forest area in regions dominated by agricultural utilization decreased continuously, and

finally forests were often cleared because of the high demand for arable land which had to serve the needs of the increasing population. Thus the last 'virgin' forest in the Netherlands, the *Beekbergerwoud* (120 ha), was felled for agriculture from 1869 to 1871. Overexploitation of forests on poor soils transformed many of them into extensive heathlands, and in this way, some countries had major losses of forest (land remaining in forest: Ireland 1900: less than 1%, Denmark 1800: 2-3%, Great Britain 1900: 5%, Scotland 1750: 4%, Netherlands 1800: 3 - 4 %, Portugal 19th century: 7%, Belgium 1850: 14%) .

Although afforestation programmes were occasionally introduced by the 17th century, many of the European forests were degraded due to high industrial demand and forest farming. Wars had also contributed to this development. In contemporary perception, there was only one solution at hand: the afforestation of the non stocked and waste areas. All over Europe, afforestation activities were carried out in the 19th/20th century, particularly on wasteland and abandoned farmland.

Reafforestation of the wasteland was promoted and financially supported by almost every European government from the middle of the 19th century onwards (i.e. *Fonds Forestier National* in France, *Eifelkulturfond* in Germany). A range of motives led to this policy. One of the driving forces was the necessity to increase the production of timber. By this means government officials reacted to the perceived urgent demands of industry, in particular the paper industry, and thus achieved a national independence from import (France, Great Britain, Poland). Another motive was the need to restore unfertile barren land to reduce human famine and to protect farmland against natural hazards, as in Switzerland, Austria, Slovenia, Germany and France. In Denmark by the late 1860s, an emerging national movement towards the utilisation of the vast areas of barren heathland provided a foundation for afforestation activities that lasted essentially unchanged for a century. Patriotism, industrial development, and substantial public grants were some of the driving forces. The most conspicuous factor appears to be the loss of land due to war. "*Land lost outwardly should be regained within the country*" became a successful slogan for heathland afforestation. At the same time it was believed strongly that afforestation would be a major factor in promoting economic development for the benefit of land owners as well as of entire local communities. This was probably the main argument in almost every European country for about a whole century.

However afforestation was carried out mainly with conifers (spruce or pine) and in many European countries from the 19th century onwards afforestation changed the traditional management towards non-native plantation forestry particularly when heath land was recultivated (United Kingdom, Belgium, Denmark, Germany, Netherlands). Due to monoculture plantations the extent of the European forest area as a whole increased from the low point in 1800 to the present day (e.g. Netherlands from 4% to almost 10%). This increase is noticeable in almost every European country. However the present share of forest and other wooded land still differs quite remarkably, ranging from about 9 % (Ireland) to nearly 70 % (Finland and Sweden) of the total land are (see figure 2).

Although the ever increasing timber consumption had resulted in the first efforts to introduce systematic forest management (notably in Central Europe in the 17th and 18th century), the organization of modern forest administration and forest legislation dates mainly back to the 19th century (see figure 3). In the second half of the 19th century in several European countries a new forest act came into force that also took into account the protective functions of forests (protecting and protected). Mainly the Forest Law from 1852 (valid at this time in Austria, Slovenia and the Czech Republic) pointed out the importance of forests for public welfare thus not only promoting the reafforestation of cleared areas but also the exclusion of forests from regular utilisation when they had to fulfil protective functions. In Cyprus forests were put under the protection and control of the government in 1879 and classified into *Forest Reserves* and *Open Forests*. In Portugal the *Forest Regime* founded in 1901 and still in existence, is a protection scheme that provides the sustainable management of high forests for timber and other forest products, planting of new forests for soil erosion and the protection of freshwater and landscapes. During the 20th century, particularly after World War II, these laws were adopted to the new demands of society and often demanded a general protection of forests or a specific type (e.g. U.K. 1970s: establishment of the concept of ancient woodland). Political changes of the 1990s gave rise to major modifications in the legislative and institutional framework of the forestry sector in Czech Republic 1995, Finland 1996, FYR of Macedonia 1997, Slovenia 1993. This is also the case of Poland where the Forest Act of 1991 placed both productive and environmental functions of forests on equal terms, laying out rules for sustainable forest
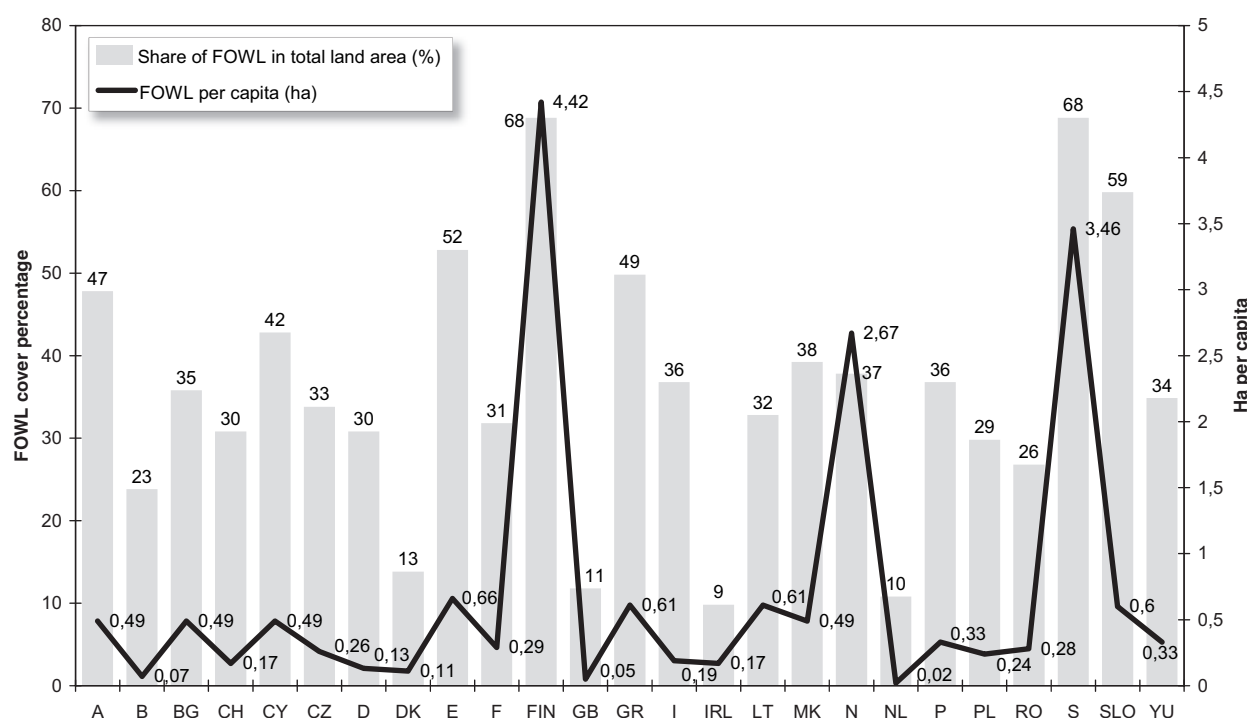
Figure 2:

Forest and other wooded land (FOWL) cover percentage and FOWL per capita in the COST E27 countries (MCPFE 2003b)

management. In Bulgaria due to the *eighth Forest Act* forests are subdivided into three categories: "*forests for timber production and environmental functions*", "*protective and recreation forests*" and "*forests in protected territories*".

3.1.8. Research, education and knowledge about nature

From the 18th century onwards the *Age of Enlightenment* gave rise to a growing interest in nature and natural sciences and the foundation of societies of nature research (e.g. Switzerland: 1746 Zurich, 1786 Bern, 1790 Geneve). Together with the idealised perception of nature and the increasing development of the alpinism and tourism (starting from the PR-effective spectacular conquest of the Großglockner – the highest mountain in the Eastern Alps - in 1800) a tremendous interest in nature including fauna and flora commenced. When in 1848 Josef John started preparations for scientific studies of stand development in the *Šumava* virgin forests (Czech Republic) on the Schwarzenberg estates and for the long-term preservation of these stands, research on native woodland dawned. Thus several compartments in the old-growth *Boubin* virgin forests became permanent reserves. In Germany the first strict forest reserve (*Hornisgrinde*/Württemberg) was established in 1911.

This development was also promoted by the foundation of research institutes and schools (e.g. 1824 High school Eaux et Forêts in Nancy/France, 1855 foundation of the Swiss Federal Institute for Technology, 1872 High school for Agriculture and Forestry Vienna/Austria, Forest Research Centre Vienna 1874 Vienna/Austria, 1816 Forest Academy and 1904 High School Tharandt, 1896 first forestry school in Cham Koria/Bulgaria; 1925 establishment of the Agronomy and Forestry Faculty at the University of Bulgaria, 1847 Foundation of the Agriculture and Forestry Faculty in Skoplje/FYR of Macedonia). In consequence the botanist R. Hultin stated scientific and forestry management reasons for the establishment of national parks in Finland in 1890. Often scientists in the fields of geography and biology were the pioneers in nature conservation, such as in Norway from the 1850s onwards.

At the International Agricultural Congress in Vienna in 1907 the protection of natural landscapes, natural stands, virgin forests, moor land and habitats of rare plants and animals received attention and measures were discussed how to provide special protection (Dimitz, 1907). Around the turn of the century there were already several nature reserve areas in Austria. In 1911 a project for the creation of a natural forest reserve in the Austrian Alps had come a long way. The opinion was expressed that
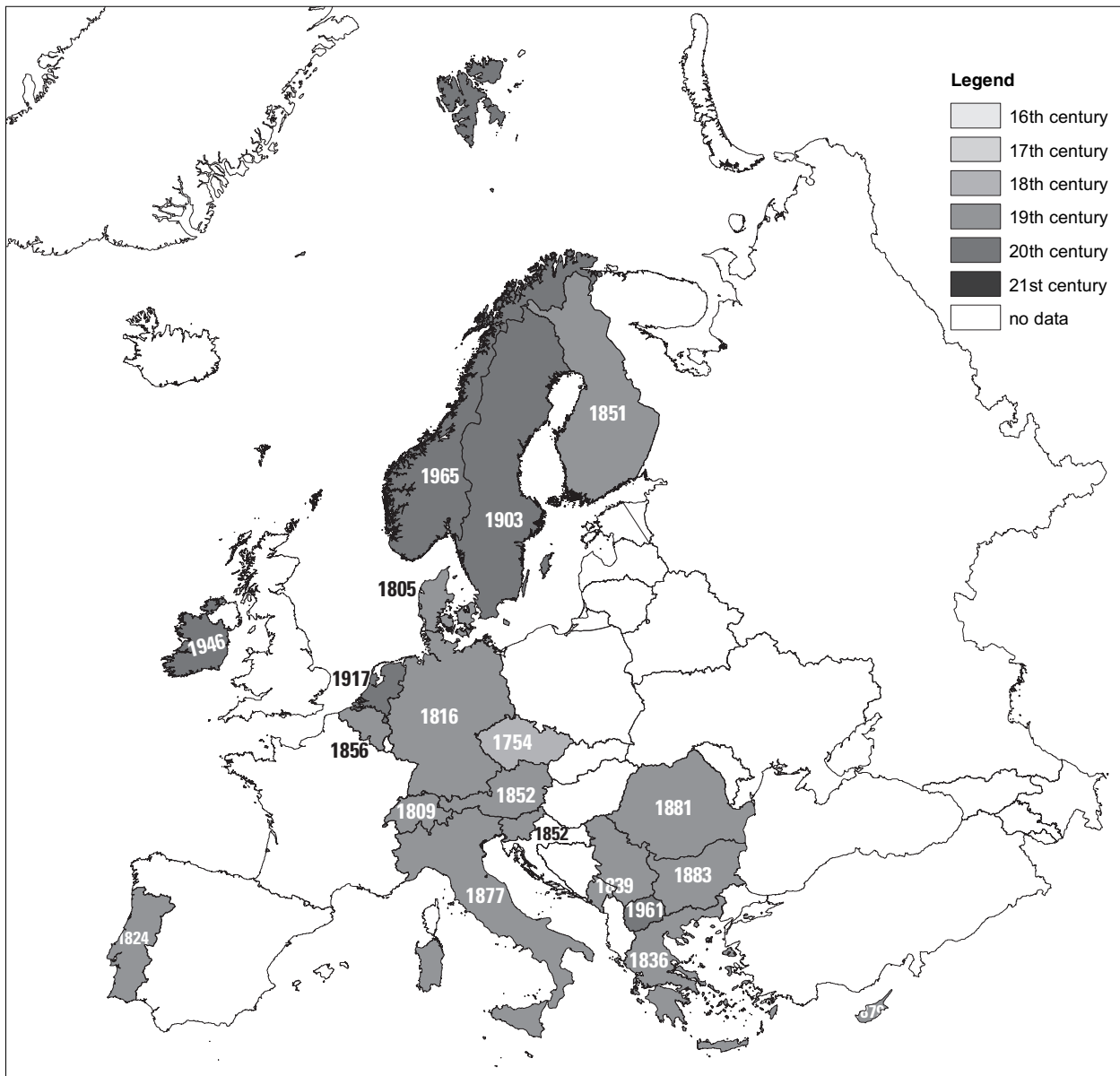
Figure 3:
The enactment of the first forest laws in Europe

because man claimed the largest part of the earth for himself at least a small part of nature should be preserved in its original state. Here and elsewhere in Europe research was promoted by several interested associations claiming for protected areas for scientific studies. This development was also associated with the establishment of National parks in Europe. In Slovenia for example, a Section for Nature Monuments Conservation was established in the frame of Slovene Museum Society in 1919. In Poland the first strict forest reserve was established in the *Bialowieza* Forest in 1821, in Lithuania the first strict nature reserve *Žuvintas* in 1937. Research and education were driving forces to establish a network of Protected Forest Areas, including 'stocked total

reserves' in the German Democratic Republic from the 1950s onwards. At the same time (1949) the legal basis for *National Nature Reserves* – initially intended as a research resource - was established in the U.K. The foundation of Nature reserves for the purpose of research and education increased during the 1970s in manifold European countries (Germany, Austria) thus also creating new relationships between research and reserves. In the late 1970s in Slovenia the forest reserves network was improved by the Forest Faculty and the Forest Institute and many new reserves were established, primarily for their forest plant associations, but also based on naturalness criteria and research goals. In Austria a contractual agreement was arranged between the University of Applied Life

Sciences and the Austrian State Forests to make the reserves located in State forest properties available for research in 1986. Research and education as well as the protection of natural forests have been targeted when in 1995 the Austrian Federal Forest Research Centre, scientists and stakeholders instituted the Austrian *Natural Forest Reserve Programme* to develop a representative net of natural forest reserves for all Austrian forest communities.

3.1.9. Military and political motivations

Apart from the fact that, of course, the military and political situation of a country always influences the method and intensity of forest area protection, some special cases in which the political circumstances explicitly led to certain measures of forest protection should be mentioned here. In the Middle Ages, for example, it was a common interest to maintain dense forest areas in the country's border areas. They should serve the military protection against enemies from neighbouring countries. There is evidence of such border forests for instance from German and Lithuanian borders in the Baltic region, from the Rhine for the defence of Roman attacks and from Slovenia for the resistance against Turkish invasions. In medieval times, hunting forests of the nobility (see chapter 3.1.2.) also had a military component as hunting was not only regarded as a symbol of power but also as training for war. This aspect was reported from the Netherlands in particular. In the 19th century during the Europe-wide process of nation building, forests had often an important symbolic meaning for the national identity. This aspect was relevant, for example, in the struggle for independence in Finland and Poland. In Spain the transition from a feudal to a liberal social and political structure led to the so-called Desamortización process in the middle of the 19th century. Large forest areas that were formerly noble property were sold to individuals and communities. In the course of this process an extensive forest inventory was carried out and those former manor forests that were of public interest were designated by the state as Public Utility Forest and thereby protected against devastation.

3.2. Importance of motivations in the course of time

Over time, the main motivations (driving forces) (as a single fact or interrelated with a couple of others)

for forest protection varied. They are partly interrelated. When evaluating this development and the importance of a particular motivation, several additional influencing factors (frame conditions) have to be taken into consideration e.g. population density and increase, economy (condition of the market in particular with regard to agriculture), politics, scientific influence. The reason, why the year 1789 is considered to cause a change in people's perception of and behaviour towards nature is the Enlightenment–movement and the start off of the French Revolution (1789–1799). The Enlightenment was the point where Europe broke through what historian Peter Gay calls "*the sacred circle*," where previous dogma circumscribed thinking. The Enlightenment is held, in this view, to be the source of critical ideas, such as the centrality of freedom, democracy and reason as being the primary values of a society. This view argued that the establishment of a contractual basis of rights would lead to the market mechanism, the scientific methods, religious tolerance and the organization of states into self-governing republics through democratic means. In this view, the tendency of the philosphes in particular to apply rationality to every problem is considered to be the essential change. From this point on, thinkers and writers were held to be free to pursue the truth in whatever form, without the threat of sanction for violating established ideas.[2]

The importance of the particular motivations for the protection of forest areas in Europe from the 15th century until today is illustrated in figure 4, the development from 1789 till present day in figure 5. Both figures are the outcome of the review of the country reports (Latham et al., 2005) being an important resource for the historical evaluation. When analysing the frequency of the facts mentioned in the country reports it becomes obvious that in the overall assessment during the whole period spiritual and religious motives were the most important driving forces for the protection of European forests and woodlands. Analysing the motivations in detail before and after the Enlightenment it turns out, that religion and spirituality were less important during the 19th and 20th century. However the protection of biodiversity and the natural value of landscapes, ecosystems and the protection of rare plants and species was also an important goal from the 15th century onwards and became even more important after 1789. Further main driving forces on the European scale were hunting interests, wood production

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[2] http://en.wikipedia.org/wiki/French Revolution; http://en.wikipedia.org/wiki/The Age of Enlightenment, website visited 2006-09-21
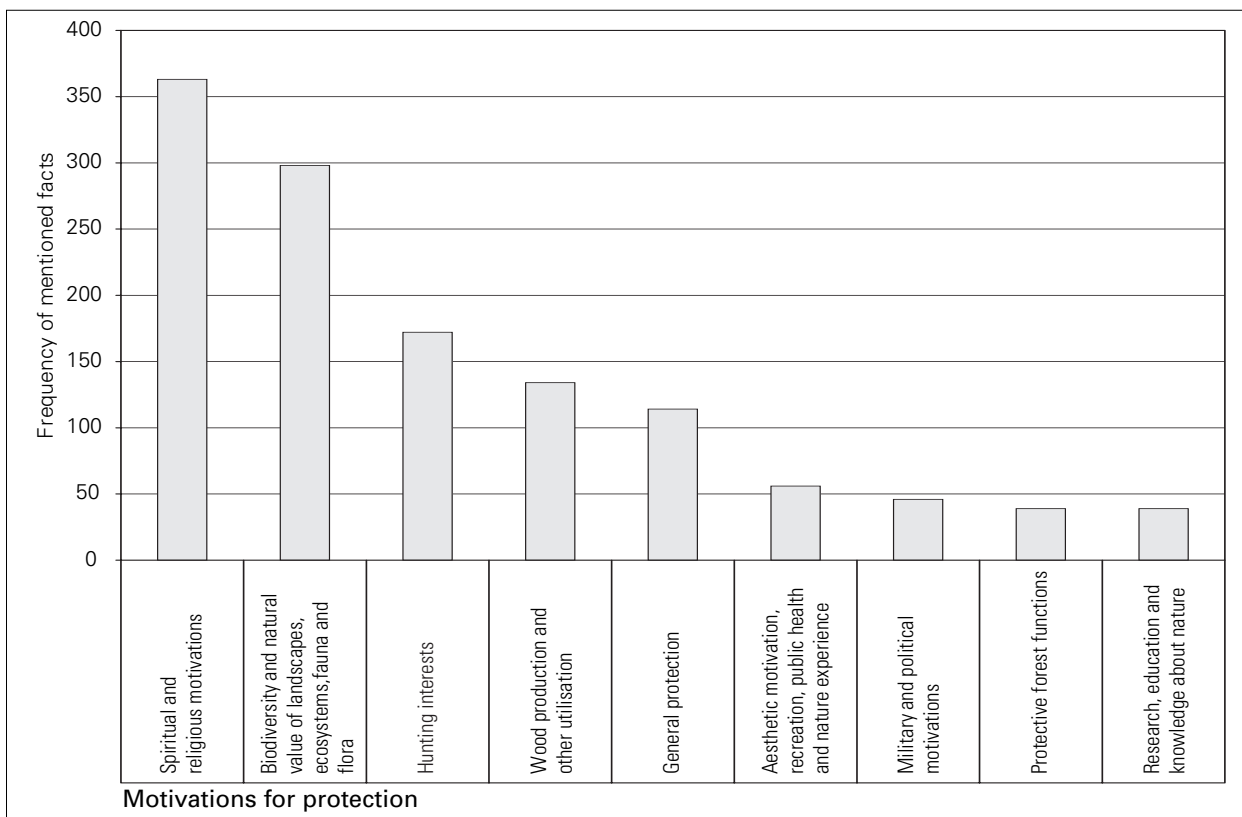
Figure 4:
The importance of the different motivations for forest area protection in Europe from the 15th century B.C. until today

Figure 5:
The importance of the different motivations for forest area protection in Europe from 1789 until today
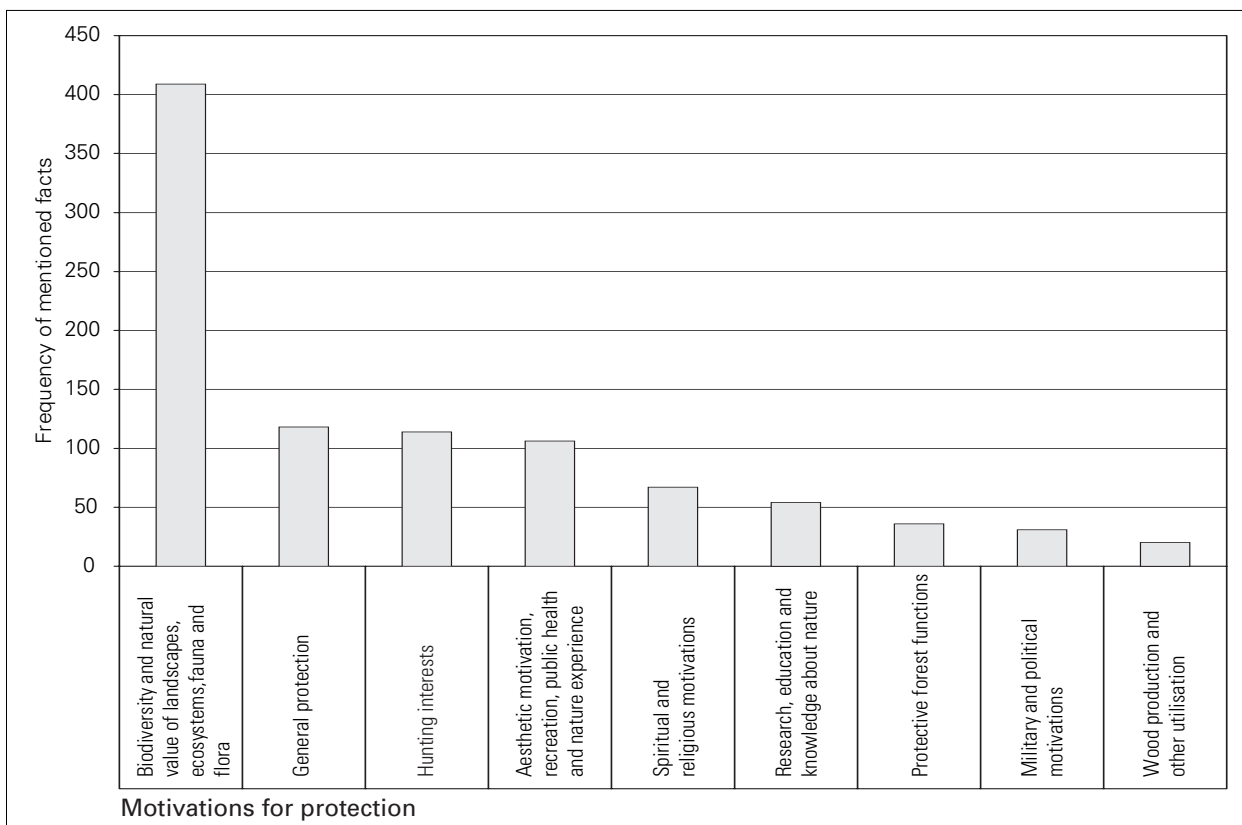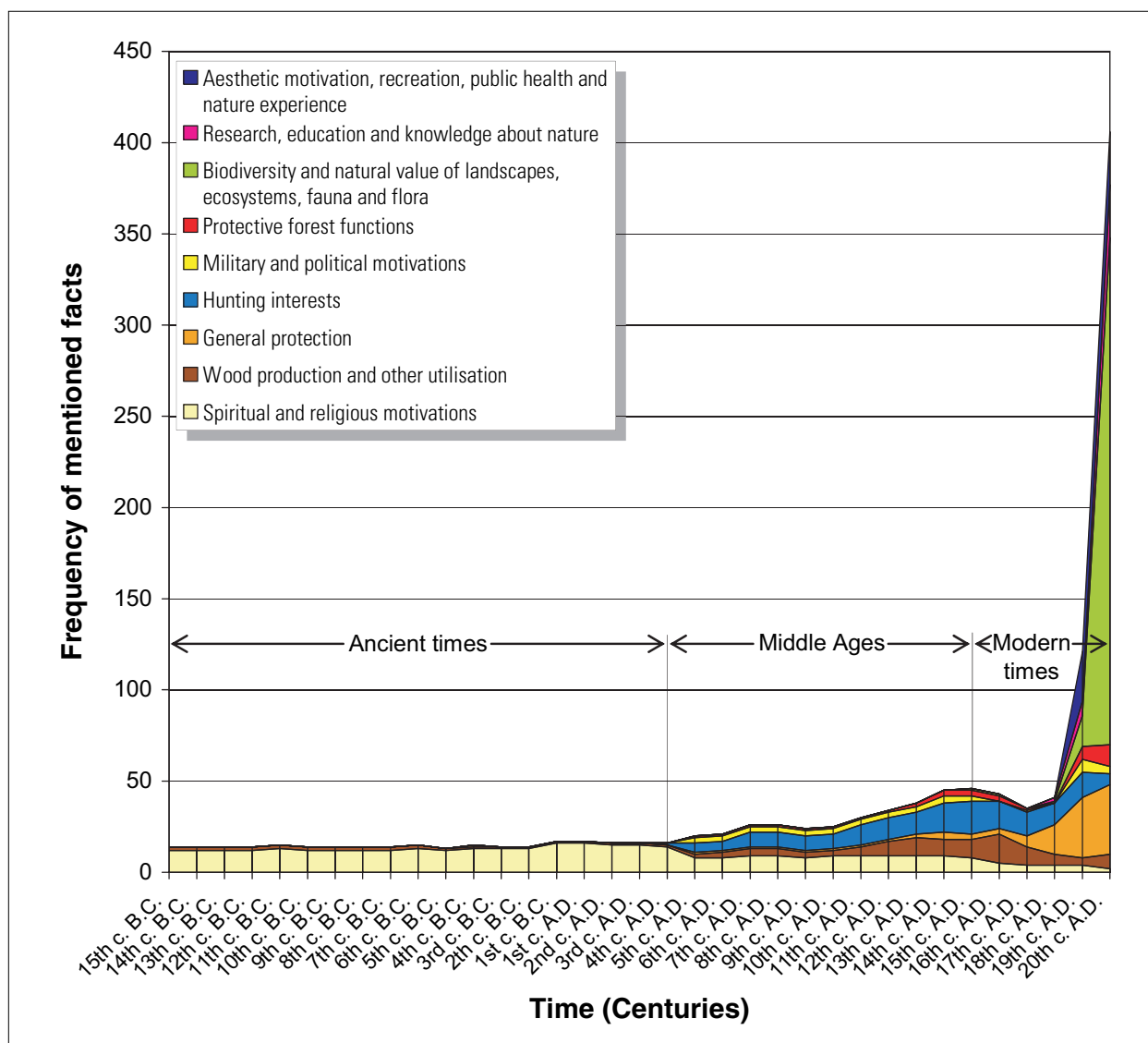
Figure 6:
The development of the importance of the different motivations for forest area protection in the course of time from the 15th century B.C. until the 20th century A.D.

and aesthetic motivations including recreation and public health. Thus it is evident, that the importance of recreation and aesthetic motives increased in the 19th and 20th century. In the overall European assessment research and political motivations were less significant concerning woodland protection.

The development of the importance of the different motivations for the protection of woodland in the course of time from the 15th century B.C. until the 20th century A.D. is illustrated in figure 6, from 1789 onwards till today in figure 7.

4.   Discussion:
Forest protection across time and space

4.1.   Similarities

The diverse motivations for the protection of the forest surface can be recognized in almost every European country. The ranking of the importance of the different motivations during the period before and after the French Revolution are demonstrated in
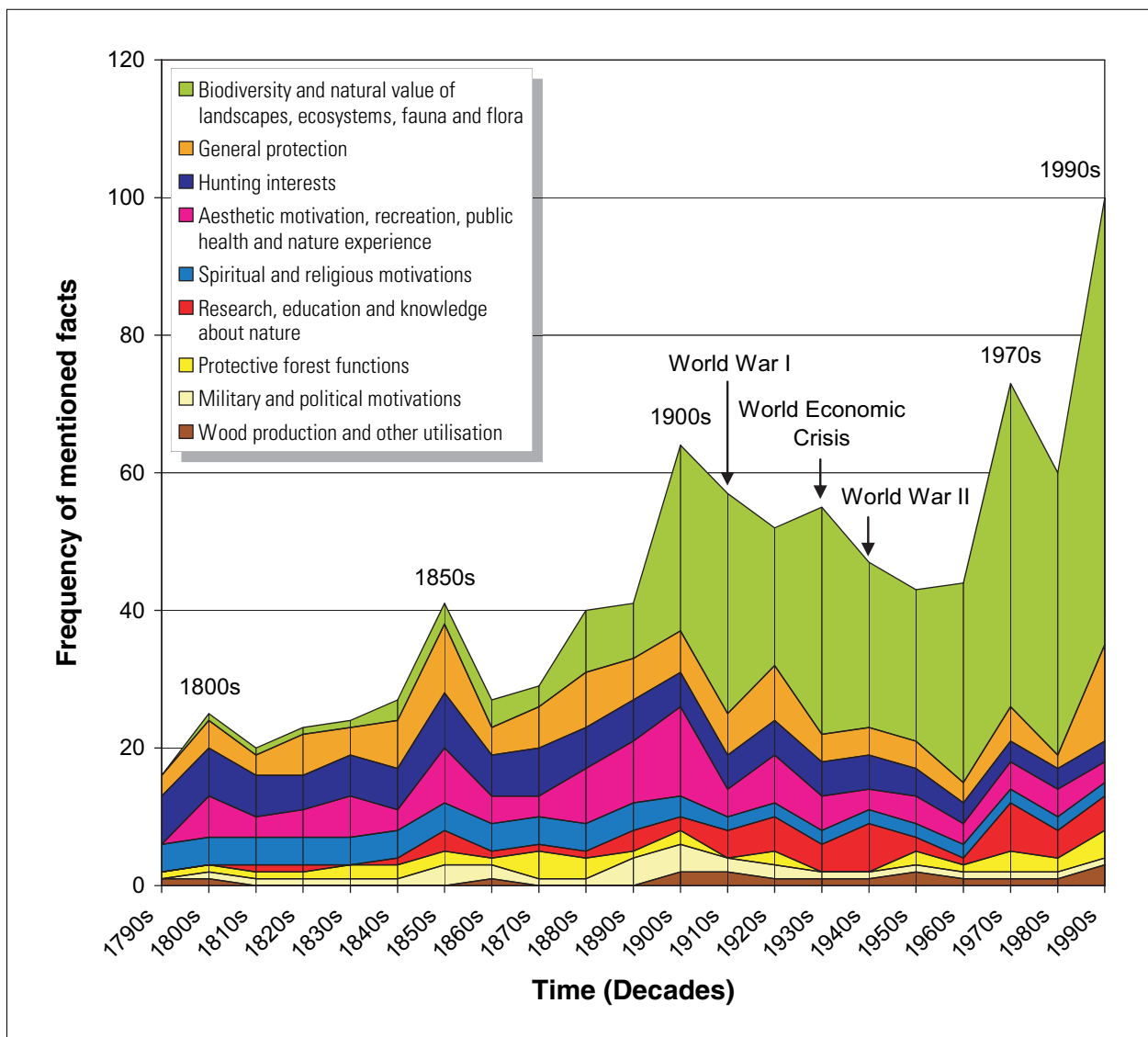
Figure 7:
The development of the importance of the different motivations for forest area protection in the course of time from 1789 until 2000

figures 4 and 5. Also the trend with regard to the kind of motivation over the centuries proves similarities. In Europe, different trains of thought (Enlightenment movement, Romanticism) brought about certain responses and reactions concerning the protection of forests. In different periods different motivations (driving forces) dominated (see figures 6 and 7). Because of its extent and continuity, one of the most important motivations for the protection of wooded land dating back almost to ancient times is spirituality and religion. This motivation already existed in the pre-Christian period and was present in every European country. In modern times however this motive increasingly lost its importance and can hardly be noticed at present day (apart from some traditional customs).

Hunting also, has always been a driving force in the protection of forests and wooded land all over the continent. However the importance of this motivation varied between countries. Generally its importance decreased markedly in the 19th century. From the 16th century onwards general protection for the
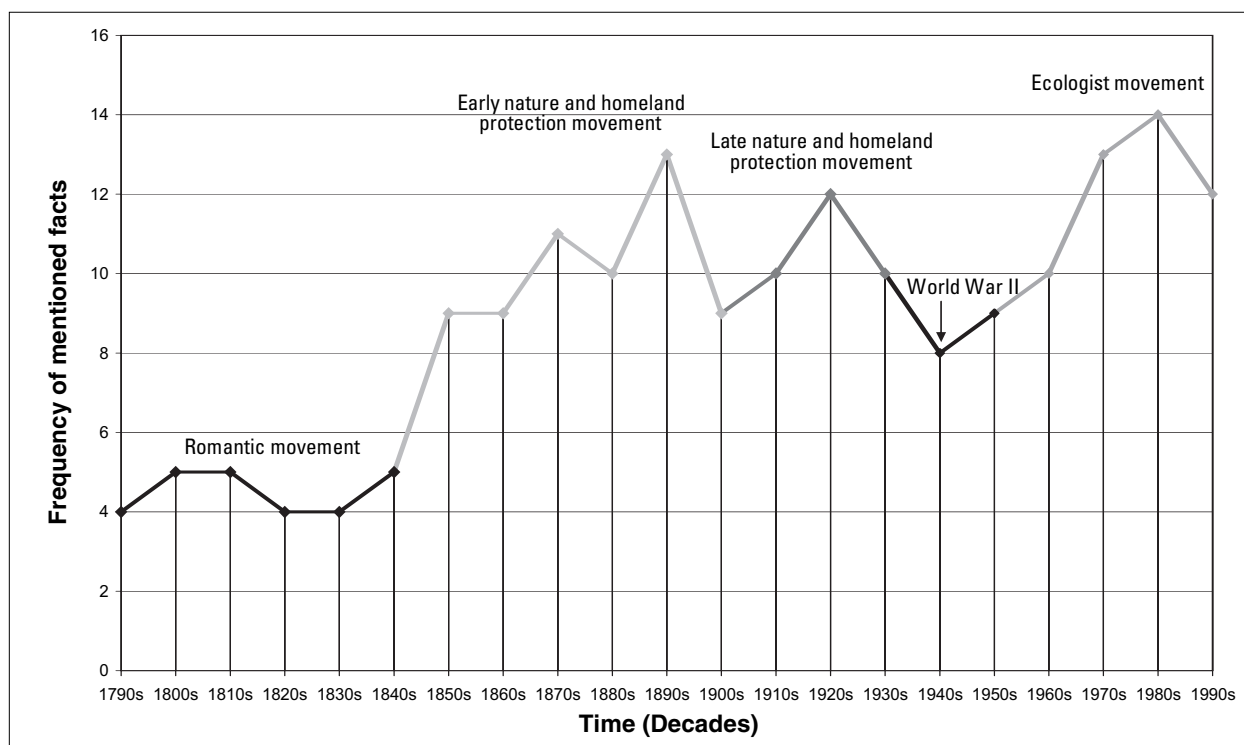
Figure 8:
The development of the European nature protection movements from 1789 until 2000 (Temporal importance of the different motives within Europe in the course of time (frequency of mentioned facts within the decades)

protection of wood production and other utilisation (also for political and military reasons such as the maintenance of a timber reserve) increased. This also holds true for the protective forest function as a stimulus for protection. Overall, aesthetic and research motivations were less important across Europe before 1789.

The early Romantic period coincides with what is often called the *"age of revolutions"* including, of course, the American (1776) and the French (1789) revolutions, an age of upheavals in political, economic, and social traditions, the age which witnessed the initial transformations of the Industrial Revolution. It moved people from the countryside into rapidly expanding towns. It turned labour into a disciplined and mainly indoor activity, with an increasing distinction between owners, employers and managers on one side and workers on the other. Industrialization brought preliminary exploitation, pollution and urban squalor. The fear of loosing the former "harmony" of men and landscape renewed interest in folk culture. The search began to preserve the stories, songs, legends as an international language of human commonality, In the Romantic period Nature was a constant companion and teacher and became the context in which man came

to understand his place in the universe.[3] Thus the view of the increasing urban society on nature and natural phenomena changed, thereby also altering the importance of motivations with regard to protection. Part of this development was the birth of several civil movements that put focus on the natural value of nature and aimed at its protection (see figure 8).

From the beginning of the 19th century onwards the exploration of natural phenomena gained more and more importance, also in connection with the exclusion of forests and woodland from utilisation for the purpose of nature observation. This period is closely connected to the early nature and homeland protection movement, also noticeable in other fields.

As Germany's nineteenth-century industrialization and urbanization threatened the country's scenic landmarks, middle-class Germans were among the first in Europe to call on both the state and private citizens to protect their nation's environment. Of greatest concern to Germany's landscape preservationists was the effect of industrial modernity on the character and contours of *homeland* (*Heimat*), a word that signifies a deep emotional attachment to place. Following Riehl (1851), a conservative social theorist of the mid-nineteenth century, many nineteenth-century observers recited the aesthetic enjoy-

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[3] http://www.geocities.com/froebelweb/web4003.html visited Sept. 23 2006
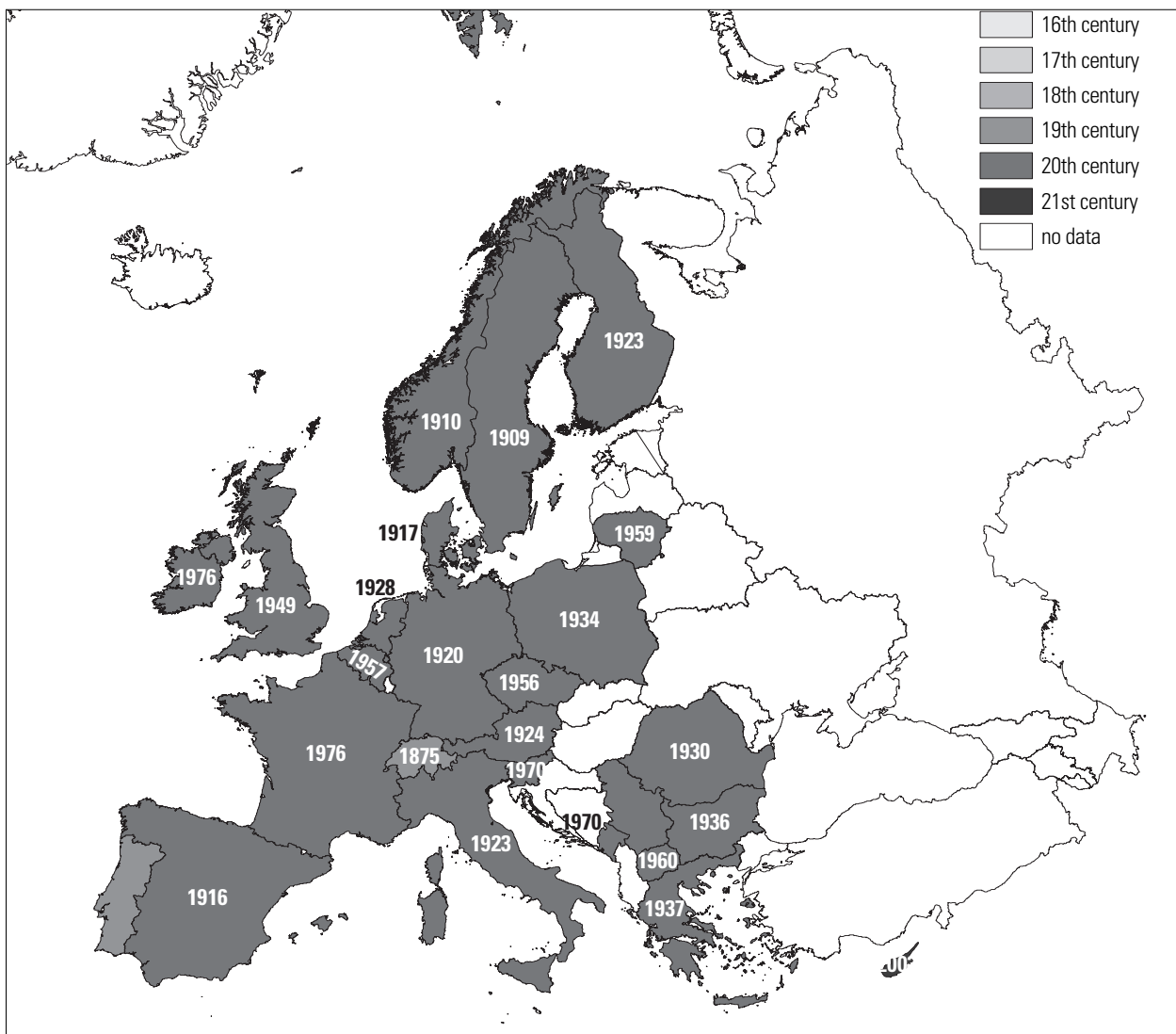
Figure 9:
The enactment of the first nature protection laws in Europe

ment of forests, meadows, and rock formations as a form of sacred patriotic devotion, arguing that such landmarks needed to be revered and protected. As Riehl once remarked, "*We must retain the forest not only to keep our stoves from growing cold in winter, but also to keep the pulse of our nation beating warmly and happily*". *Homeland* societies' activities included the creation of local heritage and natural history museums, research into local folklore and dialects, the publication of regional histories, and historic preservation (Lekan, 2004). Since the 1900s the growing interest in biodiversity became the dominating motivation for nature protection in almost every European country (late nature and homeland protection movement).

New associations formed, under the headings of *Naturschutz* (nature protection) and *Heimatschutz* (homeland protection), that gave rise to an environ-

mental reform movement that for instance by 1914 included tens of thousands of members located in every German state and province. These organizations dedicated themselves to a variety of nature preservation activities, including researching and creating inventories of Germany's natural features, lobbying government agencies to pass regulations designed to protect the *Heimat* landscape, and raising public awareness about both the beauty of nature and the need to care for the natural environment. As part of the modernizing efforts of the Weimar Republic, these organizations also began in the 1920s to involve themselves in regional landscape conservation, that advocated future-oriented, environmentally sensitive planning, and laid the institutional foundation for modern environmental regulation. This development can be observed in most European countries, however with divergent intension and duration.

Landscape preservation and the preservation of the habitat in general (particularly rare species of fauna and flora) became an important task from the beginning of the 20th century onwards (see figure 7). Many landscape preservation organizations developed as branches of regional natural history groups, beautification societies, and hiking clubs (e.g. *Deutscher und Österreichischer Alpenverein*).

During World War I a decrease with regard to protection movements and activities can be recognized in almost every European country, particularly concerning the aesthetic motivation and biodiversity. However, research gained increasingly importance and developed during the subsequent decades. The wide-ranging economic crisis of the 1920s and 1930s and the general need for timber and firewood (in some countries timber was the only resource which was considered to improve the state's budget) were the reasons why the protection of forests and woodland was not a priority. This also holds true for the protection of biodiversity. However, also in this period nature protection became an important task and gave rise to the publication of the first nature protection laws in many European countries (see figure 9).

The destruction of extended forest areas during and after World War II (over-exploitation, large clearings) was the driving force for a growing interest in ecology, visible in forestry (close to nature silviculture) as well as in nature protection from the 1950s onwards (see figures 7 and 8). This social concern is apparent from the numerous nature protection laws published in the second half of the 20th century (see table 1). The importance of nature protection movements increased from the 1970s onwards and was very much supported and promoted by research. The year 1970 can be considered as the beginning of a new approach in the field of nature protection. Thus the idea or protection moved from the protection of specific natural phenomena and small protected areas to an integrated protection of large areas and the protection of the forest ecosystem as a whole taking into consideration its biodiversity.

4.2.   Differences and possible reasons

Although a general development of nature protection can be observed in the course of European history, some remarkable divergences are evident with regard to the ranking of importance of the different kinds of motivation. The reasons might derive from different facts.

- Geographical location and topography
- Climate and percentage of forest cover
- Population density
- Time, duration and intensity of industrialisation
- Type of forest management
- Time of implementation of forest laws
- Time of implementation of varying protection laws
- Wars and its results

4.2.1. Geographical location and topography, climate and percentage of forest cover, population density

Landscape changes are generally driven by settlement and cultivation. Since the last ice age human beings have taken advantage of the possibilities offered by the surrounding landscape, although their impact on vegetation was initially confined to a small area (Küster, 1995). However the natural conditions for the growth varied within a wide range across the different geographical regions. Though apparently present in Turkey and eastern Greece by around 8,000-9,000 years ago, the impact of agriculture on vegetation seems to have been very localized. Elsewhere in Europe, the only human communities present seem to have been hunter-gatherers, but by 5,000 years ago agriculture had spread to most parts of Europe. These early cultural changes have very much influenced the development of the forest surface.

At this later time, evergreen Mediterranean vegetation replaced deciduous forest in Greece and Italy. In southern France, however, pollen evidence indicates closed deciduous forest present in areas that are now evergreen scrubs, although with some indications of sporadic clearance. Widespread clearance and replacement by maquis seem to have occurred only around 2,000 years ago. Approximately 5,000 years ago, the pine/evergreen-oak forest cover was decreasing in the Ebro Basin of north-eastern Spain. On Crete, pollen evidence also suggests that ca. 5,000 years ago the original deciduous forest cover was lost, to be replaced by maquis. Some parts of the English chalklands may have been largely cleared for agriculture at the same time. However, these localized occurrences did not influence the overall pattern. Willis and Bennett (1994) argue, on the basis of their review of pollen evidence from around Europe, that agricultural impact on the vegetation was negligible almost everywhere before 4,000 years ago. Even in Greece, significant soil erosion due to deforestation does not seem to have occurred until about this time, when the
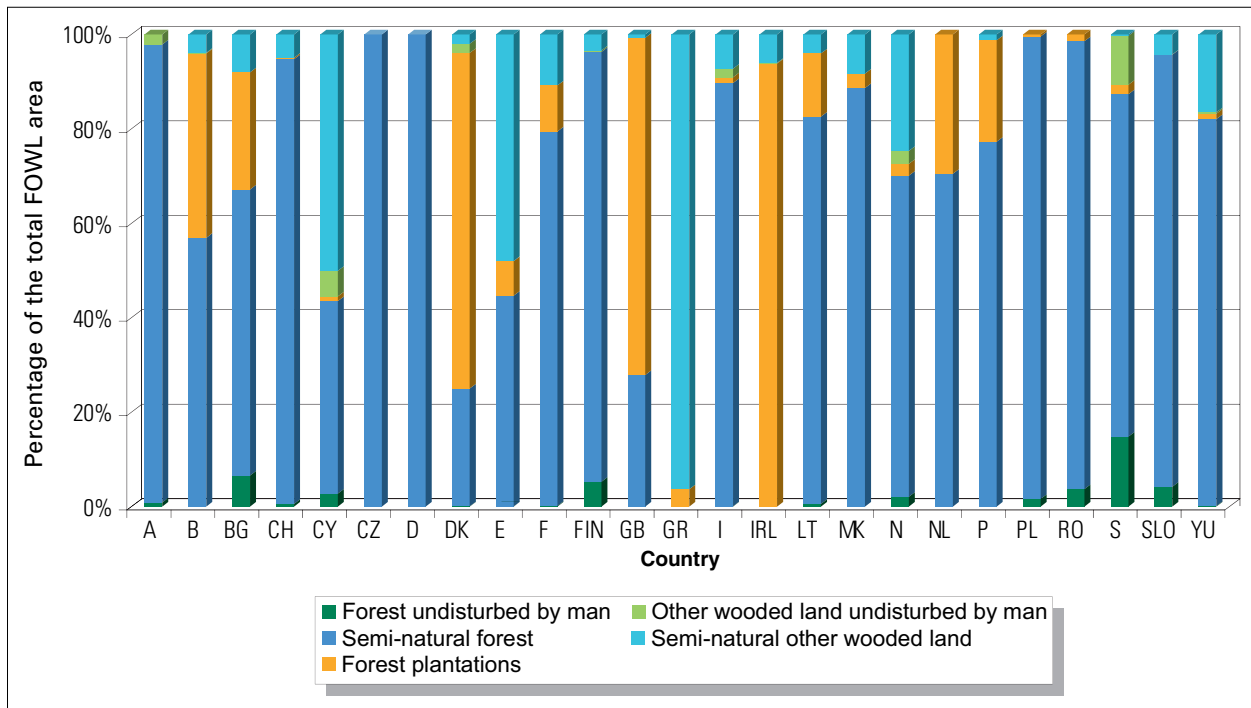
Figure 10:
Forest and other wooded land by categories of naturalness in the COST E27 countries (MCPFE, 2003b)

Figure 11:
Forest and other wooded land by forest types (species groups) in the COST E27 countries (MCPFE, 2003b)
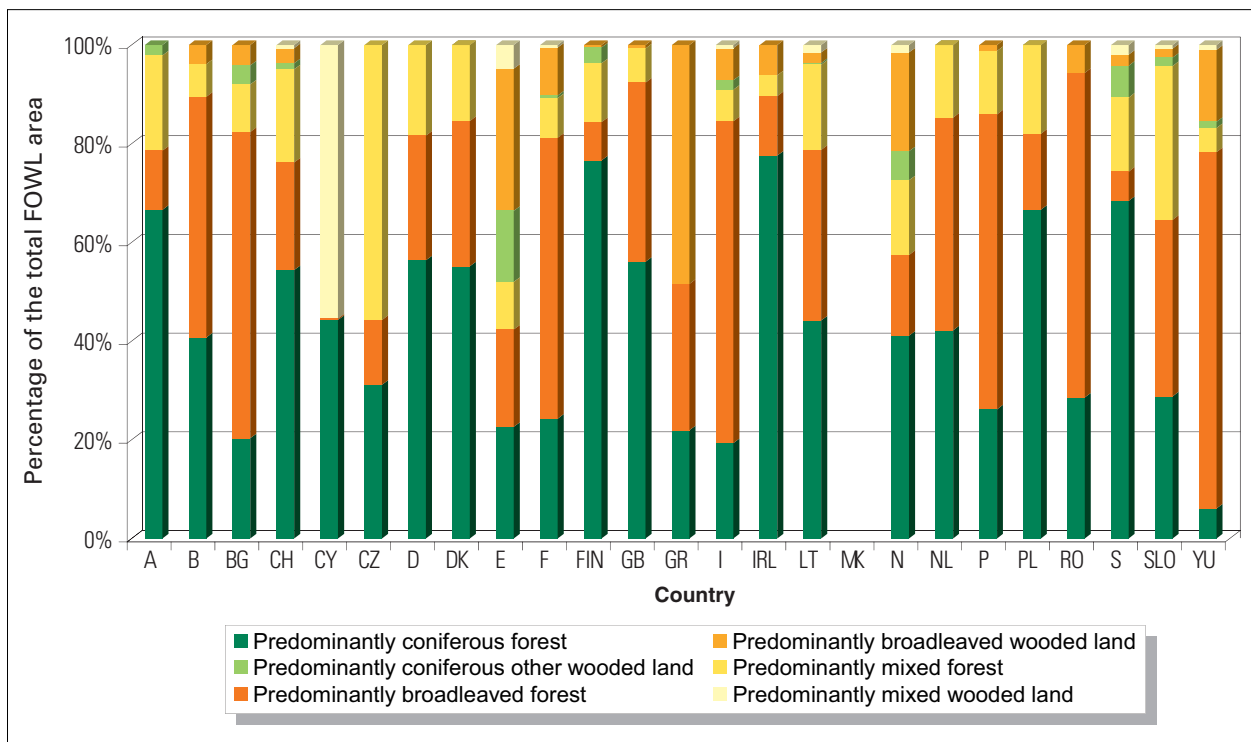
clearance of the original forest cover for agriculture also started in Western Europe (Great Britain, France, Netherlands, Denmark). In Central Europe, however, the composition of tree species and the spreading out of woodland remained quite stable until the early

Medieval period, from which time onward in this region much of the original forest cover was likewise cleared for agriculture (Johann, 2004b). Because of these early clearings and the efforts during the 19th/20th century concerning afforestation the percen-

tage of plantations – in relation to the total forest surface - is the highest such as in Belgium, Denmark, Ireland, Netherlands, Portugal, Great Britain, whereas in Central and Northern Europe the semi-natural forests still dominate (see figure 10). This is due to the fact, that in these countries the forest cover was never totally removed and a certain proportion sustained over the centuries (e.g. Austria, Czech Republic, Finland, Sweden, Germany, Poland, Slovenia, Switzerland). Sweden and Finland are the countries with the highest proportion of untouched (ancient) forests in Europe. Figure 11 also proves, that apart from the natural potential vegetation these plantations were carried out mainly with conifers. Thus the percentage of conifers (growing on sites where broadleaves are the natural potential vegetation) of the total forest surface in Ireland, Great Britain and Denmark are among the highest in Europe. In these countries despite or just because of the small amount of remained woodland in particular ancient forests the intensity of the occurrence of nature protection movements from 1789 increased and is still an important social demand today. It is also proven by the early establishment of National Parks in these countries (the Netherlands 1930, Ireland 1936, United Kingdom 1951) (see figure 1).

4.2.2. Time, duration and intensity of industrialisation, type of forest management, time of implementation of forest laws

Although a general trend towards regular forest management can be noticed in the 19th century in Europe, the time when the first forest protection laws were enacted differs. Apart from the earliest activities, a slow but continuous increase can be observed after the migration of peoples, until a first peak in the 16th century. Measures to sustain the forest cover, forest policy and the organization of forest management were closely associated with the proportion of the existing woodland.

Thus a large number of laws aiming at sustainable forest management and the protection of the forest surface occurred in regions where there was a high demand for firewood and charcoal for industry and related mining activities (mainly salt and iron ore) (see fig. 1 and 2). However there is occasional mention of measures for forest protection by the 13th and 14th centuries Laws and orders aiming at a sustainable forest management increased from the 16th century onwards. The regional trend was stopped by the effect of the Thirty Years' War (famine, widespread depopulation, decrease of industry). However,

this outcome was less important in some parts of Europe (e.g. mining districts in Austria, Hungary, Slovenia), thus resulting in an strengthening and standardization of forest legislation concerning forest management and protection of the forest area. The 19th century's increasing demand for energy gave rise to a growing interest in forest protection, and at this time also in countries not previously involved in forest legislation. The demand for forest protection was particularly high in countries where intensive farming had reduced the forest surface to a minimum, and consequently the establishment of protected areas increased in these countries (e.g. Spain, Italy, Great Britain, the Netherlands). Thereby the motivation moved from general protection to the protection of distinct objectives of protection.

4.2.3. Time of implementation of various protection laws

The varying demand for protection, caused by local conditions (topography, geographical site, climate) is also expressed by the time when protection laws were coming into force. In the Alps the protection of the cultural landscapes, woodland and local people regionally had already become law by the 13th /14th century. Due to natural hazards the demand increased in the course of the 19th century, particularly in the mountainous regions (e.g. France, Italy, Austria) and countries subject to soil erosion e.g. Slovenia, Croatia, Hungary, Germany. In the course of the 20th century the protection of the cultural landscape and human beings became an important mission in the countries concerned with this problem. The establishment of protection and protective forests is closely related to this task.

5.   Remarks

The contradiction between landscape-destroying industry and supposed undamaged nature, having been put on an equal footing with rural cultural landscape. It has gone on for more than one hundred years, and is still effective until today. People are no longer aware that cultural landscapes have also been shaped by human beings. The 18th century's gardens and parks copied former grazed woodland and coppice forests (English landscape gardens) or pollarded trees and shrubs (Italian and French gardens and parks). Mass-tourism of the

present day demands natural recreation landscapes. And nature protection movements waver between the request for wilderness and the safeguard of certain species.

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ANNEX

Table 1:
Development of forest and nature protection in Europe[4]

County		First Protected Forest Area(s) of the modern times	Establishment of the first protected area categories	Establishment of the first national park		First nature protection law(s)	First institution(s) responsible for PFAs	First forest law(s)	Beginning of the regular forest management
		Year	Year	Year	Type5	Year	Year	Year	Year
Austria	A	1517	1852	1983	2	1924		1852	
Belgium	B		1957		3	1957		1856	ca. 1830
Bulgaria	BG	1931	1936	1934	1	1936	1958	1883	1883
Cyprus	CY	1983	1967	1983	1	2003		1879	1879
Czech Republic	CZ	1838	1933	1963	1	1956	1922	1754	1754
Denmark	DK				3	1917		1805	
Finland	FIN	1803	1938	1938	1	1923		1851	1851
France	F	1853	1906	1963	2	1976			
FYR of Macedonia	MK			1948	26	1960	1949	1961	
Germany	D	1806	1852	1969	1	1920	1906	1816	
Greece	GR	1938	1937	1938	1	1937		1836	1928
Ireland	IRL		1936	1936	2	1976	1970	1946	1906
Italy	I	1856	1922	1922	2	1923		1877	1980
Lithuania	LT	1541/ 1847	1937	1974	1	1959	1957		
Netherlands	NL	1547	1906	1930	1	1928	1905	1917	ca. 1900
Norway	N	1898	1970	1962	2	1910		1965	1920
Poland	PL	1890	1921	1932	1	1934			
Portugal	P	1971	1970	1971	1			1824	1824
Romania	RO	1873	1927	1935	1	1930	1930	1881	1852
Serbia and Montenegro	YU	1821	1948	1960	1	1970		1839	1839
Slovenia	SLO	1614/ 1892	1914	1981	1	1970	1940	1852	1771
Spain	E		1855	1918	2	1916	1917		1835
Sweden	S	1500	1909	1909	2	1909	1964	1903	1850
Switzerland	CH	1548/ 1876	1838	1914	2	1875	1906	1809	
United Kingdom	GB	1877	1920s	1951	2	1949	1949		1919

[4] Selected data derived from the history questionnaires supplemented with data derived from the country reports (red: supplemented from country report)

[5] 1: forest national park, 2: non-forest national park, 3: no national park

[6] information taken from the World Database on Protected Areas (http://www.unep-wcmc.org/wdpa/)

COST Action E27

Protected Forest Areas in Europe - Analysis and Harmonisation (PROFOR)
Results, Conclusions and Recommendations

Organisations Involved in the Establishment and Maintenance of Protected Forest Areas

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Abstract. In order to establish and manage Protected Forest Areas (PFAs) in a country, there must be a structure of actions, agreements and obligations in that country, which may differ for different types of PFA. Some tasks (policy making, development of legislation) tend to be the responsibility of national government; others (executive tasks, local surveillance) are more often carried out at local level. Besides the obvious responsibilities (such as the establishment and management of PFAs) countries' policies on PFAs depend on certain strategies influenced by international agreements, lobbies and the national social and economic climate. Furthermore, there is a legislative framework, which often incorporates regulations, restrictions and optional subsidy arrangements for PFA types and names the institutions accountable for managing PFAs.

The network of organisations accountable for PFAs differs to some extent in each member state of COST Action E27. This chapter highlights the similarities and the differences between and within countries. The resulting insight can help understand certain actions and anticipate the reactions of countries to international decisions and agreements. It also gives a clue as to why certain countries have difficulty in providing national data. Some of the variation is attributable to the country's politics and history. Other differences may be due to the influence of country size and socio-economic climate on the organisational structure.

Keywords: Forest protection, institutional organisation, Europe, comparative analysis

This chapter highlights what the organisations and stakeholders involved in establishing and maintaining PFAs in or between the countries in COST Action E27 have in common and what are unique features. The information presented is based on the Country Reports, questions to individual delegates and a survey of all twenty-five countries. An overview of the tables showing the organisations responsible is provided in Annex 1 in Chapter 7.

1.   Operating level of organisations

The level of government involvement, i.e. the degree to which government decisions, directions and obligations have to be followed, varies depending on the responsibilities associated with nature conservation (Fig. 1).

Organisations related to PFA categories operate on different levels. Most government organisations responsible for outlining policy and developing procedures for designation, control and subsidy arrangements operate at the **national level**. Networks and the designation of National Parks are also often planned centrally for the entire country.

Countries with an established **regional level** have organisations that operate county, region or province wide. Although legislation, policy-making and planning are developed centrally, in practice, the more detailed management planning for regions and executive tasks are transferred to regional forest and nature services, National Park administrations, consultancy bureaus or non-governmental organisations (NGOs).
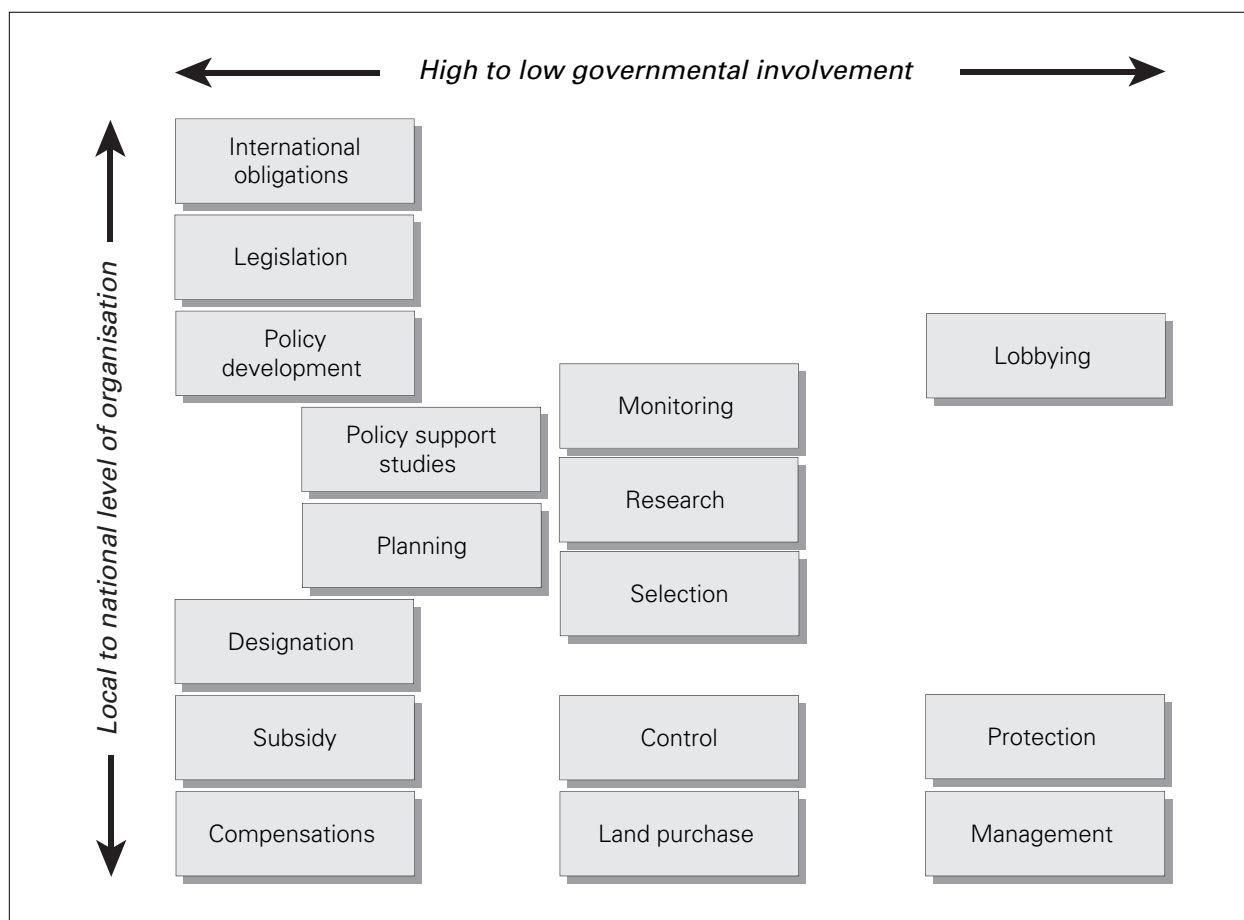
Figure 1:
Actions and concepts influencing the establishment and maintenance of PFAs. Their position in the figure regarding level of organisation and government involvement may vary per country and per PFA type

At the **local level**, executive tasks become more frequent and plans more detailed. Local administrative boards, NGOs, private landowners, municipalities and districts have a certain degree of freedom for decision making, planning and management. In many countries, a process of devolution of power is ongoing. While thresholds in terms of quantity and, to a lesser extent, quality of PFAs are set at a higher level of organisation, local organisations can determine the exact locations and delineation of PFAs.

The structure of organisational levels differs between countries. Furthermore, some organisations may operate at different levels simultaneously. For example, in Denmark, international legislation has been incorporated in nature conservation policy by the Danish Forest and Nature Agency at national level, while the actual implementation is done at the regional level by the same organisation.

An exception to the tiered organisational structure is Cyprus, where the Ministry of Agriculture, Natural Resources and Environment and the Council of Ministers do the planning and decision-making and the national Forest Department is accountable for most executive tasks.

The picture of operating levels acquires an additional dimension for countries with a federal-like structure: Austria, Belgium, Germany, Serbia and Montenegro, Spain, Switzerland and the United Kingdom. In these countries, authority is often devolved to a **sub-national level**, respectively to 9 Federal Provinces, 3 regions, 16 Länder, 2 republics, 17 Autonomous Regions and 2 Autonomous Cities, 26 cantons and 4 countries. One task that continues to be the responsibility of the national government is to ensure that the country's policies comply with international agreements and obligations. In many cases, federal institutes are supported or coordinated by organisations operating nationally. The political structure has a strong influence on the hierarchy. Country size, however, is not significantly correlated with the number of levels (Fig. 2). A preliminary assumption that small countries have fewer organisa-
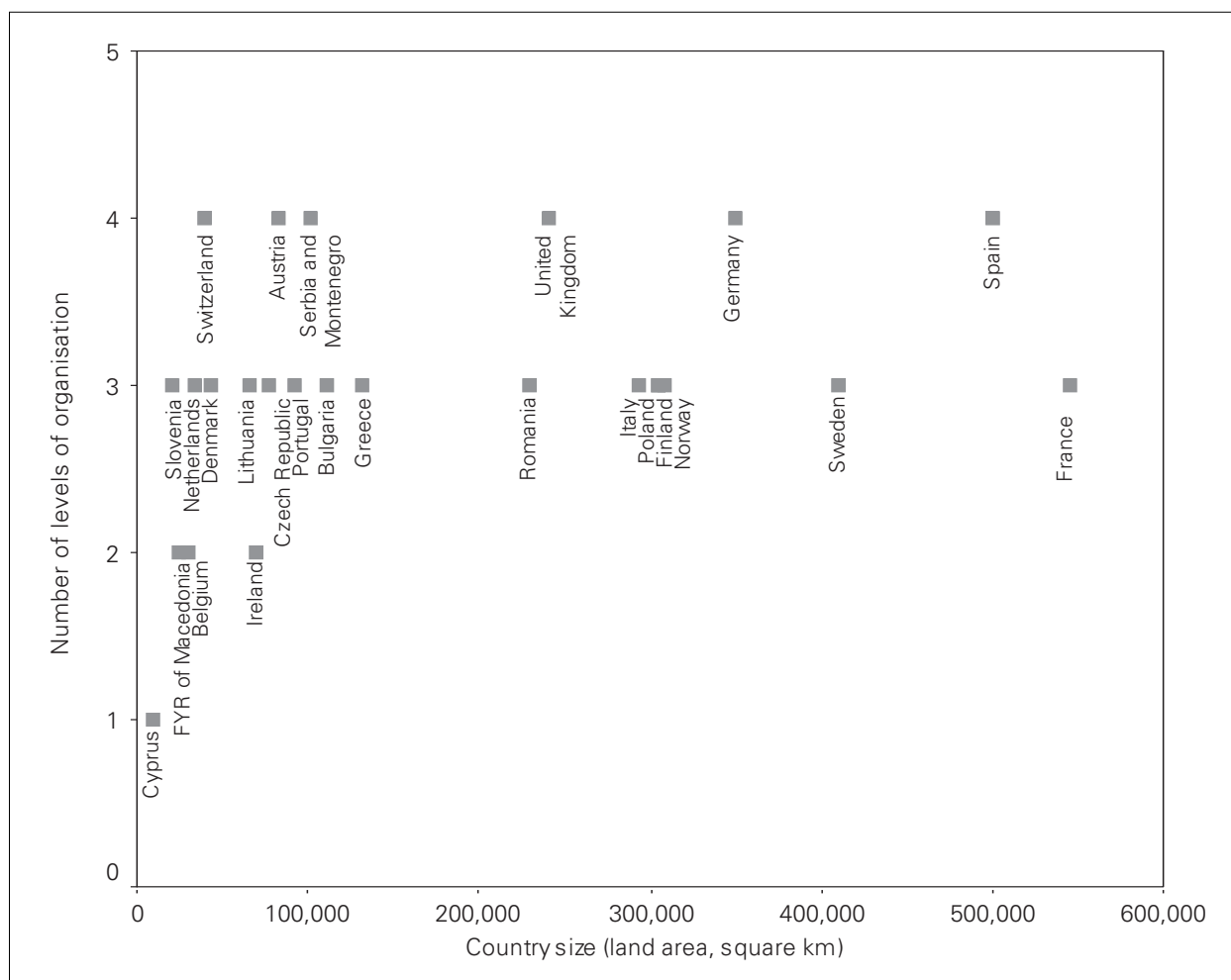
Figure 2:
Number of levels of organisation of nature conservation, ranging from the local to the national level, in relation to country size. The importance of the national level of organisation varies from country to country

tional levels (i.e. a less complicated organisational structure) than large countries needs further investigation. For a more extensive overview of multi-level governance in Europe in relation to National Forest Programmes, see (Hogl, 2002).

2. Type of organisation (accountability to government decisions, duties etc.)

The countries analysed have different types of organisations, with varying powers to make decisions. In some countries (e.g. Bulgaria, Cyprus, Greece) almost all decisions are governmental and organisations generally have to act in accordance with them. In such countries, government organisations also do research

to support policy. In other countries (e.g. Italy, Poland, Romania), many tasks are the responsibility of organisations that operate independently of the government and are also financially independent. These NGOs may be publicly owned (with membership open to individuals), or privately. In Switzerland and Denmark, decisions are made by the government, but nature conservation NGOs that operate at a national level and have been in existence for some years have the right of appeal. This right means that objections can be filed against decisions relevant for nature conservation and environmental protection. In this way, NGOs using their expertise in these fields can highlight negative effects on nature and the environment, thereby providing an important counterbalance to strong economic interests in public and private projects.

A nonparametric statistical test (Kruskal-Wallis) shows that the post-socialist countries have signifi-

cantly (p = 0.020) fewer NGOs than the other countries. On the other hand, the number of tasks carried out by NGOs is not significantly different between post-socialist and other countries.

Exceptions to the distribution of organisations between government and non-government are the so-called QUANGOs: quasi-autonomous non-governmental organisations, i.e. administrative bodies that are nominally independent but rely on government funding. The acronym NDPB, non-departmental public body, is often suggested as being more appropriate.

Universities in general are difficult to classify within the abovementioned categories, as in half of the countries they are registered as government institutions, funded by the government; but in all countries they generally carry out research independently of government influence and thus their function of doing independent and objective research is maintained.

3. Organisations and their responsibilities regarding PFAs

The existence of PFAs is based upon a structure of actions supported by a range of organisations. Table 1 shows these different actions relating to PFAs in terms of the level and type of organisations accountable for the action. The numbers refer to the number of countries having organisations with the attribute in question. Tables specified for each country can be found in Annex 1 in Chapter 7. The table indicates the strong influence of the national level, and of mainly government organisations with little independence, except for lobbying, done at all levels of organisation by non-government organisations, and selection of areas and research, done at all levels by both government and non-government organisations with usually some degree of independence.

Table 1:
Potential tasks in terms of operating level, type and degree of independence of organisations responsible for PFAs. Numbers refer to the number of countries having organisations with the task in question. Within a given country, some tasks are carried out by organisations from different operating levels, types or degrees of independence, therefore the sum of a row may exceed the value of 25 (the total number of countries in the analysis)

Task	Number of countries	Operating level				Type		Degree of independence		
		National	Sub-national	Regional	Local	Government	Non-government	None	Independent in some ways	Operating independently
International agreements and obligations	25	24	3	1		25		23	3	
Review and development of legislation	25	21	7	2	1	25	1	23	3	2
Policy support and foresight studies	24	21	6	5	2	24	7	13	19	6
Lobbying	25	22	6	17	15	5	25	2	6	25
Selection	25	21	9	18	16	24	19	14	17	19
Land purchase	23	19	7	14	11	23	14	17	15	10
Designation	25	20	8	9	8	25	3	22	9	3
Management planning	25	20	8	18	10	24	9	17	19	5
Protection	25	21	9	19	14	25	15	18	19	11
Research	25	22	8	17	10	23	18	7	23	17
Monitoring	25	22	7	7	4	25	6	12	19	7
Control	24	17	8	11	7	24	1	15	14	1
Compensation	21	15	8	7	4	21	1	15	9	1
Subsidy arrangements	22	15	6	7	3	21		15	7	

3.1. Legislative framework and international/national agreements, regulations, obligations

In all the participating countries, it is the government that develops, implements and reviews legislation and incorporates international agreements. In some countries with a federal-like structure authority regarding legislation and implementation of ordinances in the field of nature conservation is often devolved, leading to different legislative systems, for example in Belgium, where in Flanders a Forest decree (1990, last amended in 1999) and a law on nature conservation (Nature decree, 1997) have come into force, while in Wallonia the old forest act of 1854 and the nature conservation act of 1973 are still in force. Countries with more than two subnational entities often have a more complex structure of legislation development.

Restrictions on general activities within PFAs and the protection of the overall forest area are generally imposed at national or federal level through legislation, regulations, ordinances, etc. relating to nature conservation. In a few countries (Spain, Switzerland) a procedure for designating or establishing PFAs is embedded in legislation. In Greece, expropriation of private property is mandatory in core areas in the National Parks (the most recent of which was designated in 1974).

It should be mentioned that not all PFA categories described in the Country Reports of this Action are protected by law. Nevertheless, they have official status in terms of designation and maintenance. Their protection often relies on voluntary initiatives and nature conservation agreements. There is a Europe-wide trend for private owners to take on the protection of PFAs through these types of nature conservation and agri-environmental schemes.

Many countries have ratified international conventions, some of which include agreements on binding restrictions and activities. However, rather than stipulating obligations, most conventions propose distinct policy guidelines that parties can follow (ECNC 2002, WWF, 2003).

Implementation of Pan-European agreements in national legislation does occur to a moderate degree. Amendment acts realign national policies for nature conservation with contemporary EU policies. The protection of the EU Natura 2000 network is often arranged by updating decrees. New EU member states have made considerable efforts to comply with European environmental legislation.

3.2. Policy development and reactions from outside

It is the ministries (departments in Ireland and the UK) in charge of environmental policy that are responsible for nature conservation policy strategies within the existing framework of nature legislation. In some countries, the protection of forest areas is in the remit of a ministry of environment; in others, this responsibility is split between two ministries: one including environmental issues and one including agriculture.

Policy lines concerning nature conservation and PFAs are usually based on policy foresight and monitoring studies by supportive institutions which may or may not be governmental. In most of these organisations, funding through government is usual (so, they are QUANGOs). Policy, eventually adopted on national level by governmental institutions, contains the guidelines for regional or local organisations, which have a certain degree of freedom to act and which usually report final decisions and designations to higher authorities, to which they also submit annual reports.

In line with national and international agreements, there is a general tendency to enlarge nature networks (e.g. Natura, 2000) in policy plans.

Policy lines, when made public, provoke reactions from different stakeholders. Lobbies try to win votes to strengthen their point and to get authorities to pay more attention to it. In some countries, individual parties or persons lobby for single actions; in other countries, lobbying is more organised. Special mention should be made of Switzerland, where lobbying is an integral part of the political system: the general public are targeted for lobbying as well as the government, as decisions are often made by referendum. Bulgaria and Spain explicitly mention that several Ministries also lobby.

3.3. PFA appointment procedures

The process of selecting and designating PFAs is often complicated: for example, in Norway there are 8 steps from selection to the final establishment of a PFA, including documentation and study, planning and involvement of stakeholders. The selection procedure can be legally binding to a greater or lesser extent and differs strongly between countries and between PFA types. Government institutions operating within the current policy lines and legislative

framework are usually responsible for selecting PFAs; they are often supported by government or independent advisory bodies or research institutes. Generally, private owners or NGOs can make proposals for new PFAs, although if they do not own the sites proposed, the chance of success is small.

The criteria for selection may be scientific, or pragmatic. The scientific approach for selection is usually based on conservation of species or habitat types, or on the naturalness of the area in terms of natural dynamic processes. For an analysis of selection criteria, see chapter 2.4 of this report.

It is common for government institutions to select areas at local level, following instructions regarding average size and total area of a certain PFA type or network set at national or sub-national level. Sometimes (e.g. in the Netherlands) large NGOs have their own selection procedures for PFAs. Where selection is devolved to independent institutions at regional and local level, the responsibility for the final designation of PFAs usually rests with national or sub-national authorities. The size of the area is also a factor: the designation of smaller areas is the responsibility of lower authorities, whereas in the case of larger PFAs, especially National Parks and network structures, it is usually the Minister of the accountable ministry who has to sanction the final designation personally. In Germany, certain accredited nature conservation organisations can participate in the designation process; in Austria, designation also takes place in response to proposals from private parties.

In almost all the countries, it is national, regional and local authorities and the larger NGOs (and sometimes – e.g. in Denmark – large private organisations) that purchase land for nature conservation. Sometimes, the possibility of the state or an NGO acquiring the land is taken into account in an analysis of potential PFAs. In other cases, final designation automatically includes acquisition of the site by the state. The procedures for land acquisition also depend on the strictness of the management regime in the PFA type and the legislative framework in the country concerned. Examples of countries in which land purchase is not practised are Bulgaria, and Serbia and Montenegro. Another way to protect areas is through contracts or agreements (e.g. for a period of 20 or 50 years) between the accountable organisation and the landowners. Several countries prefer this strategy rather than land purchase.

Post-socialist countries such as Lithuania, Poland and Romania are still dealing with claims to land made by pre-socialist owners or their heirs. This, like the newly established Natura 2000 sites throughout Europe, can interfere with the national policy for nature conservation and the establishment of networks. The pre-purchase or expropriation rights of the state and the compensation mechanisms for forest owners differ hugely between countries (FAO, 1997).

3.4.   Management planning and in situ protection of PFAs

Before actual protection measures are taken, management plans are drawn up for the protection of PFAs. Some countries have sophisticated guidelines for the maintenance of habitats, species and natural processes in the existing forest types. Often, specialised institutions are responsible for planning nature protection and conservation at site level, though sometimes private owners and NGOs draw up their own plans. In half the countries, the management planning and the actual management are done by the same or same type of organisation; in the remaining half, different organisations are sometimes in charge of the separate tasks. The Slovenia Forest Service is responsible for drawing up forest management plans for the entire forest area in the country, regardless of the ownership. In most countries, the approval and adoption of plans of larger PFAs and networks is the responsibility of the state.

In most cases it is the owner who is responsible for the management and protection of the PFA (see e.g. the section on ownership in the COST E4 document by Bücking et al., 2000, p.49). However, sometimes management is not done by the owner. Furthermore, some areas have more than one owner. Therefore sometimes, in larger PFAs, a dedicated board or independent legal entity ensures that the interests of all stakeholders involved are considered, while taking into account the protection objectives of the specific PFA.

Management for the protection of PFAs can be active or passive, to protect against undesired external and internal influences. Sometimes (e.g. Lithuania) management also includes involving and encouraging the general public to make sustainable use of natural resources. Finland mentions that sometimes NGOs organise work camps in state-owned PFAs, in order to carry out conservation measures. Authorities may influence the management of protected areas by offering grants, or by making recommendations.

3.5. Research and monitoring in PFAs

Research in relation to PFAs can be classified as 1) research for the purpose of setting out and supporting policy lines, as mentioned in section 3 or 2) research and monitoring carried out by independent organisations (universities, research institutes, expertise agencies). Some of the applied research is commissioned by NGOs, independent institutes or private individuals. Most of the fundamental research is carried out by universities and research institutes that have some degree of independence. The funding, however, often comes from the state or from national or international grants. Selection criteria for the acceptance of project proposals can significantly influence the type of research. NGOs may also fund research projects or studies. Research by all types of institutes is carried out at different scales, either organised as a national network of research or as individual regional or local projects. According to (Birot et al., 2002), smaller countries tend to have a certain narrowness of policy research, due to the limited number of institutes involved.

Monitoring, defined as the ongoing study of habitat or population development over time, takes place in research for political purposes (e.g. impact studies to assess the effectiveness of management, which is then reported to the government, and to Europe for Natura 2000 sites) as well as in applied and fundamental research for other purposes. Single inventories are sometimes confused with monitoring efforts. Existing national monitoring grids or schemes are listed and discussed in the separate Country Reports. The ongoing COST Action E43 'Harmonisation of National Forest Inventories in Europe: Techniques for Common Reporting' includes a more extensive investigation of monitoring systems.

3.6. Checking compliance with regulations and agreements

Instruments for the checking the implementation of agreements and protection measures include local surveys and assessments, case studies and national monitoring programmes. The implementation of agreements etc. is usually checked by a government institution, operating independently of the planning and management of PFAs. Although legislation is created at national level, it is enforced by regional and local offices and municipalities, who also check

that agreements and regulations are being complied with in their region. In the case of larger PFAs with several owners, the established boards inspect the agreements incorporated in the jointly developed management plans. In Switzerland, NGOs can check protection measures in their own PFAs. They may also carry out case studies or surveys in PFAs administered by cantonal or federal authorities and thus exert political pressure to enforce protection measures.

If the actual management does not comply with agreements on management activities or statutory restrictions, the organisation or individual accountable may be fined. Neglect of agreements may have consequences (sometimes these are statutory) for subsidies or compensation. The control system is not comprehensive in all countries, and often a sample of areas is taken to represent the entire national protected area.

The impact of protection measures is usually checked by means of assessments and national monitoring programmes.

3.7. Compensation and subsidy arrangements

Compensation is paid to landowners for loss of income and, implicitly, the loss of the freedom to make future decisions because of the nature conservation arrangements, including non-management, relating to their property. Most often, all or part of their land has been designated a PFA and compensation payments are a passive way of 'buying' their acquiescence. Another recent development involves inducing private owners or NGOs to undertake nature conservation, by making grants available for certain management activities and conservation measures in PFAs. Furthermore, as chapter 2.6 of this report emphasises, the socioeconomic value of PFAs for different stakeholders can act as an incentive for protection.

This relatively new concept of incentives for nature conservation is approached differently in many countries. For example, in Bulgaria and in Serbia and Montenegro, compensation is paid and there are no subsidies, while in Poland there are subsidies but no compensation mechanism. Switzerland and Slovenia incorporate compensation and subsidies in one system. In Romania, the structure for compensation is in place, but no payments have yet been made. (Papageorgiou & Domínguez-Torres, 2002) mention that in some countries forest owners are reluctant to

apply for grants due to the complexity of institutional and administrative processes.

In general, compensation and subsidies are paid by government institutions to non-government owners. Compensation for loss of income due to the expropriation of land is usually done in a single payment; management contracts usually depend on existing schemes of incentives for special management activities. In some countries there is a practice of drawing up voluntary contracts between the landowner and the government.

Areas that are eligible for compensation or subsidies are usually part of larger PFAs or PFAs selected and checked according to well-defined criteria. Examples of payments for nature conservation are Natura 2000 contracts and harvest loss compensation in France, compensation or subsidy structures for nature reserves, national parks and Forest Key-Habitats in Sweden, compensation for the purchase of private lands in Greece and subsidy schemes for the execution of specific management activities in the Netherlands. In Bulgaria, private owners whose property is inside a (future) PFA are given the opportunity to exchange it for land elsewhere.

In many countries, the owners of properties included in PFAs that are eligible for subsidies also incur additional mandatory supervision. Usually, it is government organisations who supervise the agreements for paying compensation and subsidies. In Switzerland, NGOs and private persons or enterprises sometimes sponsor PFAs.

4.   Discussion and conclusions

In general, the countries included in this study have similar organisational structures for the protection of their PFAs. The extent to which tasks are devolved often depends on the country size: larger countries tend to devolve more decisions to lower authorities, whereas small countries retain power at national level. The political situation also influences the organisation of nature protection to a large extent: countries with a federal structure often develop legislation, carry out monitoring and designate PFAs at sub-national level, although the broad policy lines are set out at national level. It is therefore usually complicated for such countries to provide country-wide data on nature conservation. In Switzerland, the political system with plebiscites and referendums

on most important decisions complicates the establishment of PFAs and the implementation of protection measures. Awareness raising and the provision of incentives for nature conservation are used to increase public acceptance. Finally, the role of NGOs differs strikingly between countries, with responsibilities and tasks ranging from lobbying in all potential ways, to PFA protection and land purchase.

The consequences of the federal system on nature conservation are usually that the designation procedures, enforcement of nature protection legislation and policies and sometimes even PFA types within one country differ per state. In general, this situation has not improved in recent decades; in the United Kingdom there is even a devolution of decisions. This decentralisation of government structures and functions is ongoing in most countries (FAO 1997, Neven, 2002).

Most of the post-socialist countries are, or are in the process of becoming, members of the European Union, i.e. have complied with EU requirements concerning nature conservation. There are no striking differences between post-socialist and other countries in procedures and policies. The post-socialist countries may ultimately have as many NGOs as the other countries. The NGOs in the various countries carry out a similar number of tasks, but it should be noted that differences in the influence NGOs have in each country were not investigated in this research project. In addition to NGOs, throughout Europe private owners are having a growing impact on the protection of PFAs, as awareness of the financial benefits accruing from protected areas such as financial compensation and tourism (for a more comprehensive survey of the socioeconomic value attached to PFAs in Europe, see also chapter 2.6 of this report).

Other issues that are beyond the scope of this synthesis, but surely interesting in the framework of studying organisation of nature conservation in European countries, include national legislation, the balance of protection delivered by different types of institutions, the role of forest owners and the actual contents of the specific subsidy and compensation regulations, and the procedures for fines.

As this COST Action shows, there are many differences, both large and small, between and within the participating countries. These differences contribute to the diversity in how nature conservation is organised and, perhaps, to biological diversity. To understand these differences it is extremely important to

formulate definitions in nature conservation for each country. This, in combination with recognition of the fact that the organisation of nature conservation is strongly influenced by the political, economic and social climate, should contribute greatly to better transparency of national policies for nature conservation. European countries are watching each other's experiences with nature conservation closely and their strategies seem to be converging, but future analyses are required to confirm this trend.

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COST Action E27

Selection Criteria for Protected Forest Areas Dedicated to Biodiversity Conservation in Europe

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1.   Introduction

The loss of original forest cover, the transformation of old-growth forests and the development of large-scale forestry have had considerable impact on forest habitats and have led to the gradual decline of numerous species in Europe over the last centuries. Today, the number of threatened taxa is high. As an example, data gathered by TBFRA 2000 show that for forest dwelling species in Europe, 20-50 % of mammals and 15-40 % of birds are categorised as threatened. In addition to the adoption of adequate forest management systems, the establishment of networks of Protected Forest Areas (hereafter PFAs) where no commercial forestry take place are needed in order to maintain viable populations of endangered species and slow down the decline of forest biodiversity (Speight 1989, Haila 1994, Bengtsson et al. 2000, Parviainen et al. 2000, Angelstam & Andersson 2001, Hanski & Walsh 2004).

The Convention on Biological Diversity (1992) and the Helsinki MCPFE conference (1993) acted as incentives to encourage managers and policy makers to consider biodiversity conservation as a new challenge for forestry and to initiate the development of a coherent PFA network in Europe. This development has become more urgent than ever, as European ministries have recently committed themselves to halting the loss of biodiversity by 2010.

Most European countries haven't waited for international commitments to start to set aside forest areas. However, the first reserves were mainly established for hunting, scientific, cultural or scenic purposes and were rarely designed to meet specific biodiversity conservation objectives. Many existing reserves have been chosen in an *ad hoc* fashion and are located in remote areas with rocky or marshy soils that are unsuitable for commercial forestry (Pressey & Tully, 1994, Rodrigues et al., 1999, Fridman, 2000). To meet conservation objectives, PFA selection needs to be based on scientifically objective criteria and to complete existing networks with additional sites for efficient species conservation, whilst minimising costs for society (Stokland, 1997, Rodrigues et al., 1999). The most important issue when designing a reserve system is that it represents as much as the available biodiversity as possible (representation issue) and that it will guarantee the long term viability of the species within it. It means that objective criteria have to be defined and adopted, (i) as indicators to measure biodiversity and to assess representativeness and (ii), as quantified conservation targets (Possingham et al., 2000, Cabezza & Moilanen, 2001, Pressey & Cowling, 2001).

For a reserve network to be considered representative, it has to include one or several populations of every species present in a region. However, as detailed distribution data are often not available for many taxonomic groups, it has been proposed that practical forest reserve selection is focused on surrogate data from classical forest inventories that is much easier to collect, e.g. the distribution of forest types, signal species or structural characteristics of forest habitats (Margules & Usher, 1981, Prendergast et al., 1999, Pressey & Cowling, 2001, Prieditis, 2002, Siitonen et al., 2002, Hanski & Walsh, 2004).

In this paper, the following questions are raised:

1. How long have standard criteria been used for the selection of PFAs?
2. What kind of criteria are used for PFA selection?
3. Is the importance of criteria determined by regional differences?
4. Is the importance of criteria linked to MCPFE protection categories?
5. Which quantitative targets and benchmarks are used for the different criteria?

Table 1:
Presentation of the 14 scientific standardised criteria used for the selection of protected forest areas dedicated to biodiversity conservation. A code and a short description is presented for each criterion.

Compositional criteria	
FORTYP	Forest type and habitat representativeness
HABDIV	Habitat diversity within individual PFA (habitat complexes)
VEGITG	Vegetation integrity (proximity to potential natural vegetation, presence of native tree species, etc.)
THRHAB	Rare and threatened habitats
THRSPE	Presence of red-listed species
Structural criteria	
VERSTR	Vertical structure of the vegetation (mixture of different age classes)
NATREG	Presence of natural regeneration
OLDGRO	Presence of old-growth stages (overmature trees, large quantities of dead wood, etc.)
SOIITG	Soil and hydrology integrity
Spatio-temporal criteria (landscape criteria)	
FORCON	Forest continuity over time
OLDCON	Old-growth continuity over time
MINSIZ	Minimum size of protected area
CONNEC	Connectivity and PFA environment (e.g. inclusion into a larger forest area)
TOPOGR	Landform and topography

2.   Material & methods

Criteria used for the selection of PFA primarily dedicated to biodiversity conservation (MCPFE categories 1.1-1.3) were identified through a standardised questionnaire completed by the COST Action E27 representatives of 21 European countries (see list hereafter). A total of 105 PFA types were considered.

The questionnaire was prepared on the basis of information collected in the country reports of the COST Action E27 action (Latham et al., 2005) and proposed a set of 14 operational criteria that can be classified into three types (table 1). Compositional criteria refer to the identity, the variety and the rarity of biological elements; structural criteria are based on the physical organisation of forest ecosystems; spatio-temporal (or landscape) criteria refer to site history and area, connectivity and landscape ecological context.

2.1.   Use of standard criteria for the selection of PFA in Europe

A first set of questions in the questionnaire refers to the use of standard criteria for the selection of the different PFAs corresponding to MCPFE 1.1-1.3 categories. It was asked if, and since when, standard selection criteria are used.

2.2.   Types of selection criteria

The way the 14 selection criteria are used in the selection procedure of each national PFA type was also assessed. The following grading was used to quantify the importance of each criterion : (0) criterion is not used, (1) criterion of incidental importance and (2) criterion of primary importance.

2.3.   Regional differences

Four groups of countries can be identified in Europe on the basis of the extent, the fragmentation and the naturalness of forest areas, as a consequence of the historical development of human activity and land use intensity. Forest conditions in Nordic countries are very different from those found elsewhere in Europe, having experienced major human impact later than other parts of Europe. The cover of forests

Table 2:
State of forest resources and naturalness of forest areas in the different European bio-geographic regions. Average value and standard deviation between the countries included in each region are shown. FOWL: forests and other wooded lands Data:(MCPFE, 2003).

	Northern Europe	Central Europe	Southern Europe	Western Europe
Share of FOWL in total land area (%)	57 (18)	37 (11)	43 (7)	18 (9)
FOWL / capita (ha)	3.5 (0.9)	0.4 (0.2)	0.5 (0.2)	0.1 (0.1)
Share of forest in FOWL area (%)	86 (12)	83 (37)	68 (25)	94 (7)
Share of natural forests in forest area (%)	8.3 (7.3)	2.5 (2.7)	1.3 (2.7)	0.1 (0.1)
Share of plantation of exotic species in forest area (%)	2 (2)	7 (11)	10 (10)	45 (27)
Share of natural regeneration in forest area (%)	34 (8)	60 (30)	59 (36)	19 (15)

and other wooded lands (FOWL) has been maintained at a very high level and natural forest still reach 6 millions of ha in this region (table 2).

A typology adapted from (Parviainen et al., 2000) & Hanski & Walsh, 2004) was used for this purpose. Region 1 (boreal forests of Northern Europe), includes Finland, Norway and Sweden; region 2 (Central Europe) includes Austria, Bulgaria, Czech Republic, Lithuania, Macedonia, Romania, Slovenia and Switzerland; region 3 (Mediterranean countries) includes Cyprus, Greece, Italy, Portugal and Spain and region 4 (Western Europe) includes Belgium, Denmark, France, Netherlands and UK. The groups are referred to as bio-geographic regions hereafter.

2.4. Differences according to MCPFE protection categories

Although the main management objective of all the PFA types included in the dataset is biodiversity, they refer to three different categories : MCPFE 1.1 where no active intervention is allowed, MCPFE 1.2 where minimum intervention is allowed (e.g. control of game, fire or insect outbreaks) and MCPFE 1.3 where active management conservation practices are implemented (e.g. grazing and coppicing).

We also tested whether there are differences in the frequency of use of the different types of criteria according to these protection categories.

2.5. Quantitative appraisal

Finally, country representatives were asked to give information on standards, benchmarks, quantitative targets and references to scientific literature used for criteria assessment. A synthesis of the information collected from the questionnaires and from the scientific literature is presented in the following.

3. Results

3.1. Use of standard criteria for the selection of PFA in Europe

For a long time PFAs have been selected in an *ad hoc* manner, and without the use of explicit criteria. It is only since 1975 that standard criteria and procedures have been used to optimise the choice of sites and to improve the efficiency of reserve networks (figure 1). Most European countries adopted a set of standard criteria between 1980 and 2000, which are either defined in nature and forest legislation or more informally adopted by conservation agencies and administrations. However, 8 countries out of the 21 considered in this study do not really use standard criteria for site selection and work on the basis of a pragmatic approach.
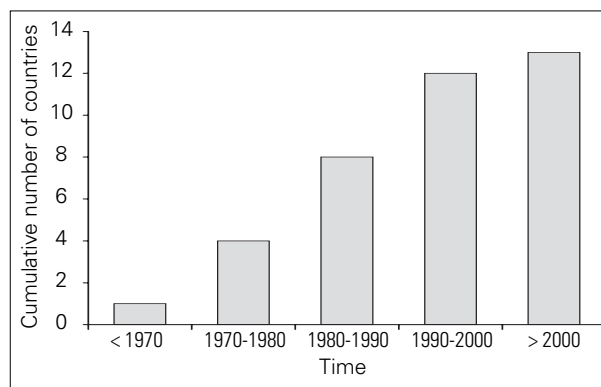
Figure 1:
Use of standardised criteria for PFA selection in European countries : turning point from when standardised criteria are used. Data: COST Action E27.
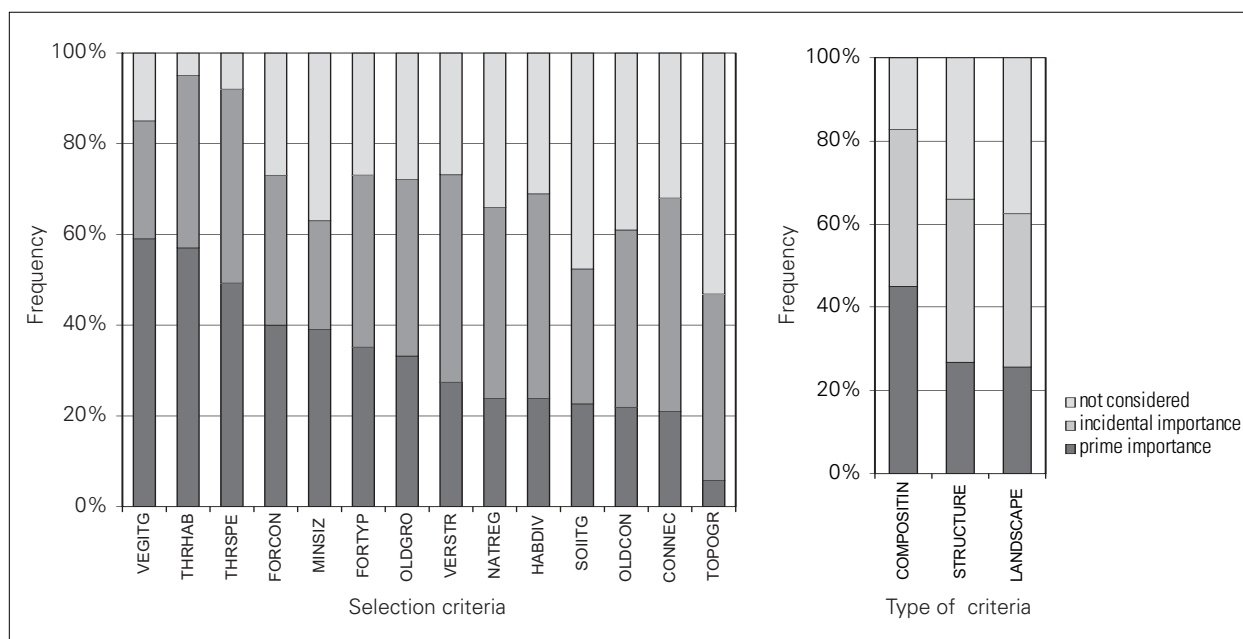
Figure 2:
Importance of standardised criteria for the selection of PFA in Europe. Data: COST E27.

3.2.   Types of selection criteria

Compositional criteria are generally used more frequently than structural and landscape features (figure 2). The most popular criteria are the integrity of vegetation and the presence of rare species and habitats; each is considered to be of prime importance for the selection of more than half of the PFA types included in the dataset. Most other criteria are considered of prime importance for 20 to 50 per cent of the PFA types. Note that the location of PFAs in specific landforms or topographical situation (e.g. steep slopes) is rarely taken in consideration.

3.3.   Regional differences

Compositional criteria are considered of prime importance all over in Europe and no substantial regional difference was found when comparing their importance in the different European countries (figure 3), except for habitat representativeness that is more often used in Southern (58

% of PFA types) than in Northern Europe (19 % of PFA types).

On the other hand, structure-based and landscape criteria are clearly much more popular in Nordic countries than in the rest of Europe, that attach more importance to old-growth conditions, soil integrity and spatial considerations (site size and connectivity).
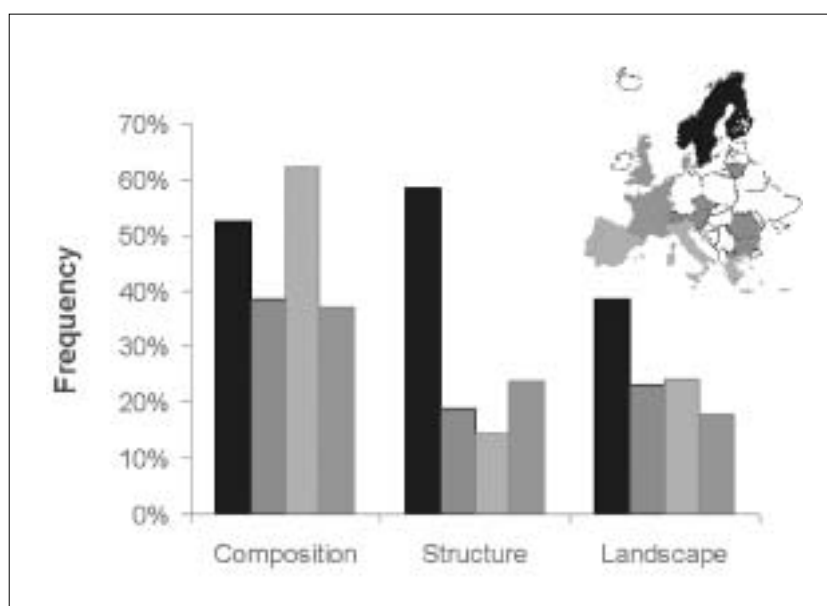
Figure 3:
Use frequency of the major criteria types considered as prime importance for the selection of PFA in the different bio-geographic regions.
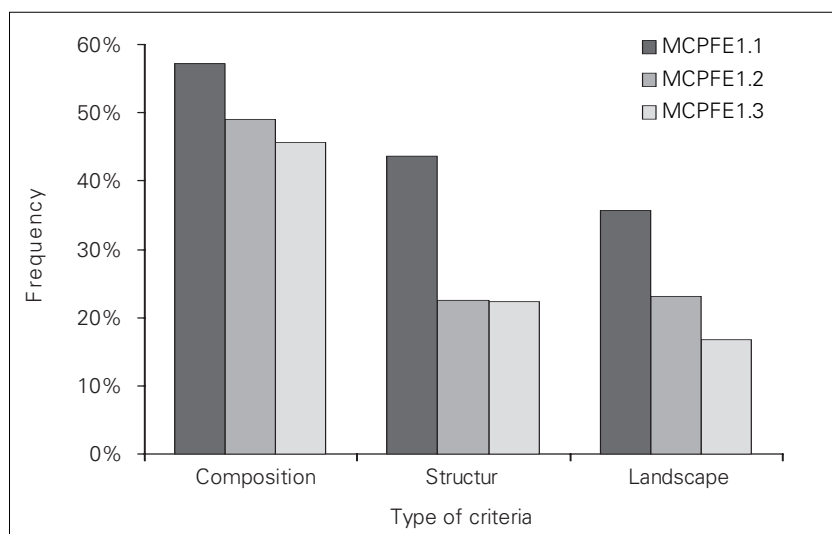
Figure 4:
Use frequency of the major criteria types considered as prime importance for the selection of PFA belonging to MCPFE categories 1.1-1.3. MCPFE1.1: forest reserve with no active intervention, MCPFE1.2: forest reserve with minimum intervention and MCPFE1.3: forest reserve with conservation management practices.

3.4. Differences according to MCPFE protection categories

Standard selection criteria are more often used for the selection of strict forest reserves than for the selection of reserves where conservation management practices are implemented (Figure 4). Special importance is attached to structural and landscape criteria linked to site naturalness and integrity (e.g. vertical stratification of vegetation, tree natural regeneration, presence of old-growth stage and ecological continuity over time) when designing networks of reserves without active intervention (MCPFE 1.1 category). It is striking to note that no specific criterion is related to the designation of forest reserves with conservation management practices.

3.5. Benchmarks and quantitative appraisal of selection criteria

i/ Compositional criteria

• *Threatened species and habitats* – Many conservation agencies refer to official lists of rare and threatened species or habitats for selecting sites and rely on high quality distribution maps or species inventories when available (see e.g. Nitare, 2000, Bensettiti et al., 2001 or Fremstad & Moen, 2001).

Species conservation is one of the major motivations for developing forest reserve networks in Europe. Official lists of protected species usually guide site selection. The focal or umbrella species concept (Kerr, 1997) is sometimes used as a tool for the selection of sites in conservation networks, e.g. for the identification of key habitats in Nordic and Baltic countries. The total or a given proportion of the sites where the umbrella species occur is set aside for protection and it is presumed that populations of numerous other species will also be protected as a consequence (Hodgetts, 1992, Roberge & Angelstam, 2004).

PFA selection often focuses on threatened habitats. In Finland and in Switzerland, some PFA types are even entirely dedicated to the conservation of specific rare habitat types as bogs, mires, fenlands or alluvial forests. In the UK, all the semi-natural woodland types are considered as priority habitats to be protected in the framework of the so-called 'habitat action plans'; they include actions to complete and consolidate the representation of these forest types within protected areas (Latham et al., 2005).

• *Forest type and representativeness* – An important site selection criterion when designing PFA networks is that they should represent as much of the available biodiversity as possible. Networks should therefore contain complementary sites to cover the diversity of species or vegetation types in a given area (Stockland, 1997, Possingham et al., 2000, Cabeza & Moilanen, 2001).

Representativeness is taken into account for PFA design in most of the European countries; the objective is to include at least one example of every major forest type per biogeographic area in each national PFA network. Forest typology usually follows classification systems developed at a national scale. However, the representation target is not always fulfilled and forest types are unequally represented within PFA networks. Regional and national studies show that there is a skewed distribution of forests within reserves towards low productivity forests, either in mountain areas or in wet soil conditions. On the other hand, high

productivity forests are strongly underrepresented (Stockland, 1997, Broekmeyer, 1999, Fridman, 2000, Angelstam & Andresson, 2001, Leyman & Vandekerkhove, 2002, Prieditis, 2002, Hanski & Walsh, 2004).

- *Vegetation integrity* – The presence of native tree species is a prerequisite to guaranteeing vegetation integrity. Moreover, various indices were developed to quantify integrity on the basis of comparisons between potential and current composition of the vegetation, especially in Western and Central Europe (see e.g. Grabherr et al., 1998, Broekmeyer, 1999 and de Keersmaeker et al., 2001). Note that non-vascular plants are often useful to assess vegetation integrity in forest ecosystems, e.g. those species with poor dispersal capacities (see also forest continuity over time) (Hodgetts ,1992, Rose, 1992, Nitare, 2000).

ii/ Structural criteria

- *Vertical structure of the vegetation* and *presence of natural regeneration* – Age and tree mixture, multi-layered structure and presence of natural regeneration at the stand scale are typical attributes of natural forests and can be considered to guarantee the effective functioning of ecosystems (Peterken, 1996, Gilg, 2005). These data are often available from forest inventories, but formal benchmarks are rarely used in the site selection process.

- *Presence of old-growth stages* – Large amounts of dead wood and presence of over-mature trees are key elements for the development of forest biodiversity (see e.g. Hodge & Peterken, 1998, Siitonen, 2001, Grove, 2002 & Vallauri et al., 2005). These elements are often used as prime criteria for the selection of strict forest reserves in areas where there are still large remnants of natural forests, namely to identify key-habitats in Nordic and Baltic countries. Site selection relies on structural indicators together with the presence of taxa known to be strictly dependent on old-growth features (lichens, mosses, lignicolous fungi, wood-peckers, etc.) (Kumpulainen et al., 1997, Nitare, 2000, Gjerde & Baumann, 2002, Prieditis, 2002, Siitonen et al., 2002, Belova et al., 2005).

- *Soil and hydrology integrity* – Soil and hydrology integrity can be considered as an indicator of the good functioning of forest ecosystems and could be used as an additional criterion to identify areas of high naturalness. These aspects are of particularly high importance for the conservation of forests growing on alluvial, marshy and peaty soils.

In practice however, this criterion is rarely taken in consideration except for some PFAs in Austria, Bulgaria, Denmark, Finland and Switzerland.

iii/ Spatio-temporal criteria

- *Forest and old-growth continuity over time* – Ancient woodlands have an intrinsic high conservation value because they are an effective source of biodiversity. They shelter many plant and animal species with a low dispersal ability, that are dependent on long habitat persistence at a particular place (ecological continuity) and are unable to colonise new isolated forest sites. As those assemblages of species are not replaceable within a reasonable time, forest and old-growth continuity over time have been suggested in scientific literature as a prime criterion for the selection of forest reserves (Nilsson et al., 1995, Hermy et al., 1999, Norden & Appelqvist, 2001, Rolstad et al., 2002, Wulf, 2003). This criterion has been taken in consideration for the selection of 40 % of the PFA considered in this study, based on the study of historical maps or through field survey of compositional and structure-based indicators of continuity (see e.g. Alexander, 1988, Rose, 1992, Nilsson et al., 1995, Hansson, 2001).

- *Minimum size of protected areas* – Central and Western European countries frequently refer to the concept of minimum structure area (Koop, 1989), e.g. the smallest area which is needed to express all the temporal phases of the natural forest cycle in a sustainable way. Reference data were determined for different natural forest ecosystems in Czech republic, Hungary, Romania or Slovakia on the basis of studies performed on gap dynamic processes; threshold areas mainly range between 10 and 100 ha according to forest type and site conditions. This approach was however rarely adopted for forest ecosystems driven by large scale perturbations as wind throws, fires or inundations (Bücking, 2003).

The minimum size for a PFA can be also assessed in focusing on long term biodiversity persistence through ecological knowledge of habitat requirement and meta-population capacity of target species. Although scientists frequently advise that such processes are considered in reserve network design, it is rarely used in practice (Cabeza & Moilanen, 2001). As an example, the need to increase the size of protected key habitats to maintain viable populations of threatened species is frequently stressed by scientists in Nordic and

Baltic countries (see e.g. Sverdrup-Thygeson, 2000, Hansson, 2001, Pykälä 2004 and Hanski & Walsh, 2004).

· *Connectivity and PFA environment* – As for minimum size of PFA, connectivity of individual sites is a critical consideration for the persistence of species in reserve networks. In spite of the development of new reserve design algorithms that explicitly take connectivity and isolation into account (Cabeza & Moilanen, 2001, Briers, 2002, Siitonen et al., 2002), country reports of the E27 COST Action do not refer to any standardised methodology for connectivity assessment in site selection process; it is also one of the least popular criterion according to the results gathered through the criteria questionnaire (Figure 2).

· *Habitat diversity within individual PFA* – Though several studies have demonstrated that habitat diversity of forest patches is an important determinant of species richness in forest ecosystems (Peterken & Game, 1984, Honnay et al., 1999), this criterion is poorly considered in the evaluation of potential sites and it mainly occurs in large scale PFAs like national parks.

· *Landform and topography* – The presence of specific landforms (steep slopes, deep valleys, etc.) is not often considered as a selection criterion for PFAs, except for some national parks and other landscape protection areas.

4. General discussion

Over the last decades, a great deal of research, money and effort has been put into the development of theory and techniques to design efficient reserve networks, both for the protection of forest biodiversity (conservation goal) and for the study of natural processes within them (natural forests as a reference system) (Parviainen et al., 2000). Predicitive models to identify biodiversity hotspots, where rare species and habitats are to be found (Prendergast et al., 1993, Myers et al., 2000, Fleishman et al., 2001), and spatial algorithms aiming to maximise connectivity and to maintain viable populations in site networks (Hanski & Ovaskainen, 2000, Angelstam & Anderson, 2001, Briers, 2002, Siitonen et al., 2002, Latham et al., 2004) have been developed in a conservation planning perspective. PFAs are also considered as interesting providers of the necessary reference data for

nature-based silviculture in production forests (see e.g. Brang, 2005). In this context, habitat representativeness and minimum structure areas are considered as the two basic elements to design PFA networks (Koop, 1989, Bücking, 2003, Parviainen & Frank, 2003). Recent studies dedicated to the definition and the assessment of naturalness of forest ecosystems and vegetation integrity have helped to identify forest remnants with the highest potential regarding the study of natural dynamics (Peterken, 1996, Grabherr et al., 1998, du Bus de Warnaffe & Devillez, 2002, Uotila et al., 2002, Gilg, 2005).

In the same time, standard criteria have been increasingly used in the practice to select protected forest areas in Europe. This development is very encouraging as it can certainly help to reach both conservation and scientific goals assigned to forest reserve networks. However, about 38 % of the European countries still rely on pragmatic approaches and do not make use of any standard criteria to design reserve networks. Quite often, the first stage of conservation planning identified by (Pressey & Cowling, 2001) is even not fulfilled (Figure 5). Data collected in the framework of the COST E27 action show that there is a shortage of quantitative conservation targets and that design criteria are often not adequately defined, at least in a perspective of species and habitat conservation.
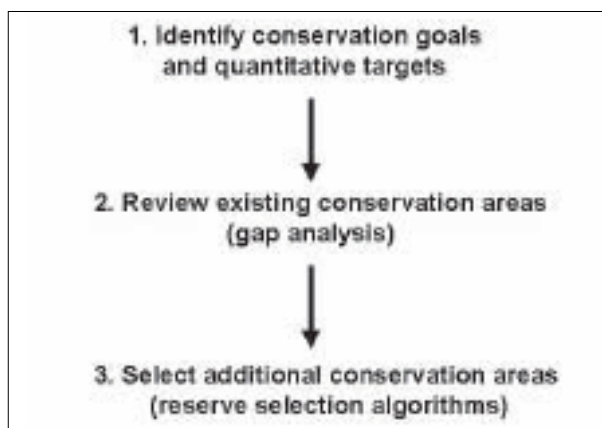
Figure 5:
Three major stages of conservation planning. Adapted from (Pressey & Cowling, 2001).

Though composition issues are often integrated into selection criteria, important spatio-temporal dimensions are only used infrequently by practitioners. In many cases, minimum size of protected areas, site connectivity, or forest continuity are simply not taken into account. Even for the presence of rare or threatened species and habitats, two

criteria that are considered as prime importance for the selection of most PFAs, the availability of reliable distribution data prevents adequate design of reserve networks.

While gap analyses and reserve selection algorithms are recognised as powerful tools to identify indicatives sets of potential conservation areas and to operate as parts of decision-support systems (see e.g. Pressey & Cowling, 2001), their use for the selection of protected forest areas is rather limited and mostly restricted to a few countries from northern and western Europe. It means that we do not have any idea about the representativeness and the efficiency of PFA networks in most of the European countries. In other words, we do not have any idea how close we are from the main conservation goal of reserve networks, the long term maintenance of forest biodiversity.

Despite of the rarity of gap analyses performed on PFA networks in Europe, all of them emphasise that high productive forests growing on fertile soils are strongly underrepresented in reserve networks. Those forests are however very valuable for biodiversity and often shelter diversified and specific species assemblages when natural conditions prevail (Stockland, 1997). The Bialowieza forest is probably the best example of such a protected forest, showing the huge biodiversity potential of such an ecosystem. It is one of the most important biodiversity hotspots in Europe, being home to many species that are rare or extinct elsewhere, including wisent, large carnivores and woodpeckers that specialise on dead wood (Wesolowski, 2005).

As shown above, criteria for the selection of MCPFE 1.3 category are rather vague and not well defined. Though the conservation management of such areas should be based on species action plans defining cutting regimes, patch size and other practical issues, explicit reference to threatened species or habitats as a selection criteria only concern 70 % of PFA types listed under this protection category. The lack of clear criteria for MCPFE 1.3 category is probably linked to the wide spectrum of interpretation of the definition of the category itself (Vandekerkhove et al., 2006).

The low utilisation rate of standard criteria for the selection of forest reserves is also a problem with regard to the scientific goal which devolves to those areas. Structural criteria together with the minimum size of PFA and vegetation integrity should guarantee the high natural value of forest ecosystems and be considered as major prerequisites before undertaking studies on competitive interactions between tree species, natural regeneration under canopy layer, gap dynamics, etc. (Brang 2005). However, those criteria are used together only for the selection of 19 % of the PFAs in Europe (mainly in AU, BG, CZ, DK, FI, IT and UK).

In conclusion, it is clear that guidelines and criteria for PFA designation deserve to be improved and sharpened in many European countries. In a general way, structural and spatio-temporal criteria certainly deserve to be better taken into consideration. The integration of such criteria together with the identification of quantitative targets in the designation process should be based on the existing stock of conceptual and methodological studies and should be implemented in the field through a synergy between theoreticians and practitioners. This is the only way to build a functional network of Protected Forest Areas, acting as real sanctuaries for biodiversity and as unique research laboratories.

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COST Action E27
Protected Forest Areas in Europe - Analysis and Harmonisation (PROFOR)
Results, Conclusions and Recommendations

Forest Protection in the Context of Landscape

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1.   Introduction

Protection of characteristic landscapes was one of the first motives of nature conservation laws in Europe. The Country Reports of COST Action E27 (Latham et al, 2005) illustrate this, by emphasising the protection of the following within PFAs: natural beauty, scenery, cultural heritage, amenity values and recreational and educational functions.

According to the definition given by the European Landscape Convention[1], landscape is *"an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors"*. Landscape is therefore understood in terms of the *living environment* (Galiana, 2003). National COST E27 delegates have also highlighted the importance of the human component for the characteristically small-structured and varied cultural landscape within PFA, and their predominance of semi-natural woodlands. Landscape values concern not only biophysical aspects, but also European societies through their intensive use of forests for centuries. Indeed, this is the reason why the richness and diversity of rural landscapes is such a distinctive feature of the European continent.

This chapter aims to summarise the information within these reports on landscape, spatial issues and other considerations related mainly to socio-spatial conflicts in protected sites.

2.   Nature protection at the landscape scale

2.1.   Forest landscape diversity of European PFA

Landscape Character has been defined as *"a distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another"* (Pérez-Soba & Wascher, 2005) .

It has been difficult to provide the national delegates with a common reference to report landscape character areas of PFAs because there is no common protocol at the national level. The existing landscape character areas classification at the international level - that included in the *Dobris Report* (Stanners, D. & Bourdeau, Ph., 1995) -, has been drawn at a regional scale and so cannot properly describe forest landscape diversity at the national level. Nevertheless, European political institutions are aware of the importance of landscape issues[2], and of the need to establish a classification and map of Landscape Character Types at the European level (Mücher, S.; Klijn, J. & Wascher, D., 2005). In fact, this has been the aim of the expert network called European Landscape Character Assessment Initiative (ELCAI), funded under the 5th Framework Programme. Its objective was to produce a pan-European landscape classification and the General Map of Landscapes[3], named LANMAP2, which has a four level hierarchical classification based on four input criteria:
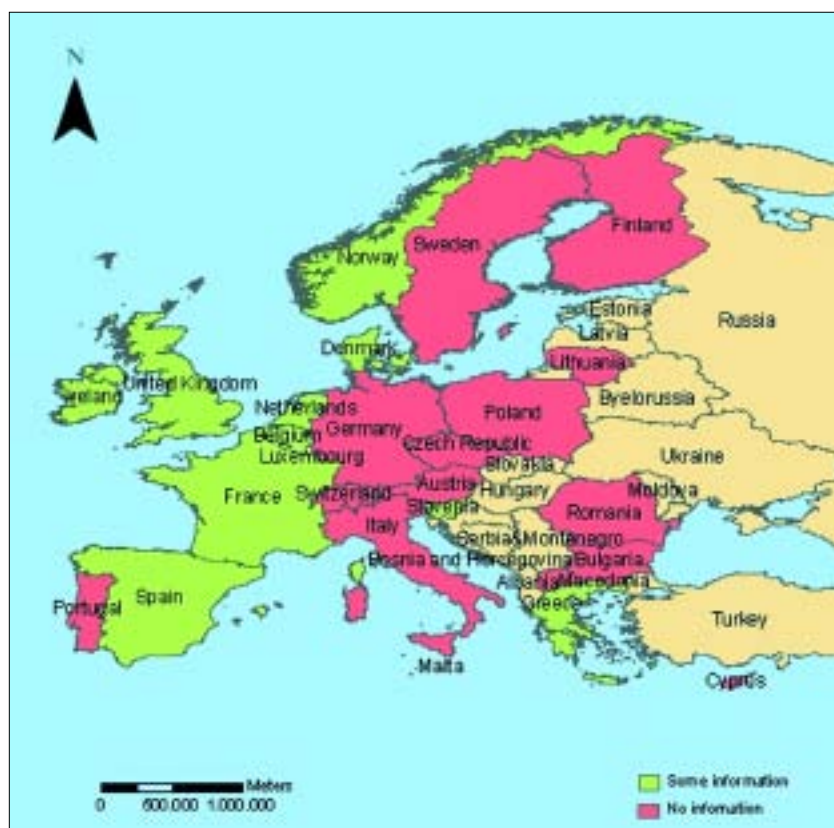
Figure 1:
Information about BEAR types related to forest landscape in Country Reports
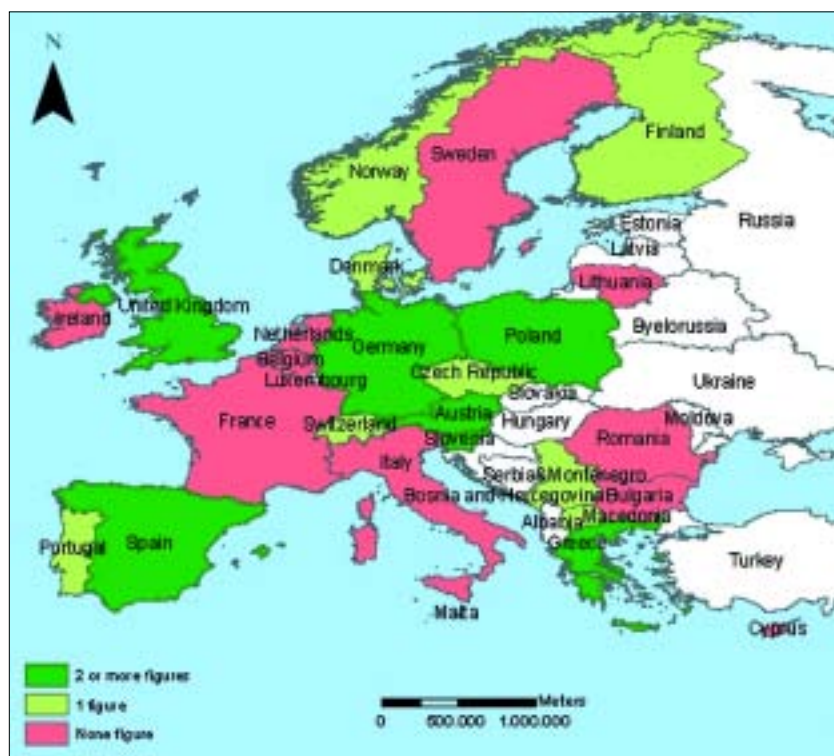
Figure 2:
Existence of PFA figures for landscape conservation

environmental zone, topography, parent material and land use (Wascher, 2005). The highest level of the classification is determined by climate and has only eight classes (Arctic, Boreal, Atlantic, Alpine, Mediterranean, Continental, Anatolian, Steppic). The second level is determined by climate and topography (lowlands, hills, mountains, high mountains, alpine) and has 31 classes. The third level, determined by climate, topography and parent material (rocks, sediments, organic material, unclassified) has 76 classes. In all, it has 375 landscape types at the lowest level (level 4), which includes land use (Pérez-Soba & Wascher, 2005). Unfortunately, LANMAP2 wasn't available until the end of the COST E27 project and so delegates were not able to use it to report PFA data.

An additional complication is that approaches to forest landscape characterisation vary widely between and even within European countries (e.g. Ireland) in terms of methodology and emphasis. The BEAR classification for forest types was selected for use in this study because it is intended to harmonize existing systems for the analysis of forest types into a pan-European forest biodiversity indicator system; it has been consistently adapted to the national, landscape and stand levels (Larson, 2001).

The COST Action E27 Country Reports actually contain relatively little information on forest landscape types within PFAs. The main reason for this lack of information is that there are little published data available at the national level. Many countries (e.g. Sweden) cannot present area figures for PFAs according to the BEAR forest types due to the lack

of quantitative definitions at the national level. Besides, in most cases, information about forest landscape through main tree species composition, forest communities and forest biotopes data correspond to all national forests and not only to PFA. However some countries have managed to provide some information about forest landscapes using BEAR types, sometimes even for the whole national forest area and not just PFA (e.g. Spain).

So, it is difficult to assess the most representative landscape characters of European PFAs. There is any case an inherent bias, as countries have mostly stressed highlands and mountain areas as the very first

protected areas, because of their scenic and natural values and their lack of habitation.

2.2. PFA figures for landscape conservation

In many European countries, nature conservation laws often aim to maintain the entire landscape and scenery at its current status (e.g. Austria, Sweden). In this sense, National Parks appear to be, in general, the most suitable national category for landscape protection in Europe. National parks have even been identified as the only current type of protection for

Table 1:
PFA specific designation types for forest landscape protection

Country	PFA designation types	Number of sites	Total area (ha)
Austria	Landscape Protection Areas	252	806.800.
	Protected part of a Landscape	343	n.i.
Czech Republic	Protected Landscape Areas	24	520.000
Denmark	Areas with a Preservation Claim (National Trust)	n.i.	70.000
Finland	Special Areas under Landscape Ecological Planning	n.i.	872.000
Former YR of Macedonia	Landscape with Special Natural Features	3	n.i.
Germany	Landscape Protection Area	7.181	4.084.161
	Protected Landscape Components		9.683
	Banned Forests		200.552
	Recreational Forests		79.091
Greece	Protected Landscapes	n.i.	n.i.
	Protected Landscape Elements	n.i.	n.i.
	Landscapes of Exceptional Natural Beauty	n.i.	n.i.
	Aesthetic Forest	19	33.106
	Ecodevelopment Areas	n.i.	n.i.
Norway	Landscape Protected Areas	126	n.i.
Poland	Landscape Park	n.i.	n.i.
	Area of Protected landscape	n.i.	n.i.
	Natural Landscape Complex	n.i.	n.i.
Portugal	Protected Landscape	3	n.i.
Serbia and Montenegro	Landscapes with Exquisite Characteristics and Beauties	3	4.206,00
Slovenia	Landscape Park	41	58.223
	Regional Park	3	26.320
Spain[4]	Protected Landscape	151	11.596,28
	Picturesque Site	1	1.172,95
Switzerland	Landscapes and Natural Monuments	162	203.497
United Kingdom	Areas of Outstanding Natural Beauty	n.i.	n.i.
	National Scenic Area	40	n.i.
n.i.: no information provided by national delegates in PFA tables.			

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[4] Aside from the designation types related to nature conservation laws, in the Balearic Islands there are two protection categories from spatial planning regional laws which deserve special protection because of landscape values: Rural Areas of Landscape Significance and Settlements Areas in Landscape of Interest.

forests on a larger scale (implying areas of at least several thousand of hectares). Besides, this designation type usually contains a representation of the most important landscapes characters in the country (Denmark, Netherlands, Spain).

Some countries have also underlined the value of Nature Parks designation type for landscape-scale protection (Bulgaria, Germany, Romania), as well as types such as strict nature reserves and wilderness reserves (Finland).

There are also some specific designations which deliver special protection to forest areas because of aesthetic or cultural values. However, these mostly correspond to landscape protection categories concerned either with areas dominated by forests or other land uses. Many Country Reports have set out the comprehensive approach of large-scale nature protection (Denmark, Finland, FYR Macedonia, France, Ireland, Netherlands, Poland, Sweden, Switzerland and United Kingdom). In fact, nature conservation sites at the landscape scale usually not only contain forest land, but mosaics of different land uses. In general, the aim of these protection categories is to avoid land use change due to settlement pressure (Spain, Switzerland), and the valorisation of these areas through sustainable development initiatives (i.e. Austria).

3.   Spatial relationships in PFA

3.1.   Connectivity: national and regional PFA networks

The relatively small size of European PFAs, as well as their administrative and juridical fragmentation, are factors which can impede the ecosystem functioning of habitats. Thus, there is a general need to enlarge existing PFAs and to increase connectivity between PFA sites, for example, through ecological corridors. These connections can be through traditional (e.g. cattle ways), or natural features (e.g. water courses) or through nature protection designation types (i.e. Environment and Biodiversity Corridors, in the Spanish region of Extremadura).

In many countries, there are projects or initiatives to design and implement different systems of networks to connect the PFAs in the future (Austria, Norway, Romania, United Kingdom). However, in some countries (namely Ireland) ecological corridors have not been recognised as a priority, compared to other options such as a site enlargement and buffering, maintenance of hydrological processes and site management.

The existence of national and regional formally protected area networks (apart from from Natura, 2000) in some European countries should also be stressed (Belgium, France, Spain, Switzerland). These usually consist of networks that aim to include a complete and balanced representation of the biodiversity and main ecosystems in the country, e.g: National Parks Network and Protected Areas Regional Network in Andalucía and Catalunya (Spain), Biological Reserve and Natural Reserve Network (France), National Ecological Network (Netherlands), National Network of Protected Areas (Romania), Habitat Mapping System of Important Areas for Biodiversity (Norway), and Emerald programme (Switzerland and other countries of the European Council, which are not part of the European Union). However, the networking initiatives in Germany (Biotope Network), Czech Republic (USES – Spatial System of Ecological Stability) and in Poland (EECONET[5]) have connectivity intentions, as the aims are to connect the existing protected sites through the strategic designation of new protected areas (Germany) or within the national ecological network of river valleys (Poland) or any other linear landscape elements in the landscape.

Generally, these national or regional networks are related to a nature conservation legal framework, but there are also specific PFA networks of recent or historical establishment in some countries, like Germany (PFA network in the Lower Saxony state, 1994) or Spain (Public Utility Forest Catalogue, 1901).

At the other extreme, some countries (e.g. FYR or Macedonia) have no network or ecological corridor systems at all. Furthermore, a large number of Country Reports don't mention connectivity issue as an issue (Austria, Bulgaria, Cyprus, Denmark, Greece, Lithuania, Portugal, Serbia and Montenegro, Slovenia and Sweden).

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[5] Actually, EECONET (European Ecological network) is a specific network of Poland. It is being prepared for whole Europe in connection with NATURA 2000 mapping. The aim of EECONET is "to connect the existing protected sites through the strategic designation of new protected areas", in the frame of NATURA 2000 mapping.
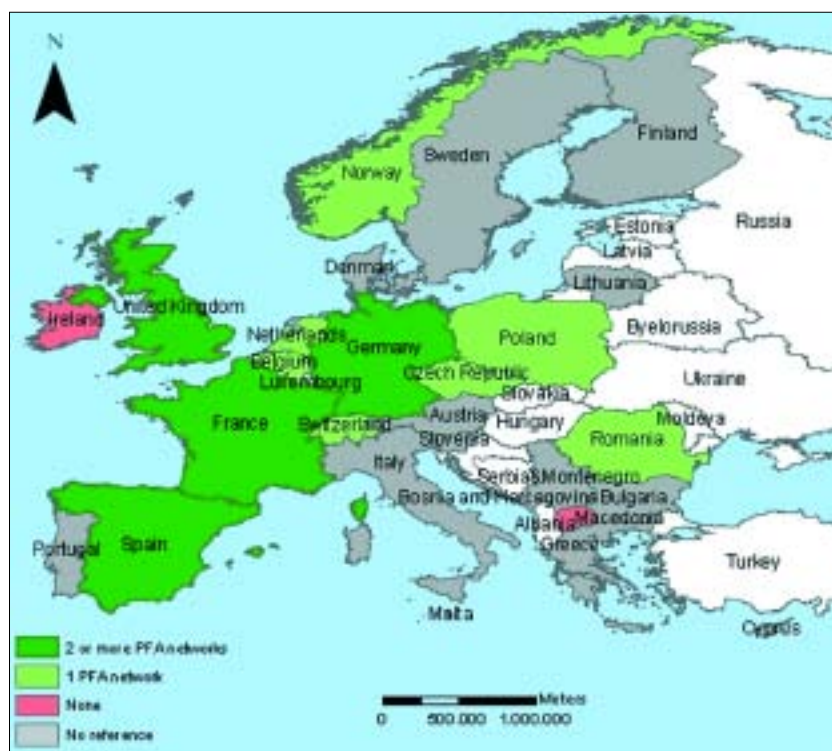
affect the present and future activities of local populations.

Rules and regulations for activities are established depending on factors such as protection category, objectives of management, motivations for declaration, etc. These regulations often limit certain uses and activities, with economic repercussions for the stakeholders, who in many cases are reluctant to accept them.

In general, all Country Reports show the importance of human intervention and of the influence of public opinion in the management of PFA. Thus, some countries (Belgium, Czech Republic) have highlighted the resistance of the public to accept regimes of zero management (strict reserves). On the other hand, other categories with less limiting management regulations are more easily accepted by the local population.

The increase in awareness of the requirement for sustainable forest management in PFAs has also been mentioned. This implies new socio-economic development possibilities and the improvement of recreational and social functions.

3.2. Problems of overlap between PFA categories and networks

In some European countries, PFAs may have several designation types from different legal frameworks (i.e: national scale, regional scale and Natura 2000 Network; forest protection and nature conservation). This is the case in Finland, where about 95% of the Natura 2000 sites overlap with other PFA types. The situation is also very complicated in Denmark, Greece, Spain, Netherlands and United Kingdom, where the significant overlap within PFA types makes it difficult to provide exact figures of forest protection that refer to the international systems categories. This overlap can often also produce conflicts due to the differences in restrictions of the types involved.

4. Socio-economic dimensions of PFAs through management regulations and socio-spatial conflicts

4.1. Land-use and spatial planning in PFA: socio-economical dimension of PFA through management regulations

The protection of forest areas can lead to theoretical frameworks for land-use planning to be developed. These models are implemented at local level and

4.2. Socio-spatial conflicts and resolution schemes: participatory mechanisms at the regional and local level

It is clear that conflicts among stakeholders are mainly due to different interests in the use of natural resources. Conflicts related to economic interests within PFAs are mentioned by almost all countries, and those related to the economic exploitation of forest resources, hunting and social demands for leisure are particularly emphasised. To a lesser extent conflicts related to the public opposition to the declaration of sites are also mentioned, as are those related to the ownership structure (Table 2).

Public participation appears to be the main tool to resolve conflicts and reconcile different interests. This participation is expressed in many different

Table 2:
Conflicts and resolution schemes

Kind of conflicts		Countries	Resolution schemes
Conflicts of interests (timber production; farming; hunting)	Timber	Austria, Germany, Portugal, Ireland, Switzerland, Sweden, Walonia (Belgium), Norway, Lithuania	Financial compensation Participation in decisions Purchase of lands Strict regulations
	Hunting	Austria, Switzerland, Czech Republic, Bulgaria, Cyprus, Romania	Financial compensation Creation of game reserves
	Social demands (leisure and sports)	Austria, Switzerland, Germany, Bulgaria, Greece, Norway and Denmark	Financial compensation
	Farming	Ireland, the Netherlands	Financial compensation Participation in decisions
	Different stake-holders interest, in general	Flanders (Belgium), Romania, France, Switzerland, United Kingdom, Bulgaria, Denmark, France, Germany, the Netherlands, Slovenia.	Financial compensations Agreements on restrictions Participation in decisions Restrictions implemented through contracts on a voluntary basis
Conflicts from ownership structure		Bulgaria, Finland, France, Belgium, Lithuania	Search for consensus or balances Participatory planning

ways according to the tradition from the country. In some cases it may involve a simple explanation to the local population or the affected agents of the policies and activities to be carried out, whereas in other cases participation is developed through more sophisticated mechanisms such as voluntary contracts (e.g. France) of management or participatory planning (e.g. Finland). Another notable tool is economic compensation, which is commonly applied to conflicts like commercial exploitation, hunting or farming restrictions. Sweden has mentioned the importance of a strict legislative framework with penalties including fines and even imprisonment.

5.   Gaps and open questions

The treatment of landscape and spatial relationships issues in COST E27 was very heterogeneous from the start. Efforts were made to unify data collection, but some Country Reports were still missing data, in particular on connectivity in PFA national and regional networks other than Natura 2000.

It has not been possible to produce a comprehensive vision of the landscape diversity or landscape character assessment of PFAs at the European scale. This is because suitable data are not available at the national level, and because of incompatibilities in the very different classification systems used. The BEAR system did not turn out to be useful because it is not widely used. Thus, the data available at the national level does not allow us to identify the main forest landscape character areas in European PFA and their frequency of protection.

One significant result however, is that landscape protection in Europe is often not restricted to forests, but frequently concerns a mosaic of land-uses. Besides, the designation types of landscape protection are (often) used as an instrument of spatial planning.

In general, the main detected problems in the provided information on the topic by national delegates of COST E-27 were:
· uneven and incomplete qualitative data;
· scarce reference to forest landscapes in strict PFAs at the national scale, and no mention of differences between PFA figures or categories;
· incomplete information about the more suitable national PFA categories for landscape conservation.

In summary, the COST E27 Reports agree with the Pan-European Biodiversity and Landscape Diversity Strategy, in suggesting that protection of Europe's forest in a landscape context in insufficient, in terms of both specific designation types and of spatial scale.

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COST Action E27
Protected Forest Areas in Europe - Analysis and Harmonisation (PROFOR)
Results, Conclusions and Recommendations

Assessing Socio-economic Values of Protected Forest Areas

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1.   Introduction

Many European countries are in the process of establishing and extending Protected Forest Areas (PFA), for example as national parks, NATURA 2000 areas, and large-scale landscape protection areas (Parviainen & Frank, 2003). At the same time, in some countries there are increasing economic pressures to exploit the resources within PFAs. Protection initiatives can have both positive and negative effects on the area of protection, as well as on the surrounding landscape and, not least, the local communities themselves. So far, most research has focussed on the ecological side of nature protection – especially impacts on biodiversity, habitats and natural processes – but knowledge of socioeconomic perspectives within and around protected areas is rather limited (but see Hiedanpaa, 2002, Smith & Scherr, 2003, Leppanen et al., 2005).

Some key questions are: How does the protection of a forest area affect landowner(s)? What are the effects for neighbours, local society, and other users of natural resources? Are the restrictions and management applied balanced by possible value-added effects? Are there differences in effects between different protection categories? And, can any general patterns be detected at the European scale? So far, these questions have not been addressed at the Euro-

pean level, and there is a broad need for a better understanding of the socio-economic impacts on societies when PFAs are established or enlarged.

Thus, one of the aims of COST Action E27 was to analyse the socio-economic effects of PFAs Europe and to draw general conclusions about the differences and similarities across PFA types, countries, and regions[1]. The aim was divided into three main objectives:
- To identify factors or criteria to assess the socioeconomic value of Protected Forest Areas (PFAs) in Europe;
- To analyse and discuss the balance between limitations, benefits and compensations for different stakeholder groups;
- To analyse and discuss the effect of PFAs in a regional context.

With these questions and objectives in mind, three working hypotheses about the socio-economic value of PFAs in Europe were developed:
- Limitations, benefits and compensations are balanced in PFAs in Europe;
- There is a difference in the effects of the limitations, benefits and compensations between PFAs and their area of influence, and between strict and non-strict PFAs;
- Patterns of higher concentrations of positive and negative effects of PFAs can be detected across Europe.

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[1] According to the scientific sub-area 1B of the Memorandum of Understanding (MoU), the Protected Forest Areas analysis will focus on a "tentative description of PFA's various outputs according to their total economic value".

The results based on these working hypotheses are organised in three sections: 1) an overall assessment of the socio-economic values of PFAs in Europe, 2) a multifunctional analysis of the grouping of effects, and 3) a country and region-wise analysis of the socio-economic value and effects of PFAs in Europe.

2.   Methodology

2.1.   Materials: Definitions, questionnaire design and data formats

The analyses are all based on a qualitative approach to data collection based on contributions from 21 countries participating in COST Action E27. Sampling was carried out at two independent events in January-February 2005 and in May-June 2005.

PFAs and their surrounding areas were divided into four different classes, based on the definitions of MCPFE, with strict PFAs being MCPFE categories 1.1 and 1.2, and non-strict PFAs being MCPFE categories 1.3, 2 and 3 (MCPFE, 2003) (see table 1). The definitions of the area of influence were less strict than the definition of the actual PFAs and may vary slightly between countries.

Table 1:
Definitions of the four classes of PFAs.

	Strict PFA	**Non-strict PFA**
Actual PFA	**Class 1A:** MCPFE 1.1 and 1.2	**Class 2A:** MCPFE 1.3, 2, and 3
The area of influence (surrounding the PFA)	**Class 1B:** The surrounding area with a lower degree of protection	**Class 2B:** The socio-economic area of influence

Data collection was based on the central assumption that the socio-economic effects of PFAs in Europe can be divided into limitations, benefits and compensations. A basic list of these kinds of effects was then elaborated using analysis of a study case in the Autonomous Region of Catalonia; the results were presented at a meeting of COST Action E27 in Catania. The list was distributed among the national delegates of COST Action E27, who refined it and added additional items. Finally, a basic list with descriptions of 20 types of limitations, 10 types of benefits and 18 types of compensations was defined

(see Table 2). Similarly, a list of the main stakeholder groups involved in PFAs in Europe was developed. The list of stakeholder groups in the actual PFAs included six groups: landowners, scientists, recreational visitors, hunters and fishermen, state administration, and people with indigenous rights. The area of influence included – in addition to the first six groups, but differentiating hunters and fishermen – also: tourism enterprises, community inhabitants, municipalities, property developers and artisans, making a total of 12 stakeholder groups.

The questionnaire was divided into parts, based on the division of PFAs and their areas of influence into four classes (A1, A2, B1, and B2). In each part of the questionnaire, stakeholders were listed in columns, and limitations, benefits and compensations in rows. This resulted in 4 separate questionnaires with a total of 1.728 combinations of stakeholder groups and effects (limitations, benefits and compensations).

For each cell in this matrix, each country was asked to give the combination a score (excluding obviously impossible combinations which were blacked out). Scores for each cell (= a unique combination of stakeholder and his/her limitations, benefits and compensations) could be either "0", "1", or "2", where:
· 0 = such a limitation/benefit/compensation never occurs to this stakeholder group in the country;
· 1 = such a limitation/benefit/compensation occurs in at least one case for this stakeholder group in the country, even if it is exceptional. In countries with decentralized or federal structures, 1 also meant that such a limitation/benefit/compensation occurs in one or two federal states or autonomous regions of the country;
· 2 = such a limitation/benefit/compensation occurs commonly for this stakeholder group in the country.

Finally, there was an option of entering "NR" (Non-Relevant) for combinations, which were considered irrelevant for the specific country (see Figure 1).

Because the its design, the questionnaire could not reveal whether the specific limitation/benefit/compensation concerned a large or small number of people or stakeholders, but simply the existence of any given socioeconomic effects of a PFA.

Twenty countries responded to the questionnaire (Fig. 2), which were submitted via the COST Action E27 homepage, hosted by the European Forest Institute (EFI) during spring of 2005.

The questionnaires contained rather detailed information about socio-economic effects of PFAs across Europe. However, all results and conclusions

Table 2:
Socio-economic effects of PFAs divided into limitations, benefits and compensations.

Limitations	Benefits	Compensations
L1: Timber harvesting	B1: Jobs created directly by the PFA (administration, technical and maintenance staff, etc)	C1: Tax reduction or exemption
L2: Planting trees	B2: Jobs created indirectly by the PFA (e.g. nature guides in independent companies, hire of bicycles, canoes, etc)	C2: Purchase of cutting rights. Cash compensation for income not received from the sale of the wood given the limitations in the planned use
L3: Clear-cutting (cuttings > 1 ha)	B3: Provision (by the administration) of infrastructure and services for the region around the PFA	C3: Economic compensation for the naturalization of the management practices
L4: Small scale wood extraction (e.g. firewood for local use)	B4: Regulation of the exploitation of the hunting and fishing resources in the area to guarantee their conservation and enable the leisure or sporting use of these.	C4: Subsidies for specific action orientated to promoting activities that benefit the conservation of the PFA
L5: Building forest roads	B5: Creation of marks of certification of quality or origin linked to the goods or services produced in the PFA	C5: System of financial help to promote agrarian production methods compatible with the requirements of environmental protection and the conservation of natural areas
L6: Construction, e.g. building cabins or erecting radio masts	B6: Increase in the flow of visitors to the area, which implies an increase in the number of overnight stays, sales of local products, etc.	C6: Participation in the benefits generated by the collection of entry fees, specific taxes, sale of products, etc. that could be through a consortium of owners
L7: Drainage	B7: Promotion of the tourism business structure through the web of the PFA	C7: Grants for the rehabilitation of rural dwellings
L8: Recreational hunting	B8: Increase of the land value	C8: Subsidies for the improvement and restoration of habitats
L9: Fire control	B9: Increase of facilities for rural tourism	C9: Subsidies for promoting public use and environmental education projects
L10: Hunting for game control	B10: Increase on information on natural values	C10: Grants to cultural entities that work to promote the cultural and natural values of the PFA heritage
L11: Safeguard within the areas		C11: Advantages in spatial policies (e.g. higher incentives in the protected area)
L12: Pesticide treatment		C12: Technical support for planning and management by the owners of forest properties in the PFA
L13: Scientific sampling		C13: Preparation of projects for the technical improvement of agrarian exploitations
L14: Collection of berries, mushrooms, etc.		C14: Construction of forest fire fighting infrastructure
L15: Livestock grazing		C15: Forestry work, control of plagues and reforestation done by the administration responsible for
L16: Use of genetic resources (e.g. seed collection)		C16: Improvements in public infrastructure, such as car parks, recreational zones, railings, improvement and conservation of trails and routes, signposting, etc.
L17: Public access		C17: Elaboration of planning documents (Agenda 21, Sustainable development programmes, etc.)
L18: Safeguard at the borders		C18: Education of stakeholders to better be able to manage their PFA.
L19: Changes in land use		
L20: Request of environmental impact assessment for changes in land uses or establishment of new activities		

Figure 1:
Sample of data collection through a questionnaire about benefits in non strict PFA (example from Spain)

Benefits	STAKEHOLDERS IN THE PFA						STAKEHOLDERS IN THE PFA AREA OF INFLUENCE											
	Landowners	Visitors	Hunters and Fishermen	Scientists	State administration	People with rights (nor fishermen or hunters)	Landowners	Tourism enterprises	Community inhabitants	Municipality	Hunters	Fisherman	Visitors	Property developers	Artisans	Scientists	State administration	People with rights (nor fishermen or hunters)
B1 — Jobs created directly by the PFA. In function of their training, the members of the community can obtain jobs in different categories (administration, naturalists, warden, technical and maintenance staff, etc.).	1		1	1	2	1	0	0	0	0	0	0		0	0	0	0	0
B2 — Jobs created indirectly for the PFA, such (e.g. Nature guides in independent companies, Hire of bicycles, canoes. Studies and work commissioned by the PFA or other institutions. Supplies. Taxi and transport companies).	2		2	2	nr	2	2	2	2	2	2	2		2	2	2	nr	2
B3 — Provision (by the administration) of infrastructure and services for the region around the PFA.							2	2	2	2	2	2	2	2	nr	2	nr	2
B4 — Regulation of the exploitation of the hunting and fishing resources in the area to guarantee their conservation and enable the leisure or sporting use of these.	2		2		nr	0	2	1	1	1	2	2					nr	0
B5 — Creation of marks of certification of quality or origin linked to the goods or services produced in the protected forest area (non-wood forest and agricultural products, wood, water restoration, hotel trade, etc.).	2		nr		nr	2	2	2	2	2	nr	nr		nr	2		nr	2
B6 — Increase in the flow of visitors to the area, which implies an increase in the number of overnight stays, sales of local products, etc.	nr		nr		nr	nr	nr	2	2	2	nr	nr		2	2		nr	nr
B7 — Promotion of the tourism business structure (restaurants, accommodation, etc.) through the web of the PFA.	nr	2	nr		nr	nr	nr	2	2	2	nr	nr	2	2	2		nr	nr
B8 — Increase of the land value	2	22	nr		nr	nr	2	nr	nr	2	nr	nr		2	nr		nr	nr
B9 — Increase of facilities for rural tourism	nr	2	nr		nr	nr	nr	2	nr	2	nr	nr	2	2	2		nr	Nr
B10 — Increase on information on natural values (studies, surveys, leaflets, publications, etc).	nr	2	1		nr	1	nr	2	2	1	1	1	2	nr	nr		nr	1

in this chapter are given with caution, because of the qualitative and subjective character of the data. Even with very detailed guidelines for filling in the questionnaire matrices there may have been misunderstandings that can't be revealed in the analyses and results. Moreover, even though the input is based on expert knowledge, only few people were involved per country so some issues may have been missed. Finally, the division of positive answers into "1" and "2" may also vary between individuals. However, it was assumed that there was at least consistency within replies for each country.
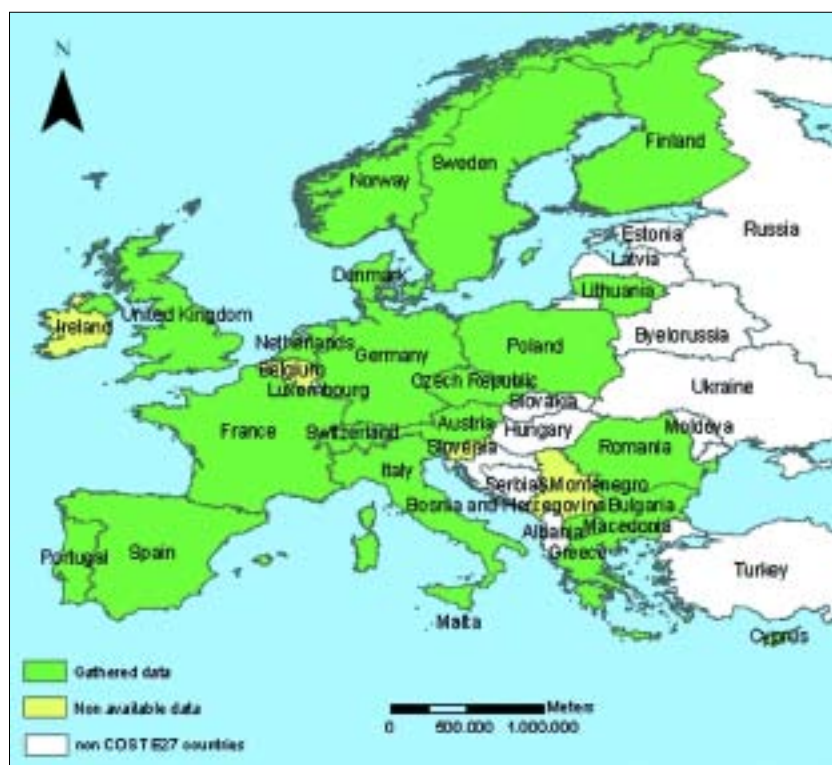
Figure 2:
Map of member countries of COST E27 included in the analysis of the socio-economic value of PFAs in Europe.

2.2. Methods: Selection of criteria, methodological approaches and data analyses

The first step in the data analyses was to define and select which criteria should be considered in detail. The following criteria were defined:

1. Strict versus non-strict PFA
2. Type of socio-economic effect (Limitation, Benefit, Compensation)
3. Actual PFA versus Area of Influence
4. Stakeholder groups
5. Geographical criteria

From these criteria, analyses were divided into three main issues: 1) an overall assessment of the socio-economic values of PFAs in Europe, 2) a multivariate analysis of groups of socio-economic effects and, 3) a country and region-wise analysis of the socio-economic value and effects of PFAs in Europe.

The overall assessment of the socio-economic values of PFAs in Europe was based on the elaboration of six meta-tables, each of them corresponding to one type of economic effect in PFAs and their Areas of Influence respectively; each meta-table was divided into sides for strict and non-strict PFAs (see table 3).

Both the overall assessment of the socio-economic values of PFAs and the country and region- wise analysis of the socio-economic value and effects of PFAs focussed on the commonalities among countries. Therefore, only results concerning the majority of countries were highlighted. For this purpose two main categories of 'majority' were considered: "At least 50% of the countries" when 11 or more answers were positive (answering "1" or "2"), and "At least 75% of the countries" when 17 or more answers were positive (answering "1" or "2"). Moreover, the positive answers were divided into one group with all countries answering either "1" or "2 (socio-economic effect occurs or commonly occurs) and one group with countries answering only "2" (socio-economic effect commonly occurs).

The multivariate analysis of groups of socio-economic effects was based on indirect and direct gradient analyses in the programme Canoco (Ter Braak & ?milauer, 1998). Methods based on unimodal model (DCA, Detrended Correspondence Analysis, and CCA, Canonical Correspondence Analysis) were used (Lep? & ?milauer, 2003).

First, unconstrained (indirect) ordinations (DCA) was made to detect the overall pattern of variability in the response data. The data from all four classes of protected areas - Strict PFA (Str In), Area of influence of strict PFA (Str Out), non strict PFA (NStr In), Area of influence of non strict PFA (NStr Out) were used. The values of limitations, benefits and compensations were used as response data. Indications of protected area class and country were used as

Table 3:
Overview of the six meta-tables constructed for the overall assessment of the socio-economic values of PFAs.

	PFA (strict/non-strict)	Area of Influence (strict/non-strict)
Limitations	Meta-table: L1	Meta-table: L2
Benefits	Meta-table: B1	Meta-table: B2
Compensations	Meta-table: C1	Meta-table: C2

supplementary explanatory variables. Supplementary explanatory variables were passively displayed in the ordination space.

In the next step, the constrained (direct) ordination (CCA) was used to identify the variability in response data that can be explained by the explanatory variables. Moreover, particular CCA analyses were made individually for each class of protected area. Country, group of countries and type of stakeholder were used as explanatory variables in a separate analysis, and the percentage of explained variability determined. The statistical significance of the relation with explanatory variables was tested by the Monte Carlo permutation test. The resulting ordination diagrams were produced using the CanoDraw programme (Ter Braak & Smilauer, 1998).

3. Results

3.1. Overall assessment of the socio-economic values of PFAs in Europe

Table 4:
Number of countries selecting the proposed limitations

Common limitations		Strict PFA	Non strict PFA	Area Influence S- PFA	Area Influence NS- PFA
L1	+Timber harvesting	16	19	15	11
L2	+Planting trees	17	17	14	10
L3	+Clear-cutting (Cuttings > 1ha)	15	16	14	11
L4	+Small scale wood extraction	16	11	8	8
L5	+Building forest roads	17	17	12	10
L6	+Construction, e.g. building cabins or erecting radio masts	16	14	14	10
L7	+Drainage	15	13	12	10
L8	+Recreational hunting	15	13	11	9
L9	+ Fire Control (E4)*	9	10	8	9
L10	+Hunting for game control	15	14	12	10
L11	+Saveguard within the borders	10	8	8	5
L12	+Pesticide treatment (E4)*	18	14	16	9
L13	+ Scientific sampling	9	8	6	6
L14	+Collection of berries, mushrooms, etc.	16	10	10	9
L15	+Livestock grazing	16	13	11	9
L16	+Use of genetic resources (e.g. seed collection) (E4)*	13	9	9	7
L17	+Public access	17	11	9	7
L18	+Safeguard at the borders(E4)*	11	7	7	6
L19	+Changes in land Use	16	14	16	10
L20	+Request of Environmental impact assessment for changes in land uses (…)	10	12	15	11
TOTAL limitations stated by > 75% respondents		4	3	0	0
TOTAL limitations stated by > 50% respondents		12	11	12	3

	Stated by 50-75% of the countries.
	Stated by more than 75% of the countries.

A) ANALYSIS OF ANSWERS 1&2 (happens & commonly happens) RELATED TO LIMITATIONS, BENEFITS AND COMPENSATIONS IN THE CONSIDERED AREAS

This section of the analysis focuses on the commonalities between countries, and so results related to the 50% or the 75% of the respondents have been highlighted. Limitations, benefits and compensations are described separately and a common overview provided at the end of the section. Differences between areas are noted, while all the stakeholders are considered as a whole and not differentiated.

Every limitation, benefit and compensation proposed in the questionnaire (20 limitations, 10 benefits and 18 compensations) were in all the countries by at least one stakeholder in each of the 4 classes considered.

A.1-Limitations
Considering all the areas together, 5 of a total of 20 limitations proposed have been answered affirmatively by more than 75% of the countries (see table 4); this increases to 18 out of 20 (90%) when considering the limitations agreed by more than 50% of the respondents (see table 4).

The activities related to forestry (*timber harvesting, planting trees, clear-cutting, pesticide treatment*) are those with more limitations in the 4 classes considered. Public access is highly scored in the strict PFAs, but not in the areas of socioeconomic influence.

As expected, the number of coincident limitations is higher in the PFAs than in the socio-economic influence areas ("*Area Influence S- PFA*" & "*Area of Influence NS- PFA*"). It is also higher in the strict PFA ("*Strict PFA*" & "*Area Influence S- PFA*") than in the non-strict PFA ("*Non strict PFA*" & "*Area of Influence NS- PFA*"). Fire control (L9) and also scientific sampling (L13) are the limitations least selected by the respondents in all areas, and are the only two not selected by the majority of the countries.

A.2-Benefits

Considering all the classes together, 6 of a total of 10 benefits proposed were answered affirmatively by more than 75% of the countries (see table 5). All the benefits were recorded by the majority of countries.

The lowest number of benefits were reported in the Strict PFAs compared to the other 3 areas and, in general, are higher in the areas of influence than in the Strict PFAs themselves.

A.3-Compensations

Considering all areas, only 3 kinds of compensation (1 economic and 2 technical) of the 18 proposed (all of them in "*Non strict PFA*) were reported by a minimum of the 75% of the respondents (see table 6); this number increases to 16 out of 18 when compensations stated by at least 50% of the countries are considered (Table 6).

In summary, it can be highlighted that limitations mainly concentrate in the actual protected forest area (Strict and non strict PFA), while benefits are recognized in all the 4 areas but to a major degree in the areas of socio-economic influence.

Compensations are mainly applied in the Non Strict PFA, and to smaller degree in the socio-economic areas of influence, followed by the areas of socio-economic influence.

There is a higher degree of coincidence among countries with respect to benefits than to limitations or compensations.

Table 5:
Number of countries selecting the proposed benefits

Common limitations		Strict PFA	Non strict PFA	Area Influence S- PFA	Area Influence NS- PFA
B1	+*Jobs created directly by the PFA*	18	19	17	18
B2	+*Jobs created indirectly for the PFA*	15	18	18	19
B3	+*Provision (by the administration) of infrastructure and services for the region around the PFA*	-	-	17	16
B4	+*Regulation of the exploitation of the hunting and fishing resources in the area*	13	15	15	11
B5	+*Creation of marks of certification.*	9	15	13	13
B6	+*Increase in the flow of visitors to the area*	11	17	19	21
B7	+*Promotion of the tourism business structures through the web of the PFA.*	9	16	18	19
B8	+*Increase of the land value*	7	15	12	13
B9	+*Increase of facilities for rural tourism*	7	15	16	18
B10	+*Increase on information on natural values*	16	18	17	19
TOTAL limitations stated by > 75% respondents		1	4	6	6
TOTAL limitations stated by > 50% respondents		5	9	10	10
	Stated by 50-75% of the countries.				
	Stated by more than 75% of the countries.				

There next section focuses on the impact of benefits, limitations and compensations on the different stakeholders categories considered in the survey.

B) ANALYSIS OF ANSWERS 1&2 (happens & commonly happens) RELATED TO LIMITATIONS, BENEFITS AND COMPENSATIONS THROUGH A STAKEHOLDERS COMPARISION

Some general trends can be noted regarding the number of limitations, benefits and compensations stated by the majority of the countries.

For most stakeholders, the number of limitations is higher in "*Strict PFA*" than in "*Non strict PFA*" (Table 7); in "*Non strict PFA*" than in "*Area Influence of Strict PFA*", and in "*Area of Influence of Strict PFA*" than in "*Area of Influence of non strict PFA*".

Landowners are the stakeholders that face most limitations in all cases, followed by the *state administration, hunters and fishermen* in "*Strict PFA*" and "*Non strict PFA*", or by *municipality* in "*Area Influence S- PFA*" by "*Area of Influence NS- PFA*".

Table 6:
Number of countries selecting the proposed compensations

Common limitations		Strict PFA	Non strict PFA	Area Influence S- PFA	Area Influence NS- PFA
ECONOMIC COMPENSATIONS					
C1	*Tax reduction or exemptions*	8	9	6	2
C2	*+Purchase of cutting rights (…)*	13	13	7	4
C3	*+Economic compensation for the naturalization of the management practices.*	9	13	8	2
C4	*+Subsidies for specific action orientated to promoting activities that benefit the conservation of thePFA.*	9	18	10	10
C5	*+ System of financial help to promote agrarian production methods compatible (…).*	7	12	9	9
C6	*+ Participation in the benefits generated(...).*	10	12	9	9
C7	*+Grants for the rehabilitation of rural dwellings*	5	13	11	9
C8	*+Subsidies for the improvement and restoration of habitats.*	10	16	11	13
C9	*+Subsidies for promoting public use and environmental education projects*	12	14	11	11
C10	*+ Grants to cultural entities (…)*	9	12	9	11
C11	*+ Advantages in territorial policies.*	7	12	11	9
TECHNICAL COMPENSATIONS					
C12	*+Technical support for planning and management by the owners of forest properties in the PFA*	10	17	10	11
C13	*+Preparation of projects for the technical improvement of agrarian exploitations.*	7	13	12	11
C14	*+Construction of forest fire fighting infrastructure.*	9	11	13	10
C15	*+Forestry work, control of plagues and reforestation done by the administration responsible for.*	10	14	13	10
C16	*+Improvements in public infrastructures*	12	16	15	13
C17	*+Elaboration of planning documents*	11	14	11	8
C18	*+Education of stakeholders to better be able to manage their PFA*	11	17	12	13
TOTAL limitations stated by > 75% respondents		3	3	0	0
TOTAL limitations stated by > 50% respondents		3	16	10	7
	Stated by 50-75% of the countries.				
	Stated by more than 75% of the countries.				

In general terms, the number of benefits stated by stakeholder (see table 10) is higher in the areas of socio-economic influence than in the actual PFA (*"Strict PFA"* & *"Non strict PFA"*). Nevertheless, hunters and fishermen seem to enjoy more benefits in *"Non strict PFA"* than in *"Area Influence S-PFA"* and *"Area of Influence NS-PFA"*.

The following section focuses on the role of different stakeholders as a target group for limitations, benefits and compensations, and on common threats between countries. For this reason, results relate to items highlighted by 75% of the respondents (see tables 4, 5, 6, and table 15, in the conclusions).

A.1-Limitations

At least 75% of the respondents reported that only *landowners, visitors, hunters-and-fishermen* and *state administration* were subject to any limitation and, in all the cases within PFA themselves (*"Strict PFA"* and *"Non strict PFA"*). In contrast, the majority of countries didn't report *community inhabitants* and *artisans* to be subject to any limitation (see Table 8).

Land owners and *state administration* are the most important stakeholders, followed by *community inhabitants* and *municipality.*

Public access becomes a major limitation for *visitors* and *hunter and fishermen* in strict PFAs.

A.2-Benefits

Benefits, in contrast to limitations, are more spreadout and shared among stakeholders. L*andowners, tourism enterprises* and *community inhabitants* are the stakeholders that get the most benefits (see Table 9).

Landowners, community inhabitants and administration are the main beneficiaries of the job opportunities created, whilst *tourism enterprises, municipalities* as well as the *community inhabitants* are the main beneficiaries of the indirect benefits.In the *"Non strict PFA"*, the main beneficiaries are the *landowners* and the *administration*. In contrast, in the *"Area Influence S- PFA"* &

Table 7:
Number of limitations, benefits and compensations selected by at least 50% respondents per area and stakeholder.
n: number of items stated by 50% of the countries; in brackets () number of items selected by the 75% of the respondents; –: not present in the questionnaire.

		Landowners	Visitors	Hunters and Fishermen	Scientist	State administration	People with rights	Tourism enterprises	Community inhabitants	Municipality	Property developers	Artisans
Limitations	Strict PFA	16(3)	1	5(1)	1	15	1	-	-	-	-	-
	Non strict PFA	13(2)	0	2	0	10(2)	1	-	-	-	-	-
	Area Influence S- PFA	11	0	2	0	9	0	2	3	6	1	0
	Area Influence NS- PFA	3	0	0	0	1	0	0	0	1	0	0
Benefits	Strict PFA	5	1	2	2	4(1)	0	-	-	-	-	-
	Non strict PFA	9(3)	3(1)	3	2(1)	8(2)	0	-	-	-	-	-
	Area Influence S- PFA	10	4	3	2	8	0	9(5)	9(3)	10(2)	6	6(1)
	Area Influence NS- PFA	10(1)	4(1)	3	3	7	0	10(6)	10(5)	10(5)	7	8(2)
Compensation	Strict PFA	4	-	0	-	4	0	-	-	-	-	-
	Non strict PFA	17(3)	-	0	-	10	0	-	-	-	-	-
	Area Influence S- PFA	7	0	0	-	4	0	1	2	8	1	0
	Area Influence NS- PFA	6	-	0	-	3	0	1	0	4	0	0

Table 8:
Number of countries with affirmative answers by stakeholder in limitations

		Strict PFA						Non strict PFA					
		LO	V	HF	S	SA	PR	LO	V	HF	S	SA	PR
L1	Timber harvesting	16	-	-	-	14	9	18	-	-	-	19	11
L2	Planting trees	17	-	8	-	15	9	16	-	7	-	17	10
L3	Clear-cutting (Cuttings > 1ha)	15	-	-	-	13	9	16	-	-	-	14	8
L5	Building forest roads	17	-	8	-	16	9	17	-	7	-	15	6
L12	Pesticide treatment (E4)*	18	-	10	-	16	8	15	-	8	-	14	7
L17	Public access	14	17	17	15	14	10	11	10	8	7	9	6

		Area Influence S- PFA										Area Influence NS- PFA									
		LO	V	HF	S	SA	TE	CI	M	B	ART	LO	V	HF	S	SA	TE	CI	M	B	ART
L1		15	-	-	-	11	-	8	7	-	-	11	-	-	-	10	-	9	7	-	-
L2		13	-	8	-	9	4	6	6	8	5	10	-	4	-	9	5	6	6	5	4
L3		14	-	-	-	12	-	-	8	-	-	11	-	-	-	11	-	-	7	-	-
L5		12	-	5	-	11	6	6	11	9	-	8	-	4	-	9	6	4	10	9	-
L12		16	-	8	-	14	-	11	13	-	-	9	-	5	-	9	-	6	9	-	-
L17		6	9	8	7	7	9	8	7	9	8	7	7	7	7	7	7	7	7	5	6

	Stated by 50-75% of the countries.
	Stated by more than 75% of the countries.

Table 9:
Number of countries with affirmative answers per stakeholder in benefits.

		Strict PFA						Non strict PFA					
		LO	V	HF	S	SA	PR	LO	V	HF	S	SA	PR
B1	Jobs created directly by the PFA.	15	-	7	14	18	6	17	-	10	17	19	10
B2	Jobs created indirectly for the PFA	15	-	9	12	13	6	18	-	12	16	16	10
B3	Provision by the administration of infrastructure….	-	-	-	-	-	-	-	-	-	-	-	-
B6	Increase in the flow of visitors to the area,	11	-	6	-	8	4	17	-	10	-	14	8
B7	Promotion of the tourism business structure through the web of the PFA.	9	8	4	-	8	3	15	16	8	-	13	8
B9	Increase of facilities for rural tourism	7	8	5	-	7	3	14	15	8	-	12	8
B10	Increase on information on natural value .	12	14	12	-	16	6	15	17	14	-	18	9

	Area Influence S- PFA										Area Influence NS- PFA									
	LO	V	HF	S	SA	TE	CI	M	B	ART	LO	V	HF	S	SA	TE	CI	M	B	ART
B1	15	-	4	14	16	14	17	15	9	10	15	-	6	11	13	13	18	15	13	15
B2	15	-	9	14	16	17	18	16	12	14	16	-	10	16	13	18	19	18	15	18
B3	13	14	12	9	14	17	16	15	15	12	15	16	11	10	12	15	15	15	14	12
B6	16	-	10	-	11	19	17	16	16	17	16	-	10	-	11	21	19	18	15	17
B7	13	13	6	-	12	18	16	18	11	12	15	15	7	-	11	19	17	18	12	15
B9	16	14	5	-	11	16	13	15	12	11	18	16	5	-	11	18	16	17	13	13
B10	14	16	13	-	16	17	15	17	11	12	16	18	14	-	16	19	18	19	10	12

	Stated by 50-75% of the countries.
	Stated by more than 75% of the countries.

"Area of Influence NS- PFA" the ones obtaining the highest number of benefits are the *tourism enterprises*, *community inhabitant* and the *municipality*.

A.3-Compensations
Compensations were mainly reported in the *Non Strict PFA,* followed by the area of influence of the *Non Strict PFA* (see Table 10).

Table 10:
Number of countries with affirmative answers per stakeholder in compensations

		Strict PFA						Non strict PFA					
		LO	V	HF	S	SA	PR	LO	V	HF	S	SA	PR
C4	Jobs created directly by the PFA.	9	-	7	-	7	3	18	-	7	-	6	6
C8	Subsidies for the improvement and restoration of habitats.	10	-	7	-	8	3	16	-	10	-	12	8
C12	Technical support for planning and management by the owners of forest properties in the PFA.	10	-	-	-	8	3	17	-	-	-	12	5

	Area Influence S- PFA										Area Influence NS- PFA									
	LO	V	HF	S	SA	TE	CI	M	B	ART	LO	V	HF	S	SA	TE	CI	M	B	ART
C4	10	-	7	-	7	-	9	9	-	7	11	-	5	-	5	-	7	10	-	-
C8	11	-	8	-	10	4	7	9	-	8	13	-	8	-	10	3	8	10	-	-
C12	10	-	-	-	8	-	-	7	-	-	11	-	-	-	9	-	-	8	-	-

	Stated by 50-75% of the countries.
	Stated by more than 75% of the countries.

Table 11:
Main features by stakeholder group

Stakeholders in the actual PFA and also in their area of socio-economic influence

Landowners (LO) face the most limitations, together with the SA. LO also get a high number of benefits (as many others stakeholders). At the same time it is part of the small group (with SA and M) of stakeholders that get compensations. Limitations and compensations are more frequent in *Strict PFAs*, whilst benefits are more frequent in the socio-economic area of interest.

Visitors (VI). According to the majority of respondents, visitors mostly get benefits from the PFA (to a lower degree than LO). Only limitations have been stated in *Strict PFA* (collecting berries and public access). No compensations have been stated by the majority for this group.

Hunters and Fishermen (H&F). This group faces some limitations (particularly in *Strict PFA*) but also a high number of benefits. They are not subject to compensations.

Scientists (SC) don't have many limitations, except access to *Strict PFAs*, which is limited in the majority of the countries. In the same way, they don't receive many benefits or compensations .

State administration (SA) follows a trend similar to the LOs. They get a high number of limitations, benefits in the same level as many other stakeholders, and some compensation.

People with rights (nor fishermen or hunters). Only 1 limitation has been stated by the majority of countries in the very PFA (strict and non-strict PFA), nor benefits, neither compensations.

Stakeholders only in the PFA area of influence:

Tourism enterprises. This group enjoys the highest level of benefits. In all the countries it has been stated that they get profit from the increase in the flow of visitors. Just 2 limitations (construction & request of environmental impact assessment) have been stated by the majority of countries and both of them in the area of influence of the Strict PFA. This group also gets compensations.

Community inhabitants get mainly benefits from the PFA. 3 limitations have been stated in the area of influence if Strict PFA , related to hunting, pesticides and land use changes. This group also gets compensations in form of grants or improvement in public infrastructures.

Municipality (M). Although this group was only analysed in the socioeconomic area of influence, they follow the same pattern as LO and SA: high level of benefits (as many other stakeholders groups), some limitations and also some compensation.

Property developers. This group gets more benefits than limitations (mainly related to construction). They also get one compensation in form of construction of public infrastructures.

Artisans only get benefits, the most important of those are the indirect jobs created and the increment of the flow of visitors.
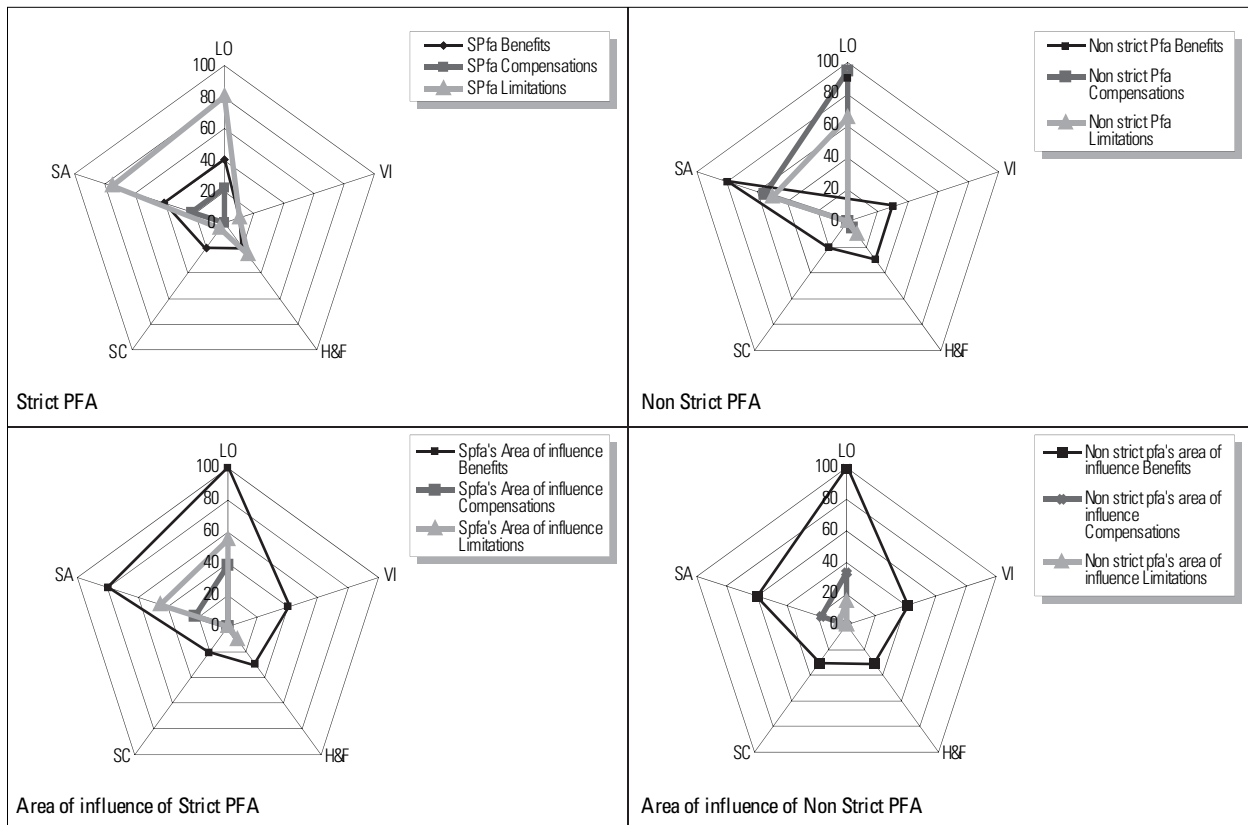

Figure 3:
Socio-economic implications of PFA to the stakeholders. Percentage of benefits, limitations and compensations out of the total proposed in the questionnaire. Results related to landowners (LO), visitors (VI), hunters and fishermen (H&F), scientists (SC) and state administration (SA).
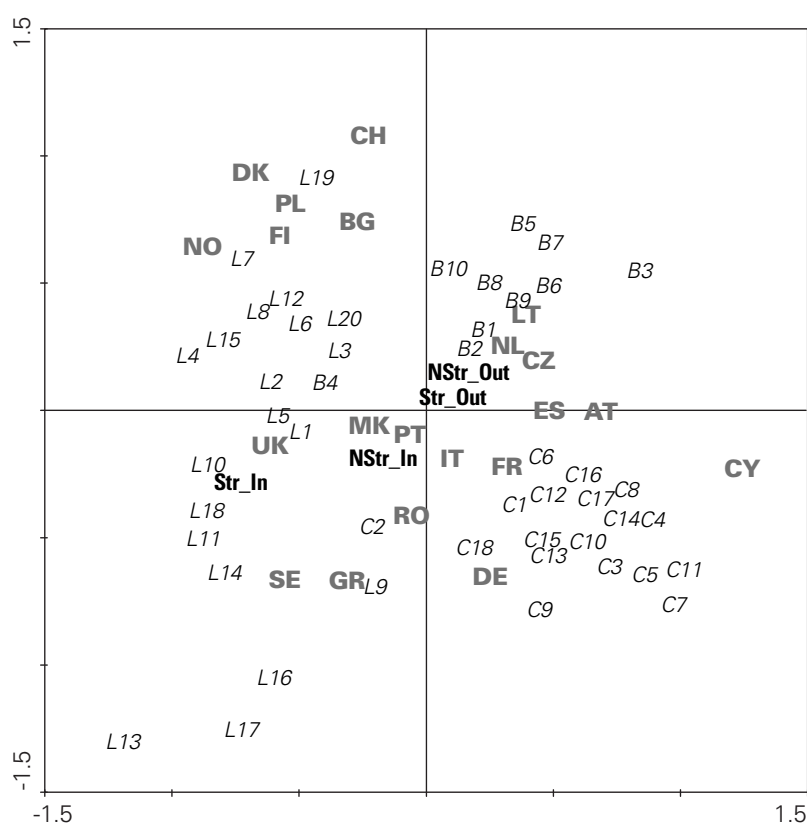
Figure 4:
CCA analysis. Biplot diagram summarizing the effects of countries and types of areas (explanatory variables) upon values of limits, benefits, and compensations (dependent variables).

3.2. A multifunctional analysis of the grouping of effects

Global analyses of data from all PFA classes

Results of multivariate analysis enable us to visualize the balance of limitations, benefits and compensations in particular countries. Consequent CCA analysis (see Fig. 4) proved the significant differences in the types of areas and countries (Monte Carlo permutation test, p = 0.001). The first ordination axis separated limitations on the left (in protected areas and countries SE, UK, NO, FI, PL, DK; see Appendix 1), and compensations and benefits on the right. The second ordination axis separated prevailing compensations (in DE, FR, CY) and benefits (in the area of influence and countries LT, NL, CZ).

Table 12:
The summary of multivariate analyses. The values of limitations (L), benefits (B) and compensations (C) were used as dependent variables in all analyses. Total explained percentage variance represents the variance in dependent data explained by all axes.

Analysis	Explanatory variables	Total explained percentage variance	Percentage variance explained by the first axis	Percentage variance explained by the first and second axes
Analyses with all data used:				
DCA - all data used	country, protected area type (as supplementary variables)	100	12.7	22.8
CCA - all data used	country, protected area type	21.2	5.4	8.9
Separate analyses for each type of protected area:				
CCA - NonStrict IN	country	29.9	5.9	10.6
	group of countries	7.3	3.6	5.3
CCA - NonStrict OUT	country	33.3	7.6	13.4
	group of countries	6.4	2.5	4.4
DCCA	type of stakeholder	17.8	6.0	9.1
CCA - Strict IN	country	31.8	7.0	12.9
	group of countries	6.7	3.0	5.0
CCA - Strict OUT	country	28.4	6.3	11.2
	group of countries	5.6	2.0	3.6

Particular analyses for each type of protected area
Limitations, benefits and compensations were separated to a certain degree as in the global analysis. It applies especially to analyses where countries were used as explanatory variables. A greater amount of variability in data was usually explained in these particular analyses than in the global analysis made for all protected areas together (see table 12). Countries used as explanatory variables explained more variability than groups of countries (for example for Strict PFA see Fig. 6).

The following relationships among socio-economic aspects and countries were identified for particular classes of PFA (Fig. 5):

- *Strict PFA:*
  Countries: prevailing limitations – BG, CH, DK, FI, NO, PL, prevailing benefits and compensations - FR, IT, RO

- *Area of influence of strict PFA:*
  Countries: prevailing limitations - BG, DK, FI, GR, MK, PL, SE, UK, prevailing benefits - CZ, LT, NL, prevailing compensations - AT, CY, DE, ES, FR
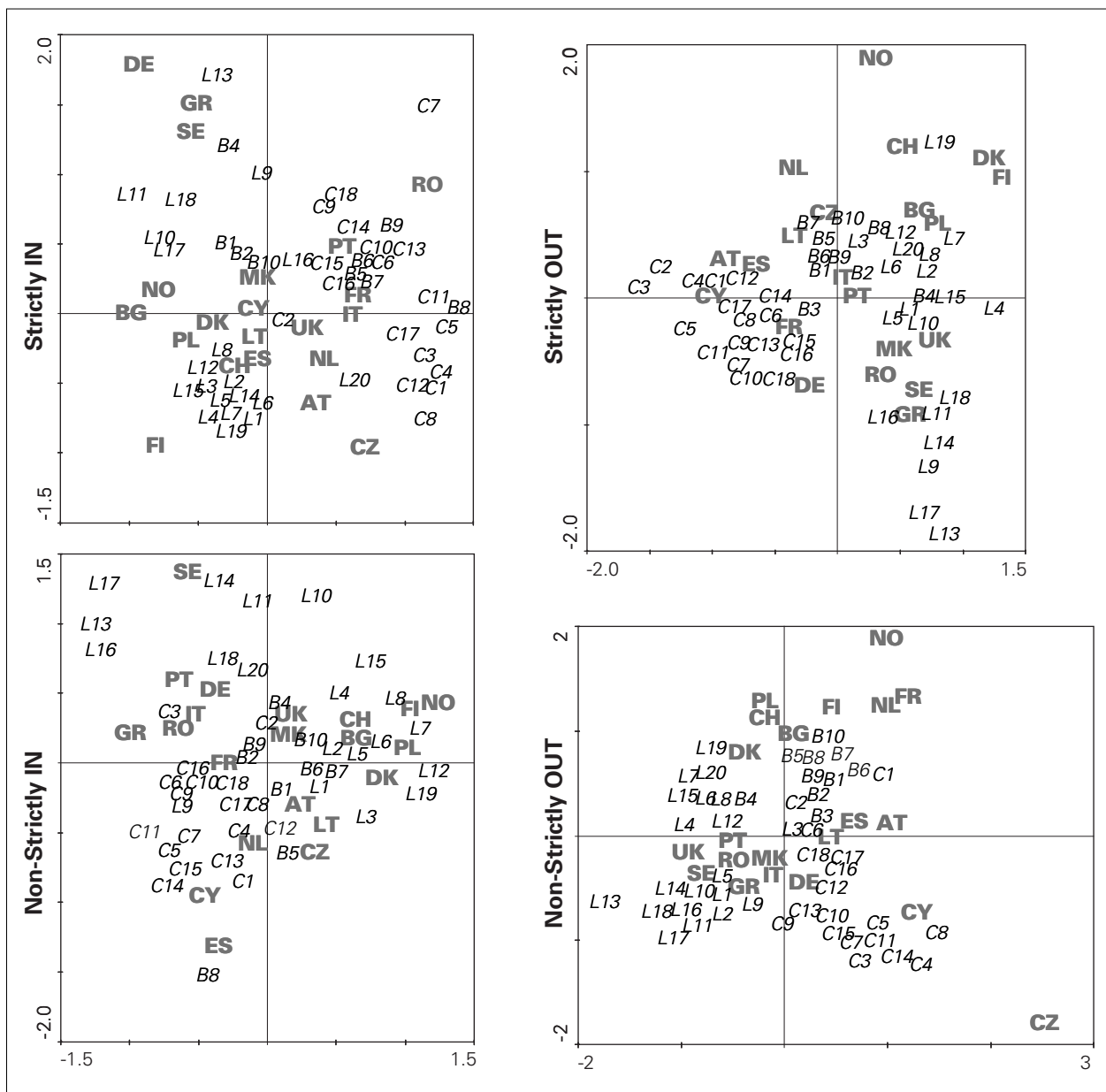

Figure 5:
CCA analysis for four types of PFA (Strict PFA - Strictly IN, Area of influence of Strict PFA – Strictly OUT, Non-strict PFA – Non-strictly IN, Area of influence of non-strict PFA – Non-strictly OUT). Explanatory variables: countries. Country abbreviations see Appendix 1.

- *Non strict PFA:*
  Countries: with prevailing limitations - CH, DK, FI, NO, PL, SE, prevailing benefits and compensations: CY, ES, FR, GR, IT, MK, NL, RO
- *Area of influence of non strict PFA:*
  Countries: prevailing limitations - GR, PT, RO, UK, SE, prevailing benefits - BG, FI, FR, NL, NO, prevailing compensations - CY, CZ, DE

  Countries not mentioned as prevailing in limitations-benefits-compensations can be considered as "balanced" with respect to the socio-economic effects of PFA.

3.3. A country and region-wise analysis of the socio-economic value and effects of PFAs in Europe

The socio-economic effects of PFA vary substantially from one country to another throughout Europe, depending on the socio-political and socio-cultural context. Therefore, a general assessment from the answers of national delegates to questionnaires about limitations-benefits-compensations was summarised in order to synthesize the national specifications (see table 13).

Table 13: Assessment of socio-economic effects of PFA at the national level			
Austria	All socio-economic revenues, benefits and effects are higher in *non strict PFAs*. However, the number of limitations on the exploitation of forest potential is high, and hence the limitations outweigh the benefits of compensations received by stakeholders. Focussing the attention on the PFAs areas of influence, limitations are more strictly defined for the forest areas adjacent to strict PFA. In this sense, the *areas of influence of non strict PFAs* receive a higher number of benefits and compensations.	Denmark	The four classes of protected areas in Denmark receive a very limited amount of economic compensation. Protective regulations are very restrictive within *strict PFAs*, where hunters and fishermen have to cope with all the limitations while receiving hardly any compensation at all. The situation is just the opposite for this stakeholder in *non strict PFAs*, where benefits and compensations are positive. Following the same tendency as in the *non strict PFA*, the economic value of the *areas of influence of PFAs* is clearly positive and socio-economic benefits stand out.
Bulgaria	The economic value and benefits for Bulgarian PFAs are altogether positive, and even more so for non strict PFAs. The main stakeholders are landowners, the state administration, hunters & fishermen: all of them benefit evenly from the existence of PFAs. Bulgarian forest policies, however, only cater for a reduced proportion of compensations to the said stakeholders in the four considered spatial classes (*strict and non strict PFAs*, and their *areas of influence*)	Finland	Finnish socio-economic revenues of *strict PFAs* yield a negative balance, while the opposite is found in *non strict PFAs*. The four classes of protected areas in Finland receive a very limited amount of economic compensations. The highest socio-economic profits are obtained in the area of influence of *non strict PFAs*.
Cyprus	The economic value derived from *non strict PFAs* in Cyprus is positive and beneficial as a whole. Looking cautiously at *strict PFAs*, benefits and compensations are basically enjoyed by the public administration, while other stakeholders have to bear and cope with some limitations. Likewise, the economic value of the *areas of influence of PFAs* is clearly positive.	France	Both *strict PFAs* and *non strict PFAs* have remarkable economic effects in France: most of the considered limitations, benefits and compensations affect all stakeholders evenly, except people with rights. In general terms, the benefits and compensations are wider and broader than the limitations both in the *strict* and in the *non strict PFAs*. However, the economic value of the actual protected areas is slightly higher in *non strict PFAs* than in *strict PFAs*. On the other hand, in the *areas of influence*, the economic effects of forest protection show great differences whether under strict protection or non strict protection. Limitations are outstanding in the areas of influence under strict protection, although some benefits and compensations are also present. In *areas of influence of non strict PFAs*, however, high benefits are a constant, together with some compensations and no limitations whatsoever.
Czech Republic	In the *strict PFAs* of the Czech Republic, forest landowners support a high number of limitations to exploitation while they scarcely receive any benefits or compensations at all. The situation found in relation to state administration is quite different: this stakeholder also bears a strict number of limitations, but also receives a much higher proportion of benefits and compensations. The pressure upon landowners is lower in *non strict PFAs*: although they might have to support a significant number of limitations, they also receive a high number of benefits and compensations. In this case, the position of the state administration is, once again, more advantageous, from the point of view of the total amount of benefits and compensations received. On the other hand, people with rights receive a high number of benefits in *non strict PFAs*, but none in *strict PFAs*. Likewise, the benefits obtained by the municipalities and the state administration in the *areas of influence*, stand out over those obtained by other stakeholders.	FYR of Macedonia	The stakeholders bearing the positive and negative economic effects of PFAs are always the end users: visitors, hunters & fishermen, etc. As a whole, Macedonian stakeholders in the four classes of PFAs considered enjoy very few and limited compensations.

Germany	Any stakeholder assumes 50% of any limitation, benefit or compensation in German *strict PFAs*, while on *non strict PFAs*, the share of limitations and benefits is higher than 50% for landowners and the state administration. Nevertheless, the landowners don't surpass 50% of compensations, the opposite of state administration The limitations to landowners are higher in the *area of influence of strict PFAs* than in the actual PFAs. Municipalities receive most of the benefits from the existence of PFA in their areas of influence, particularly of *strict PFAs*. The economic effects (limitations, benefits and compensations) have greater impacts in the *area of influence of the strict PFA* than in the *area of influence of non strict PFAs*.	Romania	Landowners support few limitations while obtaining all the benefits and compensations. The state administration plays an outstanding role as a stakeholder, but the position of the landowners is even more advantageous in so far as compensations are concerned. Looking at *areas of influence*, benefits and compensations are higher than the limitations imposed to each stakeholder. Nonetheless, the state administration and the landowners bear more limitations, while the municipalities and the state administration obtain greater compensations.
Italy	In Italy, *strict PFAs* have the greatest limitations, although this fact is balanced channelling greater compensations than those paid to *non strict PFAs*. It is worth noting the economic advantages of forest protection in the *areas of influence of PFAs*, since, although these areas bear strict limitations, all benefits and most of the compensations are accounted for in this sector.	Spain	*Strict PFAs* have an overall negative economic value and revenue, while *non strict PFAs* have an slightly positive value. However, the *areas of influence* of both *strict and non strict PFA* yield a high economic value. Compensations and benefits paid to landowners and people with rights over those forest lands are wide and well structured in *non strict PFAs*. Compensations are fairly high in the *area of influence of strict PFAs*, while these decrease in the actual PFAs.
Lithuania	Landowners are the main stakeholders followed by the state administration and people holding forest land rights. In the *non strict PFAs*, landowners enjoy higher compensations than limitations. Furthermore, in the *areas of influence* of both *strict and non strict PFA*, the benefits stand out as an economic effect, outweighing the limitations and the compensations.	Sweden	The state administration and hunters & fishermen are the main stakeholders in *strict PFAs*, while in *non strict PFAs* the most relevant stakeholders are the state administration and the landowners. The economic value of PFAs yields an overall positive outcome, having the direct benefits as the most relevant economic effect, particularly in *strict PFA*. The economic effects of *strict and non strict PFAs* are more balanced in their *areas of influence*.
Netherlands	Landowners are the main stakeholder. The compensations they receive are higher than the limitations imposed, both in the *strict and non strict PFAs*. In the *areas of influence*, benefits are the only relevant economic effect, above all related to development activities such as tourism enterprises, property developers and artisans.	Switzerland	The landowners bear the most limitations in *strict PFAs* but they get compensated for the loss of income due to the abandonment of timber cutting. The state (cantonal) administration may receive some other forms of compensation for tasks related to PFAs, e.g. technical assistance and education or support for special projects, promoting activities etc. In the *non strict PFAs*, there are usually more benefits for the landowners. Limitations and compensations are more or less even. No substantial differences are found between the *areas of influence of strict and non strict PFAs*. As the Swiss forest law already contains many management restrictions and obligations applying to the whole forest area, there are no special limitations in the area of influence of a PFA.
Norway	There is hardly any compensation at all in any of the four classes of PFAs considered. The economic value of PFAs is clearly negative: limitations are high, while there are very few and minor benefits, particularly in *strict PFAs*, and very limited compensations. However, the economic value is positive in the *area of influence* of both the *strict* and the *non strict PFAs* (particularly in the *area of influence of strict PFAs*).		
Poland	The state administration is the least relevant stakeholder. However, people with rights over forested lands benefit most from the existence of protected areas, in the *strict* as well as in the *non strict PFAs*. The areas of influence yield a main economic effect of benefits while compensations account for the lowest economic effect.		
Portugal	The economic revenue derived from PFAs appear, in general to be slightly positive, mainly for landowners and people with rights over the forestlands. The *areas of influence* of both *strict* and *non strict PFA* yield a high economic value. People with rights are a relevant stakeholder in strict PFA. Landowners receive abundant benefits and compensations both in *strict and non strict PFA*.	United Kingdom	All economic effects (limitations, benefits and compensations) are very high in the four classes of protected areas. Hence, the economic value of the actual PFA and their areas of influence is remarkable. Benefits stand out particularly in *non-strict PFA* and in their *areas of influence*.

Table 14:
Main economic effects by stakeholder in strict and non strict PFA of European countries.

	L1 (Limitations in PFA)		B1 (Benefits in PFA)		C1 (Compensations in PFA)	
	Strict PFA	**Non strict PFA**	**Strict PFA**	**Non strict PFA**	**Strict PFA**	**Non strict PFA**
Austria	**LO, SA**, PR	**LO, SA, PR**	LO	**LO,SA, PR**	LO, SA	**LO, SA,** PR
Bulgaria	**LO, SA, HF**		LO, SA, HF	**LO, SA, HF**		
Cyprus			SA	**LO, SA**, HF		**LO,** SA
Czech Republic	LO, SA			**SA, PR**		LO, **SA**
Denmark	**LO, HF**	LO	**LO**	**LO, HF**		
Finland	**LO, SA, HF, PR**	**LO, SA, HF, PR**		LO, SA, **HF, PR**		
France	**LO, SA, HF**	**LO, SA**, HF	**LO, SA, HF**	**LO, SA, HF**	**LO, SA, HF**	**LO, SA, HF**
FYR Macedonia	LO, SA, **HF**		**LO, SA**, HF	**LO, HF**		
Germany		LO, SA		LO, SA		SA
Greece	SA	SA		**SA**		SA
Italy	**LO, SA, HF, PR**	**LO, SA, PR**	**LO, SA, HF, PR**	**LO, SA, HF, PR**	**LO, SA, HF, PR**	**LO**, SA, **HF, PR**
Lithuania	**LO, SA, PR**	LO, SA, PR	**LO**, SA	**LO, SA, PR**	LO, SA	**LO**, SA
Netherlands	LO				**LO**	**LO**
Norway	**LO, SA, PR**	LO, SA, PR		LO, SA, PR		
Poland	**LO, SA, PR**		LO, **PR**	LO, **PR**		
Portugal	LO, PR	**LO**	**LO**, SA, **PR**	**LO**	**LO, PR**	**LO**
Romania	SA	LO, **SA**	**LO, SA**	**LO, SA**	**LO, SA**	**LO, SA**
Spain	LO, PR	LO		LO		**LO**, PR
Sweden		SA	SA, HF	SA		LO, SA
Switzerland	**LO**, SA	LO, SA	**LO**	LO	SA	LO, SA
UK	**LO, SA, HF, PR**	**LO, SA, HF, PR**	**LO, SA, HF, PR**	**LO, SA, HF, PR**	**LO, SA,** HF, **PR**	**LO, SA**, HF, PR

LO: Landowners
SA: State Administration
HF: Hunters & Fishermen
PR: People with rights

The analysis of the economic effects of PFAs has shown clear differences between European countries. These relate both the four classes of protected areas (*strict and non strict PFA*, and their *areas of influence*), as well as the main stakeholders with respect to limitations, benefits and compensations (see table 14).

In standard characters: Stakeholders with more than 50% of the list of limitations/benefits/compensations.

In bold characters: Stakeholders with more than 75% of the list of limitations/benefits/compensations .

From these national scenarios, it has been possible to characterise and group countries according to their similarities and coincidences in their distribution of limitations/benefits/compensations, and to the main stakeholders involved in each category of PFA (Fig. 6). As a result, we have obtained the following patterns of socio-economic effects of PFA throughout Europe, at a regional scale:

· **Group 1:** *Central European countries of the former Western Europe* (Austria, Germany, Switzerland):

- These countries have very similar characteristics of their non strict PFAs.
- Compensations are generally not balanced with limitations.
- The state administration and the landowners represent the main stakeholders.

· **Group 2:** *Former Eastern European continental countries* (Bulgaria, Czech Republic, Lithuania, Poland, Romania)

- Benefits are relevant, but there are few compensations (most noticeable in Bulgaria, Romania and Poland).
- The main stakeholder is the state administration. However, the role of landowners is relevant concerning the limitations in strict PFA and the compensations in non strict PFA.
- People with rights play a relevant role as a stakeholder in all kinds of economic effects, and above all concerning the benefits in non strict PFA (Czech Republic, Poland, Lithuania).

- **Group 3:** *Mediterranean European countries* (Cyprus, FYR Macedonia, Greece, Italy, Portugal, Spain)
  - Slightly positive economic value of non strict PFAs.
  - Users (hunters & fishermen, visitors) have a significant role as economic stakeholders.
  - Compensations are more relevant in the area of influence than in the actual PFA (above all in strict PFAs).
  - In eastern Mediterranean countries, the main economic stakeholder in strict PFA is the state administration, while landowners stand out as the main stakeholder in non strict PFAs (Greece, FYR Macedonia, Cyprus).
  - Limitations-benefits-compensations are generally balanced in the areas of influence of strict and non strict PFAs, with the exception of Cyprus.
- **Group 4:** *North-Western European countries, under Atlantic influence* (Denmark, France, The Netherlands, The UK)
  - Strong national specificities, but in general limitations-benefits-compensations are well balanced, with a rather positive economic value of the existence of PFA.
  - Landowners are the main economic stakeholder.

- **Group 5:** *Scandinavian countries* (Norway, Sweden, Finland)
  - Very few compensations.
  - The State Administration and people with rights are the most relevant economic stakeholders.
  - Benefits stand out in the area of influence of non strict PFA, where the economic effect of the forest protection is rather positive; this offers a contrasting situation if it is compared with the actual PFA.

4.   Discussion and conclusions

The COST Action E27 has addressed the complex issue of the socio-economic consequences of PFAs in rural areas by considering (i) limitations and restrictions, (ii) direct and indirect benefits, and (iii) compensations. It has tried to assess whether PFAs contribute to rural development or whether they compromise the socio-economic development of local populations (Table 15). The aim was not to estimate the overall economic value of PFAs, but to assess the structure of their socio-economic value through a qualitative approach using MCPFE PFA categories. The socio-economic effects have been analysed for different stakeholder groups, based on four classes of PFAs (actual protected areas –strict and non strict PFAs- and their areas of influence).

From the balance of socio-economic impacts that PFAs have across European countries, it has been demonstrated that the *non-strict PFA* (MCPFE categories 1.3., 2 & 3) have substantial economic value in Europe. The high proportion of benefits received by the different stakeholders in these PFAs as well as in their areas of influence should be noted. This could explain the popularity and frequency of MCPFA category 1.3., such as the Natural Park in Spain or the Regional Park in France.
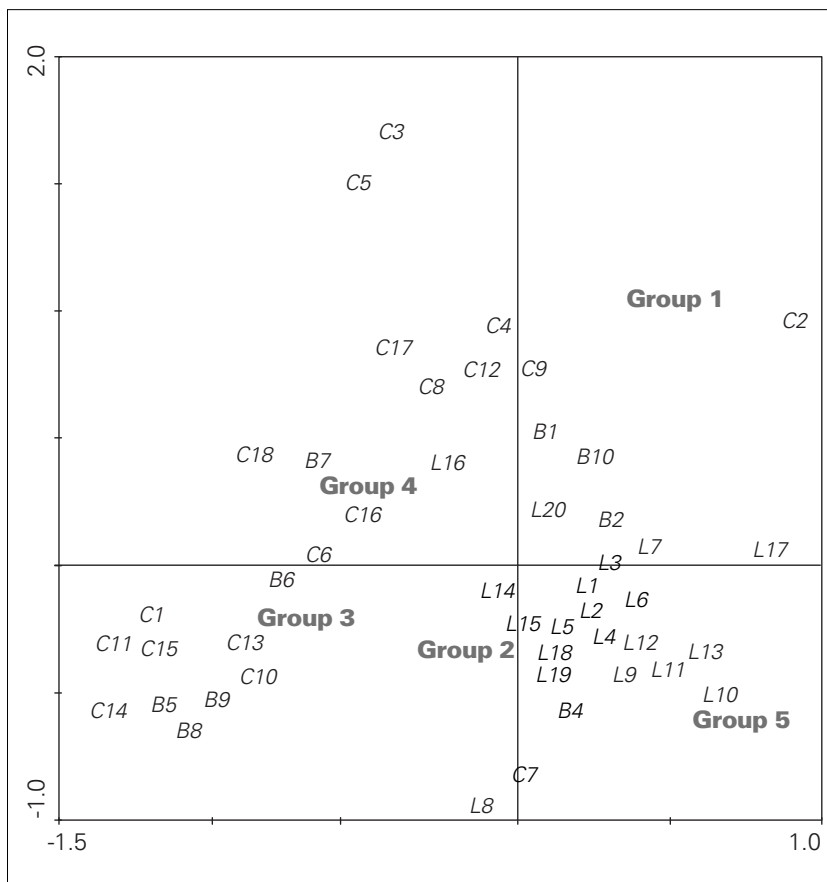

Figure 6:
CCA analysis for Strict PFA (Str IN). Explanatory variables: groups of countries.

Landowners are the stakeholders who are most affected in the four classes we considered (*strict PFA, non strict PFA, areas of influence of strict and non strict PFA*) and for each kind of economic effect (limitations, benefits and compensations). Nevertheless, it is evident from the the questionnaire results that the landowners have to support the higher costs of PFAs (limitations), while the benefits and compensations are distributed more equally between other possible stakeholders: the local society gets the benefits.

In summary, our results have shown that a key feature of the socio-economic effects of PFA in Europe is diversity at the national level. Nevertheless, the national specificities regarding positive and negative effects of the existence of PFA in Europe can be reduced to distinct regional patterns which can help our understanding of the socio-economic aspects of nature protection in Europe.

5.   Acknowledgements

6.   References

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| *Table 15:* |
| *Main factors to assess the socio-economic value of PFAs in Europe* |

L1-	Timber harvesting (19 countries)
L12-	Pesticide treatment (18)
L2-	Planting trees (17)
L5-	Building forest roads (17)
L17-	Public access (17)
L3-	Clearcutting (Cuttings > 1ha) (16)
B6-	Increase in the flow of visitors to the area (21)
B1-	Jobs created directly by the PFA (19)
B2-	Jobs created indirectly for the PFA (19)
B7-	Promotion of the tourism business structures through the web of the PFA.(19)
B10-	Increase on information on natural values (19)
B3	Provision (by the administration) of infrastructure and services for the region around the PFA (18)
B9-	Increase of facilities for rural tourism (18)
C4-	Subsidies for specific action orientated to promoting activities that benefit the conservation of the PFA (18)
C12-	Technical support for planning and management by the owners of forest properties in the PFA (17)
C18-	Education of stakeholders to better be able to manage their PFA (17)

<table>
<tr><td colspan="2">Appendix I:
List of abbreviations of countries.</td></tr>
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COUNTRY	Code
Austria	AT
Bulgaria	BG
Cyprus	CY
Czech Republic	CZ
Denmark	DK
Finland	FI
FYR Macedonia	MK
France	FR
Germany	DE
Greece	GR
Italy	IT
Lithuania	LT
Netherlands	NL
Norway	NO
Poland	PL
Portugal	PT
Romania	RO
Spain	ES
Sweden	SE
Switzerland	CH
United Kingdom	UK

**Appendix II:
List of stakeholders.**

Stakeholders in the PFA:	
S1	Landowners
S2	Visitors
S3	Hunters and Fishermen
S4	Scientists
S5	State administration
S6	People with rights (nor fishermen or hunters)
Stakeholders in the PFA area of influence:	
S7	Landowners
S8	Tourism enterprises
S9	Community inhabitants
S10	Municipality
S11	Hunters
S12	Fisherman
S13	Visitors
S14	Property developers
S15	Artisans
S16	Scientists
S17	State administration
S18	People with rights (nor fishermen or hunters)

**Appendix III:
Scores (sum of 1 and 2) of particular countries for all limits (L), benefits (B) and compensations (C), including all stakeholders.**

	BG		CY		CZ		DK		FI		MK		DE	
	s	%	s	%	s	%	s	%	s	%	s	%	s	%
L	270,00	0,40	63,00	0,08	154,00	0,33	256,00	0,55	266,00	0,54	415,00	0,45	271,00	0,34
B	332,00	0,49	324,00	0,43	133,00	0,28	179,00	0,38	189,00	0,38	289,00	0,31	269,00	0,33
C	79,00	0,12	375,00	0,49	180,00	0,39	32,00	0,07	40,00	0,08	222,00	0,24	267,00	0,33
	681	1	762	1	467	1	467	1	495	1	926	1	807	1

	GR		LT		NO		PL		PT		RO		ES	
	s	%	s	%	s	%	s	%	s	%	s	%	s	%
L	300,00	0,48	298,00	0,33	189,00	0,58	252,00	0,50	308,00	0,42	369,00	0,41	240,00	0,30
B	184,00	0,29	350,00	0,39	109,00	0,33	235,00	0,46	239,00	0,32	296,00	0,33	270,00	0,34
C	146,00	0,23	255,00	0,28	28,00	0,09	20,00	0,04	195,00	0,26	225,00	0,25	290,00	0,36
	630	1	903	1	326	1	507	1	742	1	890	1	800	1

	SE		CH		UK		AT		FR		IT		NL	
	s	%	s	%	s	%	s	%	s	%	s	%	s	%
L	363,00	0,51	234,00	0,45	593,00	0,56	228,00	0,24	289,00	0,30	534,00	0,39	38,00	0,31
B	195,00	0,27	237,00	0,45	271,00	0,26	335,00	0,36	341,00	0,35	441,00	0,32	48,00	0,39
C	152,00	0,21	51,00	0,10	195,00	0,18	369,00	0,40	348,00	0,36	406,00	0,29	36,00	0,30
	710	1	522	1	1059	1	932	1	978	1	1381	1	122	1

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COST Action E27

Protected Forest Areas in Europe - Analysis and Harmonisation (PROFOR)
Results, Conclusions and Recommendations

The Need for Harmonised Information on Protected Forest Areas

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1.   Decision-making requires reliable information

Decision-making on forest policy and management requires reliable, updated and comparable information. Countries are asked to provide information or data on forests to numerous international conventions, instruments and bodies. The implementation of convention action plans and the progress towards sustainable forest management include monitoring, assessment and reporting of forest-related data.

Monitoring is understood to mean periodic quantitative or qualitative measurement or observation of a specific parameter. *Assessment* means the analysis and synthesis of the monitoring data and observa-

Caption: boreal pine forest in Oulanka National Park, Finland (photo : Kris Vandekerkhove)

tion, and *reporting* means the dissemination of the results of assessment. For informed decision-making harmonised definitions, terms, content and scope of forest characteristics are also required.

Monitoring, assessment and reporting are initially undertaken by countries, based on national data sets, and are subsequently compiled by various bodies for international use.

Criteria and indicators of Sustainable Forest Management (SFM) have been developed as tools for monitoring, assessment and reporting. At a global level, there are nine regional/geographical area initiatives and processes that use criteria and indicators: namely MCPFE (Pan-European Process), Montreal Process, ITTO, Tarapoto Proposal, African Timber Organization, African Dry-Zone Process, Near East Process, Dry Forest Asia Initiative and Lepaterique Process. In total, some 150 countries are involved in these initiatives.

In Europe, the first set of Pan-European Indicators for SFM was developed in the early 1990s within the Helsinki-process (1993-1995). These indicators have been revised and adapted for use and were endorsed at the fourth Ministerial Conference in Vienna in 2003 (MCPFE, 2002, 2003, Rametsteiner & Mayer, 2004).

One of the 9 indicators for the criterion C4: 'Maintenance, conservation and appropriate enhancement of biological diversity in forest ecosystems' is indicator 4.9: 'Protected forest'. Its interpretation means that countries are required to monitor, assess and report the area of Protected Forest (PFA – Protected Forest Area) that is present in the country, both in absolute (ha) and relative (% of forest cover) figures.

2.   Users of information on protected forests

In Europe, the Ministerial Conference on the Protection of Forests (MCPFE) is the highest level process for forest policy dialogue and co-operation, including forest biodiversity issues. MCPFE collaborates closely with the Ministerial process "Environment for Europe" and in "the Pan European Biological and Landscape Diversity Strategy (PEBLDS)" (endorsed at the Sofia meeting in 1995).

Within the Ministerial process, agreements are made and commitments undertaken, through resolutions at the Ministerial conferences.

At the Third Ministerial Conference on the Protection of Forests in Europe in Lisbon, the resolution L2 was adopted by the signatory countries, committing themselves to:

1. 'adopt the six criteria for sustainable forest management from the "Pan-European Criteria and Indicators for Sustainable Forest Management" and endorse the associated indicators as a basis for international reporting and for the development of national indicators;
2. Proceed to implement, continuously review and further improve the associated indicators; (…)

and commit themselves to:

1. Promote the development and implementation of national criteria and indicators using the Pan-European criteria and indicators as a reference framework, and taking into account specific country conditions and integrate them into national forest programmes or other relevant policy frameworks.
2. Improve the quality and promote the necessary adaptations of national data collection systems, to fulfil the needs of information for national and international reporting on sustainable forest management recognising the need for continuity of terms and definitions'.

After the Lisbon Conference the criteria and indicators were updated and revised to make them suitable for reporting purposes. The revised indicator set adopted at the Vienna Conference 2003 includes the indicator 4.9: Protected forests: 'Area of forest and other wooded land protected to conserve biodiversity, landscapes and specific natural elements, according to MCPFE Assessment Guidelines' (MCPFE, 2003). By adopting resolution 4, the signatory countries committed themselves to 'apply the MCPFE Assessment Guidelines for Protected and Protective Forests and Other Wooded Land and further develop them, when appropriate". This commitment makes the reporting on PFAs obligatory, using the MCPFE assessment guidelines. The formulation 'develop them, when appropriate' however indicates that the Assessment Guidelines can be further elaborated and are not necessarily to be considered as 'set in stone'. The reporting procedure is primarily aimed to produce statistics and basic information for setting goal and informing discussions at forest and environmental policy level. In addition to MCPFE, also other processes, institutions etc. require reliable data on PFAs.

In the context of the Biodiversity Conservation Strategy 2010 and its Biodiversity Action Plan on Natural Resources, biodiversity indicators have also been developed to evaluate progress. One of these

indicators is the surface of protected areas. Reporting of these politically adopted indicators is obligatory for Member countries.

Some of the other international processes and end users of data on protected forests are UNFF[1] (as a global forest policy forum), CBD[2], CSD[3], OECD[4], UNEP[5], UNFCCC[6] and the World Bank. The principal end user institutions of the information and data on PFAs in Europe are the EU Commission, EEA[7] and UNECE Timber Committee.

3.   Bodies collecting information

The main international organizations that collect data for forest-related indicators, including PFAs are the FAO, UNECE/FAO, IUFRO and its Task Force on a Global Forest Information System (GFIS) and ITTO[8] through periodic forest resource assessments (FRA). Likewise, UNEP-WCMC and other environmental international organizations (IUCN[9], IUCN´s WCPA[10], WRI[11], WWF[12]) collect forest-related information on forest biodiversity. In Europe, the EEA and its Topic Centres, Eurostat, EFICS[13], JRC[14] and EFI[15] are bodies that collect data on protected forests. For the MCPFE process the main information source is the TBFRA[16] as an activity under the UNECE Timber Committee.

4.   European list of protected areas

In 1995, the European Environmental Agency (EEA) (with the help of its Topic Centre (ETC/NC) in Paris), the Council of Europe and the WCMC began co-ordinating their activities with respect to compiling a data base on designated areas. This project is called the "Common Database on Designated Areas" (CDDA), and includes information from national, EU and international designated areas. The aim is to produce a complete database on all protection categories and protected sites in Europe. Data-input is

generally co-ordinated by the relevant national authority, usually the Environment Department or Ministry.

This CDDA list is an important database as it collates all designation types with national titles, numbers and area. It contains information on over 50 000 designated areas from 48 countries, covering more than 800 various national designation types. (It is estimated that the total number if of all designated areas in Europe amounts to approximately 65 000 to 70 000 sites). However, CDDA does not make any analysis on the harmonisation of national designations. Comparison of protected forests in different countries is extremely difficult because of the numerous categories and definitions. The data collected also indicate important 'gaps and anomalies', mainly on protection categories initiated by authorities other than Nature Conservation, e.g. Forest Authorities. Harmonisation between Forestry and Nature Conservation administrations is often required.

5.   Natura 2000 network

The Natura 2000 Network is a European initiative designed to ensure the preservation of biodiversity within the European Union. A network of sites is being formed in the Member States under the EU Habitats and Bird Directives (Habitat Directive 92/43/EEC; Birds Directive 79/409/EEC). The primary aim is to preserve the most important habitats, natural habitat types and species within the territory of the EU. Besides forests, the Natura 2000 network also includes all other ecosystem types, such as aquatic systems, heath/peatland, grassland, dunes, scrubland, and rock outcrops.

The Natura 2000 network is not a classification system as such, rather a network of sites. In some EU countries, the Natura 2000 network is based mainly on the existing network of nationally protected areas, supported with additional areas nominated especially for the Natura 2000 purposes. In other countries

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[1] United Nations Forum on Forests
[2] Convention on Biological Diversity
[3] Commission on Sustainable Development
[4] Organization for Economic Cooperation and Development
[5] United Nations Environment Programme
[6] United Nations Framework Convention on Climate Change
[7] European Environment Agency
[8] International Tropical Timber Organization

[9] World Conservation Union
[10] World Commission on Protected Areas
[11] World Resources Institute
[12] WWF - World Wide Fund for Nature
[13] European Forestry Information and Communication System
[14] Joint Research Centre of European Commission
[15] European Forest Institute
[16] Temperate and Boreal Forest Resource Assessment

however, designation of Natura 2000 sites is based solely upon the presence of well developed habitats and the recorded presence of populations of species listed in the Annexes of the Directive, irrespective of its protection status nationally, or site ownership.

In addition, there is a very wide range of interpretation from country to country on the management guidelines and restrictions with respect to Natura 2000 sites. The Directive only states that the habitats and species should be maintained in a 'favourable conservation status' and 'must not deteriorate' (EC, 1992). Any activities that weaken the status of the area in terms of the preservation of important natural habitat types or the habitat of certain species are prohibited. In some countries, the network primarily includes strictly protected areas (reserves), while in majority of countries, multi-purpose landscapes are also included. The continuation of practices such as commercial forestry, farming, fishing or hunting is generally allowed, and sometimes even considered essential for the preservation of the site (i.e. the continuation of current management regimes).

The Natura 2000 network is a very important European networking tool, aimed at the conservation of habitats and species. However, it is not a 'classification-system', and is not exclusively focused on 'Protected areas', as it also includes areas with multipurpose use of forests and other ecosystems. Therefore, it is considered not to be within the focus of COST Action E27, and is hence not considered or discussed further in this paper. (In any event, all legally binding and long term protected areas included in Natura 2000 networks, become apparent in national data sets under the normal assessment criteria of protected areas, which place them into the various categories of international classification systems, i.e. they appear in the MCPFE and IUCN systems.

6.   Protected forests in Europe: a wide diversity of approaches and the need for further harmonisation of their assessment

Scope of this publication: Protected Forest Areas – operational definition

The terms 'Protected Forest Area (PFA)' or 'Area of Protected forest' are open to wide interpretation and have created a lot of confusion. Interpretation of these terms is different amongst countries and between different reporting processes. Further clari-

fication is therefore required from the official bodies that produce statistics on PFAs, on how PFA is defined (see chapter 6.2 by Frank et al. in this volume). In the meantime, the COST Working Group during discussions on the subject has used the following 'common understanding' on PFAs, i.e. area of 'forest' (as defined by FAO-FRA) within the borders of specified 'protection categories'. In other words it is the 'overlay' of the 'area of forest' and 'area within specific protection status' or 'the area of forest that is officially designated for protection'. This straightforward approach means that there is no difference between terms like 'Protected Forest Area', 'Area of Protected Forest' and 'Forest Protected Area'.

UNECE/FAO definition of forest (FAO, 1998) as it is used in FRA 2000 and 2005 (slightly modified formulation, same content) (FAO, 2001; 2006)

Forest: *Land with **tree crown cover** (or equivalent stocking level) of **more than 10 percent** and **area of more than 0.5 ha.** The trees should be able to reach a **minimum height of 5 m at maturity** in situ. It may consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground, or open forest formations with a continuous vegetation cover in which tree crown cover exceeds 10 per cent. Young natural stands and all plantations established for forestry purposes which have yet to reach a crown density of 10 percent or tree height of 5 m are included under forest, as are areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention or natural causes but which are expected to revert to forest.*

Includes*: Forest nurseries and seed orchards that constitute an integral part of the forest; forest roads, cleared tracts, firebreaks and other small open areas; forest in national parks, nature reserves and other protected areas, such as those of specific scientific, historical, cultural or spiritual interest; windbreaks and shelterbelts of trees with an area of more than 0.5 ha and **width of more than 20 m**; plantations primarily used for forestry purposes, including rubberwood plantations and cork oak stands.*

Excludes*: Land predominantly used for agricultural practices.*

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

The '**protection categories**' considered are related to the definitions used in the IUCN-Protected Area Management Categories and MCPFE Assessment Guidelines. Consequently, within the framework of the

IUCN-classification system, PFA covers all forest (with 'forest' as defined by FAO-TBFRA) '*dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means*' (IUCN, 1994).

Within the framework of MCPFE Assessment Guidelines, PFA covers all forest (with 'Forest' as defined by FAO-TBFRA) '*with the main management objective 'biodiversity', 'protection of landscape and specific natural elements' and 'protective functions', officially declared in legally binding documents.*' (MCPFE, 2003a).

In this paper, PFA explicitly does NOT include
- sites and areas that do not comply with the overall definition of forest
- sites with multifunctional management in which conservation of landscape and biodiversity is of equal importance to other functions (economic, recreational, etc.).

It should be stressed that these are 'operational' definitions of the term PFA, and that the COST Action E27 does not confer any 'valuation' to the fact that certain sites are in- or excluded; some excluded sites or categories may have a much higher impact on, or effectiveness for, the conservation of biodiversity in forests than some sites that are included.

7. PFA in Europe: a wide diversity of approaches

The European concept of forest protection is much more complex and varied than in other Continents that contain huge areas of untouched forests. In Europe, protected areas are often small, generally state-owned, but sometimes also owned by local authorities or non-governmental organisations or even privately-owned. The management and upkeep of protected areas is often linked with multiple forest use objectives.

Even within Europe there are large differences in historic use, area, socio-economic importance and public pressures on forests. This is also reflected in the various approaches to protection and conservation of forests and forest biodiversity. In remote, sparsely populated areas (like the Carpathian Mountains, Nordic countries), vast forest areas, not significantly altered by human intervention, are still present. Conservation here is primarily focused on rather large, non-intervention areas.

In densely populated areas of Europe (e.g. Germany, UK, The Netherlands) forests have always been intensively used and altered by man. Forest area was also much reduced resulting in fragmented forest areas, greatly altered by human interference. In addition, the ownership of the forest is very fragmented. Conservation is mainly focused on small areas with high conservation value. Consequently, restrictions and protection regimes are linked to the management history and public pressure on the area and are different to the large, non-intervention areas. Management can include non-intervention, but also mitigating measures to counteract negative influences emanating outside the area. Even the continuation of ancient forest management practices are allowed, as over the centuries, many (rare) species have adapted to, and are exclusively linked to, these management regimes.

Also the relevance and importance of other aspects such as 'sustainable grazing' or 'risks from fire outbreaks' or 'protective functions against slope erosion' are very different within Europe. This is also reflected regionally in differing policies for protection regimes in forests.

These aspects, in addition to other, mainly historic and socio-economic reasons, explain the wide diversity of approaches to PFAs in Europe. This very complicated situation is not necessarily problematic as the 'local perspective' is most important and reflects the reality on the ground. This diversity of approach coincides with, and perhaps even enhances the diversity in the forest. Due to the multitude of approaches to PFAs as a result of local conditions, classification of protected forests into 'international' categories is generally very difficult.

8. The requirement for harmonisation of reported figures

In order to produce reliable and comparable figures on protected forests for the whole of Europe, a common standard is needed.

In Europe, two international classification systems are used for the reporting on protected forests:
- IUCN developed a set of Protected Area Management Categories for world wide use (IUCN, 1994). It contains six protection categories. TBFRA in Europe has used the IUCN Management Category System for the reporting of protected forests areas in TBFRA 2000 (UN-ECE/FAO, 2000).
- MCPFE produced figures on protected forest area in its 'State of Europe's forests 2003'. For this purpose the MCPFE Assessment Guidelines for Protected and Protective Forest and Other Wooded Land were developed during 1999 – 2003 and

endorsed by national governments during the MCPFE Conference in Vienna in 2003 (Annex 2 to the Vienna Resolution 4) (MCPFE, 2003a, 2003b, 2003c). As far as is possible these MCPFE classes were aligned with the respective Protected Area Management Categories of IUCN.

In order to evaluate their possible usefulness for assessment of European PFAs, an analysis of both existing international classification systems (i.e. MCPFE and IUCN) and the results derived from these systems is required. In this publication, both systems are described, and evaluated, by comparing the statistics of TBFRA (using IUCN categories), the MCPFE's State of Europe's forests 2003 (using the Assessment guidelines), and through the crucial input from the country experts of the COST-action E27, gathered by means of questionnaires, country reports and plenary discussions. The objectives are to analyse the differences in reporting, based on the local background and expertise of the delegates in the COST-action, to point out the sources of divergence and confusion and to propose interpretation guidelines that can be used to provide more harmonised data on protected forests in Europe.

> **Important note:**
> *Harmonisation is required for comparison and reporting. However, the existent diversity of approaches in the different countries has its historic and social reasons and should also be appreciated and respected.*
> *Therefore the objective of this publication is by no means to evaluate or compare the effort, approach and strategies used in the different countries.*
> *The conclusions and guidelines that are derived from the analysis only focus on the explanation of the differences observed. Suggestions are made regarding better formulation, definition and additional 'user guidelines' for internationally endorsed classification systems, in order to produce more harmonised European statistics on Protected Forest Areas.*
> *Comparative tables that are reproduced in the following chapters are therefore only intended to highlight the differences observed in the interpretation of the international 'standards' used to produce harmonised data.*

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COST Action E27

Protected Forest Areas in Europe - Analysis and Harmonisation (PROFOR)
Results, Conclusions and Recommendations

Classification Systems used for the Reporting on Protected Forest Areas (PFAs)

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1. The IUCN Protected Area Management Categories

1.1. Origin and objectives of the classification system

Since the 1970s through its Commission on National Parks and Protected areas, IUCN has provided international guidance on the categorisation of protected areas. The primary scope of these guidelines is (IUCN, 1994):

· to alert governments to the importance of protected areas
· to encourage governments to develop systems of protected areas with management aims tailored to national and local circumstances

Caption: Atlantic oak forest in Union Wood, Co. Sligo, Ireland (Photo courtesy of: Kris Vandekerkhove)

- to reduce the confusion which has arisen from the adoption of many different terms to describe different kinds of protected areas
- to provide international standards to help global and regional accounting and comparisons between countries
- to provide a framework for the collection, handling and dissemination of data about protected areas
- to improve communication and understanding between all those engaged in conservation

The current set of Protected Area Management Categories of IUCN were developed in the 1980s and further improved in the 1990s, and eventually published in 1994. Since then, they have been widely applied and referenced. As previously stated, the IUCN typology is mainly designed to facilitate the evaluation and categorisation of protection regimes of individual protected areas, thereby creating a common understanding of protection regimes. It is considered as a form of 'official recognition' or 'certificate' for protected sites at an individual level. They are also designed to be used as a classification tool for international reporting (providing a common basis of understanding).

The IUCN classification system was developed for Protected Areas in general, and not for specific ecosystems or biotypes such as Protected Forest Areas (PFAs).

1.2.   Overview of the IUCN Protected Area Management Categories

The IUCN system encompasses one overall definition and six categories. The following definition is taken from (IUCN, 1994): (EUROPARC & IUCN,

IUCN definition of a protected area:

an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.

No site can be considered to be a protected area unless it meets this general definition

Within this definition, IUCN further classifies protected areas into six management categories, ranging from strictly protected nature reserves to areas that combine biodiversity protection with a range of other functions, such as resource management and the protection of traditional human cultures. The six categories are:

Category Ia: Strict nature reserve/wilderness protection area: managed mainly for science or wilderness protection - an area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring

Category Ib: Wilderness area: protected area managed mainly for wilderness protection - large area of unmodified or slightly modified land and/or sea, retaining its natural characteristics and influence, without permanent or significant habitation, which is protected and managed to preserve its natural condition

Category II: National park: protected area managed mainly for ecosystem protection and recreation – natural area of land and/or sea designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible

Category III: Natural monument: protected area managed mainly for conservation of specific natural features - area containing specific natural or natural/cultural feature(s) of outstanding or unique value because of their inherent rarity, representativeness or aesthetic qualities or cultural significance

Category IV: Habitat/Species management area: protected area managed mainly for conservation through management intervention - area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats to meet the requirements of specific species

Category V: Protected landscape/seascape: protected area managed mainly for landscape/ seascape conservation or recreation – area of land, with coast or sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area

Category VI: Managed resource protected area: protected area managed mainly for the sustainable use of natural resources - area containing predominantly unmodified natural systems, managed to ensure long-term protection and maintenance of biological diversity, while also providing a sustainable flow of natural products and services to meet community needs

IUCN stresses that the number assigned to a category does not reflect its importance: all categories are needed for conservation and sustainable development. They do imply a gradation of human intervention.

2000) provided additional guidelines for interpretation and application of this system in Europe. A summary of the most important aspects is outlined and discussed in chapter 3.4.

Finally, further guidance on the use of IUCN Protected Area Categories for the assessment of Protected Forest Areas is also given in (Dudley & Phillips, 2006).

1.3. Use of IUCN-categories for the reporting on PFA in Europe

The European concept of forest protection is much more complex and varied than in other Continents that contain huge areas of untouched forests. Within Europe there are large differences in historic use, area, socio-economic importance and public pressures on forests. This is also reflected in the various approaches to protection and conservation of forests and forest biodiversity.

In remote, sparsely populated areas (like the Carpathian Mountains, Nordic countries), vast forest areas, not significantly altered by human intervention, are still present. Conservation here is primarily focused on rather large, non-intervention areas. In densely populated areas of Europe, forest area was much reduced resulting in fragmented forest areas, greatly altered by human interference. In addition, the ownership of the forest is very fragmented. Conservation is mainly focused on small areas with high conservation value. Consequently, restrictions and protection regimes are linked to the management history and ownership of the area and are different to the large, non-intervention areas.

The IUCN classification system is more appropriate for protection regimes in vast, untouched, continuous forest areas. Some of these IUCN- categories are therefore of limited use in Europe. Moreover, this system is subject to wide interpretation, and can cause confusion; the differences between the various categories, and the criteria for their application is not always very clear. This may not cause a problem for the assignment of individual sites, as a process of assessment, negotiation and subsequently assignment by IUCN can be provided on a site by site basis.

However, problems do occur when the IUCN categories are used for other purposes, such as the reporting and production of country statistics, as occurred in the TBFRA 2000-reporting process.

As a follow-up to Sustainable Forest Management (SFM) initiatives (i.e. Ministerial Conferences, Rio-declaration, etc.) FRA decided to include 'criteria and
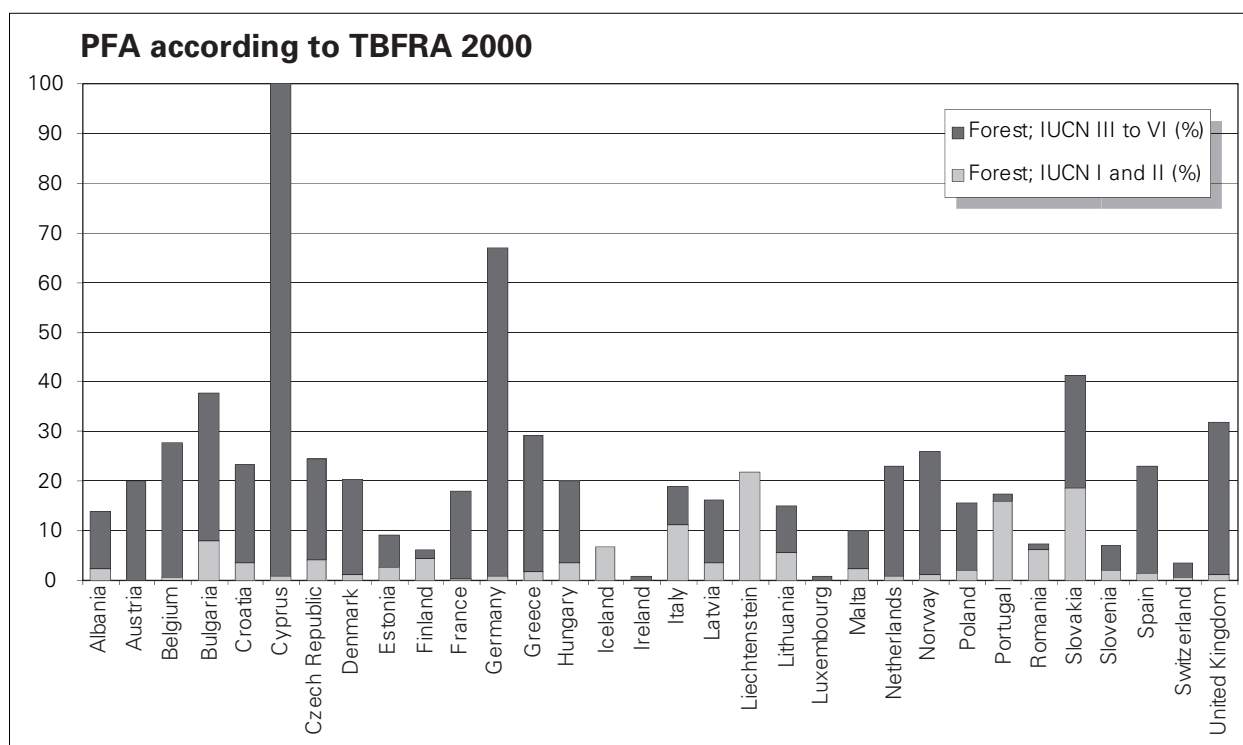

Figure 1:
Reported figures for Protected Forest Area (relative to the total forest area), as reported in the Temperate and Boreal Forest Resource Assessment (FAO) 2000.

indicators of SFM in their Forest Resource Assessments, one of these indicators being the area of forest within certain protection regimes. It was agreed to use the existing IUCN Protected Area Management Categories for this purpose, as they were readily available and developed for worldwide use. The six categories were merged in two classes, one covering primarily the strictly protected forest areas (non-intervention), and the other covering all remaining IUCN management categories. Hence, the TBFRA 2000 questionnaire contained a table (i.e. Table 8) to be filled by country experts stating the 'area of Forest and other wooded land by IUCN-categories: (I-II) and (III-VI).

The assessment of national forest protection regimes to the IUCN-typology was left to national or regional reporting teams, that were often not familiar with the IUCN categories. This enquiry produced a wide range of results, depending on the 'strictness' of interpretation by the country experts of the IUCN-categories, especially categories III-VI. As shown in the graph below, reported figures varied from less than 1 % to 100% of the forest area, depending on the strictness of interpretation of the protection categories. These results, are clearly not harmonised between countries, and do not reflect the actual protection efforts in the different countries.

These figures are therefore of limited use for monitoring, assessment and reporting purposes, as was also admitted in the main report of TBFRA (UN-ECE/FAO, 2000, p. 232), and the UNECE/FAO discussion paper, number 33 (Dudley & Stolton, 2003).

2. MCPFE Assessment Guidelines for protected and protective forest and other wooded land in Europe

2.1. Origin and objectives

The Ministerial Process on the Protection of Forests in Europe aims to improve the status of forest in all its signatory countries. In its 'resolutions' the Ministerial Conferences commit to a number of general objectives to improve forest condition. At the same time, monitoring, assessment and reporting on these aspects is needed. Therefore, the signatory countries committed themselves to monitor the development in their countries by agreeing on a set of criteria and indicators for Sustainable Forest Management (MCPFE, 2002). One of the 9 indicators for the crite-

rion 'C4: Maintenance, conservation and appropriate enhancement of biological diversity in forest ecosystems' is indicator '4.9: Protected forest'. This means that countries are required to monitor, assess and report on the total PFA that occurs in the country, both in absolute (ha) and relative (%) figures (MCPFE, 2002).

Originally, the results collected by TBFRA - using the IUCN classification system - were used for reporting in Europe. As the results on PFAs were very diverse, the Vienna Liaison Unit in Austria of the Ministerial Conference on the Protection of Forests in Europe (MCPFE) initiated in 1999 to produce new guidelines for the assessment of PFAs in Europe, that better reflect the European situation (MCPFE Liaison Unit Vienna, 1999a, 1999b). An ad hoc MCPFE technical group on Classification of Protected Areas designed a specific set of assessment guidelines, using 5 classes of protection for the purpose of producing harmonised statistics.

These new assessment guidelines were officially endorsed at the Ministerial Conference in Vienna in 2003, and included as Annex 2 to the Vienna Resolution No. 4 (Conserving and enhancing Forest Biological Diversity in Europe) (MCPFE, 2003a, 2003b).

2.2. Overview of the MCPFE-assessment guidelines

The MCPFE-Assessment guidelines for PFAs are defined and explained as follows (MCPFE 2003b):

Overview of MCPFE-assessment guidelines (MCPFE, 2003a,b):

General principles

"Protected and protective forest and other wooded land have to comply with the following general principles in order to be assigned according to the MCPFE Assessment Guidelines:
- Existence of legal basis
- Long term commitment (minimum 20 years)
- Explicit designation for the protection of biodiversity, landscapes and specific natural elements or protective functions of forest and other wooded land

"Explicit designation" in the context of these guidelines comprises both:
- Designations defining forest and other wooded land within fixed geographical boundaries delineating a specific area
- Designations defining forest and other wooded land not within fixed geographical boundaries, but as specific forest types or vertical and horizontal zones in the landscape"

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

MCPFE- Class 1:
Main Management Objective 'biodiversity

1.1: No active intervention
- the main management objective is biodiversity
- no active, direct human intervention is taking place
- activities other than limited public access and non-destructive research, non-detrimental to the management objective are prevented in the protected area

1.2: Minimum intervention
- the main management objective is biodiversity
- human intervention is limited to a minimum
- activities other than listed below are prevented in the protected area :
  - ungulate/game control
  - control of diseases/insect outbreaks*
  - public access
  - fire intervention
  - non-destructive research, non-detrimental to the management objective
  - subsistence resource use **

* in case of expected large disease/insect outbreaks control measures using biological methods are allowed provided that no other adequate control possibilities in buffer zone are feasible

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

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

MCPFE Class 2:
Main Management Objective 'protection of landscape and specific natural elements'
- interventions are clearly directed to achieve the management goals landscape diversity, cultural, aesthetic, spiritual and historical values, recreation, specific natural elements
- the use of forest resources is restricted
- a clear long-term commitment and an explicit designation as specific protection regime, defining a limited area is existing
- activities negatively affecting characteristics of landscapes or/and specific natural elements mentioned are prevented in the protected area

MCPFE Class 3:
Main Management Objective 'protective functions'
- The management is clearly directed to protect soil and its properties or water quality and quantity or other forest ecosystem functions, or to protect infrastructure and managed natural resources against natural hazards
- Forests and other wooded lands are explicitly designated to fulfil protective functions in management plans or other legally authorised equivalents
- any operation negatively affecting soil or water or the ability to protect other ecosystem functions, or the ability to protect infrastructure and managed natural resources against natural hazards is prevented

The Liaison Unit also produced a table that facilitates linkage of the MCPFE system with the IUCN-classification system. It also provided a link to the Common Database on Designated Areas (CDDA) of the European Environmental Agency (EEA).

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

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

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

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

The results are less diverse than those of TBFRA 2000. Thus, they appear more reliable than those
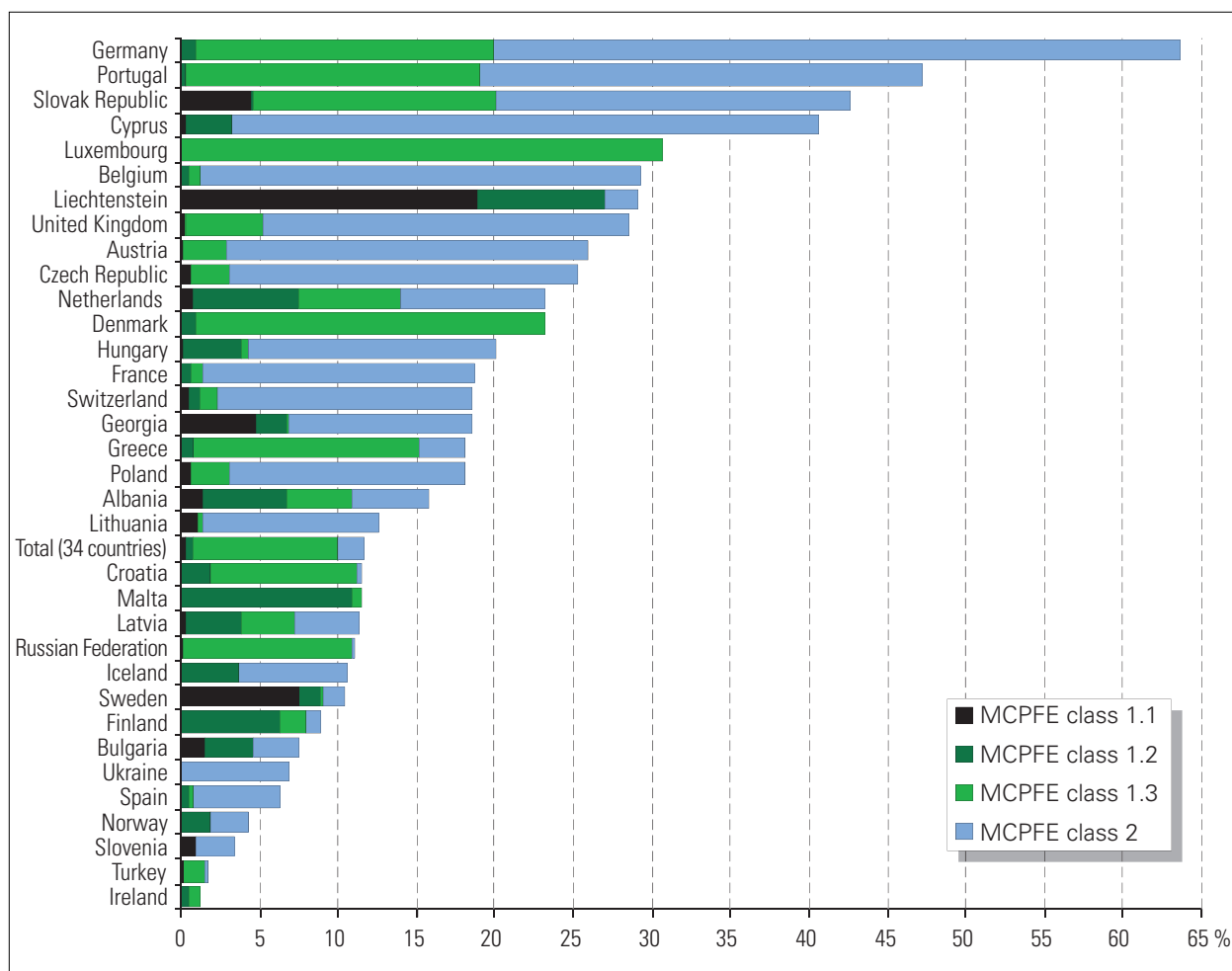
Figure 3:
Reported data on PFAs in Europe using the MCPFE classification system (excluding class 3: protective forests).
Note: Ukraine was provided data only on MCPFE class 2; information on MCPFE classes 1.1 to 1.3 is not available. In Germany and Portugal all Natura 2000 areas are under class 1.3

produced by TBFRA 2000 using the IUCN categories. However, the range of results is still very wide and variable and their reliability appears questionable. In the following chapter, this is further elaborated.

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COST Action E27
Protected Forest Areas in Europe - Analysis and Harmonisation (PROFOR)
Results, Conclusions and Recommendations

Evaluation of Data Derived from International Classification Systems: Issues Arising from the Assessment of Reported Statistics

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1. Input from the country experts

In order to evaluate the usefulness, potential and drawbacks of both classification systems for the reporting on PFAs in Europe, the country experts of COST Action E27 were asked to provide some input, using a standardised format (questionnaire). The list of country experts involved in the action is provided in the annex to this publication.

Country delegates were first asked to evaluate the reported figures and to produce alternative figures based on compiled national statistics, the statistics in the COST Action E27 country reports (Latham et al., 2005), and best professional judgement. Based on

Caption: beech snag in Ruhrbush Forest Reserve – Elsenborn, Belgium.   *(Photo courtesy of Kris Vandekerkhove)*

this comparison they were requested to point out the main sources of variation between the reported figures. They were consequently asked to study the classification systems again from their national perspective, and point out the possible problems, difficulties or shortcomings, and to produce suggestions for improvement.

2.   Comparison of the statistics

An assessment of reported figures in TBFRA 2000 (applying the IUCN categories), MCPFE State of Europe's Forests (using the MCPFE Assessment Guidelines) and the personal estimates of the COST Action E27 country experts is presented at the end of this chapter (Figure 2). The results of this comparison show considerable variation. In many cases the estimates of the representatives are quite similar to the results of (MCPFE, 2003b). However, they are

sometimes more comparable to the TBFRA-data, and in some cases, are completely different to both TBFRA and MPCFE. This is illustrated in the figure below, showing the wide range of responses for a selection of countries.

3.   Discussion - very variable results based on reliable data sets

In the replies of the country representatives, the MCPFE-Assessment Guidelines (MCPFE, 2003a) were more often than not considered to be more precise, more flexible and were generally considered to be better adapted for the reporting on PFA classes in Europe. This was not unexpected as the system was especially developed for this purpose.

Contrary to what was expected, however, the figures for MCPFE are almost as divergent as for TBFRA. The considerable differences between the
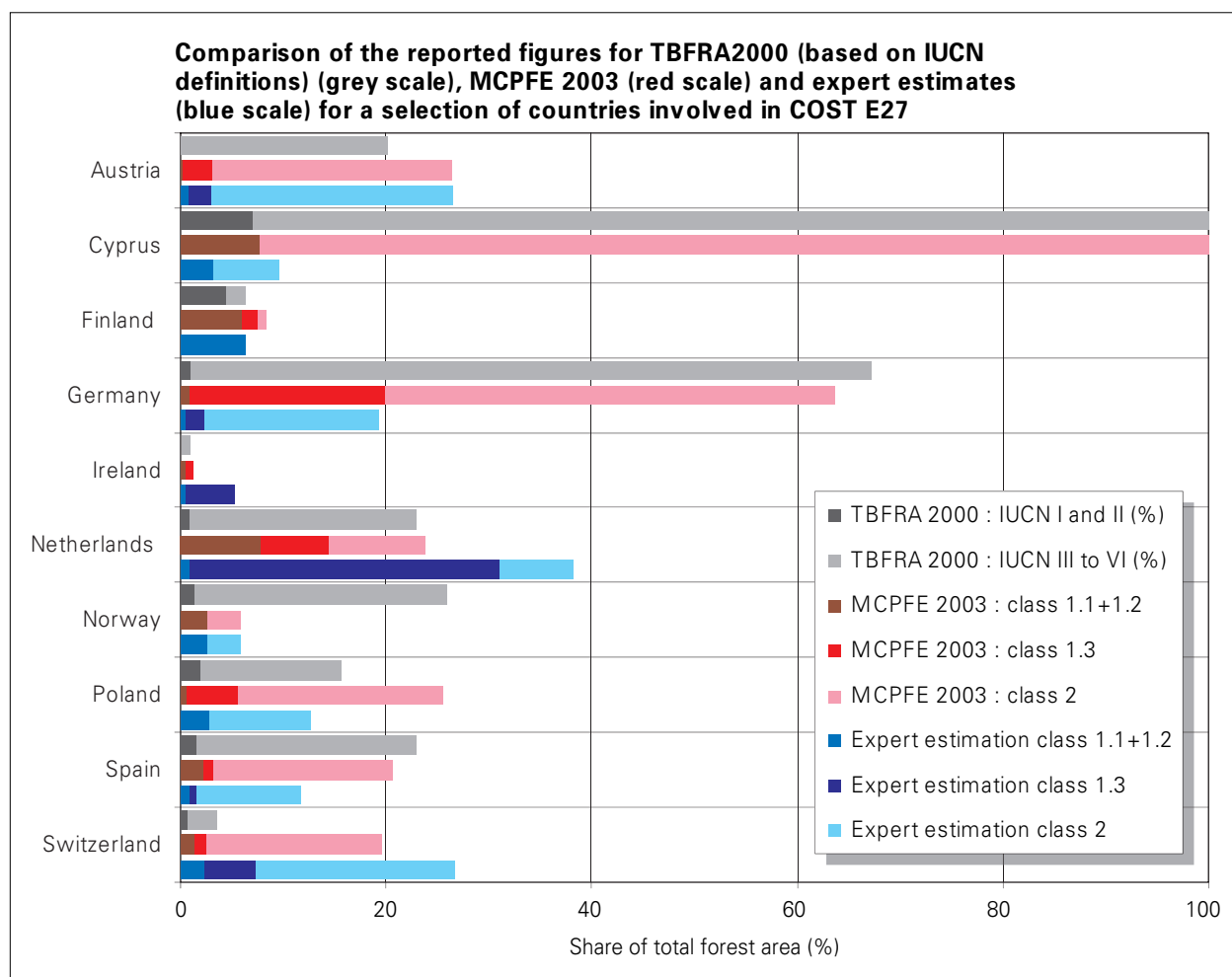

Figure 1:
Area of Protected forest (as a percentage of total forest area) for a selection of countries : comparison of the statistics as they were reported in TBFRA 2000, MCPFE, 2003 and the expert judgement1 of the country representatives in COST E27.

two assessments were previously pointed out by (Dudley & Stolton, 2003)[2].

The expert estimates provided an extra source of comparison. In some cases, the expert estimates were indeed closer to the MCPFE-reported figures, but in other cases, they were more in line with TBFRA, or even more divergent from both. Even on quite strictly defined protection categories (like strict reserves), reported figures are sometimes very heterogeneous or even of a different order of magnitude.

It can be concluded that there exists considerable confusion and to date, no harmonised and comparable dataset on PFAs in Europe is available.

This conclusion is in line with the conclusions of (Dudley & Stolton, 2003): '*These results show clearly that further work is needed on statistical analysis and that any figures for forest protection in Europe must currently be treated with considerable caution.*'

The comments on the comparisons provided by the country experts however, not only accentuate the differences but also denote how such considerable variation occurs. Although the results are very divergent, almost all experts state that the reported figures are indeed based on reliable data (maximum 20% error, and generally less). The information for TBFRA and MCPFE reporting was mostly gathered by official scientific or administrative bodies, using reliable data sources[3]. Most information is based on national official databases, GIS-layers and analysis, etc. In some cases specific studies were undertaken to provide the required data. Therefore, a lack of reliable data is not considered to be the main cause of the divergence observed.

Slight changes or differences are sometimes explained by new developments since the TBFRA-data were gathered, i.e. some new protected areas that have been designated and/or expanded (e.g. in Slovenia, The Netherlands, etc.).

Also, differences in the definition and delineation of 'forest' are pointed out as a key factor explaining the variation observed. Some protected areas include both forest and open areas. This fact results in differences due to the application of alternative definitions of forest used in European countries, as does the level of detail of the delineation (e.g. satellite data vs. terrestrial surveys). The FRA definition of forest provides a very straightforward but broad interpretation of forest (crown cover > 10%; 5m high), while national definitions are sometimes much more restrictive. Some protected areas that are normally not considered as 'forest' in the national statistics (e.g. mires and heathlands with dispersed trees, non-productive forest, etc.) should be included in the data sets of 'protected forest' if the FRA-definition of forest is used.

Therefore, it should be very clearly stated what categories of forest or other wooded land are included in the reporting procedure (whether national or FRA- forest definitions are used), and country correspondents should inform the data-collector on the level of detail and methodology used in the calculations.

In the paper by Frank (Chapter 6.2, this volume) a report is given on the different definitions of forest and how they were used in the different reporting procedures.

However, almost all correspondents state differences in interpretation of the classification system as the main reason for the discrepancies observed. Indeed, minor differences in interpretation can produce major variation in results[4].

Therefore, in order to produce reliable and comparable data on PFAs in Europe, further clarification of the protection categories and assessment guidelines are required. In the following chapter, suggestions on this issue by the COST Action E27 are presented. They are the result of extensive working group sessions.

As differences in interpretation are so apparent, it is also advisable to incorporate an extensive and thorough harmonisation phase in the reporting process, in order to harmonise the interpretation of the different classes by the responsible reporting bodies in each country[5].

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[1] Any views or opinions expressed in the documents of COST E27 are those of the authors only.

[2] 'Unfortunately from a comparative perspective, protection data from TBFRA and MCPFE are dramatically different (…) Perhaps more significantly than the average figures – which might be explained by the differences in understanding about what constitutes "protected" – are differences between what countries reported for IUCN protected area categories I and II and MCPFE classes 1.1 and 1.2, which are supposed to be directly analogous.'

[3] National forest inventories are not commonly used as a source for this kind of detailed information : it is only mentioned in 8 out of 23 replies

[4] Example : the consultants upon whose report the figures for the UK were based, estimated that the total area in categories 1 to 6 of IUCN could vary between around 8% to 25% of the UK forest area depending the assumptions used. This lack of clarity is most pronounced within categories 3-6 inclusive; and it also applies to the allocation of areas to categories.

[5] Within countries where the data are decentralised (e.g. when the data-gathering is the responsibility of the regional government), additional problems of co-ordination and transmittance of data may exist and can further complicate the harmonisation process.
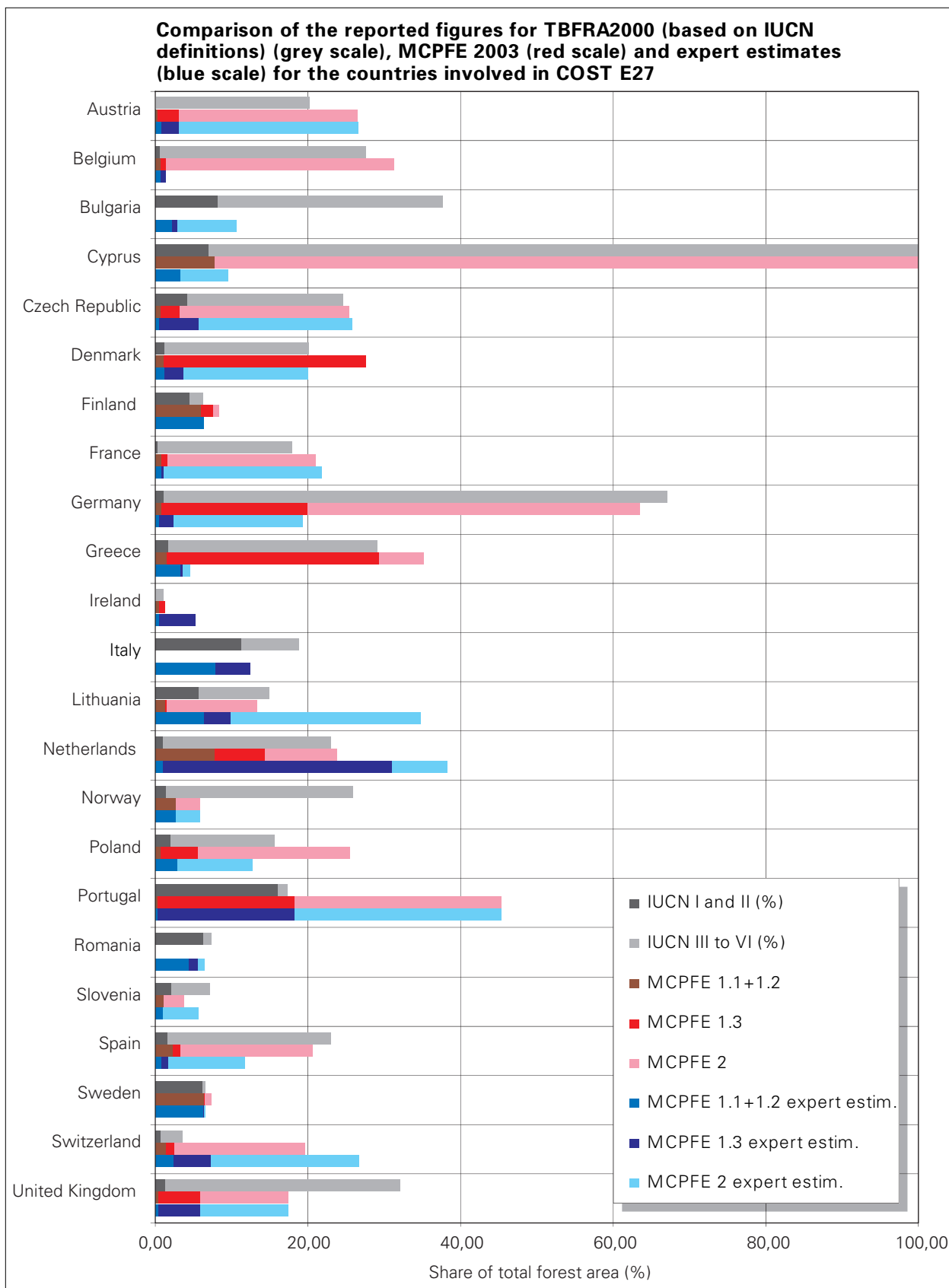
Comparison of the reported figures for TBFRA2000 (based on IUCN definitions) (grey scale), MCPFE 2003 (red scale) and expert estimates (blue scale) for the countries involved in COST E27

Legend:
- IUCN I and II (%)
- IUCN III to VI (%)
- MCPFE 1.1+1.2
- MCPFE 1.3
- MCPFE 2
- MCPFE 1.1+1.2 expert estim.
- MCPFE 1.3 expert estim.
- MCPFE 2 expert estim.

Share of total forest area (%)

Figure 3.
Area of Protected forest (as a percentage of total forest area) for a selection of countries : comparison of the statistics as reported in TBFRA2000, MCPFE2003 and the expert judgement[6] of the country representatives in COST E27.

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[6] Any views or opinions expressed in the documents of COST E27 are those of the authors only.

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COST Action E27

Protected Forest Areas in Europe - Analysis and Harmonisation (PROFOR)
Results, Conclusions and Recommendations

Suggestions for Clarifying Protected Forest Area (PFA) Categories for Reporting Purposes

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based on the discussions in Working Group 2 of the COST Action E27

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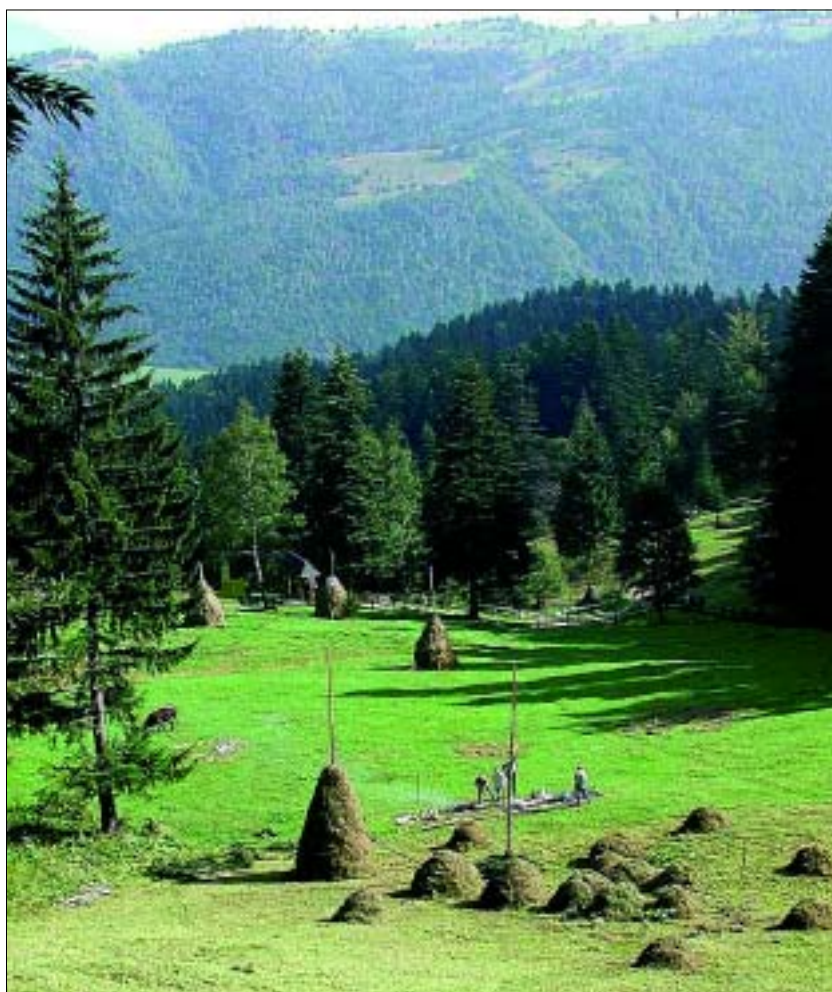
Photo: traditional hay-making in the buffer zone of Piatra Craiului National Park, Romania (Photo courtesy of Kris Vandekerkhove)

1.   General remarks

This paper is based on the comparison of official statistics and results derived from the questionnaire circulated among the COST-Action E27 delegates, discussion ensued in COST-working group 2 'Harmonisation and improvement of information on European Protected Forest Areas – international dimension'. This resulted in a number of suggestions designed to improve the quality and comparability of the statistics that are derived from the two internationally endorsed systems for Protected (Forest) Areas, i.e.

· The Protected Area Management Categories of (IUCN, 1994), used (amongst others) in FRA 2000
· The MCPFE-Assessment Guidelines for PFA developed by the Vienna Liaison Unit of the Ministerial Conference on the protection of Forests in Europe (MCPFE, 2003).

The result of this work has been compiled in this paper.

Two COST Action E27-technical papers were also produced, which were designed to provide direct input to the IUCN and MCPFE processes. The technical paper relevant to the IUCN-classification system (Vandekerkhove (ed), 2004) was sent to the agency contracted by IUCN (i.e. Equilibrium) to produce a guidance paper on the use of IUCN Protected Area Categories for Forest Protected Areas' in the context of the IUCN project -'Speaking a Common Language' (Dudley & Phillips, 2006). The COST Action E27 technical paper with analysis and recommendations on reported figures and assessment guidelines for the reporting of PFAs using the MCPFE framework (Vandekerkhove et al. (eds.), 2005) was sent directly to the MCPFE Liaison Unit in Warsaw. After further editing and consultation, it accompanied the questionnaires for the MCPFE 2007 status assessment of Europe's forests, as an official MCPFE Information Document (Frank & Parviainen, 2006).

Before proceeding further, some important **preliminary remarks** are necessary:

· Both the IUCN system of Management Categories and the MCPFE Assessment Guidelines are considered in the context of classification of protection management intentions. It does not necessarily reflect the activities that are actually performed, allowed or tolerated in practise.
· Both classify management objectives and restrictions. They don't evaluate the actual quality and conservation value of sites. Hence, a particular Class may include a wide range of forest types, with different degrees of naturalness (i.e. from pristine virgin forests to plantations) and varying biodiversity quality.
· Both classification systems (i.e. definitions, restrictions, etc.) are unlikely to be altered; they are internationally endorsed and widely accepted.

However, clarification and guidelines on the criteria that are used are required, when they are used for official PFA reporting purposes, in order to prevent ongoing discrepancies in interpretation. This paper attempts to provide guidance for more accurate interpretation thereby ensuring more harmonised assessments and reporting of PFAs, and in order to avoid current anomalies as a result of differences in interpretation.

2.   Suggestions for the clarification of the reporting on statistics of PFAs in Europe when using IUCN-Categories on Protected Areas

In this chapter, input from the country experts on the application of the Protected Area Management Categories developed by the International Union for Conservation of Nature (IUCN, 1994) for the reporting of statistics on PFAs is outlined. The primary objective is to provide better, more harmonised international statistics on PFAs.

2.1.   Summary of the main results from the questionnaire

· Of the 23 questionnaires received, only 3 countries reported data for all 6 IUCN-Categories. In most European countries, only 2 or 3 Categories occur, and often none if the Categories are interpreted in their strictest sense.
· In general, many Protected Area types don't really comply with any Category, and are often allocated to one general Category (i.e. Category IV).
· Categories II and IV were the most commonly reported, together with Category I (although some correspondents were a bit reluctant to use Category I, as it is not very clear how strictly its criteria should be interpreted).

- 18 of the 23 correspondents stated that the IUCN-classification of Management Categories is too strict and confusing for correct implementation in their country. Almost all representatives (i.e. 20 of 23) had a lot of difficulty with the meaning of Category VI. Most delegates did not know how to deal with this Category at all. Moreover, some suggested that all the forest in their country - which is managed in a close-to-nature, sustainable manner - could fit comfortably into this Category.
- Most correspondents were uneasy regarding the categorisation of PFAs with specific local protection regimes. The following problems were commonly mentioned:
- There was much uncertainty regarding the size requirements for Protected Areas. The IUCN-guidelines state that a Protected Area should be 'large enough for the functional development of the ecosystem' (IUCN, 1994). However, no minimum area is imposed or suggested by IUCN.
- Protective forests don't fit into the classification system at all; in some countries, they are assigned to IUCN Category VI, although they do not comply specifically with its definition and criteria. In other countries, they are simply not reported at all.
- In many countries, numerous management guidelines and restrictions for conservation purposes are applied or even imposed in multifunctional forests. Some countries include such areas in Category VI, whilst others exclude them from the reported data.
- The IUCN classification system does not take into consideration the zoning of Protected Areas, resulting in different parts of individual PFAs fitting into more than one Category. The guidelines (IUCN, 1994) suggest assigning sites to the Category that corresponds with the largest proportion of the site. On the other hand, the Interpretation guidelines for Europe (Europarc & IUCN, 2000) state that where 'Multiple Classifications' occur, the areas belonging to different Categories should be 'identified separately for accounting and reporting purposes'. This contradiction should be removed, as it has important consequences on the reported figures (e.g. : up to half of the 'non-intervention' area in a country may be covered by National Parks core areas, which should, in total, be reported in Category V).
- There is uncertainty regarding the legal status for inclusion in the network, because of the expression 'or other effective means' in the general definition.

- Some activities such as hunting, fishing and reindeer husbandry predominate as diagnostic characteristics of the IUCN Categories, even though they often have a marginal (or even positive) effect on the ecosystem. In many cases, the current management may well allow for classification in Categories with stricter management criteria (Category I or II), but due to the presence of reindeer husbandry or 'subsistence hunting' (e.g. for Saami people) or 'open access to public', they must be assigned to other Categories, e.g. all the Protected Areas in Northern Finland are classified in Category VI because of reindeer husbandry. Consequently, Category VI includes a wide array of very different national types of Protected Areas ranging from strict nature reserves and national parks to protected peatlands and wilderness areas.
- Most correspondents concluded that the IUCN classification system appears to have been developed for continents and countries where large areas of pristine or natural landscape still persist. The system is more suitable for very large Protected Areas and does not readily allow for the assessment of small scale Protected Areas. It is too coarse for smaller areas, where due to the presence of population pressure, human impact is a factor in spite of protection measures and restrictions. Some of the IUCN- categories are therefore of limited use in Europe.
- Moreover, the classification system is very much subject to variable interpretation, and causes a lot of confusion: the differences between different Categories are not always very clear.

2.2. Recommendations for additional guidelines for better application of IUCN Categories in European PFA reporting processes

2.2.1. General recommendations

The IUCN Protected Area Management Categories were not specifically developed for the purpose of reporting statistics on PFAs in Europe, but to assist governments and others in designating protection areas for terrestrial and aquatic ecosystems.

Clarification and an interpretative guide are required if this classification system is to be used for statistical purposes. Simply extrapolating the existent Categories to the protection regimes in European countries is not possible, and results in the production of very vague datasets that cannot be used with confidence for comparative purposes.

Much of the potential confusion about what is or is not a Forest Protected Areas can be avoided if the hierarchical nature of the definition is stressed, and the system applied sequentially. In short, the Categories are only applied if the area in question already meets the definition of a Protected Area.

The process of assignment should begin with the IUCN definition of a Protected Area and then be further refined by reference to the IUCN Categories:

```
        ┌─────────────────────────────────────────────────────────┐
        │   Does the area meet the IUCN definition of a Protected Area?   │
        └─────────────────────────────────────────────────────────┘
                 │                                    │
                 ▼                                    ▼
        ┌──────────────────┐              ┌──────────────────┐
        │        No        │              │       Yes        │
        └──────────────────┘              └──────────────────┘
                 │                                    │
                 ▼                                    ▼
        ┌──────────────────┐              ┌────────────────────────────┐
        │ Not a protected  │              │ IF SO: assign to one of    │
        │      area        │              │   the IUCN Categories      │
        └──────────────────┘              └────────────────────────────┘
```
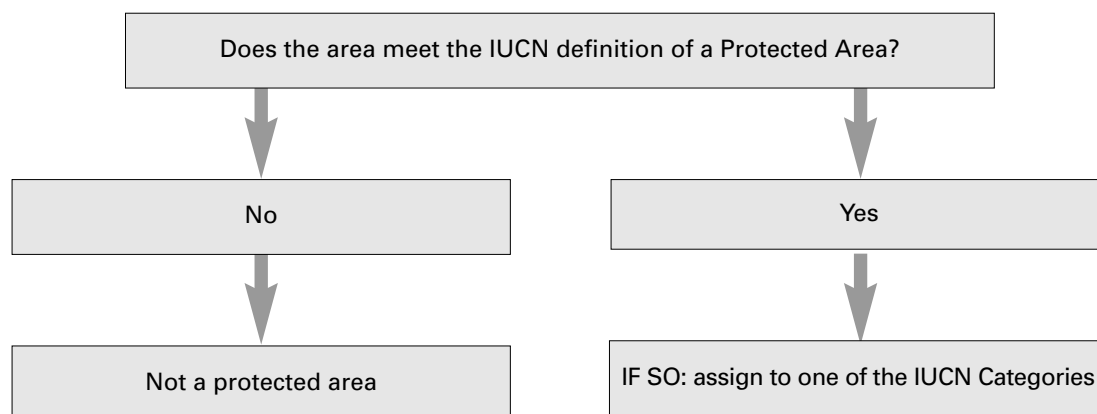
It follows that any area that appears to fit into one of the Categories based on a consideration of its management practices alone, but which does not meet the general definition of a Protected Area, should <u>not</u> to be considered as Protected Area as defined by IUCN.

Figure 1:
Illustration of the hierarchy involved between the over-arching definition and Categories of Protected Areas in the IUCN guidelines for Protected Area Management Categories. (taken from Dudley & Phillips, 2006)

2.2.2. Stressing the hierarchy between the IUCN definition on Protected Areas and the Management Categories

It is important to stress as a prerequisite that all sites should comply with the over-arching IUCN definition on Protected Areas, inherent in Categories I-VI. No site can be considered to be a Protected Area unless it meets the over-arching definition which is defined as: *an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.*

Using this definition, IUCN further classifies Protected Areas into six Management Categories, ranging from strictly protected nature reserves to areas that combine biodiversity protection with a range of other functions, such as resource management and the protection of traditional human cultures.

According to IUCN all forests that don't have biodiversity conservation as their primary function

and objective should be excluded from reporting procedures on PFAs. This principle is clearly illustrated Fig. 1 (Dudley & Phillips, 2006).

If this prerequisite had been clearly stressed to the responsible national authorities at the outset of the TBFRA 2000 reporting process, this would have removed a lot of confusion, and would almost certainly have produced better, more comparable data.

The working group also endorses a strict interpretation of the overriding definition, i.e. forests (and in the wider sense all Protected Areas) reported in IUCN-Categories should always have conservation and enhancement of biodiversity/natural values as the primary goal. This should be guaranteed through legally binding, long term commitments, linked to national nature conservation programmes.

Hence, it should be emphasised at the outset that multifunctional forests should not be included in reporting statistics, even if nature conservation is of equal importance to other functions over the whole area, or even the main function in some parts of the

area (key biotopes, etc.) as they do not comply with the over-arching definition of IUCN Protected Areas. Multifunctional forestry means that all functions are equally important, with primary objectives to be fulfilled, which vary depending on location within the forest area. In some parts, an economic function will predominate, in others the recreational function, etc., and in specific areas (i.e. vulnerable sites, rare and key biotopes), the conservation function will pertain, ensuring that these key-biotopes will receive adequate management. This may involve non-intervention (i.e. patches of swamp forest), or a specific management regime such as mowing or grazing in patches of heathland within the forest. These key biotopes and their management are an integral part of multi-functional forestry, and should not be 'segregated' for the purposes of reporting in PFAs statistics.

Consequently, areas set aside under specific certification programmes (i.e. FSC - min 5% of the area) are not compatible with the over-arching definition set by IUCN. Certification programmes are voluntary and can be revoked at any time; they don't require any long-term commitment and therefore don't comply with the overall requirement of 'protected through legal or other effective means'. Moreover, they are an integral part of multifunctional forest management which qualify as a requirement of the certification body as 'good forest practice'.

2.2.3. Remarks relevant to the IUCN definition of a Protected Area

The working group expresses concern that the IUCN definition of a Protected Area looses some of its power and focus by including 'associated cultural resources', as this leaves it open to wide interpretation, resulting in the inclusion of all kinds of multi-functional and other site uses (be they traditional or otherwise).

The most important aspect to highlight is that it is quite unclear as to what should be included as 'legal *or other effective means*.' It follows that 'other means' need to be indefinite and stipulated in official documents (i.e. management plans, etc.). However, most management plans have a timeframe of 10-20 years, after which management practices and even management objectives may be altered or modified. Moreover, management plans are commonly considered to be 'supporting technical documents' that provide guidance to management though may not necessarily include clear and enforceable commitments.

In many countries conservation objectives are also encouraged through protective ownership, (e.g. conservation trusts or state and local authorities), conservation management grant schemes, management plans for designated sites, etc. It should be clarified whether these should be included as 'legal or other effective means'.

Regarding the 'legal basis' for inclusion in the reporting process, MCPFE Assessment Guidelines (see below) appear stricter than the IUCN system. Management plans alone are not considered to provide sufficient 'legal basis' for inclusion, as they are only an implementation tool toward the conservation objective. Inclusion of management plans can only occur if they are associated with an explicit, legally binding designation.

A similar situation arises with forests where grant schemes and other state incentives that focus on conservation and enhancement of biodiversity are applicable, provided an agreed management plan is implemented. Although they can be very effective in addressing biodiversity management requirements, they are essentially voluntary in the sense that owners are often not compelled to carry out every action stated in the management plan if they decide not to.

Therefore it would be useful for IUCN to produce a document that clearly defines the criteria that must be fulfilled in order to comply with 'legal or other effective means'.

2.2.4. Definition of size criteria for 'minimal area'

In the IUCN system it is stated that '*the areas should be large enough to allow the ecosystem to fully develop*' *(IUCN, 1994)*. However, no guideline size criteria are provided as to the minimal area that should be considered. Potentially, every country may have its own interpretation of what this lower limit should be. This lower limit may not be absolute but dependent on local/ regional features or even site conditions.

Moreover, in densely populated areas, where valuable natural sites comprise small fragmented relics, there is little choice as to what the size of a protected site should be. The absence of clear guidelines on 'minimum size criteria' for sites is reported to be a major cause of uncertainty on the inclusion of certain national protection categories (e.g. strict forest reserves in many European countries apparently fulfil all other requirements of Category I, but are often smaller that 50 ha).

2.3.   Using the UNECE/FAO definition of forest in combination with the IUCN definition of Protected Area to produce reliable and comparable statistics on PFAs in Europe

The UNECE/FAO definition of a 'forest' (FAO, 1998) is quite simple and straightforward :

'Land with tree crown cover (or equivalent stocking level) of more than 10 percent and area of more than 0.5 ha. The trees should be able to reach a minimum height of 5 m at maturity in situ. It may consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground, or open forest formations with a continuous vegetation cover in which tree crown cover exceeds 10 per cent. Young natural stands and all plantations established for forestry purposes which have yet to reach a crown density of 10 percent or tree height of 5 m are included under forest, as are areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention or natural causes but which are expected to revert to forest.'

This definition may be criticised as inadequate for the purposes of biodiversity reporting since it doesn't make any difference between natural forest and plantation, but the criteria have considerable merit since:

· they are universal and widely accepted within the International forestry community
· they are very simple and unambiguous: although not always easy to measure, the criteria are clear and are not open to interpretation: 10% coverage; 0,5 ha; 20 m wide are universal measures.

In order to avoid any further confusion a strict and straightforward approach is recommended. The reported figures should be the simple intersect between boundaries of the officially Protected Area regimes, and the area of 'forest' defined according to FAO-definition (see also Chapter 6.2 of this volume). The working group rejects firmly the suggestion of a posteriori exclusion or inclusion of certain forests based on qualitative criteria or specific local objectives, as suggested in the WCPA Best Practice guidance paper on forests and Protected Areas (Dudley & Phillips, 2006).[1]

The Working Group stresses the importance of a fundamental principle in the development and application of the classification system, namely that assignment is on the basis of the management objective, including levels of protection, restrictions on use, etc. The classification is thus made disregarding the actual ecological value of sites, or the effectiveness of implemented management objectives. This was also clearly outlined in the WCPA guidance paper (Dudley & Phillips, 2006). '*This means that candidate Protected Areas are assigned an IUCN Category according to the purposes set out in legislation, management plans or other means. They are naither determined according to the governance and management arrangements nor the ownership of land and water. Nor is the assignment a statement of the effectiveness of the management of the Protected Area. This rule applies to Forest Protected Areas just as much as to any other kind of Protected Area.*'

There are no compelling arguments to exclude certain types of forest from the reported data if the management intention is nature conservation. If a plantation is included in an IUCN Protected Area (i.e. as it fulfils the basic requirements of a Protected Area), it should consequently be reported in the statistics.

When a forest (be it a natural forest or a plantation) is managed for management objectives other than biological diversity, it should be excluded from the statistics of IUCN Protected Areas at the outset. Hence, any debate on excluding it afterwards when finalising statistics on forests will not arise.

In some cases, protected areas may include a minority of areas where other primary functions pertain (i.e. built up areas, roads, patches of arable land or forests that provide firewood for local communities). Excluding them from the total area would result in the area being broken up. Although they may have a low biological value, and be managed for other purposes, patches within Protected Areas should not be subtracted when delineating boundaries and reporting on the size of PAs, as they are considered crucial to the 'integrity' of the site. Therefore, a consistent approach should be adopted for forest stands with other primary functions and/or low biological value that are inside Protected Areas.

Another argument for adopting the straightforward approach recommended is the feasibility and practicality of same. Even if the restrictions within the current system are clarified and refined further in order to avoid divergent interpretation, it will be difficult to produce reliable data. For some countries

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[1] In this document it is suggested to exclude planted forests that are managed for production which are present within the boundaries of a site that complies with the over-arching definition.

the most basic overlay of 'forest' with 'Protected Area' causes problems due to the lack of detailed information. As many countries don't have detailed statistics of the different classes of naturalness to be found in their Protected Areas, more complex and selective overlays will prove to be impossible or unreliable.

The production of detailed information as described should be a component of a separate assessment of the 'status' of Protected Areas. More detailed assessments of the status of forests within PAs will be possible when these datasets are available for the total area.

2.4 Recommendations for the specific IUCN Protected Area Management Categories

Category Ia - Strict Nature Reserve: Protected Area managed mainly for science

Definition
An area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring

Objectives of Management
- *to preserve habitats, ecosystems and species in as undisturbed a state as possible;*
- *to maintain genetic resources in a dynamic and evolutionary state;*
- *to maintain established ecological processes;*
- *to safeguard structural landscape features or rock exposures;*
- *to secure examples of the natural environment for scientific studies, environmental monitoring and education, including baseline areas from which all avoidable access is excluded;*
- *to minimise disturbance by careful planning and execution of research and other approved activities; and*
- *to limit public access.*

Guidance for Selection
- *The area should be large enough to ensure the integrity of its ecosystems and to accomplish the management objectives for which it is protected.*
- *The area should be significantly free of direct human intervention and capable of remaining so.*
- *The conservation of the area's biodiversity should be achievable through protection and not require substantial active management or habitat manipulation (c.f. Category IV).*

Issues requiring clarification
- What is the minimum area required?
  All over Europe there are many Strict Forest Reserves, which often represent the majority of non-intervention forests of the countries concerned. Their management objectives are in line with the IUCN Guidelines for Category Ia (IUCN, 1994), but they are often small. In most European countries, especially Central and Western European countries, these strict reserves have an area of approximately 30 – 300 ha; in some cases, especially in fragmented landscapes, they may be less than 30 ha. The Guidance for selection states that the 'area should be large enough to ensure integrity of its ecosystems and to accomplish the management objectives for which it is protected' (IUCN, 1994). The paper on Interpretation and Application of the IUCN Management Categories for Protected Areas in Europe states that 'the strictly protected research areas are generally not large enough to ensure the integrity of its ecosystems (most of them are smaller than 2000 ha)' (Europarc & IUCN, 2000). However, it is not clear whether this size limit is an absolute requirement for inclusion. If this is the case virtually no sites in Europe comply with Category Ia. The only Category that caters for smaller areas is Category III : natural monuments. However this Category appears to be focused on individual features rather than ecosystems.
- What possibility is there to intervene in cases of disturbance which may cause major catastrophes outside the PA (e.g. fire, insect outbreak)?
  In many European countries exceptional interventions are possible in order to prevent catastrophic events outside the area emanating from within. However, such interventions may only be authorised by the relevant authorities on a case-by-case basis. Interventions inside the area may occur if all alternative solutions prove ineffective, e.g. intervention failure in the buffer zone adjacent the PFA. Are these exceptional interventions acceptable in Category Ia or can intervention only occur in buffer zones surrounding it (which may belong to another Category)?
- Do 'future natural forests' (i.e. previously managed or man-made forests that are left to develop freely) comply with this Category? They are certainly not 'examples of the natural environment'. However, natural development and succession can be monitored in these areas. Should it be mandatory to elaborate on whether these are areas of native

woodland or otherwise? In conclusion, this is perceived as a qualitative criterion.

Clarification sought from consultants employed by IUCN confirmed that this Category is certainly intended for large undisturbed areas, where no intervention is allowed (i.e. extremely strict criteria). This Category was not developed for Europe but Southern Asia, North America and South America. However, in the current revision process, IUCN will look at extending this Category to allow strict European reserves to be included. (Nigel Dudley, pers. comm.). This is in line with the statement in the interpretation guidelines for Europe (Europarc & IUCN, 2000): '*in Europe, Categories Ia/Ib, III and VI especially are under-represented relative to other regions (…) It is desirable therefore to encourage the wider use of these Categories in particular.*'

CATEGORY Ib - Wilderness Area:
Protected Area managed mainly for wilderness protection

Definition
Large area of unmodified or slightly modified land, and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.

Objectives of Management
- *to ensure that future generations have the opportunity to experience understanding and enjoyment of areas that have been largely undisturbed by human action over a long period of time;*
- *to maintain the essential natural attributes and qualities of the environment over the long term;*
- *to provide for public access at levels and of a type which will serve best the physical and spiritual well-being of visitors and maintain the wilderness qualities of the area for present and future generations; and*
- *to enable indigenous human communities living at low density and in balance with the available resources to maintain their lifestyle.*

Guidance for Selection
- *The area should possess high natural quality, be governed primarily by the forces of nature, with human disturbance substantially absent, and be likely to continue to display those attributes if managed as proposed.*

- *The area should contain significant ecological, geological, physiogeographic, or other features of scientific, educational, scenic or historic value.*
- *The area should offer outstanding opportunities for solitude, enjoyed once the area has been reached, by simple, quiet, non-polluting and non-intrusive means of travel (i.e. non-motorised).*
- *The area should be of sufficient size to make practical such preservation and use.*

This Category was also developed with large wilderness areas in North America in mind, and is only relevant in Europe for very large National Parks in Nordic regions.

Issues requiring clarification:
(Europarc & IUCN, 2000) confirm this interpretation but state that Wilderness may include areas exploited for a limited period in the past, without the natural diversity of habitats and species being significantly altered, and which have been returned to natural succession. Former military areas that are left unmanaged might fit in, provided they are of considerable size. This new approach is currently under review, as this may require a change in the definition of this Category (Nigel Dudley (pers. comm.). A new definition will need further clarification of terms (i.e. limited period, significantly altered, considerable size) to ensure unambiguous assignment of sites to this Category.

CATEGORY II - National Park:
Protected Area managed mainly for ecosystem protection and recreation

Definition
Natural area of land and/or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.

Objectives of Management
- *to protect natural and scenic areas of national and international significance for spiritual, scientific, educational, recreational or tourist purposes;*
- *to perpetuate, in as natural a state as possible, representative examples of physiographic regions, biotic communities, genetic resources, and species, to provide ecological stability and diversity;*

- *to manage visitor use for inspirational, educational, cultural and recreational purposes at a level which will maintain the area in a natural or near natural state;*
- *to eliminate and thereafter prevent exploitation or occupation inimical to the purposes of designation;*
- *to maintain respect for the ecological, geomorphologic, sacred or aesthetic attributes which warranted designation; and*
- *to take into account the needs of indigenous people, including subsistence resource use, in so far as these will not adversely affect the other objectives of management.*

Guidance for Selection
- *The area should contain a representative sample of major natural regions, features or scenery, where plant and animal species, habitats and geomorphological sites are of special spiritual, scientific, educational, recreational and tourist significance.*
- *The area should be large enough to contain one or more entire ecosystems not materially altered by current human occupation or exploitation.*

The IUCN consultants confirmed that many National Parks in Europe do not meet the standards of Category II and should be included in Category IV or V. For example, managing invasive species will put such areas into Category IV, unless restoration management is clearly limited in time and extent (Europarc & IUCN, 2000).

Category II excludes exploitation or occupation as it is inimical to the objectives of the designation. Exploitation is excluded if it upsets the natural balance of the ecosystem. Traditional practices, e.g. hunting /fishing by indigenous people, are allowed. As a consequence of the requirements of this Category, i.e. 'natural' state of the site, and the exclusion of active management for conservation, very few sites in Europe comply. Only some of the larger 'core areas' or some national parks and reserves in Nordic countries fulfil the requirements.

Issues requiring clarification:
The IUCN should make it very clear that there is not a hierarchy within the classification system. To this end both positive and negative examples should be included for each Category. In other words a national park that complies with Categories IV or V may be more relevant in certain countries, but is not less valuable than a site that is in Category II.

The term 'natural' needs further clarification. It is defined as 'ecosystems where, since the industrial revolution (1750), human impact has been no greater than that of any other native species, and has not affected the ecosystem's structure (IUCN, 1994). However, the European guidelines (Europarc & IUCN, 2000) also suggest that the term should also apply to areas where land use has ceased and natural succession is now underway.

Furthermore, a clear definition or explanation is needed of what is understood or meant by 'subsistence use by indigenous people'.

In the interests of clarity, a guidance paper from IUCN should include a glossary of all key terms that are currently open to interpretation.

CATEGORY III - Natural Monument: Protected Area managed mainly for conservation of specific natural features

Definition
- *Area containing one, or more, specific natural or natural/cultural feature which is of outstanding or unique value because of its inherent rarity, representative or aesthetic qualities or cultural significance.*
- *Objectives of Management*
- *to protect or preserve in perpetuity specific outstanding natural features because of their natural significance, unique or representational quality, and/or spiritual connotations;*
- *to an extent consistent with the foregoing objective, to provide opportunities for research, education, interpretation and public appreciation;*
- *to eliminate and thereafter prevent exploitation or occupation inimical to the purpose of designation; and*
- *to deliver to any resident population such benefits as are consistent with the other objectives of management.*

Guidance for Selection
- *The area should contain one or more features of outstanding significance (appropriate natural features include spectacular waterfalls, caves, craters, fossil beds, sand dunes and marine features, along with unique or representative fauna and flora; associated cultural features might include cave dwellings, cliff-top forts, archaeological sites, or natural sites which have heritage significance to indigenous peoples).*
- *The area should be large enough to protect the integrity of the feature and its immediately related surroundings.*

This Category is the smallest Category in terms of area. Remarkable/veteran trees may be included (although they have a limited lifespan). Man-made artefacts/monuments are normally excluded. The Category

includes spiritual sites, which may be small but very important, e.g. rag/prayer trees. This Category was developed to protect these areas by including them in larger areas thereby helping to increase biodiversity. Examples of areas that should be included are waterfalls, caves, craters sea cliffs and Karst landscapes.

Issues requiring clarification
It should be clearly acknowledged if man-made 'semi-natural' aspects can be included. For example, specific landscape features that are the result of long-time human land-use such as Karst areas, remarkable trees that were planted or pollarded/pruned over time, patches of ancient coppice with standards, or wood pasture.

If man-made elements can be included, it should be clear to what extent the required degree of naturalness should be, e.g. in respect of patches of old semi-natural woodland or wood pasture. Many of these could fit either here or in Category IV depending on the naturalness data provided.

(Dudley & Phillips, 2006) state that 'harvesting is not an appropriate form of management in Categories I-III'. Does this imply that sites or parts thereof that require human interventions on a regular basis, or where regular restoration works occur, should be excluded? Examples of such sites are:
- Karst and Cliff areas that require regular removal of (native or exotic) invasive shrubs and trees.
- Regular removal or coppicing of trees and shrubs in order to conserve or improve views on scenic hilltops, castles, ruins and waterfalls
- Restoration of Karst-areas or Land dune areas by removal of pine plantations
- Old pollard trees that require regular tending and pruning

CATEGORY IV - Habitat/Species Management Area: Protected Area managed mainly for conservation through management intervention

Definition
Area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species.

Objectives of Management
- *to secure and maintain the habitat conditions necessary to protect significant species, groups of species, biotic communities or physical features of the*

environment where these require specific human manipulation for optimum management;
- *to facilitate scientific research and environmental monitoring as primary activities associated with sustainable resource management;*
- *to develop limited areas for public education and appreciation of the characteristics of the habitats concerned and of the work of wildlife management;*
- *to eliminate and thereafter prevent exploitation or occupation inimical to the purposes of designation; and*
- *to deliver such benefits to people living within the designated area as are consistent with the other objectives of management.*

Guidance for Selection
- *The area should play an important role in the protection of nature and the survival of species, (incorporating, as appropriate, breeding areas, wetlands, coral reefs, estuaries, grasslands, forests or spawning areas, including marine feeding beds).*
- *The area should be one where the protection of the habitat is essential to the well-being of nationally or locally-important flora, or to resident or migratory fauna.*
- *Conservation of these habitats and species should depend upon active intervention by the management authority, if necessary through habitat manipulation (c.f. Category Ia).*
- *The size of the area should depend on the habitat requirements of the species to be protected and may range from relatively small to very extensive.*

This Category is quite broad hence it may include virtually all Protected Areas in many European countries, from 'minimal intervention areas' to intensive active management, with some economic revenue such as hay, timber, etc. as side products. Most of the PFAs in Europe are included in this Category. This Category is probably the clearest one, although problems arise when management activities result in marketable 'economic goods'.

Issues requiring clarification:
In order to avoid confusion with Categories I and II, it should be made clear what timeframe is acceptable for restoration works, or to what extent exceptional interventions (in case of catastrophes) or minimum interventions (such as the periodic removal of seedlings of invasive species) are allowed in Categories I & II. Depending on the strictness of these guidelines, more PFAs may be classified in Category IV, I or II.

A lack of definition and/or examples for this Category may lead to difficulties in interpretation, especially when management aims to conserve certain natural values linked to ancient management techniques, (such as wood pasture or coppice with standards) or where typical forestry techniques of stand transformation occur. Hence, the actual management may be very similar or even identical to some of the practices carried out in multifunctional forests.

In order to prevent the wrongful inclusion of multifunctional forests, the relationship to the overriding general definition should be clearly stated. The management objective is the basic determinant here; all management is carried out in order to fulfil clearly predefined nature conservation goals.

In order to fulfil these goals, some marketable goods may be produced (e.g. wood, meat, hay, etc.), as a means to this end, but they should not be the primary objective.

IUCN Category V - Protected Landscape/Seascape: Protected Area managed mainly for landscape/seascape conservation and recreation

Definition
- *Area of land, with coast and sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.*
- *Objectives of Management*
- *to maintain the harmonious interaction of nature and culture through the protection of landscape and/or seascape and the continuation of traditional land uses, building practices and social and cultural manifestations;*
- *to support lifestyles and economic activities which are in harmony with nature and the preservation of the social and cultural fabric of the communities concerned;*
- *to maintain the diversity of landscape and habitat, and of associated species and ecosystems;*
- *to eliminate where necessary, and thereafter prevent, land uses and activities which are inappropriate in scale and/or character;*
- *to provide opportunities for public enjoyment through recreation and tourism appropriate in type and scale to the essential qualities of the areas;*
- *to encourage scientific and educational activities which will contribute to the long term well-being of*

resident populations and to the development of public support for the environmental protection of such areas; and
- *to bring benefits to, and to contribute to the welfare of, the local community through the provision of natural products (such as forest and fisheries products) and services (such as clean water or income derived from sustainable forms of tourism).*

Guidance for Selection
- *The area should possess a landscape and/or coastal and island seascape of high scenic quality, with diverse associated habitats, flora and fauna along with manifestations of unique or traditional land-use patterns and social organisations as evidenced in human settlements and local customs, livelihoods, and beliefs.*
- *The area should provide opportunities for public enjoyment through recreation and tourism within its normal lifestyle and economic activities*

For this and the next Category there is a thin line between 'conservation area' and sustainable multifunctional use of natural resources. IUCN acknowledges that misuse of this Category is common (IUCN, 1994).

It is suggested that in Europe it is virtually always, the regional nature parks, nature parks, regional parks as well as many national parks which belong in this Category (Europarc & IUCN, 2000). It should be clearly emphasised that they do comply 'as long as they adhere to the IUCN definition of a Protected Area'.

Areas have been incorrectly classified to Category V even though they do not meet this basic IUCN definition of a Protected Area.

Issues requiring clarification
Nature conservation or landscape protection
The definition of Category V causes considerable confusion, as there is a contradiction with the overarching general definition. The definition of Category V is 'an area managed mainly for landscape conservation or recreation' while the over-arching definition states that the area should be 'especially dedicated to the protection and maintenance of biological diversity (…)'. What is the primary function of this Category, biodiversity or landscape protection?

In order to address this contradiction, the working group suggest that for a Category V site emphasis be placed on the requirement that it be 'officially

protected with the primary objective being conservation of biodiversity', and that the way to realise this conservation goal is through the conservation of the current landscape configuration. The hypothesis in this case is that historic management of the site has led to a landscape with important conservation values, which should be maintained through the continuation of traditional use patterns. This clearly differs from the MCPFE Category 2 (see below) where the main management requirement is the protection of the landscape, primarily for aesthetic and/or cultural reasons, without a specific primary conservation objective (although these sites may also have important biological values).

Indeed, when clarifying Categories V and VI (and in fact all Categories), a lot of confusion could be avoided by excluding any reference to its current naturalness status. The biological value, or naturalness of a site is no basis for inclusion or exclusion of sites in IUCN Protected Area Management Categories; indeed some multi-functional forests will have much higher biological values than many of the IUCN-classified sites.

The European guidelines (Europarc & IUCN, 2000) state that 'In order to fulfil the management objectives, *a significant part of this type of area should primarily be managed for conservation purposes.* The inclusion of many areas depends on how strictly the prerequisite 'a significant part of this type of area should primarily be managed for conservation purposes' is interpreted. What % area is significant and the term 'primarily' requires quantification (i.e. do both strict nature reserve and multifunctional forest with nature protection or conservation of a specific species as the primary objective comply?).

In many countries initiatives are taken in certain rural areas (i.e. sometimes called 'national park' or 'regional park' or 'natural park') where the promotion of a sustainable combination of recreation and multifunctional use of the landscape is the objective, with specific conservation aspects and goals included, even though it is not always the primary objective. Depending on the answers received, the total area in this Category will vary greatly (from tens of thousands of ha to 0 ha).

CATEGORY VI - Managed Resource Protected Area: Protected Area managed mainly for the sustainable use of natural ecosystems

Definition
- *Area containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.*
- *Objectives of Management*
- *to protect and maintain the biological diversity and other natural values of the area in the long term;*
- *to promote sound management practices for sustainable production purposes;*
- *to protect the natural resource base from being alienated for other land-use purposes that would be detrimental to the area's biological diversity; and*
- *to contribute to regional and national development.*

Guidance for Selection
- *The area should be at least two-thirds in a natural condition, although it may also contain limited areas of modified ecosystems; large commercial plantations would not be appropriate for inclusion.*
- *The area should be large enough to absorb sustainable resource uses without detriment to its overall long-term natural values.*

This Category was designed for vast natural areas with limited human pressure (i.e. Amazon and Congo Basin) and does not apply readily to the European Continent. Zoning is extremely important in these areas. This Category recognises the importance of cultural and social values and allows native communities to be sustained via exploitation of natural resources, e.g. rubber tapping is permitted in the Protected Forest Area (Nigel Dudley, pers. comm.) Further advice on category VI suggests that 'large commercial plantations are not to be included and a management authority must be in place' (IUCN, 1994).

The areas to which it might apply most readily in Europe include some parts of Scandinavia, including those inhabited by the Saami people (Europarc & IUCN, 2000).

For the purposes of PFA statistics, all COST Action E27 correspondents reported that this Category was very problematic. It is very unclear what should be included. Do semi-natural forests managed under close-to-nature silvicultural systems, or forests in EU designated areas (under the Habitats Directive)

comply? What about silvi-pastoral systems in the Mediterranean basin, providing subsistence to local communities in a landscape that has been significantly altered by man in ancient times but remained relatively unaltered since?

Issues requiring clarification

Category VI was developed for 'natural systems' and requires at least two-thirds of the area to be 'in a natural condition'. It is unclear how strict this requirement should be interpreted as there are virtually no 'natural systems' left in Europe. Indeed, in Europe there is a continuous gradient from artificial monocultures to even aged and semi-natural and near-to-natural forests to small patches of undisturbed natural forest. Clear instructions are needed in order to clarify the degree of human interference that is acceptable for a forest to be considered to be 'in natural condition'. Moreover, this again is an evaluation of 'current condition and quality', not of management intentions.

The Working group suggests that in order to prevent misuse of Category VI, it is important to stress that a Category VI site is always connected to other Management Categories, i.e. Categories I-IV, together forming one functional entity, in which the area classed in Categories I-IV cover at least 2/3 of the whole entity. In this regard, areas in Europe such as buffer areas of Sumava national park or Bayerischer Wald national park where large areas of planted spruce stands are included in the core as well as in the buffer zone of the park can be assigned to Category VI.

In addition, the size of area required to support sustainable uses without loss of natural values is not easy to determine; a strict interpretation would infer that European fragmented forest remnants are highly un-natural and would need to be linked together to increase naturalness before they could be included.

Correspondents suggest to clearly, define and explain what is required here. If this is not addressed, this Category will be widely misinterpreted, leading to unreliable and incomparable datasets.

As currently defined, countries where the majority of the forests have semi-natural status co-incident with sustainable management plans (cf Nordic countries) interpret this Category widely, and include all their forests, rendering it nonsensical.

This Category is also the only one where it is clearly stated that revenue and resources can be obtained from the forest. It should be very clearly defined when 'harvest' or 'exploitation' is considered part of a conservation strategy (i.e. Category VI). It should be clearly demarcated from sustainable multi-functional forest management (i.e. outside the scope of classification). This is especially difficult for sites that are undergoing a transformation process from an artificial to a more natural forest where the ultimate objective is to install a Protected Area.

3. Analyses and suggestions from COST-Action E27 regarding clarification on the use of the MCPFE Assessment Guidelines for Protected and Protective Forest and Other Wooded Land in Europe

In this chapter, input from the COST Action E27 country experts is provided on the use of the MCPFE-Assessment Guidelines for PFAs, developed by the Vienna Liaison Unit of the Ministerial Conference on the Protection of Forests in Europe (MCPFE, 2003a) in the context of generating more harmonised international statistics on PFAs. Many of the suggestions of the working group were addressed in the MCPFE Information Document (Frank & Parviainen, 2006) that accompanied the questionnaires of the MCPFE 2007 assessment on the status of Europe's forests.

3.1. Analyses

As stated previously, the MCPFE Assessment Guidelines were generally better appreciated by Cost Action E27 country representatives for reporting on PFAs, as it is better adapted to the European situation, and was specifically developed for reporting purposes.

Most correspondents stated that the MCPFE classification system addressed - in a more precise and well-balanced way - the different protection regimes in their country. For most correspondents, it was easier to assign the different national protection categories to the MCPFE Classes.

Although very few countries reported data for all Classes, most Classes are represented in the majority of countries. Class 1.1 was most problematic; although many countries reported figures for this Class, it was clearly stated that, if interpreted in the strictest manner, Class 1.1 does not occur anywhere in Europe (i.e. in 10 out of 11 replies).

Explicit designation in the context of the MCPFE Assessment Guidelines comprises both designations defining forest and other wooded land within fixed

geographical boundaries delineating a specific area as well as designations defining forest and other wooded land not within fixed geographical boundaries, but as specific forest types or vertical and horizontal zones in the landscape. This 'zonal delineation' was only relevant to a few countries and depended very much on how it was interpreted. For these countries however, they are considered a very valuable tool to report specific PFAs (e.g. Protection of Quercus rotundifolia – forests in Portugal, or Birch forests in Norway).

None of the Cost correspondents reported problems regarding the assignment of the national PFAs to any one of the Classes in particular. However, as with the IUCN-Categories, some countries encountered problems with areas where conservation actions/management restrictions within commercial forestry (i.e. multifunctional forests; Natura 2000-sites) pertain.

For protection regimes without a strict legal basis (i.e. protective ownership, voluntary programmes, etc.) MCPFE encourages reporting of these, though separate from the official data on legally designated PFAs.

3.2   Issues requiring improvement and clarification of the classification system in order to produce more harmonised datasets on PFAs in Europe

As the MCPFE assessment guidelines are specifically developed for the European situation, most correspondents found it easier to assign the different national protection categories to MCPFE Classes. However, as outlined in the previous chapter, this has produced a false feeling of 'certainty', as the reported figures are almost as divergent as for TBFRA 2000. Indeed, as previously stated, correspondents sometimes felt quite unsure when filling in the data; just like in TBFRA, they concluded that even minor differences in interpretation can lead to hugely divergent datasets. Therefore, more clarification is needed regarding the different Classes and harmonisation of reported data is necessary in order to render them comparable.

3.2.1. General principles: strictness of the 'legally binding' status of the site

General principles
"Protected and protective forest and other wooded land have to comply with the following general principles in

order to be assigned according to the MCPFE Assessment Guidelines:[2]
- *Existence of legal basis*
- *Long term commitment (minimum 20 years)*
- *Explicit designation for the protection of biodiversity, landscapes and specific natural elements or protective functions of forest and other wooded land "Explicit designation" in the context of these guidelines comprises both:*
  - *Designations defining forest and other wooded land within fixed geographical boundaries delineating a specific area*
  - *Designations defining forest and other wooded land not within fixed geographical boundaries, but as specific forest types or vertical and horizontal zones in the landscape"*

Data on forest and other wooded land according to these two designation types should be distinguished in the reporting.

Issues requiring clarification
1. It should be made clear that <u>all</u> of the general principles need to be fulfilled in order to comply (and not only one or some of them). Also, as for the IUCN Categories, the strict hierarchy between the 'general principles' and the Classes of protection and protective forest should be clearly stressed. Only sites that comply with the 'general principles' are eligible for classification in one of the subordinate Classes.
2. A clear criterion on 'Minimal size' for all Classes is required, or alternatively, if none is considered necessary, this should be made clear (see also definition of 'forest').
3. There is confusion on the strictness of the term 'legal basis'; all management regimes/plans and restrictions in forests are directly or indirectly linked to forest or nature conservation legislation, hence very wide interpretation is possible. Also the strictness of an 'explicit designation' is open to interpretation. In particular, it is unclear how management plans comply within this context.

The working group suggests clarification of the 'general principles' as follows:
All protected/protective areas must have a legal and permanent status of protection (i.e. governmental decree under nature conservation Acts, laws or statutes, forestry Acts, laws or statutes), or official

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[2] MCPFE Assessment Guidelines for Protected and Protective Forest and Other Wooded Land in Europe, MCPFE (2003)

written contracts between state authorities and forest owners. The single Protected Area (name) or groups of areas (protected habitats) should be mentioned in the national/regional legal documents. Other means for protection should be considered as voluntary contributions toward protection.

A *management plan* is a prerequisite for any site to be included in national PFA datasets, but is *not sufficient to be recognised as an 'explicit designation'* on its own. Management plans are considered to be technical executive documents. They must be linked to a higher level of commitment, i.e. an Act or contract, underpinning this management plan and referring explicitly to the area in question.

By including both positive and negative examples in an additional technical guideline, much of this confusion could be avoided. Some specific examples are suggested by the WG:

Examples of what should be included:
- All 'conservation areas' *sensu stricto*: these are sites that have an official and permanent (*ad infinitum*) status of protection (i.e. nature reserve, national park, etc.)
- Also included are:
  - Private nature reserves, recognised by the state: recognition is by official legal status (e.g. 'recognised nature reserve') connected to an explicit legal instrument or document of recognition (i.e. Act, ministerial decision). This recognition is linked in contract format with management commitments for time periods of at least 20 years
  - Areas that are explicitly and legally designated, for example 'a forest with protective forest designation. These must have received explicit designation through a specific Act or Ministerial Decision. In this context, a management plan alone is not considered to be sufficiently explicit.

Examples of what should not be included:
- All forms of 'voluntary' conservation and protection initiatives, (e.g. protected ownership, sites owned or 'leased' for extended periods by private or state nature conservation bodies, but with no 'official' protection status), *incentive programmes* for biodiversity/groundwater protection, etc. (e.g. areas of forest subject to forest biodiversity conservation grant schemes). These are generally short-term contracts that often lack binding commitments on the owner or follow up measures to ensure binding conditions are implemented. In addition, the owner may break the contract if he or she decides to do so.

- *Key-biotopes and conservation zones delineated within the framework of forest certification* programmes; these are not linked to long term commitments and legally binding Acts; moreover, they are considered part of multifunctional management required for certification. If certification is revoked, there is no obligation on the owner to continue with previously agreed management commitments.

- Areas of conservation and/or areas of protective forest *delineated only in management plans.* Management plans are considered to be technical executive documents. They provide guidance to the manager but are quite flexible in their application. In some countries however, they may be legally binding, and are thus legal instruments, but most have too short a timeframe. If such delineations in management plans are not linked to long term contracts or legal Acts that are specifically made to ensure that the main management objectives are met, they can only be considered to be 'voluntary initiatives' by local managers or administrations.

- Forest areas within the boundaries of national or international 'official' networks (e.g. *Natura 2000, National Ecological Network,* etc.). In some countries Natura 2000 sites coincide with national protection categories (national parks, reserves, etc.). In such cases these sites should be included in national PFA datasets. However, in many countries, Natura 2000-status does not impose a primary management objective for protection or protective forest, but allows the continuation of multifunctional and economic management, as long as it does not contravene the conservation objectives set out in the Birds and Habitats Directives. Therefore, Natura 2000 sites do not fulfil the basic requirements of the general principles and conditions, and hence should be excluded from the reporting procedure, even if extra restrictions are imposed on the owner for conservation of biodiversity or protective criteria. Individual sites that are also protected under national legislation for nature or landscape conservation can be assigned. Since management activities in these individual sites may vary from 'free development without any intervention' to 'intensive restoration measures', the categorisation according to the specific Classes must be decided for each individual site using the normal assessment procedures.

For designated forests with no fixed boundaries, it should be clear that 'management plans', or 'general guidelines for forest management' are not sufficient 'on their own' to warrant inclusion, but are an integral part of good sustainable forest management:

- national forest Acts may impose restrictions on the choice of tree species or harvesting methods (e.g. clearfelling) along streams, in watershed areas or on slopes greater than 30°
- national legislation may forbid the exploitation of certain forest types (e.g. birch forest at the timber line, etc.).

However, conservation or protective function objectives linked to these guidelines are not enough on their own to qualify for inclusion.

Many of the situations mentioned above do however comply with 'voluntary contributions' as mentioned in the assessment guidelines, and can be reported separately, i.e.

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

The working group presumes that this 'strict' and 'exclusive' segregated approach will almost certainly produce more comparable data.

However, this doesn't confer any 'valuation' judgement as a result of sites being included or excluded; as in IUCN, some excluded sites or types of protection may have a much higher impact or effectiveness regarding the conservation of biodiversity in forests compared to sites that are included.

3.2.2. MCPFE designations 'not within fixed boundaries': forest types or vertical/horizontal zones

Explicit designation in the context of the 'general principles' of the Assessment guidelines includes both designations within fixed geographical boundaries and designations that are not within fixed boundaries but are specific forest types or vertical and horizontal zones in the landscape.

Some countries did not include any forest in this rather 'vague' Class while other countries did find this a very useful type (e.g. Cork and Rotundifolia oak stands in Portugal, Ancient Semi-Natural Woodlands outside designated areas in the UK, protective

mountain birch forest in Norway, etc.). It is debateable, however, how much these reported Classes comply with the general principles as sites outside officially designated areas' are sometimes reported here. Divergent interpretation and reporting is inevitable if the general principles are not strictly applied.

Issues requiring clarification

There are differences in the interpretation of how explicit the main management objective should be, e.g. in Sweden and Norway similar regimes exist for protective mountain birch areas. Norway did report these areas, however, Sweden did not as their designation is not sufficiently explicit for conservation or protective functions. Therefore, it should be clearly stated that the prerequisites for inclusion are as strict as for MCPFE types 'within fixed boundaries-designations'. The only difference is that the demarcation of the area is not made on a map, but in a descriptive way, referring to specific forest types or vertical and horizontal zones in the landscape.

3.2.3. Definition of 'Forest' to be used in data collection

Some Protected Areas include both forest and open areas; to date, it is unclear what land cover should be reported. The working group suggests a strict and straightforward approach; the reported figures should be the simple intersect between boundaries of the officially Protected Area and protective regimes, and the area of 'forest'. In this regard, common definitions of 'forest' and 'other wooded land' are also required, in order to produce comparable data. The UNECE/FAO definitions of a 'forest' and 'other wooded land' (FAO, 1998) provide straightforward criteria, but is quite general, (i.e. crown cover > 10%; >5m high for forest >5m for other wooded land, area > 0,5 ha, width > 20m; land predominantly used for agricultural practices is excluded). Individual country definitions and national statistics on PFAs can be much more restrictive. At national level some land cover areas that comply with the FAO definition are not considered as forest *sensu stricto* (e.g. mires and heathlands with dispersed trees, non-productive forest such as dwarf birch stands at the timberline).

Suggestion of the WG:

It is suggested that a common definition of forest (preferably the FAO-definition) is used by all countries. If this is considered unrealistic (because it would impose new procedures in the calculation of national statistics) the country correspondents that

use alternative definitions should state what definition of 'forest' and 'other wooded land' was used in the production of their national statistics on PFAs, and provide an estimation of the potential difference if the FAO definition were used.

Results will also depend on how the data is sourced, e.g. satellite data vs. terrestrial surveys. Methodology should also be reported by country correspondents.

However, in order to achieve comparable data, a common use of definition and level of detail in the calculation and acquisition of the data is required.

3.2.4. Clarification on activities allowed and management restrictions that apply in the assessment guidelines

With respect to the activities allowed and restrictions that apply to the different Classes, discussions within the working group concluded that it is virtually impossible to apply general standards and criteria for the whole of Europe for certain activities, as their impact is completely different depending on where they are applied, e.g. commercial berry and mushroom picking is allowed in National Parks in Finland, but has no negative impact on the site, as the areas are remote and the intensity of exploitation is minimal. In Central, Western and Southern Europe however, commercial mushroom and berry picking can be a significant problem, and is often restricted, even in multifunctional forests.

Therefore, instead of trying to formulate general standards, this paper will only highlight the topics that need clarification or which are open to multiple interpretations. Suggestions are made based on specific examples.

MCPFE Class 1:
Main Management Objective "Biodiversity"

Issues requiring clarification

A further explanatory introduction to MCPFE Class 1 is suggested :
The main management objective is the conservation and further enhancement of Biodiversity, in all its different aspects as defined in the universally endorsed definition of Biodiversity, formulated in the Convention on Biological Diversity (Anon., 1992):

"Biological diversity" means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and

the ecological complexes of which they are part; this 0includes diversity within species, between species and of ecosystems.

Conservation of biodiversity in forests may include the conservation of rare genetic resources, protection of species and ecosystems, but also of natural processes.

It is clear that all aspects of biodiversity cannot be fulfilled to their full extent in the same place at the same time. The enhancement of one aspect may lead to a decrease of another, e.g. choosing the option of non-intervention in forests will in the long run lead to a more natural and richer ecosystem, but may lead to a temporary decrease in species richness.

It should also be clear that there is no value ranking order between Classes 1.1 to 1.3: these Classes are complementary (i.e. both strict and managed Protected Areas are required for the conservation of biodiversity).

MCPFE 1.1:
No Active Intervention

Guidelines
- *the main management objective is biodiversity*
- *no active, direct human intervention is taking place*
- *activities other than limited public access and non-destructive research non-detrimental to the management objective are prevented in the Protected Area*

Issues requiring clarification

No active direct human intervention :
From the replies of country correspondents, the conclusion is drawn that - when interpreted in its strictest sense - there are <u>no</u> areas in Europe that comply with this Class. This is because there must always be the possibility of intervention where emergencies occur. This conclusion is also in accordance with the COST E 4 report on Strict forest reserves in Europe (Parviainen et al, 2000).

It is therefore suggested that a specific addendum be added to the technical interpretation of Class 1.1: In Class 1.1 the main objective is the safeguarding of natural processes to their full extent. This means that no intervention should take place, even if this might cause temporal decline of certain species or habitats, due to natural fluctuations or natural calamities (i.e. fire, inundation, etc.). However, exceptional interventions may be necessary, and therefore allowed in order to prevent catastrophic events outside the area

emanating from within. Such interventions may be authorised by the relevant authorities only on a case-by-case basis. Interventions inside Class 1.1 areas may only occur if all alternative solutions prove ineffective, e.g. intervention failure in the buffer zone adjacent the PFA. This excludes intervention to prevent or change spontaneous development in the reserve, even if these might cause a collapse of the area itself. (e.g. curative intervention to combat 'biotic disruptions', especially pest outbreaks).'

Limited public access:
The impact of access restrictions can vary greatly depending on local access regimes applied in different countries. If interpreted as 'only access on foot on existent public tracks', this excludes many of the 'strict reserves' in countries where a 'right to roam' exists. However, in other countries this would impose no additional restrictions where, in public forests, access is also limited to existing public tracks.

Also, the impact of 'public access' on the site is very much dependent on:
· local public pressure (remote, sparsely populated area vs. densely populated area)
· vulnerability of the site to human disruption (trampling, fire risk, etc.)
Therefore, it is almost impossible to formulate standard guidelines on access restrictions.
It should be clearly stated that the recreational function is secondary to the scientific and conservation function; public access is not completely restricted, but can only be allowed in so far as it does not in any way contravene the main biodiversity objective (spontaneous development) of the site.
This may imply :
- access on a limited number of existent pathways (or even a 'right to roam' in remote, less vulnerable sites),
- no 'safety measures' (e.g. felling of dangerous trees along tracks) or 'public promotion' of the area;
- minimal maintenance of the access paths is permissible (e.g. removal of logs off pathways into the forest).

Non-destructive scientific research:
It should be defined to what extent scientific activity is considered as not having an adverse impact on natural processes:
e.g. surveys of saproxylic invertebrates may require capture (and killing) of large numbers of individuals,

the temporary or permanent removal of logs (i.e. for incubation); cutting or carving of trees for the placement of trapping devices, 'fogging' of tree crowns, tree ring analysis may require boring or felling of sample trees, soil studies may imply boring and removal of soil samples; digging of 'profile pits', etc.

The following points are suggested:
Permissible activities include scientific sampling in so far as it does not adversely impact the populations of sampled organisms:
· the numbers of sampled individuals fall within the range of natural population fluctuations, e.g. invertebrate inventories using trap devices or collection of seeds for scientific purpose - not as a seed supply/seed resource; mushroom picking for identification, not for consumption, etc.
· The sampling methods only disturb the site to a very limited extent; removal of soil samples, making bore-holes, temporary removal of logs, etc.

All other interventions that have a more permanent effect on the site are not permitted, i.e. felling or killing of trees, permanent removal or relocation of logs, digging of soil profile-pits, sampling methods requiring the use of pesticides (e.g. fogging), etc.

Examples of sites in Class 1.1:
· most 'core-areas' of national parks fit into this Class
· 'scientific reserves' for the study of spontaneous forest dynamics (Naturwaldreservat, Bannwald, Réserve intégrale, integraal bosreservaat, riserva naturale integrale, etc.)

MCPFE 1.2:
"Minimum Intervention"

Guidelines
· *the main management objective is biodiversity*
· *human intervention is limited to a minimum*
· *activities other than listed below are prevented in the Protected Area:*
  - *ungulate/game control*
  - *control of diseases/insect outbreaks**
  - *public access*
  - *fire intervention*
  - *non-destructive research, non-detrimental to the management objective*
  - *subsistence resource use ***
* in case of expected large disease/insect outbreaks control measures using biological methods are allowed provided that no other adequate control possibilities in buffer zone are feasible.

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

As in Class 1.1, Class 1.2 also focuses on the conservation of natural dynamics. However, contrary to Class 1.1, intervention is allowed and the main objective is the safeguarding of natural processes but not necessarily to their full extent.

This Class is indeed relevant to many of the small PFAs in Europe; they are very much influenced by developments outside the site, and may require continual intervention in order to mitigate negative influences from outside the reserve, that may cause unnatural imbalances within the PFA.

Issues requiring clarification

Basic principle of interventions in Class 1.2:
A limited list of allowable interventions is given, but with no guidance about the basic principle behind any of these possible intervention operations. Intervention is allowed and justified to the extent that it is required to mitigate unnatural imbalances or negative external influences. They are therefore limited to the minimum necessary. The intervention operations applied do not disrupt but support natural dynamics, and are therefore by definition, small scale in nature.

Pest control:
Further clarification is suggested; follow-up activities such as monitoring the populations of individual species are also allowed (e.g. pheromone and tree traps), as well as small scale 'curative' measures (debarking of infested trees *in situ*) excluding the use of pesticides. However, the removal of old/dead trees is not in line with the principle management objective and is therefore should be avoided.

Fire intervention:
Following clarification is suggested: an active fire control programme is allowed, not only to prevent calamities outside the PFA, but also to protect the vegetation inside a PFA. Active fire control measures allow for the extinction of fires that spread into the reserve. Preventive measures are normally excluded from the PFA, i.e. no active removal of 'fuel', moribund or dead trees. Fire prevention tracks should preferably be located in the buffer zone of the reserve. They are allowed inside the reserve only in exceptional situations, such as extremely rare and fire sensitive sites (especially in the Mediterranean area,

i.e. isolated, natural broadleaf-remnants, i.e. *Juniperus thurifera* forest, etc.).

Ungulate/ game control:
Additional specific guidance on this topic is suggested: In areas where no natural control of game populations exist (due to the disappearance of large predators, the provision of alternative anthropogenic food sources such as winter feeding of game, etc.), populations of game within Protected Areas may rise to a level that is detrimental to the site or its natural dynamics. In such cases, game control/culling is allowed in order to keep the population in balance with the ecosystem. Game control measures, however, are exclusively focused on maintaining the biodiversity objectives of the site.

Public access:
Additional specific guidance on this topic is needed as it is open to wide interpretation. The following explanatory note is suggested:

The rules for public access are, in principle, identical to Class 1.1: public access is allowed in so far as it does 'not adversely affect the objectives'. However, in Class 1.2 'minimum intervention' sites, activities 'encouraging' access to the site are sometimes compatible and acceptable:
· guided tours, ecotourism and educational tours, etc.
· guided trails on public footpaths;
In this context, tracks can be maintained and 'safety felling' of dangerous trees adjacent to frequently used tracks may be carried out. Mass events, sports and motorised recreation, are not allowed as they are detrimental or cause too much disturbance to the site.

Subsistence resource use (indigenous people and local communities):
It is suggested that some examples are included that illustrate regional differentiation in the implementation of permissible activities:
· Reindeer husbandry, subsistence hunting and firewood collection by Saami-people in Northern Scandinavia are allowed in Class 1.2 sites; the impact of these activities is so small that it is considered non- detrimental, and hence, do not significantly adversely affect the primary objectives.
· Shelter hut facilities (with firewood) in remote areas in Alpine and Nordic regions should be allowed in this Class.
· Commercial and non-commercial collections of berries and mushrooms by indigenous and local

communities are permissible in the Northern Scandinavian PFAs within this Class. Due to the inherent very low recreation pressure, these activities are not considered to have a significant adverse effect on the primary objectives.

- Applying the same philosophy, similar activities should be forbidden in densely populated areas:
  - firewood collection by 'local communities' in Central and Southern Europe may well have a negative impact on the natural dynamics of sites.
  - sheep and goat grazing in the Mediterranean and Alpine regions; these are generally detrimental to Protected Areas, and seriously affect the natural dynamics and species composition.
  - large-scale commercial picking of berries and mushrooms in Eastern, Central, Southern and Western Europe.

However, some of these activities may be in line with the management objectives of Class 1.3, and hence permissible in such sites.

Possibility for the extension of the allowed activities to cyclic elimination of invasive exotic species :

Cyclical intervention to allow for the removal of exotic species is a common practice in many reserves in Europe that are left to develop freely. This specific situation is not catered for in the Assessment Guidelines. When the current guidelines are followed, they are to be allocated to Class 1.3, although they are much more in line with the principle of Class 1.2. The principle of cyclical intervention for the removal of invasive exotic species is very similar to pest and game control, activities that are allowed in Class 1.2.

Therefore, it is suggested to extend the allowable activities to include 'control of invasive exotic species'. Further clarification is suggested as follows. Where there is a presence of invasive, exotic species, intervention is allowed, where such species are known to cause serious disruption to natural processes if left uncontrolled (i.e. small scale interventions - cyclical control):

- elimination of seedlings of *Prunus serotina, Rhododendron ponticum, Quercus rubra, Robinia pseudoacacia, Acer negundo, Pseudotsuga menziesii, Ailanthus altissima, etc.*
- control of Muskrat, Grey squirrel, Sika deer, Racoon, Pine Wilt Nematode, etc.

However, sites where larger scale restoration and transformation operations are performed are <u>not</u> included in Class 1.2. This applies even where intervention is considered a short term, isolated activity required to improve the situation and subsequently allow the forest to develop unmanaged. An intervention is considered to be 'Large scale restoration' when it clearly and visually interferes with natural dynamics or succession of the ecosystem. While this 'transformation/transition phase' is in progress, the PFA complies with Class 1.3 (active intervention).

Transformation activities (which classifies areas into Class 1.3) include:

- Large scale intervention in order to remove populations of invasive, exotic species present in the area (*Robinia pseudoacacia* or *Prunus serotina* removal campaign, removal of mature rhododendron-bushes, girdling or cutting of exotic tree or shrub species, etc.)
- The conversion of plantations towards natural stands
- Removal of conifer plantations in native broadleaf woodlands)
- Conversion of coppice to high forest
- Conversion of even-aged high forest to a more diverse species, structure and age class regime
- Active restoration of natural vegetation, natural water regimes (subsequent to previous drainage).

Once the transformation or 'primary installation works' are performed, a minimum intervention regime can be imposed with periodic control and small scale intervention. Subsequently, the site may be reclassified into Class 1.2.

Examples of sites in Class 1.2:

- National parks in Northern Finland; no forest operations are allowed, but reindeer husbandry and subsistence use by Saami people are allowed; free right to roam
- 'Minimum intervention' forest and nature reserves in the UK, Ireland, Belgium, and The Netherlands; no further forest operations allowed and spontaneous development only. However, small scale interventions to remove invasive exotic species such as *Rhododendron ponticum, Prunus serotina*, etc., are undertaken in order to prevent their spread over the entire area and disrupt natural processes and/ or suppress indigenous species regeneration. Also, the control of sika-deer and grey squirrel is allowed in Ireland and the UK
- 'strict reserves' in Central Europe where game control is currently allowed, in order to prevent overstocking by game, thereby disturbing the natural regeneration of palatable species.
- Some National Parks in Spain (like Sierra Nevada National Park) the Spanish classification term is "Parque Nacional", i.e. natural areas, with limited

human exploitation, which are protected due to the beauty of their landscapes, the representativeness of their ecosystems and the uniqueness of their flora. They have ecological, aesthetic, educational and scientific values whose conservation deserves special attention. One of the main management programs in Sierra Nevada deals with the prevention and extinction of forest fires. As a consequence, one of the main objectives of the Ordnance Plan is 'Defending the natural space against forest fires'.

MCPFE 1.3:
"Conservation Through Active Management"

Guidelines
- *the main management objective is biodiversity*
- *a management regime with active interventions directed to achieve the specific conservation goal of the Protected Area is taking place*
- *any resource extraction, harvesting, silvicultural measures detrimental to the management objective as well as other activities negatively affecting the conservation goal are prevented in the Protected Area*

There is a lot of confusion surrounding the inclusion of protected forests where even limited commercial extraction of timber (or other financial revenue from hay, meat, etc.) occurs. The guidelines on management regime may lead to a wide spectrum of interpretation ranging from 'pure conservation management' to 'good multifunctional forest practice with special attention to biodiversity'. On the other hand, management in Class 1.3 sites may involve similar techniques as in multifunctional forests.

Issues requiring clarification
It is suggested that additional specific guidance on this topic be provided in an explanatory note: The key element is that all sites in Class 1.3 should comply with the primary management objective of 'biodiversity' and especially to the *general principles:*
- Existence of a legal basis
- Long term commitment (minimum 20 years)
- Explicit legal designation for the protection of biodiversity

The primary objective (conservation of biodiversity) should be clearly stated via the conservation status of the site, which should have a legal basis, with a long term commitment linked to an explicit designation. Therefore, only 'officially designated Protected Areas'

may be included (i.e. with defined borders - or where a specific forest association occurs which has no fixed geographic boundaries).

Active management is consequently performed solely as a function of this objective. Management may produce marketable goods as by-products, which may result in commercially viable or loss-making activities. However, the production of marketable goods should never be the primary goal, but rather a subsidiary or secondary objective as a result of management to achieve the primary 'biodiversity' objective.

Active management will primarily be focused on two key aspects:
- *restoration management:*
  Many Protected Areas have been drastically altered by man over past centuries and may need a long term restoration programme to be restored. This may include transformation of plantations to natural forest stands, restoration of natural groundwater regimes, removal of stands comprised of invasive exotic species (e.g. *Rhododendron, Prunus serotina, Robinia*) etc. This restoration programme normally has a limited timeframe (i.e. 10-20 years). Thereafter, non-intervention management, minimum-intervention or continual active intervention for biotope or species conservation are all possible.
- *active management for specific biotopes or species conservation:*
  In many Protected Areas, active management is performed in order to conserve or restore specific biotopes and associated species. Management often consists of ancient management regimes that are no longer commercially viable and are therefore dying out. Consequently, the cessation of management endangers species associated with these ancient management regimes.

Examples of activities that fulfil the requirements of ancient management regimes:
- Prescribed burning and 'slash and burn' as a specific measure for the protection of threatened species, as performed in Koli National Park (FIN)
- Coppice and coppice with standards management performed or reinstalled for the conservation of rare butterflies and vegetation, in nature reserves in the UK, Belgium, Germany, etc.
- Transformation of neglected even-aged semi natural woodlands (previously coppice-with-standards) to optimise species and structural diversity (IRL)

- Cutting and mowing of forest tracks and glades for the conservation of rare light-demanding species in nature reserves in the UK, Belgium, Netherlands, etc
- mowing of mixed larch-spruce forests to create specific open agro-forestry systems of "Lärch-Wiesen" in alpine regions for conservation of light demanding species (Austria, Germany, Italy and Switzerland)
- Removal and control of invasive exotic species e.g. *Rhododendron sps.* in Ireland
- Forest grazing (wood pasture) created or maintained in order to keep a specific open woodland mosaic and the diversity (i.e. fungi, plants, birds, etc.) associated with it, as performed in nature reserves in the Netherlands and Belgium, the New Forest National park (UK), the Borkener Paradis nature reserve (Germany), etc.

Examples of sites that should not be included in Class 1.3:
- Coppice and coppice with standards management systems in multifunctional forests where a specified conservation status does not exist.
- Species protection programmes in the context of regular forest management (outside specified conservation sites); the conservation of rare and vulnerable biotopes or specific species is considered an important aspect of sustainable multifunctional forest practice. It has a very important contribution to the overall conservation of species and habitats, but should not be included in the reporting of PFAs.
- Transformation of man-made forests to natural forest stands as part of a management objective in local, regional or national forest strategies (i.e. aimed at more stable or more 'attractive' forests) or in the context of a local management plan.
- Forest grazing as a commercial activity, even when in harmony with forest and conservation goals, but outside explicitly designated Protected Areas (e.g. Pig and Cattle grazing in Dehesa-landscapes outside Protected Areas in Spain and Portugal).

Natura 2000 sites do not automatically fulfil the requirements of Class 1.3. If Natura 2000 sites comply with the General Principles stated in Annex 2 of MCPFE Resolution 4, the affiliation to Classes 1.1, 1.2, 1.3 or 2 of each individual site should be examined on a case by case basis.

MCPFE Class 2:
Main Management Objective: "Protection of Landscape and Specific Natural Elements"

Guidelines
- *interventions are clearly directed to achieve the management goals landscape diversity, cultural, aesthetic, spiritual and historical values, recreation, specific natural elements*
- *the use of forest resources is restricted*
- *a clear long-term commitment and an explicit designation as specific protection regime, defining a limited area is existing*
- *activities negatively affecting characteristics of landscapes or/and specific natural elements mentioned are prevented in the Protected Area*

This Class is less strictly defined as previous Classes, and appears to cover a wider range of forest management regimes. This Class was almost certainly envisaged, bearing in mind the type of conservation applied in 'regional parks', 'natural parks' etc: i.e. sites of important scenic beauty that have received an official status of protection. Management objectives are a delicate balance between commercial activities (agriculture, forestry) and conservation of landscape with specific elements of historic and natural value. It often involves incentives for conservation and restoration and for the promotion of compatible types of recreation.

Countries may however be tempted to interpret it as broadly as possible to include all semi-natural woods outside officially designated 'conservation areas' (class 1). Moreover, the specific aspects of 'landscape protection' are not always clearly defined; all forests have, to a certain extent, an important function in 'shaping' and conserving the landscape. The simple conservation of forest against deforestation could in this sense be considered as an important protective measure toward landscape conservation.

As shown in the figure 1 and 2 in chapter 3.3, this appears to be the Class that causes the most confusion: differences in interpretation may lead to the inclusion or exclusion of vast proportions of the forest area.

Issues requiring clarification
Additional technical guidelines are suggested which emphasise that only sites that comply with the general principles should be included, i.e. forests within the boundaries of specifically designated

protected landscapes, and designated in law. Consequently, the site should be managed for landscape protection/conservation. All other functions are subordinate to the conservation and development of the aesthetic, socio-cultural or historical values of the landscape, of which the forest is an integral and essential component.

Commercial forestry is still possible in some of these sites, as long as it complies with the primary objective of landscape protection. Regulations within protected landscapes may therefore include important restrictions on forest management (e.g. construction of forest roads, tree species composition, harvesting methods, use of clearfelling, etc.), or even forbid the continuation of specified commercial forestry activities. In most cases however, the continuation of regular multifunctional forestry operations is possible in protected landscapes, as long as it does not contravene the landscape conservation goals. It remains unclear how the guideline 'the use of forest resources is restricted' is to be interpreted. Is it an absolute requirement that management restrictions are imposed and if so, how important should these restrictions be.

The addition 'and specific natural elements' also requires further elaboration. It is very unclear what is meant. Because of the similarity of terminology, it could be assumed that this coincides with the definition of an IUCN Protected Area Management Category III: 'natural monument': *features of outstanding significance (appropriate natural features include spectacular waterfalls, caves, craters, fossil beds, sand dunes and marine features, along with unique or representative fauna and flora; associated cultural features might include cave dwellings, cliff-top forts, archaeological sites, or natural sites which have heritage significance to indigenous peoples.* However, other interpretations are also possible. In its current formulation, it has already been interpreted as 'key biotopes in commercial or certified forests' or 'habitats of the Habitat directive' and even 'all natural and semi-natural forests that receive a close-to-nature or traditional management'. All of these are or can be regulated in a legally binding long term commitment.

In particular, the situation vis avis Natura 2000 sites must be clarified in this context: habitats (that comply with the Habitats Directive) may indeed be considered as 'specific natural elements' and there are long term legally binding commitments for all sites that are officially designated as 'Special Area of Conservation' with fixed geographical boundaries.

Examples of sites that fulfil the requirements:
- forest within most European 'National Parks' (that comply with IUCN Category V, and not with Category II), Regional parks, Regional natural parks, Natural parks,
- forests within official 'protected landscapes' or 'protected natural monuments'

MCPFE 3 Class 3:
Main management objective 'protective functions'

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

Protective forests are essentially beyond the scope of this aspects of classification. They are not covered in the IUCN Protected Area Management Categories and are not PFAs as such. In the MCPFE State of Europe's Forests (MCPFE, 2003b) they are also reported separately.

In the annex to the Vienna Declaration however, they are incorporated in the 'Assessment Guidelines for Protected and Protective Forests in Europe' (MCPFE, 2003a). Hence, the issue of protective forests in the context of MCPFE assessment were covered in the work of COST Action E27.

Issues requiring clarification
The wording 'with respect to management plans' is rather confusing and almost certainly contradicts the general principles, where an explicit designation is required. Management plans **are considered** to be technical executive supporting documents and are not considered to be sufficient on their own, especially as they may not provide guarantees toward a long-term commitment.

Only forests that are specifically designated as 'protective forests' for the protection of soil cover, and forests in watershed protection areas, should be

included. These areas have all been explicitly designated and involve long-term commitments.

Officially designated protective forests always require an extra, specific explicit designation. Reference can be made in a management plan, but is given additional status via this explicit designation, which is the only way it can be officially recognised as 'protective forest'.

Examples of sites that fulfil the requirements:
· Forests within the borders of official 'protective forests', explicitly designated by means of a Ministerial Act, law or decree. Specific restrictions on tree felling or clearfell size may also be imposed.
· Forests within the borders of state-endorsed watershed areas; specific restrictions on tree species composition or the use of herbicides may be imposed.

Examples of sites that do not fulfil the requirements:
Protective zones identified in the context of a management plan; these have not been endorsed at a higher (i.e. national or International) level and are therefore not considered to be explicit enough.

Forests managed under specific management regimes, imposed through forest administration directives, e.g. where forests border streams (i.e. buffer zones - no plantation of conifers allowed within defined areas adjacent streams; no clearfelling allowed, etc.): these designations are not explicit enough, rather they are considered as regulations for 'good forest practice'.

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COST Action E27
Protected Forest Areas in Europe - Analysis and Harmonisation (PROFOR)
Results, Conclusions and Recommendations

The Clearinghouse Mechanism

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1.   Introduction

The collection, preparation and presentation of information about protected forest areas was seen as an important task of the COST Action E27. The World Wide Web allows making information available in a cost-effective and pertinent fashion. Internet technology also allows for the establishment of interactive databases and document handling services; these can be made open to the public, or access can be restricted. According to the COST E27 Memorandum of Understanding a website was to be established and should include: (1) interactive databases on national and international categories of protected forest areas (PFAs) in Europe; (2) diverse and condensed information related to PFAs; and (3) a document handling and access facility. As the purpose of developing the website was to compile and disseminate information it was seen to have the potential to develop into a 'European Clearinghouse Mechanism on PFAs'.

The term clearinghouse originally referred to a financial establishment where checks and bills were exchanged among member banks so that only the net balances needed to be settled in cash. Today, its meaning has been extended to include any agency that brings together seekers and providers of goods, services or information, thus matching demand with supply (CBD, 2005). COST E27 intended to support the scientific cooperation between countries, to develop a mechanism for exchanging and integrating information on a subject matter and cater for the establishment of an expert network on PFAs. Thus the clearinghouse mechanism development was

based on the following principles. It should (1) be needs driven, (2) provide access to information, (3) support decision-making, (4) have no vested interest in controlling the expertise or information, and (5) be created for the mutual benefit of all participants. A very wide and comprehensive network of experts was established within COST E27, and in doing so these principles were put into practice. The activities were implemented by Working Group 3 – WG3: Clearinghouse mechanism for European protected forest areas.

There were three main tasks of WG3.
1. To establish a web presence for COST E27. This included the preparation of the environment for establishing interactive databases for data and information and act as a platform for data and document management.
2. To collect information on maps of PFAs and to build an web-based PFA map directory.
3. To collect and organise accompanying information on PFAs in the website. This included the elaboration of PFA key terms (see chapter 6.1 by Schweinzer et al. in this volume), metadata on organisations dealing with PFAs, the establishment of an environment for building a PFA photo gallery, and providing tools for data analysis and visualisation.

The main source of data and information for the different sections of the clearinghouse were: (a) questionnaires completed by the COST E27 delegates; or (b) direct input from Working Group 1 (WG1: Description and analysis of European protected forest areas) and Working Group 2 (WG2:
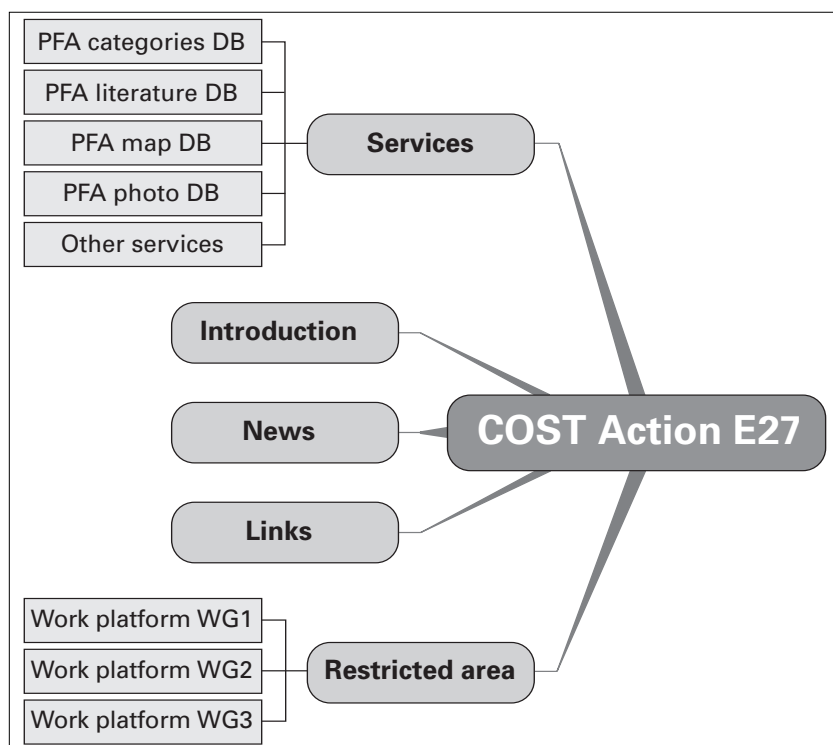
Figure 1:
Structure of COST E27 clearinghouse mechanism.

Harmonisation and improvement of information on European protected forest areas). The COST E27 website included both open access pages and a restricted section which was used for the action's internal and draft information and documentation. Documents were moved to the public section of the website upon finalisation. The basic structure of the website is presented in Figure 1.

2.   Content of the clearinghouse mechanism

Besides general information on COST E27, particular attention was given to the establishment of a set of databases. The contents of the four databases and the tools for data analysis and visualisation are described in more detail in the following sections.

2.1.   The PFA catergory database

The issue of definitions of PFAs is of high political importance both at national and international levels. In order to better understand the differences and

synergies between countries and their definitions, and in particular in the light of international reporting of PFA data, there was a need for a comprehensive overview of the national and international definitions. A collection of PFA categories of protected areas was initiated in the COST Action 'Forest Reserves Research Network' during 1995-1999 (COST E4, 2000; Parviainen et al., 2000). The collection of definitions concentrated mainly on strictly PFAs. The COST E27 expanded that collection to include other category definitions of PFAs. A searchable web database was built to allow interested users access to these definitions or guide them to other important sources of information. By the end of the COST Action a total of about 330 entries were recorded from 28 countries of which four countries were not in COST E27 but had provided information during COST E4. They include categories such as national park and nature reserve but also specific categories (national or even sub-national) such as gene conservation forest, natural enclave and biological interest site. Because the same categories are used by different countries in some cases (e.g. national park, nature reserve forest reserves, natural park), the total count of different PFA category types is less than 330. Figure 2 shows the number of reported PFA categories occurring in individual countries. Figure 3 illustrates a search result from the PFA category database.

The Common Database on Designated Areas (CDDA) is a joint initiative of the European Environment Agency, the Council of Europe, and the UNEP-WCMC is. It aims at better co-ordinating and streamlining information on designated areas resulting from various legal frameworks, whether at international, Community or national level. The national designation module of the CDDA currently includes more than 838 individual designations registered according to national or sub-national law from both EEA member and other European countries (EEA, 2006). The collection of COST PFA related categories can be seen as a contribution to the activities of the CDDA and vice versa. Further an analysis was
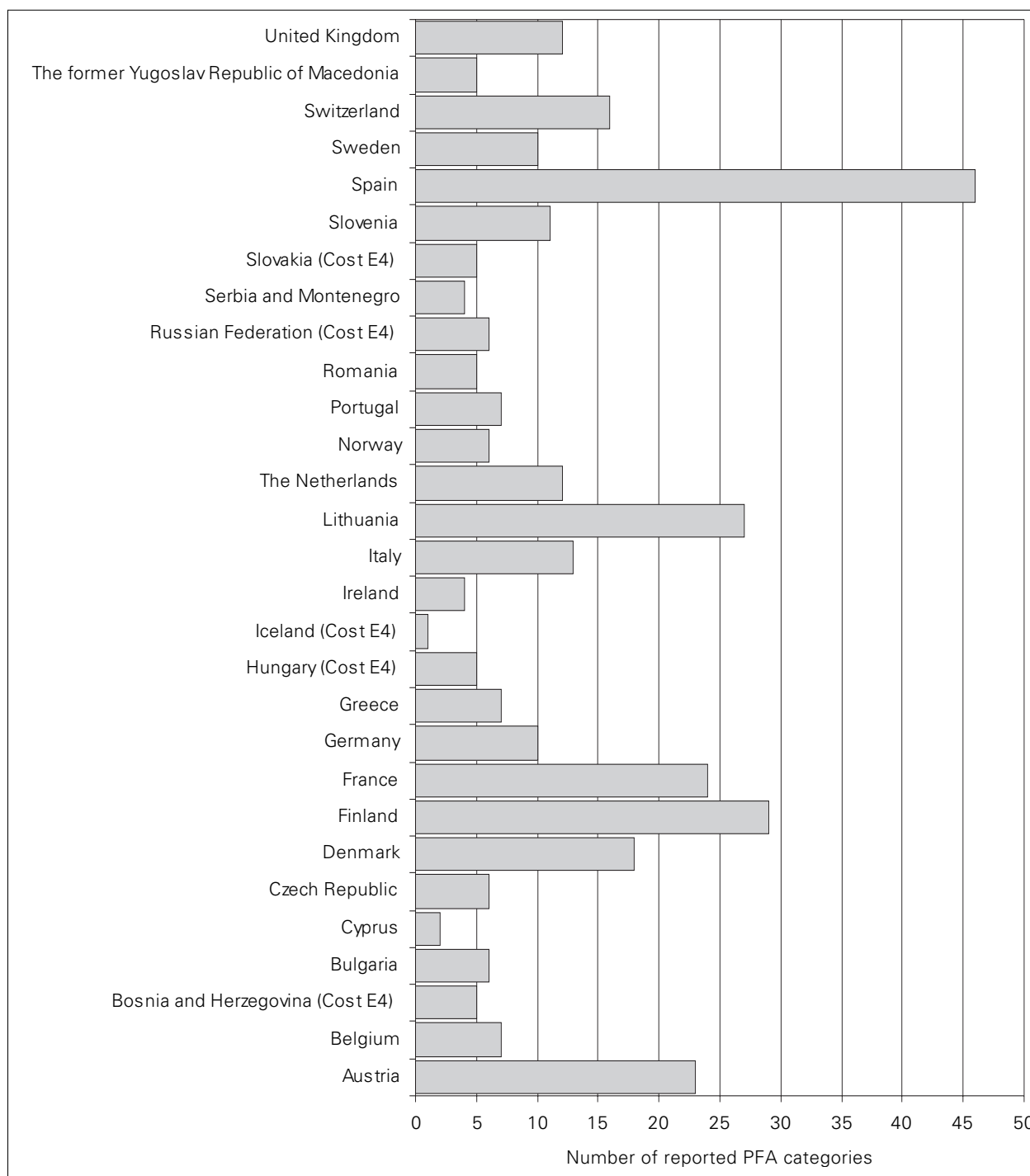
Figure 2:
Number of PFA category definitions in the COST E27 PFA terminology database and one query result for Spain (below).

performed in COST E27 on the completeness of designation types, and number of sites in the CDDA for PFAs. The analysis showed that there were gaps,

overlaps and differences in terminological use of designation types between the CDDA and the COST PFA related categories.

Country	Spain
English term	Integral Nature Reserve
National term	Reserva Natural Integral
Definition	Their aims are (i) to preserve against any human intervention the natural systems and their evolution (only scientific research activities are allowed, and the accessibility is totally controlled); (ii) to influence on the natural systems evolution in order to ensure their improvement, reconstruction and regeneration.
ID	154

Figure 3:
Search result from the PFA category database.

PFA Bibliography Database

Country:	Romania
Year:	2003
Keywords:	biodiversity
Author:	Note: If boxes "keywords" and "author" are empty, all the records will be retrieved.

[Search] [Reset]
Return to previous page

Figure 4a:
User interface COST E27 literature database.

Country	Romania
Author	Cristian Stoiculescu
Year	2003
Title	Aspects from the contributions and role of ICAS in biodiversity conservation in protected areas
Abstract	Due to the ICAS contribution of 15 years of researches (1988-2002): (1) the protected area increased from 0.39% in 1989 to 5.19% in 2002; (2) the number of small recognized protected areas in forest area increased from 41 to about 350, except those from the large protected areas; (3) the number of national parks and other protected areas increased from 1 to 17, and their area also including non-wooded lands, increased 113 times, from about 100 km2 to about 11,300 km2; (4) the problem of the Romanian virgin forests and the need to preserve them through protected areas was promoted to the Romanian and European authorities and mass-media; (5) biodiversity conservation in protected areas was taken over in governmental strategies for sustainable development, in laws, national and international statistics.
Keywords	forest management planning, protected areas, biodiversity, national parks, relict, virgin and quasivirgin forests, temporarily protected natural reserves in forest area
ID	1074

Figure 4b:
Search result from COST E27 literature database.

2.2.   The PFA literature database

The main aim of the literature database was to create a comprehensive repository, containing literature references related to PFAs at national and international levels. The entries have been extracted from several sources. The sources include: (1) the annotations of selected papers on research in strict forest reserves (COST E4, 2000); (2) compilations of literature reference lists of the COST E27 country reports (COST E27, 2005) and other documentation (e.g. on naturalness and history of PFAs); (3) highly relevant PFA literature was collected directly from country delegates. Each literature record in the database consists of the following elements:
· country
· author
· year of publication
· title
· abstract
· topic, keywords, key phrases or classification codes

The database can be searched by country, year, keywords and author (see Figure 4a). There are about 1100 entries for 30 countries in the database, with the earliest reference year as far back as 1904. Figure 4b shows a search result for Romania.

2.3.   The PFA map analysis and database

The objectives of WG3 with regard to PFA mapping were to: (i) describe current mapping activities of PFAs in Europe; (ii) investigate the possibility of building a pan-European PFA map using the data input from participating COST E27 countries; and (iii) to produce a meta database of available PFA (and PFA related) maps.

GIS-based information is becoming ever more important both in research and in decision-making. This is also the case for the mapping of PFAs. At the national level GIS layers for PFAs have been or are being established. At the international level there is at present no comprehensive map available on PFAs. The UNEP-WCMC had implemented a project entitled 'European forests and protected areas: gap analysis' (UNEP-WCMC, 2000). The gap analysis of PFAs in Europe was designed to provide relevant information on the distribution and conservation status of European temperate forests, in support of the Pan-European Biological and Landscape Diversity Strategy and in particular WWF's forest strategy

for Europe. In the course of their activities a map of PFAs of Europe was produced giving an indication of the distribution of protected areas in forests (http://www.unep-wcmc.org/forest/eu_gap/region.htm).

The European Nature Information System (EUNIS) database was developed and is managed by the European Topic Centre on Biological Diversity (ETC/BD) for the European Environment Agency (EEA) and the European Environmental Information Observation Network (EUNIS, 2006). It is a web application that provides access to publicly available data in a consolidated database including information on:

- Data on Species, Habitats and Sites compiled in the framework of NATURA2000 (EU Habitats and Birds Directives);

- Data collected from frameworks, data sources or material published by ETC/BD (formerly the European Topic Centre for Nature Conservation);
- Information on Species, Habitats and Sites taken into account in relevant international conventions or from International Red Lists;
- Specific data collected in the framework of the EEA's reporting activities, which also constitute a core set of data to be updated periodically.

EUNIS data are collected and maintained to be used as a reference tool or dataset for assistance to the NATURA 2000 process (EU Birds and Habitats Directives) and coordinated with the related EMERALD Network of the Bern Convention, the development of indicators (EEA Core Set; Bio-IMPS, Biodiversity Implementation Indicators; IRENA, Indicator reporting on the integration of environmental concerns into agricultural policy) and environmental reporting connected to EEA reporting activities. The EUNIS database application allows different data catalogues to be searched; the Common Database on Designated Areas (CDDA) has been of particular interest to the COST Action E27 (Table 1, Figure 5).

Select data set					
☐	Natura 2000	☑	CDDA National	☐	Nature Net
☐	European Diploma	☐	CDDA International	☐	Corine Biotopes
☐	Biogenetic Reserve	☐	Emerald	☐	

Table 1:
Data catalogues in the EUNIS database application (EUNIS, 2006).
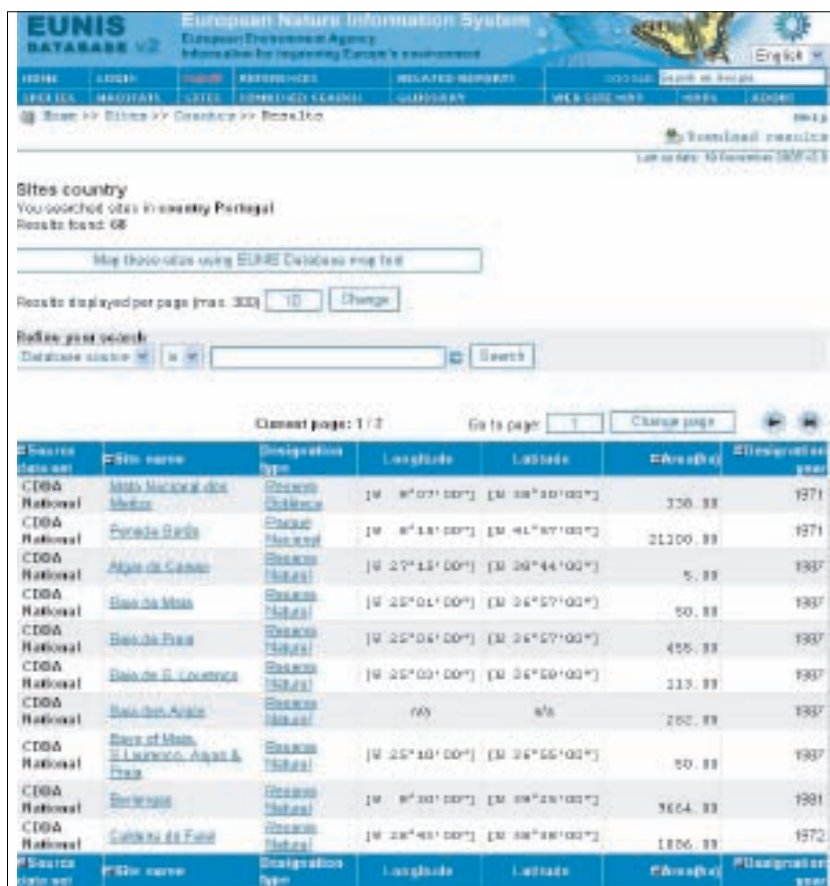
Figure 5:
Search of EUNIS database for national CDDA designation for Portugal.

The EUNIS database contains information on designated areas of protection both at national and international designation level by country, size, designation types, designation year, coordinate location, altitude, and some specific applications such as species and habitat types within sites and legal instruments underlying designation types. The CDDA currently contains 75 792 designated areas from 46 countries. Most designated area descriptions are accompanied by geographic point locations. At present there are activities within the CDDA to collect also digital boundary information. So far this is being implemented on a voluntary
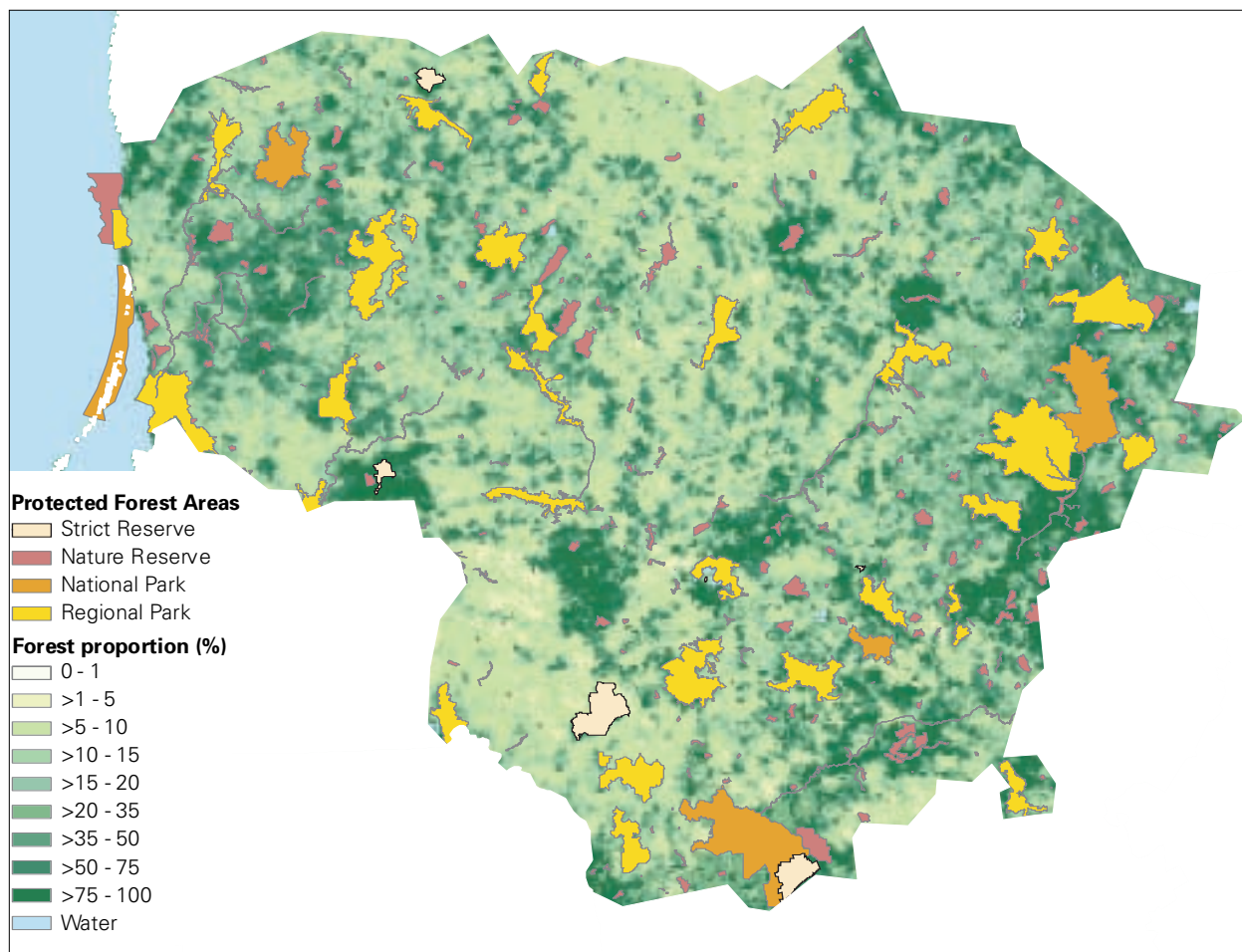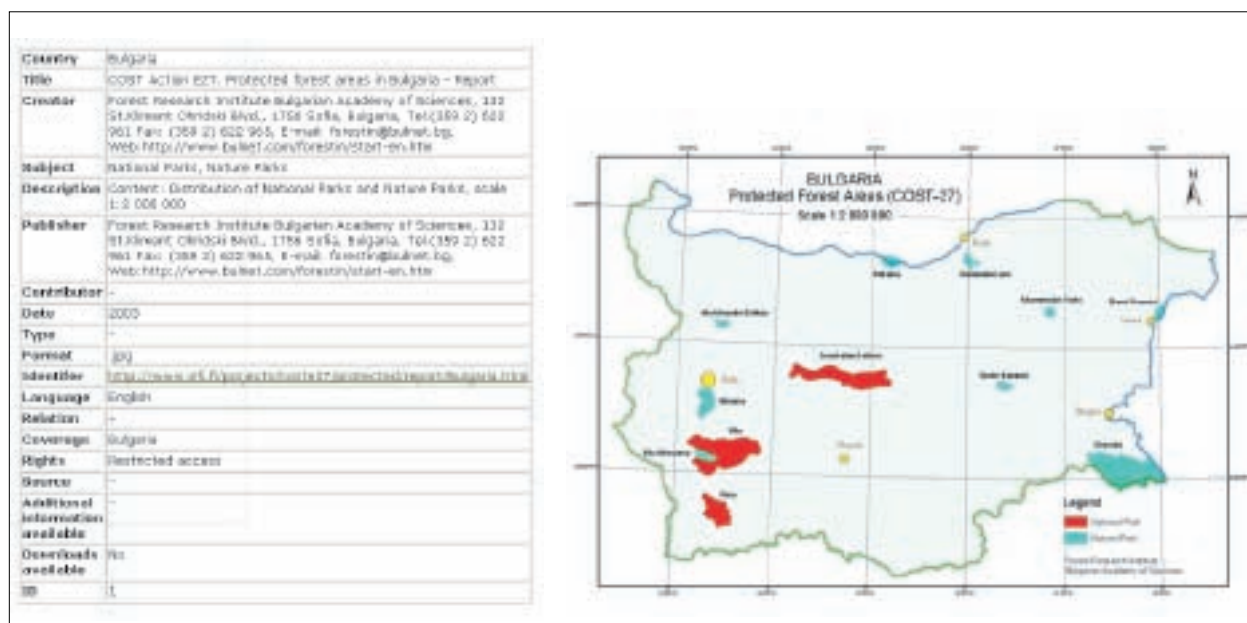
Figure 6:
The Forest Map of Europe overlaid with polygons showing location of Lithuanian PFA categories.

Figure 7:
Search result from COST E27 map database.

basis and unofficial testing data has been collected for 17 countries. The aim of these efforts is to compile a comprehensive boundary layer for the designated areas in the CDDA.

A cross check on the completeness of the CDDA designation types related to forests showed that in some cases there were differences between the figures reported by the CDDA and those reported by the COST E27 delegates. For example, the CDDA may give total area figures for a designated area which may or may not correspond with the actual forest area within a particular designated area.

WG3 also investigated the possibility of building a digital pan-European map of PFAs using the potential data input from the participating COST E27 countries. However, the investigation showed that the establishment of such a GIS data bank and the corresponding map would be a rather complex exercise. The most demanding issues were:

- The restrictions in use and general availability of digital maps which include PFA layers;
- The lack of available polygon boundaries for protection categories other than those more officially (and internationally) recognised such as national parks, nature parks or biosphere reserves;
- The lack of available polygon boundaries for the actual forest area within a protection category;
- The need to agree on common denominators for organising the various types of protected forest area categories existing at the national level (i.e. which national categories for example belong under strictly PFAs);
- The differences in use of coordinate systems;
- The lack of uniformity of files for maps.

These difficulties were regarded as too severe to be solved within the COST E27. An attempt was made to test a method by using PFA categories from two case study countries (Lithuania and Bulgaria) and combine those with a forest proportion map of Europe (Päivinen et al., 2001; Schuck et al., 2003).

The GIS case study analyses were based on geo-referenced data of PFAs compiled by the Lithuanian State Service for Protected Areas and the Bulgarian Forest Research Institute. For Bulgaria the used polygons were digitised from the Bulgarian PFA map. For Lithuania the PFA categories 'Strict reserve', 'Nature Reserve', 'National Park' and 'Regional Park' were considered, whereas 'National Parks' and 'Natural Parks' were analysed for Bulgaria. The PFA maps were overlaid with the raster of the relevant part of the forest map of Europe (Figure 6). The forest map

of Europe shows the percentage of forest per square kilometre. The values of the pixels falling within the PFA polygons were summed up for each PFA category. Using this method the forest cover area (in hectares) per PFA type could be estimated. The results were compared with the statistics of forested areas from the COST E27 PFA data tables. The comparison showed how well the figures calculated from the forest map correspond to those of the PFA tables. Of the four considered Lithuanian PFA categories the most accurate results were achieved for 'Regional Parks' and 'Strict Reserves', where the calculated forest area differed by less than 1% from the statistics of the PFA tables. The other analysed PFA types showed differences of 16% (Nature Reserves) and 26% (National Parks). These errors may be explained by the low resolution of the European forest map. Due to its pixel size of 1 x 1 km it is not possible to provide accurate area estimates for small regions. Especially for the category 'Nature Reserve', which comprises only very small areas, the inclusion or exclusion of pixels partly covered by PFAs has a significant effect on the results. The discrepancy between the results for Lithuanian 'National Parks' may also be affected by differences between the forest map and the polygon boundaries of countries or regions: the *Kursiu Nerija National Park*, situated on the narrow peninsula in the west of Lithuania, is not properly covered by the forest map thus contributing to a potential distortion of the results for the category national park. The possibility that within certain protection categories there is frequently a mosaic of different habitat types may have influenced the result based on the 1 x 1 km forest proportion map, which has been built using nine classes.

For the Bulgarian data the variation from the reported numbers was greater. This might have been caused by the digitising of the Bulgarian PFA sites which brought additional inaccuracy into the study. Due to these limitations no further analysis was made. If a forest proportion map of higher resolution became available, the described method could be tested in more detail on providing acceptable estimates of forested and non-forested areas within PFA sites.

Based on these experiences of applying the above described method and its limitations, the activities of WG3 with regard to PFA mapping was thus restricted to establishing a meta database on available PFA map material within the participating countries and within pan-European activities of interest (e.g. European forests and protected areas: gap analysis

map of the UNEP-WCMC). Those could be: scanned map images; a description of printed material; links to on-line interactive maps; or GIS databases. Nearly 150 records had been submitted to the database. Figure 7 shows an example of a search result from the map database.

2.4.   The PFA photo database

The photo database has been set up as a result of a discussion on finding an 'eye-catching' product on how to bring closer the object PFA. Photos from the participating countries were thought to provide a cross section of PFAs and their categories. The database illustrates the diversity of PFAs in a range of biogeographic regions (from Boreal to Pannonian to Mediterranean) thus giving a better understanding of the multitude of concepts and perceptions related to PFAs. The database contains about 160 photographs and an associated metadata record containing extra information about the photograph, including the following elements:
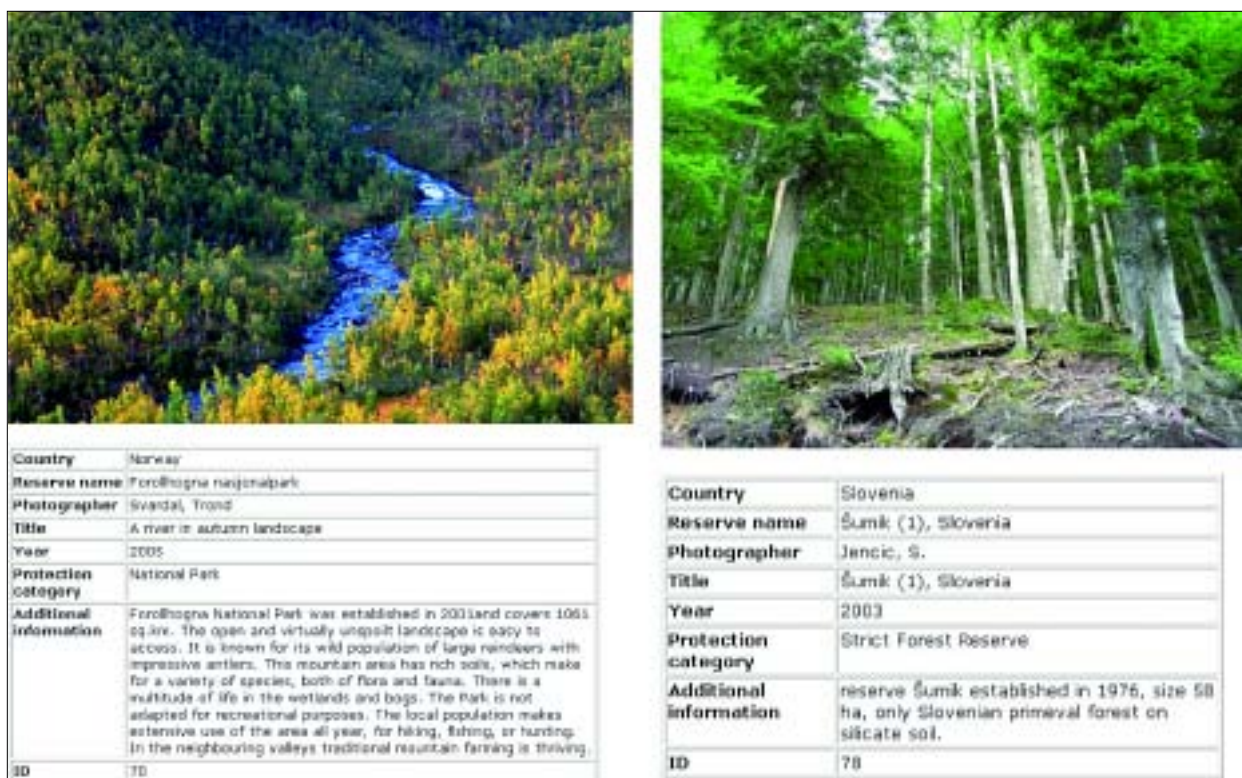- country
- reserve name
- photographer
- title of entry
- year
- protection category
- additional information

The entries show photos from protection categories such as biosphere reserves, forest reserves, national nature reserves, national parks, Natura 2000 sites, natural parks, natural reserves, nature monuments, nature parks, nature reserves, protected natural monuments, strict forest reserves and world heritage. Two examples of search results for different countries and protection categories are shown in Figure 8.

2.5.   Analysis and visualisation of PFA data

The aim of this activity within WG3 has been to assist the working groups by providing necessary data as tables, and also providing options to apply the use of web-based analysis and visualisation tools. To cater for this task the European Forest Information System (EFIS) demonstrator was used (Schuck et al., 2005). The EFIS allows data processing and visualisation based on data users' specified requests in the form of maps and graphs. It is furthermore perfectly suited for implementing exploratory data analysis (Andrienko & Andrienko, 2006).

Country	Norway
Reserve name	Forollhogna nasjonalpark
Photographer	Svardal, Trond
Title	A river in autumn landscape
Year	2005
Protection category	National Park
Additional information	Forollhogna National Park was established in 2001 and covers 1061 sq.km. The open and virtually unspoilt landscape is easy to access. It is known for its wild population of large reindeers with impressive antlers. This mountain area has rich soils, which make for a variety of species, both of flora and fauna. There is a multitude of life in the wetlands and bogs. The park is not adapted for recreational purposes. The local population makes extensive use of the area all year, for hiking, fishing, or hunting. In the neighbouring valleys traditional mountain farming is thriving.
ID	70

Country	Slovenia
Reserve name	Šumik (1), Slovenia
Photographer	Jencic, S.
Title	Šumik (1), Slovenia
Year	2003
Protection category	Strict Forest Reserve
Additional information	reserve Šumik established in 1976, size 58 ha, only Slovenian primeval forest on silicate soil.
ID	78

Figure 8:
Search result from COST E27 photo database.

The actual sources of information which were used for this purpose consist of both international data (MCPFE, 2003; UNECE/FAO, 2000) and the national PFA data/information tables. The national PFA tables were collected in conjunction with the elaboration of the PFA country reports (COST E27, 2005). National tables were submitted by 25 member countries. They include information on the protec-tion category, the PFA type in the landscape context, administration and ownership, PFA type summary statistics, preliminary international classification (IUCN, MCPFE), the motivation of preservation and existing restrictions. For analysis and explora-tion purposes the information was organised by protection categories. Ten general category groups were distinguished:

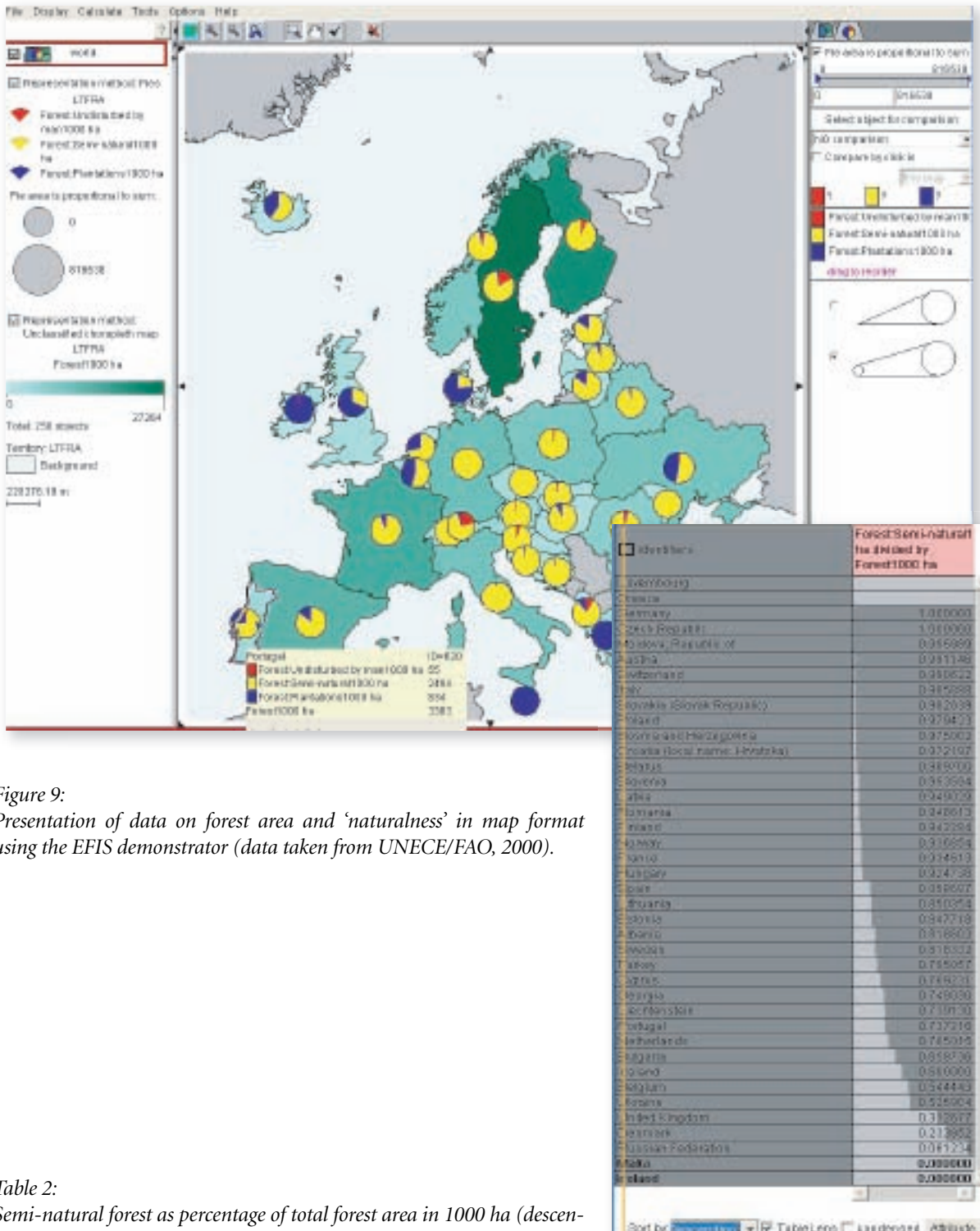

Figure 9:
Presentation of data on forest area and 'naturalness' in map format using the EFIS demonstrator (data taken from UNECE/FAO, 2000).

Table 2:
Semi-natural forest as percentage of total forest area in 1000 ha (descen-ding order).

- biosphere reserves
- national nature monument
- national park
- natural forest reserve
- natural monument
- natural park
- nature park
- protected forest
- protected landscape
- protection forest

This grouping allowed differences and similarities between countries or regions to be visualised. The complete tables are available on the COST E27 clearinghouse mechanism (http://www.efi.fi/projects/coste27/).

In the following Tables and Figures, examples are presented using both international and national PFA data.

Figure 9 is an example using internationally collected data. The analysis and following visualisation shows the distribution of the forest area (1000

Table 3:
Excerpt from the summary data table on PFA restrictions (general activities). Note: no data for Belgium, Cyprus and Poland available.

Country	Timber harvesting	Planting trees	Clearcutting (Cuttings >1 ha)	Small scale wood extraction (e.g. firewood for local use)	Building forest roads	Construction e.g. building cabins or erecting radio masts	Drainage	Recreational hunting	Subsistence hunting	Hunting for game control	Scientific sampling	Collection of berries, mushrooms, etc.	Livestock grazing	Public access
Austria	1	1	1	1	1	1	1	1	-	2	2	2	1	4
Bulgaria	1	1	1	2	1	3	3	1	-	2	4	4	1	3
Czech Republic	2	2	2	2	2	2	1	1	-	3	3	3	1	3
Denmark	3	3	3	3	3	2	3	3	-	3	3	4	3	3
Finland	1	1	1	1	1	2	1	1	2	1	2	3	1	3
Former YR of Macedonia	1	1	1	1	2	1	1	1	-	3	4	1	1	4
France	2,5	1,5	1,5	2,5	1,5	1,5	1,5	1,5	-	2,5	2	-	-	3
Greece	1	1	1	1	2	1	1	1	-	1	3	1	1	2
Germany	2	2	2	2	2	2	2	2	-	3	3	2	3	3
Ireland	2	3	2	1	2	2	2	1	-	3	3	1	1	4
Italy	2	3	2	3	3	2	2	1	2	1	3	2	3	3
Lithuania	3	2	2	3	3	3	2	3	-	3	3	3	3	4
Netherlands	2	3	2	3	3	3	3	3	-	3	3	3	3	3
Norway	2	1	1	3	1	2	1	3	-	3	3	4	3	4
Portugal	3	3	3	3	3	2	2	2	-	3	3	3	3	3
Romania	2	2	1	2	3	2	2	1	2	2	3	2	1	3
Serbia Montenegro	2	3	2	2	3	-	3	3	-	3	3	3	3	3
Slovenia	2	2	1	3	2	2	2	2	-	2	3	3	2	1000
Spain	3	3	3	3	3	2	3	3	-	3	3	3	3	3
Sweden	1	1	1	2	1	2	1	1	3	1	2	4	1	3
Switzerland	1	1	1	1	1	1	1	1	-	1	4	1	1	2
UK	3	3	3	3	3	-	3	3	-	3	3	3	3	3

1 = activity is strictly prohibited; 1,5 = between 'activity is strictly prohibited' and 'activity is usually prohibited, but with some exceptions or conditions'; 2 = activity is usually prohibited, but with some exceptions or conditions; 2,5 = between 'activity is usually prohibited, but with some exceptions or conditions' and 'activity is usually allowed, but with some exceptions or conditions'; 3 = activity is usually allowed, but with some exceptions or conditions; 4 = activity is allowed with no restrictions.

ha) which is indicated by the degree of darkness (shades of green). Those data are overlaid by the proportions (shown using pie charts) of 'naturalness' i.e. forest undisturbed by man, semi-natural forest and plantations as defined by the UNECEUNECE/FAO (UNECE/FAO, 2000).

The map shows that only a very small proportion of countries have any notable amount of forest undisturbed by man according to the UNECE/FAO data, with the exception of Liechtenstein, the Nordic countries and a few countries in south-eastern Europe. The tool allowed the data to be processed further, and a new variable to be derived: in this case the proportion of semi-natural forest within the total forest area in 1000 ha (see Table 2). It shows that Germany and the Czech Republic have reported 100% of their forest to be considered semi-natural according to the definition given by the UNECE/FAO. Again this new value could then be used for further analysis and/or be displayed on a new map.

Table 3 presents an excerpt of the restrictions (general activities) within national parks applied for 22 countries. Information is given on restrictions and activities that are allowed in national parks. The activities range from timber harvesting, road building, hunting, scientific sampling, livestock grazing to the collection of mushrooms. Figure 10 displays public access restrictions in national parks for 22 European countries using a colour map display over-

laid by standalone bars which indicate restrictions on collecting berries, mushrooms, etc. The map indicates that public access to national parks among the 22 countries is usually allowed (with some exceptions or conditions). Only Greece and Switzerland prohibit public access (with some exceptions or conditions). This is indicated by the dark red colour in the map. Collecting berries, mushrooms etc. is strictly prohibited in the Former Yugoslav Republic of Macedonia, Greece, Ireland and Switzerland (low height of bars).

Figure 11 illustrates the restrictions on timber harvesting, planting trees, clear cutting (cuttings larger than 1 ha) and small-scale wood extraction (e.g. firewood for local use) in national parks for 22 European countries using a set of maps. The restrictions are indicated by the degrees of darkness of shading in the maps. In Denmark, Portugal, Spain and the UK the activities are usually allowed, but with some exceptions or conditions (dark brown colour).

Future users of the PFA table data may find a broad variety of applications for this dataset. The web-based tool presented above may serve as an effective means for users to explore, analyse and display data which resulted from the activities of the COST Action. When using the PFA table data it should however be considered and noted that the data are those compiled by the COST Action members, and are not official national sources and thus should be referred to as taken from COST E27.
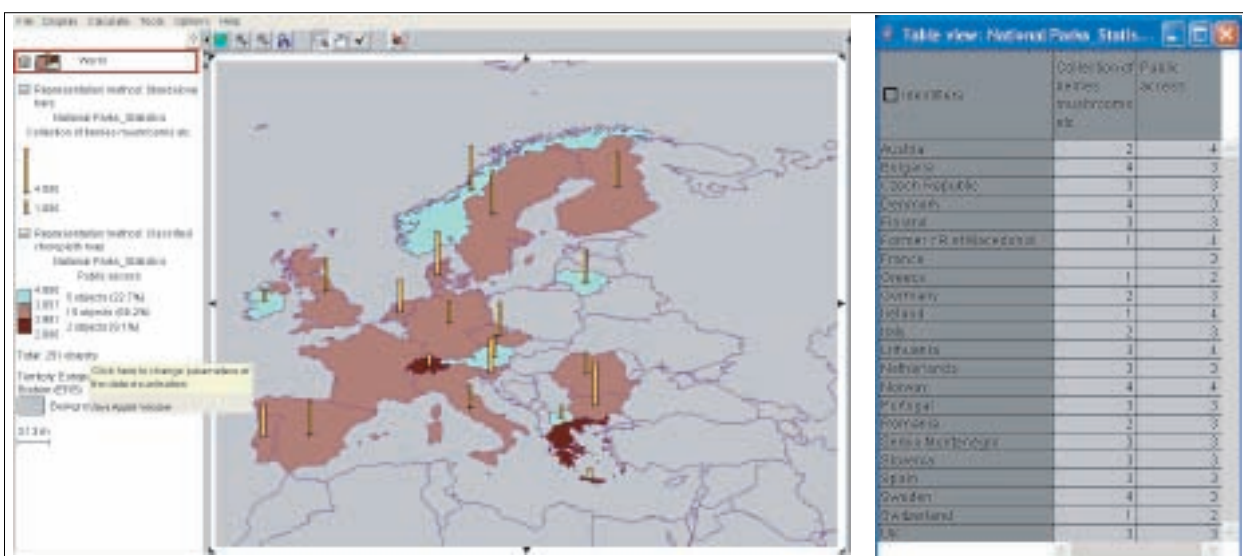

Figure 10:
Presentation of data presented in Table 3 on public access restrictions in combination with restrictions on collecting of berries, mushrooms, etc. in national parks. Note: no data available for restrictions on collecting of berries, mushrooms, etc. in France.
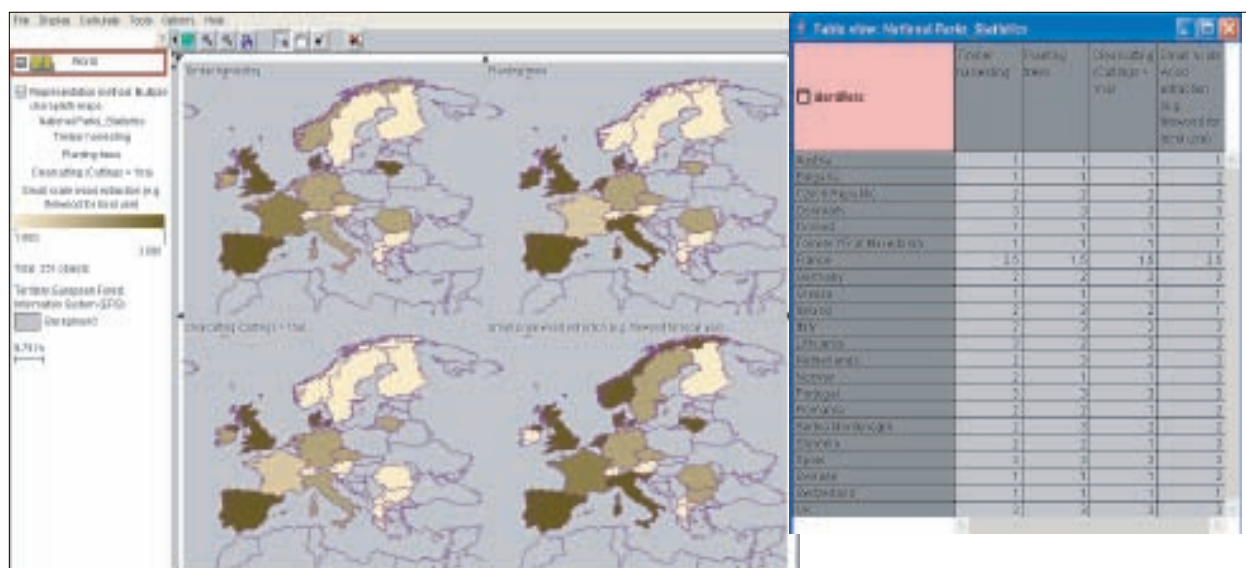
Figure 11:
Presentation of data (Table 3) on timber harvesting, planting trees, clear cutting (with cuttings larger than 1 ha) and small-scale wood extraction (e.g. firewood for local use) in National Parks.

3.   Conclusions

The clearinghouse mechanism developed under WG3 has played an important role for the COST Action E27. In the action's operational phase the restricted work platforms of the different working groups were essential in supporting the communication and the exchange of data among the country delegates. Information services and databases were then developed in order to make available the outcomes of the working groups to a wider audience.

As pointed out in Chapter 1 of this paper the clearinghouse mechanism does not comply with the definition of a clearinghouse to its full extent which intends to bring together seekers and providers of goods, services or information and thus matching demand with supply. There had not been considerable efforts undertaken to map the needs of user and stakeholder groups. One can envisage the user community of the PFA clearinghouse mechanism to include forest policy makers, researchers, but also European citizens with an interest in PFAs in Europe. The developed services were based, however, on the tasks as set out in the COST E27 Memorandum of Understanding and did not go beyond those tasks. It would surely have been beneficial to implement a detailed user and stakeholder consultation for assessing user group expectations towards: (1) the transfer of knowledge;

(2) suitable transfer tools; and (3) the most effective set-up, functioning and design of the PFA clearinghouse mechanism. In this respect well-developed clearinghouse mechanisms are the CBD (http://www.biodiv.org/chm/default.aspx), the European Community Biodiversity Clearing-house Mechanism (http://biodiversity-chm.eea.eu.int/), and comprehensive web portals such as that of the European Environment Agency (http://www.eea.eu. int/main_html).

Nonetheless the outcomes of the activities of WG3 are a useful contribution in highlighting activities surrounding the issue of PFAs. The website includes a number of valuable databases and reports on PFAs which may serve useful for researchers, give input to policy discussions at the national and European level and allow the general public to gain insight into differences between countries in their approaches in the protection of forests. Further a set of PFA data tables can be interactively displayed so that the user can get familiar with PFA data, its complexity and explore particular aspects of the data.

The future outlook for the management and development of the PFA clearinghouse depends very much on the dedication and ability of the established COST E27 network to keep it active and updated. It should be stressed that only if further efforts are made to enhance the interface between seekers and providers of information on PFAs will demand match with supply.

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COST Action E27

Main Results, Conclusions and Recommendations

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In order to get a reliable and comparable picture of the protection status of forests in European countries, common standards and harmonisation of protection categories with respect to one another are needed. The existing diversity of protected forest areas (PFA) in the different countries also has historical and socio-economic roots which must be understood and respected.

The COST action E27 "Protected forest areas – analysis and harmonisation" (PROFOR, http://bfw.ac.at/020/profor/) has aimed to provide a better understanding of national and international distinctions of protected forest areas and tries to explain the reasons for this diversity. The main task of the action was to analyse and harmonise the whole range of PFA categories in Europe in compliance with existing international categories for protected areas (COST, 2001).

Some 100 researchers and experts from 25 European countries participated in the Action. Major emphasis was placed on the cooperation between scientists and managers from both nature conservation and forest administration. Besides the 25 European signatory countries, the international organisations MCPFE and EEA had an official observer status and were fully involved in the work process with open access to all documents and data. COST E27 PROFOR also co-operated directly with the organisations IUCN, PEBLDS and UN-ECE.

1. Data and information sources

1.1. Country Reports

A fundamental element of the COST Action E27 were the Country Reports (Latham et al., 2005), which were written with a consistent content and structure to assist comparisons of information between countries. They supply detailed description of national protected area types with their historical and socio-economic backgrounds. The sources of information used consist of both international data (MCPFE, 2003; UN-ECE/FAO, 2000) and national PFA data/information tables. The national PFA tables were collected in conjunction with the production of the PFA Country Reports. National tables include information on the protection category, the PFA type in a landscape context, administration and ownership, PFA type summary statistics, preliminary international classification (IUCN, MCPFE), motivations for protection and existing restrictions.

1.2. An information portal for European protected forest areas

Internet technology allows for the establishment of interactive databases and document handling services,

which can be either open or closed to the public. The COST Action E27 "Protected Forest Areas in Europe" website was established in order to allow essential communication, management and dissemination. The development of a website included (1) interactive databases, (2) diverse and condensed information related to protected forest areas (PFA), and (3) a document handling and access facility. The site includes restricted working group platforms; interactively searchable databases on PFA categories; PFA related literature; PFA related maps; and a PFA photo gallery. All database records are accompanied by metadata which allows the user to get an overview of the information resources at hand. The website can be found on the Internet at http://www.efi.fi/projects/coste27/.

1.3.   EEA Standard Data Bank for designated areas

In 1995, the European Environmental Agency, the Council of Europe and the WCMC began co-ordinating their activities with respect to compiling a database of designated areas. This project is called the "Common Database on Designated Areas" (CDDA), and includes information from national, EU and international designated areas. The aim is to produce a complete database of all protection categories and protected sites in Europe. Data-input is generally co-ordinated by the relevant national authority, which is usually the Ministry of Environment or equivalent.

This CDDA list is an important database as it collates all designation types with national titles, numbers and areas. It contains information on over 50 000 designated areas from 48 countries, covering more than 800 various national designation types. (It is estimated that the total number of all designated areas in Europe amounts to approximately 65 000 to 70 000 sites). However, CDDA does not make any analysis on the harmonisation of national designations. Comparison of protected forests in different countries is extremely difficult according to this CDDA category because of the numerous categories and definitions.

The CDDA list groups the records according to the statutory requirements, but the classification does not make any differentiation between the management rules and strictness of protected areas. More information about the objectives of protection, habitat types, forest distribution and proportions of forests within the areas is needed. On the whole, CDDA is seen positively, if completed and regularly updated. The CDDA designation groups support the MCPFE data collection and reporting.

2.   Analysis of protected forest areas across Europe

2.1.   Development of protected forests in Europe

The state of biodiversity of European forests can not be fully understood without taking into consideration both long-term forest succession, and the history of settlement and human impact on forests. In this report, special emphasis was placed on the analysis of the diversity of motivations for the protection of the forest surface in European countries and during historical periods.

A wide diversity of motivations for forest protection can be recognized in almost every European country. Because of its extent and continuity, one of the most important motivations for the protection of wooded land is spirituality and religion, which dates back to ancient times. Hunting has also been a driving force in the protection of forests all over Europe, although its importance has varied over the centuries and has decreased markedly in the 19th century. Aesthetic and research motivations were less important across Europe before 1789, as were general protection of wood production and other utilisation, and the protective functions of forests. From the beginning of the 19th century, the exploitation of natural phenomena gained more and more importance, also in relation to the exclusion of forests and wooded land from utilisation in the interests of nature observation. Landscape preservation, preservation of habitat in general and particularly of rare species of fauna and flora became an important mission from the beginning of the 20th century onwards. During the 1920s and 1930s, even during the wide-ranging economic crisis and the general need for timber and firewood, nature protection became important and gave rise to the publication of the first nature protection laws in Europe. The importance of the nature protection movement increased from the 1970s, and was very much supported and promoted by scientific research. The year 1970 marked the beginning of a new approach in the field of nature protection: protection moved from that of specific natural phenomena and small protected areas to the integrated protection of large areas, and the protection of biodiversity through appropriate forest management.

In Central Europe, the tree species composition and extent of woodland remained quite stable until the early medieval period, from which time onward

much of the original forest cover was cleared for agriculture and human settlement. In the Mediterranean Region widespread clearance and replacement of forests by maquis seems to have occurred around 2000 years ago. Because of the early clearance of almost all forests in the Atlantic region of Europe for agricultural purposes and the efforts to re-afforest during the 19th / 20th century, the percentage of the forest area that is plantations is the highest in Belgium, Denmark, Ireland, The Netherlands, Portugal and United Kingdom; in Central and Northern Europe semi-natural forests still dominate. Many plantations were of conifers. Thus the percentage of conifers, growing on sites where broadleaved trees form most of the potential natural vegetation is highest in Ireland, United Kingdom and Denmark. In Central and Northern Europe the forest cover was never totally removed and a certain proportion sustained over the centuries. Sweden and Finland have the highest proportion of protected untouched forest remnants in Europe.

2.2.   A general analysis of protected area types

There is a great variation in typology, restrictions on use and motivation for designation between PFA type and countries, and a superficial analysis of the data records may be misleading. An attempt was made to identify characteristics, similarities and differences between categories of protected forest areas and countries with respect to restrictions and motivation for designation by means of multivariate statistical methods. The analyses shows a clear separation between restrictions which pertain to timber resources and silvicultural management and those relating to non-timber production and public access. These differences are in parallel with the differentiation between North and South: in Northern Europe the restrictions affect the harvesting of timber resources and the forest infrastructure. In the Mediterranean and Atlantic countries this applies to access restrictions and non-forest products (mushrooms, berries, etc.). Counties with a high share of forested areas and relatively low population density have restrictions which aim at the preservation of large protected forest areas. Countries with high population density and low forest cover must limit tourism and the exploitation of non-forest products.

2.3.   Selection criteria for protected forest areas dedicated to biodiversity conservation

Data collected in the framework of the COST Action E27 show that there are very seldom quantitative conservation targets and that design criteria are often not adequately defined, at least in a perspective of species and habitat conservation. Many existing reserves have been chosen in an ad hoc fashion, without the use of explicit criteria. Though composition issues are often integrated into selection criteria, important spatio-temporal dimensions are only used infrequently by practitioners. In Western and North European countries the majority of forests are owned by families and individual people. Due to the ownership structure the forests and the forest unit distribution are very heterogeneous and scattered, and therefore influence that protected forest area networks are not possible to set according to the optimal biological/ ecological criteria. In many cases, minimum size of protected areas, site connectivity, or forest continuity simply cannot be taken into account. Even the presence of rare or threatened species and habitats, two criteria that are considered as prime importance for the selection of most PFAs, the availability of reliable distribution data prevents adequate design of reserve networks.

In conclusion, it is clear that guidelines and criteria for PFA designation deserve to be improved and sharpened in many European countries. In a general way, structural and spatio-temporal criteria certainly deserve to be better taken into consideration. The integration of such criteria together with the identification of quantitative targets in the designation process should be based on the existing stock of conceptual and methodological studies and should be implemented in the field through a synergy between theoreticians and practitioners. This is the only way to build a functional network of protected forest areas, acting as real sanctuaries for biodiversity and as unique research laboratories.

2.4.   Organisations responsible for or involved in the establishment and maintenance of protected forest areas

The establishment and management of protected forest areas (PFAs) in each country depend on the structure of actions, agreements and obligations, which may vary for PFA types. There are tasks which

are generally in more national competence (policy and development) and others (executive tasks, local surveillance) where competences are more often on a local level. Besides the obvious responsibilities (such as the establishment and management of PFAs) countries' policies on PFAs depend on certain strategies influenced by international agreements, lobbies and the national social and economic climate. Furthermore, there is a legislative framework, which often incorporates regulations, restrictions and optional subsidy arrangements for PFA types and names the institutions accountable for managing PFAs.

2.5.   Forest protection in the context of landscape

National delegates of COST Action E27 have highlighted the importance of the human component for the characteristically small-structured and varied cultural landscape within PFAs, and their predominance of semi-natural woodlands. Landscape values concern not only biophysical aspects, but also European societies through their intensive use of forests for centuries. Indeed, this is the reason why the richness and diversity of rural landscapes is such a distinctive feature of the European continent. One significant result however, is that landscape protection in Europe is often not restricted to forests, but frequently concerns a mosaic of land-uses.

2.6.   The value of protected forest areas

A direct monetary valuation of protected forest areas was not directly a target of COST Action E27, but the material allowed some assessment of direct and indirect benefits, restrictions and compensations differentiated according to the individual stakeholders (forest owners, visitors, hunters, fishermen, scientists, beneficial owners, communities, etc.) Taking into account the expected regional differences it could be shown that the actual beneficiaries of protected forest areas are local although not the forest owners themselves, whereas less strictly protected areas benefit a larger number of people.

Regarding differences between stakeholders in strictly and non strictly protected forest areas it can be stated that scientists and state administration get the largest number of benefits from the strictly protected areas, whilst landowners and visitors get the major number of benefits from the non strictly protected forest areas. Considering the limitations, landowners and visitors are the groups with most limitations either in strict PFA and in non strict PFA. Compensations are mechanisms more often used in non strict PFA than in strict PFA and when they happen affect landowners.

2.7.   Identification of key terms, definitions and data flow processes for protected forest areas – a contribution to cross-border communication

Experts use their own special language, consisting of specialised terminologies. The more experts from different countries communicate, the higher are the demands for clarity and accuracy in communication. COST Action E27 members compiled a list of the most important terms that relate to protected forest areas and to identify those that were problematic. All 18 languages of the member countries were included.

Even the definition of forest varies quite considerably between European countries. It makes a clear difference for the assessment of protected forest areas if the national forest definition or the internationally agreed definition is applied. What is even more confusing is the fact that the category of "other wooded land" used in the global context does not exist in most national definitions. For international use of protected forest area statistics it is strongly recommended that the most relevant international definition of forest is used.

Several data sources such as national databases on PFAs, maps, information from systematic strata sampling and short term management planning are involved. National forest inventories (NFIs) have not yet played an important role as they were not specifically adapted to PFAs. Data transmission is a national task of the national ministries; they may involve research institutes. National reporting is made by nationally nominated correspondents.

The accuracy of data on PFAs was, in most national cases, estimated to be precise to good when considered on the national level. However, most correspondents believed that data were not comparable at the international level, as national reporting is dependant on national conditions and interpretations of assessment guidelines.

Ways to improve data quality and reporting were proposed:

1. better guidance from TBFRA and MCPFE teams of specialists in cooperation with the national experts;
2. adaptation of national nature protection designations to European protection categories;
3. better use of new data sources like GIS supported databases to exclude overlaps and double counting;
4. reporting national authorities should release relevant figures and summaries for their countries for public evaluation and discussion;
5. international reporting needs to use synergies between different actions: each item of information must only be requested once at a given date from each country; this means close cooperation especially of TBFRA and MCPFE procedures.

3. Classification of Protected Forest Areas

3.1. Classification systems

A common standard is needed to produce reliable and comparable figures on protected forests for the whole of Europe.

In Europe, two international classification systems are used for reporting on protected forests:
1. IUCN developed a set of Protected Area Management Categories for world wide use (IUCN, 1994). It contains six protection categories. TBFRA in Europe has used the IUCN Management Category System for the reporting of protected forests areas in TBFRA 2000 (UN-ECE/FAO, 2000).
2. MCPFE produced figures on protected forest area in its "State of Europe's forests 2003". For this purpose the MCPFE Assessment Guidelines for Protected and Protective Forest and Other Wooded Land were developed during 1999 – 2003 and endorsed by national governments during the MCPFE Conference in Vienna in 2003 (Annex 2 to the Vienna Resolution 4) (MCPFE, 2003a, 2003b, 2003c). As far as is possible these MCPFE classes were aligned with the respective Protected Area Management Categories of IUCN.

IUCN categories approach a global view, and include six categories. The IUCN classification has been applied to the description of vast untouched, conti-

nuous and state owned forest areas. IUCN categories include all types of ecosystems, and have not been especially well suited to classifying forest protection, while forests are often only a part of larger protection areas.

Because of the long historical use of forests in Europe which has led to altered forest ecosystems, forest fragmentation into the small, isolated areas inside other land use classes and heterogeneous forest ownership structure, the European concept of forest protection has become more complex and varied than in other continents with huge areas of untouched forests. MCPFE classification is thus adjusted especially for European conditions.

In order to evaluate their possible usefulness for assessment of European Protected Forest Areas, an analysis of both existing international classification systems (i.e. MCPFE and IUCN) and the results derived from these systems is required. The objectives are to analyse the differences in reporting, based on the local background and expertise of the delegates in the COST Action, to point out the sources of divergence and confusion and to propose interpretation guidelines that can be used to provide more harmonised data on protected forests in Europe. COST Action E27 does in no way intend to make direct comparison or valuation between countries, even if differences between countries with similar natural resources and political and administrative frameworks are highly visible.

Both the IUCN system of Management Categories and the MCPFE Assessment Guidelines are considered in the context of classification of protection management intentions. It does not necessarily reflect the activities that are actually performed, allowed or tolerated in practice. Both systems also classify management objectives and restrictions. They do not evaluate the actual quality and conservation value of sites. Hence, a particular Class may include a wide range of forest types, with different degrees of naturalness (i.e. from pristine virgin forests to plantations) and varying biodiversity quality.

3.2. Analysis of MCPFE and IUCN classification systems

Both the IUCN system of Management Categories and the MCPFE Assessment Guidelines are described, and evaluated, by comparing the statistics of TBFRA (using IUCN categories), the MCPFE's State of Europe's forests 2003 (using the Assessment

Guidelines), and through the crucial input from the country experts of the COST-Action E27, gathered by means of questionnaires, country reports and plenary discussions. Results of the comparison between TBFRA (IUCN), MCPFE and personal estimates of the COST Action E27 country delegates showed considerable variation. Even on quite strictly defined protection categories (like strict reserves), reported figures are even sometimes of a different order of magnitude. Therefore, one can state that there exists considerable confusion and, to date, no harmonised and comparable dataset on PFA in Europe is available.

In most countries, the results of the assessment of protected forest areas according to TBFRA (IUCN) and according to the Ministerial Conference for the Protection of Forests in Europe (MCPFE, 2003) differ considerably, and in some cases even extremely. A questionnaire was circulated among COST E27 delegates in order to assess the plausibility of the results. The experts had not doubted the correctness of the data. Slight changes or differences can be explained by new development since data were gathered, i.e. some new protected areas that have been designated and / or expanded.

Also, differences in the delineation of 'forest' are pointed out as an explanatory factor for the variation observed. Some protected areas include both forest and open areas. This results in the differences due to the application of alternative definitions of forest used in European countries, as does the level of detail of the delineation (e.g. satellite data vs. terrestrial surveys). The TFRA/FAO definition of forest provides a very straightforward but broad interpretation of forest (crown cover > 10%; 5m high), while country definitions are sometimes much more restrictive. Therefore, it should be very clearly stated what definition of forest is used in the reporting procedure, and country correspondents should inform the data-collector on the level of detail and methodology used in the calculations. However, almost all correspondents state differences in interpretation of the classification system as the main reason for the discrepancies observed. Indeed, minor differences in interpretation proved to produce major variation in results.

Ambiguity may arise from individual national forest definitions applying more strict standards than the TBFRA/FAO definition. TBFRA (UN-ECE/FAO, 2000) and MCPFE (2003) data were merged and processed by official institutions. Not all data stem from national forest inventories. The information on

the area is provided by official databases and NGO databases including GIS-Layers. According to the experts, reliability of data and reporting was not the main cause for inconveniences. Even when data are reliable, the definitions of the individual protected forest categories offer a certain scope for interpretation. The aim of COST Action E27 is to find out the reasons for differing interpretations and to elaborate proposals to narrow the scope of interpretation.

4.   Recommendations for clarifying Protected Forest Area (PFA) categories for reporting purposes

Based on the results of the questionnaire among the country delegates on the working group, the comparison of official statistics and best professional judgement, and on subsequent discussions within the Working Group 2 of COST Action E27, a number of recommendations to improve the quality and comparability of the statistics that are produced have been compiled.

The difficulties regarding interpretation exist mainly on two levels:
1.   The strictness of "legal basis" and definition of "forest"
2.   The strictness of "intervention" and "management restrictions"

The COST Action E27 has produced an extensive document pointing out sources of uncertainty in the existent reporting systems, and formulating concrete suggestions or clarifications that should help reduce the divergence in interpretation, thus leading to more harmonised and comparable datasets (see Vandekerkhove et al., chapter 3.4. in this report). However, as differences in interpretation are so apparent, it is still advisable to include an extensive harmonisation phase in the reporting process, as it is impossible to clear out all imaginable differences in interpretation.

4.1.   The IUCN Guidelines for Protected Area Management Categories

The IUCN Protected Area Management Categories were not specifically developed for the purpose of reporting statistics on Protected Forest Areas in Europe, but to assist governments and others in desi-

gnating protection areas for all existing ecosystems (both aquatic and terrestrial) on a global scale. Therefore, clarification and an interpretative guide are required if this system is to be used for statistical purposes at the European scale.

The COST Action E27 endorses a strict interpretation of the overriding definition, i.e. forests (and in the wider sense all Protected Areas) reported in IUCN-Categories should always have conservation and enhancement of biodiversity / natural values as the primary goal. This should be guaranteed through legally binding, long term commitments, linked to national nature conservation programmes.

Multifunctional forests should not be included in the reporting statistics, even if nature conservation is of equal importance to other functions over the whole area, or even the main function in parts of the area (e.g. key biotopes) as they do not comply with the over-arching definition of IUCN Protected Areas.

Areas set aside under specific certification programmes are not compatible with the over-arching definition set by IUCN (1994). Certification programmes are voluntary and can be revoked at any time. They do not require any long term commitment and therefore do not meet the overall requirement of "legal or other effective means".

The IUCN definition of a Protected Area looses some of its power and focus by including 'associated cultural resources', as this leaves it open to wide interpretation, resulting in the inclusion of all kinds of multi-functional and other site uses (be they traditional or otherwise).

The most important aspect to highlight is that it is quite unclear as to what should be included as 'legal or other effective means.' It follows that 'other means' need to be indefinite and stipulated in official documents (i.e. management plans, etc.). However, most management plans have a timeframe of 10-20 years, after which management practices and even management objectives may be altered or modified. Moreover, management plans are commonly considered to be 'supporting technical documents' that provide guidance to management though may not necessarily include clear and enforceable commitments. Management plans alone are not considered to provide sufficient 'legal basis' for inclusion, as they are only an implementation tool toward the conservation objective. Inclusion of management plans can only occur if they are associated with an explicit, legally binding designation.

In many countries conservation objectives are also encouraged through protective ownership, (e.g.

conservation trusts or state and local authorities), conservation management grant schemes, management plans for designated sites, etc. It should be clarified whether these should be included as 'legal or other effective means'.

A similar situation arises with forests where grant schemes and other state incentives that focus on conservation and enhancement of biodiversity are applicable, provided an agreed management plan is implemented. Although they can be very effective in addressing biodiversity management requirements, they are essentially voluntary in the sense that owners are often not compelled to carry out every action stated in the management plan if they decide not to. Therefore it would be useful for IUCN to produce a document that clearly defines the criteria that must be fulfilled in order to comply with 'legal or other effective means'.

In the IUCN system it is stated that 'the areas should be large enough to allow the ecosystem to fully develop' (IUCN, 1994). However, no guideline size criteria are provided as to the minimal area that should be considered. Potentially, every country may have its own interpretation of what this lower limit should be. This lower limit may not be absolute but dependent on local/ regional features or even site conditions. Moreover, in densely populated areas, where valuable natural sites comprise small fragmented relics, there is little choice as to what the size of a protected site should be. The absence of clear guidelines on 'minimum size criteria' for sites is reported to be a major cause of uncertainty on the inclusion of certain national protection categories.

When using the FAO definition of forest (FAO 1998, 2001, 2006) in combination with the IUCN definition of Protected area a strict and straightforward approach is recommended. The reported figures should be the simple intersect between boundaries of the officially Protected Area regimes, and the area of "forest" defined according to the FAO definition. The COST Action E27 rejects firmly the *a posteriori* exclusion or inclusion of certain forests based on qualitative criteria or specific local objectives. Even if a plantation is included in a Protected Area (i.e. as it fulfils the basic requirements of a Protected Area according to IUCN) it should consequently be reported in the statistics.

A detailed identification of issues requiring clarification and concrete recommendations to improve the use of specific IUCN Categories are compiled by Vandekerkhove et al. in chapter 3.4. in this publication.

4.2. The MCPFE Assessment Guidelines for Protected and Protective Forest and Other Wooded Land in Europe

The MCPFE Assessment Guidelines were generally better appreciated than IUCN Guidelines for reporting on PFAs, as it is better adapted to the European situation, and was specifically developed for reporting purposes.

The MCPFE classification system addressed - in a more precise and well-balanced way - the different protection regimes in the countries. For most correspondents, it was easier to assign the different national protection categories to the MCPFE Classes. Although very few countries reported data for all Classes, most Classes are represented in the majority of countries. Class "no active intervention" was most problematic; although many countries reported figures for this Class, it was clearly stated that, if interpreted in the strictest manner, this class does not occur anywhere in Europe.

Explicit designation in the context of the MCPFE Assessment Guidelines (MCPFE 2003a) comprises both designations defining forest and other wooded land within fixed geographical boundaries delineating a specific area as well as designations defining forest and other wooded land not within fixed geographical boundaries, but as specific forest types or vertical and horizontal zones in the landscape. This 'zonal delineation' was only relevant to a few countries and depended very much on how it was interpreted. For these countries however, they are considered a very valuable tool to report specific PFAs.

4.2.1. Clarification on General Principles

By assessment of protected/protective areas according to the management objectives all the three general principles agreed in the Annex 2 to Vienna Resolution 4 (legal basis, long term commitment, explicit designation; MCPFE, 2003a) need to be fulfilled simultaneously.

All protected/protective areas must have an official and permanent status of protection: governmental (Federal, State or EU-level) decision by nature conservation act, law or statute, forest act, law or statute or official written contract between state authorities and forest owner. The single protected area (name) or group of areas (protected habitats) should be mentioned in the national/regional legal documents. Other means for protection are to be considered as voluntary contributions for protection.

Legal basis automatically creates long term commitment status as an "ad infinitum" approach. By contract with management commitments the time period is 20 years at minimum in order to be included into the category of official protected/protective areas. Forest management plans are necessary as the maintenance guidelines for protected areas, but they are flexible in their applications and have normally a shorter time span than 20 years in order to achieve long term commitment. Forest management plans are considered to be technical documents. If management plans are used as a basis for classification and delineation of a protected forest area, they must include a clear statement and connection to the long term legal basis of the protection regime.

The prerequisite for inclusion of the area into the designation type with fixed geographical boundaries is the clear delineating made on map. For the designation type without fixed geographical boundaries the prerequisite for inclusion is a strict interpretation as for type with fixed boundaries, which means clear descriptive definition of the vertical or horizontal zones in the landscape.

4.2.2. Additional general remarks

1. The same definitions and terms for forest and other wooded land as used by MCPFE-UNECE/FAO data collection guidelines for national reporting should be used for reporting on the MCPFE classes for protected/protective areas (see Report on the State of Forests and Sustainable Forest Management in Europe 2007. Terms and Definitions for the Enquiry on MCPFE Indicators fro SFM, 10 October 2005. MCPFE-UNECE/FAO Data Collection, http://www.fao.org/forestry/fra2005-terms/eng, and http://www.mcpfe.org). If national definition for forest or various scales are used this deviation from international definitions must be described and illustrated.

2. MCPFE classification is focused on the assessment of management objectives and restrictions to interventions (strictness of management). The classification does not evaluate the management effectiveness or the biodiversity aspects/quality of protected/protective areas. This means that various forest types, characters or naturalness classes can be included in the MCPFE classes. For instance forests undisturbed by man, semi-natural or even plantation forests can be included in the same MCPFE class depending on

the country conditions. On that sense there are no value ranking between the classes MCPFE 1.1 to 1.3, these categories are complementary by evaluation on the amount of forests and other wooded land protected for biodiversity. The biodiversity aspects of forests including protected areas will be described by other biodiversity indicators of MCPFE reporting.

3. Voluntary contributions without legal basis must be reported separately. Those voluntary contributions can include for instance protected forest areas on private land without official statutes, special ecological network areas, short term contracts for biodiversity/groundwater protection, Natura 2000 areas not included into the national protected categories and networks with priority object for biodiversity, cultural objects within multifunctional forests, or biodiversity objects included in landscape ecological planning. Forest areas certified with various schemes should not be included in the reporting, while voluntary, marked driven forest certification as a technical tool is aimed for multifunctional forests. Protected areas included in certified areas can be reported through normal procedure as described in these guidelines.

4.2.3. Explanatory Note to Natura 2000

Natura 2000 is a very important European networking tool, aiming at conservation of habitats and species. Natura 2000 Network is created to ensure the preservation of biodiversity in the area of the European Union. A network of areas is being formed in the Member States according to the EU Habitats and Bird Directives (Habitat Directive 92/43/EEC and Birds Directive 79/409/EEC) with the aim of preserving the most important habitats, natural habitat types and species. Besides forests, the Natura 2000 network also includes other ecosystems, such as waters, fields and meadows, and Alpine areas.

Natura 2000 is not a classification system, and not exclusively focused on protected forest areas, while it also includes areas with multi-purpose use of forests and other ecosystems. Therefore Natura 2000 network is not included as such in MCPFE reporting on protected/protective forests and other wooded land. The legally binding and long term protected areas included in Natura 2000 networks will appear according to the normal assessment rules through these interpretation guidelines into the MCPFE classes. Selected and designated Natura 2000 sites can belong to the MCPFE class 1.1, 1.2, 1.3 or 2

according to the strictness of management. In some circumstances a Natura 2000 site can also locate in multipurpose forests.

In some of the EU countries Nature 2000 network is based mainly on the existing network of protected areas, supported with additional areas nominated especially for Natura 2000 purposes. This nomination can also be made besides nature conservation law on Federal or State level according to other laws such as water conservation law, law on land use restrictions, law on recreation or environmental protection with obligation to guarantee the maintenance of habitats. Any activities that weaken the status of the area in terms of the preservation of important natural habitat types or the habitat of certain species are prohibited. In some countries the Natura 2000 network only includes strictly protected areas, while in some other countries, also multi-purpose landscapes are included, and the continuation of practices like commercial forestry, farming, fishing or hunting is allowed, and sometimes even considered essential for the preservation of the site.

Natura 2000 sites (designated both on the basis of EU Habitat Directive or Birds Directive) are to be counted into the MCPFE classes if individual sites are also protected on the basis of national (Federal or State) legislation. The protection status must fulfil the General Principles of MCPFE classification as described in Annex 2 to Vienna Resolution 4. Because management activities in individual Natura 2000 sites reach from free development without any intervention to intensive restoration measures, the categorisation according to the specific classes must be decided for each individual site by the normal assessment procedure following these guidelines.

4.2.4. Definition of MCPFE Classes

A detailed identification of issues requiring clarification and concrete recommendations to improve the use of the specific MCPFE Categories are compiled by Vandekerkhove et al. in chapter 3.4. in this report.

4.3. Recommendations for the data collection and interpretation

On the basis of careful analyses of every single category of IUCN as well as MCPFE classes the COST Action E27 has produced a recommendation proposal for the development and interpretation purposes of PFA classes. The recommendation was send to IUCN Head quarters for further discussions.

Parallel the recommendation of MCPFE assessment results was sent to the Liaison Unit of MCPFE Warsaw. On that basis an Information Note of MCPFE assessment categories was developed by the Liaison Unit for TBFRA to be used by the TBFRA country correspondents for their data collection.

4.4.   The 'habitat quality' and 'management effectiveness' in Protected Forest Areas

Reliable and comparable statistics on the Protected Forest Area are essential as they represent an important quantitative indicator of the efforts on biodiversity conservation in forests. Two other important aspects should also be taken into consideration:
- the qualitative aspects of the PFA and their management
- the 'inclusive' approach on conservation of biodiversity, as an important aspect in multifunctional forestry

COST Action E27 stresses the need for additional but separate reporting on (a) habitat quality and (b) management effectiveness.

Only the distinct and separate assessment of all three aspects area statistics, habitat quality assessment (including aspects of networking and representativeness) and monitoring, and management effectiveness assessment will provide a complete image of the status of Protected Forest Areas.

However it is stressed that they are three distinct elements that are to be assessed separately: every attempt to combine them together will only lead to unsatisfactory, confusing and incomparable data.

5.   Forest biodiversity conservation within multifunctional forestry

Protected areas as such are only one indicator of biodiversity conservation strategies in Europe. In Europe probably more than in other parts of the world, two approaches are being used for the conservation of biodiversity in forests. A 'segregative' approach, with formally protected areas where the functions 'biodiversity conservation' or 'protective functions' are predominant, and on the other hand an 'integrative' approach, where these functions are integrated in a multifunctional, close to nature silviculture.

Both TBFRA and MCPFE- reporting procedures are restricted to areas that are formally designated as protected/protective areas and do not include other areas protected under statutes and mechanisms such as forest regulations, or multifunctional (commercial) management carried out under certain 'ecological' restrictions, or where incentives for conservation measures are given.

The assessment of the amount of forest that is exclusively or primarily managed for conservation of biodiversity is an important indicator of the 'performance' of countries on this specific indicator of forest biodiversity conservation and should therefore be reported as clearly as possible in the strict sense. At the same time, there is the need for a complementary assessment of the conservation status and ecological management standards that are included in everyday practice in forests outside legally designated protected and protective forests.

As these areas cover at least 80 % of the total forest area, these efforts are crucial to overall forest biodiversity (maybe even more important than the protected areas), and should therefore be also assessed through a clear set of criteria and indicators. The MCPFE indicators already contain some elements in this respect such as statistics on naturalness, tree species composition, landscape pattern, dead wood component, introduced tree species, genetic resources and threatened species. A further elaborated set of indicators covering all aspects of status and policy on forest biodiversity conservation within multifunctional forestry is required.

The COST Action E27 is convinced that the importance of the assessment of PFA as an indicator of the performance of countries on forest biodiversity conservation is very much related to the status/regime of "non protected" forest areas: the better conservation issues are covered in multifunctional, close-to-nature silviculture the less important and essential the protected areas are.

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COST Action E27

Identification of a Core Set of Key Terms for Protected Forest Areas – A Contribution to Cross Border Communication

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Abstract. Within the COST Action E 27 a terminological study was carried out on a common subject vocabulary for protected forest areas. In general the vocabulary on protected forests is a result of several disciplines including nature conservation, forestry and administration. Further cultural and language differences in the 25 participating countries add to the diversity and different meanings of terms and concepts.

This study targeted the identification of unclear and controversial concepts of protected forests areas. The investigation was based on national terminology hence English was chosen as the common denominator for interaction.

The COST Action E27 participants were surveyed a list of 413 different important key terms compiled. This list underwent a rigid screening process resulting in 71 main key terms, which were assigned to 11 concept fields. The analysis of the terms themselves followed terminological working methods.

A ranking of the terms was possible based on the importance given by the participants (forest, natural regeneration, forest ecosystem, forest biological diversity, protected forest area). Potential problematic terms included those having primarily regional importance as e.g. ancient woodland, hemeroby, old-growth forest.

With 18 languages and over 1.100 translations of the 71 English key terms this terminology study forms the basis for a multilingual glossary on protected forests. The results will allow a more detailed analysis of the concept system of protected forest areas for several languages and countries. The outcome can also be applied in technical glossaries and dictionaries.

Any views or opinions expressed in this document are those of the authors and not necessarily those of any official body within the signatory states.

Keywords: Terminology, protected forest areas, key terms, multilingual glossary, subject vocabulary

1.   Terminology is a prerequisite for communication

The area of responsibility of COST Action E 27 forms a thematic coincidence of nature conservation, forestry, administration and right. The participants represent a large variety of languages from 25 countries, which is typical of pan-European research activities. For example, the French language is spoken in France, Switzerland and in Belgium. Italian is the official language in Italy and Switzerland. The German language is national language in Germany, Switzerland and Austria. The United Kingdom and Ireland share the English language. Serbia and Montenegro, the FRY Macedonia and Slovenia were subject to a common state language for decades in a confederation.

The English language has become established as a commonly used language for communication since the 2nd World War. In the last few decades, English has developed as the main means of communication and publication in the world of science.

From this variety of languages a necessity arises for scientists to create a clear vocabulary for communication at international level. Clearly defined concepts

are the basis for transparent language communication, either in written or verbal form. This is of particular importance as the number of languages in the process of communication increases.

Understanding a text depends on the availability of concept structures. A concept is a unit of knowledge created by a unique combination of characteristics. Concepts are not bound to particular languages (ISO 1087-1, Terminology Work – Vocabulary – Part1, quoted in: Arntz, Picht, Mayer 2004, p. 44). Concepts influence the perception of the environment. We see the world only in the concepts which we have been exposed to and made available to us. Clear, understandable and generic concepts are therefore necessary for the intellectual processing of reality and for the further development of the scientific methodology of a subject field.

As the European Union is expanding so too does the number of new languages. Currently there are 20 official languages in the European Union. Today, institutions involved in the conservation of forests including its personnel are interconnected to a much larger extent than in the past. The enforcement of directives and regulations by the EU has contributed fundamentally to increase cooperation between institutions with different expertise and tasks at various levels (local, regional, national and pan-European). Consequently the cooperation between Member States has become more interlinked.

At the same time, the rapid and progressive development of the information technology sector has made the access to digital information, including data and publications, much easier. Much of the published information is made available in English, the commonly agreed language of science. For smaller speech communities and languages spoken only by a very limited number, the transfer of knowledge to others critically depends on a commonly used means of communication. Otherwise their scientific results would not find access to a larger potential user group.

2.   The necessity of common concepts

Since the Earth Summit held in Rio de Janeiro 1992 biological diversity and the protection of forests are a central topic within international processes and international organisations. However, most of the international processes, conventions and agencies have developed their own definitions of concepts

related to forests and formulated aims according to their particular mandate.

In the case of COST Action E27, the most member countries have, for example, a common supranational subject vocabulary on protected forest areas with terms in their own language. These concepts can be defined by different conceptual characteristics. The use of commonly accepted concepts asks for harmonization of their meaning while taking into consideration national characteristics and differences. A cooperation in terminological questions should not mean to abandon national concepts in favour of international concepts. A harmonization of the vocabulary should aim to achieve cross country understanding when dealing with a certain topic or concept. It does not imply standardization or centralization:

„In this context, harmonization – unlike standardization – is meant to facilitate comparisons between definitions of related terms. It collects existing definitions, establishes linkages, identifies common elements, differences, incompatibilities and inconsistencies, as well as qualitative and, if possible, quantitative relationships. Harmonization may result in recommendations for modifications to one or several definitions which make them more compatible, consistent or even congruent." (Prüller, 2005)

3.   The question of a common vocabulary

Soon after the beginning of COST Action E27 the members were confronted with the question of unclear and controversial terms. It was agreed at the Working Group 1 Task Force meeting in Vienna, Austria in March 2003 to initiate work on key terms and concepts. The topic of Key Terms was advocated at the Pruhonice meeting in February 2004 in the Czech Republic, where the need for a very simple list of key terms from each country participating in COST Action E27 was identified. These should include the essential terms or short phrases that are used in the context of protected forest areas.

3.1.   The COST Action E27 subject vocabulary as a keyword list

There are different methods of dealing with the vocabulary of a particular subject field. Selective translations of single words are the simplest form. The

meaning of a single term in a foreign language is investigated. Related terms may be taken into consideration when working with the term(s) in question without the intention of striving towards a complete list of terms in the concept field. Such technical term collections will arise when collecting and organizing technical terms. Concepts outside the investigated subject area may be included in the collection, with the background of covering as much related vocabulary as possible.

As a result of the key term initiative, 22 member countries produced a list of more than 640 different keywords related to protected forest areas based on their importance from a national perspective. These country lists were uncommented and consisted mostly of the national terms and their English translation of important concepts or phrases related to protected forest areas. Figure 1 represents the number of keywords provided by each individual country. The terms and concept phrases have been elaborated by the COST Action E27 participants and are not based on a survey conducted in the participating countries. This implies a partly subjective viewpoint. However, it is worth noting that experts on the topic of protected forests have been involved in their elaboration. Furthermore, the result should not be seen as final since key term lists may always be subject to expansion and precision.

Since no broader requirements on the keyword lists had been made, except that they should contain "essential words or short phrases", the collected list of 647 key terms comprised both double quotations of the same term and descriptions of one and the same term with different names. Different terms with comparable but not identical meaning, and terms in a different notation were merged under a uniformed English term. So for example near-natural, near to nature, close to nature, closeness to nature, proximity to nature, quasi-natural, semi-natural formed the group of "close to nature" as a uniformed key concept. Through this approach the number of terms and phrases was reduced to 413.

From a technical perspective, terms can be grouped into different categories. They can describe objects (reserve, forest), processes (regeneration, spontaneous process), conditions (forested, natural) or parameters (attractiveness, connectivity, ecological balance). In order to produce more suitable material for further analysis, the terms were initially designated to 30 categories. Such a categorisation was implemented as a first step for the national key term lists being part of the initial cleaning process (Figure 2). A follow-up activity to further concretise the key word lists was the elaboration of a questionnaire and is described in more detail under chapter 3.2.

3.2.   A multilingual glossary for protected forest areas

A subject field or a branch of such a subject field can be divided up into smaller units based on differences in understanding and viewpoints arising from a particular subject. Accordingly the identified concepts are assigned to these units. The concepts are translated in a foreign language and provided with additional information (e.g. source of the term). This method is not fully compliant with specific processing procedures of
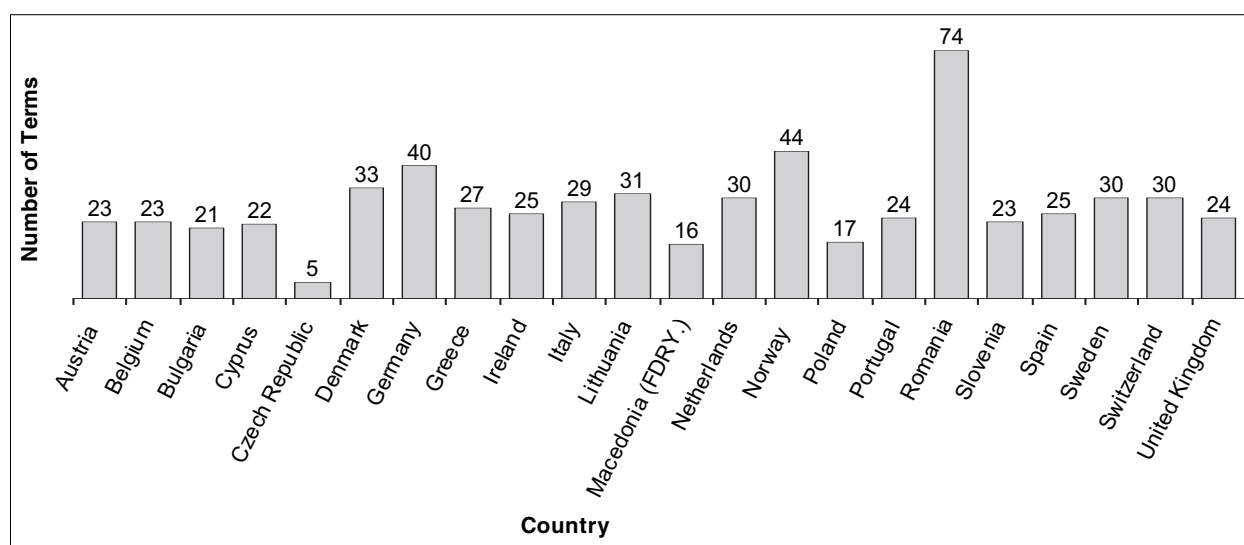

Figure 1:
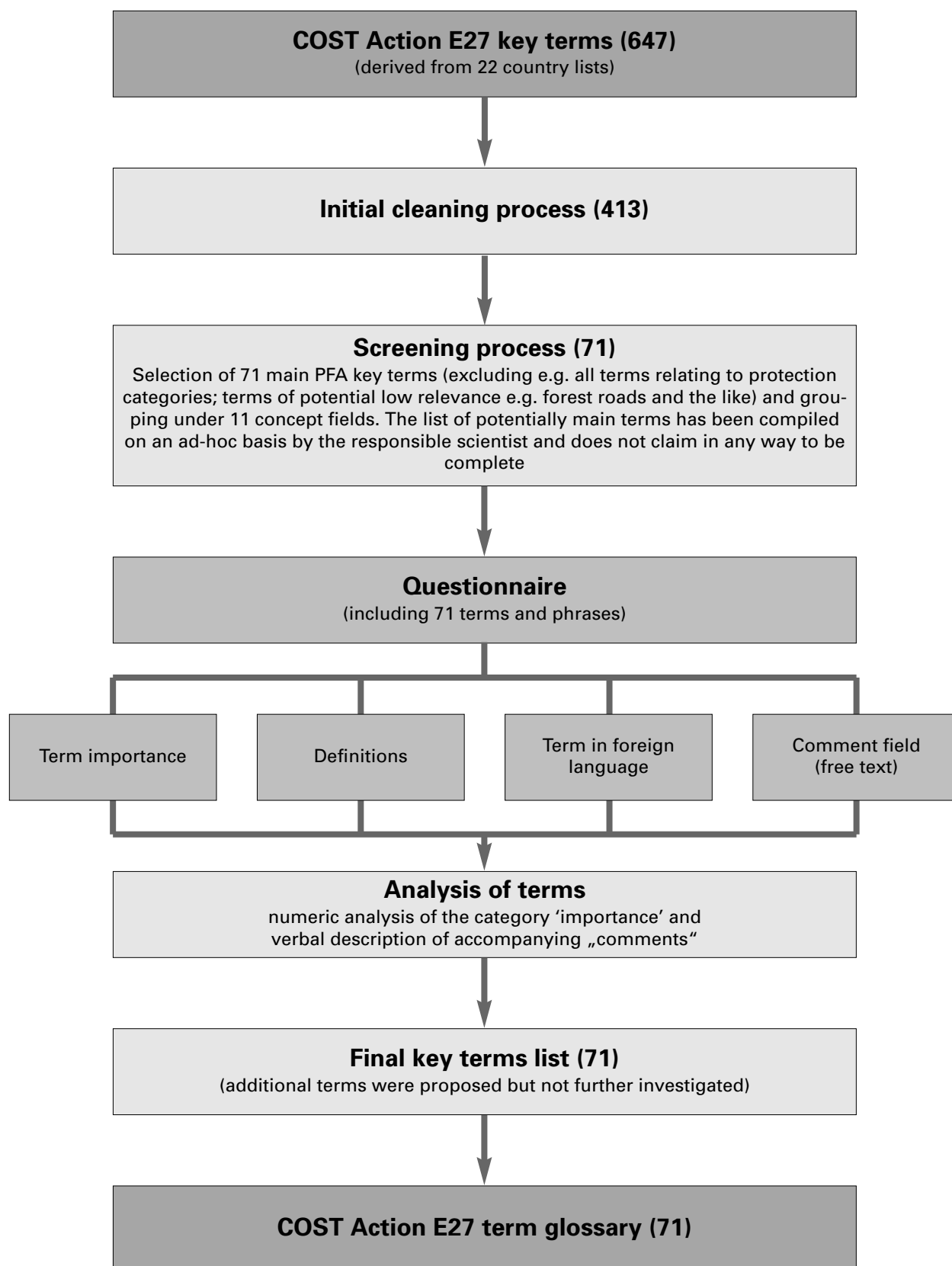*Number of key terms submitted by responding countries.*

Figure 2:
Steps of deriving key terms and establishing the COST Action E27 term glossary.

a subject area according to a systematic acquirement of terminologies (obtaining and analysis of documentation material, acquirement of concept systems). The completeness of all concepts of a subject area and the correctness of the relations between the concepts was not the target. The aim of our activity was the development of a COST Action E27 glossary.

As the country key terms were provided in both national and English language they actually have the character of a multilingual glossary. For building such a glossary the required information will need to be organised along concepts. This was considered while elaborating a questionnaire to the country experts.

Each of the concept fields contains an unstructured set of thematically related concepts, e.g. the key terms even-aged and uneven-aged were categorised to the concept field 'structural characteristics'. Natural regeneration was assigned to the concept field 'forest change processes'. This screening process

Sources of definitions used and attainable through the Internet:
European Commission, Development: Glossary of Terms: http://europa.eu.int/comm/development/body/publications/forests/en/en4_6.htm
European Environment Information and Observation Network (EIONET)   http://www.eionet.eu.int/gemet/concept?cp=835
European Forest Institute: Glossary of international terms of natural forests and natural forest research.   http://www.efi.fi/Database_Gateway/FRRN/howto/glossary.html
IUCN Species Survival Commission: IUCN Red List Categories and Criteria   http://www.iucnredlist.org/info/categories_criteria.html
IUCN Species Survival Commission: IUCN Guidelines for the Prevention of Biodiversity Loss caused by Alien Invasive Species. Gland: IUCN, 2000
FAO Forestry Department: Global Forest Resources Assessment. Update 2005. Terms and definitions. (Final version). Rome: FAO, 2004   http://www.fao.org/forestry/foris/webview/forestry2/index.jsp?siteId=4261&sitetreeId=13629&langId=1&geoId=0
4th Ministerial Conference on the Protection of Forests in Europe MCPFE   http://www.mcpfe.org/resolutions/vienna   http://www.iucn.org/themes/ssc/pubs/policy/invasivesEng.htm
IUFRO SilvaTerm Database   http://www.iufro.org/science/special/silvavoc/silvaterm-database/
Montréal Process (Ed): Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests. Montréal Process Liaison Office, 1999, 2nd Edition   http://www.mpci.org/rep-pub/1999/ci_e.html

Concept field: structural characteristics age composition			
		Term in your language:	**Importance:**
Term:	**even-aged**		
Definition:	Stand of trees in which there are only small differences in age among the individual trees. Such stands may occur naturally (after forest fires, storm, etc.) or artificially (after human evolvement).		
Source:	Schuck, Andreas; Päivinen, Risto; Hytönen, Tuomo; Pajari, Brita: Compilation of Forestry Terms and Definitions. European Forest Institute Internal Report No. 6. Joensuu: EFI, 2002		
URL:	http://www.efi.fi/publications/Internal_Reports/		
Comments	Examples of answers could include but are not limited to e.g. a) there is a divergent meaning of the key term in your language b) the term is important but needs clarification at national/international level c) the key term is not used in your country d) add a forgotten key term		
		Term in your language:	**Importance:**
Term:	**uneven-aged**		
Definition:	A stand in which trees of all or almost all age classes from seedlings to mature trees are represented.		
Source:	Schuck, Andreas; Päivinen, Risto; Hytönen, Tuomo; Pajari, Brita: Compilation of Forestry Terms and Definitions. European Forest Institute Internal Report No. 6. Joensuu: EFI, 2002		
URL:	http://www.efi.fi/publications/Internal_Reports/		
Comments:			
Importance: 1= highly important, 2 = important, 3 = of some importance (average), 4 = low importance, 5 = unimportant.			

Figure 3:
Structure of the key terms questionnaire.

resulted in 11 concept fields and 71 key terms (Appendix 1). These 71 key terms had the characteristics of being either single words like 'forest', multiple words such as 'ancient woodland' or phrases, e.g. 'protection of landscapes and specific natural elements'. All key terms were provided with definitions. The definitions refer, if possible, to the original sources of international organisations or processes. All terms provided which related to protection categories were omitted from further investigation as those have been dealt with under the establishment of a protection categories database with emphasis on forests.

The questionnaire also included an appraisal of the importance that individual terms have in the daily work on protected forest areas at country level. For this subjective assessment, implemented by country experts in the field of protected forests, the following ranking list was applied:

1= highly important; 2 = important; 3 = of some importance (average); 4 = low importance; 5 = unimportant.

Further the country experts were asked to use the comment section to respond to issues but were not limited to, such as:

a) divergent meaning of a key term in native language as compared to English

b) a term is important but needs clarification at national/international level

c) a term is not used in a country

d) list an important term not in the current list

The structure of the questionnaire fulfils the IUFRO minimum standard for terminological information (Kaennel Dobbertin, Prüller, 2001). The terminological entry consists of a number of terminological data about the concept and its term, e.g. a definition with reference for a term; the term is given in national language, the possibility to add a synonym. Therefore the questionnaire set the basis for applying methods of terminology development.

In response to the questionnaire replies were received from 22 out of the 25 member countries. They were namely Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Finland, France, Germany,
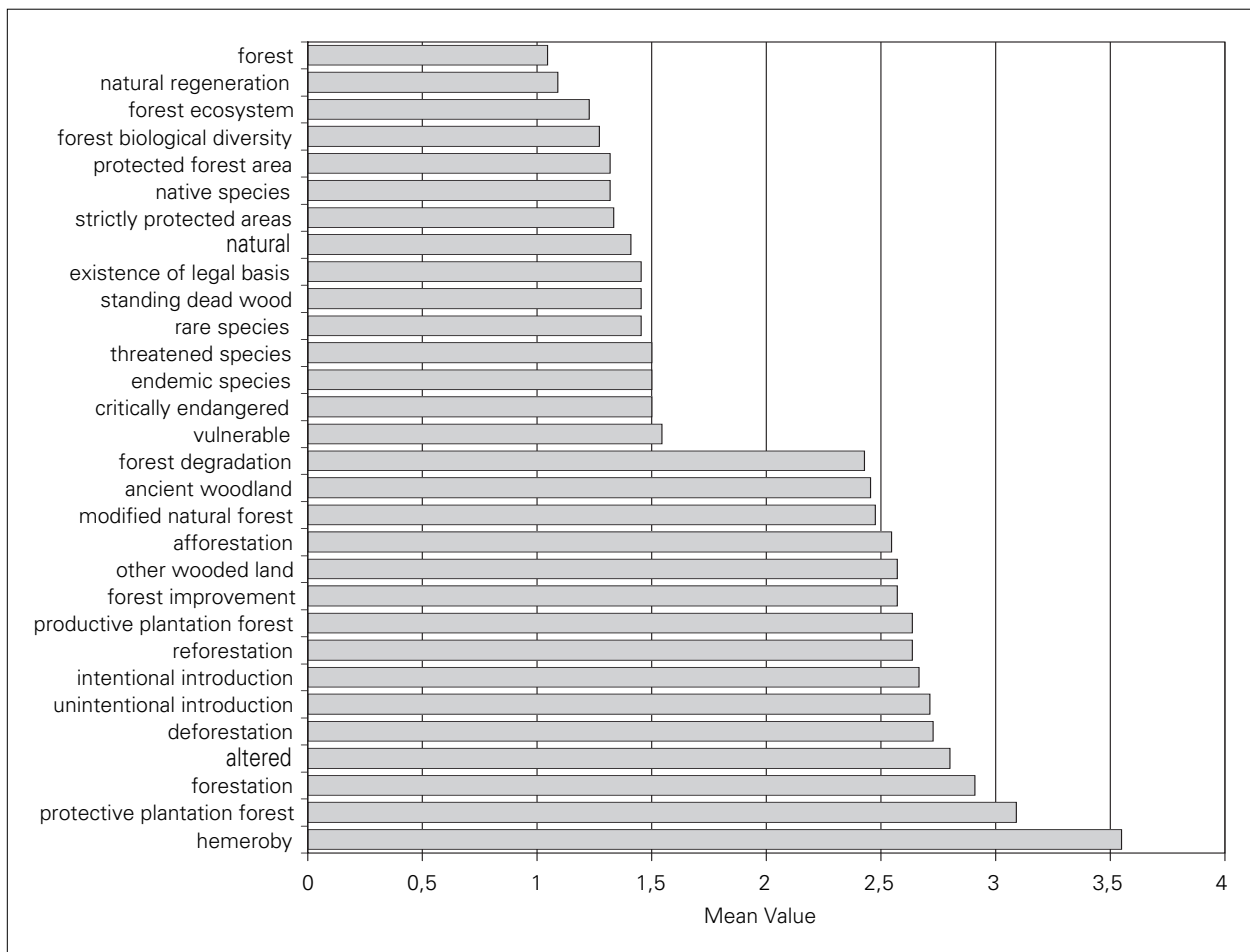

Figure 4:
The 15 most important and unimportant terms as resulting from the questionnaire.

Greece, Italy, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Serbia & Montenegro, Sweden, Switzerland, Spain, United Kingdom.

1.512 translations into national languages were received for the 71 terms included in the questionnaire. Values were indicated for the "relevance" more than 1.530 times. The comment field yielded 425 entries.

3.3. Results from the questionnaire

3.3.1. Ranking of highly important terms

The terms with the highest scores reached a mean value near 1 meaning 'highly important' (Figure 4; see Appendix 2 for full list of all 71 ranked terms). These are concepts, which reflect a positive attitude of the experts to protection and preservation of forests (e.g. forest, regeneration, ecosystem). The concepts with the lowest value for importance reached a value of 3 being 'of some importance (average)'. These are concepts which deal with human induced changes to forests (e.g. plantation forest, altered, deforestation). None of

the 71 terms was regarded as 'unimportant'. Terms, which have shown to have a more regional meaning, were also classified as of low importance. Some examples are ancient woodland (United Kingdom), hemeroby (Austria, Germany) or old-growth forest (USA).

3.3.2. Identification of problem terms

In quite a number of cases highly divergent scoring was given to terms ranking between very important (1) and unimportant (5). This difference hints towards (a) its actual importance/unimportance but (b) also to differences in meaning and understanding from one country to another. Such a result is noteworthy with a view to creating a common terminology in this case in the English language. This should therefore be given priority in clarification. Contrary scoring (e.g. "1", "5", "1", "5" etc.) increases the variance and consequently the standard deviation. Once more terms of regional importance move into the spotlight and appear as potential 'problem terms' (Figure 5). Examples are as mentioned earlier ancient woodland, hemeroby, old-growth forest. Reasons for
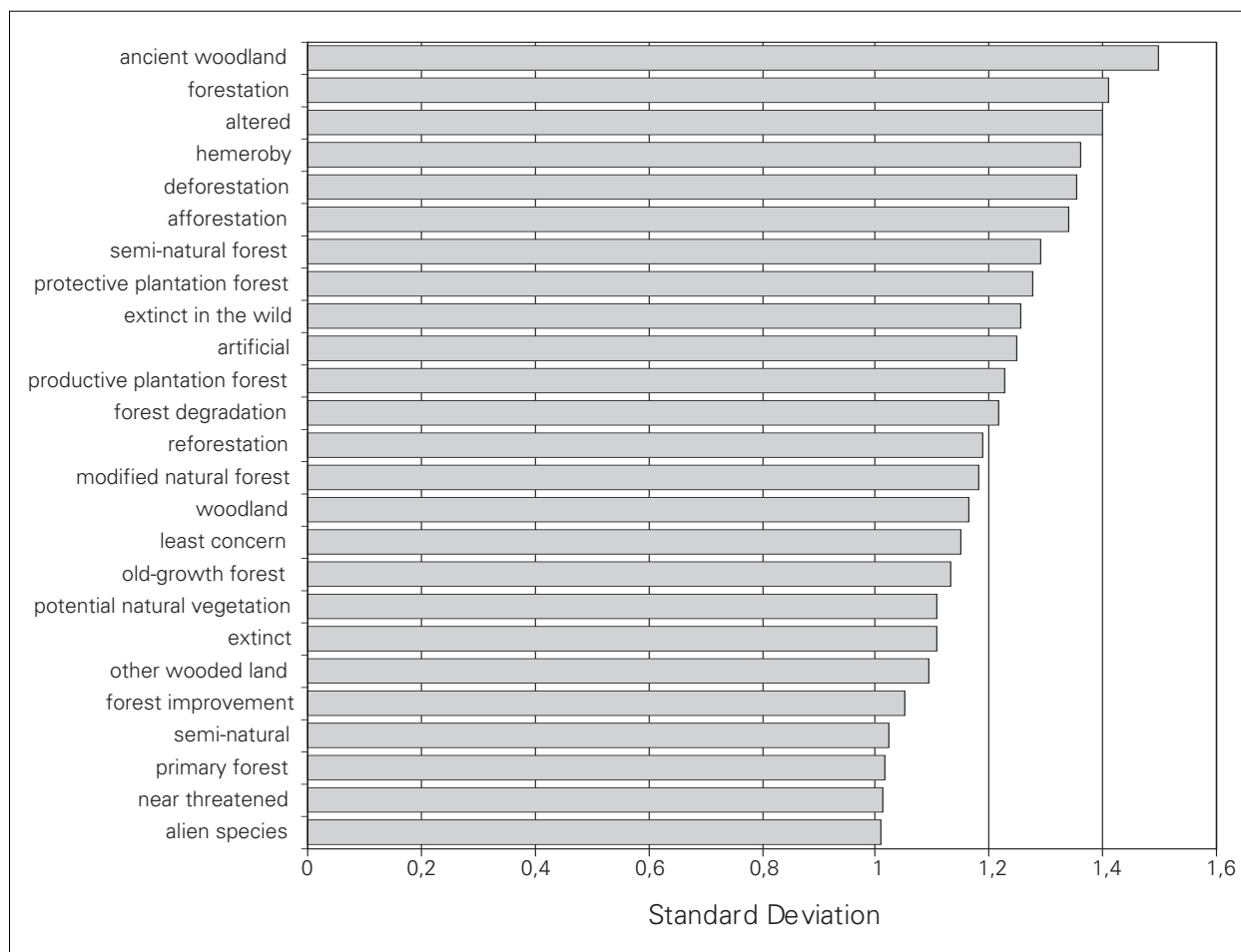

Figure 5:
Identification of potential problem terms as resulting from the questionnaire.

divergent scoring may find their origin in differing initial situations with regards to legislation, history and scientific/practical approaches in different countries but also due to different scales (regional, national and international).

3.3.3. Summary of the questionnaire section "comments"

In the questionnaire, verbal details were possible in unstructured form under the section 'Comments'. The entries can be subdivided into the following groups:

a) Terms were mentioned as missing and suggested for the admission to the questionnaire:
    biotope, habitat, biotope hazard, forest habitat mapping, biotope network, natural forest community, historical silvicultural systems, natural forest, diversity, rarity, representativity, system of protected areas.

b) Concepts subject to discussion:
    Some of the terms listed under concepts were regarded as too artificial and should be considered whether they are kept on the list. Examples are: key factors for biodiversity, natural expansion, all introduction terms (i.e. introduction, intentional introduction, unintentional introduction, re-introduction) and forest improvement.

c) Examples of the country specific use of a word are suitable in a 'linguistic context' within a multilingual glossary:
    Woodland: Woodland in the United Kingdom usually refers to remnant fragments of semi-natural forest vegetation. The Spanish term for woodland "monte" also includes shrub lands.
    Protective forest: The most important function of protective forest in Norway is a band of forest just below the timberline, which has protection status against cuttings and other detrimental human interventions. In Sweden protective forest is found mainly along the coastline in the south-eastern parts protecting sand-dunes. The term "Schutzwald" (protective forest) in Switzerland is only used for forest protecting people or important infrastructure from natural hazards (watersheds, catchments areas etc. are not included).
    Old-growth: Old growth in the usual sense rarely occurs in the United Kingdom, however it is increasingly used to describe very old trees of high associated biodiversity value in wood pasture or parkland situations.
    Mixed stand: Mixed forest is used in the United Kingdom as mixtures of native and non-native trees.

Annotations used in the comments section that repeatedly occurred in the country replies were (a) not in use, (b) does not exist, (c) no translation, (d) definition not clear, (e) needs clarification at national level. (Table 1).

Table 1:
Annotations from the comments section of the questionnaire.

Annotations	Examples
'Not in use', 'does not exist', 'no translation'	Woodland (Finland, Netherlands); other wooded land (Poland, Norway); ancient woodland (Norway, Sweden); primary forest (United Kingdom); modified natural forest (Belgium, United Kingdom); protective plantation forest (Belgium, Switzerland); old growth (Belgium); hemeroby (Bulgaria, Denmark, Finland, Lithuania, Norway, Portugal, Romania, Spain)
'Definition not clear'	Forest types for biodiversity assessment (Netherlands, Norway)
'Needs clarification at national level'	Semi-natural forest (Switzerland) Productive plantation forest (Lithuania) Forest improvement, forest degradation (Finland)

This exercise has shown that there is divergent use of some terms between the countries. These differences in the use of concepts between countries cannot be solved in the context of the COST Action E27. A first step is to make such differences visible within a glossary. A COST Action E27 glossary could form the basis for comparative studies in the various member countries and set the ground for further/future terminological assessments. In such a process it should be guaranteed that there is a clear linkage to terminology and definitions as they are available from the Forest Resources Assessment activities of the Food and Agriculture Organization, in particular when investigating national terminology and their application to the international level (FRA, 2005).

4.   Conclusions

The outcomes of the key term exercise have shown that for the subject field "protected forest" there is a potential for a common European vocabulary although some terms may be interpreted differently between countries or are not in use at national level. One major result has been the elaboration of a multilingual glossary with 71 English and more than 1.400 terms in 18 national languages. However, a glossary

does not yet represent systematic processing of the concept system of a technical language. The subject field "protected forest" was not to this point explored terminologically. Preceding the terminological work on systematically exploring a subject field for several countries and languages, there is a set of basic questions to take into account:

- What is the target of the work? For experts and administrations there is a need for clarification of concepts and definitional issues.
- Who is the target group? They may be e.g. participants of COST Action E27, experts in related fields, policy makers and the public.
- The delimitation of the subject area and its border to neighbouring/related subject areas. This is an important question as the subject field "protected forests" touches several other subject fields e.g. forestry in general, nature protection, ecology, biological diversity but also administrative fields.
- The options of publishing the results. This can be done e.g. as a printed dictionary, a glossary or a terminological database.
- A multilingual terminology is dependent on the cooperation with experts. The respective language must be the mother tongue of the author. Experts will know the technical literature and can define concepts of their subject field.

Following up on the last bullet above a technical language is a medium for professional communication. The vocabulary on a subject field in a country is determined by technical texts (periodicals, monographs, unpublished writings). Technical texts consist of a special technical terminology and show certain language and stylistic features. Also such a vocabulary is of temporary nature as it is subject to continuous further development as science progresses. The function and structure of a generic technical language needs to include commonalities and differences based on technical languages at a national level. Only then will a vocabulary reach a level of applicability once a constant stream of input from technical texts can be guaranteed both at a national and international level.

A number of issues worth addressing at country level dealing with technical languages may be:

- The share of technical terms in the words of the standard language
- The frequency of the technical terms in a text
- The share of the non-language based means of communication (pictures, graphics, formulae)
- Who are the mediators of the communication? Are they scientists, civil servants, practitioners?

Such investigations were not in the aims of the COST Action E27. The COST Action E27 literature database (http://www.efi.fi/projects/coste27/Databases.html) may offer a first entry point for obtaining an overview on scientific literature at the level of a country.

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Appendix 1:
The 11 concept fields and their 71 key terms

Structure of the Questionnaire:
Concept fields with key terms

1. **Definitions related to forest**
    forest, woodland, other wooded land, ancient woodland, productive forest, protective forest, protected forest area

2. **Forest characteristics**
    primary forest, modified natural forest, semi-natural forest, productive plantation forest, protective plantation forest, old-growth forest

3. **Naturalness**
    Natural, near-natural, semi-natural, altered, artificial, potential natural vegetation, hemeroby

4. **Forest change processes**
    natural regeneration, natural expansion, forestation, afforestation, deforestation, reforestation, forest improvement, forest degradation

5. **Forest biodiversity**
    forest ecosystem, forest biological diversity, forest types for biodiversity assessment, key factors of biodiversity, biogeographical regions

6. **Alien & native species**
    Introduction, intentional introduction, unintentional introduction, re-introduction, native species, alien species, alien invasive species, naturalized species

7. **Structural characteristics: species & age composition**
    pure stand or forest, mixed stand or forest, even-aged, uneven-aged

8. **Stand characteristics**
    standing live trees, standing dead wood, shrub layer, regeneration layer, lying dead wood, ground vegetation

9. **Protection regime**
    existence of legal basis, long-term commitment, explicit designation, forests left to free development, strictly protected areas

10. **MCPFE protection classes**
    no active intervention, minimum intervention, conservation through active management, protection of landscapes and specific natural elements, protective functions

11. **Red List categories for classifying species at high risk of global extinction**
    Extinct, extinct in the wild, critically endangered, endangered, vulnerable, near threatened, least concern, threatened species, rare species, endemic species

Appendix 2.
Ranking of importance of all key terms (71)
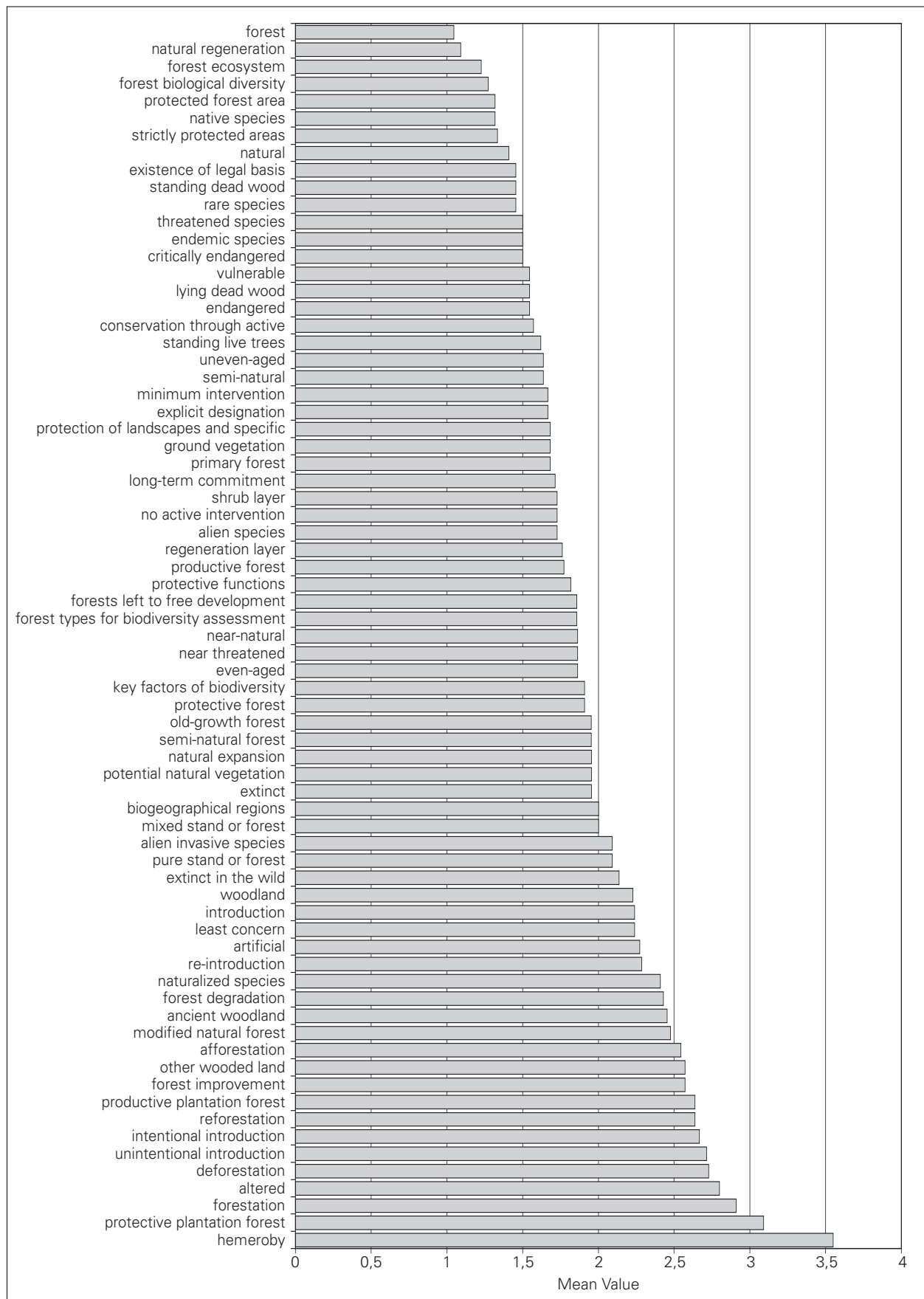
Mean Value

COST Action E27
Protected Forest Areas in Europe - Analysis and Harmonisation (PROFOR)
Results, Conclusions and Recommendations

Forest Definitions and Assessment of Protected Forest Areas – A COST Action E27 Investigation

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1.   Introduction

There are many ways to define a forest depending on the perspective of the user and the goal of the definition. There is a huge number of definitions, and correspondingly what is understood to be a forest. One common definition has been agreed in the Temporal and Boreal Forest Resources Assessment (TBFRA) system (FAO, 2004) (see Table 1). This does not necessarily mean that the same definition is used in national forest inventories or for other sources of information on protected forest areas (PFAs). Many problems are caused by the use of ambiguous, unclear definitions when analysing and interpreting the results of TBFRA. To ascertain and clarify the use of national definitions of forest, a questionnaire was distributed within the COST E27 countries with the aim of gathering detailed information about the use of forest definitions in the context of PFAs in Europe. The investigation does not deal with national or international definitions of protection regimes or categories, but focuses on the definition of forest itself when reporting to international organisations.

Table 1:
TBFRA – FAO definition on forest and other wooded land.

Definitions used for TBFRA ("Temporal and Boreal Forest Resources Assessment")

Forest:
Land with tree crown cover (or equivalent stocking level) of more than 10 percent and area of more than 0.5 ha. The trees should be able to reach a minimum height of 5 m at maturity in situ. May consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground; or of open forest formations with a continuous vegetation cover in which tree crown cover exceeds 10 percent. Young natural stands and all plantations established for forestry purposes which have yet to reach a crown density of 10 percent or tree height of 5 m are included under forest, as are areas normally forming part of the forest area which are temporarily un-stocked as a result of human intervention or natural causes but which are expected to revert to forest.

Includes: Forest nurseries and seed orchards that constitute an integral part of the forest; forest roads, cleared tracks, firebreaks and other small open areas within the forest; forest in national parks, nature reserves and other protected areas such as those of special environmental, scientific, historical, cultural or spiritual interest; windbreaks and shelterbelts of trees with an area of more than 0.5 ha and a width of more than 20 m. Rubberwood plantations and cork oak stands are included.

Other Wooden Land:
Land either with a tree crown cover (or equivalent stocking level) of 5-10 percent of trees able to reach a height of 5 m at maturity in situ; or a crown cover (or equivalent stocking level) of more than 10 percent of trees not able to reach a height of 5 m at maturity in situ (e.g. dwarf or stunted trees) and shrub or bush cover.
Excludes: Areas having the tree, shrub or bush cover specified above but of less than 0.5 ha and width of 20 m, which are classes under "other land": Land predominantly used for agricultural practices.

Source/Reference:
Forest Resources of Europe, CIS, North America, Australia, Japan and New Zealand. (Industrialised temperate/boreal countries). UN-ECE/FAO Contribution to the Global Forest Resources Assessment 2000. Geneva Timber and Forest Study Papers, No. 17. Main Report. United Nations, New York and Geneva, 2000. 445p

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2.   Questionnaires

The following questionnaire was distributed among the 23 country delegates of Working Group 2 who were asked to report back by 15 April 2004. It must be stated at the outset that any views or opinions expressed by the delegates are not necessarily those of any official body or national authority within the signatory states.

Three groups of questions were responded to covering:
1. The existence and elements of a national legal definition of "forest" and "other wooded land"
2. The use of either TBFRA definitions and/or national definitions when reporting to TBFRA, MCPFE and EEA and the consequences of same
3. The distinction/demarcation of forests and other wooded land from other land categories inside Protected Areas and the tools and methods used to differentiate forests from other wooded land, or other vegetation types

Table 2:
Questionnaire on definitions of forests used of in the reporting of PFAs of Europe

	Country:
	Person responsible:
	Institute:
1.	**National definitions**
1.1a	Legal definition of "forest" used in your country
1.1b	Source/Reference
1.2	What are the main criteria to make a distinction between forests and other wooded land or other vegetation categories? Please indicate if the criteria listed below are used in your national definition. Yes or no? Please indicate also limits or threshold values.
1.2°	Tree crown cover in % (limit)
1.2b	Minimum height of trees at maturity in m (limit)
1.2c	Minimum area in ha (limit)
1.2d	Other criteria
1.2e	What are the main problems to distinguish "forest" from "other wooded land" or other land- or vegetation types
1.3a	What do you understand by "other wooded land" in your country?
1.3b	What are the criteria used to make a distinction between forests and other wooded land. Please indicate also the relevant threshold values or limits
1.4a	Is there a definition of "protected forest" or "protected forest area" existing in your national laws? Please indicate the definition
1.4b	Source
2.	**Use of TBFRA definitions**
2.1	Did you use TBFRA definitions of forests and other wooded land when reporting on PFAs to TBFRA? Or did you use the national definitions?
2.2	Did you use TBFRA definitions of forests and other wooded land when reporting on PFAs to MCPFE? Or did you use the national definitions?
2.3	Did you use TBFRA definitions of forests and other wooded land when reporting on PFAs to EEA? Or did you use the national definitions?
2.4	What are the consequences of using national definitions instead of TBFRA definitions? How are the results influenced?
3.	**Survey of area of forests and other wooded land inside of protected areas**
3.1	How is the proportion of protected areas measured that are partly covered by forests or other wooded land? How is the area of forests or other wooded land distinguished from other land- or vegetation categories inside of protected areas?
3.2	Tools and methods to differentiate forests from other wooded land or other vegetation types
3.2a	Areal photographs
3.2b	Land register, „Kataster"
3.2c	Forest inventory data
3.2d	Other methods

3.   Replies of COST E27 Working Group 2 Delegates

A total of 17 replies from 23 countries' WG2 members received by March 2004 were subsequently analysed. The response from 17 of the 23 countries consulted can be partly explained by the fact that at that juncture of the action some countries had not joined whilst others had only recently joined.

Table 3:
Replies from countries on national definition's of forest.

Question No	1.1.	1.2a	1.2b	1.2c	1.2d	1.2d
Country	definition in legal instrument	Tree crown cover in %	Minimum hight of trees at maturity	Minimum area in ha	Other criteria - Minimum widths	Other criteria
Austria	yes	not explicit limited	no	0.1	10 m	appearance of forest tree species, which are listed in an appendix to the forest act
Bulgaria	yes	no	no	0.1		
Cyprus	not defined	use of TBFRA	use of TBFRA	use of TBFRA		
Czech Republik	yes	no	no	no		
Denmark	yes	10%	5 m	0.5	20 m	
Finland	yes	no	no	0.25 (South Fin) - 0.5 (North Fin)		Sparsely stocked or treeless areas with potential mean annual increment less 0.1 m^3/ha are classified as unproductive land
France	does not exist	Forest, woods and poplar plantations > 10 % (IFN and Teruti)	no	0.05 ha for IFN, 0.5 ha for Teruti		limitated list of forest trees (not cultivated in orchards for edible fruits for example), canopy breadth > 15 m
Germany	yes *	no	no	no		areas related to forest management included, solitary trees, isolated tree groups in open landscapes or cities, rows of trees excluded. The federal states are allowed to include or exclude areas from the forest assignation within the frame law of the fede
Greece	yes	25%	no	0,3		qualifying criteria exist
Ireland	no **	20%	5 m	0.1	20 m	
Italy	yes ***	20 % (1st NFI), 10 % (new NFI)	no (1th NFI), 5 m (new NFI)	0.2 ha (1st NFI), 0.5 ha (new NFI)	20 m	
Lithuania	yes		5 m	0.1		
Norway	yes	no	5m	0.1	no exact limit ***	distinction between Productive forest (yield capacity > 1 m^3/a/ha) and Non-productive forest (yield capacity 0.1 - 1 m^3/a/ha)
Portugal	yes	10%	5m	0.5	20 m	
Slovenia	yes	75% *****		0.05		Overgrown agricultural land (pioneer forests) which is at least 20 years out agricultural use; area of dwarf pine and other shrubby forests, mainly in the area of alpine timberling is categorized as a forest
Sweden	yes	10%	5	0.5		Land suitable for wood production and not primarily used for other purposes. Potential yield under ideal management conditions at least 1 m^3 stem volume over bark from stump to tip / ha / a

Germany: * Federal Forest Law
Ireland: ** Forestry Act of 1946 under review
Italy: *** The new NFI uses the (FAO) TBFRA 2000 definition
Norway: **** Width of forest is considered in case of tree-covered strips along roads, rivers, etc. No exact limit.
Slovenia: ***** According to the regulations (1998) forest tree cover or forest plant cover should be at least 75 %

Table 4:
Replies from participating countries on the national definition and use of "other wooded land".

Country	National definition of other wooded land OWL
Austria	Other wooded land is mainly determined by the occurrence of vegetation types associated with dwarf pine and shrubs, which are usually unsuitable for commercial forestry, e.g. Pinus mugo and Alnus viridis
Bulgaria	National definition of "other wooded land" is missing in Bulgarian forest law (29.12.1997) because such types of vegetation have no economic value for national forestry. No separate term is available for those areas, and are described in NFI data under "forests"
Cyprus	Use of criteria and definition of TBFRA
Czech Republic	Distinction follows the Kataster-type "forest" and "non-productive land"
Denmark	Applies the TBFRA definitions. In practice other wooded land includes shrub land, heath land with scattered trees, thickets, bio-energy plantations. Shelterbelts less than 20 m wide and fruit orchards are NOT included as other wooded land or forest. Distinction follows crown cover and height at maturity in situ.
Finland	Approximately 30 % of the poor productive land (national definition) is OWL according to the FAO definition. A small fraction of the unproductive land (nat. def.) is OWL according to the FAO definition. Therefore, the sparsely stocked part of unproductive land is regarded as OWL. Distinction criteria: Potential mean annual increment > 0.1 m3/ha/a
France	Heathlands, Mediterranean maquis and garrigues. Distinction of OWL: Tree cover of ligneous or semi-ligneous species (as ferns, heather, broom, gorse …) < 10 % and > 25 %
Germany	The term OWL is not used in Germany. Distinction between forests and other wooded land using the manual for the interpretation of aerial photographs.
Greece	Forest land canopy of forest vegetation < 25 %
Ireland	Areas > 0.1 ha supporting trees, strips of trees < 20 m in width, canopy cover < 20 %, < 5 m in height
Italy	1st NFI: bush-land, riparian woods, dwarf stands. The new NFI has adopted the FAO definition: 5-10 % minimum cover of trees able to reach 5 m at maturity or minimum 10 % of trees not able to reach 5 m or of bushes or shrubs.
Lithuania	Roads, ditches, technological and firebreak lines, timber yards and other forestry facilities, game supplemental feeding places, land for forest planting and regeneration
Norway	The category "Other wooded land" as such does not exist in national classification system. It partly corresponds to the national category "non-productive forest", and partly to other categories.
Portugal	OWL are bush vegetation (mainly Quercus coccifera and Arbutus unedo). OWL has 10 % cover, minimum area of 0.5 ha and 20 m width and species do not reach 5 m height at maturity; included in a species list. There are no problems in distinguishing forests from OWL. Problems exist between OWL and the shrub category.
Slovenia	Individual forest trees, groups of forest trees up to 0.5 ha, non-autochthonous riverine and wind-belt trees, avenues, parks, plantations of forest trees, pens for rearing game, and pastures overgrown with forest trees if used for pasturing, irrespective of how they are described in the land register. The main problem is how to distinguish between forest and overgrown/unmanaged agricultural land (pioneer forest).
Sweden	Use of FAO-TBFRA definition. The main problem is to distinguish "forest" from "other wooded land" or other land- or vegetation types and to estimate the potential to reach 5 m at maturity.

4.   Conclusions

4.1   National definition of "Forest"

Generally an explicit definition of "forest" in the forest law does not exist in all countries. Very different national definitions are used; national definitions account for the particular character of a country. In most cases national inventories are based on the definition as defined in forest law.

The main criteria that distinguish between forests and other land are:
· minimum tree crown cover: 10 % - 75 %
· minimum height of tree at maturity: if an element of the forest definition it is always indicated as 5 m

Table 5:
Replies from country correspondents on the national definition and use of "protected forest" and "protected forest area".

Country	National definition of "protected forest" or "protected forest area"
Austria	No explicit definition of "protected forest" or "protected forest area" exists in the Forest Act. Only § 32a, which has been established in the amendment of 2002 which deals with the specific treatment of PFAs
Bulgaria	-------
Cyprus	-------
Czech Republic	No explicit definition in the Forest Law. According to the Law on Nature and Landscape Protection forests can be included in all categories of nature protection but a specific category for forests does not exist.
Denmark	Protected forests (understood as protected against conversion to other land use) are well defined.
Finland	No definition
France	None
Germany	Protected Areas are defined without clear reference to forest in the Federal Nature Protection Law. Forest Laws of the federal states may define "protected forests", e.g. in the State of Baden-Württemberg (State Forest Law - Landeswaldgesetz, § 32: Waldschutzgebiete).
Greece	None
Ireland	None
Italy	A common definition does not exist: as protected forest the forest inside of a protected area is what is understood to be the meaning.
Lithuania	The Forest Law defines forest groups according to management purposes, regimes and the main functional purpose including protected (committed to protect forest naturalness – I group, and committed to protect ecosystems and its components and recreation forests – II group) and protective (to protect productive stands protecting soils, air, water, human environment – III group) forests.
Norway	None
Portugal	None. There are different types of legally defined conservation areas that include forest areas.
Slovenia	An explicit definition of "protected forest" or "protected forest area" does not exist in the Forest Act, only "protection forest" and "forests with special purposes" are mentioned.
Sweden	None. The Environmental Code recognises types of protection, for instance nature reserves, natural parks, etc. The composition of vegetation types and land types is not the main focus for protection. Instead their values are the basis for a decision to protect. Vegetation mapping is more important than delineating a segment of protected forest. Simply "protected forest" is included in areas that are legally protected by law.

- minimum area of forest: 0.05 – 0.5 ha, however, this varies even within countries
- minimum width of forest strips: 10 – 20 m

Other criteria used include listed forest tree species, a minimum increment, e.g. 0.1 m3/a/ha, minimum number of years taken out of agricultural use.

,No common set of definition criteria applicable to all countries has been identified from analyses of the questionnaire. National definitions are also based on other criteria, depending on specific conditions pertaining to each country, i.e. socio-economic relations and wood production criteria (Northern Europe), forest functions (Central Europe), organic - entirely of wild woody plants, appearance of forest tree species, minimum period taken out of agricultural use, increment, etc.

4.2 National definition of "Other Wooded Land"

In most countries no national definition of "Other Wooded Land" exists or the term is not used or is unknown. Countries try to apply the TBFRA / FAO definition of "Other Wooded Land (OWL)", but only a few countries fully use the FAO / TBFRA definition in their national inventories. Even if no national definition exists, some vegetation types, which do not comply with the national definition of forests are reported as OWL, e.g. dwarf pine vegetation (*Pinus mugo*), riparian woods, bush land (*Quercus coccifera, Arbutus unedo*). Generally, the definition of "other wooded land" as well as of forests seems to be a global compromise to cover all types of wooded land.

Table. 6:
Replies from country correspondents on the national use of FAO / TBFRA definitions when reporting on PFAs to TBFRA, MCPFE or EEA and the consequences of same.

Country	Use of FAO - TBFRA or national definitions			
	when reporting to TBFRA	**when reporting to MCPFE**	**when reporting to EEA**	**What are the consequences of using national definitions instead of TBFRA definitions? How are the results influenced?**
Austria	National	National	National	NFI data (based on national definitions) are used as the only reliable data source when answering international questionnaires. The reason is that one data set cannot lead to misinterpretation or confusion by any national or international organisation handling national forest data. Nevertheless, a re-calculation of Austrian Forest Inventory data to the FRA 2000 definitions is more ore less impracticable as there is no national definition of OWL. Methods to differentiate such deviances are available but are too expensive.
Bulgaria	Only TBFRA	Only TBFRA	Only TBFRA	
Cyprus	TBFRA	TBFRA	TBFRA	We don't use national definitions
Czech Rep.				
Denmark	TBFRA	TBFRA	?	Since Denmark has implemented a NFI since 2002 the TBFRA definitions form the basis of the area estimates. Previously the data was more uncertain – based on questionnaires.
Finland	TBFRA	TBFRA	TBFRA	The national forest area (forest land + low productivity forest land) is bigger than the area of TBFRA forest area
France	National	National		Not so many because national definitions are very similar to TBFRA definitions
Germany	No figures for OWL in the TBFRA report	No figures for OWL in the MCPFE report	No figures for OWL in the EEA report	Not relevant
Greece	National	National	National	Definitions are harmonised to ecological, social and political conditions
Ireland	National	National	National	Criteria on canopy cover would reduce figures, as 10 % more cover is required than the minimum for TBFRA. The minimum area requirement is 4 % less than TBFRA and this would increase figures. These differences would balance each other and errors in figures should be minimal.
Italy	National during 1st NFI, TBFRA during new NFI	National	National	The old (national) and the new (TBFRA 2000) definition of forest of the two Italian NFIs were compared. The differences between the forest proportions obtained applying the two definitions, due to the different minimum threshold values of crown cover and of forest size, were very little, i.e. approximately 1 % (De Natale et. Al., 2003).
Lithuania	National	National	National	Specific definition of forest (0.1 ha, the crown cover/stocking level not stressed quantitatively in the official definition) is indicated on presentation to TBFRA and MCPFE. Information is reflected in the reporting.
Norway	National - Subjective adaptations were used for OWL	National - Data were not split on forest and OWL	National	According to national definitions the forests are understood as the productive forests and the non-productive forests. Other wooded land is not recognised, but will constitute a significant area, especially within PFAs.
Portugal	TBFRA	TBFRA	Not reported	None, because TBFRA and national definitions are fully compatible.
Slovenia	TBFRA			Total forest area is larger for area covered by dwarf pine and other shrubby forests
Sweden	TBFRA	TBFRA	PAs are reported to EEA including forest and OWL	Sweden has a lot of OWL. Therefore it is easy to misunderstand new figures when your reference is productive land. Also comparison between counties will be confusing if you discuss areas for industrial forestry.

4.3 National definition of "Protected Forest" or "Protected Forest Area"

In most countries no explicit legal definition of "Protected Area" or "Protected Forest Area" exists.

4.4 Use of FAO / TBFRA definitions when reporting on PFAs to TBFRA, MCPFE or EEA and consequences

The answers of the working group members were very heterogeneous: There are countries that use their national definitions when reporting (e.g. Austria, France, Greece, Italy, Lithuania, Norway) but some countries also use FAO/TBFRA definitions (e.g. Bulgaria, Cyprus, Finland, Ireland, Sweden).

The consequences of using national definitions vs. TBFRO / FAO definitions are seen as very heterogeneous and complex:

- Country delegates are aware of different figures when using either the national definitions or the international definition.
- Only one country delegates considers the FAO - TBFRA and national definitions as fully compatible.
- Most countries do not see substantial differences in the forest proportions when using FAO - TBFRA or national definitions, with the exception of differences caused by higher proportions of "Other Wooded Land" (OWL).
- Only one country reported a comparative analysis of both approaches, and concluded that there are very little differences in the resultant figures.
- Delegates stated that the differences in the figures are mainly caused by different threshold levels of crown cover and/or minimum area of forests.
- A second primary source of variation in the figures is the different use of the FAO – TBFRA category "Other Wooded Land" (OWL) which is generally unknown but accounted for in all national definitions OWL is not recognised in the national definitions, particularly in northern countries but constitutes a significant area, specifically in PFAs.

Generally, differences in the definition and delineation of 'forest' are pointed out as an explanatory factor for the variation of figures observed. Some protected areas include both forest and open areas. This results in differences due to the application of alternative definitions of forest used in European countries, as does the level of detail of the delineation (e.g. satellite data vs. terrestrial surveys).

In order to avoid imprecise figures a strict approach is recommended: The reported figures should be the simple intersect between boundaries of the officially Protected Area regimes, and the area of "forest" as defined according to FAO or national definitions.

The TBFRA/FAO definition of forest provides a very straightforward but broad interpretation of forest (crown cover > 10%; 5m high), while national definitions are sometimes much more restrictive. Some protected areas that are normally not considered as 'forest' in national statistics (e.g. mires and heathlands with dispersed trees, non-productive forest, etc.) should be included in the figures of 'protected forest' when the TBFRA/FAO-definition of forest is used.

Therefore, it should be very clearly stated what categories of forest or other wooded land are included in the reporting procedure (whether national or TBFRA/FAO - forest definitions are used), and country correspondents should inform the data-collector on the level of detail and methodology used in the calculations.

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COST Action E27

Protected Forest Areas in Europe - Analysis and Harmonisation (PROFOR)
Results, Conclusions and Recommendations

Data Flow and Reporting

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Preliminary Remarks

This report is based upon a literature review (see references) and reports from the UNECE/FAO, FAO and the Liaison Unit of the Ministerial Conference on the Protection of Forests in Europe (MCPFE). Specific information was collected through three questionaires during the COST Action E 27 – Protected Forests in Europe (PROFOR) – WG 2 (Harmonisation and improvement of information on European Protected Forest Areas – International dimension). These included the initial questionnaire of 2003, a complementary questionnaire sent out in September 2005, and a special questionnaire addressing the 'Common Database of Designated Areas (CDDA)' of the European Environmental Agency (EEA). The authors of this chapter would like to thank Dr. Malgorzata Buszko-Briggs, Dr. Christof Wildburger and Dr. Roman Michalak for providing detailed information on the MCPFE reporting process. Additional thanks to Dr. Dominique Richard and Marc Rockaerts of the European Topic Centre for Biological Diversity for making themselves available regarding queries on the CDDA.

1. Introduction: Legal, administrative and organisational background

For many years an urgent requirement has been identified for a set of up-to-date, internationally comparable data on the extent, location, nature, condition and productivity of the forest resource, at a global and regional level. Such data are vital inputs to any serious discussion of, or decision making for, forest policy, wood supply, industry location, protection of biodiversity, climate change, and a whole host of topics linked in one way or another to the forest resource, including information on the protection status of forests.

As pointed out in chapter 3.1. reporting is the last of three steps in data flow:

i)   *Monitoring* is understood to mean periodic quantitative or qualitative measurement or observations of a specific parameter.
ii) *Assessment* means the analysis and synthesis of the monitoring data and observation in view of a special subject, action or political process. Assessment needs harmonised definitions, terms, and objectives.
iii) *Reporting* means the dissemination of the results of assessment. For informed decision-making harmonised definitions, terms, content and scope of forest characteristics are also needed.

Therefore the prerequisite for reporting is that the parameters to be monitored and assessed must be defined from the very beginning. The problem of the TBFRA and MCPFE reporting systems is that the assessment categories were overlayed on to existing national categories.

Data on PFAs are collected and used by numerous official and non-official organisations (Table 1).

The Food and Agriculture Organisation of the United Nations (FAO) is responsible for leading this work at a global level. However, the coverage of temperate and boreal forests in the United Nations Economic Commission for Europe (UNECE) region and some other industrialised countries has been entrusted to a team in Geneva formed by UNECE and the FAO European Forestry Commission. The collected data is inserted into the Global Forest Resource Assessment (FRA) database after it has been compiled. The Temperate and Boreal Forest Resource Assessment in the year 2000 or in short referred to as 'TBFRA-2000' was the latest in a series of surveys of the temperate and boreal industrialised countries available for the work of COST E 27. It is administered from Geneva. The first of the assess-

Table 1:
Organisations collecting data on protected forest areas

Global organisations	Reporting Bodies and activities		
FAO	Food and Agriculture Organisation of the United Nations		
UN-ECE	United Nations Economic Commission for Europe	UN-ECE/ FAO	FRA: Forest Resources assessment
IUFRO	International Union of forest research Organisations	GFIS	Global Forest Information Service
ITTO	International Tropical Timber Organisation		
UNEP	United Nations Environment Programme	WCMC	World Conservation Monitoring Center
		UNEP, WCMC. WWF	European Forests and Protected Areas Gap Analysis
IUCN	World Conservation Union	WCPA	World Commission on Protected Areas
WRI	World Resources Institute		
WWF	WWF- The Conservation Organisation		
EEA	European Environment Agency	ETC/NC European Topic Centre on Nature Con-servation/ Nature Protection and Biodiversity	
WCMC, Council of Eur	CDDA: Common Data Base on Designated Areas		
UNECE Timber committee	United Nations Economic Commission for Europe	TBFRA	Temperate and Boreal Forest Resources Assessment
MCPFE	Ministerial Conferences on protection of Forests in Europe	Forest Processes Helsinki, Strasburg. Lisbon, Vienna, Warsow	Reports: State of Forests
EFICS	European Forestry Information and Communication System		
EC	European Commission	JRC	Joint Research Centre of European Commission
EFI	European Forest Institute	Information Services, Databases, EFIS (European Forest Information Centre)	Data Bases COST E 4 (FRRN), COST E 27 clearinghouse

ment reports was published in 1947. A follow up activity was the FRA 2005 to which the UNECE/FAO provided regional information for the ECE region (FAO 2003, 2004, 2005).

Several different international processes and initiatives emerged which develop and deal with criteria and indicators. In the pan-European context this process is mainly formulated and organised by the Ministerial Conference on the Protection of Forests in Europe (MCPFE). So far, four Ministerial Conferences have taken place: 1990 Strasburg, 1993 Helsinki, 1998 Lisbon and 2003 Vienna. The MCPFE is a high level co-operation initiative comprising approximately 40 European countries and the European Community. It addresses the most important issues on forests and forestry. The MCPFE makes

recommendations regarding the protection and sustainable management of European forests. It is a platform of dialogue for signatory states, the European Community and observer countries and organisations, as well as national and international forest stakeholders. It also represents a platform for the integration of policy and science. The MCPFE is linked to global and other regional processes and initiatives addressing forestry issues and indicator development. The MCPFE has established and endorsed a catalogue of 6 criteria and 35 indicators to monitor the sustainable management and use of forests. In order to perform its tasks and actions, in particular with respect to the criteria and indicators, the MCPFE has developed close ties with information and data collection agencies which include, for

example, the FAO and the UNECE/FAO. This coope-ration, in particular, is currently being further enhanced (ECE/FAO, 2005).

In recent times, the need for more information about the state of forests and their protection was discussed, in particular at the World Congress on National Parks and Protected areas (Caracas, 1992) and the IUCN/WWF conference in 1995. Fears of a decline of natural forests were enhanced by statistical data presented at these conferences. To counteract the loss of primary and close-to-nature sites and forests, the protection of 10% of the earth's surface within defined protection regimes was espoused. At the same time the Rio Convention on Biological Diversity promoted a vision of sustainable manage-ment through a declaration on forests (UNCED, 1992).

The IUCN being the only organisation that offers a worldwide management classification system (IUCN et al., 1994; BISHOP et al., 2004) was clearly prede-stined to give the framework of the reporting catego-ries. The overriding definition of an IUCN protec-tion category is: "*an area of land and/or sea especially dedicated to the protection and maintenance of biolo-gical diversity, and of natural and associated cultural resources, and managed through legal or other effective means.*" This fundamental request was stressed repeatedly in the discussions of the Cost Action with IUCN. The grouping of protected forest areas was therefore directly based upon the IUCN categories in the TBFRA 2000 data collection process and assem-bled under two main two classes: (1) IUCN catego-ries I and II (strict protection) and (2) IUCN catego-ries III to VI (less strict protection). These categories were seen to be sufficient for standardised reporting on protected forest areas for the TBFRA 2000 data collection process. During the data collection process the various types of protected areas including forests were schematically attributed to the IUCN-catego-ries (e.g. in the case of FI, SE, AT), as generally only a few of the national protected areas are officially listed in IUCN-categories. An exception occurred regarding National Parks. They have an internationally adopted ranking as national parks are very interested in being acknowledged international through a recognised classification system such as provided by the IUCN, which provides high visibility and publicity.

The actual lack of reliable data on 'strictly' protected forest areas was one of the main drivers for the COST action E 4 'Forest Reserves Research Network' (1995 to 1999) (Schuck et al., 1994,

Parviainen et al., 2000). In COST action E4 not only were the definitions, the national restrictions, the statistical data on their distribution, and the research methodologies of this most demanding forest protection category investigated (Bücking et al., 2000), but also other forest protection categories inevitably came into perspective (Parviainen et al., 2000).

Recently, when examining Germany, the strictly protected area in each of the 12 terrestrial national parks was calculated. The remaining area, i.e. not strictly protected but within the boundaries of the Parks, is subject to management plans aiming at improving their state in order to satisfy the require-ments for a national park. Only two national parks (Jasmund and Eifel) met the strict prerogative of national park (IUCN category II), i.e. 'at least 75% of the park area should be unmanaged (BfN 2004)'. However, at present all terrestrial German national parks are classified as IUCN category II, irrespective of where management of some form occurs (See country report Germany [Welzholz et al., 2005]).

As mentioned previously the MCPFE cooperates closely with the UNECE/FAO to compile data neces-sary to comply with its criteria and indicators. Though the MCPFE at first based its work on protected forest areas data (PFAs), as collected under the TBFRA 2000 system, which is based on IUCN categories, the need for more suitable information on PFAs was sugessted due to difficulties and discre-pancies as described in the German example.

This resulted in the MCPFE Assessment Guide-lines for Protected and Protective Forest and other wooded land in Europe (MCPFE, 2003a). They were elaborated upon by the joint 'Work programme on the Conservation and Enhancement of Biological and landscape Diversity in forest ecosystems 1997-2000' of the MCPFE and 'Environment of Europe' (The pan-European Ministerial Process of the Mini-sters of Environment). It was a consultative process including preparatory groups, working groups and workshops, directly involving experts within coun-tries and organisations participating in the MCPFE process (Rametsteiner, 2001; MCPFE 2003, p.119 [Annex VI])(Fig. 1). The guidelines were used to collect and analyse national data on protected and protective forest and other wooded land (OWL) in European countries. This was done within the frame-work of a supplementary TBFRA enquiry in 2000. The results are published in the MCPFE State of Europe's Forests report (2003b).

2.   Reporting bodies ("focal points")

In both systems – TBFRA and MCPFE - the "Focal Points" were officially nominated by the governments of the participating countries to report on PFAs. Therefore, the reported data generally represented official national statistics. In order to compile the statistics it was noted by the focal points that cooperation between different official bodies took place in order to achieve the best available information. This included, for example, different governmental agencies, particu-larly those responsible for forestry and nature conservation, cooperation between governmental bodies and state forest research -nature conservation or -environment institutes, and between official governmental bodies and private conservation organisations (NGOs) (Table 2). A point worth mentioning in this context is that in Federal countries or in countries with strong regional structures - data are collected on a regional level and are then compiled and transmitted subsequently by a national body.

The official TBFRA report, however, is even more stringent about the uniformity of datasets because it

Table 2:
Data collection and Data flow

	TBFRA	MCPFE
Data collection		
National	AT, BE, BG, CZ, DK, FI, FR, IE, IT, LT, NO	AT, BG, DK, FR, IE, LT, IT, NO
National/Regional	DE, ES, (IT), PL, SE, SI	DE, ES, (IT), SE, SI
Regional	CH, UK	CH, UK
Data production		
Administration of Forestry	AT, BG, CH, CZ, DE, ES, FI, FR, SI, (SE), UK	AT, BG, CH, CZ, DE, ES, FI, FR, SI, (SE), UK
Administation of Nature Conservation	CH, ES, FI, IE, IT, NO, PL, SI	AT, BG, CH, CZ, DE, ES, FI, FR, SI, (SE), UK
State Research Institute for Forestry/Agriculture	BG, DK, FI, PL. SI	BG, CH, DK, FI, SE, SI
State Research Institute for Nature Conservation	CH,DK,SI,UK	DK, SI, UK
Others*	CH, CZ, FI, FR, LT, PL	BG, CZ, FI IE, IT, LT, PL, SI, UK
Data Sources		
GIS	BG, IE, FI, LT, SE, UK	AT, CZ, IT, SE, SI, UK
Database on protected areas	AT, DK,ES, FI, IE, IT, NO. SE, UK	ES, IT, SE, UK
National Forest Inventory (NFI)	BG, FI, FR, DK, ES, IT, LT, NO, SE, UK	DK, ES, FI, NO, SE, SI
Others**	CZ, IE, PL, SI, UK	BG, CZ, FI, IT, IE, LT, PL, SI, UK
Data transmission (reporting)		
Administration for Forestry	AT, CZ, DE, IT, PL, SE, SI, UK	AT, CZ, DE, IT, SE, SI, UK
Administration for Nature Conservation	IE, IT, SE, UK	IT, SE, UK
State Research Institute for Forestry/Agriculture	DK, ES, FI, PL, NO, SE, SI	DK, ES, FI, NO, SE, SI
State Research Insti for Nature Conservation	DK, ES, PL	DK, ES, PL
Others*	CZ, LT, PL	CZ, PL, LT
Control phase in data collection		
not needed (data are already gathered in one database)	CZ, FI, NO, LT	CZ, FI, NO, LT
no control (data are collected from different sources and directly transmitted)	ES, PL	ES, PL
simple quality check up (completeness)	AT, DE, DK, IE, IT, SE, SI, UK	DK, DE, IE, IT, SE, SI, UK
workshops/meetings for coordination and national harmonisation	DK	AT, SE

1st   Questionnaire (2003) answered by AT, BE, BG, CH, CY, CZ, DK, FYR MAC, FI, FR, DE, GR, IE, IT, LI, NE, NO, PT, RO, SI, ES, SE, SI, UK

2nd   Questionnaire Sept. 2005 answered by AT, BG, CH, CZ, DE, DK, ES, FI, FR, IE, IT, LT, NO, PL, SE, SI, UK

*   Other organisations: Ad hoc nominated consultants/experts; national museum; mapping authorities; UNEP-WCMC-mapping; Non-governmental organisations.

**   Other data sources: short term forest planning, systematic strata sampling, aerial and satellite images.

is assumed that different points of view on nature protection occur within the reporting bodies (FAO, 2000b: Global Forest resources Assessment Chapter 7). As comparable or even the same statistical data sources have been used it is nevertheless almost certain that the TBFRA and MCPFE data of one country are relatively homogenous and comparable. Some progress has occurred by involving new information facilities like GIS supported Data Bases and NFI and aerial photography between the older TBFRA and the more recent MCPFE datasets.

On the other hand, it was shown that the CDDA initiative (see chapter 3.1, 'The need for harmonised information on Protected Forest Areas') seems to be supported more by the National Nature Conservation Bodies and therefore, some specific forest protection focused categories are not represented. This database was generally unknown to the members of COST E 27 before the start of the action and the general enquiry. Representatives of CDDA willingly accepted the propositions of COST E 27 regasrding improving data flow, categoriy completion and the information content.

3.   Data sources used by the focal points

3.1.   UNECE/FAO data collection for TBFRA 2000 based on the IUCN classification system

The status of protected forest areas for the year 2000 was assessed under two initiatives: (1) The UNEP World Conservation Monitoring centre (UNEP-WCMC) prepared and updated maps of protected forest areas for FAO based on detailed surveys by the World Conservation Unit (IUCN), using IUCN protected area management categories (FAO 2000, chapter 7); (2) within the forest resources assessment for 2000 implemented under the auspices of FAO, ECE countries submitted statistics on protected forest areas in response to a questionnaire sent out by UNECE/FAO for the TBFRA 2000 data collection process. This resulted in numerous cases where discrepancies in the statistics reported to the TBFRA 2000 occurred. Furthermore, discrepancies were shown to exist between PFA mapping data and the country responses to the TBFRA 2000 statistical information data. Potential reasons for these differences may be found in countries having interpreted

the IUCN management categories more broadly in the FRA 2000 questionnaires than in the IUCN surveys. One major problem is that the minimum area required to comply with a PFA area is not identical in the statistical data compared to the PFA mapping approach. These discrepancies highlight the ongoing difficulties in obtaining a consistent approach when comparing forest areas that countries report as being protected.

3.2.   Data collected under the MCPFE classification system

Data are generally based upon the official statistical data of the countries concerned. The statistical data-sets are based on information derived from either the NFI's, mapping authorities, national museums, short term forest planning, (general) forest management plans, systematic strata sampling in PFAs) or a combination of different sources. The data were collected via a questionnaire filled in by the countries, based on the MCPFE classissfication system and the results published in the MCPFE State of Europe's Forests report (2003). In conclusion, it became apparent that the interpretation of the IUCN and MCPFE classification systems and their implementation in the national context varies among countries (Global Forest Resources Assessment; FAO, 2000b Chapter 7) which consequently lead to differences in the amount and assignment of reported protected forest areas.

4.   Harmonisation of Reporting by the Focal Points and MCPFE

Elaboration of the MCPFE Assessment Guidelines for Protected and Protective Forest and Other Wooded Land in Europe began with a questionnaire asking for all national protection categories. After analyses and grouping by the Vienna Liaison Unit (LU) the MCPFE task force asked the LU to prepare a proposal for a classification of the existing protection categories, which was subsequently discussed and improved in several steps by the countries concerned and finally adopted as a part of Resolution 4 by the Ministerial Conference in Vienna in 2003 (Wildburger, personal communication). The countries made simple "quality check ups" of data (e.g. completeness of data) before transmitting the data to the LU. Some countries have

consistent data bases at their disposal which did not require further quality controls.

Only a few countries reported that they held workshops for coordination and national harmonisation, though many more countries collected and collated data from different regional and institutional sources. This in particular, turned out to be a complicated procedure in Federal Republics or Autonomous Regions where the responsibility of forestry and nature conservation is clearly delegated to subnational governments. The LU analysed the national data from the point of view of plausibility, coherence, homogeneity and in comparison with data from other countries. Problematic data were discussed with the country representatives, and countries were asked for clarification and examination. The LU had the impression that the data were given very consciously, and divergent or questionable data were not the result of unclear guidelines or interpretation but due to political decisions.

5.   Accuracy of data

5.1.   Evaluation of the data from the point of view of the TBFRA

The issue of data quality requires some discussion. In a number of cases, due to both misinterpretation of questions and the lack of necessary information and training options, data quality is questionable and some of the results controversial. In this respect the TBFRA 2000 data assessment has uncovered serious disagreement in interpretation, particularly what actually constitutes a protected forest area. Indeed the the TBFRA 2000 enquiry has to some extent opened up a debate on the status of protected forest areas within its member countries. (UN-ECE/FAO Main report 2000):

1) Figures are less ambiguous for the more complete forms of protection, corresponding to categories I and II (strict nature reserves, wilderness areas, national parks and natural monuments). For these categories, the TBFRA 2000 survey provided an important overview of the status of protection within the [forest] biome.

2) European countries have traditionally put greater emphasis on the less strictly protected area categories, and particularly those in category V. This category is closely related to the western European national park model. This choice reflects in part the need to integrate conservation within a cultural and usually, a densely populated landscape.

5.2.   Evaluation of data accuracy by the participating countries

The COST E 27 delegates, - in so far as they felt competent to give an opinion on the evaluation of the data - were of the opinion that data on protected forest areas provided to the TBFRA 2000 and MCPFE State of Europe's Forests report 2003 are precise (5-10% error) or good (up to 20% error) from the national perspective, but that the international comparability between countries does constitute a problem which should not be underestimated (table 3).

Table 3:
Accurracy of data provided by countries to the TBFRA process.

	TBFRA	MCPFE
Precise (5-10% error)	BG, CY, CZ, SI, LT	AT, CY, LT, SI, ES
Good estimate (upto 20% error)	RO, ES, NL, NO, SE, UK	BE, GR, NL, NO, RO, SE, UK
Rough (>20% error)		BG
No evaluation possible	AT, CH, DE, FI, FR, IT, PT	CH, DE, FI, FR, GR, IT, PT

Use the following accuracy levels:
precise numbers (5-10% error),
good estimate (up to 20% error),
rough estimate (up to 50% error),
or order of magnitude (up to 100% error, which means that the correct area can be between 0 and as much as double the number provided).

6.   Reported problems on the main sources of error

6.1.   Conclusions arising from the TBFRA 2000 data collection process

Although the IUCN and World Commission on Protected Areas (WCPA) provide detailed guidelines (IUCN et al., 1994; BISHOP et al., 2004) for distinguishing between the various categories, several ambiguities remain and provide a challenge for country correspondents. The main problems are mainly dealt with in chapter 6.2 of this contribution to the COST Action E27 final report:

- not clear enough guidance to allow international standardisation of data;
- how to best measure the forest proportion in 'mixed' protected areas i.e. various land cover classes;
- the actual definition of forest within protected areas;
- how to treat category mixtures in one protected area i.e. different types of protection classes (e.g. national parks with embedded strict forest or nature reserves);
- the obligation of official legal designation in private lands;
- how to include protection commitments by private land owners;
- what role does the effectiveness of protection measures play in reporting?
- the issue of minimum size of the IUCN protection category I.

An additional problem not mentioned previously, may be solved in the future by means of GIS supported data bases that are currently being established in many countries. This is that different categories of protection may overlap and is thus related to point 3) of the list above. Overlapping is a problem in Europe that should not be underestimated. It occurs frequently in the course of introducing new protection strategies like Natura 2000, the Bird and Habitat Directives, or even the EU Water Framework Directive. Most if not all forest areas in central Europe are already multifunctional. This leads to the conflict of attributing a forest area to a protection or protective category, and stressing one function over others. This may not be true for the very strictly protected forest reserves, where the function of timber production is explicitly excluded and the recreation function highly restricted. Forest functions such as. protection against erosion, water supply, maintenance of landscape character etc., are compatible with commercial forest management. In general a forest area may at the same time be subject to several protection categories and assigned to multiple protective functions, and will thus be counted several times in reporting statistics (FRA, 2005).

6.2.   Problems mentioned by the correspondents

Both the TBFRA 2000 and MCPFE State of Europe's Forest Report - 2003 mention a number of generic problems:

- the category definitions are "ambiguous", "unclear", "not usual in the national contexts";
- some criteria are not applicable or are irrelevant;
- the MCPFE categories need to be interpreted within the national legal framework and at the regional habitat scale;
- national protection classes had to be re-categorised according to international standards, a process which may still be going on in the countries concerned.

For the TBFRA 2000, only the groupings in 2 main classes, i.e. IUCN I and II, and III to VI – was regarded as too coarse for the existing national protection policies. Correspondents are well aware that their unavoidable national viewpoints and options regarding interpretation may well bring into question international comparability. Therefore further clarification is urgently needed and wanted by correspondents, including the revision of assignment to some categories. In general, there was criticism expressed that IUCN-categories are not forest-focused and that the application of global and large scale oriented IUCN categories are not suitable to depict the multiple initiatives in small, industrialised or densely populated countries to protect forests. Therefore it cannot be ruled out completely that some countries interpreted the assessment guidelines rather liberally by attributing protected areas to percieved "better" protection categories, or conversely, interpreting non-protected areas as "protected" (see TBFRA Main report[UN-ECE/FAO 2000], p 232).

The correspondents agreed that the MCPFE classification system is easier to apply than the IUCN categories. Therefore the MCPFE data are regarded as the more accurate estimations of PFAs, not only because of the more detailed classification categories and because the data are more recent, but also due to the partial application of new classification techniques.

6.3.   Deficits in data production and prospective progress

Comparing the TBFRA 2000 and MCPFE initiative of 2003

Data collection is improving by means of new recording techniques. However, one should keep in mind that implementation is ongoing and that there can be large differences between regions and countries. GIS

supported data bases are being established, aerial photogrammetry and the interpretation of satellite images using novel techniques are becoming ever more important. According to experts, GIS applications for recording PFAs need further harmonisation with regard to technical methods and scaling. Unclear or ambiguous descriptions of categories strongly affect the progress of implementation of the new techniques.

National Forest Inventories (NFIs)
NFIs give a statistical overview of forests based upon sampling grids or other sampling designs which may vary from one country to another (EC, 1997). They are not specially designed for depicting rare, non-homogenously distributed protected areas. They are therefore not particularlyuseful for reporting on individual PFAs, but may be considered for the global PFA statistics.

There are several opinions about the quality of the statistical data on PFAs and the reliability of the application of the assesssment guidelines: Firstly, the view of the TBFRA Expert group is that some correspondents were reluctant to provide politically sensitive information and that the respondants had especial difficulty in providing data for TBFRA parameters which were not strictly focussed on forest lands (e.g. protected forest areas; FAO UN-ECE/FAO 2000a,b). Secondly, the insider view of the PROFOR respondants was that questions about statistical data were answered thoroughly, but that the correspondents were obliged to follow the national decisions on the interpretation of the protection caregories. Therefore, the evaluation of the national correspondents in COST Action E 27 were, on the whole, very critical concerning the value and reliability of the statistical data, when used for international comparison.

7.   Reasons for changes occurring in PFA statistics

Annual forest area fluctuations range between –0.2 and +0,9 % of the respective total area in the COST E27 participating countries. These fluctuations are due to succession (natural expansion of forest), afforestation (conversion of agricultural land to forest),

and deforestation (roads, settlements etc.).The total forest area amounts to 1 004 005 000 ha (FAO, 2000b; MCPFE, 2003, Table 1.2.a). In general, the forest area has increased in Europe between 1990 and 2000 by 0.08 %. It is evident that the low but continuous gain or loss in forest area may have some influence on PFA statistics, but it is not considered as a primary factor for the discrepancies observed in the PFA statistical data.

Countries measure the forest area and other relevant variables using their own definitions (FAO 2000b). The delivery of countrywide forest resource data during the FRA process was based on on the outcome of national or regional forest resource inventories from which the FRA data were derived. So it should be borne in mind that the data were harmonised from national estimates to match the international definitions.

Also the TBFRA 2000 and the MCPFE data compilation may be based on different reference years for individual countries. In some cases reporting shortcomings were corrected for the MCPFE report. This makes a comparison of PFA data questionable, especially as a different categorisation of the protected forest areas was applied. Only future reporting using the same classification scheme will highlight any changes that occur, i.e. if the countries base their reporting on the same data sources and provide sufficient explanations where significant changes occur between two reporting periods. However, based upon the data analysis carried out by the COST E27 experts it is not very likely that the next international assessment will facilitate objective changes to be observed as compared to the MCPFE 2003 report (MCPFE, 2003), since the classification system will remain subject to potential biased reporting due to national or regional interpretations of classification categories.

In countries adapting their protection framework to IUCN standards the MCPFE classes (as for example, Bulgaria) or national conservation policy may show protected forests area fluctuations that are due to new forest and nature protection laws.

Most countries use national definitions for forest. Differences caused by divergent forest definitions are seldom analysed, but are presumed to be small (see chapter 6.2). Larger differences are presumed to occur when productive forest land is seperared from non-productive forest, as in Scandinavian countries.

8.   General conclusions/ Summary

Working Group 2 analysed data collection, data flow and the reporting of data on Protected Fores Areas (PFAs) to CDDA (Common Database on Designated Areas), TBFRA (Temperate and Boreal Forest Resources Assessment), and MCPFE (Ministerial Conference on Protection of Forest in Eurpe).

CDDA is a collection of conservation types and names. It is important as a reference data base showing how different forest protection regimes operate in Europe.

The main focus of data flow analysis was on the reporting procedures for TBFRA and MCPFA.

Several data sources occur such as national databases on PFAs, maps, information from systematic strata sampling and short term management planning.. National Forest Inventories (NFIs), however, have not yet played an important role, as they were not yet finalised or not specifically adapted to PFAs. It is hoped that the data quality will improve with more involvement of GIS supported data bases, which will help to better define the geographical borders of PFAs, to show multiple protection functions and to avoid double counting of areas. Aerial photograpy and/or Satellite photographs may also contribute to better datasets.

In most cases the accuracy of data was estimated to be 'precise to good' at the national level. However, most correspondants believed that data were not comparable at an international level, as national reporting is dependant on national conditions and interpretation of assessment guidelines.

Responsibility for data collection is allocated either to the Ministries/administrations of Environment/ Nature Protection or Agriculture/Forestry. Regional data, collected by regional ministries or administrations, have to be compiled to national data by the national bodies; in some cases regional data are transmitted directly. Official data collectors may utilise State agencies for Nature conservation, State and Private Nature conservation or forest institutes, Museums, Nature Protection NGO's, official or private experts to improve the information. Normally the conditions for the highest quality data are met:

Requireing that data must be accurate means that they should represent the best possible information. Best information implies that all available credible sources have been reviewed and the data selected have been checked and validated (Wardle et al 2003).

Data transmission is a national task of the national ministries; it may involve research institutes. National reporting is co-ordinated by nationally nominated correspondants.

TBFRA and MCPFE are cooperating closely. However, the TBFRA 2005 reporting system does not any longer take into account differences in the biodiversity protection regimes, and reports only one figure for areas that are designated for the conservation of biodiversity.

In TBFRA, the evaluation team and the Team of Specialists (ToS) is in close cooperation with the national correspondants for data collection, data control and data compilation.

In the MCPFE process the preparatory groups within the Liaison unit are in close cooperation with the national correspondants responsible for the preparation of assessment guidelines, field tests, data collection, checking of plausibility, coherence, completeness of data, and data compilation.

At the Ministerial level the official data are endorsed, published, interpreted, and new tasks and programmes of processes are formulated and installed.

Though the official representatives of TBFRA and MCPFE expressed the opinion that the protection categories were clearly defined, the COST Action E27 (PROFOR) experts were ofthe opinion that the assessment guidelines were not sufficiently clear to allow for internationa comparison of statistics. The application of the MCPFE assessment guidelines was easier as definitions were less unambiguous and better adapted to national PFAs.

A number of ways to improve data quality and reporting were proposed:
· better guidance from TBFRA and MCPFE specialist teams of in cooperation with national experts;
· adaptation of national nature protection designations to European protection categories;
· better use of new data sources such as GIS supported data bases, in order to exclude overlaying and double counting of areas;
· reporting national authorities should make available for public evaluation and discussion, the relevant figures in their countries and the method of data clustering;
· international reporting needs to use synergies between different actions: information must only be requested once at a prescribed date from each country; this means close cooperation especially of TBFRA and MCPFE procedures.
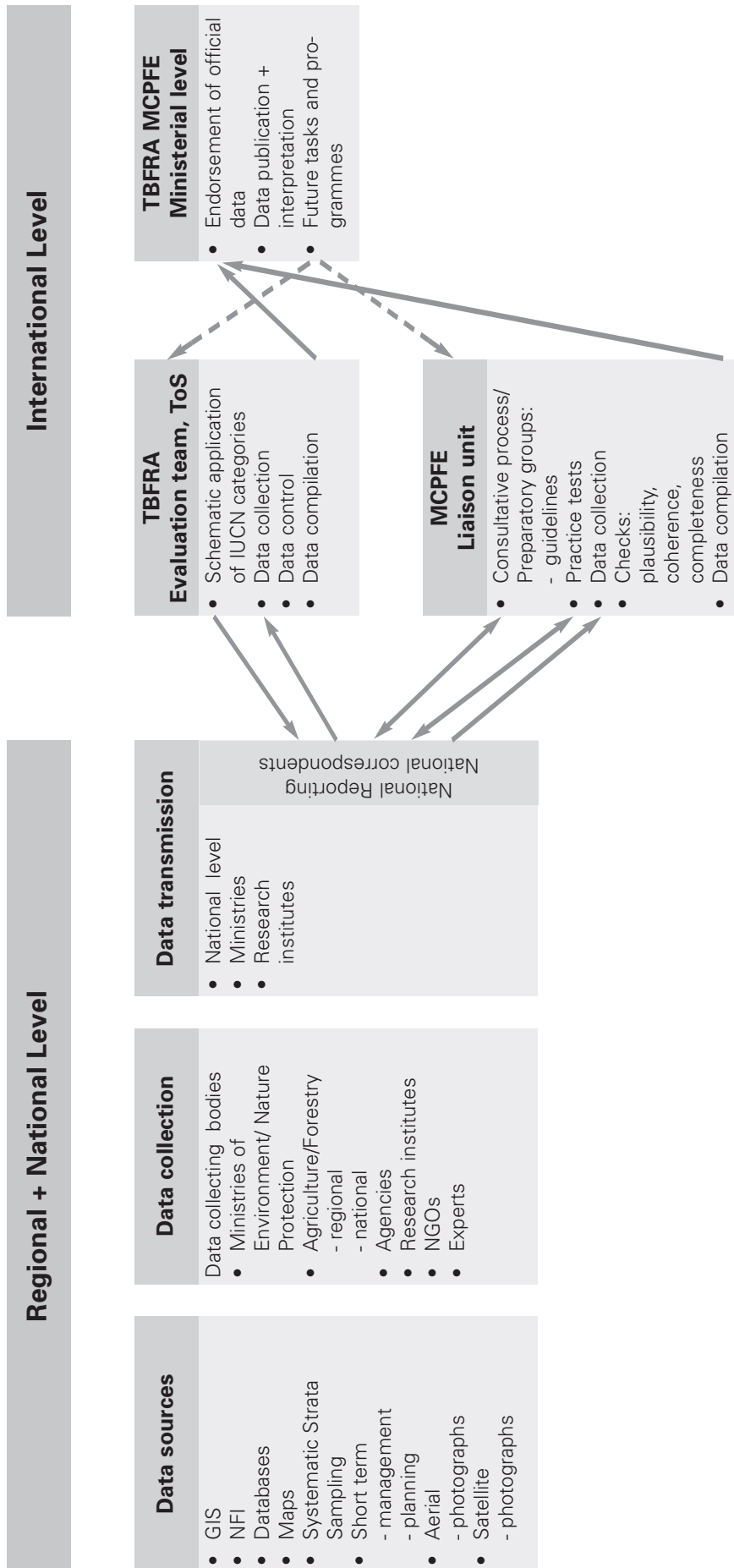
Figure 1:
Data Flow

9.   References

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Annex

Country abbreviations
(Might be good to add other abbreviations which are used frequently which should be come part of an overall abbreviations list e.g. TBFRA 2000, FRA , MCPFE, IUCN, CDDA etc.)

	EU-Abbrev		EU-Abbrev		EU-Abbrev
Austria	AT	Germany	DE	Portugal	PT
Belgium	BE	Greece	GR	Romania	RO
Bosnia-Herzegovina		Hungary	HU	Russian Federation	RU
Bulgaria	BG	Iceland	IS	Serbia-Montenegro	SM
Croatia	HR	Ireland	IE	Slovak Republic	SK
Cyprus	CY	Italy	IT	Slovenia	SI
Czech Republik	CZ	Lithuania	LT	Spain	ES
Denmark	DK	Netherlands	NL	Sweden	SE
Finland	FI	Norway	NO	Switzerland	CH
France	FR	Poland	PL	United Kingdom	UK

List of Abbreviations

C&I	Criteria an Indicators
CBD	Convention on Biological Diversity
CDDA	Common Data Base on Designated Ares
CEC	European Commission (Commission of the European Community)
CEPF	Confederation of European Forest Owners
CIS	Commonwealth of Independent Sates
CNPPA	Commission on National Parks and Protected Areas
COST	European Co-operation in the Field of Scientific and Technical Research
EC	European Commission
ECE	Economic Commission for Europe [of the UN]
EEA	European Environment Agency
EFI	European Forest Institute
ETC/NC	European Topic Centre on Nature Conservation
FAO	Food and Agriculture Organization the United Nations
FSC	Forest Stewardship Council
IUCN	The World Conservation Union
IUFRO	International Union of Forest Research Organizations
MCPFE	Ministerial Conference on the Protection of Forests in Europe
OWL	other wooded land
PEBLDS	Pan-European Biological and Landscape Diversity Strategy
SFM	sustainable forest management
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFF	United Nations Forum on Forests
WCMC	World Conservation Monitoring Centre

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