Implementing Criteria and Indicators for Sustainable Forest Management in Europe

CI-SFM

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Preface

In recent years the concept of sustainable forest management has received an unprecedented level of attention. Policies from other sectors increasingly formulate demands which relate to the world's forests. Policies on climate change and renewable energy, raw material supply or the protection of mountains, waters, soils and specific species are just such examples. Modern forest policy tries to accommodate these multiple demands with the concept of a multifunctional approach to forests and sustainable forest management. In doing so, the forest sector can look back on 300 years of experience and development – practical and scientific – of the concept of sustainable forest management. This includes a clear definition (MCPFE, Helsinki, 1992), criteria and indicators (regional processes and ITTO) and guidelines at all levels. There is hardly any other sector with such a track record on sustainability for the sake of future generations.

Nevertheless, new challenges emerge and there are differences between countries throughout Europe and worldwide in both forests and forest management.

The agreement on pan-European criteria and indicators was an unquestionable milestone, which received high attention and expectations from governments and stakeholders. However, questions are now being raised about whether we are able to make a difference with this particular tool, especially in the light of the abovementioned new and emerging challenges, and whether we use it to its full potential.

The Oslo Ministerial Conference in 2011 called on its goals and 2020 targets for European forests to ensure, through sustainable management, the multiple forest functions and the enhancement of the lasting provision of goods and services of all European forests. To this end, it was decided to take European and national actions to ensure the further development of sustainable forest management and its tools.

This EFI project on *Implementing criteria and indicators for sustainable forest management* in Europe was initiated to help preparing the ground for further work under FOREST EUROPE. It addressed this complex question with two clearly formulated objectives: (a) to analyse the implementation of criteria and indicators for sustainable forest management in the 46 signatory states of FOREST EUROPE, and (b) to strengthen the process and the use of criteria and indicators, not only as a tool for monitoring and reporting, but also for policy making at national and European level.

In this report, the project team guides us through the various development phases and uses of this important tool starting from the general conceptual base and finishing with an analysis of the pan-European experiences accumulated in the last 10 years and further back.

We are confident that the project results will provide solid background information for future decisions, including on a potential revision of the set of criteria and indicators and on improving their use as a tool to facilitate the implementation and communication of the concept of sustainable forest management at all levels.

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Abbreviations and acronyms

AG	Advisory Group
ATO	African Timber Organisation
C&I	Criteria and indicators
CBD	Convention on Biological Diversity
CDDA	Common Database on Designated Areas
CFRQ	Collaborative Forest Resources Questionnaire
CICI	International Conference on the Contribution of Criteria and Indicators for Sustainable Forest Management
CIFOR	Centre for International Forestry Research
CPF	Collaborative Partnership on Forests
CSD	Commission on Sustainable Development
DG	Directorate General
DPSIR	Driving Forces-Pressures-State-Impacts-Responses
EC	European Commission
ECCI	Expert Consultation on Criteria and Indicators for Sustainable Forest Management
EEA	European Environment Agency
EFI	European Forest Institute
EU	European Union
EUFGIS	European Information System on Forest Genetic Resources
FA	Forest Administration
FAO	Food and Agriculture Organization of the United Nations
FMU	Forest Management Unit
FRA	Forest Resources Assessment
FSC	Forest Stewardship Council
GCC	General Co-ordinating Committee
ICP	International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests
IEA	International Energy Agency
IFF	Intergovernmental Forum on Forests
IGO	Intergovernmental Organisation
IPF	Intergovernmental Panel on Forests
IPGRI	International Plant Genetic Resources Institute
ISCI	Intergovernmental Seminar on Criteria and Indicators for Sustainable Forest Management
ITTO	International Tropical Timber Organization
IUCN	International Union for Conservation of Nature
IUFRO	International Union of Forest Research Organizations
JFSQ	Joint Forest Sector Questionnaire
JRC	Joint Research Center
JWEE	Joint Wood Energy Enquiry
LBA	Legally binding agreement
LBI	Legally binding instrument
LU	Liasion Unit
LULUCF	Land Use, Land-Use Change and Forestry
MCPFE	Ministerial Conference on the Protection of Forests in Europe
NFI	National Forest Inventory

NFP	National Forest Programme
NGO	Non-governmental organisation
NLBI	Non-legally binding instrument
NWG	Non-wood goods
OECD	Organisation for Economic Co-operation and Development
OFAC	Observatory of Central African Forests
PEFC	Programme for the Endorsement of Forest Certification
PEOLG	Pan European Operational Level Guidelines
REC	Regional Environmental Centre
REDD	Reduced Emissions from Deforestation and Forest Degradation
RES	Renewable energy sources
SEBI	Streamlining European Biodiversity Indicators
SFM	Sustainable Forest Management
SIA	Sustainability Impact Assessment
SoEF	State of Europe's Forests
TBFRA	Temperate and Boreal Forest Resources Assessment
UN	United Nations
UNCDD	United Nations Convention to Combat Desertification
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNFF	United Nations Forum on Forests
USA	United States of America
USSE	Union of Southern European Forest Owners
WRI	World Resources Institute

1. Introduction and scope of the report

1.1 Criteria and indicators emerging in the context of sustainable forest management

Since the beginning of the 1990s, an enhanced view on sustainable forest management (SFM) has entered the stage of forest policy, and the concept of criteria and indicators (C&I) has developed as one means of implementing sustainable forest management (SFM) worldwide (Wijewardana, 2008). In the wake of the United Nations Conference on Environment and Development (UNCED) of Rio 1992, several different international processes and initiatives have developed criteria and indicators as a policy instrument to evaluate and report progress towards SFM. In addition, indicators are used in certification initiatives to support monitoring and reporting for marketing purposes (Rametsteiner and Simula, 2003) and a variety of science-based monitoring and evaluation purposes from national down to the forest management unit level (Franc et al., 2001; Raison et al., 2001), often directly referring to political SFM processes (e.g., PEFC to the pan-European process).

In Europe, the initiative to promote and officially commit to SFM is driven by the Ministerial Conference on the Protection of Forests in Europe (MCPFE). In the 1990s, a set of national-level indicators was established to initialize and standardize pan-European reporting. This set was adopted at the third MCPFE in Lisbon (MCPFE, 1998); at the fourth MCPFE in Vienna (MCPFE, 2003a) an improved set of six criteria and 35 quantitative indicators (describing the forest status and changes) and 17 qualitative indicators (describing the national forest policies, institutions and instruments used to move towards SFM) was adopted. By now, the pan-European set has served as the basis for the State of Europe's Forests assessments in 2003, 2007 and 2011 for the reference years 1990, 2000, 2005, 2010.

Reaching an advanced state after their introduction, there is a clear notion today that there is little policy implementation research on-going on the use and impact of pan-European C&I. Policy makers and administrative bodies alike are interested in knowing whether their proposed systems work, and whether their efforts in data collection and processing is useful and making a difference. End-users of C&I information are interested in using C&I data as a sound basis for their judgments.

What seems simple, tends to become complex due to the nature of SFM and the flexibility, but the high methodological demands of C&I. In principle, we can state that C&I are multi-functional in their nature. They can be used for a variety of purposes. For instance (after Linser, 2001):
- as a reporting tool in terms of description and diagnosis of a situation;
- as a communication instrument to improve clarity on complex items;
- as forecasting tools for picturing future trends;
- as tools for the collection and processing of information and interests;
- as means of political control both as controlling and decision-making instruments; and
- as instruments for checks of effectiveness of programs and measures.

From these tasks, heterogeneous demands on the development and use of indicators for SFM monitoring and assessment can be formulated (after Mendoza et al., 1999):

(i.) Indicators are to give a reliable picture of the forest situation and the complexity arising from a multi-dimensional view of forest systems.

(ii.) Indicators should gather quantitative and qualitative information from different sources and on different scales.

(iii.) The assessment of sustainable forest management calls for the participation of multiple interest groups, stakeholders and experts, and a high degree of transparency.

(iv.) There is need of case-specific clarification on which parameters and methods are used to assess sustainability. For reaching high acceptance in a SFM process, achieving consensus among the interest groups is crucial.

(v.) Analysis of indicator applications should be interactive to secure learning effects and informed decision-making.

Furthermore, crucial requirements in the design of sustainability indicators include: (i) relevance for the policy and planning processes and specific to the observed system; (ii) sensitivity to changes both in the observed system as well as in policy and management practices (Vacik and Wolfslehner, 2004); (iii) validity in terms of revealing underlying assumptions, surrogates and proxies; and (iv) links to the decision environment in forest policy and planning (Failing and Gregory, 2003).

Examining how these theoretical claims differ from the practical implementation of C&I, and how big these gaps are in quantity and quality is put to test in this study. We also want to break down the general observation in C&I research to the specific empirics and needs in the implementation of the pan-European C&I set in order to further develop a consistent, transparent, and moreover highly accepted instrument for monitoring, evaluating, and assessing SFM in Europe.

These considerations provide the framework for the following analysis of the implementation of the pan-European C&I in general, in theory, and – most relevant – in practice in the 46 signatory states of the FOREST EUROPE process.

1.2 Problem definition

As mentioned before, information on the implementation of the Pan-European C&I set is scarce and vague. This project is the first effort to collect information on the state of C&I implementation in Europe.

The particular problems we have identified refer to:

• What does it mean to implement C&I (definition, concepts)?
• How has the pan-European C&I set been implemented in practice?
• What problems and gaps have been encountered?
• What should be done to improve the situation, with respect to:
  – Practice in countries, international organizations;
  – Theory and concepts of C&I;
  – Structure and content of the pan-European set.

To address these problems, the scope of the report is defined along the following lines:

1) Definition of "Implementation of C&I"
The term "implementing criteria and indicators" is often used, but has not yet been formally defined, at least in the pan-European context. "Implementing" may be understood as putting into practice agreed objectives or methods. However, despite an extensive academic literature on C&I, there is no formal official text defining the objectives of the pan-European set. The nearest approximation is the Lisbon resolution L2, from 1998[1].

However, in the interests of clarity and structure, it is desirable to have a definition for use in the project, so the following working definition has been drawn up, after discussion inside the project team and with the advisory group, and will be used during the project.

2) Status-quo and advancement in C&I application and research
Much has been researched on C&I in the past 20 years in general. Hence, a condensation of these findings is needed to build a sound reference to the pan-European C&I set. This relates to issues such as C&I structure, indicator development and selection, C&I design vs. actual use, transparency and communication, transience among different levels of application and among different C&I and information systems.

3) Examination of implementation practice
Finally, an empirical analysis is needed in order to understand the strength and weaknesses of the current C&I set in the actual 'implementation'. The pan-European set of C&I may be implemented at several levels: pan-European, national and subnational. Consequently, experiences and expert knowledge has to be gathered on all different levels of implementation that goes beyond information in scientific literature, and findings synthesized for the further development of the C&I set. These aspects refer inter alia to (i) applicability, (ii) consistency, (iii) validity, (iv) acceptance, (v) efficiency, and (vi) flexibility of the implementation of the pan-European C&I set.

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1 The revised indicators were only endorsed by an Expert Level Meeting, not formally approved by ministers in Vienna, and contain no formal definition of objectives.

1.3 Aims and structure of the report

Following the outline of the emerging role of C&I for SFM monitoring and assessment, the increasing demands towards a C&I set, and the problem definition arising from the need for better understanding the implementation of C&I, the State-of-the-Art report has the following main objectives:

1) To provide a definition and structured framework for the analysis of the implementation of C&I for SFM;

2) To provide a historical overview of the different developments of the pan-European C&I for SFM at European, national and other sectors level;

3) To review indicators with respect to conceptual validity, data availability, linkages to other indicators, and actual and potential challenges in implementation;

4) To conduct a sound analysis of the current practice of C&I implementation based on the working definition, and synthesizing the state-of-the art of scientific literature with expert knowledge of policy makers, C&I experts, and practical advisors;

5) To study the modes of C&I implementation on international, European and national levels and link the findings to outcomes and impacts of C&I implementation as well as to the implementation environment in terms of procedure, infrastructure, and capacities;

6) To identify demands and potentials for the further development of the pan-European C&I set by drawing conclusions from lessons learned of the past process and current practice.

The report is structured as follows:

Chapter 2 sets the context of how C&I have been developed and used worldwide and in Europe. It relates the role of C&I to the emerging concept of SFM and the international dialogue on forests. It introduces the pan-European SFM process FOREST EUROPE, and outlines the genesis of the pan-European C&I set, its development, purpose, structure, and procedural progress.

Chapter 3 provides a state-of-the-art review of the scientific discourse on C&I methodology and application. It looks at C&I development, structure and design, fields of applications, indicator systems and logical frameworks, data quality and availability, consistency and validity of C&I systems, and distils major findings to be pursued further in the context of the pan-European C&I set.

Chapter 4 provides the methodology applied to the empirical part of the study, in particular as regards: (i) the working definition of implementing C&I; (ii) quantitative analysis of C&I as reported in the State of Europe's forests reports; (iii) interview design of experts; (iv) nationals assessments and (v) regional perspectives of C&I implementation with dedicated workshops.

Chapter 5 presents the major empirical findings on the implementation of C&I. It summarizes the state of implementation of MCPFE commitments related to C&I and gives insight into pan-European and national approaches on C&I implementation (monitoring, reporting, data collection, communication, policy formulation and other fields of application). It provides analysis on strength and weakness of C&I implementation, and identifies potentials for further improvement of the C&I set in terms of usability, effectiveness, consistency, and compatibility of the current C&I set with other information instruments.

Chapter 6 builds a synthesis of the cumulative findings and lessons learnt obtained during the various analyses. It provides a clear perspective on the current status of C&I implementation and the main trends associated with the various fields of applications.

Chapter 7 draws conclusions delivering an outlook for future development of C&I (i) at the pan-European level and to international organizations, (ii) for policy makers at the national and sub-national levels, inside and outside the forest sector, (iii) the research community, (iv) for a broad range of affected stakeholders. It proposes recommendations to overcome the challenges identified during the investigation of this study.

The report shall serve as a state-of-the-art document on the implementation of the pan-European C&I set, and may serve as a reference and input for the further development of C&I in the Forest Europe process, and in the negotiations on a legally-binding instrument on SFM in Europe.

2. Setting the context

2.1 Background

2.1.1 The concept of sustainable forest management

Since the publication of the Brundtland report, *Our Common Future* (WCED, 1987), the principle of sustainable development has been widely recognized and defined as:

> *... development that meets the needs of the present without compromising the ability of future generations to meet their own needs* (WCED, 1987).

Although the principle of sustainability has been recently accepted, Wiersum (1995) argues that it has been accepted in forestry since the eighteenth century when early forest managers in Europe developed an understanding of natural forestry productivity and how it might be enhanced through silviculture to maintain a continuous supply of wood, game, and other products for human use and consumption. The concept was fundamentally driven by the desire to avoid the social and economic disruption associated with shortages of timber, whether for local use or as the basis for a community export economy. During the past century, the concept of sustainability in forestry has evolved to a greater depth and richness. Our vastly expanded understanding of the complex functioning of forest ecosystems, and a recognition of the full range and diversity of resources, values and ecological services that forests represent, has created new challenges and opportunities (Sample, 2004). Nowadays, sustainable forest management (SFM) has become a key concept that underpins modern forestry. It refers not just to the flow of goods and services but also to maintaining forest ecological processes essential for maintaining ecosystem resilience – the capacity of a forest ecosystem to recover following disturbance (Thompson et al., 2009). It relates to the *multiple uses* and *functions* of the forests (e.g., wood production, collecting non-wood forest products, recreation, protection of soil and water resources, biodiver-

sity conservation, carbon sequestration) and aims to maintain and enhance social, cultural, environmental and economic values of forests for the benefit of present and future societies. The new understanding of the concept became increasingly influential with the increasing rates of deforestation and degradation of the world's forests, and has become an integral component of international agreements and forest policy deliberations in the past two decades.

2.1.2 The international dialogue on world's forests

a. Sustainable forest management as an international challenge

In the political context, the concept of SFM was first set out at the United Nations Conference on Environment and Development (UNCED), often referred to as the Earth Summit, in Rio de Janeiro, in 1992. The discussions and negotiations were mainly focused on the management, conservation and sustainable development of forests and whether or not to launch negotiations for an international legally binding instrument for forests. However, attempts to agree on a forest convention failed, leading to the adoption of the Forest Principles (in full the "Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forests") and Chapter 11 of Agenda 21 on "Combating Deforestation". In that context, the world governments declared:

> *... to support the management, conservation and sustainable development of all types of forests, both natural and planted, in all geographical regions and climatic zones* (UNCED, 1992c).

They also called for the formulation of scientifically sound criteria and guidelines for the management and sustainable development of all types of forests. While discussions and agreements on forests have intensified since UNCED, a number of

international processes and initiatives (e.g., ITTO[1], FAO[2], UNFF[3]) have been launched upon the need to define what constitutes SFM and how to monitor and assess its progress. Although there is no single universally agreed definition of SFM the most widely, inter-governmentally agreed definition is the one adopted by the General Assembly of the United Nations in December 2007:

> *Sustainable forest management, as a dynamic and evolving concept, aims to maintain and enhance the economic, social and environmental value of all types of forests, for the benefit of present and future generations (UNFF, 2007).*
>
> *The elements [of sustainable forest management] are: (i) extent of forest resources; (ii) forest biological diversity; (iii) forest health and vitality; (iv) productive functions of forest resources; (v) protective functions of forest resources; (vi) socio-economic functions of forests; and (vii) legal, policy and institutional frameworks (UNFF, 2007).*

Similarly, a number of regional initiatives have been established in Africa, Central America, the Amazon basin, Asia and Europe, e.g., Helsinki Process for Europe (1993), Montréal Process for North America (1993), Tarapoto Process for the Amazon (1995), and the African Timber Organization's Criteria and Indicators (1996). Despite the broad debates and varying definitions of SFM in the different processes worldwide (e.g., ITTO, FAO, Montréal process, MCPFE[4], Tarapoto, UNFF), often there is a common reference to the environmental, social and economic values and uses of the forests.

In the pan-European context, the term was defined conceptually in a political context at the Second Ministerial Conference of Protection of Forests in Europe (MCPFE) in Helsinki in 1993:

> *"Sustainable management means the stewardship and use of forests and forest lands in such a way, and at a rate, that maintains their biodiversity, productivity, regenera-*

tion capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems." (Helsinki 1 Resolution, MCPFE, 1993)

The pan-European definition, as many others, emphasizes the multiple functions of the forests and can be characterized as the maintenance of balance between society's increasing demands for forest products and benefits, and the conservation of forest health and biodiversity.

The importance of the social, economic, environmental, cultural and spiritual aspects of forests have been emphasized in many efforts through which international and national organizations seek both political understanding and the practical means and ways to sustainably manage all types of forests. These efforts include, among others, the development of guidelines and criteria and indicators, which have contributed to a better understanding of what SFM actually means (ISCI, 1996).

b. The International forest regime
The debate on the conservation and sustainable management of forests as well as on the question of an international legal instrument for forests takes place in various processes and initiatives which are jointly called the *"international forest regime"*. This includes global and regional processes, international and multi-lateral organizations as well as the three Rio Conventions: (i) the United Nations Framework Convention on Climate Change (UNFCCC), (ii) the Convention on Biological Diversity (CBD) and (iii) the United Nations Convention to Combat Desertification (UNCCD). While the international community failed to reach consensus on the contents of a forest convention, the three Rio conventions were set as legally binding agreements. Although they consider only certain aspects, functions and roles of forests, their objectives have a tremendous influence on the concept developments, understanding and implementation of SFM and have stimulated a number of political discussions and debates (e.g., the Ecosystem Approach and its interlinkages to forests, *Reducing Emissions from Deforestation and Degradation* – REDD*).*

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1   International Tropical Timber Organization
2   Food and Agriculture Organization of the United Nations
3   United Nations Forum on Forests
4   Ministerial Conference on the Protection of Forests in Europe

Since it is outside the scope of this study to discuss what the different views have been in the international negotiations aimed at a global forest convention, it is sufficient to say that in order to advance beyond the agreements contained in the "Forest Principles" and Chapter 11 of Agenda 21, intergovernmental discussion and debate continued, first under the Intergovernmental Panel on Forests (IPF), and then under the Intergovernmental Forum on Forests (IFF). IPF and IFF agreed to more than 200 proposals for action towards SFM, but were not able to resolve many issues related to finance, transfer of technology and trade. The discussions also failed to build an agreement on an international legal instrument for forests. Countries eventually reached a compromise that resulted in the establishment of the United Nations Forum on Forests (UNFF), with the main objectives to promote the management, conservation and sustainable development of all types of forests and to strengthen long-term political commitment. Since 2000 the UNFF is the platform for the enhancement of the discussions on SFM at the global level. One of the most prominent outcomes is the *Non-Legally Binding Instrument (NLBI) on all types of forests* (UNFF, 2007), with the option to negotiate on a *Legally Binding Instrument (LBI)* in the future. Within the UNFF negotiations on a NLBI, C&I are considered as a conceptual framework to provide a common understanding of what is meant by SFM as well as a useful tool for monitoring, assessment and reporting towards its progress.

To support the work of UNFF and to promote close cooperation and coordination on forests between major multi-lateral international organizations, a Collaborative Partnership on Forests (CPF) was established in 2001. The CPF consists of 14 international organizations working together to improve forest management and conservation and the production and trade of forest products. In addition, the number of forest-relevant international and multi-lateral organizations and associated initiatives (e.g., the Tropical Forest Action Plan, the World Bank, UNDP, WRI) has significantly increased over the years. Also relevant are a series of non-governmental processes, for example, the Forest Stewardship Council (FSC), the Programme for the Endorsement of Forest Certification (PEFC), the World Commission on Forests and Sustainable Development, and the CIFOR International

Dialogue on Sustainable Forest Management – that have taken place and expanded the debate around issues like forest certification, integrated land management, and how to build institutional capacity and the role of forests in global ecological cycles. Non-governmental organizations (NGOs) have also been particularly active in international discussions and initiatives on forests. In the past years, they have contributed to important decisions on conservation and protected area issues.

The most recent developments in international forest policy include the climate talks focused on REDD+, the World Bank/FAO initiative on indicators to monitor and assess forest governance, and efforts by FAO and the International Energy Agency (IEA) to develop principles, C&I for sustainable woodfuel production, as well as recent collaboration among C&I processes and FAO to streamline and rationalize national reporting for the global forest resources assessment in 2015 (FRA 2015). While the UN Conference on Sustainable Development (Rio+20) in 2012 marked 20 years since the Forest Principles were adopted at the 1992 Rio Conference, the International Year of Forests 2011 as well as the International Day of Forests (March 21) first held in 2013, have underscored the value of forests and SFM worldwide.

2.2 Criteria and indicators for sustainable forest management

Over the last few decades, the need for justification and legitimacy of political actions in objective and quantified terms has led to the increasing use of evaluation approaches in almost all fields of human activity to determine whether policies or programmes are working effectively and to demonstrate that their resources are used in a responsible manner. For example, trends towards new public management and evidence-based policy making indicate that the world of public management has become, first and foremost, a world of measurement. In such a performance-indicator culture, it comes as no surprise that the notion of evaluation becomes increasingly important (Pregerning et al., 2012). In the fields of environment and sustainable development policy, evaluation also plays an important role. One of the main issues associated with negotiating a sustainable future is to define sustainability and then determine progress towards this goal (Hickey

and Innes 2005). This is the aim of C&I. A criterion has been defined as *"a standard that a thing is judged by"* while an indicator has been defined as *"any variable...used to infer performance"* (Prabhu et al. 2001 cited in Pregerning et al. 2012).

2.2.1 The intended role of criteria and indicators in forest policy

C&I for SFM have taken a prominent role since the Rio Earth Summit in 1992, as Chapter 11 of the Agenda 21 called for the formulation of scientifically sound criteria and guidelines for the management and sustainable development of all types of forests:

> *...indicators of sustainable development need to be developed to provide solid bases for decision-making at all levels and to contribute to a self-regulating sustainability of integrated environment and development systems* (Chapter 11, Agenda 21, UNCED, 1992b).

Following the UNCED decisions, the international community has widely recognized and acknowledged the important role that indicator systems can play towards the achievement of long-term SFM. Various international and regional processes and initiatives (see Table 1) have led to the development C&I for SFM for use at international or regional level, national and sub-national, as well as forest management unit (FMU) levels. Different stakeholder groups (e.g., forest owners/managers, policy makers, scientists and civil society) with different views and interests are involved in the development process, reflecting the increasing global demand for sustainable economic growth, social equality, environmental conservation and good governance. In broader terms, C&I have been considered as useful tools to promote improved forest management practices as an integral part of sustainable development by*:*

- Providing a conceptual framework that characterizes the essential components of SFM;
- Providing a measure of the state of forests and their management, and thus assessing progress towards the achievement of SFM;
- Identifying trends and changes as well as emerging gaps and threats in the conditions of forests and their management;

- Determining the effects of forest management interventions over time;
- Facilitating decision-making in national forest policy processes;
- Providing a reference framework for the formulation and evaluation of national forest policies and programmes;
- Identify enabling conditions and mechanisms, including financial and technical resources that affect national implementation of C&I;
- Clarifying issues related to forest certification and marketing of forest products even though C&I are not performance standards.

In that context, Rametsteiner (2001) differentiates between two major areas of use of SFM indicators: (i) the collection of information; and (ii) the utilization of information for policies. The core user groups of information on SFM indicators collected in forest policy contexts are governmental organizations, such as forest policy institutions, environmental institutions or national accounting services, forest owner and forest owner interest groups, and environmental groups. These groups can use indicators for different purposes at a international and/or regional scale, national and sub-national as well as the FMU levels (Rametsteiner, 2001). Table 1 is a summary of the most prominent and various roles C&I for SFM can serve at the different levels.

2.2.2 Criteria and indicators for sustainable forest management developed within the international and regional initiatives

Already in 1991, the International Tropical Timber Organization (ITTO) developed C&I for sustainable management at the FMU level to:

> *assess the conditions of natural tropical forests in producer member countries and help identify weaknesses in forest practices and improvements needed* (ITTO, 1992).

By 2000, based on ITTO's pioneering work and the outcomes of the Rio Conference, eight post-UNCED international initiatives and processes worldwide had been established for the development and implementation of C&I for SFM at various levels (Table 2).

Table 1. Role of criteria and indicators for sustainable forest management at different levels.

Role of criteria and indicators	
International and/or regional scale	• Support international forest policy deliberations and negotiations on issues related to sustainable forest management • Provide a common understanding within and across countries of what is constituted by sustainable forest management • Provide a basis for collecting, categorizing, analyzing, reporting, and representing information the state of forests and their management • Provide an international reference for policy makers in the formulation of national policies and programmes • Serve as a basis for international cooperation and collaboration on SFM activities
National and sub-national level	• Describe, monitor, and report on the national forest trends and changes • Assess progress towards sustainable forest management and identify emerging threats and weaknesses • Assist in the development and evaluation of national and/or sub-national forest policies, strategies, plans and programmes • Serve as a basis for cross-sectoral forest related data collection • Focus research efforts where knowledge is still inadequate
Forest management unit level	• Evaluate management practices, control forest concessions and clarify issues related to certification. • A basis for developing forest certification systems (e.g. PEFC)

Source: FAO/ITTO, 1995; ISCI, 1996; IPF, 1997; FAO, 2001 and 2003.

The MCPFE C&I for SFM were developed in 1993 as "*a basis for international reporting and the further development of national indicators*" (Lisbon 2 Resolution, MCPFE, 1998). At the same time, C&I for West and Central Africa were developed under the auspices of the African Timber Organization (ATO) to promote implementation of SFM at regional, national and FMU levels. In addition to these initiatives, an indicator set for temperate and boreal forests was developed under the Montréal Process in 1995 to provide a common framework for member countries to describe, monitor, assess, and report on national forest trends and progress toward SFM. Similarly, in order to define the patterns by which the sustainability of the Amazonian forest can be evaluated, eight countries of the Amazon Basin have jointly developed regional C&I for sustainability, known as the Tarapoto Process. In the mid-1990s three other C&I initiatives were launched supported by the Food and Agriculture Organization (FAO) and United Nations Environment Programme (UNEP): the African Dry Zone, the Near East Process, and the Dry Forest Asia initiative. Similarly, in 1997, C&I for regional and national level have been developed in Central America under the Lepaterique Process. While each process differs in specific content or structure, they are all conceptually similar in objective and approach. C&I of all the international, regional and national processes and initiatives centre around seven globally agreed elements of criteria for SFM[5]:

• Extent of forest resources;
• Biological diversity;
• Forest health and vitality;
• Productive functions of forest resources;
• Protective functions of forest resources;
• Socio-economic functions;
• Legal, policy and institutional framework.

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5   The seven key thematic elements of sustainable forest management have been identified at the International Conference on the Contribution of Criteria and Indicators for SFM (CICI) in Guatemala in 2003, as well as at the Expert Consultation on Criteria and Indicators for SFM (ECCI) in the Philippines in 2004.

Table 2. Summary of international and regional C&I processes and initiatives.

Year	International and regional process/initiative	Region/ Forest Types	Number of Member Countries	Number of criteria	Number of indicators	C&I level
Prior to UNCED						
Early 1992	ITTO	Humid tropical forests	55	7	66	National FMU
Post-UNCED						
1993	African Timber Organization (ATO)	West and Central Africa	13	28	60	National FMU
1993	FOREST EUROPE (former MCPFE)	Europe (boreal, temperate and Mediterranean-type forests)	46 + EC	6	35	Regional National
1995	Dry Zone African Process	North, East and Southern Africa	29	7	47	Regional National
1995	Montréal Process	Temperate and boreal forests	12	7	67	National
1995	Tarapoto Proposal	Amazon Forest	12	7	47	International National FMU
1996	Near East Process	Near East	30	7	65	National
1997	Lepaterique Process	Central America	7	4 regional 8 national	40 regional 53 national	Regional National
1999	Dry Forest Asia Process	South and Central Asia	9	8	49	National

Source: FAO, 2001; Requardt, 2007; ITTO, 2012.

While agreement on common criteria facilitates international dialogue and communication on forest-related issues between the different C&I processes, there is no globally agreed set of indicators for those criteria, as indicators need to be adjusted to the ecological, economic, social and institutional conditions and needs of each region. There is also unwillingness to agree on a single global set of indicators as that could be interpreted as the embryo of a global compulsory set of standards.

Parallel to the work carried out in the forestry sector, similar initiatives involving criteria and/or indicators have emerged under other international instruments or processes where forests are part of another focal theme, such as sustainable development (OECD and the UN Commission on Sustain-

able Development – CSD), biodiversity conservation (Convention on Biological Diversity – CBD), combating desertification and deforestation (UN Convention to Combat Desertification – UNCCD), etc. (FAO, 2003).

2.3 The pan-European process

2.3.1 The FOREST EUROPE – Ministerial Conferences on the Protection of Forests in Europe (MCPFE)

The Ministerial Conference on the Protection of Forests in Europe (now referred to as FOREST EUROPE) has shaped the pan-European forest dialogue for more than 20 years now. It has been recognized not only as an international platform for national policy setting, providing links between global and regional policy developments, but also as a platform for the cooperation between policy and science. Over the years, FOREST EUROPE has promoted and reinforced cross-border cooperation on forest policies throughout the European region. A number of concepts (e.g., sustainable forest management) have been introduced into the European forest policy arena. The main activities are centred around developing and updating policies and tools for maintaining the multiple functions of the forests crucial to society and for enhancing the lasting provision of goods and services. FOREST EUROPE is a well-established continuous and multi-stakeholder participatory process that currently involves 46 European countries and the European Community. In cooperation with a wide range of international institutions, scientific organizations and civil society groups, the pan-European process demonstrates its political will and commitment to implement long-term management and conservation of the European forests.

FOREST EUROPE is based on Ministerial Conferences, follow-up Expert Level Meetings (i.e., the decision-making body in the working process between the conferences), Round Table Meetings (i.e., the platform to exchange information and views on emerging issues), and Workshops and Working Groups (i.e., the platform to discuss specific subjects of scientific or technical nature). The work of FOREST EUROPE and its Liaison Unit (LU) is coordinated by the General Co-ordinating

Committee (GCC)[6] on implementation of FOREST EUROPE decisions and on strategic developments. The Liaison Unit (LU) is the service-support office of FOREST EUROPE and is responsible for organizing and conducting all FOREST EUROPE meetings as well as for preparing reports and documents necessary for the meetings. The location of the LU is changed according to the country of chairmanship (currently, the LU is based in Madrid as Spain holds the chairmanship of FOREST EUROPE until the next Ministerial Conference).

Up to now, six Ministerial Conferences, considered as landmarks in the development of European forest policies, have been held:

- **1st MCPFE**, 1990 Strasbourg
  Initiating Cross-Border Mechanisms for the Protection of Forests in Europe
- **2nd MCFPE**, 1993 Helsinki
  A Commitment to Sustainable Forest Management in Europe
- **3rd MCPFE**, 1998 Lisbon
  Recognising the Multiple Roles of Forests
- **4th MCPFE**, 2003 Vienna
  European Forests-Common Benefits, Shared Responsibilities
- **5th MCPFE**, 2007 Warsaw
  Forests for Quality of Life
- **6th MCPFE**, 2011 Oslo
  European 2020 Targets for Forests and Launching Negotiations for a Legally-Binding Agreement

Important documents of the Ministerial Conferences are the adopted declarations and resolutions, reflecting the FOREST EUROPE regional approach towards the protection and sustainable management of forests on the pan-European level. As already mentioned, the concept of SFM was defined at pan-European level and outlined in **Helsinki 1 Resolution**, providing a general forest policy direction and a long-term goal. The Helsinki conference also set the beginning of the development of the pan-European C&I for SFM and the pan-European Operational Level Guidelines (PEOLG) to promote SFM and facilitate the evaluation of progress towards it. Although the

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6   The GCC is at present (2013) constituted by five countries: Norway, Spain, Slovak Republic, Turkey, and Germany.

definition has not been changed since its adoption, the general regional approach of FOREST EUROPE is continuously developed, and constantly adapting to new policy challenges and areas of concerns for the effective planning, manage and delivery of forest goods and services. Even though non-legally binding, the adopted declarations and resolutions are implemented at the national and regional levels, enhancing a common understanding, development and implementation of actions towards SFM. Key elements of the work between the Ministerial Conferences are the FOREST EUROPE Work Programmes implemented jointly with existing international scientific and technical institutions and organizations working in the field of forestry. This important pan-European cooperation constitutes a guiding principle of the MCPFE and includes the Food and Agriculture Organization of the UN (FAO), the UN Economic Commission for Europe (UNECE), the European Commission (EC), the UN Environment Programme (UNEP), the Union of Foresters of Southern Europe (USSE), research institutions such as the International Union of Forest Research Organizations (IUFRO), the European Forest Institute (EFI), the Regional Environmental Centre (REC), and the International Plant Genetic Resources Institute (IPGRI), NGOs and other relevant international and national forest authorities and institutions.

2.3.2 The pan-European criteria and indicators for sustainable forest management

a. Development
The development of the pan-European C&I for SFM is the result of a multi-stakeholder participatory process, led by governments, formed by different forest stakeholders and experts representing different backgrounds, views, interests and information requirements. In the follow-up process to the 1993 Helsinki Conference, the pan-European C&I were developed as a common policy instrument to monitor, evaluate and report progress towards SFM. In that context, criteria were defined as standards that:

> *...characterise the essential elements or set of conditions or processes by which sustainable forest management may be assessed* (MCPFE, 2002b).

Indicators were defined as variables that:

> *...show changes over time for each criterion and demonstrate the progress made towards its specified objective* (MCPFE, 2002b).

To fulfil their purpose, indicators shall be (MCPFE, 2001a and 2001b):
- uniform across Europe;
- applicable on national level;
- coherent with the Ministerial Conference Resolutions, especially H1 and H2;
- comprehensive and simple;
- reportable;
- adjustable.

In 1994, at the MCPFE Expert Level Meeting in Geneva, a core set of six criteria formulated as policy goals, 27 quantitative and 101 descriptive indicators was developed, adopted and presented at the conference of the United Nations Commission on Sustainable Development (CSD) in 1995. Jointly with the ITTO C&I for SFM, the first MCPFE C&I catalogue formed an important basis and supported other regional processes (e.g., Montréal Process) to develop C&I for SFM (Requardt, 2007).

At the 1998 Ministerial Conference in Lisbon, the MCPFE reported on the status of SFM in Europe by using the pan-European C&I, based on preliminary results of the UN-ECE/FAO Temperate and Boreal Forest Resources Assessment in 2000 and on additional data. Noting that C&I can play a prominent role towards the realization and implementation of a long-term SFM, the Signatory States and the European Community gave them a high political status by adopting Resolution L2 "Pan-European Criteria, Indicators and Operational Level Guidelines for Sustainable Forest Management". Since the development of the first pan-European indicator set, knowledge, data collection procedures and information needs have progressively developed and as a result, the existing pan-European indicator set was improved and approved by the MCPFE Expert Level Meeting in Vienna 2002. It was officially endorsed by the MCPFE Vienna Conference in 2003 (Table 3), signifying the consensus achieved by the European countries on the most important aspects of SFM. An Advisory Group (AG), representing relevant organizations in Europe, was formed to as-

sist the MCPFE during the improvement process by ensuring comprehensive utilization of the existing knowledge on indicators and data collection aspects in Europe. The Advisory Group consulted with a wide range of experts through a series of four workshops, which ensured that the diversity of national situations and experiences as well as the work undertaken by various bodies in Europe were adequately reflected (MCPFE, 2002a). It is also important to note that the relevant terms and definitions used for the pan-European C&I are in compliance with the TBFRA/FRA terminology. Furthermore, in order to give a comprehensive picture of protected and protective forests and other wooded land in Europe, while keeping links to international classification systems used for all kinds of protected area, an MCPFE Classification of *Protected* and *Protective Forests and Other Wooded Land* in Europe was established making more distinctions than the classifications of the *International Union for Conservation of Nature* (IUCN) and the Common Database on Designated Areas (CDDA) of the European Environment Agency (EEA) (MCPFE, 2001c).

b. Structure

In line with the seven key thematic elements of SFM, the improved pan-European set (see Table 3) consists of six criteria:

1) Maintenance and appropriate enhancement of forest resources and their contribution to global carbon cycles;

2) Maintenance of forest ecosystem health and vitality;

3) Maintenance and encouragement of productive functions of forests (wood and non-wood);

4) Maintenance, conservation and appropriate enhancement of biological diversity in forest ecosystems;

5) Maintenance, conservation and appropriate enhancement of protective functions in forest management (notably soil and water); and

6) Maintenance of other socio-economic functions and conditions.

The fulfilment of the six criteria can be evaluated through 35 quantitative indicators which show changes over time for each criterion and demonstrate the progress made towards its objectives

(MCPFE, 2000a). On the other hand, 17 qualitative indicators enable monitoring of the overall policies, institutions and instruments regarding national SFM, enhance accountability and transparency of policy making and allow better understanding of the interplay between the state of forests and policy-making. Up to now, the pan-European set has served as the basis for State of Europe's Forests assessments in 2003, 2007 and 2011 and provided information on the status and changes of major aspects underlying SFM. This information is meant to facilitate the evaluation of the achievements towards each criterion's goals (FOREST EUROPE, 2011a). Irrespective of the improvement of the pan-European C&I, the FOREST EUROPE signatories have committed themselves to continue to promote development and implementation of C&I at a national level by further improving the "*basis for forest monitoring and harmonized reporting systems*" in order to fulfil the needs of information for national and international reporting on SFM. They recognized also the need for continuity of terms and definitions and decided to proceed to implement, continuously review and further improve the associated indicators (MCPFE, 2002a,b; FOREST EUROPE, 2011a).

c. Purpose

In accordance with the achieved harmonization basis, the potential role of the pan-European C&I in supporting scientific, political and operational work undertaken with regard to SFM has been widely recognized. At the 1998 Lisbon Conference, the political commitments made by the European forest ministers and the European Union in relation to the development and implementation of the pan-European indicators were outlined. Although clear objectives were not specified, FOREST EUROPE signatory states and the European Community officially have agreed to use the pan-European C&I as "*a basis for international reporting and the further development of national indicators*" (Lisbon 2 Resolution, MCPFE, 1998) and a tool for monitoring, evaluating and reporting progress towards SFM. In general terms, by the use of pan-European set as a common system for measuring and reporting national data, two major objectives can be achieved: (i) to provide a pan-European overview representing the state and trends of European forests, and (ii) to allow demonstration to the

Table 3. Improved pan-European criteria and indicators for sustainable forest management (MCPFE, 2002a).

C1 Maintenance and Appropriate Enhancement of Forest Resources and their Contribution to Global Carbon Cycles	C4 Maintenance, Conservation and Appropriate Enhancement of Biological Diversity in Forest Ecosystems
1.1 Forest area and OWL 1.2 Growing stock 1.3 Age structure and/or diameter distribution 1.4 Carbon stock	4.1 Tree species composition 4.2 Regeneration 4.3 Naturalness 4.4 Introduced tree species 4.5 Deadwood 4.6 Genetic resources 4.7 Landscape pattern 4.8 Threatened forest species 4.9 Protected forests
C2 Maintenance of Forest Ecosystem Health and Vitality	C5 Maintenance and Appropriate Enhancement of Protective Functions in Forest Management
2.1 Deposition of air pollutants 2.2 Soil condition 2.3 Defoliation 2.4 Forest damage	5.1 Protective forests – soil, water and other ecosystem functions 5.2 Protective forests – infrastructure and managed natural resources
C3 Maintenance and Encouragement of Productive Functions of Forests	C6 Maintenance of Other Socio-Economic Functions and Conditions
3.1 Increment and fellings 3.2 Roundwood 3.3 Non-wood goods 3.4 Services 3.5 Forests under management plans	6.1 Forest holdings 6.2 Contribution of forest sector to GDP 6.3 Net revenue 6.4 Expenditures for services 6.5 Forest sector workforce 6.6 Occupational safety and health 6.7 Wood consumption 6.8 Trade in wood 6.9 Energy from wood resources 6.10 Accessibility for recreation 6.11 Cultural and spiritual values
A. Overall policies, institutions and instruments for sustainable forest management	B. Policies, institutions and instruments by policy area
A.1 National forest programmes or similar A.2 Institutional frameworks A.3 Legal/regulatory frameworks and international commitments A.4 Financial instruments/economic policy A.5 Informational means	B1 Land use and forest area and OWL B2 Carbon balance B3 Health and vitality B4 Production and use of wood B5 Production and use of non-wood goods and services, provision of especially recreation B6 Biodiversity B7 Protective forests B8 Economic viability B9 Employment (incl. safety and health) B10 Public awareness and participation B11 Research, training and education B12 Cultural and spiritual values

OWL= Other wooded land

public of whether progress is being made towards achieving certain commitments (Prins, 2002). Based on the implementation of MCPFE commitments (1998–2011), particularly in relation to the Lisbon 2 Resolution, the pan-European C&I are considered as (MCPFE, 2003a, 2007a, FOREST EUROPE, 2011c):

- Framework for international reporting on the trends and changes in the state and conditions of forests and forest management in Europe;
- Framework for the management, monitoring and reporting on SFM and related policies;
- An instrument to evaluate existing sets of national or sub-national C&I, and also newly established guidelines;
- Framework for promoting better management and forest policy enhancement;
- Basis for data collection and the drawing up of country reports on forest resources and their management;
- Functional tool contributing to international agreements towards SFM and forest certification;
- Basis for developing of national standard and certification of management systems.

In addition, the pan-European set has been viewed as a potentially useful instrument to formulate, monitor and evaluate National Forest Programmes (NFPs), designed to implement and realize a common strategy and policy of a long-term SFM within Europe.

2.3.3 Cooperation and collaboration among C&I for SFM processes and initiatives

Concerning the role of the pan-European C&I for international reporting to FOREST EUROPE, it was soon realized that co-operation with relevant organizations (i.e., UNECE, FAO) and the work undertaken under the agenda of FRA and TBFRA is needed in order to avoid duplication of efforts and overlap among the processes and to facilitate comparisons between countries. As a result, over the last two decades there has been collaborative work towards harmonization as well as improved communication and coordination among the processes. Harmonization relates to the *"existing con-*

cepts which should be brought together in a way to be more easy to compare, which could be seen as a bottom up approach starting from an existing divergence and ending in a state of comparability" (Köhl et al., 2000). Since the first expert meeting on the harmonization of C&I for SFM, held in Rome in 1995, there have been a number of international seminars, conferences and workshops on how to clarify terminology and facilitate comparison between countries. Although there was general agreement on the need to ensure comparability between the different processes, it was also recognized that they should pursue their goals unimpeded, and in a way that would be compatible with their particular environmental and socio-economic contexts (FAO, 1997). In the following years, further possibilities for improvements in harmonizing ongoing initiatives related to C&I (e.g., ITTO, Montréal process, FOREST EUROPE, FAO FRA) have been discussed at the Inter-Criteria and Indicator Process Collaboration Workshop (held in Poland 2006), the Forest Criteria and Indicators Analytical Framework and Report Workshop (held in Finland, 2008), the International Seminar on Challenges of SFM -Integrating Environmental, Social and Economic Values of Forests (held in Japan, 2011). Subsequently, the Joint Workshop of the Montréal Process, Observatory of Central African Forests (OFAC), ITTO, FOREST EUROPE and FAO in Canada, in October 2011 has led to a process to develop a Collaborative Forest Resources Questionnaire (CFRQ) in order to reduce the proliferation of monitoring requirements and associated reporting burdens imposed by the different processes and initiatives. In addition, in 2012, the Technical Consultation on *"Preparation for Global Forest Resources. Assessments 2015"* held in Ispra, (Italy) and the *"Streamlining Forest Based Reporting"* Workshop in Florida (USA) have further highlighted the benefits of collaborative work among the processes and continued relevance of C&I for SFM. However, in spite of these joint efforts to streamline and rationalize national reporting for Tropic, FRAs and regional forest assessments, the need to continue to strengthen efforts to reach global consensus on key concepts and terms used in the international discussion on C&I has been underscored.

Figure 1. Major developments in FOREST EUROPE with respect to sustainable forest management and criteria and indicators since UNCED in 1992.

FOREST EUROPE
Ministerial Conference Oslo (Work Program Item 1: Further development of sustainable forest management and its tools)

FOREST EUROPE, UNECE and FAO: Status and Trends in Sustainable Forest Management in Europe (State of Europe's Forests 2011)

MCPFE is renamed
FOREST EUROPE

MCPFE Reporting on
Sustainable Forest Management
(State of Europe's Forests 2007)

MCPFE Reporting on Sustainable
Forest Management
(State of Europe's Forests 2003)

**Improved pan-European
indicators for sustainable
forest management
(MCPFE Expert Level
Meeting, Vienna)**

Lisbon 2 Resolution:
Pan-European Criteria, Indicators and Operational Level Guidelines for SFM (MCPFE, Lisbon)

Development and adoption of the first C&I for SFM set (MCPFE Expert Level Meeting, Geneva)

Helsinki 1 Resolution:
Definition of sustainable forest management in Europe (MCPFE, Helsinki)

United Nations Conference on Environment and Development (Rio Summit)

Forest Principles and Agenda 21: Sustainable forest management as a key component of sustainable development (UNCED, Rio de Janeiro)

Criteria and guidlines for the management and sustainable development of all types of forests (UNCED, Rio de Janeiro)

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3. The conceptual basis of the pan-European criteria and indicators for sustainable forest management

3.1 C&I: genesis and requirements

The development of sustainability indicators as a basis for decision-making processes has been called for by the Agenda 21. These indicators are intended to serve as instruments for measuring progress towards reaching the goal of sustainable development.

Generally spoken, indicators help measure trends, monitor changes, and support assessments. Sustainability indicators in particular should create meaning and give information about the interlinkages between human, economic and environmental systems. Such indicators *"offer an understanding of how human actions affect different dimensions of sustainability (economy, environment, social issues)"* (Rametsteiner et al., 2011). The sustainability dimensions are based on normative principles, which build a reference frame for C&I. Among these are the principles of common but differentiated responsibilities, inter-generational equity, intra-generational equity, justice, participation and gender equality, as well as boundary definitions e.g., of the forest or the forest sector.

Several organizations and governments have issued sets of sustainability indicators by now: for instance the United Nations Commission on Sustainable Development (CSD) presented its first set in 1995; in the context of the European Union a set of sustainable development indicators have been launched in the beginning of 2000 and have been refined in 2007. In the wake of presenting sustainability strategies, some countries have also developed indicator sets – some are detailed, while others are less specific. Sector-specific sustainability indicator sets have also been put forward – for example, for forestry by the Ministerial Conference of the Protection of Forests in Europe (MCPFE), and for the agricultural and transport sectors led by the European Environmental Agency (EEA). More recently, indicators have been employed in a variety of impact assessment tools (Ness et al., 2007). The EU Commission has been fostering the approach of Sustainability Impact Assessment (SIA) to overcome sectoral boundaries by identifying potential impacts of policy actions and support policy and decision-making processes in the context of sustainable development (EC, 2002).

Whatever C&I approach or scheme is followed, in principle C&I for SFM are applied on three different levels: (a) international and national, (b) sub-national/local, (c) forest management unit. Implementation on all three levels is deemed important (Wijewardana, 2008). Furthermore, C&I have been used to a certain extent with different purpose in marked-based certification instruments (Rametsteiner and Simula, 2003). All these levels face heterogeneous expectation and claims. C&I have to achieve a balance between system validity and reducing complexity. They need to condense key information in an understandable and communicable way as a form of constructed knowledge, while maintaining reliable and sound information on ecological, economic, and social aspects, which interact with each other, and can be furthermore related to the goals of sustainable management (Linser, 2001).

Against this background, a lot of demands are put on C&I from the conceptual point of view. From a procedural point of view two main aspects are important: (a) definition of indicators (i.e., which content?), and (b) selection of indicators (i.e., who decides,?) (Rametsteiner et al., 2011).

In terms of *which content?,* the initial definition of indicators, frequently used are the following six aspects (Rametsteiner et al., 2006):

- Relevance for sustainability: in theory, the framework of environmental, economic and societal indicators determines to what extent the system dynamics and behaviours underlying sustainability (and in effect, sustainability impact assessments) can be captured and understood. Sustainability indicator sets are supposed to address those three dimensions.
- Compatibility with existing sets: a range of relevant sustainability indicator sets are already

available, both within scientific and political contexts. Consistency with the relevant existing sustainability indicator sets (sector-specific and general frameworks) with respect to themes and issues could enhance its political relevance and acceptance.

- Relevant measures: indicators are supposed to provide relevant measures reporting towards the goal of sustainability. This relevance may differ depending on the geographical scale on which they are applied.
- Availability of data: indicators shall benefit from adequate data availability within the appropriate spatial scale and they are supposed to be based as far as possible on already existing data so as to be able to use existing competency in maintaining data sources and interpreting indicator values.
- Technical feasibility and scale: indicators are to be selected according to their practical applicability on the various geographical scales.
- Affordable cost of indicator application: the cost of data collection has to be taken into account when selecting indicators to keep costs at feasible levels.

In terms of *who decides?*, the selection of indicators is both a scientific and a normative process (Rametsteiner et al., 2011). Hence the following two factors of analysis for the actual selection of indicators are to be investigated:

- Actors: indicator sets are developed in both a political and scientific context, where policy makers, scientists and the wider public are involved or not involved. This has been discussed in the literature as making choices at the interface of science and policy (McCool and Stankey, 2004). Ideally, there is consensus on the objectives of C&I before their design.
- Decision-making mode: hierarchical or consensus-led decisions are taken during indicator selection. Consensus-led decisions are not easily acceptable for scientists (Rametsteiner et al., 2011) as they are neither facts-oriented nor based on scientific reasoning.

Furthermore the following aspects are relevant (see also Wedeles and Williams, 1999; Duinker, 2001):

- Reference: C&I must be based on a central reference to prove legitimacy and goal compliance to cover the underlying value scheme.

- Validity: C& I should measure what they intend to measure, and do this in a consistent and reproducible manner including terms and definitions, measurement units and measurement procedures. In particular, proxy and surrogate functions need to be clarified and explained a priori.
- Sensitivity: C&I must be able to react to and display changes of systems to properly document and inform on these variations.
- Goal context: C&I only fulfill their full potential when there is a clear goal reference, i.e. to interpret a change of indicator value and the direction thereof. This is precondition for any indicator-based assessment and operational link to policy- and decision-making.
- Communication: C&I should not only be understandable for scientists and expert but entail a broader public for the communication and explanation of SFM issues.
- Prognoses and trends: C&I should be designed to depict trends and to create not only ex-post descriptions, but also ex-ante prognosis to be used as prospective planning and policy-making tools.

The validity of these claims vis-à-vis the pan-European C&I will be tested in this report.

3.2 C&I development

Recently, the process of indicator development itself has been increasingly put into the spotlight (e.g., Rametsteiner et al., 2011). Indeed, the question of indicator development seems to have shifted to a procedural debate when designing indicators (Hezri and Dovers, 2006). A proper development process is crucial for transparency, comprehensibility and acceptance of indicator-based systems. There is a strong notion that information management in sustainability issues is a complex social task rather than a technical, purely scientific process (Spash and Vatn, 2006), and that indicator development should relate to political-social systems in terms of participation and science-stakeholder interaction (McCool and Stankey, 2004). Spangenberg (2008) proclaims an iterative indicator development process incorporating both scientific experts (for scientific input and steering) and stakeholders (for judgments and advices). A particular advantage of such an approach is that user needs and methodological gaps in addressing the SFM

problem can be identified and clarified together with stakeholders and decision makers.

In general, a dichotomy can be observed between science-driven and policy-driven indicator processes (Rametsteiner et al., 2011). They can both be driven by bureaucrats involved in a specific area, as well as include policy makers, scientists and citizens. However some indicator sets are more scientifically driven (e.g., Sustainability Impact Assessment) and involve policy makers only on the side; other development processes are more policy-driven and involve scientists mainly in their expert function (e.g., MCPFE, EU-Indicators and EEA). Citizens and stakeholders usually participate only to a very limited extent or are not involved at all. Following the normative aspect underlying the sustainability concept (as outlined above), participation is strongly connected to the idea of democratic practice.

The indicator literature highlights the need to better understand and structure the development process as such (e.g., Niemeijer and Groot, 2008a; Cimorelli and Stahl, 2005; Niemeijer 2002). Some authors have outlined more technical approaches to sustainability indicator development to be followed (e.g., Niemeijer and Groot 2008b; McCool and Stankey, 2004; Failing and Gregory, 2003; Reynolds et al., 2003); others (Pülzl and Rametsteiner, 2009; Rametsteiner et al., 2011) have pointed out that the participation aspect is crucial for the norm creation and knowledge production process that both underlie the development of sustainability indicators. This also implies that there is a shift from developing mainly technically–based indicators towards designing hybrid instruments involving "multi-objectives" and "multi-stakeholder" perspectives (Journel et al., 2003). In terms of decision analysis, decision-making does not only require empirical facts and data but also information about values as well as a proper process for integrating facts and values (Gregory et al., 2006). Besides fulfilling the requirements of proper measurement, validity and significance there is strong demand for an enhancement towards supporting decision-making in an integrated manner. Hezri and Dovers (2006) state that sustainability indicator frameworks often hide their nature that they are also political tools. Hence, a clear definition of the purpose of those sustainability indicators and the roles that scientists and policy makers play

in their selection and use is needed (McCool and Stankey, 2004). This incorporates strong emphasis on participation and transparency both within the development process and its implementation (Pülzl and Rametsteiner, 2009).

Approaches and conceptual ideas on how to structure the indicator development process, especially for natural resource use and management indicators have been proposed by several authors (Niemeijer and Groot, 2008a; Wilson et al., 2007; Donnelly et al., 2007; Hezri and Dovers, 2006). In this regard, Rametsteiner et al. (2011) highlight that the decision of "who participates and decides" during the indicator development process is more important than the technical aspects on how to develop them. Both substantive expertise as well as balanced interest representation are essential. They present two conceptual frames that could be followed during the development process. Those two models are either focusing on information and knowledge production or on norm creation during the design process (Table 4).

While the knowledge production frame is driven by the search for scientific, technical objective and sound knowledge, the norm creation frame puts an emphasis on balancing norms, values as well as interests. Scientists from the natural and social sciences as well as experts (e.g., bureaucrats) are involved in the knowledge production framework; citizens or their substitutes (e.g., democratically elected politicians, diplomats or other civil servants) are involved in the norm creation framework. Ideally those scientists and experts identify the best available knowledge, while citizens and politicians opt for the best possible reflection of norms, values and try to find a balance between interests. Ideally, approaches from a range of disciplines guide the science, while on the other hand democratic voting (e.g., by consensus) guides the work of the politicians and citizens. Finally the knowledge production frame puts an emphasis on a 'truthful' representation of human-system and eco-system interactions, while the norm creation frame puts an emphasis on the expression of democratically legitimized preferences on the values of nature as well as on a reconciliation of inter-generational and intra-generational equity.

Both, information/knowledge production and norm creation frames are to be encountered in sustainability indicator development processes.

Table 4. Characteristics of the two main frames for sustainability indicator development processes (Rametsteiner et al., 2011).

	Knowledge production	Norm creation
Background and input	Scientific / technical objective knowledge	Norms, values and interest
Actors	Scientists, experts	Citizens or their substitutes (democratically elected politicians as representatives)
Ideal-type knowledge application	'Best available' reflection of factual knowledge	'Best possible' reflection of societal norms, values and interest
Ideal-type process	Scientific methods of disciplinary, inter-, multi- or trans-disciplinary science	Democratic voting/consensus formation
Outcomes	'Truthful' representation of human system-ecosystem interaction	Democratically legitimized preferences on values of nature, inter- and intra-generational equity

What varies is the degree to which these two are balanced (or not), and how these two interplay with each other. These two ideal-types come in different forms: on the one hand they may be completely separate domains of knowledge production and norm- creation, and on the other hand they may be integrated. in that regard they appear to follow an 'integrationist idea', where knowledge production and norm creation are merged, and the role of different participating actors at times is indistinguishable.

3.3 Indicator systems as logical frameworks

We have seen earlier that C&I are in principal requested to be multi-functional, multi-disciplinary, and analytic.

Accordingly, the shaping of indicators may vary in the type of information they carry (e.g., statistics, modelling results, expert estimations), type of data (quantitative or qualitative), type of aggregation (single aspect vs. composite index) as well as in geographical (global, national, regional, forest management unit) and time scales (state vs. continuous, short-term vs. long-term) (Rametsteiner, 2001). All these arguments imply that there is a conceptual framework underlying the use of any C&I that specifies structure, purpose, and modes of implementation as well as means how to synthesize information carried by indicators to an overall interpretation of SFM.

However, it has been suggested that international C&I schemes generally lack a coherent conceptual framework (Grainger, 2012), which is inter alia due to:

- Difficulties in fully capturing interdisciplinary concepts and design;
- Variation between scientific concepts and negotiation outcomes in political processes;
- Terms and definitions, consistency are better agreed upon on Principle level than on C&I, so Work on C&I is often kept separate from the political process due to terms and definitions designed on general, overarching level;
- C&I sets tend to accumulate parameters in order to satisfy various claims – this leads, however, to huge amounts of parameters and data collection of C&I sets that are not coherent in themselves;
- Consequently, only one-third of indicators may be ready for instrumental use in a narrow understanding of SFM, while symbolic and redundant use is overly abundant.

It comes as no surprise that systemic and analytical features have not been fully developed in most international C&I schemes. For instance, there is missing link from criteria to SFM pillars (economic, ecological, social), and little conceptual understanding on how these criteria interact and can be thematically clustered.

A second example is the missing interaction between quantitative and qualitative policy indicators, which bear the potential to more systematically understand the human-nature interaction in the context of SFM.

Further, while SFM in principle acknowledges that there are potential conflicts among land users, land-use forms, environmental and societal interests, these trade-offs are not explicitly addressed by C&I. Mostly, international agreements remain uniformly vague with regard to preference and trade-off statements towards competing forest functions and interests (Lowe, 1995).

From the structural point of view, increasing experience in assessment and analysis of indicators has shown that listings and hierarchical arrangements of C&I reflect but a partial view on the complex nature of SFM combining ecological and human systems under a common umbrella (Kelly, 1998; Prabhu et al., 2001). Furthermore, an indicator set should be sufficiently balanced to give a reliable picture of a planning problem. It has been observed that indicator sets are often imbalanced and weak in social and cultural aspects (Gough et al., 2008) as well as in issues of vague importance in every-day forestry business such as water protection or nature conservation (Hickey et al., 2005).

Indicators are often arranged in indicator systems in order to enrich problem perspectives and systemic understanding. The building of indicator systems or models means that singular approaches are not sufficient because there is need for the analysis of linkages among indicators, checks for plausibility, and for analysis of changes in the system (Kelly, 1998).

Following this argument, indicators should be designed for considering their potential interactions and feedbacks within a given set. This would help to provide more insight into systemic cause-effect relationships and – by identifying key processes and indicators – help to make data collection and analysis more efficient (Requardt, 2007).

Considering the state-of-the-art, it can be ob-

served that methodological approaches to consider networks of indicators are still scarce in the field of natural resource management. Among few examples, causal networks of environmental/ecological indicators have been highlighted by Niemeijer and de Groot (2008a,b) and Lin et al. (2009). In sustainability issues, network approaches have been demonstrated for forest policy (Requardt, 2007) and local level indicators (Mendoza and Prabhu, 2003; Wolfslehner et al., 2005). Most recently, Wolfslehner and Vacik (2011) demonstrated the methodological implications of arranging the 35 quantitative MCPFE indicators in three different types of indicator models (hierarchical decomposition linkages, relationship linkages, cause–effect linkages) (Figure 2). The analysis showed that the significance of indicators in networks methods is strongly affected by the structuring procedure and depends on how cause–effect relationships are interpreted. A clearer definition of these linkages will reduce 'unwanted noise' in assessments due to redundancies of interactions among indicators and lead to clearer and less ambiguous interpretations of causal relations.

However, Grainger (2012) raised concerns about using given C&I sets for purposes for which they have not been designed. Since the nature of most international C&I schemes is that they are mostly accumulations of forest-related information, the question is whether we can employ them at all in system-analytical and assessment procedures.

3.3.1 Assessment: towards advanced use of C&I

Glück stated already in 1995 that a central problem of the MCPFE SFM process is the absence of thresholds, weights and aggregation rules to make an indicator set applicable and expressive. In fact, there has been little progress to date in employing C&I as assessment tools. Reporting indicator by indicator on collected data renders C&I mainly descriptive, while giving little insight into the overall progress towards SFM. To proceed beyond the formulation and planning phase of SFM initiatives it is of prime importance to develop practical recommendations to evaluate impacts and outcomes of SFM and to transfer SFM implementation from political negotiation to the practical and technical level. There are growing expectations that policy
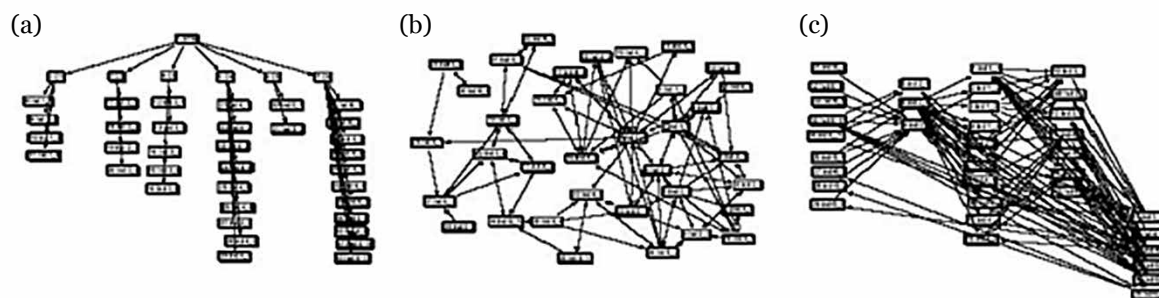
Figure 2. (a) Hierarchical C&I, (b) SFM network, (c) DPSIR (Driving force, Pressure, State, Impact, Response) system of pan-European SFM indicators (Wolfslehner and Vacik, 2011).

makers and forest managers can demonstrate SFM by quantifying progress towards goals and outcomes (Raison et al., 2001).

Conceptually, assigning a new key role to indicators in sustainability assessment puts an extra-burden on them. Whereas (sustainability) assessments have been equivalent to collecting and reporting information only, an integrated assessment means integrating this information into various stages of the decision-making process (Lee, 2006). Linking information to decision-making in a consistent manner is thus deemed a crucial function of sustainability indicators (Searcy et al., 2005).

Hence, a series of processes is needed to prepare both collected and generated data and create knowledge out of data. This entails spatial and temporal scaling of heterogeneous data to common scales, a comparative consistency check, and where appropriate synthesising information from a variety of sources. The latter point may be important to simplify and merge huge amounts of parameters, to eliminate redundancies in the data and to convey comprehensible information. This could also include a unit transfer from technical parameters towards commonly known and understood measures.

When considering indicators as assessment tools they, in addition to the issues discussed in section 3.1, need to be:
- Operational: the decision maker must be able to judge the performance of indicators using meaningful units and corresponding scales.
- Complete and balanced: the whole decision problem has to be depicted by the indicators, not only partial aspects.

- Manageable: the set of indicators should be clearly structured and limited in complexity to support a comprehensible application of assessment tools.
- Non-redundant: indicators should not overlap in reporting the same information.

Against these criteria, we see that data availability is one of the driving forces for indicator selection (Niemeijer, 2002), and has led to the phenomenon of 'data availability bias' (Failing and Gregory, 2003). There is also a tendency to overestimate authoritative forms of scientific knowledge at the cost of more tacit and informal forms of knowledge (Siebenhüner and Barth, 2005). These aspects have to be taken into account to achieve a balanced and legitimate assessment scheme.

A second important issue for employing C&I as assessment tools is the definition of thresholds that define progress towards SFM.

Indeed, the formulation of thresholds and reference values for indicators is a potentially conflict-burdened topic. There are hardly any scientific-based thresholds for aspects of SFM to be applied at the FMU level (Rametsteiner, 2001). Thus, defining thresholds would again require stakeholder value input and supposes that there would be broad consensus (e.g., agreement on measurable goals). It is more likely that forest stakeholders would try to avoid such targets and thresholds because of their intrinsic normative power. Efforts to establish reference values both in political and scientific spheres are conspicuous by their rarity (Reynolds et al., 2003). Nonetheless, generally abandoning thresholds would lead to certain limitations of in-

dicator approaches. From a systemic point of view, as well as the lack of progress towards reaching SFM goals and objectives, there is also a lack of opportunities to evaluate changes in single indicators and in clusters of indicators. Reference values can be of different forms: as real thresholds, benchmarks, modelled reference conditions, desired future states, trends, tipping points, development of standards and norms (USDA, 2002).

3.4 Outcomes and constraints

Over the past 25 years, C&I for SFM have developed as powerful tools and are well-known for playing a central role in the implementation of SFM. Ever since their introduction in sustainability sciences, indicators have been deemed to be more than just simple data carriers. They are intended to draw and moreover communicate a picture of a certain problem by providing a selection of (often simplified and synthesized) key information which – most importantly – refers to the user's information needs. Before addressing the empirical aspects of the use of the pan-European C&I, it is necessary to collect an overview of reported outcomes and shortcomings of C&I so far.

As reported in the literature, the main merits of C&I implementation are (Grainger, 2012; Wijewardana, 2008):
- Supporting a global understanding of what constitutes SFM;
- A vehicle to foster political processes on SFM;
- Find a common symbolic language to overcome historic conflicts (e.g., forestry vs. environmentalists) and hence support consensus-finding;
- Find a common terminology in the global environmental governance;
- Substantial progress in streamlining and structuring forest reporting;
- Support unambiguous communication and learning among stakeholders;
- Serving as a means for education and capacity-building by fostering participatory decision-making and decentralized policy implementation.

Further achievements can be seen in:
- Measuring aspects of SFM at regional and forest management unit level (Mendoza and Prabhu, 2000; Franc et al., 2001; Raison et al., 2001);

- Global convergence in the understanding of C&I (McDonald and Lane, 2004);
- Serve as a reference for regional and local C&I application (e.g., Adam and Kneeshaw, 2008);
- Allow for combined top-down and bottom-up approaches in C&I development (Khadka et al., 2012);
- Support participatory modes of knowledge generation and exchange (Thomson, 2005).

Despite the progress in implementing C&I over a relatively short period, some general shortcoming are evident:
- Little conceptual foundation from which to exploit the full potential of C&I;
- Little instrumental use of C&I, much more symbolic use;
- Unclear reference to political goals as regards SFM, neglecting potential conflicts and trade-offs within the concept of SFM, may lead to confusing signals given by different indicators (Grainger, 2012);
- Uneven implementation of C&I among countries;
- Weak political will to support C&I implementation, little priority to forestry issues in competing claims;
- Little conception of how to present the findings based on C&I beyond description of indicator outcomes;
- Limited operational design and data availability;
- No assessment features providing diagnosis, warning signals, and guidance (Wijewardana, 2008).

Further limitations are reported as:
- Unbalanced indicator sets, which are particular weak in socio-economic indicators (Gough et al., 2008);
- Harmonization, terms and definition on forest information is still imperfect and hampers reliable C&I interpretation (Irland, 2010);
- Monitoring and streamlined reporting are still challenges for policy makers and forest managers (Hickey, 2008);
- C&I are strongly outcome-centred measure but fail in identifying direct links to and evidence on forest management activities and responses (Foster et al., 2010);

- C&I do not consider linkages, interdependencies, and causal chains among indicators (Requardt, 2007), and do not connect quantitative and qualitative policy indicators;
- C&I fail to facilitate more systemic analysis of how SFM is embedded in socio-ecological systems (Wolfslehner and Vacik, 2011).

In the subsequent sections, these findings are referred to as the empirics of pan-European C&I implementation. It is put to test what are the specifics of the European set as compared to the conceptual considerations, and how the state-of-the-art can be updated in 2013.

4. Research methods and data analysis

4.1 Setting the research framework

4.1.1 Aims of the research

This research attempted to analyze the implementation of Criteria and Indicators (C&I) for sustainable forest management (SFM) in the 46 signatory states of the FOREST EUROPE process and strengthen the process and the use of C&I, not only as a tool for monitoring and reporting, but also for policy making at national and European level. In order to realize the study objectives, the research was carried out in several steps. We started with the analysis and conceptualization of the term "implementing criteria and indicators", and developed a working definition, based on a review of relevant MCPFE resolutions and documents as well as publications from other international and regional process on criteria and indicators for sustainable forest management. Then we collected information, through a comprehensive literature review, expert interviews, a written enquiry to national correspondents and regional workshops. The information collected was then analyzed, synthesized and used as the basis for our conclusions and recommendations. This chapter describes the methods we used to obtain and analyze the information which is presented in Chapters 5, 6 and 7.

4.1.2 Purpose and development of the working definition of "Implementing criteria and indicators for sustainable forest management"

"Implementing" may be understood in normal speech as putting into practice agreed objectives or methods. However there is no formal official text defining the objectives of the pan-European set, against which actions could be measured. The nearest approximation is Lisbon resolution L2, from 1998[1], which refers to:

a coherent set of tools to assess and assist further progress in sustainable forest management, at the international and national levels; (MCPFE, 1998);

and to:

providing relevant information for forest policy development and evaluation, national forest policies, plans and programmes and as a basis for cross-sectoral forest related data collection (MCPFE, 1998).

The lack of a formal statement of objectives made it difficult to define how the C&I are being 'implemented' and to assess whether the implementation is successful.

Therefore, we decided to develop a working definition, which would be used and tested during the project, making it possible for the project in its final stage to recommend a revised definition which could be discussed and perhaps approved at the policy level, and thus guide future work.

The project team, after consultation with the Advisory Group, which includes representatives of many of the major actors for pan-European forest sector cooperation, proposed the following working definition of *"Implementing criteria and indicators of sustainable forest management"* for the purposes of this project:

Use the pan-European criteria and indicator set, or a national set derived from it, and specifically the information structured according to it, to achieve one or more of the following applications:
1. *Provide a framework for dialogue and communication between policy makers, inside and outside the forest sector, and other relevant stakeholders, on SFM and forest policy development;*
2. *Monitor and report on the state and trends of the forest sector;*
3. *Assess progress towards sustainable forest management and identify emerging issues;*

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1 The revised indicators were only endorsed by an Expert Level Meeting, not formally approved by ministers in Vienna, and contain no formal definition of objectives.

4. *Formulate, implement, monitor and evaluate national or sub-national forest programmes, policies and/or plans;*
5. *Provide information and/or assessment to indicator sets outside the forest sector e.g., for sustainable development or biodiversity, or the forest sector in other regions e.g., Montréal Process.*

Notes on the working definition

(i) *The pan-European set of criteria and indicators may be implemented at several levels: pan-European, national and sub-national. The level of implementation is always specified in the analysis prepared by the project, but the focus is on the national level, as well as the sub-national level in those countries where responsibility for forest policy is at the sub-national level.*
(ii) *"Forest sector" is the area covered by the pan-European set of criteria and indicators, including the quantitative indicators in all six criteria and the qualitative indicators.*

The working definition, and in particular the five listed applications, were used as the framework for all parts of the analysis, notably:
• interview template, and the structure of the state-of-the-art report;
• enquiry for national and sub-national assessments;
• agenda of the workshops;
• final report.

This has ensured a comprehensive and balanced approach, not favoring one application over another[2]. At all stages, those addressed by the project – interviewees, correspondents, workshop participants – have been asked to comment on the working definition and make suggestions for a revised definition. These comments and suggestions will be summarized in the various outputs and taken into consideration when proposing a

revised definition of implementing C&I for use by policy makers.

4.2 Data collection

The next step was to carry out fieldwork aiming to test it and to establish how well it served the purpose of analysing the implementation of the pan-European indicator set at different levels. A combination of four research methods to increase the validity of the study's conclusions was used to collect information against the implementation of the pan-European C&I for SFM and to test the applicability of the working definition:
• Literature review (desk research) on the landscape surrounding the development and implementation of the (pan-European) C&I;
• Semi-structured interviews with experts from the inside and outside the forest sector;
• National assessments questionnaire distributed to all 46 FOREST EUROPE signatories;
• Regional workshops implementing C&I for SFM.

4.2.1 Literature review

A comprehensive literature review was carried out to provide a background for understanding the topic and a historical overview of the different developments in relation to the pan-European criteria and indicators for sustainable forest management. The main body of literature was made up of the relevant peer-reviewed academic articles and books on the subject area, MCPFE resolutions and declarations, State of Europe's forests reports, national reports on the use of C&I for SFM. Other sources including reports and documents of relevant international, European and national organizations, conference papers and websites were also referred to for this report. The literature review underpinned the development of the research and supported the approaches we used for data gathering.

4.2.2 Expert interviews

a. Conducting the interviews
To gain a more complete and detailed picture on the implementation process of the pan-European C&I, we decided to solicit input from key experts in the field, asking them about their views and perspectives and speaking about their experiences ac-

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2   There is a natural tendency, if no formal structure exists, to focus on areas where there has been activity and ignore those where there has been no activity.

cording to the five major applications, outlined in the working definition.

We used a semi-structured interview approach, following the working definition presented in chapter 4.1.2, which offers topics and questions to the interviewee, but which is designed to elicit the interviewee's views and opinions on the topic of interest, as opposed to leading the interviewee toward preconceived choices. Although we had a list of questions, it was preferred that the experts should speak freely to get a more holistic overview. To ensure reliability, all the experts were always asked identical questions, but the questions were in some cases followed by probes that address additional subjects with less structure. Furthermore, this open-ended quality allowed the participants to contribute as much detailed information as they wanted and it also allowed us to clarify any ambiguity. We asked the experts to answer 13 open-ended (qualitative) and 2 close-ended (quantitative) questions. The interview questions can be found in Annex 1 of the report.

Experts were chosen to broadly represent major stakeholder groups involved or because they have an interest in the development and implementation of the (pan-European) C&I for SFM. We identified six major stakeholder groups both within and outside the forest sector. Due to time constraints and challenges in identifying experts on C&I, the major focus was placed on stakeholders active at international, European, and national levels. We conducted interviews with representatives from the following stakeholder groups:

- Inter-governmental organizations from the forest and outside sectors;
- Non-governmental organizations at global, European and national levels within and outside the forest sector, including forest owner and forest industry associations;
- European Commission Directorates- General (DGs) and related European Union (EU) institutions dealing with forest and forest-related issues;
- Policy makers, i.e., governmental officials/representatives of Ministries of Agriculture, Rural Development, Forests or Environment;
- Representatives of forest administration and relevant authorities at national level;
- Representatives of the scientific community (e.g., research institutes at European and national levels, universities, research centres).
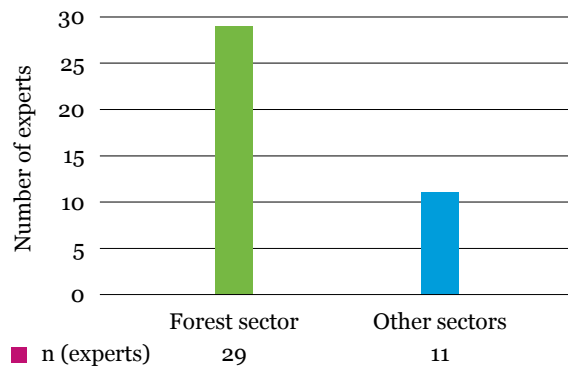
Figure 3. Number of experts interviewed from inside and outside the forest sector.

The goal in selecting a wide spectrum of interviewees was to gather perspectives that are representative of the multiple views and interests involved in the development and implementation process of the pan-European C&I. Although a preference was given to stakeholders within the forest sector, we also considered expertise from stakeholder groups in other sectors such as agriculture, environment, climate change, energy, biodiversity (Figure 3). Furthermore, we conducted interviews with experts from various European regions who provided insights on the implementation of C&I at pan-European, national and sub-national levels in the corresponding country.

We identified 74 experts representing the identified stakeholder groups, having a range of expertise and backgrounds. It is important to note that the collected views and opinions of the respondents (experts in the field) do not necessarily represent the position on the matter of their organizations as several of them responded to the questions in a personal capacity.

During the period from May to September 2012 we completed 40 interviews, from which ten were conducted to test the wording of the questions, identify potential ambiguous questions, and gain experience on the interview technique. In total, 36 experts took part in skype/phone interviews and due to limited availability, four of the experts completed the interview questions in a written form. From all the contacted experts, 22 did not respond and 12 proved unreachable via email or telephone. All audio-taped data was transcribed and subjected to qualitative and quantitative analysis.

Table 4. Comparison of response rates across the stakeholder groups.

Abbr.	Stakeholder group	Invitations Sent (n)	Interviews completed (n)	Response rate (%)
FA	Forest administration and extension services	12	6	50
IGO	Inter-governmental organizations	9	4	44
NGO	Non-governmental organizations, incl. forest industry and owner associations	17	8	47
EC	European Commission and related EU institutions	10	6	60
PM	Policy makers (government officials)	9	4	44
RES	Research and academia	17	12	70
Total		74	40	54

b. Expert interviews analysis

Comparison of response rates across the stakeholder groups

Considering the total number of conducted interviews (40 out of 74), it is more likely to obtain results that are biased in favour of the sample population most interested in the topic. This error is known as a 'non-response bias', which is, in fact, the most important factor in assessing the effect of a response rate on the validity of a study. We used the method of 'Comparison of Response Rates Across Sub-Groups of the Target Population' to address the problem of non-response bias. This technique is used to better understand the existing expertise and increase confidence in data quality. The method does not help determine the extent of non-response bias, but it can indicate whether there might be non-response bias. The results of the comparison method are presented in Table 4.

Table 4 indicates that the response rate across the different stakeholder groups does not differ considerably. If the response rates are quite similar across sub-groups, non-response bias – should it exist – will likely have a limited impact on the analysis results.

Qualitative Analysis

The qualitative analysis, which constitutes the main body of the interview assessments, was centred on the open-ended questions. The responses from all the 40 interviewees were taken into consideration and included in the analysis. The overall analytical approach employed to reveal the recurring ideas and patterns was a thematic analysis. This is a method for identifying, analysing, and reporting themes (patterns) in the data. A theme captures important information within the data and its relation to the research question. It represents some level of patterned response or meaning within the data set. At the beginning of any thematic analysis the organization and coding process is essential to categorize and gain knowledge of the data. The information was organized in four major sections:

1. Implementation of the pan-European C&I for SFM according to the five applications outlined in the working definition;
2. Structure and content of the pan-European C&I;
3. MCPFE resolutions and declarations;
4. Working definition on "Implementing the pan-European C&I for SFM".

Due to the large volume of information, each section was further divided into sub-sections and then subjected to a more detailed analysis, mainly centred on the achievements, impacts, challenges and needs and potentials for improvement associated with the implementation of the pan-European set.

Quantitative Analysis

A quantitative analysis was carried out to complement the qualitative analysis. It was developed around the questions asked for gaining information about experts' attitudes towards the usefulness and impact of the pan-European C&I for SFM on certain aspects. Since the quantitative questions were still developing during the pilot study conducted with 10 experts, the responses that were included in the quantitative analysis amounts to 30.

With regard to the usefulness, the respondents were asked to indicate their opinion on a four-point scale from 1 to 4, representing:

1. No = Strong disagreement
2. Rather no = Disagreement
3. Rather yes = Agreement
4. Yes = Strong agreement

The results of the assessment are presented and described in section 5.4.1.

The opinions on the impact of the pan-European C&I on a number of aspects were evaluated using a six-point scale: 0 (not at all), 1 (very low), 2 (low), 3 (moderate), 4 (high), and 5 (very high). The results are presented in chapter 5.4.2 and are clustered according to the five major C&I applications, outlined in the project's working definition (see chapter 4.1.2).

To carry out a quantitative analysis that realistically and reliably displays and summarizes the trends identifiable in the attitudes of the respondents, we selected those answers that were provided in a clear and explicit form (i.e., when the respondent directly made a choice). The answers that lacked clarity due to various reasons (e.g., some questions were difficult to assess, or required a type of information/opinion that the respondents were not acquainted with), were coded as "no answers", and considered as such in the analysis.

4.2.3 National assessments on implementing the pan-European C&I for SFM

a. Enquiry on the implementation status of the pan-European C&I for SFM

The national assessments aimed to investigate: (i) to what extent the pan-European C&I, or national sets derived from it, are being implemented at national level in the 46 FOREST EUROPE signatories, (ii) the fields of application of C&I at national level, and (iii) factors influencing the effectiveness of C&I.

To achieve the objectives, we developed an enquiry (see Annex 2) structured according to the project's working definition (see chapter 4.1.2), containing both quantitative and qualitative questions. It was organized into the following sections:

- The adaptation of the pan-European C&I to national circumstances, in particular the existence of National C&I sets and their differences with the pan-European C&I set;
- The pan-European set, or the national set derived from it, as a framework for dialogue and communication on SFM and forest policy development;
- Major challenges in providing information to the State of Europe's Forests 2011;
- The pan-European set as a tool for reporting on progress towards SFM at national level;
- Use of C&I for SFM in national forest policies, programmes, and/or plans;
- Use of C&I for SFM to provide information for other sectors (e.g., sustainability, biodiversity, climate change, etc.);
- Institutions responsible for the implementation of C&I for SFM;
- Usefulness of C&I as a framework for dialogue and communication, to monitor and report on the state and trends and assess progress towards SFM.

The enquiry was distributed to the 46 FOREST EUROPE national correspondents during summer 2012 and 39 responses were received from 38 countries[3] by the end of March 2013. Over 80 national

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3   From Belgium the project team received two submissions, one from Wallonia and one from the Capital Region of Brussels.

specialists participated in completing the enquiries. The high response rate has made it possible to achieve comprehensive insight to what extent the criteria and indicators have been implemented at national level.

b. Analysis of national assessments
The information received was organized into excel sheets in order to carry out a quantitative analysis and a qualitative analysis. The analyses allowed for comparisons between countries and identification of common patterns on how C&I are implemented at national level.

Quantitative Analysis
The quantitative analysis represents the main body of the national assessments and was developed to gain information about the national correspondents' opinion of the usefulness of the pan-European C&I for SFM or the national set derived from it on certain aspects, e.g., C&I as a framework for dialogue and communication on SFM and forest policy development.

The national correspondents were asked to indicate their opinion on the use of C&I on a scale from between 0 (do not know/no opinion), 1 (not at all) – 9 (to a great extent). In order to allow trends to be displayed in an "easy-to-read" form the points on the scale were grouped into five classes: great extent (rank 9–7), moderate extent (rank 6–4), minor extent (rank 3–2), not at all (rank 1), and no opinion/no ranking.

The frequency distribution was calculated for each rank and each question and later displayed in color maps or column bar diagrams, making it possible to identify trends within the pan-European region.

Qualitative Analysis
The qualitative analysis was developed to complement the quantitative assessment. The qualitative analysis consisted of explanatory questions connected to the national correspondent's opinion about the usefulness of the pan-European C&I for SFM or the national set derived from it, and also open-ended questions. Similar to the qualitative analysis of the expert interviews, we used thematic analysis to find the recurring ideas and patterns for each section of the enquiry. Due to the variety of

answers, the correspondent's explanatory notes or answers to open-ended questions were clustered to groups to allow the display of certain trends and patterns.

4.2.4 Regional workshops

Three regional workshops were held in the spring of 2013:
- 26–27 March, Western Balkans – Zagreb, Croatia;
- 23–24 April, Central and Eastern Europe – Budapest, Hungary;
- 20–21 May, Western Europe – Estoril, Portugal.

The regional workshops and their content were evolved and driven by the following reasons. Based on the submissions received during the national assessments, it was clear that the national C&I applications are very diverse. However, the foundation of these differences was not visible in some of the cases (e.g., possible open interpretation of the enquiries). Supplementary information was required to acquire better understanding of the national circumstances that influence national applications. In order to explore these details, half-day working group sessions were scheduled, all structured around the project's working definition (see chapter 4.1.2).

The workshops provided opportunities to share experiences and initiate information exchange among participating countries. This information exchange was not limited to forestry sector participants, but other sectors were invited to contribute. These platforms for exchange of experiences between countries were not available in recent years, and especially not on regional level. Most of the discussions related to C&I, but were mainly targeted at the preparations for the FAO's Global Forest Resources Assessments and FOREST EUROPE's State of Europe's Forest reports.

The workshop outcomes will feed in and support the work of the FOREST EUROPE "Expert Group to Propose Improvements in Tools for SFM", which had its mandate from the FOREST EUROPE Ministerial Conference in Oslo in 2011 to provide suggestions to improve further the tools of SFM in the pan-European context.

In light of the items above, the regional workshops had three clear objectives:

- define and understand the various aspects of the implementation of both criteria and indicators at national and regional levels;
- share experiences about national applications and identify common regional issues;
- propose recommendations on fostering C&I implementation at national and pan-European levels.

These objectives were common to all three regional workshops carried out during the spring of 2013. The regions (Western Balkans, Central and Eastern Europe, and Western Europe) were selected based on the premise to secure an equal representation and coverage of the various conditions in Europe.

The primary target audience were the national correspondents contributing to the national assessments of the project. However registrations remained open for all interested stakeholders.

The conclusions and recommendations of the regional workshops (see Annex 3) were transmitted to later regional workshops and the pan-European Forum. They are taken into account in the analysis and are a vital input to the preparation of the project's conclusions and recommendations, as they reflect closely the realities of practitioners on the ground.

4.2.5 Analysis of C&I for SFM databases

To provide a general overview of the actual data completeness on the pan-European indicators, a quantitative analysis on the information gathered for the State of Europe's Forest 2011 (SoEF) report was conducted.

The data on the quantitative indicators published in SoEF via the statistical database is provided by UNECE (FOREST EUROPE, UNECE and FAO, 2011). Information on 28 out of 35 indicators was directly provided by countries, i.e., Forest Europe member states, through the national enquiry. Data for the remaining seven indicators[4] were provided by international data providers (EC JRC[5], ICP Forests[6], Bioversity International, EUROSTAT, FAO, UNECE – JFSQ and JWEE[7], and others). The analysis displays results for the years 2000, 2005 and 2010 and mirrors regional differences since country-specific data are clustered for the Forest Europe Regions (i.e., North Europe, Central-West Europe, Central-East Europe, South-West Europe and South-East Europe). It highlights the completeness of records available via the statistical database, cross-checked with the data published in SoEF 2011. With respect to the difference in the number of sub-categories that need to be reported by the member states (e.g., indicator 1.1 *Forest area* consists of 'Forest', 'Forest available for wood supply', 'Other wooded land', 'Total forest and other wooded land' and 'Other land') the final results are calculated as mean values across all subcategories per indicator for a respective year. For indicators 6.7 *Wood consumption* and 6.8 *Trade in wood*, where annual data is available, the year 2000 reflects the average value of the period 1998–2002, and the year 2005 reflects the average value of 2003–2007, as reported in SoEF 2011. Beyond the quantification of the database cells filled, a complementary data quality check is performed based on the assessment approach presented in SoEF 2011.

The response rates of countries on qualitative indicators is gathered for the years 2007 and 2010, and communicated as a percentage of reported parameters under each of the overall qualitative indicators.

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4   Indicators: 2.1 Deposition of air pollutants, 2.2 Soil condition, 2.3 Defoliation, 4.6. Genetic resources, 4.7. Landscape pattern, 6.7 Wood consumption, 6.8. Trade in wood.

5   Joint Research Centre.

6   International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests.

7   Joint Forest Sector Questionnaire; Joint Wood Energy Enquiry.

5. Perspectives on implementing criteria and indicators for sustainable forest management in Europe

This chapter investigates the various perspectives on implementing criteria and indicators (C&I) for sustainable forest management (SFM) in Europe. It is divided in four major sections. The first section provides insights into the MCPFE Commitments and presents the views and opinions of the interviewees on the clarity and visibility of the MCPFE declarations and resolutions. The second one comprises the results from the national assessments, and highlights the main trends in C&I implementation at national level. In order to achieve a better understanding of the various aspects associated with the national implementation and to identify regional issues relevant for the various regions in Europe, three regional workshops were held in spring 2013 – the outcomes are presented in the third section of the chapter. The last section presents the results of the expert interviews on implementing the pan-European C&I for SFM[1].

5.1 Implementation of MCPFE Commitments

5.1.1 State of MCPFE Commitments and associated achievements and challenges

The political commitments in relation to the development and further improvement of the pan-European C&I have been outlined in the 1998 Lisbon Declaration, L2 Resolution "Pan-European Criteria, Indicators and Operational Level Guidelines for Sustainable Forest Management", and in the 2011 Oslo Ministerial Decision: European Forests 2020. The MCPFE analyses conducted in 2003, 2007 and 2011 have shown that a wide range of actions have been undertaken across the countries with respect to implementation of the L2 Resolution: e.g., development and implementation of national C&I sets, international reporting of C&I (i.e., State of Europe's Forests), quality and adaptation of data, dissemination and adaptation of the pan-European Operational Level Guidelines (PEOLGs), common definitions, evaluation indicators and data, etc. Nevertheless, there are a variety of challenges that have been reported by the countries, e.g., necessary additional parameters and guidelines, continuous monitoring systems, financial support, the collection of data, outside or even within the forestry sector at national and sub-national levels, or of indicators related to multi-functional forestry or biodiversity, and lack of institutional, informational or financial facilities (MCPFE, 2003a). To gain a deeper understanding on actual achievements and associated challenges, particularly in relation to their relevance, clarity and visibility (publicity) (questions 9 and 10 in the Interview questions – see Annex 1) of the outlined declarations and resolutions, the interviewed experts were asked to express their views and opinions on the subject.

Out of the 40 interviewees, 34 provided answers to questions 9 and 10; according to most of them, the MCPFE declarations and resolutions are seen as a foundation for implementing SFM in Europe. Even though the declarations and resolutions are non-legally binding instruments, they are treated with the utmost seriousness by most FOREST EUROPE signatories. Nevertheless, nearly all the respondents commented rather on the importance of FOREST EUROPE as a political process promoting SFM throughout the pan-European region and enhancing cross-border cooperation on forest policies between different actors. In that context, the MCPFE declarations and resolutions on sustainable forest management (Helsinki 1 Resolution) and criteria and indicators (Lisbon 2 Resolution) are viewed as effective and their added value is highlighted in terms of:

• providing a conceptual and normative guidance for the development of tools and policies for SFM (e.g., criteria and indicators, operational guidelines, national forest programmes);

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1   The methodology for the national assessments and the conducted interviews are presented in chapter 4.

- influencing forest policy decisions on SFM related issues;
- serving as a framework for dialogue and communication on SFM and relevant issues (e.g., ecosystem approach);
- identifying needs and topics relevant for the sustainable development of the European forests.

However, against the achievements and impacts, particularly at pan-European level, 29 out of 40 interviewees explicitly noted that FOREST EUROPE is weakly positioned at European Union (EU), national, and sub-national levels as well as in nearly all topics outside the core forest policy area (e.g., biodiversity, climate change, energy). In other words, the MCPFE declarations and resolutions are eminent, clear and easily understandable mainly for policy makers and other relevant stakeholders involved in the high-level pan-European forest policy area, but not for the stakeholder groups at EU, national and sub-national levels (e.g., citizens, forest owners, managers) both within and outside the forest sector. The main challenges arise from a few areas where the relevance as well as visibility of the pan-European process and its declarations and resolutions could be strengthened and improved. These include:
- The non-legally binding nature of the MCPFE declarations and resolutions;
- Communication and collaboration with other forest-relevant sectors (e.g., climate change, energy, biodiversity);
- Participation of a wide network of relevant actors at EU, national and sub-national levels;
- Information dissemination (i.e., FOREST EUROPE publications) and the tailored products for different target audiences (e.g., economic, environmental and social actors);
- Financial resources of FOREST EUROPE and its structure (i.e., rotation of secretariat)
- The role of the forest sector in national economies (i.e., visibility is higher in more advanced countries with strong forest sectors).

Concerning the clarity of the C&I for SFM relevant MCPFE documents, and in particular the *L2 Resolution* and the 2011 *Oslo Ministerial Decision: European Forests 2020*, there is a strong consensus among the experts that there is room for improvement with regard to reaching a wider target-audience inside and outside the forest sec-

tor. In that context, the lack of clearly defined objectives, targets and measures with respect to SFM, and the implementation and further development of the pan-European C&I is seen as one of the biggest obstacles. In addition, the lack of explanatory definitions on common terminology, e.g., "principle", "criterion", "indicator" and "verifier" was also explicitly highlighted by some experts.

5.1.2 State of the pan-European C&I for SFM reporting for the SoEF reports

For the 2011 State of Europe's Forests report, the information on the pan-European qualitative indicators for SFM was provided directly by the countries (38 out of 47 national reports (including the European Commission). These countries represent nearly 97% of forest area of the FOREST EUROPE region (excluding the Russian Federation). There has been a significant improvement in information availability for 2010 for the different qualitative indicators as compared to the situation in 2007 when the percentage of the represented forest area was 79% (excluding the Russian Federation). The response rates for all indicators in 2010 are much higher than those in 2007. Major reasons for the increased coverage of information are thorough review and validation process carried out jointly by UNECE/FAO and EFI, improved institutional capacities across countries and increased commitment to report on qualitative indicators. The detailed representation on the data completeness of the qualitative indicators can be found in Table 5. The green shading indicates a higher coverage of requested answers, while the red shading indicates incomplete data.

Data availability regarding qualitative indicators emerges positively from 2007 to 2010. For both reporting years data on *part A. Overall policies, institutions and instruments for sustainable forest management* appears more complete than for *part B. Policies, institutions and instruments by policy area*, although the highest response rate for any indicator was 81% (Table 5).

The distribution of the data completeness regarding the quantitative indicators is presented in Table 6. The data is presented in accordance with the regional classification[2] used in the State of Eu-

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2 North Europe (NE), Central- West Europe (CWE), Central- East Europe (CEE), South-West Europe (SWE), South-East Europe (SEE).

Table 5. Results for qualitative indicators for the years 2007 and 2010 including legend for color code (in percent).

Indicator	2007	2010
A1. National forest programmes	66.7	80.9
A2. Institutional frameworks	66.7	80.9
A3. Legal/regulatory frameworks and international committments	66.7	80.9
A4. Financial instruments/economic policy	66.7	80.9
A5. Informational means	57.8	80.9
B1. Land use, forest area and OWL	57.8	74.5
B2. Carbon balance	55.6	76.6
B3.Health and vitality	57.8	72.3
B4. Production and use of wood	57.8	76.6
B5. Production and use of NWGs, recreation	57.8	74.5
B6. Biodiversity	57.8	78.7
B7. Protective services	60.0	72.3
B8. Economic viability	60.0	70.2
B9. Employment	60.0	72.3
B10. Public awareness and participation	57.8	72.3
B11. Research, training, and education	57.8	72.3
B12. Cultural and spiritual values	57.8	70.2
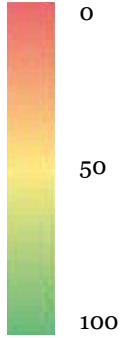
Table 6. Results for quantitative indicators for the years 2000, 2005 and 2010 including legend for color code (in percent).

Table 7. Data quality estimation for indicators – number of indicators lacking reliable data (relative color code to reflect regional situation).

Indicator	SoEF 2011					
	NE	CWE	CEE	SWE	SEE	Europe
1.1	0	0	0	0	0	0
1.2	0	0	0	3	0	3
1.3	0	1	2	5	9	17
1.4	0	0	0	3	1	4
2.1	1	1	1	4	1	8
2.2	2	4	5	4	9	24
2.3	1	2	1	3	4	11
2.4	1	6	2	5	2	16
3.1	1	2	1	4	2	10
3.2	1	1	5	4	4	15
3.3	2	3	5	4	4	18
3.4	4	5	8	7	8	32
3.5	0	0	1	3	2	6
4.1	0	3	3	4	5	15
4.2	0	1	0	4	0	5
4.3	0	0	0	3	1	4
4.4	0	0	1	4	4	9
4.5	1	1	3	5	6	16
4.6	0	0	0	4	2	6
4.7	0	2	3	1	0	6
4.8	0	0	0	0	0	0
4.9	0	0	1	4	3	8
5.1	0	4	1	4	4	13
5.2	6	7	3	5	6	27
6.1	0	0	0	0	0	0
6.2	0	1	3	4	4	12
6.3	2	3	6	4	8	23
6.4	5	4	5	5	8	27
6.5	0	1	2	3	3	9
6.6	2	3	2	5	8	20
6.7	0	0	0	3	0	3
6.8	0	1	0	3	0	4
6.9	0	1	4	5	3	13
6.10	3	3	5	6	9	26
6.11	3	4	6	4	5	22

rope's Forests reports. There was a high variability in data availability between the different reporting years; this is mainly due to data availability during data compilation for SoEF 2011. The data availability also varied between the different Forest Europe regions. Regionally, there is a lack of information for South-West-Europe amongst all criteria for every point in time. Data completeness is higher for South-East-Europe but there are still gaps. Northern Europe provided the most comprehensive data, while Central-West- and Central-East-European countries report adequately for most indicators. Across all regions there is a progressive improvement in the data completeness

when comparing the respective reporting periods. As regards the indicator set, it can be seen that Criterion 1 stands out with regard to the completeness of records since information for all sub-categories is covered well by all regions. Information on Criterion 2 is provided by International Data Providers mainly, and data for Criterion 3 and 4 seems to be scarce. Information on indicators for Criterion 5 is adequate although there is room for improvement. Data completeness for Criterion 6 is satisfactory at an overall level, and has been improving.

In terms of data quality a rough analysis was done based on the preparatory work for the assessment chapter in SoEF 2011 (Table 7). It can

be observed that the greatest concerns about data quality are for indicators 3.4 *Services*, 5.2 *Protective forests – infrastructure and managed natural resources*, 6.4 *Expenditures for services*, 6.10 *Accessibility for recreation* and 2.2 *Soil condition*. In general, criterion 6 needs the strongest enhancement in data quality.

5.2 National perspectives on implementing criteria and indicators for sustainable forest management

5.2.1 General introduction

The national assessments in our study aimed to answer three principal questions: (i) To what extent are the pan-European criteria and indicators, or national sets derived from it, being implemented at national and sub-national level in the 46 FOREST EUROPE countries?; (ii) To what fields are C&I at national and sub-national levels being applied?; and (iii) What factors influence the effectiveness of C&I?

This enquiry, which was structured around the project's working definition, was distributed to the 46 FOREST EUROPE national correspondents during summer 2012, and 39 responses were received by the end of March 2013. This national level enquiry is available in the Annex 2. Over 80 national specialists participated in completing the enquiry. The high response rate of 85% allowed a comprehensive insight into the extent to which the C&I have been implemented at national level. This section summarizes the outcomes of the enquiries, which were submitted by 38 FOREST EUROPE countries[3] (from Belgium we received two submissions, from Wallonia and from the Capital Region of Brussels). Eight countries did not respond to the enquiry: Georgia, Italy, Liechtenstein, Malta, Republic of Moldova, Monaco, Netherlands, Ukraine.

The term "C&I sets" is used in the text as shorthand for the expression "the pan-European C&I set or the national set derived from it".

The maps on the following pages represent the rankings for several enquiry questions (the number of relevant question is shown in brackets on the map). The national correspondents were asked to indicate their opinion on the use of C&I on a scale from 0 (do not know/no opinion), 1 (not at all) to 9 (to a great extent). In order to allow trends to be displayed in an "easy-to-read" form the points on the scale were grouped into five classes: great extent (rank 9–7), moderate extent (rank 6–4), minor extent (rank 3–2), not at all (rank 1), and no opinion/no ranking.

5.2.2 National C&I sets and their use among the respondents

More than two-thirds of the respondents indicated that the pan-European C&I set has served as a basis for the development of national C&I set. In over half of the countries the development and maintenance of national C&I sets involves a broad range of stakeholders. In addition, the pan-European set has been used by half of the countries for publishing national reports. Nevertheless, only a few countries have produced national reports more than once. In one-third of the countries data collection has been modified at the national/sub-national level after 2004 to allow conformity with the pan-European C&I set and to meet the variety of needs that have arisen since.

a. National C&I and their differences to the pan-European C&I

Since 2003, the pan-European C&I set has served as a basis for the development of national C&I sets in over two-thirds (64%) of the FOREST EUROPE countries (Figure 4). Most of the countries where no national C&I exist are planning to develop a national C&I set in the next few years.

The pan-European C&I and the national C&I differ between the reporting countries due to country specific additional indicators mostly related to: (i) the objectives of a National Forest Programme; (ii) new requirements for certification; and (iii) the importance of forestry for society. In particular the additional national specific indicators, up to 255 in one country, are related e.g., biodiversity, carbon cycle, forest health, water, forest management, forest governance, climate change impact, ecosystem services and wood construction issues.

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3   Albania, Andorra, Austria, Belarus, Belgium (Wallonia and Capital Region of Brussels), Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Holy See, Hungary, Iceland, Ireland, Latvia, Lithuania, Luxembourg, Montenegro, Norway, Poland, Portugal, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, the former Yugoslav Republic of Macedonia, Turkey, United Kingdom.

b. Main bodies involved in developing and maintaining the national C&I set

The development and maintenance of the national C&I set involves a wide range of stakeholders according to the respondents in about two-thirds of the respondents. This participatory approach, with up to 30 different stakeholders, involves ministries, state/federal, sub-national and local authorities, public associations, science community, forest industries, small- and medium-sized enterprises, private and communal forest owners, and NGOs. The inclusion of a wide range of stakeholders is considered by the countries as favorable for defining common objectives, priorities and goals of indicators. However, there is now information on how much the different stakeholders have influenced at which point of the process in developing and maintaining the national C&I set.

c. National reports

Comprehensive national forest reports based on the C&I sets have been published by 19 FOREST EUROPE countries (Figure 5). These national reports are seen as a useful communication tool for policy makers and the general public; a minority of these countries have published the reports more than once, and some of reports are also available in English in addition to the native language. Nevertheless, the majority of the countries stated that a national/sub-national report structured according to pan-European C&I set is planned for the period between 2012 and 2015.

d. Modified data collection

The data collection at the national/sub-national level has been modified continually in 13 countries after 2004 to allow conformity with the pan-Euro-
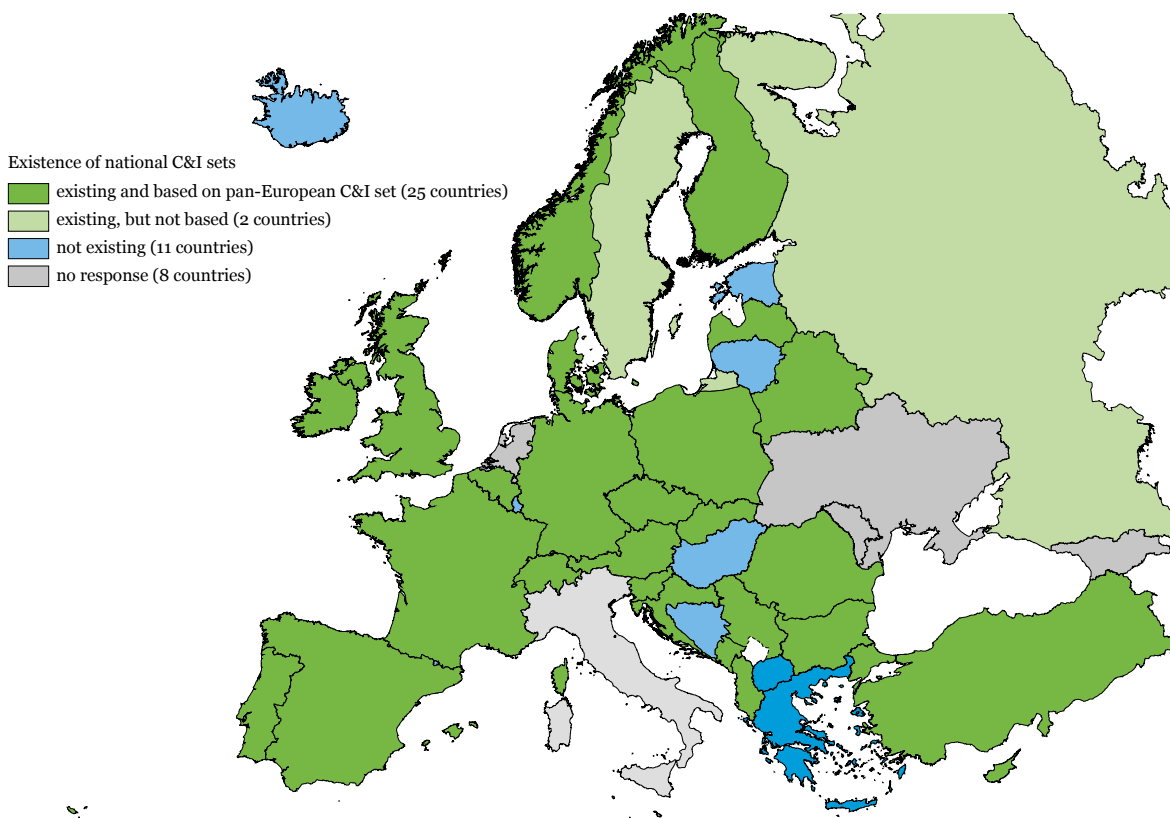
Figure 4. Existence of national C&I sets in FOREST EUROPE countries.

pean C&I set and to meet the variety of needs that have arisen since. For many countries the modifications include the integration of the C&I parameters in the design of the national/sub-national forest inventories. Suitable mechanisms for collecting data for certain indicators – e.g., on non-wood goods (Criterion 3), services (Criterion 3) and socio-economic indicators (Criterion 6) – are an exception within the countries.

5.2.3 The C&I set as a framework for dialogue and communication

The C&I sets are used by the FOREST EUROPE countries mostly to support the dialogue and communication with policy and decision makers and for the dialogue within the forest sector. For the dialogue and communication with policy and de-

cision makers the C&I sets are used for example to define forest legislation and its implementation, for forest decision making, or for revision of environmental guidelines and guidelines for best forest practice. Within the forestry sector, the C&I sets are used mostly for providing basic information on forests at forest and wood sector forums, for improving technical regulations on forest management, for description of the SFM concept, and for preparation of forestry development and forest management plans and programmes.

The FOREST EUROPE countries see the use of C&I sets to communicate with other sectors as challenging for two major reasons: (i) the means and channels to use C&I for communicating with other sectors are currently missing; and (ii) the limited influence of C&I on other sectors (e.g., environmental sector). Similarly, the use of the C&I sets
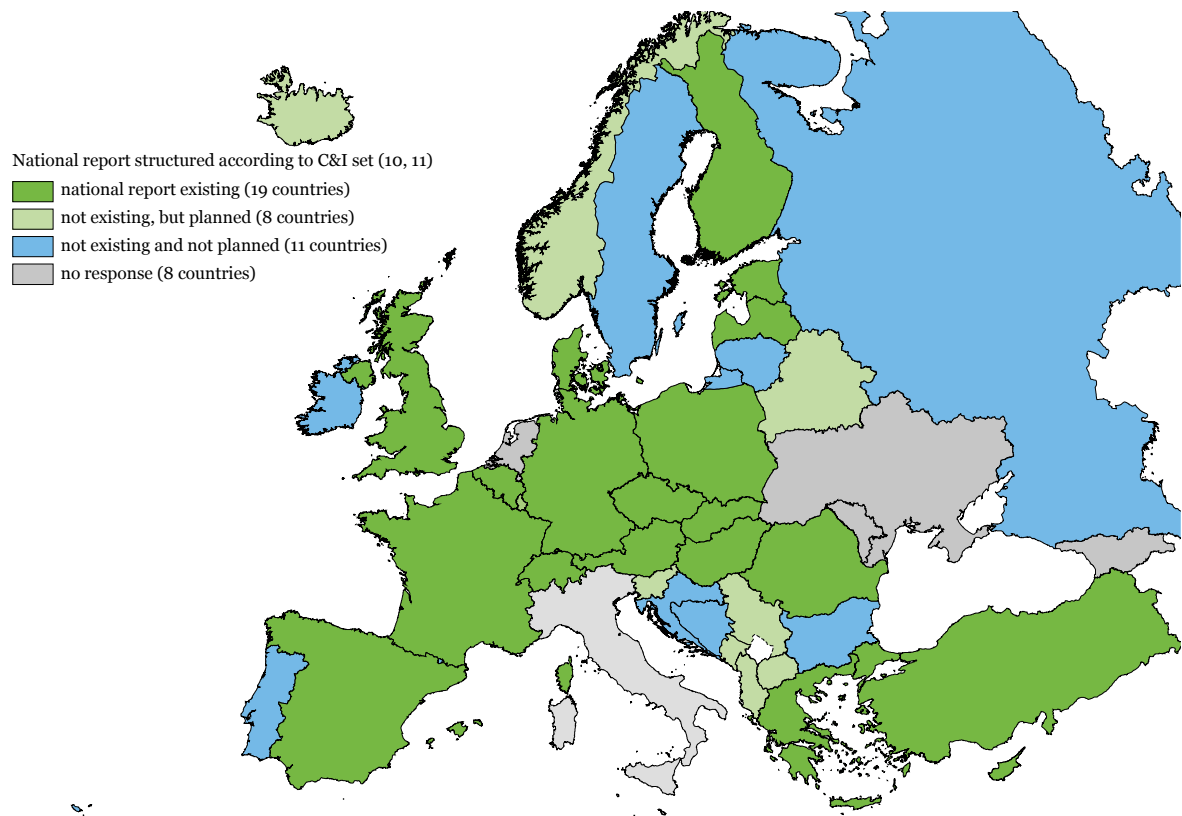
Figure 5. Existence of national report based on the pan-European C&I sets in FOREST EUROPE countries.

to communicate with the general public is rated by the majority of the reporting countries as the most challenging, mostly due to the limited availability of effective communication channels.

a. Support policy and decision makers
The C&I sets are seen by over half (56%) of the respondents as being to a *great extent* useful (Figure 6) for providing information to policy and decision makers in a wide range of applications, e.g.,:
• for development of strategic guidelines;
• for forest planning and decision making;
• for defining forest legislation and its implementation;
• for reporting the status of forests to authorities;
• for revision of environmental guidelines and guidelines for best forest practice; and
• for development of a National forest strategy.

These reporting countries are using in a few cases a selected set of indicators (e.g., 1.1 forest area, 1.2 growing stock, 1.4 carbon stock, 3.1 increments and fellings, 2.4 forest damage, 6.2 contribution of the forest sector to GDP and 6.9 energy from wood resources) to support policy and decision makers.

Some 21% of the reporting countries viewed the C&I sets as being to a *moderate extent* useful to policy and decision makers, e.g.,:
• for input to a starting phase of a forest policy related committee;
• for reporting to government officials;
• for a common general explanation;
• as a tool for defending the SFM concept against competing ones in the fields of agriculture, nature conservation or sustainable development; and
• as a tool to explain the multi-functionality of forests.

A few countries (10%) ranked the use of the pan-European C&I or the national set to support policy and decision making as being to a *minor extent* useful due to e.g., the fact that for many decades there have been positive development trends in a majority of C&I – this has restricted the use of C&I as an argument to change major policy development.

b. Communication within the forest sector
The C&I sets are seen by half of the responded countries (54%) as being to a *great extent* a useful

tool to communicate within the forest sector on key forestry issues (Figure 6). At national level, the sets provide basic information on forests:
• at forest and wood sector forums;
• for improving technical regulations on forest management;
• for description of the SFM concept; and
• for preparation of forestry development and forest management plans and programmes.

In over one-fifth of the reporting countries the use of C&I sets was ranked as being to a *moderate extent* useful, due to following reasons: minor importance of the forest sector, the lack of information among many foresters on C&I concept, and the lack of threshold levels.

Countries that are using the C&I sets to a *minor extent* highlighted the following challenges: (i) use of the C&I sets only for certification and for creating awareness, and (ii) already existing platforms for dialogue with stakeholders within the forests sector to discuss SFM and forest policy development without the explicit use of the pan-European C&I set.

c. Communication with other sectors
The communication with other sectors on key forestry issues using C&I is seen by the respondents as challenging. More than one-third of the respondents are using the C&I sets to raise the awareness of forest sector issues with other sectors to a *great extent*, and more than one-third are using the sets to a *moderate extent* to *minor extent* (Figure 6).

Among the countries the sets are used for providing information on forest issues to forest related sectors on e.g., biodiversity, rural development, farming and nature protection. Nevertheless, challenges are seen by the countries mostly by (i) the missing means in using C&I to communicate with other sectors, (ii) the existence of a C&I set for a particular sector (e.g., biodiversity), and (iii) the limited influence of pan-European C&I to other sectors (e.g., environmental sector).

A few FOREST EUROPE countries (5%) report on *not using* the set to communicate with other sectors.

d. Communication with general public
Within the pan-European countries there is a wide range of ways to communicate on forestry issues
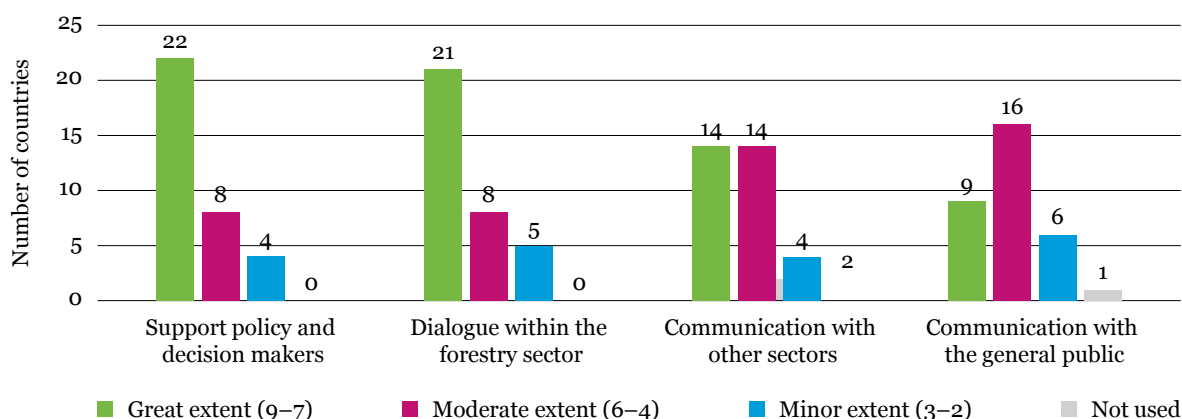
Figure 6. Number of FOREST EUROPE countries using the C&I sets: to support policy and decision makers; for dialogue within the forest sector; for communication with other sectors; and for communication with the general public.

with the general public, e.g., press releases, brochures, comics, workshops, public events, and modern social media. Nevertheless, communication with the general public is considered by the countries to be the most challenging, due to the difficulty for the general public to understand C&I.

Addressing the general public on forestry issues is seen by about one-fifth the respondents as successful (Figure 6). In about half of the countries the C&I sets are used to a *moderate extent*, including the use of selected indicators of public importance and the preservation and improvement of ecosystem services and changes in forest cover. In six countries the C&I sets are used to a *minor extent*. Challenges are seen in these countries as related to the limited availability of adequate communication channels.

5.2.4 Major challenges in providing information to State of Europe's Forests 2011

Within the pan-European countries the following major challenges in providing information to State of Europe's Forests 2011 were identified: (i) no data available for certain indicators due to the fact that those indicators are not assessed by national forest inventory or that national statistics are not compiled for certain indicators; (ii) the need to convert, adapt, extrapolate national data in order to fit the

SoEF reporting tables; and (iii) difficulties with the terminology and definitions and the structure of the SoEF reporting tables in general.

About two-thirds of the respondents have the opinion that the C&I sets can be used to monitor and report on the state and trends of the forest sector. Weaknesses are seen in the coverage of the indicator set.

Moreover, respondents see the need to revise to pan-European C&I set, making suggestions for improving the existing set by harmonization of terms, definitions and harmonization on data collection and presentation, and enhancing the existing set with new indicators.

a. Major challenges

The FOREST EUROPE Report on "State of Forests and Sustainable Forest Management in Europe (State of Europe's Forests 2011)" relies on data that is provided by FOREST EUROPE countries through a joint FOREST EUROPE/UNECE/FAO questionnaire on quantitative and qualitative indicators. In addition, data/information on indicators 2.1, 2.2, 2.3, 4.6, 4.7, 6.7, and 6.8 were provided to the report by the International Data Providers (EC JRC, ICP Forests, Bioversity International, EUROSTAT, FAO, UNECE - JFSQ and JWEE, and others).

Major challenges in providing information to State of Europe's Forests 2011 were identified
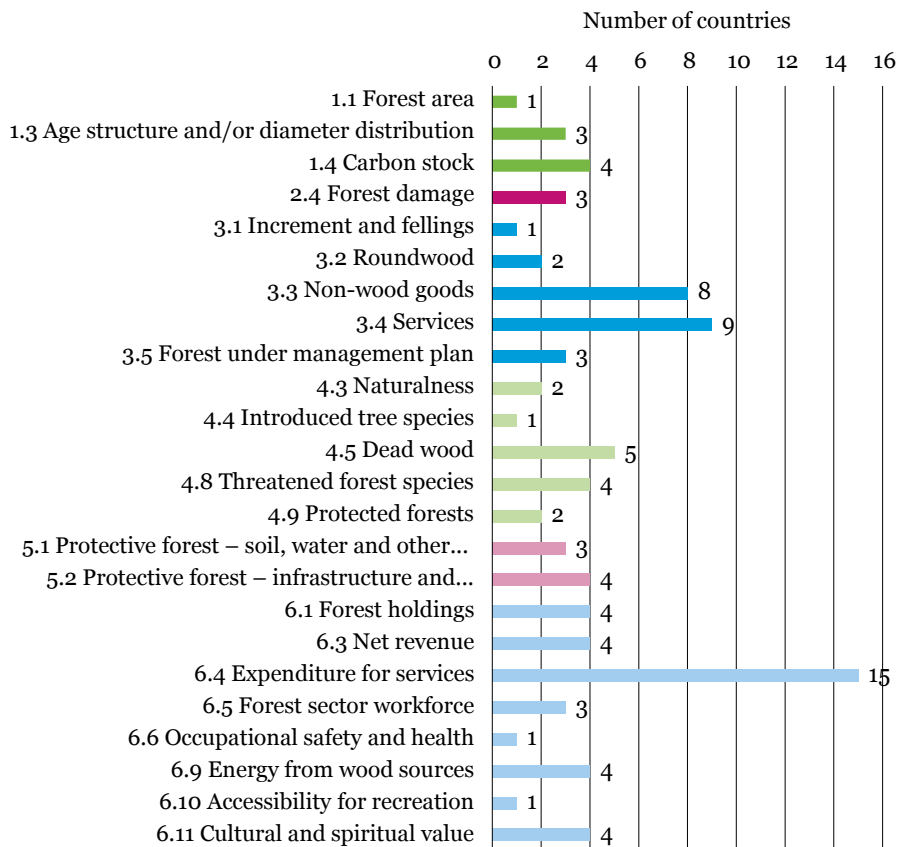
Figure 7. Challenging pan-European indicators for countries on data that is provided by FOREST EUROPE countries through a joint FOREST EUROPE/UNECE/FAO questionnaire on quantitative and qualitative indicators.

among the countries. In general, the challenges are related to lack of data for particular indicators because: (i) certain indicators are not measured by national forest inventory; and (ii) national statistical data are not compiled for certain indicators. Further challenges mentioned were:

- the need to convert, adapt, extrapolate national data in order to fit the SoEF reporting tables; and
- the harmonization of data collection terminology and definitions.

b. Most challenging pan-European indicators to be reported to State of Europe's Forests 2011 report
Respondents were asked about what were the most challenging indicators when providing information to the State of Europe's Forests 2011 report. Based on the answers provided by the countries, the following challenging pan-European indicators, in terms of unavailable methodology to collect data,

definition problems and comparability, can be identified (Figure 7):

- indicator 6.4 Expenditure for services (15 responses)
- indicator 3.4 Services (9 responses)
- indicator 3.3 Non-wood goods (8 responses)

Respondents had the opinion that criterion 6 (total 36 responses), criterion 3 (total 23) and criterion 4 (total 14) incorporate the most challenges, also due to the fact that these criteria include the most indicators in terms of number (C6 = 11 indicators, C3 = 5 indicators, and C4 = 9 indicators).

c. Monitor and report on the state and trends
Slightly less than two-thirds (63%) of the respondents see the pan-European C&I set as a useful tool to monitor and report on the state and trends (Figure 8)**.** The considerable potential covering all main as-
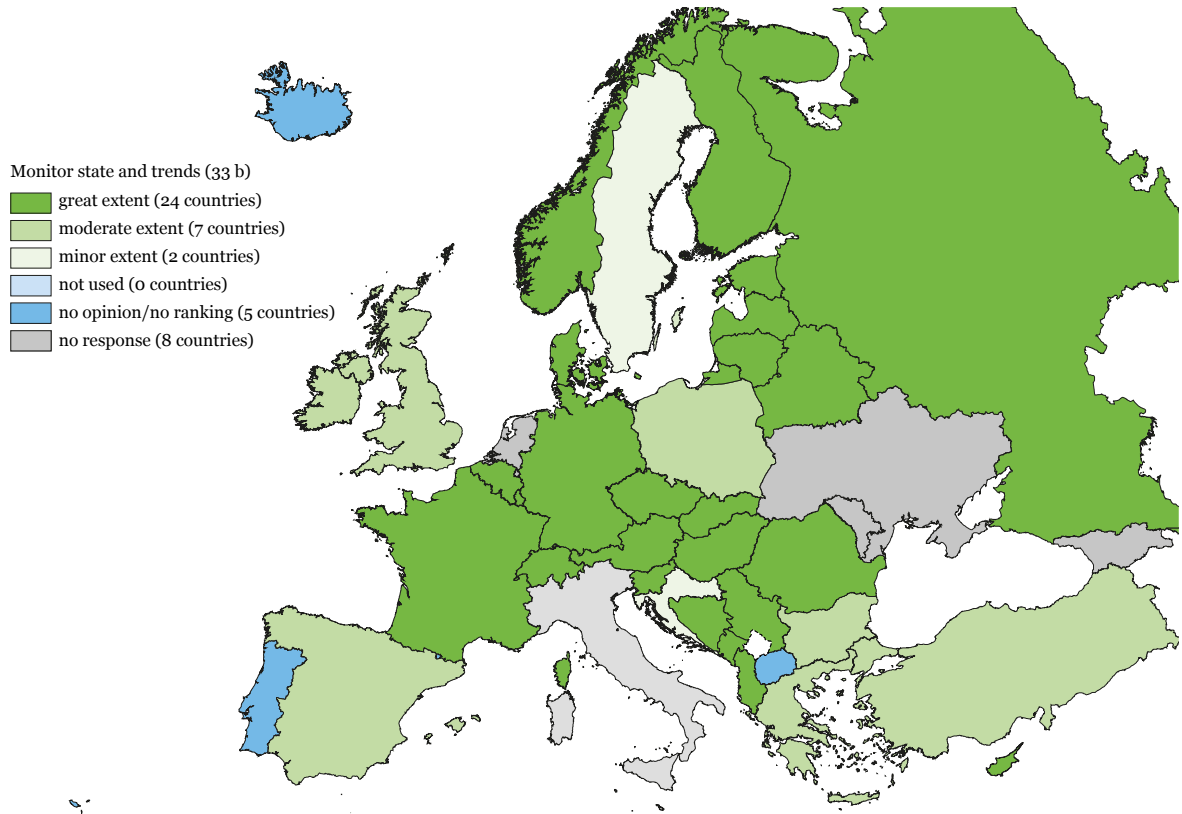
Figure 8. To what extent have countries used the C&I sets to monitor and report on the state and trends?

pects related to sustainable forest management is seen by most of these countries. In seven countries the indicator sets are used to a *moderate extent* to monitor and report on the state and trends, having the opinion that particular indicators lack in some cases sufficient focus, or that the indicators do not cover the whole range of the forest sector.

d. Revision of the pan-European C&I set
The need for a revision of the pan-European C&I set is seen by some of the respondents. In general, suggestions include the further development on harmonization of terms/definitions and the assessment of relevance of certain indicators. In particular, respondents suggest a revision of indicators on volume definitions, soil carbon pools, and forest types to ensure harmonization with reporting of greenhouse gas (GHG)/land use, land-use change and Forestry (LULUCF), Convention on Biological

Diversity (CBD), social and cultural indicators, and ecosystem services.

In addition, some new indicators were suggested to be included to the pan-European C&I set to cover currently missing elements, e.g., biomass production and extraction, climate change issues, valuation of ecosystem services and efforts to combat illegal logging. Furthermore, there was a need identified by some countries to include national threshold values for indicators, as well as trade-off tools to be able to provide assessments for SFM.

5.2.5 Use of pan-European C&I set in assessing sustainable forest management at national level

The pan-European C&I set is used by about half of the FOREST EUROPE countries to assess SFM at national level in National Forest Programme pro-
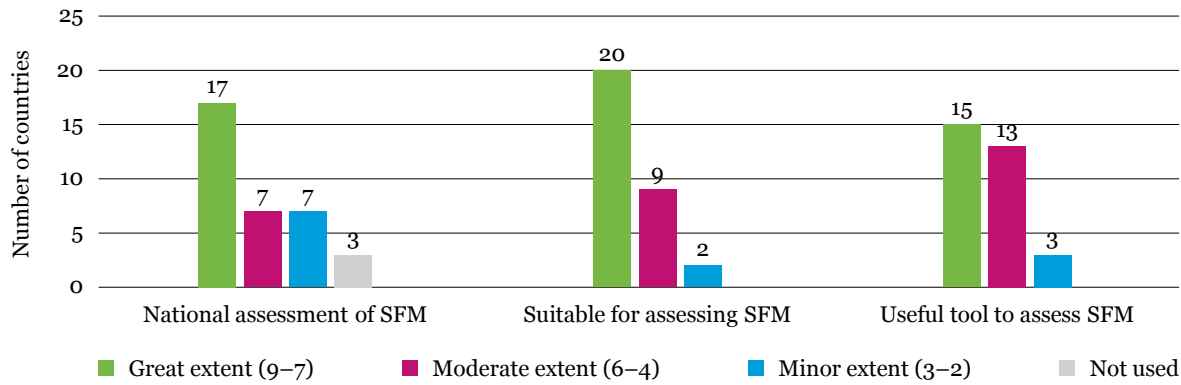
Figure 9. Use of the C&I sets for assessing SFM at a national level.

cesses, forest policies and strategies. Most of these countries see that the pan-European C&I set is a useful tool for assessing SFM and helping to distinguish certain trends and to make comparisons, especially on the impacts of forest policy on the forests and forest management, or monitoring the development of forest area, biodiversity, landscape and employment.

Within the FOREST EUROPE countries the pan-European C&I has been used to some extent to identify emerging issues and new challenges, e.g., identification of target values in forest dialogue groups, academic research projects on development of a sub-national criteria set out of proposed set by different international institutions and annual reports on the state of a country's forests.

a. National assessment of Sustainable Forest Management (SFM)
The pan-European C&I set is used by 44% of the countries to a *great extent* to assess SFM at national level (Figure 9) for compiling background information prior to National Forest Programme processes, forest policies and strategies. According to the respondents opinion the pan- European C&I set help to distinguish certain trends and to make comparisons, especially on the impacts of forest policy on the forests and forest management or monitor the development of forest area, biodiversity, landscape and employment.

Countries that use the pan-European C&I set to a *moderate extent* to assess SFM at national level, use e.g., a limited number of the indicator set or

use the set to assess forest management certification systems.

In a few countries the indicator set is used to a *minor extent*, because no regular national assessment is performed, or limited number of indicators are assessed, or that there has not been any systematic assessment of SFM. However, a few issues have caught some attention, e.g., protected forest areas.

It is worth noting, that few countries report that the pan-European C&I set is *not used* for the national assessments of SFM, due to the need to resolve issues related to the practical application of C&I before launching the national assessment of SFM or assessing SFM without the C&I sets.

b. Suitable for assessment of Sustainable Forest Management
Most of the respondents that report that the pan-European C&I set is used to a *great extent* to assess SFM at national level, also ranked that the set is to a *great extent* suitable for assessment of SFM (Figure 9). Respondents report that the C&I set is used in the preparation and monitoring of forest policies and strategies, reporting on the condition of forests, setting the direction of forest management, publishing information about forests and forestry intended for political decision makers and other interested parties, identifying issues for research, and forest certification. These challenges are seen by those countries, where long time series are not available yet.
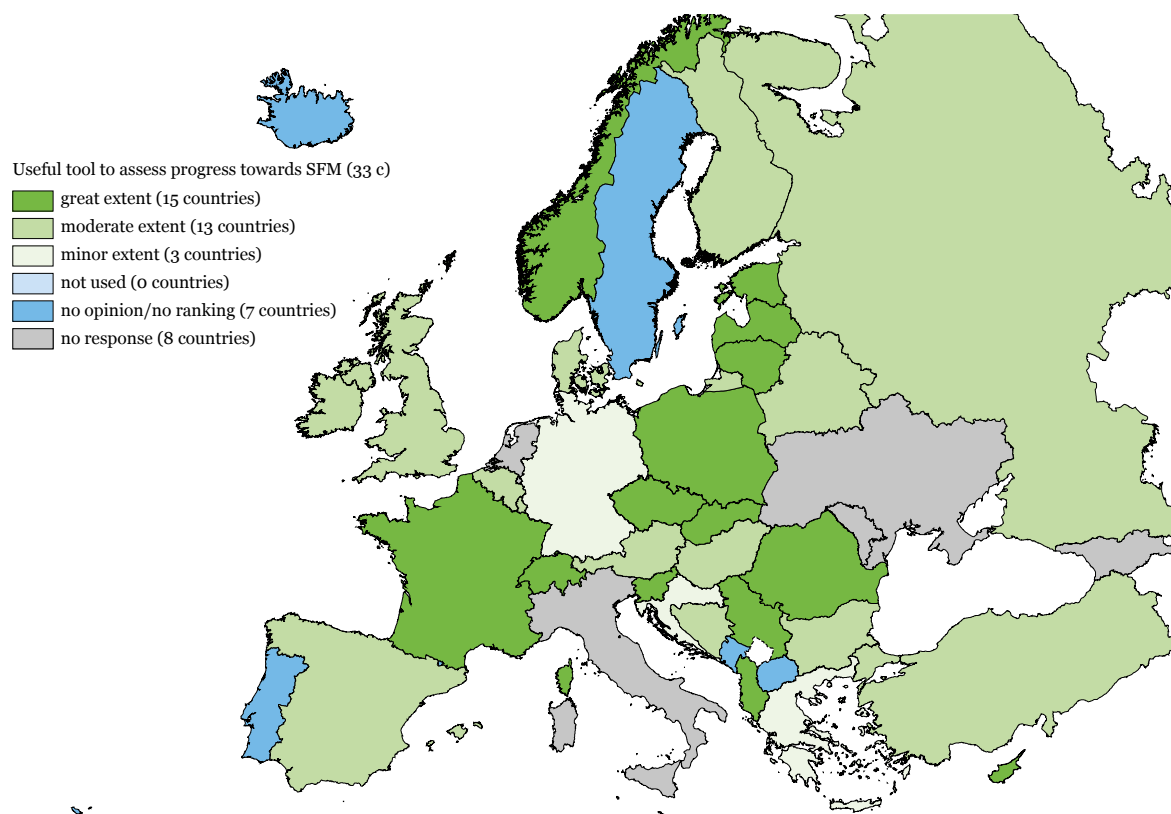
Figure 10. To what extent do FOREST EUROPE countries consider the pan-European C&I set as a useful tool for the assessment of SFM?

In about 25% of the FOREST EUROPE countries the indicator sets is seen as suitable to a *moderate extent*. Challenges are seen mostly in the lack of information for certain indicators and the need in the further development of the indicator set. In a few countries the indicator sets is seen as suitable to a *minor extent*.

c. Pan-European C&I to identify emerging issues and new challenges
Within the FOREST EUROPE countries the pan-European C&I has been used to some extent to identify emerging issues and new challenges, e.g.,: role of forests as sink of greenhouse gas emissions, improvement of forest policy in relation to production of energy from renewable sources and promotion of green economy, development of species composition, biodiversity and deadwood issues, and the development of forest area. Nevertheless, some countries expressed the opinion that indicators are an instrument for assessing and monitoring, but not as a tool to identify emerging issues.

d. Formal processes to identify emerging issues and new challenges
A few respondents report using the pan-European C&I in formal processes to identify emerging issues and new challenges, e.g., identification of target values in forest dialogue groups, academic research projects on development of a sub-national criteria set proposed by different international institutions, and annual reports on the state of a country's forests.

e. Assessment progress towards SFM
Slightly more than one-third of the respondents see the pan-European C&I set to *great extent* as a useful tool to assess progress towards SFM (Figure 10), seeing the great potential of using the C&I set for identifying emerging issues. Nevertheless, some respondents state that clearly defined political objectives (e.g., through thresholds, recommended trends in C&I) and defined importance (weight) of particular indicators (must be flexible for adjustment to national/sub-national circumstances) are pre-conditions for progress towards SFM.
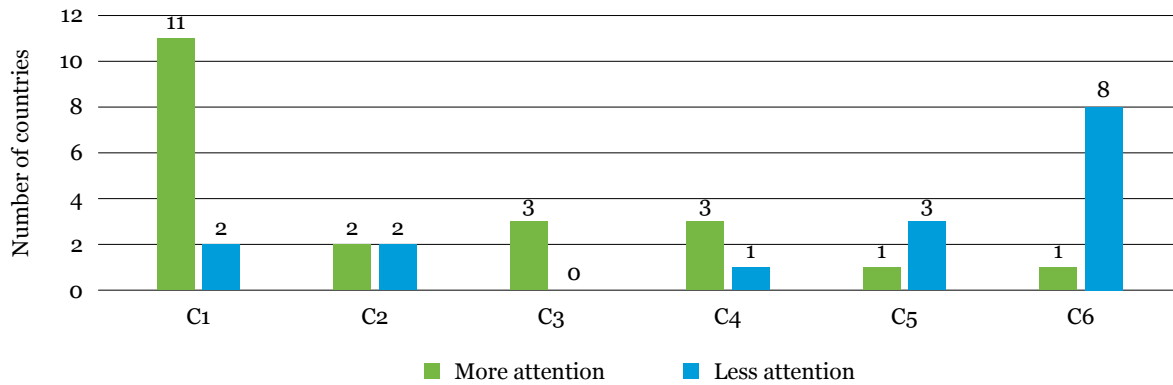
Figure 11. Criteria receiving more and less attention in the process of formulating, implementing, monitoring and evaluating national forest programmes and policies.

The reasons stated for using the pan-European C&I indicator set to a *moderate extent* to assess the progress towards SFM are the lack of assessment methods and the lack of data for specific indicators. The respondents stress that at a strategic level the C&I set can fit the purpose, but on an operational level the recommendations on forest management (e.g., threshold values of forest certification) are seen as more important.

5.2.6 Use of C&I set in national forest policies

In over two-third of the countries the C&I sets, have been used to formulate, implement, monitor and evaluate national or sub-national forest programmes and policies. Criterion 1, providing basic information on forest area and growing stock, is seen by the countries as being the most important for that purpose. Slightly more than 50% of the countries view the pan-European C&I set as being to a *great extent* a useful tool to formulate, implement, monitor and evaluate national forest programmes.

a. Reference to the pan-European C&I set in policy documents
More than two-thirds of the respondents mentioned that there is an explicit reference to the pan-European C&I set in major policy documents, including national forest programmes, forest laws, forest reports and forest strategies.

b. The use of pan-European C&I to formulate, implement, monitor and evaluate national or sub-national forest programmes, policies and criteria considered during the process
In over two-thirds of the countries the C&I sets, have been used to formulate national or sub-national forest programmes and policies. In addition, over half of the respondents reported that the C&I sets have been used to implement, monitor and evaluate national or sub-national forest programmes, policies.

In the context of formulating, implementing, monitoring and evaluating national forest programmes and policies, less than two-thirds of the respondents provided information on what criteria received more attention or less attention. The majority of the respondents stated that Criterion 1 received more attention at all stages of the process, and is seen as tool to provide basic information on forest area (1.1) and growing stock (1.2), two critical measures of SFM. Less attention was set during the process to Criteria 6, mostly due to the limited data availability (Figure 11).

c. The pan-European C&I set as tool to formulate, implement, monitor and evaluate NFPs
About half of the respondents see the pan-European C&I set to a *great extent* as a useful tool to formulate, implement, monitor and evaluate NFPs (Figure 12). Seven of the countries rate the C&I set as being useful to a *moderate extent*. Challenges are seen by these countries mostly in the lack of

Useful formulate, implement, monitor and evaluate NFPs and policies
- great extent (21 countries)
- moderate extent (7 countries)
- minor extent (5 countries)
- not used (0 countries)
- no opinion/no ranking (5 countries)
- no response (8 countries)
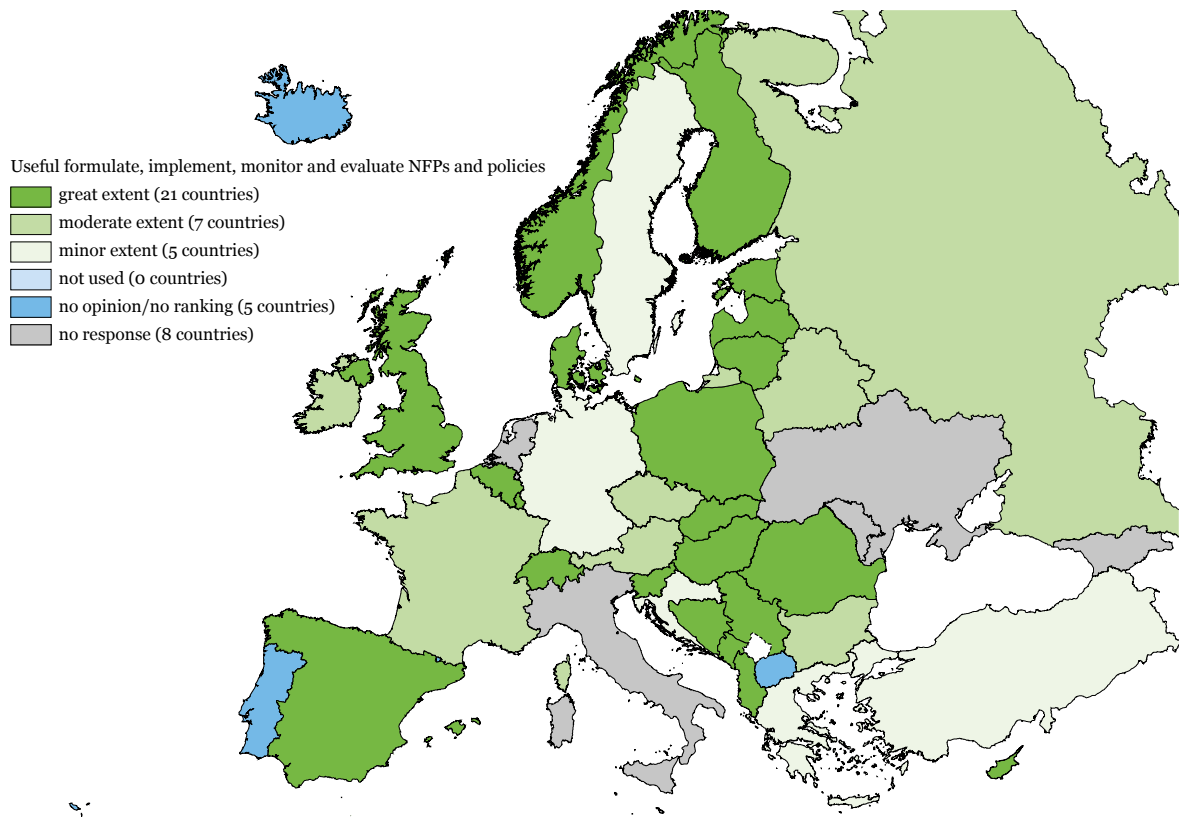
Figure 12. To what extent do countries consider the pan-European C&I set as a useful tool for formulating, implementing, monitoring and evaluating NFPs?

available data. In five of the countries the C&I set is used only to a *minor extent.*

d. Examples or lessons learnt from using the C&I sets at all stages of the process

A few of the respondents reported on examples or lessons learned from using the C&I sets. One respondent stated that for a country with a small forestry sector, meeting the monitoring requirements for all the C&I is challenging due to financial constraints. Another country expressed the opinion that the indicators on age structure, increment and fellings, tree species composition, regeneration, wood consumption enables measurable forest management goals and measures to be set at a national level.

5.2.7 Use of C&I to provide information to other sectors

It is clearly visible that information is required with fewer details for the other sectors, thus the reduced amount of information is not reflecting the

added value of the pan-European C&I set. Some of these mobilized elements are used traditionally (e.g., forest area or protected forests), where the impact of the set is also indirect. The use of information by the other sectors seems difficult due to two main limiting factors. Firstly, the inconsistent definitions developed by the different sectors undermine the effective and uniform interpretation of the information; however the raw data comes from the same origin at national level. Secondly, the dialogue is not consistent between the forest and the other related sectors. The situation is complex – with similar indicators being used for the forest sector at national and pan-European and international levels, and also for other related sectors. Simplifying the situation is a challenge for the future. Better understating of the demands and supply possibilities of the sectors could lead to better harmonized and widely accepted definitions, but the precondition for this process is increased involvement and enhanced cross-sectoral communication. Cases of these dialogues are appearing, but not within an established framework or plat-
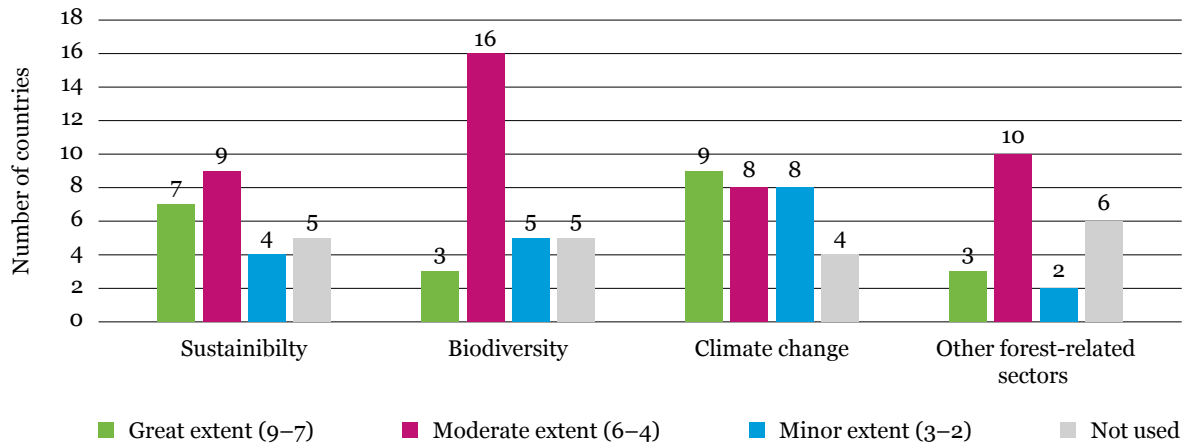
Figure 13. Number of countries using the pan-European set to provide information to other sectors.

form. However, there are examples for national initiatives, which could improve the current state.

a. Use of C&I for providing information to the sustainability sector

Only a few of the respondents are using the pan-European C&I set for reporting to the sustainability sector, and only very limited elements of the information are used (Figure 13). Moreover, there is no clear link to the source and frame of these information elements, and therefore the contribution of the pan-European C&I set remains hidden. The international commitments in this application are only visible to a limited extent. Only a very few countries referred to the United Nations Millennium Development Goal 7: ensure environmental sustainability, but the use for various national reports was more often emphasized.

b. Biodiversity

The information use for the biodiversity sector is more tangible, particularly related to the Convention on Biological Diversity (CBD). Some 10% of the respondents referred to the CBD reporting, but the direct reference to the pan-European C&I set is lacking. Use for various national reports was also emphasized by a few countries (Figure 13), but the dominant views suggest the indirect connections. In these cases additional barriers could be that no forestry experts are involved in the interpretation of the supplied data.

c. Climate change

Most of the countries highlighted specific examples for using the pan-European C&I set as a tool to provide information on the climate change sector. The respondents referred here mainly to the LULUCF enquiries, because often the same national experts are involved here as for the FAO FRA or the SoEF reporting. This level of involvement could be helpful to facilitate the communication between the sectors with the support of the pan-European C&I set. However, the actual impact on the developments remains marginal, if any (Figure 13).

d. Other forest-related sectors

The further involvement of other forest-related sectors using forestry information is either at an early stage or completely lacking. The most common references are to the energy, agriculture, rural development and environmental sectors, which have mostly developed their own indicators sets (Figure 13). There does not seem to be dialogue between these sets, because the national indicator sets are able to access the local data sources, and thus the forest sector has no or only limited involvement.

5.2.8 Institutions responsible for aspects of C&I implementation

a. Institutions responsible for dialogue and communication, for monitoring and reporting, and for reporting on the progress towards SFM and NFPs

For the majority of the FOREST EUROPE countries, the most common main institutions responsible for dialogue and communication inside and

outside the forest sector, other stakeholders, and the general public on SFM and forest policy development are different forest-related ministries and/or authorities.

In addition, countries stated that the following institutions are responsible for monitoring and reporting on the state and trends of the forest sector: forest-related research institutes and ministries, statistical offices, universities, and state forest services.

Reporting on the progress towards SFM and on the progress of NFPs and policies is carried out in the majority of the FOREST EUROPE countries by different forest-related ministries and/or authorities.

b. Providing information outside the forest sector
A few respondents provided information on institutions that are responsible for providing information and assessment outside the forest sector. Those institutions are mostly forest-related ministries.

5.2.9 Contribution to promote sustainable forest management in Europe

Within the pan-European countries the C&I are seen as a tool to promote SFM e.g., in reaching a common understanding, provide a framework for dialogue and communication with forest sector stakeholder on SFM, and as fundamental framework for the range of forest strategies and policies directly related to or within forestry (Figure 14).

a. Promotion of Sustainable Forest Management by the pan-European C&I set at pan-European level
About 44% of the respondents have the opinion that the pan-European C&I set has been to *great extent* useful in promoting SFM at a pan-European level (Figures 14 and 15). Some of the countries see the strength of the pan-European C&I in reaching a common understanding, as a useful tool to provide a framework for dialogue and communication with forest sector stakeholders on SFM at a European level, and as a fundamental framework for the range of forest strategies and policies directly related to or within which forestry is an important element at a European level. Nevertheless challenges are seen here mostly in the gaps between
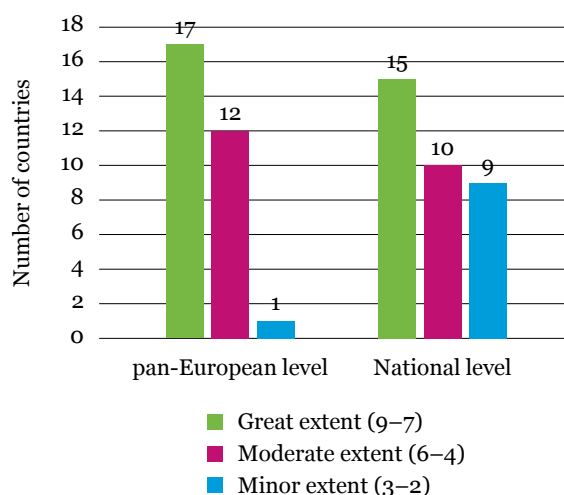
Figure 14. To what extent do C&I promote SFM at pan-European and national levels?

facts on forests and public understanding of the forest sector situation.

In about one-third of the respondents the pan-European C&I set is seen as being to a *moderate extent* useful to promote SFM at a pan-European level. These countries see challenges mostly in the lack of available data and a lack of acceptance by other sectors (e.g., ecosystem approach). In addition, a few countries have the opinion that SFM is possible to be implemented even without any C&I set, if the political objectives and definitions of basic principles of SFM exist. Furthermore, it is considered that the pan-European C&I set has helped to improve international monitoring and reporting on forests, which can be considered as one of the main achievements of the process.

b. Promotion of Sustainable Forest Management by the pan-European C&I set at national level
Over one-third of the respondents have the opinion that the pan-European C&I set is used to a *great extent* to promote SFM at a national level (Figures 14 and 16). Some respondents see that the pan-European C&I set is a useful tool at a national level to deliver a framework for dialogue and communication amongst forest sector stakeholders, allowing sectoral and cross-sectoral interests to more comprehensively appreciate and understand the SFM concept and its component elements.
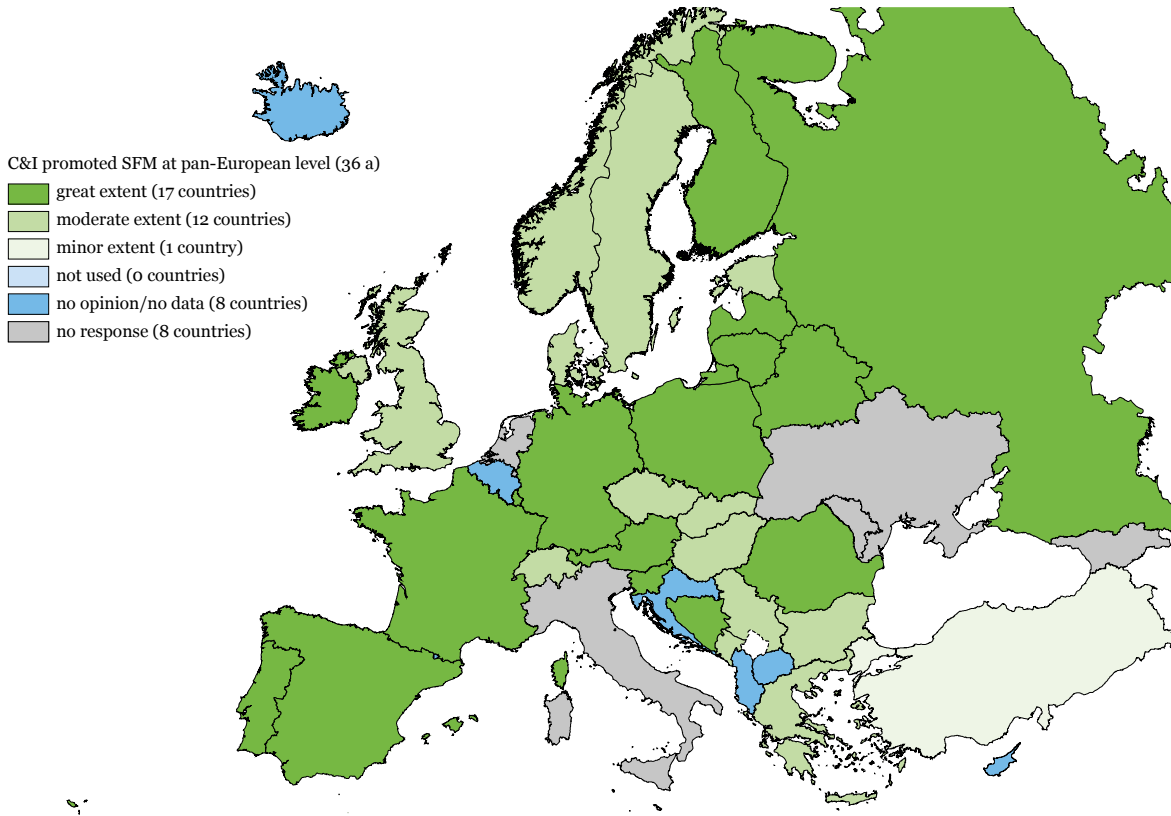
Figure 15. To what extent do countries consider that the pan-European C&I set promote Sustainable Forest Management at the pan-European level?
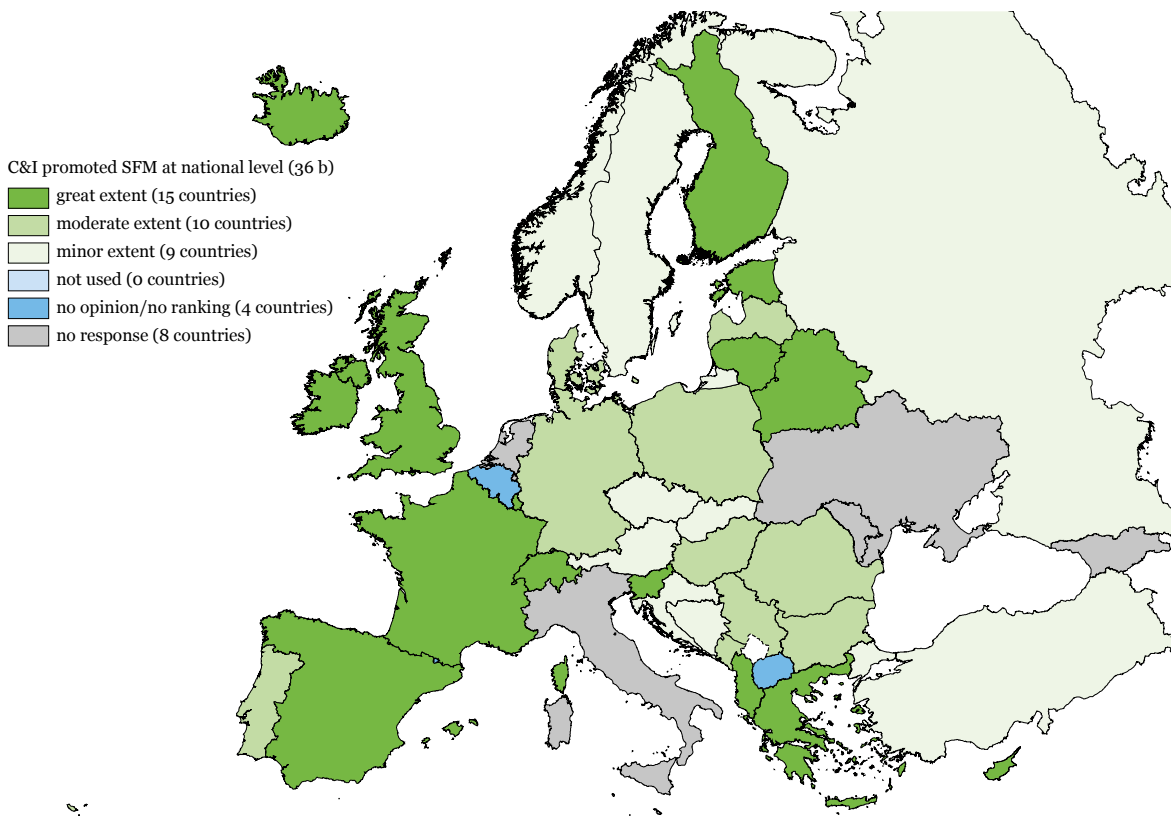
Figure 16. To what extent do countries consider that the pan-European C&I set promote Sustainable Forest Management at the national level?

c. The use of the pan-European C&I set- other purposes than to provide a framework for dialogue, monitor and report on the state and trends, assess progress towards SFM, formulate, implement, monitor and evaluate NFPs, and provide information to other sectors

A few respondents suggested other purposes for which pan-European C&I set could be used. These include:

- to develop new dimensions and orient activities like research/development and investment;
- for the dialogue at the international (regional) level, harmonious development of joint positions for UNFF;
- particular indicators could be used for the assessment of progress in rural development strategies;
- to describe in more practical terms the main components of SFM for countries that so far have not already developed systems to systematically assess and evaluate progress towards SFM;
- to describe employment, social development, rural development policy, climate change adaptation and mitigation, protection of water resources; and
- to promote the forestry approach in other sectors, e.g., on the use of sustainable biomass for bioenergy.

5.3 Regional perspectives on implementing criteria and indicators for sustainable forest management

To gain a regional perspective on the implementation of C&I for SFM, three workshops were organized in Zagreb (Croatia), Budapest (Hungary) and Estoril (Portugal). The objectives of these workshops were to discuss and describe aspects that:

- define and understand the various aspects of the implementation of both criteria and indicators at national and regional levels;
- share experiences about national applications and identify common regional issues; and
- propose recommendations on fostering C&I implementation at national and pan-European levels.

These workshops furthermore aimed to facilitate information exchange between different stakeholder groups and national correspondents. In total, aside from a number of international organizations and NGOs, 18 FOREST EUROPE sig-

natories contributed to the regional workshops (Figure 17).

The text is based on the outcomes of these regional workshops. Each workshop is described with a short summary and some of the proposed recommendations are presented[4]. More details on the workshops (e.g., proceedings and related documentation) can also be found on the CI-SFM project website.[5]

5.3.1 Zagreb: A regional workshop for the Western Balkans

The participants that took part in the Zagreb workshop represented both the forestry and environmental sectors operating in the Western Balkan region. However, few of the participants were directly involved in C&I implementation. Given the broad representation of stakeholders, the workshop was divided into three Working Groups (WGs). These WGs were tasked with addressing a different set of the five applications listed in the projects working definition (see chapter 4.1.2):[6]

- WG 1 focused on policy (application 1 and 4);
- WG 2 focused on monitoring and reporting (application 2 and 3); and
- WG 3 focused on other sectors, particularly on the environment (application 5).

Results from the workshop demonstrate that there are only limited applications of C&I throughout most of the countries in the Western Balkans region. The main reason for this is principally due to a lack of awareness with regard to the implementation of C&I at the national level. Even more, the few examples of C&I applications in the Western Balkans were in fact indirect applications of C&I through certification (e.g., PEFC and FSC) or international and national reporting (e.g., FAO, UNECE or by relevant ministries or through forest management plans). The main issues discussed during the

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4   Please note that the complete lists of recommendations are attached in Annex 3.
5   See http://ci-sfm.org/events for more information.
6   Application: (1) Provide a framework for dialogue and communication between policy makers, inside and outside the forest sector, and other relevant stakeholders, on SFM and forest policy development, (2) Monitor and report on the state and trends of the forest sector, (3) Assess progress towards sustainable forest management and identify emerging issues (4) Formulate, implement, monitor and evaluate national or sub-national forest programmes, policies and/or plans, (5) Provide information and/or assessment to indicator sets outside the forest sector e.g., for sustainable development or biodiversity, or the forest sector in other regions e.g., Montréal Process.
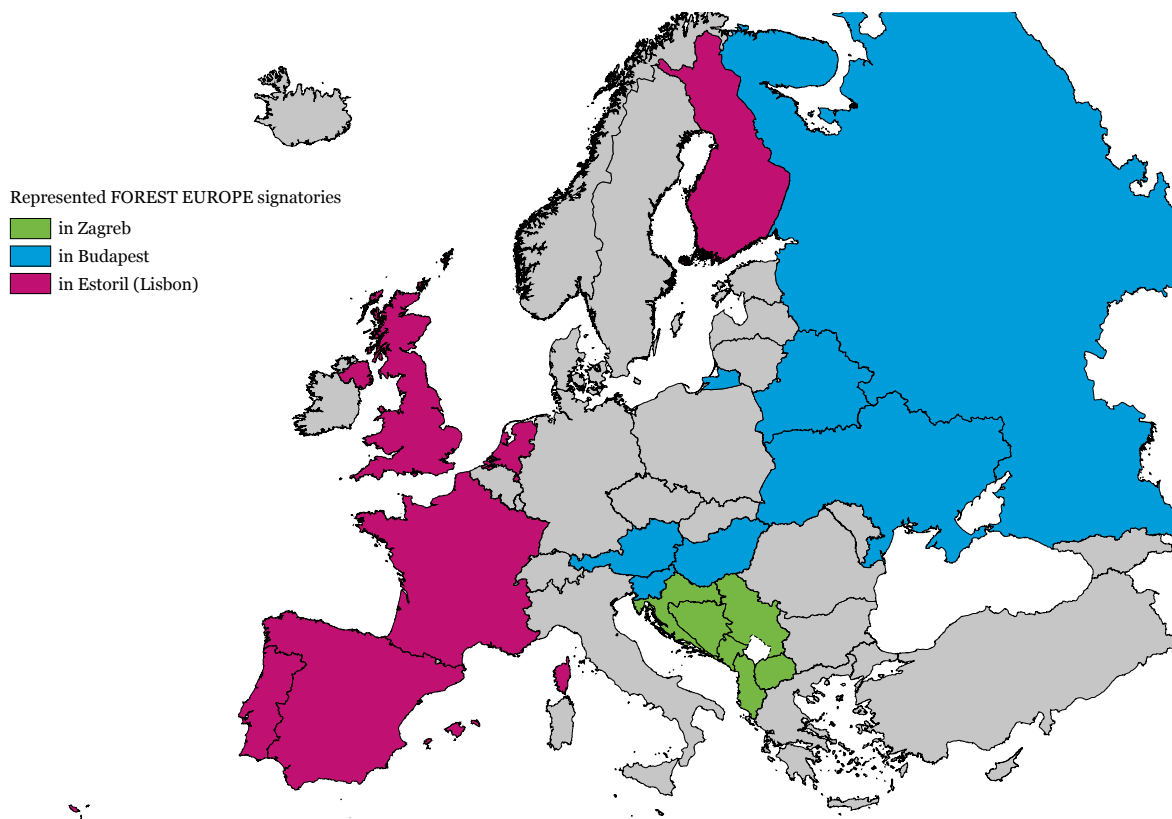
Figure 17. Representation of the FOREST EUROPE signatories at the regional workshops.

workshop were consequently linked to the lack of implementation of C&I applications and the specificities of the Western Balkans region underlying this problem. The specific challenges of the region were primarily identified as institutional and governance-related, in particular concerning the various applications of C&I, and not the set directly. Examples include the lack of human capacities and awareness at all governance levels, challenges of cross-sectoral coordination and a missing common interpretation of indicators due to limited stakeholder involvement.

5.3.2 Budapest: A regional workshop for Central and Eastern Europe

The participants of the Budapest Workshop were (in comparison to the Zagreb Workshop) mostly national correspondents responsible for reporting to State of Europe's Forest Report, or to the Global Forest Resources Assessment. Given the expertise represented, the workshop was able to address more specific and technical questions, even at indicator level. The same format was applied across

all workshops, but given a smaller number of participants in this case, the Budapest workshop was divided into two Working Groups (instead of three) according to the same applications listed earlier.

- WG 1 focused on policy (applications 1 and 4);
- WG 2 focused on monitoring and reporting (applications 2 and 3);
- Both WGs were also requested to address application 5.

Results from the workshop demonstrate that there is a significantly varied application of C&I throughout most of the countries in the Central and Eastern European region, ranging from limited (or indirect) to extensive applications. Austria and Slovenia reported on good practice applications of C&I, in contrast to a significant part of the Eastern European region that had limited or indirect applications. This was principally due to varied national frameworks as regards reporting on forests (e.g., Russian Federation) and a lack of awareness, human capacities and available resources (e.g., Ukraine and Belarus). The main challenges identified for not applying C&I are the lack of efficient

communication channels and awareness from the top (policy makers and ministries) to the bottom (stakeholders and NGOs). Furthermore, the difficulties in finding a common interpretation for C&I still remain a challenge for many countries in the region. This particularly applies for indicator definitions and targets. Other challenges discussed were complimentarity in reporting (at the institutional level and by forest owners), such as the demanding reporting duties, and the lack of cross-sectoral communication. On the assessment towards sustainable forest management it was noted, that national or sub-national targets and thresholds should be the starting point to initiate this process. Therefore the pan-European C&I set is not seen as necessarily able to cover all the relevant aspects, but should facilitate the dialogue at the national level.

5.3.3 Estoril: A regional workshop for Western Europe

The Estoril participants were mostly national correspondents responsible for reporting to State of Europe's Forest Report, but practitioners and researchers joined the meeting as well. Given the expertise represented, the Estoril workshop was also able to focus on technical questions. The workshop was divided into two Working Groups in line with the previous events.
- WG 1 focused on policy (application 1 and 4);
- WG 2 focused on monitoring and reporting (application 2 and 3);
- Both WGs were also requested to address application 5.

Participants presented their national experience of implementing C&I (in Finland, France, the Netherlands, Portugal, Spain, and United Kingdom). The project team reported for the first time on the ongoing pilot studies on sub-national implementation of C&I in Germany and Italy. These presentations demonstrate that there are significantly varied applications of C&I throughout the countries represented, ranging from Northern to Southern Europe. The discussions and the outcomes of the policy group noted that C&I were, first and foremost, used as a framework for communication and dialogue on SFM. The main challenges were identified as the cost–benefit ratio of applying C&I and

the mismatch between indicators and the priorities of policy makers. To address these policy issues, the development of clear C&I objectives would be necessary. The participants also thought that there will be opportunities that may come out of the legally binding agreement (LBA) negotiations. Also the needed link between analysis and policy-making (e.g., policy relevance) was discussed. The monitoring and reporting group discussions remarked that some definitions for C&I should be made clearer for international reporting. It was also noted that changes between reporting cycles should be avoided if possible. In order to strengthen the reporting aspects, the first recommendation concerned the need to review the current set of C&I. More specifically, the availability of data, quality and possible interpretations should be taken into account. Secondly, additional work is needed to resolve discrepancies in monitoring and assessment, particularly to reach a common understanding on defining targets and threshold values at national or sub-national level. It was also emphasized that national correspondents should be involved in this process. Finally, discussions on forms of reporting and communication showed that it is important to have different types of outputs for different audiences (e.g., European reports, brochures, leaflets and databases). It was further recommended that combined indicators or shortened sub-sets of indicators can be extracted to simplify messages when trying to convey results.

The above discussion points and recommendations from the above described three regional workshops provide an overview of the main challenges in implementing C&I in these three regions, including possible solutions in the form of recommendations. However, it was difficult to provide unified, region-specific recommendations, especially because the national conditions differ so much. The recommendations should therefore be taken as more general suggestions for how the implementation of the C&I set could be improved.

5.4 Experts' perspectives on implementing criteria and indicators for sustainable forest management

All the interviewees (40) expressed their views and opinions revealing interesting trends and patterns. In total, 30 out of the 40 experts rated their atti-
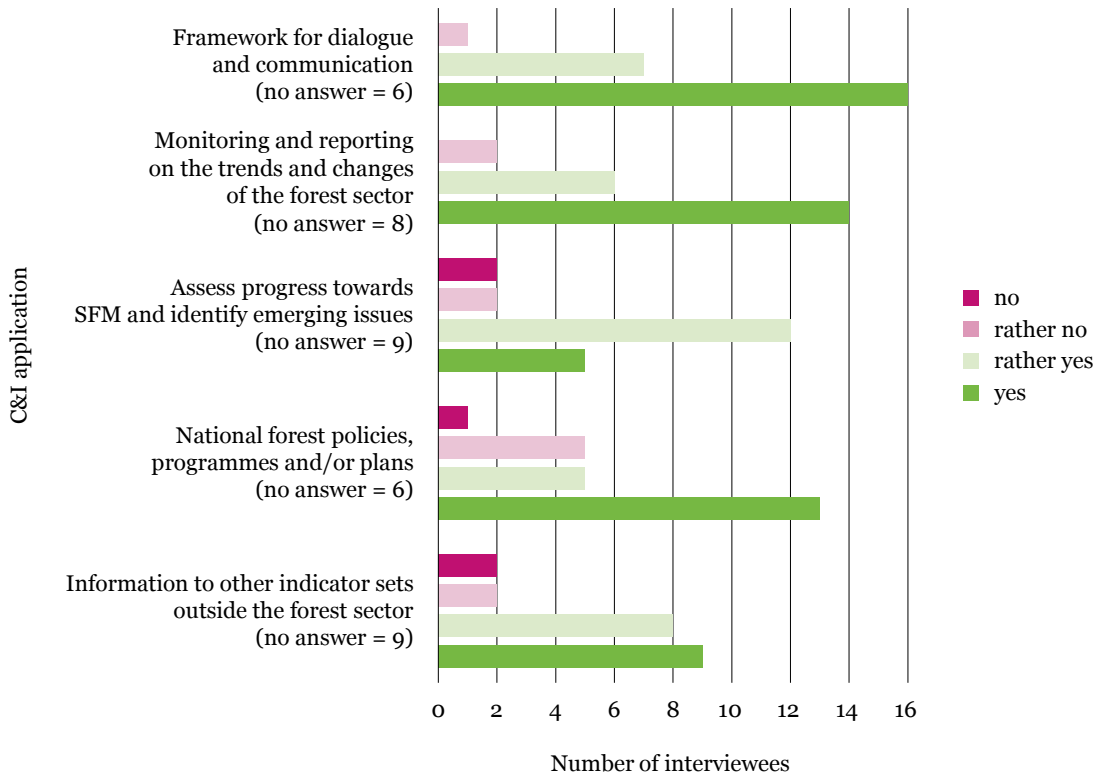
Figure 18. Usefulness of the pan-European criteria and indicators per application.

tudes towards the usefulness of the pan-European set and the impacts and achievements for each of the five C&I applications, outlined in the project's working definition (see chapter 4.2). These 30 respondents are highlighted in the graphs of this section, which is divided in three major parts: 5.4.1 provides insights into the usefulness of the pan-European C&I, whereas the 5.4.2 presents the achievements, impacts and challenges for each of the C&I applications. Proposed changes and additions to the working definition are summarized and described in 5.4.3. It is important to note that some of the findings from the expert interviews are also found in the national assessments (see chapter 5.2).

5.4.1 Has the pan-European C&I set been useful?

Since its development, the pan-European indicator set has emerged as an internationally agreed policy instrument to support SFM practices in Europe. Its usefulness has been widely discussed in the expert level meetings of FOREST EUROPE, in the State of European Forests Reports, and in international

seminars of C&I application. However, there has been relatively little analysis of the practical implementation of the pan-European C&I. Figure 18 summarizes the views of the experts who rated the usefulness of the pan-European set in the different contexts. For the purposes of this study, "useful" has been defined as relevant, valid, easily understandable, cost-effective, and easy to measure.

As can be seen, evaluations vary for each of the outlined C&I applications given the different experiences and individual perceptions of the usefulness of the pan-European C&I. Nevertheless, no major differences were found, and overall, the usefulness of the indicator set is commented rather positively. Many interviewees stated that the pan-European indicators provide a workable solution for their needs in relation to the five major C&I applications. This is particularly true for the use of the pan-European C&I as a framework for dialogue and communication. More than half of the experts strongly agreed that the C&I are useful in supporting and stimulating multi-stakeholder and collaborative discussions and negotiations about SFM and forest policy developments. However, it

has been argued that some of the criteria (e.g., C1 Forest resources and carbon) and indicators (e.g., 3.4 Services, 3.5 Forests under management plans, 4.3 Naturalness) are not clearly defined and informative enough (at least in part because of difficulties achieving consensus during their drafting). Therefore, as one interviewee stated, it is difficult to measure them and indicators may be misleading and poorly understood by policy makers inside and outside the forest sector, other relevant stakeholders and the civic society (see also section 5.4.2a).

There is a clear consensus among the experts that the pan-European indicators have been quite useful for monitoring and reporting on the trends and changes of the forest sector. According to many, the C&I set has significantly contributed to improved information availability, quality and comparability across Europe which in turn has led to increased transparency and accountability. Nevertheless, the need for commonly agreed and scientific methodologies across Europe to monitor some of the indicators (e.g., 3.4 Services) has been strongly emphasized. In addition, it was frequently stated that although most of the pan-European indicators appear to be cost-effective as most of the countries are collecting the data for their own purposes, or data is extracted from the FAO FRA reports, in some cases additional work is needed and some indicators are expensive to measure (e.g., 3.4 Services, 4.3 Naturalness) (see also chapter 5.4.2b).

Although the respondents' attitudes towards the C&I effectiveness in assessing progress towards SFM were rather positive, many interviewees seemed quite reluctant in this regard. Concerns have been expressed particularly in relation to the current structure of the pan-European C&I. It was argued that the indicator set does not account for the non-linear relationships between the different components of SFM and does not show the interlinkages between individual indicators and the dynamic nature of the system. Furthermore, a few experts strongly emphasized issues related to data quality, lack of thresholds and scientific methodologies to identify any trends (positive or negative) in assessing the progress towards SFM. For this purpose, the existing pan-European indicators do not seem valid for making an objective assessment of SFM.

Nevertheless, the significance of the pan-European C&I set has increased, particularly in relation

to forest policy. There is a broad notion among the experts that the C&I for SFM provide a compelling normative framework for the development of national policies, laws, institutions and instruments towards multi-functional forest management. However, the actual operationalization of the indicators to influence or change forest policies is still limited to a few countries (see also chapter 5.2.4d).

Regarding the use of the pan-European C&I to provide information to forest-related sectors, the majority of interviewees underlined the deficiency of indicators for monitoring important cross-cutting issues with regard to SFM (e.g., climate change, energy, biodiversity, agriculture). It was indicated that they have only been considered to a minor extent and many causal links have thus not been established yet (see also chapter 5.2.4e).

5.4.2 Achievements, impacts and challenges per application

a. As a framework for dialogue and communication between policy makers, inside and outside the forest sector, and other relevant stakeholders, on SFM and forest policy development

Achievements and impacts
The pan-European C&I provide a structure within which a vast amount of information on different aspects of SFM is collected and analysed. This is fundamental for communicating key forestry issues to different stakeholder groups inside and outside the forest sector. In general, almost all interviewees consider the pan-European C&I as a communication instrument, which has contributed to systemic understandings of SFM across Europe, and hence have provided a common language and an impetus for advancing the knowledge on the matter.

Figure 19 summarizes the views of the experts who rated the impacts of the pan-European C&I as a framework for dialogue and communication, particularly in relation to their role in:
• Stimulating and assisting discussions and negotiations about SFM;
• Raising awareness and political commitment to SFM;
• Public/Stakeholder participation.

The majority of experts who rated the impacts as *moderate* and *high* explicitly stated that the pan-
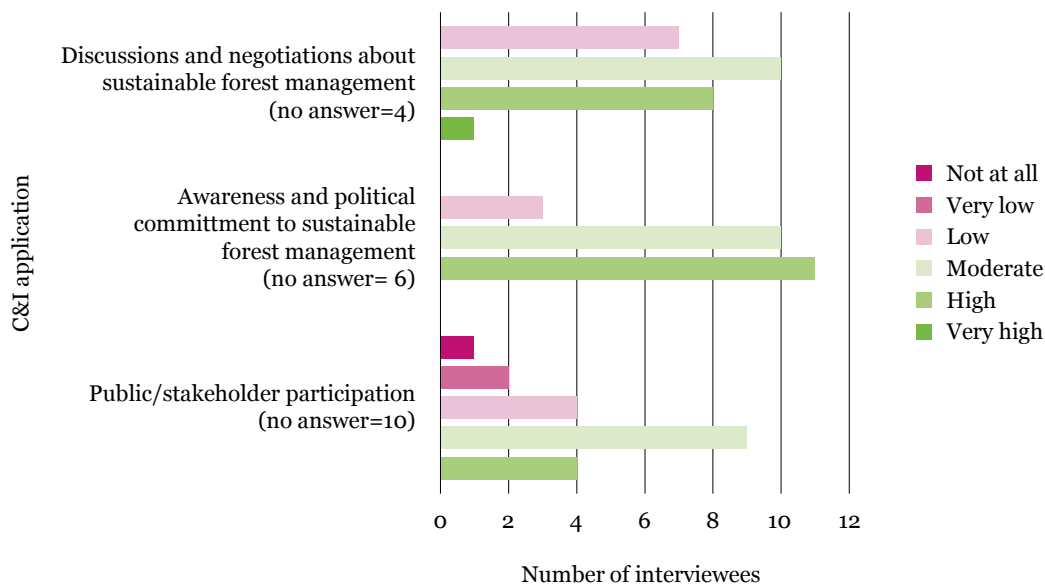
Figure 19. Impact of the pan-European C&I for SFM on dialogue and communication activities.

European C&I set has significantly contributed to discussions about SFM related issues and forest policy developments within the forest community itself. For example, specific indicators (e.g., Indicator 4.6 Genetic Resources) have served as a good basis for discussions in international meetings or deliberative workshops, and for initiatives (e.g., EUFORGEN[7]) at pan-European and national levels on establishing measures for promoting better management and forest policy developments, as well as a basis for data collection and the drawing up of country reports on forest resources and their management. A few experts particularly referred to the use of the pan-European C&I in the currently ongoing negotiations for a Legally-Binding Agreement (LBA) on Forests in Europe, as well as in the development of national forest programmes and policies in some countries (e.g., the Austrian Forest Dialogue). The pan-European C&I have also been used in raising awareness of SFM-related issues, concerns and needs among the different stakeholder groups inside the forest sector and the civil society (e.g., in Spain) and as a communication instrument for interested groups to enter into dialogue with the policy makers and to influence political outcomes (e.g., in Finland).

Challenges

However, the experts who rated the impacts as rather low explicitly underlined that the pan-European C&I set does not fully serve the needs and expectations of:
- Other forest-related sectors (e.g., climate change, energy, biodiversity, agriculture);
- Stakeholder groups (e.g., intergovernmental and non-governmental organizations, national authorities, relevant sub-industries, managers) from inside the forest sector, particularly at EU and forest management unit level; and
- Civil society.

The main reasons for this stem from shortcomings of the current structure and content of the pan-European C&I. For example, the set lacks three essential characteristics for C&I: logical sequence, simplicity, and easy communicability. In view of this perspective, the information that the pan-European indicators present and summarize, is too "*technical*" and too "*prudent*" and can be interpreted quite ambiguously by the different stakeholder groups and the society. In other words, according to the experts, one of the most prominent challenges for the pan-European set is that it may not carry the intended meaning to the audience. Good indicators should reduce the possibility for distortion of messages; and in order to be understood in the public sphere, a system of

7   The European Forest Genetic Resources Programme (EUFORGEN) has developed several databases on forest genetic resources (Ind. 4.6 Genetic Resources) in Europe in collaboration with FOREST EUROPE Liaison Unit and UNECE/FAO Timber Section in order to facilitate exchange of information.
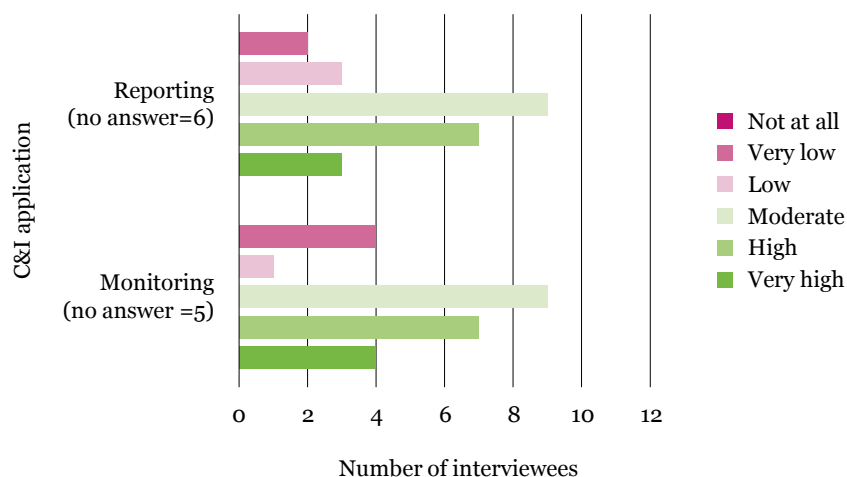
Figure 20. Impact of the pan-European C&I on monitoring and reporting activities.

visualization, and potentially aggregation is necessary (see also 5.4.2c). Moreover, the formulation of indicators and the data collected are not in a format which is immediately usable by forest- related sectors and stakeholders (e.g., environment, climate change, biodiversity, energy) and hence it is not very useful for cross-sectoral communication and other important dialogues taking place at the pan-European level (e.g., the ecosystem approach) (see also 5.4.2d).

Other cited factors that impede the use of the pan-European C&I as a framework for dialogue and communication relate to:

- Impaired awareness of the existence of the pan-European C&I, and misunderstanding of their objectives and limits, not only outside, but also inside the forest sector;
- Different interests of stakeholders which lead to unbalanced discussions and negotiations;
- The political, legal and institutional frameworks of countries;
- The institutional structure of FOREST EUROPE and different capacities and financial resources for information dissemination of rotating Liaison Units.

b. As a tool for monitoring and reporting on the trends and changes of the forest sector

Achievements and impacts
Since 1999 the pan-European C&I have served as a guiding reference framework for periodic monitoring and reporting, and the overall impact is considered *moderate* by the majority of experts (Figure 20). During the interviews, it became clear that various impacts could be linked with the use of the pan-European C&I as a tool for monitoring and reporting on the trends and changes of the forest sector. For instance, the C&I have significantly contributed to improving national forest inventories and monitoring systems, as well as the availability, quality and comparability of forest relevant information between different countries in Europe. Another example of a positive impact is the establishment of European forest databases and information systems such as EUFORGEN and EUFGIS[8].

Furthermore, many of the experts consider the pan-European C&I as highly instrumental for collecting and disseminating information on the trends and changes of the forests in Europe and their management (State of Europe's Forests reports 2003, 2007, 2011). Others put emphasis on the informed pan-European deliberations on SFM and forest policy developments (e.g., Ministerial Conferences and Expert Level Meetings on the Protection of Forests in Europe), and on development and follow-up of (pan) European guidelines (e.g., Pan-European Operational Level Guidelines for SFM) or legal arrangements (e.g., negotiations for a Legally-Binding Agreement on Forests in Europe).

In addition, the pan-European C&I set, or the derived national C&I sets, provide a balanced

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8   The European Information System on Forest Genetic Resources (EUFGIS) serves as a documentation platform linking national inventories on forest genetic resources in Europe.

compendium of information for forest research and education purposes regarding all elements of SFM. It was also indicated that the C&I approach has stipulated the scientific discourse on monitoring methodologies.

Challenges

Despite the significant progress, the interviews considered that there is still much room for improvement with regard to monitoring and reporting. In addition to the experts who rated the impact as *very low* (Figure 20), others highlighted the most prominent challenges encountered in monitoring activities. For example:

- Misinterpretation of definitions of some of the C&I and their operational contexts across countries (e.g., 1.1 Forest area, 3.4 Services, 4.9 Protected forests);
- No commonly agreed methodologies to monitor a number of environmental, social and policy indicators and lack of verification of data;
- Lack of functioning and continuous national forest inventories in some countries;
- Lack of coordination and communication within national forest authorities, between forest and other related information systems (e.g., economy, biodiversity, energy, employment) in most countries, which results in reporting of inconsistent or contradictory information;
- Inadequate institutional capacities, particularly in Eastern European countries, to meet the information needs as regards to SFM.

In addition, some indicators are not regularly or not at all produced by national forest authorities because they are not relevant in the national context, are not among the priorities of specific countries or are difficult or costly to measure. Lack of political will and commitment to FOREST EUROPE may prevent countries from investing in collecting data for most of the indicators.

As regards to the national reporting for FOREST EUROPE, there are disparities in national adaptation and implementation of the pan-European C&I across the countries. Several experts questioned the reliability of provided data noting that the pan-European indicators may serve as a way to legitimize forest policy without real progress towards SFM. Concerns were also expressed about subjectivity and corruption of national reports in

some parts of Europe. Other challenges emerge from a great variability in quality of information across national reports. Major reasons are the various levels of preparation to answer the requested questions, the level of integration of different information sources, and maintaining a regularity in the supply of qualitative and quantitative data. Further progress depends on the effectiveness of information processes including institutional and financial arrangements, legal frameworks, and information dissemination strategies.

c. Assessing progress towards SFM and identify emerging issues

Achievements and impacts

This category starts from the notion that it has been addressed in the L2 Resolution, 1998) "*to assess and assist further progress in sustainable forest management, at the international and national levels*". Even though most of the interviewees identified the impact as *high* (Figure 21), there is strong consensus that the current C&I rather provide a framework for the assessment rather than an operational approach. Experts see the role of C&I as a preparatory means to further refinement towards SFM assessment. By processing a wealth of forest-related information and thus stimulating discussion about goals and directions within the SFM context, important prerequisites are given that allow a step forward in evaluation in assessment. In that, C&I help to sharpen problem awareness, and facilitate a discussion on which achievements to reach within the forest-sector and a broader public. There is a debate about whether the C&I set may have been defined in the current form for purposes other than for assessment, and that one tool –as generic and overarching as the current C&I are – may not fulfil all demands simultaneously. If the level of application for assessment is judged to be more on the local level, pan-European C&I have had their merits to serve as a reference and baseline for further implementation.

C&I currently raise awareness for single issues and allow for benchmarking evaluation indicator by indicator. They raise attention for certain aspects and display directions of development across Europe. A more holistic and systematic assessment of SFM is not supported due to structural shortcomings (see also Chapter 3). Hence, the C&I can be
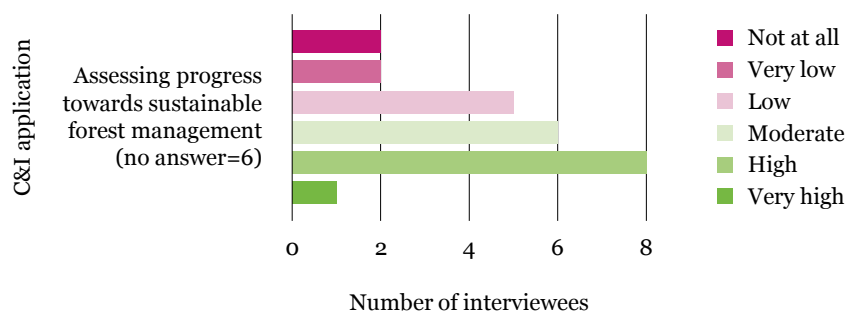
Figure 21. Impact of the pan-European C&I on assessing progress towards SFM.

judged as only partially successful. A first attempt towards pan-European assessment has been performed in the State of Europe's Forests 2011 report. This was done in a synthesized way for European regional and was still in an initial stage. Further development work on this is recommended by the experts. The initial efforts also stimulated the further work of the FAO/UNECE Team of Specialists on C&I on assessment routines for a pan-European SFM assessment. On the other hand, the request for national approaches has shown some first impacts. For instance, Austria introduced a traffic light system into their NFP and forest reports to explore whether commonly agreed targets have been achieved. An example from Catalonia in Spain gives evidence that discussions on C&I helped operationalize the debate on carbon sequestration in forests and create a dialogue on adaptive forestry.

Challenges
A central finding of the expert interviews is that the potential of C&I to provide objective and evidence-based assessment has not yet been fully reached (about one-third of the interviewees consider the C&I impact minimal). This may be due to deviations from the original purpose, improper design, or lacking implementation. Challenges for SFM assessment arise because:

- static information provided by C&I does not work as an early warning system and reflect the dynamics underlying the SFM concepts;
- the C&I set is too large for assessments and does not allow for unambiguous conclusions with respect to progress towards SFM;
- data quality is partially weak and incomplete, which will hamper a comprehensive assessment;
- there has been no process on defining target/

threshold values for a desired future state of SFM;
- C&I are not flexible enough to represent a changing world with moving targets.

While the C&I set is considered to be too big to be handled in assessment procedure, certain aspects are missing (e.g., full coverage of the forest value chains). Missing functional links of indicators to SFM may weaken the explanatory effect of assessments. The more indicators are proxies or surrogates the weaker are the analytical options for C&I-based assessment. This also holds true for missing functional and systemic links between C&I, and among indicators. Loose links between qualitative and quantitative indicators support incremental assessment rather than holistic assessment. In a broader perspective we can summarize, that the more isolated C&I-based assessment is (e.g., indicator from indicator, forests from land use) the weaker the analytical power will be.

The experts identified a number of methodological and procedural challenges:

First, finding the right methodology might entail defining and operationalizing key indicators and their roles in a SFM system, and secure sufficient data quality. The latter has been mentioned in relation to data availability of national monitoring schemes, whose heterogeneity hampers an assessment approach. In this respect, many indicators are judged as not sensitive to temporal changes in the given reporting periods by the experts. This implies the need for comprehensive time series over a longer time period to make significant statements about changes and trends, which could lead to a more focused discussion on achieved targets, short-and long-term goals, and the role that C&I
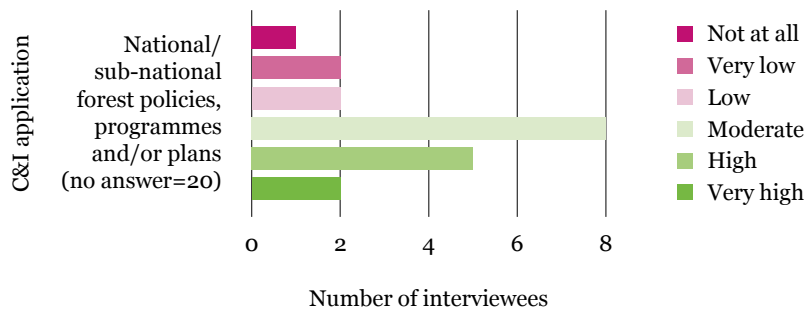
Figure 22. Impact of the European C&I on national or sub-national forest programmes, policies and plans.

play in the SFM debate. For more local assessment applications, the need of sub-national and analysis on cross-regional and eco-regional scale has been emphasized to fully harvest the analytical insight of assessment procedures, e.g., in awareness-rising and policy-making based on wanted and unwanted trends.

The second major challenge was highlighted as to identify roles and responsibilities, and guarantee political commitment. Unresolved issues include who is to perform the assessment, who sets the benchmarks/target values/thresholds, and which bodies are to evaluate and sanction the assessment results. Currently, there is no interpretative power, and it is often difficult to even decide whether a trend is positive or negative. It is understood by experts that valid assessment procedures will evolve C&I from information to policy-support means.

An extensive debate on what is expected from forests in Europe in the future would follow from this argument. In particular in the EU, we experience a strong cross-sectoral policy area in the absence of an official forest policy. In the understanding of many experts, discussions on a pan-European legally-binding agreement on SFM will refresh the discussion on the role of C&I in a different light. The inclusion of C&I in a legal framework will change their nature and will lead to a new understanding of the needs of C&I-based assessments.

d. Formulate, implement, monitor and evaluate national or sub-national forest programmes, policies, plans

Achievements and impacts
It was frequently stated during the interviews that C&I on the pan-European level are less a decision-making instrument, but are rather a process that supports norm-creation and shaping of the discourse. In this regard, a majority of experts consider the impact of C&I as *moderate* (Figure 22) and agree that the C&I are a potentially important instrument for fostering SFM implementation on national and sub-national levels in terms of a transfer function and tool that contributes to increased awareness and political commitment to SFM. C&I represent a 'soft' mode of obligation to implement SFM in national policies. On the other hand, there is an increasing and demand for better information from the public and from national decision makers within the forest sector.

While the actual range of C&I implementation is diverse in different European countries (and more in-depth analysed by interviews with the national correspondents for C&I reporting and the regional workshops), some common impacts were identified by the experts. As a baseline, the concept of C&I has brought a new logic and way of providing structured information to the forest sector. This influences the mode of discussion on national forest programmes (NFPs) and helped broaden the debate on SFM from forestry-centred to multi-functional forest management by introducing a common cognitive framework and language that may be used and understood by all participating stakeholders and interest groups. In the context of NFP and related policies, C&I can hence be judged as serving as a reference source in the development process of NFP. The strength of reference varies: C&I may be fully integrated into NFP, serve as a backbone for a new discursive structure, or simply inform the NFP process about crucial SFM topics. For instance, NFPs in Austria and Finland are fully building on the C&I structure, Italy is using them to

identify SFM targets on a regional level, and France has reference to some of C&I, while others are too general for a more spatially explicit use.

Furthermore, the experts identified three other fields of use where C&I had an impact:

1. Use in national forest legislation, standards and/or regulations.

The experts made rather general comments with respect to insight into impacts of C&I on forest legislation, standards and regulations. However, there is a broad notion that the logic behind a C&I structured SFM concept and the increasing awareness of SFM issues is shaping many initiatives in the (re)formulation of national legal instruments. There seems to be an overall red line of reference to pan-European SFM (and C&I) in many forest laws, with national specifications of course. The united commitment of European countries in the MCPFE process supports the acceptance and implementation on a national level. By this path of influence, C&I can be judged as having an impact as part of the norm-creation process of a pan-European process.

2. Use of the pan-European C&I for SFM, or a national set derived from it, in strategic planning of public forestry organizations.
3. According to the experts, the role of C&I for strategic planning of public forestry organizations is only apparent in countries with a strong forest sector. There is little evidence on use of C&I as a definite planning tool, but there is certainly a trend in streamlining terminology and data/information policies.
4. Role of the pan-European C&I for SFM in stakeholder involvement.

As related to NFP processes, it has been stated that C&I approaches shifted the discourse and gave new actors access to decision-making processes with a new balance achieved between traditional actors and other actors. The participatory power of C&I can be developed more on national and sub-national levels than on the pan-European level, and new modalities for stakeholder identification and involvement have been developed in the wake of NFP processes. This supports new modes of forest governance in terms of transparency and accountability of actions.

Challenges

Several interviewees rated the impact of the pan-European C&I on national forest policies as *low* to *not at all* (Figure 22), and underlined a few factors that impede the use of the indicators. Nevertheless, the challenges identified by all the experts can be grouped into two main instances:

1. The fragmentation of forest-related policies in Europe; and
2. The maintenance of C&I implementation in national processes.

The first point is related to the standing of C&I in a fragmented policy landscape as regards forests. It is perceived that the less responding to these external policies and the more isolated within the narrow understanding of the forest that C&I are, the less credibility C&I will have for national implementation, simply because the transaction costs for running C&I will be too high in relation to their utility. There is the view that if forest issues are decided outside forest sectoral boundaries, there will be no need for sectoral C&I, as such the case e.g., in the European Union. For the national level such a situation would mean decreased political commitment due to fading power of the C&I concept. This may also be due to multiple levels of forest authorities in countries and different legal, policy and institutional frameworks. As well, a lack of legal recognition of the concept at the international level may weaken its implementation. It is still uncertain whether a legally-binding agreement on forests in Europe would strengthen the power of C&I.

Secondly, the maintenance of C&I implementation in national processes can be summarized as a central challenge as stated by the experts. A general point refers to the political obligation and power of such an instrument and the commitment of national policy makers towards C&I support information provision and decision-making.

In particular in times of crisis, soft, sectoral and costly policy instruments without much outside visibility may easily be ignored. Lack of applicability of the C&I set on national/sub-national levels, little responsiveness to actual policy needs, weak embedding in broader context of national economies, and high costs and bureaucracy in data collection and reporting may decrease the urgency for policy makers to implement C&I. In the context of NFP, lacking progress in C&I implementation and
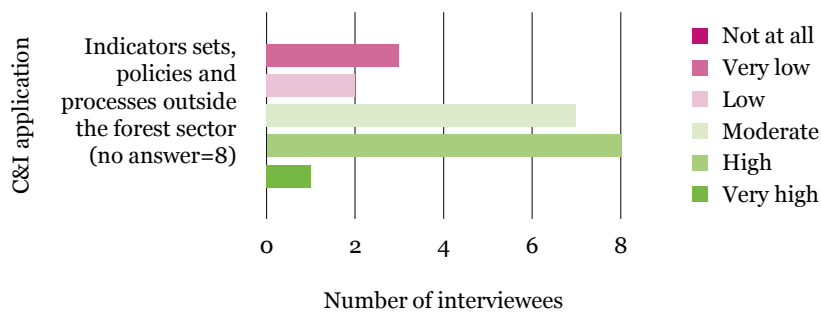
Figure 23. Impact of the pan-European C&I on indicator sets, policies and processed outside the forest sector.

little osmosis to the local and business levels may reduce stakeholder engagement into C&I implementation processes.

Regarding the national C&I processes, a harmonized approach seems to be missing. There are different interpretations of the C&I for SFM in different countries and confusion among stakeholders about concepts reported: e.g., the relation between C&I for SFM, national forest inventories, and certification. Further, there is little guidance on resolution of conflicts among stakeholders and selective use of C&I focusing on interest representation rather than on comprehensive discourse on SFM.

e. Provide information and/or assessment to indicator sets, policies and processes outside the forest sector

Achievements and impacts
The collaboration with other SFM processes maintaining C&I is notable, and in this regard many experts consider the impact as *moderate to very high* (Figure 23). For instance, there are ongoing activities on streamlining and harmonizing C&I verification and reporting with e.g., FAO, UNECE, Montreal Process, ITTO. There is a UNECE Team of Specialists accompanying the further development of C&I, and a joint forest resources questionnaire has been designed to make the FAO forest resources assessment (FRA) and pan-European C&I more compliant, and move towards a global forest resources assessment. However, linkages to global forest governance assessment frameworks (e.g., World Bank, Chatham House, UN-REDD) are under developed.

However, as mentioned earlier, C&I for SFM are primarily an instrument used in the forest sector, having been designed for forestry issues that have changed and evolved over the past 20 years. Following this line of interpretation it comes as no surprise that the impact of C&I in the world outside the forest sector is considered minimal by the experts who rated it as *very low* to *low* (Figure 23).

The main notion is that the pan-European C&I are not used or merged with other C&I sets, or simply unknown to other sectors. This could refer both to missing applicability of the C&I for cross-sectoral application and data demands, but also to the concept of SFM as such, which is not well-known or not accepted as a reference outside the forest sector. Hence, other sectors develop their own C&I sets and statistics without much interaction with the pan-European C&I set for SFM. Forest-related cross-cutting issues are hence reported from different sectoral angles (e.g., bioenergy, biodiversity), which leads to limited comparability of data and inefficiency in data collection at the national level. There are some potential links (e.g., criteria C1 and C3) to EU resource efficiency policies (e.g., agriculture, energy, land use), but they need to be further developed in terms of conceptual and statistical compliance with these systems. For instance, for climate change and energy issues a strong potential for collaboration and synergies in monitoring and reporting would exist, but there are doubts on the statistical validity of pan-European C&I to serve their purposes. Similarly there is a lack of efforts to link the pan-European C&I with EU biomass criteria. Parts of the C&I sets are reported to have been used or referenced in biodiversity indicator

sets, e.g., in France and Austria. For more forest-related policies or programmes such as the EU Forest Strategy or the monitoring programme Forest Focus, C&I would serve as structural element in the discussions.

Challenges

Both sector-political and technical obstacles can be identified as reasons for the relatively low impact of pan-European C&I outside the forest sector.

It is not clear how the forest sector is perceived by other sectors and evidently this perception differs from its self-perception. This gap needs to be overcome to open up for a cross-sectoral debate and exchange. However, different sectors have their own bureaucratic interests, constituencies, and resources. While cooperation between sectors would save resource, it could reduce influence possibilities, and interfere with stakeholder interests and sectoral resistance capacities. The lack of political (it is non-legally binding) and institutional strength of the FOREST EUROPE process currently diminish the power of the C&I outside the forest sector.

Another challenge is the conceptual validity of the pan-European C&I. It was mentioned that compared to the rather technical and narrowly scientific approach of the Montréal Process, the development of the pan-European C&I was strongly driven by policy makers. This characteristic makes it difficult for other sectors to adopt such a C&I system, which is very forest-sector oriented. As consequence, key issues for other sectors and stakeholders are often not well-addressed.

There is the observation that pan-European C&I carry plenty of information that leads to a too complex and imprecise picture with a lot of superfluous information for the use outside the sector, while on the other hand there is insufficient trust in comparable definitions, monitoring methodologies and interpretation capacity to be of cross-sectoral use. Evidently, there is a communication problem both on the C&I set as such, but also on the key elements of information it can convey.

Hence, it can be summarized that the current C&I do not respond to the needs of other sectors. For instance, biodiversity indicators do not give indications on special aspects requested by environmental NGOs such as fragmentation or degradation. Business and trade are missing the linkage of C&I to the forest value chain and the depiction of the impacts of changes along these value chains. Information on a cross-regional scale (e.g., biogeographic regions) is also missing.

In total, conceptual flexibility in the further development of C&I and improved communication of the forest sector to other sectors pose the main challenges for use of the pan-European C&I set outside the forest sector.

5.4.3 Towards a new definition on C&I for SFM implementation

a. General overview

Interviewees were shown the project's working definition of implementing C&I and towards the end of the interview were asked whether they would add another application to the working definition, and whether they had any other comments or proposed changes. Of the 40 interviewees, 11 said they accepted the working definition as it is without commenting, and 8 made no response to this question. The remaining 21 interviewees made comments and suggestions which are summarized in this section, although most of them (11 out of 21) stated that they were in general agreement with the working definition.

In general, the discussion on implementing C&I led many interviewees towards consideration of the fundamental nature of the pan-European set, and what its objectives, functions and uses are, or should be. For instance, some distinguished between implementation of SFM, and implementation of the set of C&I. One interviewee defined two different concepts: "implementation" when objectives are defined by those who drew up the set, so that actions can be compared to stated goals and "use" when the set's objectives are not formally defined and actions vary according to the user so that success cannot be measured objectively. Others considered the term "use" of C&I was more appropriate than "implementation" as different actors – policy makers, forest owners, stakeholders and others – would use the set in different ways, and its objectives are not formally specified. One pointed out that SFM is about a balance of benefits and that this balance cannot be defined only in technical terms, but is a matter for societal choices and political decisions.

Furthermore, several experts stated that the pan-European set of C&I was not a regulatory or

financial instrument, or even guidelines towards SFM, but an informational instrument, and that this characteristic was correctly reflected in the working definition.

One interviewee stated that the monitoring and reporting of progress towards SFM was the core application of the set. Another considered that there was overlap between the monitoring and reporting function and the assessment function, although others drew attention to the growing need for assessment, perhaps in the context of a compliance and implementation mechanism in a future legally-binding agreement on forests where signatories can demonstrate that they are achieving their commitments towards SFM. In the minds of the project team, "monitoring and reporting" is a descriptive term, whereas "assessment" is a normative term, comparing recorded data to some sort of a benchmark.

Several interviewees welcomed the wide scope of the working definition and the fact that it included communication and cooperation with other sectors. One pointed out the fundamental difference between providing information to other sectors, each of which has its own requirements, and sharing information with other forest sector processes, such as the Montréal Process, which is basically similar to the pan-European process.

Some interviewees pointed out that SFM on the ground, (i.e., at the forest management unit level), was achieved to a large extent through certification, which is based, at least for the PEFC, on C&I[9]. In

the opinion of the project team however, while it is true that some certification schemes are based on C&I, certification is not a *direct* use of the pan-European set of C&I. However, C&I could be used at forest management unit level as described in the previous chapters, but this level of application has not been included in the scope of this report, because the pan-European C&I are not intended for use at this level and do not set any standards which certification schemes could use.

One interviewee criticized the working definition for giving the impression that the indicator set could be used to evaluate national forest programmes, stating, correctly, that the qualities of a good national forest programme had been officially listed in one of the Vienna resolutions. However the working definition intended application 4 to refer to the use of the indicator set (and data structured according to the set) as one tool to support evaluation of NFPs, but not as the only tool used to evaluate NFPs. The working definition should ensure to remove this ambiguity.

b. Proposed changes and additions to the working definition on "Implementing Criteria and Indicators for Sustainable Forest Management in Europe"

The suggestions that were made by the experts during the interviews are summarized in Table 8; responses from the project team are also presented.

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9   In fact PEFC bases its principles on the Pan-European Operational Level Guidelines for Sustainable Forest Management (PEOLG), which are themselves based on the pan-European C&I. However the PEOLG, unlike the C&I set, are clearly normative, not purely descriptive.

Table 8. Proposed changes and additions to the working definition.

Proposal	Response by the project team
Include "society" to the list of groups concerned with dialogue and communication about the forest sector	Agreed
Insert a reference to "governance" alongside policies, NFPs etc., as it is not only formal documents and laws which determine how sustainable is forest management, but also institutions, attitudes and procedures, as well as other elements of governance	Agreed. Good governance should be participatory, collaborative, multi-level, cross-sectoral and accountable: the use of C&I can support all of these.
Consider more closely the specific needs of the other sectors, so that the data arranged according to the indicators may be more useful to them: this is probably not the case at present. One interviewee recommended a specific mention of a particular use outside the forest sector – sustainability criteria for biomass.	Agreed. With regard to sustainability criteria for biomass, this is undoubtedly important – and has already been discussed within FOREST EUROPE– but there is a risk in producing a closely defined list of specific users, such as sustainability criteria for biomass, as the list may become both overlong and too restrictive, with the danger of omission of important users.
One interviewee proposed a reference to "identifying tools to evaluate forest ecosystem services".	Not agreed, because this important aspect could be included under all the applications, and seems more a candidate for inclusion in a revised set of indicators than in the definition of "implementation".
One interviewee stressed the importance of "policy coherence", and asked whether improving policy coherence could be considered a function of the C&I set.	Agreed. This dimension is increasingly important in view of the increasing fragmentation of policies, for the forest sector and for society as a whole.
One interviewee mentioned other functions, including research, modeling, outlook studies etc.	These are clearly relevant, but seem to be already included, under application 2 on monitoring and reporting. Nevertheless, it would be useful to make specific mention of these uses for the indicator set.
Specify the EU level, between pan-European and national levels.	Agreed

6. Discussion on implementing criteria and indicators for sustainable forest management in Europe

This chapter builds a synthesis of the cumulative findings and lessons learnt on the basis of the information and opinions collected and analysed by the project. It provides the reader with a clear perspective on implementation of criteria and indicators (C&I) for sustainable forest management (SFM) in Europe and highlights the main trends on the subject. The chapter is divided into two sections. For each of the applications in the working definition (see chapter 4.1.2) the first section attempts to answer two questions: (1) Is the pan-European set used in the specific application, and, if so, in which manner? and (2) What are the main issues and challenges emerging from the experience of the past 15 years? The second section advances the discussion towards whether the pan-European C&I need a revision.

6.1 Implementation of the pan-European set of criteria and indicators of sustainable forest management 1998–2013

6.1.1 Does the pan-European set of criteria and indicators serve as a framework for dialogue and communication?

YES, because
- The pan-European C&I set has certainly increased awareness and understanding of SFM - at least within the forest sector and among those interested in forestry issues.
- The pan-European C&I set has provided stimulus and support for communication within the forest sector in terms of mind-setting and streamlining the forestry debate.
- The pan-European C&I set has facilitated deliberation and consultation between policy makers and stakeholders, thus promoting stronger stakeholder participation in the forest policy process.

The results of the various analyses (see chapter 5) signal that the pan-European set has been in-
strumental in defining the content of SFM, and has provided structure to the pan-European forest policy. Alongside other sets developed for other regions, it has also contributed to the global forest processes, notably the non-legally binding instrument on forests. Furthermore, the pan-European set has shaped information on forest related issues by defining the structure and scope of topics addressed, e.g., in international and national forest reports as well as in forestry public relations material and actions. This has led to:
- Increased transparency and accountability of data provision and comprehensive coverage, at least on the level of broad trends;
- Streamlined publishing of forest-related information according to a formal and agreed structure.

Although negotiated and agreed at the policy level, C&I have helped to integrate science into the policy debate: policy makers need objective and structured information on forest-relevant issues, which is required in an evidence-based society. In particular the comprehensive structure has made it more challenging to ignore issues where data are weak and concepts unclear.

Needs and potentials for further improvement
- The pan-European C&I set is considered complex and too focused on matters of interest only to the forest sector. This complexity creates barriers in communicating forest sector issues to the general public and other sectors as the information and rationale embedded in the set is difficult to understand for non-forestry stakeholders.
- There are also limitations for the forest sector itself: some consider the C&I too static, often not allowing identification and communication of key emerging politically relevant issues (e.g., biomass, climate change, ecosystem services). The static nature also presents obstacles to ensuring compatibility with other C&I processes.

In broader terms, conceptual shortcomings reduce the role of C&I in policy- and decision-making, as well as in communicating complex but highly forestry policy relevant topics. For instance, it was observed:

- There is no conceptual framework to explore cause-and-effect relations;
- Weak links between the quantitative and qualitative indicators;
- No composite indicators to focus on specific forest-related issues;
- Several quantitative indicators have their own conceptual shortcomings.

Furthermore, the lack and fragmentation of communication channels between forest administrations and relevant institutions as well as the intermittence of communication activities based on C&I are reported to be major limitations to a broader outreach of the forest sector.

Based on the empirical evidence, C&I are still widely perceived as a rather weak instrument as the pan-European process is non-legally binding in nature. As a consequence, progress towards Europe-wide dialogue and communication of forestry issues is limited. A stronger role of C&I in developing pan-European forest policy is currently discussed in the frame of the negotiation of a possible Legally Binding Agreement on Forests in Europe. The six criteria are embedded in the text, and the commitments are structured accordingly[1].

6.1.2 Do the pan-European criteria and indicators serve as an adequate tool for monitoring and reporting on sustainable forest management?

YES, because

- Politically endorsed, the pan-European C&I have shaped and stabilized international reporting in the region, which is highly important in terms of long-term development of national inventory systems. The pan-European set has contributed conceptually and practically to improving the comparability of forest information among European countries by setting a common reporting framework. Data collection based on C&I

has made forest sector data available to broader policy processes (e.g., Millennium Development Goals on preventing deforestation, based on FAO Forest Resources Assessment data), even though they have not always used them.

- The pan-European set has helped to improve information availability and quality, and promoted a broader understanding of forest-related information for European and national policy-making. In addition, an approach based on C&I has led to improved data availability and quality in areas which were not previously covered in forest sector statistics.

The results also showed that the pan-European C&I have been used as a reference for national applications of monitoring and reporting on SFM. Progress and adaptation of monitoring instruments based on C&I can be observed. Forest-based measurements and data collection have been streamlined. One could claim that this adaptation process has stimulated the scientific discourse on monitoring methodologies and the harmonization of monitoring systems across Europe.

Needs and potentials for further improvement

To achieve compliance with the pan-European C&I there is usually a need for modification and conversion of data measured at the national level. The collection of large amounts of data, in particular related to sub-indicators and parameters, impose a considerable burden on data collection agencies, while making it more difficult to achieve data completeness. Furthermore, recurring challenges in ensuring acceptable data verification and validation processes are evident.

Similarly, institutional challenges in monitoring and reporting are frequently encountered:

- Maintenance and regularity of monitoring instruments (e.g., monitoring cycles of national forest inventories) in times of economic crises are under pressure in many countries.
- Hence, support for the provision of capacities, education and training to implement and further develop C&I are increasingly questioned.
- Weak institutional coordination among national data providers can lead to uncertain data quality and inefficiency of data provision, and increase monitoring burdens for a broad array of reporting duties.

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1   In the Article 4 of the draft negotiating text for a legally binding agreement on forests in Europe as of 14th June 2013.

6.1.3 Do the pan-European criteria and indicators serve as a tool for assessing progress towards sustainable forest management?

PARTLY, because
- By providing time trends available for the period 1990–2010 a first assessment step may be made to review differences in trends and benchmark trends between countries.
- The Pan-European Operational Level Guidelines (PEOLG) have certainly influenced certification schemes, notably PEFC (Programme for the Endorsement of Forest Certification), by providing reference frames and stimulating assessment procedures on local/regional levels. Thus the C&I sets, on which the PEOLG are based, have had an indirect influence on the forest management level.

In addition, on the pan-European level, two assessment prototypes were presented in SoEF 2007 and 2011, which will be subject to further revision and development. An improved approach is under development for use on a pilot basis in the next State of Europe's Forests report. Examples at national level are found for assessment-type implementation reaching from using basic information and awareness-raising on forestry trends for policy makers to identification of targets and objectives for individual indicators.

Needs and potentials for further improvement
In general, the assessment procedures currently suffer from the lack of clear and explicit objectives for the C&I set. Thresholds and trade-offs for individual indicators have also not yet been developed, and there is no indication about balance between indicators. A clear political commitment to support assessment of SFM is needed. Furthermore, the pilot approaches mentioned above are being implemented, but the process is far from complete. A well-developed and approved assessment methodology allowing for a balanced approach has not yet been developed. This requires, in addition to what has already been done:
- Overcoming structural and conceptual shortcomings of indicators for SFM assessment, such as systemic components and causal indicator linkages, key indicators/parameters and composite indicators/parameters.
- Agreement, based on a widespread consultation process, on a common interpretation of indicators at the pan-European level, i.e., what is considered as a positive or alarming development or what can be regarded as acceptable.
- Better coherence and completeness of C&I data for assessment.
- Better prioritization, focus and understanding of the aim (at least of outputs).

6.1.4 Does the pan-European set of criteria and indicators facilitate the development and adaptation of national policy instruments?

YES, because
- C&I serve as a reference framework for SFM-related policies in many instances, and are perceived as safeguarding a normative and comprehensive framework for multi-functional forest management.
- By means of this implicit normative power of the SFM concept, increased political commitment to accept and support C&I, and integrate them into national policy instruments has been observed. For instance, the concept of C&I is maintained in many national forest programmes. In some cases C&I have been integrated into national legislative and/or policy instruments.

Also, by shaping the debate on SFM at national level, C&I have supported new modes of governance in national forest policy-making at least indirectly. C&I are now accepted tools to stimulate and promote SFM and implement policy at the national level. However, new approaches to political and practical implementation will be required in order to contribute to improving forest management practices by example and demonstration.

Needs and potentials for further improvement
- There is wide variation in the methods and quality of adaptation of the pan-European C&I set to the national level, and little guidance for national implementation is provided by the pan-European process. Its non-legally binding nature provides also few incentives to implement the C&I in national forest policies, programmes and laws.

- Maintaining adequate resourcing and capacities for implementing and further developing C&I remains particularly challenging, especially as most stakeholders (at least before this project) saw "implementation" of the pan-European set as, above all, supplying data for State of Europe's Forests reports.

Furthermore, selective and interest-driven indicator use may be practised, but that does not allow the complexity of SFM to be addressed. Research has shown that operational linkages between the policy and FMU level are still scarce. Such linkages would be required in order to explore and display the full compliance of SFM approaches and the impact of policy-making at the operational level.

6.1.5 Does the pan-European set of criteria and indicators generate information of inter-sectoral and international relevance?

LIMITED, because
- Collaboration and attempts for harmonization among C&I processes in the field of SFM do exist and there is at least communication ongoing on conceptual questions (e.g., with Montréal Process, Global Forest Resources Assessment). The Collaborative Forest Resources Questionnaire brings together FAO/FRA, ECE/FAO, Forest Europe, Montréal process, Observatory of Central African Forests– OFAC, and ITTO for harmonized data collection in 2014-2015.
- There are examples of linkages between different sectoral processes on national level (e.g., with biodiversity reporting for CBD), pan-European level (e.g., SEBI –Streamlining European Biodiversity Indicators), and EU level (e.g., European Committee for Standardization CEN/TC 383 – Sustainably produced biomass for energy applications).

Needs and potentials for further improvement
- Data collected according to the pan-European set, or national/sub-national sets are in fact not much used either by national broader sets (e.g., one example of complex indicator sets embedded in the national context of Finland are the so called "Findicators") or by information sets for other sectors, presumably because the data are not considered relevant or because they are not expressed in a form which is usable by the intended users. Also, the data generated through forest C&I sets are scarcely used in national and European statistics outside the forest sector. One of the reasons is the use of concepts and definitions which are only partially harmonized with those for other sectors.
- Overall, other sector policies are not very responsive to forest sector issues. Therefore, key forestry issues are often not properly conveyed to other sectors by means of the C&I for SFM. These C&I sets, which are instruments driven by sectoral concerns, are strongly defined by forest sector boundaries, and are not responsive to cross-sectoral information demands.

In addition, there are communication deficits on cross-sectoral data needs. This affects how C&I could be further integrated and adapted to address these needs at international, pan-European, European Union, national, and sub-national levels. The different objectives and interests of the sectors, e.g., protection vs. production, also play a significant role in the integration and adaption of the C&I. Finally, like in other sectors (e.g., environment), most commonly (with a few exceptions), the role of the forest sector in national economies is usually small, which very often leads to a lack of political recognition of forestry issues in other sectors, and hence information generated through forest-based C&I has only marginal visibility.

6.2 Revision of the pan-European C&I for SFM

6.2.1 Does the pan-European set of criteria and indicators for sustainable forest management need to be revised?

YES because
- The pan-European indicators focus on the current state and changes of the forest sector. However, the lack of data and explicit thresholds to a time dimension or evolution over time may impose a limited use of the indicators as an indication of progress towards SFM or of the success of forest policies and programmes.
- As systems develop over time in a changing environment, individual indicators may decrease in relevance and may have to be adapted, sup-

ported or replaced by others to meet the current or emerging needs. It is important to maintain flexibility and the ability to revise the indicator set quickly in response to new challenges and policy developments inside and outside the forest sector, without, of course, losing continuity and the ability to monitor trends over time.

- The pan-European quantitative (i.e., measurable) indicators can support evaluations of the effectiveness of measures, but need to be balanced by and linked to the qualitative (i.e., policy) indicators that provide information about the governance of the forest sector in a country.
- The main driver for the development of the pan-European indicators is the need for adopting a policy instrument for evaluating and reporting on progress towards SFM at pan-European and national levels. However, explicitly defined goals and objectives for the pan-European set or individual indicators are missing, which creates difficulties to achieve a consistent approach to implementation of C&I for SFM at pan-European and national levels.

More specifically, consideration might be given to:
- Formulation of explicit objectives of the pan-European C&I;
- Cause-and-effect relations and linkages between qualitative and quantitative indicators;
- Baseline indicators for assessing SFM by maintaining the integrity of the concept;
- A core set of composite indicators for use by policy makers and civil society by maintaining the integrity of the SFM concept;
- Strengthening partnership and collaboration with other forest and forest-related processes and policies;

- Improvement of data availability, quality and comparability;
- Recent policy developments in the European forest sector, global forestry and global trends in other sectors, e.g., in relation to sustainable wood fuel production, sustainability criteria for biomass, forest contribution to the global carbon cycle, forest governance.

6.2.2 Indicator by indicator analysis

Even though an extensive review of the individual pan-European indicators is outside the scope of this study, during the data collection some of the experts and national correspondents gave examples of how to enhance the effectiveness of the pan-European criteria and indicators in terms of content. Based on these cumulative experiences collected in the project, Annexes 4 and 5 provide an overview of the challenges and conceptual issues related to individual indicators.

Annex 4 gives an overview of monitoring aspects of indicators that have been reported as challenging with regard to data quality and availability, data coverage across European countries, and other issues encountered in the national enquiries. The project team has summarised these issues, giving a final statement for each indicator as regards its monitoring and data situation.

Annex 5 summarizes conceptual considerations by characterizing each indicator via its linkages to other indicators, its potential nature in cause-effect relationships, its role in an assessment procedure, and the context of its data provision.

Both Annexes do not anticipate any proposals for new indicators, or formulations to revise existing indicators.

7. Conclusions and recommendations

7.1 Overview of main conclusions

The project has collected and analyzed data and opinions on the implementation of criteria and indicators of sustainable forest management using national enquiries, expert interviews and regional workshops, whose methods are explained in chapter 4. The results of this work are presented in chapter 5 and discussed in chapter 6.

The main conclusions are briefly summarized:

- The implementation of criteria and indicators varies widely between countries. However, the pan-European set of criteria and indicators has served as a *framework for dialogue and communication*. It has been instrumental in defining the content of sustainable forest management and has provided structure to the pan-European forest policy process. Although negotiated at the policy level, criteria and indicators have helped to integrate science into the policy debate.
- The pan-European set has served as an adequate *tool for monitoring and reporting on sustainable forest management,* shaping and stabilizing international and national reporting, improving information availability and quality and promoting a broader understanding of forest-related information.
- The pan-European set has made a limited contribution to *assessing progress towards sustainable forest management* by providing time trends for a first assessment step. However assessment procedures based on criteria and indicators currently suffer from a lack of clear and explicit objectives and thresholds. No widely approved assessment methodology has yet been developed, although progress is being made.
- The pan-European set has *facilitated the development and adaptation of national policy instruments* as it serves as a reference framework for policies; through its implicit normative power, increased political commitment to sustainable forest management has been observed.
- The pan-European set has only *generated limited information of intersectoral relevance*: data collected according to the set, or national/sub-national sets, are not in fact much used by broader indicator sets used by other sectors, or for society and the economy as a whole.
- The *pan-European set of criteria and indicators for sustainable forest management is in need of revision* in order to react and adjust to changing realities.

A Pan-European Forum on implementing criteria and indicators for sustainable forest management took place in Vienna on 8–9 October 2013, to present the draft version of this report and discuss its conclusions and recommendations. The outcomes of the Forum are summarized in Annex 6.

On the basis of the analysis and discussion in chapters 5 and 6 (see main conclusions above) the project team has prepared recommendations, which are presented in the sections below. The recommendations are based on the input from national correspondents and expert interviews, the regional workshops and the Pan-European Forum, but are the sole responsibility of the project team. All involved in the process were given the opportunity to comment, but have not formally approved these recommendations.

7.2 Recommendations for implementation at national and sub-national levels

7.2.1 Review implementation at the national and sub-national level

The study has shown that the pan-European set of criteria and indicators for sustainable forest management is being used in many countries in a variety of different ways. Those responsible for forest sector policy at the national and sub-national level should review whether they are using the pan-European set of criteria and indicators to its maximum potential, drawing on the experiences gained by other countries. In particular they should consider:

- Constructing a national/sub-national set of criteria and indicators, based on the pan-European set, if one does not exist already.
- Preparing a national/sub-national report on the state of forests structured around the national/

sub-national set, if they have not already done so, or repeat an earlier reporting exercise.

- Using the concepts underlying the set, and the data collected in accordance with it, more intensively to inform policy and policy instruments for the forest sector and adjacent sectors in need of forestry information.
- Structuring national forest resource assessments around the set of criteria and indicators.
- Exchanging experience in the use of criteria and indicators between stakeholders

7.2.2 Promote smart use of criteria and indicators

The study has shown that the cost/benefit ratio of implementing criteria and indicators is not necessarily favourable, and their impact does not always meet expectations. To counteract this, users, notably forest administrations and researchers, should consider more efficient methods of implementation, in particular:

- Streamlining the collection of data connected to criteria and indicators with the collection of standard management information.
- Linking information collection, distribution and analysis at the Forest Management Unit (FMU), sub-national, national and international levels, for instance by using the same concepts, definitions and units, or by integrating information systems, thus economizing on resources and improving data quality and availability.
- Collecting only the information required for use by managers and policy makers, avoiding excessive detail and/or frequency.
- Focusing improvement efforts on areas where there are major gaps or inadequacies, rather than on improving the reliability of existing sets which are already adequate for decision making.
- Integrating international needs into national, sub-national and FMU-level data collection systems, which would simplify the international reporting process, improve the quality of international information and avoid unnecessary national data collection or conversion to international definitions.
- Using data originating outside the forest sector, e.g. national labour force and economic statistics.

7.2.3 Develop capacity in the field of criteria and indicators

Many countries and regions in Europe do not have the necessary capacity to implement criteria and indicators in the comprehensive way described by this project. A set of workshops along the lines of those carried out by this project could be organized in regions where countries have experienced difficulties in implementing criteria and indicators. Such workshops should, if possible, take place before the start of any revision of the pan-European set (see 7.3.1 and 7.3.2 below). Such an approach will ensure that the countries concerned can make a full contribution to the revision process and find their specific circumstances fully taken into account at the pan-European level. Other tools might also be desirable to facilitate and improve the implementation of criteria and indicators, such as guidelines.

7.2.4 Develop or enhance the use of criteria and indicators at the sub-national level

The project has shown that the pan-European set of criteria and indicators, or a set based on it, is also used at the sub-national level, notably in countries where forest policy responsibility is at that level. An effort should be made to share this experience and widen knowledge of the use of criteria and indicators at a sub-national level.

7.2.5 Use criteria and indicators indirectly to improve practice at the forest management unit (FMU) level

The pan-European set of criteria and indicators, although they cover all aspects of sustainable forest management, are not normative and are not intended for use at the FMU level. However the Pan-European Operational Level Guidelines for sustainable forest management (PEOLG), which are normative and intended for the FMU level, are based on the pan-European set as approved at the ministerial conference in Lisbon in 1998. PEFC, one of the two leading forest certification systems, is explicitly based on the PEOLG, which provides the foundation for the PEFC principles. There has

certainly been strong mutual influence between the criteria and indicators for sustainable forest management and the forest certification systems, notably as regards what constitutes the components of sustainable forest management, at all levels. The project has shown that many countries and experts consider that the pan-European set has a major indirect impact on forest management practice, as it defines sustainable forest management in a comprehensive and balanced way, even though it is not normative. When revising the C&I set, stakeholders should take this indirect influence of the pan-European set into account.

7.3 Recommendations for implementation at pan-European level

7.3.1 Formulate objectives for a revised pan-European set of criteria and indicators for sustainable forest management

The project has shown that implementation of the pan-European set has been weakened by the fact that its objectives have been developed over time in the light of experience and not explicitly formulated. It would be desirable in the future to base implementation and revision of the pan-European set of criteria and indicators on an explicit set of objectives which is based on a broad consensus. A widespread consultation should therefore be held on the objectives of a possible revised pan-European set of criteria and indicators for sustainable forest management. This consultation should be led by FOREST EUROPE or be under the aegis of the proposed Legally Binding Agreement on Forests in Europe. The consultation should involve a wide range of stakeholders, including national and sub-national policy makers and forest administrations, scientists, forest owners and forest industries, civil society and international organizations. Representatives of other sectors should be invited to participate actively. This review of the objectives of the pan-European set of criteria and indicators should be open and transparent, and take place before the process of revising the indicator set starts. It should also consider the option of not revising the set if the likely ratio between the costs of revising and implementing a new set and the benefits

in terms of improved policy, information and communication is not seen as favourable.

The project team proposes the following draft set of objectives, as a basis for discussion. This draft is based on the working definition used in the project, modified to take account of suggestions made in enquiries and expert consultations carried out during the project:

The objectives of the pan-European criteria and indicator set, or a national set derived from it, and specifically the information structured according to it, are to carry out one or more of the following functions:

1. *Provide a framework for dialogue and communication on sustainable forest management and forest policy development between policy makers inside and outside the forest sector, relevant stakeholders, and society as a whole.*

2. *Monitor and report on the state and trends of the forest sector and on the implementation of national commitments with regard to sustainable forest management.*

3. *Provide structured information and analysis making it possible to assess progress towards the goal of sustainable forest management, and on that basis to identify emerging issues and areas of concern.*

4. *Provide tools for use by those who formulate, implement, monitor and evaluate national or sub-national forest programmes, policies and/or plans, laws and improve forest sector governance.*

5. *Provide a structure and conceptual framework for research into sustainable forest management.*

6. *Provide information and/or assessment for analysis to other sectors and initiatives which are relevant to the forest sector, and provide input for cooperation with forest sector processes and policies in other regions.*

Notes on the proposed objectives

(i) *The pan-European set of criteria and indicators may be used at several levels: pan-European, EU, national and sub-national. It is not intended for direct use at the forest management unit level, but may be used*

indirectly, for instance as a reference for guidelines or certification schemes.

(ii) *"Forest sector" is the area covered by the pan-European set of criteria and indicators, including the quantitative indicators in the six criteria and all the qualitative indicators.*

7.3.2 Revise the pan-European set of indicators

The analysis of this project leads to the conclusion that it is desirable to revise the pan-European set for many reasons, including changed circumstances, ambiguity about objectives, lack of a coherent logical framework, unfavourable cost/benefit ratio for several indicators and uses, weak impact in some areas, notably communication with other sectors, and issues related to specific indicators which are summarized in the previous chapters. This revision should include not only the addition or removal of specific quantitative indicators but also the structure of the set as a whole, the relations between quantitative and qualitative indicators, linkages between indicators and the desirability of composite indicators. A number of experts interviewed by the project proposed that the criteria themselves should be revised, but the project team believes that as the criteria were formally approved in a long and delicately balanced process and fit into a global conceptual framework, the cost of reopening the process of defining the criteria would be excessive compared to the likely benefits. The project team recommends therefore that revision should take place within the framework of the existing criteria.

An open, participatory and science-based process should be put in place, under the auspices of FOREST EUROPE or the proposed Legally Binding Agreement, to prepare a revised pan-European set. This process should be founded on the following principles:

- All indicators in the revised set should contribute to achieving the agreed objectives (see 7.3.1). Those indicators which do not contribute to these objectives or which do not have a favourable cost/benefit ratio should be removed.
- A logical framework for the revised set should be designed and applied, if possible.
- The revision process should start from the existing set and relevant experience, as presented in

this report. Stakeholders, notably national and international data providers for the 'State of Europe's Forests' process, should be consulted throughout the revision.

- Weak data availability or low quality of the data should not, in itself, be a reason for dropping an indicator if it is meaningful and there is the potential for it to develop usable information.
- The set should be designed to generate enough meaningful information to satisfy the agreed objectives, without excessive volumes of data not needed for those purposes.
- The cost/benefit ratio[1] of each indicator and of the set as a whole should be explicitly considered.
- Improvement efforts should give priority to remedying major data gaps and inadequacies, rather than on increasing the reliability of data sets which are already adequate for the purpose.
- The revised set should maintain the balance between the aspects of sustainable forest management which is at the heart of the concept.

In summary, it will be essential for the long-term usefulness of the indicator set that this revision be carried out in depth, in a firm logical framework, based on sound science and a realistic assessment of past experience and with widespread participation of all stakeholders.

7.3.3 Develop harmonized methods to assess sustainability of forest management at the national and sub-national level, using criteria and indicators

Different approaches have been developed to assess (i.e. not only describe) progress towards sustainable forest management, identify areas of concern for sustainability and policy responses to them, as well as to identify emerging policy issues on an objective basis[2]. Some practices at national level were identified by the project team. At the international level, ECE/FAO is leading an effort in this direction, on a pilot basis, for use in the next SoEF. Building on the pilot exercise, a method should be developed and applied based on a wide

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1 The ratio between the cost of collecting and analysing the information and the benefit provided by that information, especially in the form of better evidence-based policies.
2 See for instance Part III of SoEF 2011.

consensus, to provide sound foundations for clear statements about the sustainability of forest management in Europe.

The effort to assess the sustainability of forest management probably implies the agreement of thresholds, at least for some of the indicators. This must be done in a transparent and consultative way, taking account of national specificities. In the opinion of the project team and many of the experts interviewed, the improvements in significance and impact of this approach justify this exercise.

7.3.4 Develop understanding and use of the qualitative indicators

At the international level, a considerable amount of information has been collected on the qualitative indicators, notably about the policy instruments in place. However, this has remained descriptive in nature. Work should be undertaken to develop objective ways to analyze the current approach and information supplied by countries, notably in two respects:

- What are the links between qualitative and quantitative indicators? In other words can trends in certain quantitative indicators be linked to specific policy instruments?
- What types of policy instruments have been most effective and efficient in achieving the stated objectives (where objectives have been formulated in measurable terms)?

Answers to these questions would help forest sector policy makers to demonstrate the effectiveness of the policy instruments in place and adapt policy and policy instruments in the light of results, thus demonstrating evidence-based policy making. This approach has been applied successfully at the national level in a few countries.

7.3.5 Develop subsets of indicators or composite indicators to address specific policy issues

The pan-European set and the national/sub-national sets based on it are balanced and comprehensive in their approach. However, to address specific policy issues, it may be desirable to use a subset of the indicators, or to create composite indicators to measure progress or to set goals, even

to manage tradeoffs. These subsets or composite indicators may be necessary only in certain regions or for a limited time/purpose according to changing needs, even though they are constructed inside the framework of the general indicator set. The revised indicator set should be designed with this need in mind, and could perhaps identify certain subsets which might be relevant to specific policy challenges.

7.3.6 Build bridges to other sectors

The project has shown that data from criteria and indicators of sustainable forest management are little known or used by other sectors (e.g. energy, biodiversity, sustainable development) or by broader indicator sets applied to the whole of society. One reason is that the information collected in the context of the forest sector indicators is not in a form which can be easily used and understood by the other sectors – and *vice versa* (information generated by other sectors is often not used in the forest sector). To remedy this, during a possible revision process the forest sector at the national and pan-European level should approach institutions, organizations or processes which may have use of or a need for forest indicator information. This could be, for instance, in the context of indicator sets based on their sector, in order to identify issues, define needs and take these into account. The needs of other sectors should be balanced against the cost of the proposed changes. A strengthened Forest Indicators Partnership[3] might contribute to this effort.

7.4 Outlook for future research

The outlook for future research needs builds on a synthesis of all the project findings including a literature review, experiences on national and sub-national levels, and opinions of experts on C&I. The project team has distilled a set of topics, found during the project implementation, which require further attention.

First, consistency among C&I applications seems desirable in order to improve the efficiency of data collection while reducing its burden and allowing

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3   An informal partnership between the Montréal Process, ITTO, FOREST EUROPE and FAO.

for consistent C&I use across different spatial levels and sectors. In fact, little is known about overlaps and contrasts among different sectoral indicator sets. The idea of having a suite of indicator subsets based on a generic overarching set has not been properly explored. Indicator subsets could provide viable approaches to address different demands on C&I (e.g. in the context of a legally binding agreement or the voluntary approach of FOREST EUROPE), and support tailored solutions with a common baseline. In addition, this might strengthen the integration of forestry C&I in cross-sectoral applications such as the European sustainability indicators. Based on the above, it should be tested how the transmittance of C&I applications from the international to the national level is ensured, and how policy indicators can be connected to forest management unit (FMU) level implementation.

Second, the concept of developing composite indicators was expressed as a promising option by many. Composite indicators are seen as an opportunity to ease the interpretation of multi-parameter indicators and to better support the communication of a status. Such approaches will have to be tested against the validity of aggregation rules and the modalities of parameter weighting procedures. There is a need for a pre-assessment of communication demands within/outside the forest sector to properly deliberate the balance between information loss through aggregation versus communication gains. It is proposed that feasibility studies are performed that address partial composites within the C&I set rather than aspiring to a full aggregation approach (e.g. a sustainability index). This would identify those indicators that show stronger instrumental than symbolic use (i.e. those which can indicate change and progress towards SFM and are sensitive enough to changes in the socio-ecological environment).

Third, the exploration of assessment procedures builds on the first two points. In advance of an actual methodological enhancement there needs to be a clear deliberation whether and how such procedures can address policy needs. To go beyond sheer academic analysis, there must be clarity about the need to show progress towards/deviation from SFM, and instruments which allow the proper interpretation of such outcomes. This implies the recognition that only a part of the current C&I set is principally applicable for assessment. Generally, a scientifically guided debate on the preferred direction for developing the forest sector, on desired futures, on the nature and acceptance of trade-offs, and acceptable/non-acceptable states of indicators is needed to make assessment approaches applicable and to define mechanisms for their execution. To achieve this, a balanced transparent methodology and procedure is needed.

Fourth, a C&I revision will require a thorough process based on the latest state-of-the-art in C&I research. In the pan-European case, applied research will be needed on how to (i) clarify the roles of participants and the ownership of the process of a C&I revision in advance, including objectives and desired outcomes, (ii) make the normative nature of C&I selection in SFM visible and transparent, and define rules for stakeholder participation, (iii) address the political-social aspects of C&I development before moving to purely technical discussions, and develop procedures to respond to this, (iv) take account of different levels of policy- and decision-making in SFM, and incorporate methods that can combine expert knowledge and interest representation, and (v) unleash potential means of guidance for National Forest Programmes and similar instruments on C&I development and revision.

In conclusion, all the above leads towards a new logical framework underlying the pan-European C&I set. A conceptual framework was so far only implicit while data- and interest-driven indicators were strong, but a possible revision offers the chance to integrate intersectoral/interdisciplinary concepts and designs to the C&I suite. Overall, there is a need to define clear references to political goals and agree on clear terms and definitions. This would allow the identification of priorities and the means by which they are communicated, and of how to develop and integrate analytical and systemic features into C&I (e.g. indicator interactions, constraints, trade-offs). It is proposed that this is performed under scientific guidance to form a robust and reliable environment for a multiple-use C&I set.

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Annex 1: Interview questions

The interview questions are structured according to the working definition of "Implementing criteria and indicators of sustainable forest management" (see Box 1), which was developed to be used during the project:

Box.1 Working definition of Implementing criteria and indicators of sustainable forest management

Use the pan- European criteria and indicator set, or a national set derived from it, and specifically the information structured according to it, to achieve one or more of the following applications:

A.   Provide a framework for dialogue and communication between policy makers, inside and outside the forest sector, and other relevant stakeholders, on SFM and forest policy development
B.   Monitor and report on the state and trends of the forest sector
C.   Assess progress towards sustainable forest management and identify emerging issues
D.   Formulate, implement, monitor and evaluate national or sub-national forest programmes, policies and/or plans
E.   Provide information and/or assessment to indicator sets outside the forest sector e.g. for sustainable development or biodiversity, or the forest sector in other regions e.g. Montréal Process

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1.   Would you agree to include your contact details in our web C&I for SFM expert network[1]? (*Optional*)

2.   In which stakeholder category would you place yourself?

International organisation	Forest administration (forest agency, extension services)
Research/Academia	Land owner/forest manager
Non-governmental organisation	Forest industry
Policy maker	Other (please specify)

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[1]   The web **C&I for SFM expert network** will be established as a part of a networking and web platform on C&I for SFM. The platform has the objectives to facilitate information exchange on the key issues and developments related to the pan-European C&I for SFM. For more information, please go to: http://ci-sfm.org/.

3. Which of the following categories best describe your experience with the pan-European C&I for SFM?

	Pan-European level	National level	Sub-national level
Development of C&I for SFM set			
As a framework for dialogue and communication			
As a tool for monitoring and reporting on the trends and state of the forest sector			
As a tool to assess progress towards SFM and indentify emerging issues			
As a tool for formulation, implementation, monitoring and evaluation national or sub-national forest programmes, policies and/or plans			
As a tool to provide information/assessment to indicator sets outside the forest sector			
Research, modelling, outlook studies, impact assessments			
Certification			
Further development of the pan-European C&I for SFM			
Other regional C&I for SFM processes			
I am familiar with the pan-European C&I for SFM			
Other (please specify)			

4. According to your experience, has the pan-European C&I set been useful* to achieve one or more of the applications defined in our working definition?

Please elaborate your answer and set a rating for each of the applications:

The pan-European C&I for SFM applications	Rating			
A	1. Yes	2. rather Yes	3. rather No	4. No
B	1. Yes	2. rather Yes	3. rather No	4. No
C	1. Yes	2. rather Yes	3. rather No	4. No
D	1. Yes	2. rather Yes	3. rather No	4. No
E	1. Yes	2. rather Yes	3. rather No	4. No

*To be considered useful, the C&I for SFM have to be **relevant**, **valid**, **easily understandable**, **cost-effective**, and **easy to measure**.*

5. How would you evaluate the impact of the pan-European C&I set on the following aspects? Please set a ranking [between 0 (not at all), 1 (very low), low (2), moderate (3), high (4), and 5 (very high)] and elaborate your answer.

    A. Increased awareness and political commitment to SFM

    B. Stimulating/assisting discussions/negotiations about SFM

    C. Monitoring on the changes and trends of the forest sector

    D. Reporting on the changes and trends of the forest sector

    E. Assessing progress towards SFM

    F. Identification of emerging threats and weaknesses

    G. Decision-making processes

    H. National or sub-national forest policies, programmes and laws

    I. Indicator sets outside the forest sector e.g. for sustainable development or biodiversity, or the forest sector in other regions e.g. Montréal process

    J. Forest management practices at forest management unit level

    K. Strategic planning of public forestry organisations (orientation of activities)

    L. Public/stakeholder participation

    M. Research, modelling, outlook studies, impact assessments

    N. Other (please specify)

6. Can you think of any factors (supporting and/or hampering) that influence the implementation of the pan-European C&I for SFM at pan-European and/or national level? Please elaborate your answer in general and/or for one or more of the applications defined in our working definition.

The pan-European C&I for SFM Applications	Factor	Supporting (+)/Hampering (-)	Level (pan-European, national, or sub-national)
A			
B			
C			
D			
E			
The pan-European C&I for SFM in general			

7. Can you think of three (3) major activities/means that could strengthen the implementation of the pan-European C&I for SFM? Please elaborate your answer in general and/or for one or more of the applications defined in our working definition.

The pan-European C&I for SFM Applications	Activities/Means	Level (pan-European, national or sub-national)
A		
B		
C		
D		
E		
The pan-European C&I for SFM in general		

8. In your opinion, are any changes in the structure and content of the pan-European C&I set necessary to ease the further implementation? Please elaborate your answer in relation to one or more of the following:

   A. Relevance- applicability/reflecting important issues/aspects
   B. Validity – measure what they contend to measure
   C. Practical – affordable and available
   D. Clarity – understandable, easily interpreted
   E. Completeness - add/remove indicators
   F. Other (please specify)

9. What do you think about the clarity of the relevant MCPFE (Ministerial Conference on the Protection of Forests in Europe) resolutions and decisions on C&I for SFM?

10. How do you see the visibility (publicity and awareness) of the relevant MCPFE resolutions and decisions on C&I for SFM ?

11. Would you add another application to the working definition on "implementing C&I for SFM" being used for this project (Annex 2)? Do you have any other comments or proposed changes?

12. What topics would you like to see discussed at the C&I for SFM regional workshops[2]?

13. Is there anything you would like to add to the topic?

14. Who else do you think we might interview?

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[2] Regional C&I for SFM workshops will be organised in order to help increasing awareness at the national and sub-national level about the development and use of C&I for SFM, and facilitate exchange about relevant experiences.

Annex 2: Enquiry on the implementation status of the pan-European C&I for SFM

This enquiry is part of the project *"Implementing Criteria and Indicators for Sustainable Forest Management in Europe"*. This project is a contribution to the FOREST EUROPE Work Programme, and closely coordinated with other work on monitoring and assessment of sustainable forest management under UNECE/FAO, in particular this carried out by the Team of Specialists on Monitoring SFM. The project is led by the European Forest Institute and financed by the Government of Germany.

Criteria and indicators (C&I) have emerged as a principal tool in promoting sustainable forest management (SFM). In the pan-European context the FOREST EUROPE process has developed a pan-European C&I set, which consists of 6 criteria and 35 quantitative indicators as well as 17 qualitative indicators. The pan-European set has served as the basis for State of Europe's Forests reports in 2003, 2007 and 2011, and provided the background and framework for national and sub-national policy formulation, analysis and monitoring. However, little is known about how the pan-European set has been implemented at the national and sub-national level.

This project is designed to a) analyse the implementation of C&I for SFM in the 46 signatory states of the FOREST EUROPE process and b) strengthen the process and the use of C&I, not only as a tool for monitoring and reporting, but also for policy making at national and European level. The project is divided into seven Working Packages.

The aim of this particular Working Package (WP3) under this project is to a) investigate to what extent the C&I for SFM are being implemented at national and sub-national level, b) investigate the fields of application C&I (e.g. monitoring and data collection, national forest reports, policy formulation, communication, etc) at national and sub-national level, c) further investigate the factors affecting the effectiveness of C&I.

To meet these objectives, we would kindly ask you, or your organization, to supply the information requested in *this enquiry*. It is essential to collect first hand information from the signatory states in order to assess the implementation of C&I at national and sub-national level. Your input will provide the basis for an objective review of the results of the pan-European C&I for SFM, and of how they have been implemented at the European, national and sub-national levels. It will be the main input for the assessment under WP3 of the project, and the factual basis for the Regional Workshops, which are preliminary scheduled for spring 2013. This information will feed into the European Conference as well, where the results of the project will be disseminated and this will also provide a platform to develop recommendations for the further development of the pan-European C&I. The conference is scheduled for autumn 2013.

This information enquiry will be carried out in two stages: a) stage 1 will deliver a comparable assessment focusing on the five points of the C&I implementation, according to the developed working definition (see Annex 1 for reference) and b) stage two, that will address specific questions, based on the feedback from the countries to the first stage. This could include regional specifics or gather case studies for one or more elements of the implementation. The second stage will also be supplemented by interviews.

This enquiry is grouped into eight **sub-headings**:

For answering the questions, please use the text fields   and the drop-down lists [Click to Choose]. Please return the questionnaire to Mr Hubert Inhaizer (hubert.inhaizer@efi.int). We kindly ask you to submit your response no later then **24th August 2012**. However, please feel free to contact us, if you would like to propose alternate deadline. We hope this arrangement will facilitate your feedback. After receiving your submission we may contact you by telephone to go through the response and collect additional information when necessary.

For more information, please contact Mr Inhaizer who will be please to provide you additional details: or visit the project's information platform at http://www.ci-sfm.org/

Thank you in advance for your participation and cooperation!

I. Background information

1. **Country (Region if applicable)**	
2. **Contact person for the questionnaire**	
3. **Position**	
4. **Organisation**	
5. **Address**	
6. **Tel. & e-mail**	
7. **Other respondents involved in compiling the response**	

II. General questions

This part investigates to what extent the pan-European Criteria and Indicators set for Sustainable Forest Management set has been adapted to national circumstances and if the countries have prepared a national report structured according to pan-European Criteria and Indicators set or the national set derived from it.

8. Do you have a national set of C&I?
☐ Yes. Please provide reference in National language and in English,if applicable
a. Is it based on the pan-European C&I set?
b. What differs from the pan-European set and why?
c. Please, describe which stakeholders have been involved in developing and maintaining the national C&I set
d. Have you modified data collection at the national and/or sub-national level to allow conformity with the pan-European C&I for instance by collecting data on new parameters because they appear in the pan-European C&I set?
e. What year did you modify the data collection at the national and/or sub-national level
☐ No, we don't have one, but it's under development.
☐ No, we don't have any and we're not planning it yet.

9. Have you prepared a national report structured according to pan-European C&I set or the national set derived from it? *Please note that this question is not about the country contribution to the State of Europe's Forests Report 2003, 2007 and 2011.*

Please provide reference and explanation, if applicable.

10. When are you planning the next (or the first, where applicable) national report structured according to the pan-European C&I set or the national set derived from it?

Please provide explanation, if applicable.

11. Are there any institutions in your country responsible for the following aspects of C&I implementation? *If yes, please provide reference.*

a. Provide a framework for dialogue and communication between policy makers, inside and outside the forest sector, and other stakeholders, as well as the general public on SFM and forest policy development
Click to choose
Please provide reference

b. Monitor and report on the state and trends of the forest sector
Click to choose
Please provide reference

c. Assess progress towards Sustainable Forest Management and identify emerging issues
Click to choose
Please provide reference

d. Formulate, implement, monitor and evaluate national or sub-national forest programmes, policies and/or instruments
Click to choose
Please provide reference

e. Provide information and/or assessment to indicator sets outside the forest sector e.g. for sustainable development (e.g. Millennium Development Goals) or biodiversity (e.g. Convention on Biological Diversity), or the forest sector in other regions (e.g. Montréal Process)
Click to choose
Please provide reference

III. Provide a framework for dialogue and communication

This part of the enquiry focuses on questions on how pan-European Criteria and Indicators set for Sustainable Forest Management or the national set has served as framework for dialogue on sustainable forest management and forest policy development.

12. To what extent have you used the pan-European C&I set or the national set derived from it as a framework for dialogue on Sustainable Forest Management and forest policy development in your country? *Please, set a ranking [between 1 (not at all) – 9 (to a great extent), 0 (do not know/no opinion)] and explain your ranking.*
a. To support policy and decision makers? C & I set Click to choose Ranking Click to choose Please explain your ranking
b. For dialogue within the forestry sector? C & I set Click to choose Ranking Click to choose Please explain your ranking
c. For communication with other sectors? C & I set Click to choose Ranking Click to choose Please explain your ranking
d. For communication with the general public? C & I set Click to choose Ranking Click to choose Please explain your ranking
13. Please provide examples, if applicable.
14. Any additional comments

IV. Monitoring and reporting

This part of the enquiry focuses on a countries experience on providing information on the pan-European quantitative Indicators to State of Europe's Forests 2011 report in order to investigate actual and potential problems.

15. Did your country face any major challenges to provide complete information for State of Europe's Forests 2011, according to the pan-European C&I set?	
Click to choose Please explain	
16. Which pan-European indicators were the most challenging? Please chose maximal 3 indicators (Annex 2) and explain.	
Indicator Please explain why	
Indicator Please explain why	
Indicator Please explain why	
17. Were there information sources relevant to Sustainable Forest Management in your country which could not be used for State of Europe's Forests 2011, for instance because of different formats and definitions, expense and difficulty of converting information, lack of accessibility, non-availability of resources or due to any other reasons?	
Please explain	
18. Any additional comments	

V. Assess Sustainable Forest Management at national level

This part of the enquiry focuses on how the pan-European Criteria and Indicators have been used to report on a country´s progress towards Sustainable Forest Management at national level. Please note that a working definition of "assessment of sustainable forest management"(see Annex X) was proposed for discussion during the Meeting of the UNECE/FAO Team of Specialists on Monitoring SFM– 22-24 May 2012, Saint Petersburg, Russian Federation[1]. In order to harmonize these initiatives the project will use this working definition as a reference in this part of the enquiry.

19. To what extent has the pan-European C&I set been used for national assessment of Sustainable Forest Management? *Please, set a ranking [between 1 (not at all) – 9 (to a great extent), 0 (do not know/no opinion)] and explain your ranking.*
Ranking Click to choose Please explain your ranking
20. To what extent has the pan-European C&I set, or a national set derived from it, been suitable for this purpose? *Please, set a ranking [between 1 (not at all) – 9 (to a great extent), 0 (do not know/no opinion)] and explain your ranking.*
Ranking Click to choose Please explain your ranking
21. Have you used the pan-European C&I set, or a national set derived from it, to identify emerging issues and new challenges and/or opportunities related to forestry in your country?
Click to choose Please explain
22. Is there a formal process to identify emerging issues in your country (e.g. trends in certain indicators thresholds identified in advance)? Please explain briefly the process and its linkages to the C&I set if applicable.
23. Any additional comments

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[1] For additional details, please visit: http://www.unece.org/fileadmin/DAM/timber/other/Item_5a.pdf

VI. Use in national forest policies

This part of the enquiry focuses on how the pan-European Criteria and Indicators, or a national set derived from it has been used to formulate, implement, monitor and evaluate national or sub-national forest programmes, policies and/or plans of a country.

24.	**Is there an explicit reference to the pan-European C&I set in any major policy document, for instance your national forest program or equivalent?**

Click to choose
Please provide reference

25.	**Has the pan-European C&I, or a national set derived from it, been used to:**

a. Formulate national or sub-national forest programmes, policies and/or plans
Click to choose
Please provide reference

b. Implement national or sub-national forest programmes, policies and/or plans,
Click to choose
Please provide reference

c. Monitor national or sub-national forest programmes, policies and/or plans
Click to choose
Please provide reference

d. Evaluate national or sub-national forest programmes, policies and/or plans
Click to choose
Please provide reference

e. Other, please specify

26.	**In your opinion were all criteria considered at all stages of the process? If not, which criteria received less/more attention?** *C 1: Maintenance and Appropriate Enhancement of Forest Resources and their Contribution to Global Carbon Cycles; C 2: Maintenance of Forest Ecosystem Health and Vitality, etc. See Annex 3 for easier reference*

a. Criteria, that received more attention.
Criterion
Please explain why

b. Criteria, that received less attention.
Criterion
Please explain why

27.	**Could you provide one or more concrete examples or lessons learnt?**

28. In your opinion, has the pan-European C&I set influenced the national forest policies in your country? Please explain and provide examples, if applicable

Click to choose
Please explain

29. Any additional comments

VII. Provide information for other sectors

This part of the enquiry focuses on how the pan-European Criteria &Indicators set or the national set has been used by other sectors and in order to find out if these sectors require any changes or adjustments in current pan-European Criteria &Indicators set.

30. To what extent has the pan-European C&I set, or the national set derived from it, been used for providing information about forestry or other sectors in your country? *Please, set a ranking [between 1 (not at all) – 9 (to a great extent), 0 (do not know/no opinion)] and explain your ranking.*

a. For sustainability (e.g. reporting on Millennium Development Goals)?
 Ranking Click to choose
Please explain your ranking

b. For biodiversity (e.g. reporting under the Convention on Biodiversity)?
Ranking Click to choose
Please explain your ranking

c. For climate change (e.g. for GHG or LULUCF reporting under the Kyoto Protocol?
Ranking Click to choose
Please explain your ranking

d. What other sectors?
Ranking Click to choose
Please explain your ranking

31. Could you provide an example or lessons learnt related to this application?

32. Any additional comments

VIII. Concluding questions

This part of the enquiry focuses on the usefulness of the pan-European Criteria &Indicator set as a framework for dialogue and communication, to monitor and report on the state and trends assess progress towards Sustainable Forest Management

33. To what extent do you consider the pan-European C&I set a useful tool to: *Please, set a ranking [between 1 (not at all) – 9 (to a great extent), 0 (do not know/no opinion)] and explain your ranking.*
a. Provide a framework for dialogue and communication between policy makers, inside and outside the forest sector, and other stakeholders, as well as the general public on SFM and forest policy development Ranking Click to choose Please explain your ranking
b. Monitor and report on the state and trends of the forest sector Ranking Click to choose Please explain your ranking
c. Assess progress towards Sustainable Forest Management and identify emerging issues Ranking Click to choose Please explain your ranking
d. Formulate, implement, monitor and evaluate national or sub-national forest programmes, policies and/or instruments Ranking Click to choose Please explain your ranking
e. Provide information and/or assessment to indicator sets outside the forest sector e.g. for sustainable development (e.g. Millennium Development Goals) or biodiversity (e.g. Convention on Biological Diversity), or the forest sector in other regions (e.g. Montréal Process) Ranking Click to choose Please explain your ranking
34. Could the pan-European C&I set be used for other purposes, besides the five listed above?
Click to choose Please explain
35. Do you think that any revision to the pan-European C&I set is required?
Please explain

36. In your opinion, to what extent has the pan-European C&I set promoted Sustainable Forest Management?

a. At pan-European level?
Ranking Click to choose
Please explain your ranking

b. In your country?
Ranking Click to choose
Please explain your ranking

37. Any additional comments you would like to make to the pan- European C&I set?

Annex 3: Recommendations from the CI-SFM regional workshops

Zagreb, Croatia 26-27 March 2013

The background and objective of the workshop (WS) was to define and understand the various aspects of the implementation of criteria and indicators (C&I) at the national level; to share experiences and identify regional issues for the Western Balkans; and to propose recommendations on C&I implementation in the region. The WS was structured across 3 Working Groups (WG) according to applications listed in the working definition[1], developed under the Implementing Criteria and Indicators for Sustainable Forest Management in Europe (CI-SFM) project.
- Working Group 1 focused on policy (application 1 and 4);
- Working Group 2 focused on monitoring and reporting (application 2 and 3);
- Working Group 3 focused on the environment (application 5).

Results[2] from the WS confirm that there are only limited and/or indirect applications of C&I throughout most of the Western Balkans region (excluding the case of Slovenia that was brought forward as a positive example). It also demonstrates a general lack of awareness as regards the implementation of C&I at the national level. Noted examples of C&I applications were certification (e.g. FSC) or international and national reporting (e.g. FAO, UNECE or by relevant ministries or through forest management plans).

From the discussions in the WS (both in the initial WGs and from the final discussion) some major issues were raised. Given the lack of C&I applications and considering the specific needs of the Western Balkans region, these are primarily related to the institutional and governance-related problems and/or barriers concerning the various applications of C&I, and not the C&I set directly. These are as follows:

- The most commonly noted issue throughout all WGs **was a lack of interest** for C&I amongst policy-makers, interlinked with a **lack of awareness and/or knowledge** at all governance levels (from the general public to stakeholders and policy-makers). This highlights the need for **raising interest and to make C&I attractive**, from the top to bottom. It was noted that if the current negotiations for an LBA were to be successful this might remedy the lack of interest for C&I implementation amongst policy-makers. Also pressure from the EU-level may help to address this issue (e.g. drive for accession).
- Connected to the previous issue is the need for **capacity building**. This is again a problem at all governance levels, ranging from a **lack of human capacities** amongst relevant national institutions (e.g. Ministries in charge of C&I implementation) to stakeholders (e.g. NGOs and research institutes). One suggestion (as a bottom-up approach) was to disseminate relevant information (adjusted to the target audience), including clear and positive case examples that demonstrate the benefits of C&I applications. Future WS's organised by FOREST EUROPE could in part facilitate this process, namely, by incorporating more **capacity-building elements** into their workshops (e.g. provide training and to utilise WS participants networks to distribute information). Another, top-down, suggestion was to lobby so that international organisations (such as FAO) exerts more pressure on policy-makers to develop capacities in relevant institutions.
- The lack of a clear institutional setup and a pervasive lack of capacities is the main problem facing C&I implementation in the Western Balkans region. This is however a complex issue that cannot be resolved through improved interest and capacities alone, but it requires improved **horizontal and vertical coordination and communications** (e.g. cross-sectoral communication), resolving **legislative issues and jurisdiction** (e.g. address who collects and have

1   The CI-SFM working definition is available online.
2   Proceedings are published on the workshop's website.

access to data), **stakeholder involvement** (e.g. tackling different perceptions of C&I and improving the understanding of indicators), **complementarity of C&I sets** (e.g. reduce reporting overload, harmonise definitions and data collection to ensure the involvement and data demand of other sectors), and **financing mechanisms** (e.g. establishing Forest Information Systems), etc.

All the above-noted issues provide a generic regional overview as regards the difficulties in implementing C&I. The absence of clear C&I applications in the Western Balkans region makes it difficult to provide concrete recommendations for how to improve the implementation of C&I. The integrated recommendations are thus rather generic and focused on how C&I implementation may be fostered throughout this region.

Budapest, Hungary 23-24 April 2013

The background and objective of the Budapest workshop (WS) was to define and understand the various aspects of the implementation of criteria and indicators (C&I) for Sustainable Forest Management (SFM) at the national level; to share experiences and identify regional issues across the Central, Eastern and part of Northern Europe; as well as to propose recommendations on C&I implementation in these regions. The WS was structured across 2 Working Groups (WG) according to applications listed in the working definition[3] of implementing the pan-European set of C&I of SFM.

- Working Group 1 focused on policy (application 1 and 4),
- Working Group 2 focused on monitoring and reporting (application 2 and 3).

Both groups were also requested to address application 5. Results[4] from the Budapest WS demonstrate that there is a significantly varied application of C&I throughout the countries represented in the WS, ranging from the Northern (Finland) to the Eastern (Russian Federation, Ukraine and Belarus) and Central (Austria, Slovenia and Hungary) parts of Europe. The major reasons for the variation in implementing C&I set comes primarily from the different national socio-economic conditions, as well as, legal, policy and institutional frameworks and a varying level of awareness, human capacities and resources available. During both the separate WG sessions and from the final round table discussion (including all participants), the following issues were raised:

WG1 on policy noted that C&I applications ranged from being not applied at all to being utilised as a tool for SFM. The main challenges identified for not applying C&I were recognized as a lack of awareness from the top (policy-makers and ministries) to the bottom (stakeholders and NGOs). Furthermore, the difficulties in finding a common interpretation for C&I as regards to definitions and targets have been strongly emphasised and linked to barriers concerning the legislative adoption of the C&I. Other challenges discussed were complimentary in reporting (at the institutional level and by forest owners), such as the overburdening in reporting duties, and the lack of cross-sectoral communication. These aspects were also connected to emerging issues, such as, support for a common definition of SFM at the national level, finding support for National Forest Inventories (NFIs), stakeholder involvement (with reference to forest owner duties and the democratisation process in Eastern Europe) and financing. To address these challenges and emerging issues it was recommended to address the following areas:

- **Legislation** – in terms of developing policy documents on the implementation of C&I and SFM. This was notably related to complementarity issues and the importance to streamline methods for data collection at the national level (dependent on national priorities) and to address institutional gaps.
- **Communication** – with regard to finding a common interpretation of C&I and SFM as well as the importance to engage in science-policy-stakeholder interactions (both horizontally and vertically).
- **Financing** – which was principally linked to the importance of raising interest (from top to bottom). This would presumably result in increased resources available for implementing C&I.

All these three issues were seen as being interlinked and dependent on each other. It is for exam-

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3   The CI-SFM working definition is available online.
4   Proceedings are published on the workshop's website.

ple difficult to raise interest amongst policy makers unless there is pressure to change the legislative framework as regards C&I applications at the national level.

WG2 on monitoring and reporting discussed two main issues. The first issue was on monitoring and reporting on the state of the forest and concerned the **assessment towards SFM** and identifying emerging issues. It was noted that the main challenge is that not all indicators are suitable for assessment of SFM. To address these challenges it was recommended to address the following areas:

- **Develop** indicators that **address future challenges**, such as, effects of climate change on forests, increased and/or decreased demand for wood, and effects of forest management on water systems.
- **Leave some indicators out** (ind. 2.3, 3.5, 4.7), because the pan-European level data supply of
  - **Defoliation** (ind. 2.3) has been reduced by ICP Forest and does not allow any longer statistically sound national derivations.
  - **Forests under management plans** (ind. 3.5), focuses on forests with management plans and equivalents and therefore almost all countries have reported 100%. However there is no information on the quality of the plans.
  - **Landscape pattern** (ind. 4.7), which has not yet an agreed methodology and so far only one country (Austria) has made suggestions on how to measure landscape pattern on a national level. On a pan-European scale data is available by the JRC.

To insure timeline assessments, the rest of the C&I set should be kept without methodological changes.
- It should be ensured that data collected by **international organisations** or **national projects** (e.g. ICP FOREST (Ind. 2.3), JRC (Ind. 4.7) and BIOVERSITY (Ind. 4.6), etc) is also integrated and collected in the future.
- **Clarify definitions**, as **some** indicators are too difficult to interpret and/or understand.
- For an assessment of SFM it is **necessary to define targets and thresholds** for the national- and/or sub-national-level, complementing the current pan-European C&I set at the national- and/or sub-national level reflecting the local conditions and stakeholder demands.

The second issue concerned the provision of information **outside the forest sector**. The challenge considered was difficulties (or lack thereof) as regards the communication between sectors. For example, the Convention on Biological Diversity (CBD) has its own set of C&I and in some countries the CBD does not request data from the forest section but rather from the environmental sector. To address this challenge it was recommended that:

- Develop **new tools for communication** on C&I. Examples provided were a scenario approach with selected sets of indicators to demonstrate the possible results and consequences of different kind of treatments on medium and long term (e.g. the balance of demand for wood and nature conservation); to demonstrate the complexity of forest ecosystems; or to develop new analytical tools. The ulterior aim would be to present results to specific target and stakeholder groups.

The noted challenges and recommendations provide an overview of the main difficulties in implementing C&I in the Northern, Eastern and Central European regions, including possible solutions in the form of recommendations. However, given that the participating countries represent such a big geographical area (stretching from Finland to Hungary), it is difficult to provide region-specific recommendations, especially because the national conditions for implementing C&I differ so much. The recommendations should therefore be taken as more general suggestions for how the implementation of the C&I set could be improved.

Estoril (Lisbon), Portugal 20-21 May 2013

The background and objective of the Estoril workshop (WS) was to define and understand the various aspects of the implementation of criteria and indicators (C&I) at the national level; to share experiences and identify regional issues across Southern and Northern Europe; as well as to propose recommendations on C&I implementation in these regions. The WS was structured across 2 Working Groups (WG) according to applications listed in the working definition[5] of implementing

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5   The CI-SFM working definition is available online

the pan-European set of C&I of SFM. WG1 focused on policy (application 1 and 4) while WG2 focused on monitoring and reporting (application 2 and 3). Both groups were also requested to address application 5. The participants were also presented with the results of the first two workshops, organised in Zagreb and Budapest.

Participants presented[6] their national experience of implementing criteria and indicators (in Finland, France, the Netherlands, Portugal, Spain, and United Kingdom) and the project team reported on the pilot studies on sub-national implementation of C&I in Germany and Italy. These presentations demonstrate that there is a significantly varied application of C&I throughout the countries represented in the WS, ranging from the Northern to Southern Europe. From the discussions in the Estoril WS, both in the separate WG discussions and from the final round table discussion (including all participants), some major issues were raised. These are as follows:

WG1 on policy initially noted that C&I were, first and foremost, used as a **framework for communication and dialogue** on SFM. Also its **supportive function in policy-making** was brought forward in the discussion. For C&I application, it was stressed as mostly implicitly applied to **organise thoughts, finding a common language** and as a **common data set**. This was linked to the formal commitment in plans and strategies at all levels concerning SFM and the role C&I have in steering this process (e.g. C&I define the boundaries for SFM). The main issues and/or problems were identified as: the **cost benefit ratio** of applying C&I, **relevance of C&I** to policy makers, horizontal and vertical **communication** (within and between sectors affecting forests), the **mismatch between indicators and policy makers priorities**, **different interpretation of indicators** and the **level of details** for some indicators is too high. This makes it costly and time-consuming to collect all the information related to these indicators. To address these issues and problems it was recommended to tackle two areas:

• The first recommendation concerned the development of **clear objectives** of what C&I are for. The purpose of this would be to revise the indi-

cator set (not criteria) in light of these defined objectives (based on existing experience) and to link regional, national and international levels of C&I.

• The second recommendation focused on the need to capitalize on the **opportunities that may come out of the legally binding agreement (LBA)** negotiations. The main point being that the LBA provide a good opportunity to increase the potential impact of C&I, for example, to re-address objectives and to increase visibility. This also touched on the need to have a dialogue with other sectors on what they really need from C&I focusing on the forest sector.

Additional remarks addressed the need to maintain a stable set of C&I to ensure that indicators can be monitored and assessed over a longer time period. Also the link between analysis and policy-making (e.g. policy relevance) as well as the cost effectiveness of the C&I application were discussed.

WG2 on monitoring and reporting initiated the discussion by noting that some **definitions for C&I should be made clearer for international reporting** (e.g. additional guidelines should be given on how to apply monitor/report). It was also noted that **changes between reporting cycles** should be avoided if possible. The main elements as regards to monitoring and reporting concerned: **forest resources** (e.g. problematic aspect of accounting for carbon in soil; difficulties to report on forest age classes), **health and vitality** (e.g. difficult to report on forest damage in terms of area, and the need to separate pests and diseases based on origin), **productive functions** (e.g. problems to classify services using international classifications and difficulties associated with measuring the production of non-wood products), **biodiversity** (e.g. focused on the definition of regeneration and difficulties in defining between natural, artificial and coppice, also aspect connected to threatened species and landscape patterns), **socio-economic functions** (e.g. expenditures for services, forest holdings in terms of fragmented ownership, and the health and safety of workforce). To address these issues and problems it was recommended to tackle three areas:

• The first recommendation concerned the need to **review the current set of indicators.** More specifically, take into account availability of data,

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6   Proceedings are published on the workshop's website

quality and possible interpretations, to take care to avoid losing data comparability over time (if the set is modified) and to integrate national specificities in the review process.

- The second recommendation focused on **discrepancies in monitoring and assessment**, namely, on the difficulties to read and interpret data coming from different countries. Targets and thresholds may be defined at national/sub-national levels and assessment, which should be based on relevant national/sub-national goals and circumstances. It was also emphasised that national correspondents should be involved in reviewing these issues.
- The third recommendation was on **forms of reporting and communication**. It is important that different types of outputs are produced (e.g. European reports, brochures, leaflets and databases). Also the Internet should be used as much as possible to disseminate information. It was further recommended that mixed tools/approaches should be applied when communi-

cating (e.g. combined indicators or shortened sub-sets of indicators) and that simple messages should be applied when trying to convey results. For example, reported numbers should be assisted by relevant explanations and/or interpretations.

The noted problems and recommendations provide an overview of the main difficulties in implementing C&I in the Northern and Southern European regions, including possible solutions in the form of recommendations. The main issues that should be addressed concerns the clarification and definition of objectives of the pan European set of C&I; revising the pan-European indicators of sustainable forest management, on the basis of agreed objectives; using C&I to improve governance of the forest sector and enhance forest policy; improving the meaningfulness, readability and applicability of the indicator set; address the indirect use of C&I through certification systems; smart use of C&I and capacity building.

Annex 4: Overview by indicator of challenges for monitoring purposes

This table reviews each quantitative pan-European indicator, from the point-of-view of monitoring sustainable forest management. It aims to indicate whether or not the quality and availability of the data are adequate to enable useful monitoring in the area covered by that indicator. Data availability and quality are only two of the aspects to be taken into account when reviewing indicators. This table does not take into account the indicators' relevance, usefulness to policy or scientific validity, especially as the objectives of the indicator set have not yet been clearly identified. Choice of indicators will be based on a combination of these factors, as part of a transparent and comprehensive process. The table is based on responses to the project's enquiry to national correspondents, and the experience of SoEF 2011. The opinion in the right hand column represents only the best judgement of the project team and has not been reviewed or approved by any other body or group. It is intended as input to a future process of review of the indicator set, as recommended by the project.

To be noted:
- The table addresses only the existing indicator set. Any proposed new indicators would also need to be reviewed from the point-of-view of data quality and availability.
- some of the "non-responding" countries for each indicator in relation to the SoEF 2011 are often the very small or forest-poor countries (Andorra, Holy See, Malta, Monaco, etc.) which cannot reasonably be expected to maintain comprehensive data on their forest resource for most indicators (except 1.1). For that reason, data are not expected to be available in 100% of Forest Europe countries.

Indicator	Data quality and availability, according to SoEF 2011	Number of countries lacking reliable data for SoEF 2011(based on Table 7)	Issues highlighted by the country correspondents in the national enquiries		CI-SFM Team's comments on data quality and availability
			Number of respondents considering the indicator as "challenging" (total respondents: 39)	Respondents' description of the challenges	
1.1 Forest area	Estimates of forest area are available for all countries and all years, with some non-respondents for availability for wood supply (7) and tree species (14). All data have been adjusted to fit international definitions.	0	1	Difference between national and international definitions on forest types: need for recalculation of data in order to fit to the reporting tables.	Data quality and availability adequate for this indicator.
1.2 Growing stock	Data provided by almost all countries for almost all years. Weaknesses in a few countries for other wooded land (13), availability for wood supply (8), species (6).	3	*not mentioned by the respondents*		Data quality and availability adequate for this indicator.
1.3 Age structure and/or diameter distribution	Data frequently missing, especially for diameter distribution. Reliable information on age only available for certain regions. Definitions vary between countries and some forests are "non-categorized".	17	3	The respondents highlighted that the problems are rooted in the data collection at national level.	Major data availability and quality issues for this indicator.

Indicator	Description		Source	Comment	Assessment
1.4 Carbon stock	Data available for almost all countries all years, on carbon in biomass, (derived from growing stock data in m3, often using standard and conversion factors agreed through IPCC). Data missing for 18 countries for soil carbon, which involves special surveys.	4	4	The respondents reported missing methodology in collecting data in their present national forest resource assessments and the need to estimate indicator 1.4 related data were seen as a challenging task as well.	Data quality and availability are adequate for biomass carbon. Need to invest in soil carbon surveys as soil is estimated to be the largest forest carbon stock and carbon stocks in soil are not well known.
2.1 Deposition of air pollutants	Accurate data provided from 300 sample plots. However many countries not, or weakly, covered by the network. Results difficult to express in terms of countries, as sampling intensity not high enough.	8	*data provided by ICP Forest/EC JRC*		Good basic data, but need to expand coverage and address the sampling question, so that national data can be developed. Another approach (percentage of land area with depositions over critical loads) used in Part III: still 8 countries with no data.
2.2 Soil condition	Data derived from two special surveys, covering 23 EU member states (BioSoil), with sufficient plots to provide national data for the countries covered.	24	*data provided by ICP Forest/EC JRC*		Data quality and availability adequate for this indicator in the countries covered in 2011. However at present no further BioSoil surveys are planned. Need to expand coverage to other EU and non-EU countries.
2.3 Defoliation	Results based on annual surveys of over 7000 plots in 30 countries. Time trends available. For sampling reasons, results not presented at national level.	11	*data provided by ICP Forest/EC JRC*		Good basic data, but problems with coverage, and sampling intensity. The frequency of surveys and the number of plots is being reduced for budgetary reasons.

2.4 Forest damage	Many methodological issues arising from the different nature of the types of damage and the ways of surveying them – indeed of what constitutes "damage" in a semi-natural eco-system. All countries were invited to report their specific damage vectors, notably area damaged by fire. Much detailed information supplied, but many gaps and data difficult to aggregate, synthesize and compare.	16	Data for some agents of for-est damage is not collected in present forest resource assess-ment. One respondent suggests including to this indicator also other categories, e.g. forest area damaged by fire, being an important cause of forest damage in this country.	3	Need for strong consensus on definitions of "damage", moni-toring approaches and data needs, before truly objective monitoring is possible.
3.1 Incre-ment and fellings	24 countries provided comparable data on both net annual increment (NAI) and fellings. Data quality/comparability issues include treatment of natural losses and harvest losses. However, in almost all cases, a reliable estimate of the fellings/NAI ratio is possible.	10	Reporting mechanisms and co-ordination of data sources for this indicator was problem-atic in the past. Nevertheless as a consequence a systematic statistically grounded national forest inventory has been de-veloped by this country, which will make it possible to provide improved data in 2013.	1	Data adequate for a general overview, but work needed to improve detailed comparabil-ity of data often derived from different sources (sample based inventories and annual indus-try surveys).
3.2 Round-wood	38 countries reported data on volume of roundwood removals, although it is clear that only a few countries assess fuelwood removals on a representative scale. 33 coun-tries reported on the value of roundwood removals, although it is not clear whether the data take into account whether the wood was actually marketed or not.	15	Respondents mentioned problems in reporting data on removals under bark.	2	Data quality and coverage adequate for volume, although better coverage of fuelwood desirable. Data quality needs improvement for value of mar-keted roundwood.

Indicator				
3.3 Non-wood goods	Data provided by 33 countries but data sets "fragmentary" for many reasons: lack of measurement systems, wide variety of non-wood goods, unclear concepts of meaning of "marketed" and how to value the production, etc.	18	8	Respondent countries viewed this indicator as the third most challenging due to missing data collection methods. The required data is estimated for many of these countries.	Data quality and coverage not yet adequate to analyze situation and trends in comparable and objective manner.
3.4 Services	Data on value of marketed services reported by 16 countries, although data limited in most countries. A number of countries reported difficulties quantifying the value of marketed services (exceptions are value of hunting and fishing licences).	32	9	Rated as second most challenging indicator, due to not existing comprehensive and complete statistics according to the proposed classification.	Data quality and coverage not yet adequate to analyze situation and trends in comparable and objective manner.
3.5 Forest under management plan	29 countries reported area of forest under management plan or equivalent, but closer examination of replies reveals that the SoEF guidelines and definitions had been interpreted in very different ways, so that data are not really comparable between countries.	6	3	Countries had difficulties in interpreting this indicator, e.g. when is a management plan outdated.	Data availability is satisfactory, but interpretation of guidelines must be standardized before truly comparable data sets can be established.
4.1 Tree species composition	29 countries reported data.	15	*not mentioned by the respondents*		Data quality and availability adequate for this indicator, although coverage could be extended.
4.2 Regeneration	Over 30 countries reported the share of forest area by regeneration type.	5	*not mentioned by the respondents*		Data quality and availability adequate for this indicator, although coverage could be extended.

Indicator	Description			Challenges	Data quality/availability
4.3 Naturalness	Over 30 countries reported on naturalness ("undisturbed by man", "semi-natural" or "plantations"). However there are serious issues of definition: e.g. stands that were established as plantations but have developed over time are considered as semi-natural in some countries.	4	2	The lack of up-to-date information on this indicator is seen by the respondents as challenging.	Data availability is adequate for this indicator. However, the present classification of this indicator is causing reporting problems for several countries, as well as problems of comparability between countries. Therefore a more clear definition of the classes is required.
4.4 Introduced tree species	11 countries unable to provide data for 2010.	9	1	*no explanation given by the respondent*	Data quality and availability adequate for this indicator, although coverage could be extended.
4.5 Dead wood	21 countries able to provide recent data (considerably more than for previous SoEF). Data sometimes based on inventory with sample plots, sometimes on local studies. National averages can be misleading.	16	5	Measuring and evaluating data on dead wood is seen by the respondents as challenging.	Data quality and availability now adequate for this indicator, and improving, as this parameter becomes part of regular monitoring efforts.
4.6 Genetic resources	39 countries reported to EUFORGEN, mostly using the EUFGIS portal and database. Information is mostly geo-referenced and analyzed by EUFORGEN.	6	*data provided by Bioversity International (EUFORGEN)*		Data quality and availability adequate for this indicator: a specialist organization (EUFORGEN) maintains and continuously improves the information set.

			data provided by EC JRC		
4.7 Landscape pattern	A one-off Europe- wide case study by JRC, using land cover maps (Corine) assessed forest connectivity and shares of different types of forest cover. Results adapted to generate data at country level for Part III.	6			The first case study should be repeated and improved, after in-depth discussion of methods and of the meaning of the results. The results should also be aggregated at the national level to obtain a link with SFM policies and instruments.
4.8 Threatened forest species	27 countries reported on this. Data were better for forest trees than for other forest occurring species. However data were "very heterogeneous", ranging from full to "fragmentary" and with unexplained differences between countries. Problems arise in differentiating "forest occurring" species from other species.	0	4	Countries stated that information on this indicator is not collected in the proposed format.	Considerable work is needed both on definitions (e.g. "forest occurring") and on data collection before the data available can be analyzed in a meaningful way. Data which are comparable over time are necessary for analysis of trends.
4.9 Protected forests	30 countries provided information, according to the detailed MCPFE Assessment Guidelines. However, the diversity of national protection regimes reduces inter-country comparability, especially with regard to classes 1.3 and 2 . The data provided by the EU countries on forest area within NATURA 2000 areas were seen as "sparse".	8	2	Difficulty to interpret the MCPFE classes was mentioned by the respondents. In addition the data delivered on overlapping with NATURA 2000 areas was mentioned as inconsistent.	Data availability is adequate for this indicator, although the results are still difficult to interpret because of the variety of national situations and definition problems. It should be considered to obtain data on NATURA 2000 in the future from EC DG Environment.

Indicator					
5.1 Protective forest – soil, water and other ecosystem function	37 countries provided information. However explanatory information provided by countries shows that "the assessment guidelines may not have been interpreted consistently". Areas reported included areas with identified protection functions, areas with given physical characteristics (e.g. slope) as well as areas with different types of "designation"; management plans, legal instruments etc. (see also 5.2).	13	3	Countries mentioned this indicator as challenging because of no data availability on classification of forests according to specific protective functions.	Areas "designated" for protection were reported by only a few countries, so the published information aggregated "designated" areas (as laid down in the indicator), with areas having a protective function. At present, most of the data supplied, although useful and relevant, do not directly address the issue defined by the indicator.
5.2 Protective forest – infrastructure and managed natural resources	Many countries were unable to separate the objectives of the protective function (soil/water v. infrastructure/natural resources), as both functions are often provided simultaneously. Several countries combined data for 5.2 with those for 5.1.	27	4	Countries mentioned this indicator as challenging because of no data availability on classification of forests according to specific protective functions.	See comment on 5.1, as well as the inevitable aggregation of data for 5. 1 and 5.2.
6.1 Forest holdings	Data on public/private ownership breakdown easily available. Data on number of private holdings were "partly or completely unavailable for many countries".	0	4	The lack of information due to protection of personal data is seen as challenging by the countries.	Data availability adequate for monitoring of broad trends in ownership, but not for more detailed analysis of number and size of holdings.

Indicator			*not mentioned by the respondents*		Data quality and availability
6.2 Contribution of the forest sector to GDP	Data available from national accounts.	12			Data quality and availability adequate for this indicator.
6.3 Net revenue	Analysis was based on statistics from Eurostat economic accounts and a few national reports. Data only available for most EU countries (not all), Russia and Switzerland.	23	4	According to the countries, the required data is not available.	Data quality and availability for this indicator improving in the countries covered: elsewhere (23 countries), data are inadequate.
6.4 Expenditure for services	Countries able to provide less than a quarter of requested data (see SoEF 2011 table 43). Main issues: data for 1990, partial coverage of services listed, non-response (15 countries). "Large amount of partial data" made aggregation and synthesis very difficult.	27	15	This indicator is reported as the most challenging under the CI-SFM project. Problems were seen here mostly in non-existing comprehensive statistic or existing but fragmented data.	Data quality and availability not adequate for this indicator. Need for systematic surveys to obtain basic data.
6.5 Forest sector workforce	Data taken from labour force surveys. May be some problems with classification of certain forest related occupations (teaching, environmental management, etc.) which are included in other parts of labour force classification.	9	3	Data for this indicator is not collected or data is obtained from different sources.	Data quality and availability adequate for this indicator.
6.6 Occupational safety and health	Data supplied by 28 countries. However "statistical basis is very different among countries", for instance as regards inclusion/exclusion of self employed contractors and private forest owners, as well as definition of "occupational accident".	20	1	Required data is not available in this country.	Data quality and availability not adequate for this indicator. Work needed on concepts and definitions, as well as to collect basic information.

6.7 Wood consumption	Data on consumption (production + imports – exports) and trade supplied annually for all products through JFSQ, and checked by a team of international agencies.	3	data provided by UNECE-JFSQ	Data quality and availability adequate for this indicator.
6.8 Trade in wood	See 6.7.	4	data provided by UNECE-JFSQ	Data quality and availability adequate for this indicator.
6.9 Energy from wood sources	33 countries reported, twice as many as for SoEF 2007, thanks to Joint Wood Energy Enquiry (JWEE) which is carried out by UNECE/FAO every two years. Gaps and uncertainties persist because of inherent problems measuring flows of wood energy.	13	4	Countries report on challenges in providing data on national level due to missing methodology.	Data quality and availability are now nearly adequate for this indicator, although they should be improved, as regards coverage and accuracy.
6.10 Accessibility for recreation	34 countries responded on accessibility, but only 17 provided quantitative estimates of intensity of use.	26	1	Country reports on challenges in providing data on national level due to missing methodology.	Data quality and availability adequate for this indicator as regards accessibility, but not for intensity of use, where basic fact finding surveys are missing in many countries.
6.11 Cultural and spiritual value	29 countries provided information on number of forest sites with cultural and spiritual values. However, there was a wide disparity of approach to the many types of site which might be included (cultural heritage, including archaeological sites, forested landscapes, special trees, other sites). "Data are incomplete … and should be treated with caution", because of inconsistencies, lack of surveys etc.	11	4	Countries report on challenges in providing data on national level due to missing methodology.	Data quality and availability not adequate for this indicator

Annex 5: Logical and structural overview for the Pan-European quantitative indicators: indicator by indicator

		Links to other indicators	Potential DPSIR categories	SoEF 2011 data provider	Proposed category in ECE/FAO pilot project on assessment of SFM
C1	**Forest resources and carbon**				
1.1	Forest area	C2: 2.4 C3: 3.5 C4: 4.1; 4.2; 4.3; 4.4; 4.6; 4.7; 4.9 C5: 5.1; 5.2	State	NC	Context/Assessment
1.2	Growing stock	C1: 1.3; 1.4 C2: 2.3; 2.4 C3: 3.5 C4: 4.3; 4.5	State	NC	Context/Assessment
1.3	Age structure and/or diameter distribution	C1: 1.2 C3: 3.5 C4: 4.2;4.3; 4.5	State	NC	Background
1.4	Carbon stock	C1: 1.2 C2: 2.1 C6: 6.9	State	NC	Background
C2	**Health and Vitality**				
2.1	Deposition of air pollutants	C1: 1.4 C2: 2.2; 2.3; 2.4 C3: 3.1 C4: 4.5; 4.8 C5: 5.1; 5.2	Pressure	IDP	Assessment
2.2	Soil condition	C2: 2.1; 2.3 C5: 5.1; 5.2	State	IDP	Assessment
2.3	Defoliation	C1: 1.2 C2: 2.1; 2.2; 2.4 C3: 3.1	State	IDP	Background
2.4	Forest damage	C1: 1.1; 1.2 C2: 2.1; 2.3 C3: 3.1 C5: 5.1; 5.2	Pressure	NC	Assessment

C3	**Productive functions**				
3.1	Increment and fellings	C2: 2.1; 2.3; 2.4 C3: 3.5	Pressure	NC	Assessment
3.2	Roundwood	C3: 3.3; 3.4	Impact	NC	Assessment
3.3	Non-wood goods	C3: 3.2; 3.4 C6: 6.10	Impact	NC	Context
3.4	Services	C3: 3.2; 3.3 C6: 6.10	Impact	NC	Context
3.5	Forests under management plans	C1: 1.1; 1.2; 1.3 C3: 3.5	Response	NC	Assessment
C4	**Biodiversity**				
4.1	Tree species composition	C1: 1.1 C4: 4.3	State	NC	Assessment
4.2	Regeneration	C1: 1.1; 1.3 C4: 4.3	State	NC	Assessment
4.3	Naturalness	C1: 1.1; 1.3 C4: 4.1; 4.2; 4.4; 4.5; 4.7; 4.9	Impact	NC	Context
4.4	Introduced tree species	C1: 1.1 C4: 4.3	State	NC	Assessment
4.5	Deadwood	C1: 1.2; 1.3 C2: 2.1 C4: 4.3	State	NC	Assessment
4.6	Genetic resources	C1: 1.1	Response	IDP	Background
4.7	Landscape pattern	C1: 1.1 C4: 4.3 C5: 5.1; 5.2	Impact	IDP	Background
4.8	Threatened forest species	C2: 2.1	Impact	NC	Assessment
4.9	Protected forests	C1: 1.1 C4: 4.3 C5: 5.1; 5.2 C6: 6.11	Response	NC	Assessment
C5	**Protective functions**				
5.1	Protective forests-soil, water and other ecosystem functions	C1: 1.1 C2: 2.1; 2.2; 2.4 C4: 4.7	Response	NC	Assessment
5.2	Protective forests-infrastructure and management natural resources	C1: 1.1 C2: 2.1; 2.2; 2.4 C4: 4.7; 4.9	Response	NC	Assessment

C6	Socio-economic functions				
6.1	Forest holdings	N/A	Driving force	NC	Context
6.2	Contribution of forest sector to GDP	N/A	Driving force	IDP	Context
6.3	Net revenue	N/A	Driving force	NC	Assessment
6.4	Expenditures for services	N/A	Response	NC	Context
6.5	Forest sector workforce	N/A	Driving force	IDP	Context
6.6	Occupational safety and health	N/A	Impact	IDP	Assessment
6.7	Wood consumption	C6: 6.8	Driving force	IDP	Context
6.8	Trade in wood	C6: 6.6	Driving force	IDP	Context
6.9	Energy from wood resources	C1: 1.4	Driving force	IDP	Context
6.10	Accessibility for recreation	C3: 3.3	Driving force	NC	Assessment
6.11	Cultural and spiritual values	C4: 4.9	Driving force	NC	NA (no meaningful parameter found)

Notes:

i. Links to other indicators: Requardt, A., 2007: Pan-European Criteria and Indicators for Sustainable Forest Management: Networking Structures and Data Potentials of International Data Sources. University of Hamburg, Germany.

ii. Potential DPSIR categories: Wolfslehner, B., Vacik, H. 2011: Mapping indicator models: from intuitive problem structuring to quantified decision-making in sustainable forest management. Ecological Indicators 11:274-283.

iii. SoEF 2011 data provider:
   • NC: data is supplied by national correspondents
   • IDP: data is supplied by international data provider (see SoEF 2011, annex 2, annex table K for list of data providers)

iv. Proposed category in ECE/FAO pilot project on assessment of SFM: ECE/FAO has proposed a system for assessment of SFM at the national level, based on the pan-European criteria and indicators. See the analytical annex of the background paper submitted to the Working Party in 2013, available at: http://www.unece.org/fileadmin/DAM/timber/meetings/20130422/WP2013-4b1-Annex.pdf In this system, parameters, based on the indicators, are used to identify "areas of concern" and the measures taken to address them. The parameters are divided into three categories as follows:
   • Context parameter: describes the situation of a country with respect to a given pan-European indicator, but cannot be used to assess the sustainability of forest management, for instance because the value of the parameter is largely determined by geography, ecology, economy or history, and is therefore not susceptible to influence by forest management or policy.
   • Assessment parameter: provides information useful to assess the sustainability of forest management in a country for a given pan-European indicator.
   • Background parameter: Cannot be used to provide reliable description or assessment of the situation with regard to sustainable forest management. Causes might be problems with data quality or methodology of data analysis, preventing meaningful use of the information available.

Annex 6: Report of the Pan-European Forum, Vienna, Austria 8–9 October 2013

The pan-European Forum was organised during the final phase of the CI-SFM project ten years after the 4th Ministerial Conference on the Protection of Forests in Europe, where the improved pan-European criteria and indicators were endorsed. It brought together the regional analysis and the experiences collected from the national reports and expert views, and allowed the presentation and the discussion of the conclusion and recommendations of the project. The participants represented different stakeholders, national and international experts.

Opening of the meeting

The Forum was opened by Prof. Dr. Barbara Hinterstoisser (University of Natural Resources and Life Sciences, Austria), Mr. Matthias Schwoerer (Federal Ministry of Food, Agriculture and Consumer Protection, Germany) and Dr. Peter Mayer (Research and Training Centre for Forests, Natural Hazards and Landscape, Austria).

Setting the context

The session was opened by setting the context, including an introduction to the CI-SFM project, its objectives and accomplishments, followed by a historical overview of the development of the pan-European C&I for SFM. One of the main challenges for the forest sector, according to participants, was insufficient dialogue and communication between the forest and other forest-relevant sectors (e.g. climate change, energy, biodiversity). It was noted that this was both due to communication weakness of the forest sector but also due to other sectors not being aware or not considering what has been established already in the forest sector.

Experiences from other regions and initiatives

Several international processes and initiatives, other than the Pan-European process, have also developed criteria and indicators as a policy instru-

ment to evaluate and report progress towards SFM. The session on experiences from other regions and initiatives provided a platform to exchange information on C&I development and implementation with other regions and initiatives, represented by panelists from the FAO-FRA[1], the ITTO[2] and the Montréal Process. The focus was on past experience, achievements and future challenges associated with criteria and indicators.

After the presentations the discussions with the audience raised the issue of the impacts of the different processes on the policy level. The representatives of the three processes agreed that the different sets have been used in raising awareness of SFM-related issues, concerns and needs among the different stakeholder groups. Challenges were seen by the panelists mostly in data availability and quality, and the need to link this information to national and sub-national policy-making.

The participants raised the question of the costs of data collection for a country. The collection of forest sector data, related to indicators imposes, in most cases, a considerable burden on data collection agencies. It was pointed out that there is also a cost – in reduced quality of evidence for policy making – in not implementing criteria and indicators. According to the panelists the costs of implementing criteria and indicators in a country depend on the general situation with regard to data collection and monitoring. As regards assessment, challenges were seen by the panelists mostly in value judgments, e.g. are certain developments positive or negative. This initiated discussion on the potential need for the development of thresholds for individual indicators in order to support the assessment of SFM.

The panelists noted that the dialogue and communication between the different sectoral processes is one of the most difficult challenges, due to different interests of the sectors and the missing linkages between information provided by the pan-European

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1   FAO-FRA: Food and Agriculture Organization of the United Nations, Global Forest Resources Assessment
2   ITTO: International Tropical Timber Organization

criteria indicators and the changing needs of the other sectors. Progress on the dialogue and communication between international processes and initiatives was mentioned by the panelists, notably the Collaborative Forest Resources Questionnaire, a co-operative project between FAO, UNECE/FAO, ITTO, Forest Europe, and the Montréal Process. This questionnaire, a step to increase collaboration on forest reporting, is aiming at a reduced country reporting burden, and improved harmonization of definitions and data.

Finally, the role of the pan-European C&I as a tool for assessing progress towards sustainable forest management was discussed by the panelists also in the light of the Pan-European Operational Level Guidelines (PEOLG) that have influenced certification schemes, notably the PEFC (Programme for the Endorsement of Forest Certification), by providing reference frames and stimulating assessment procedures on local/regional levels. The panelists agreed that the C&I also had an influence on certification schemes in their regions. The major challenge identified was the identification of future user needs and the respective adaptation of the pan-European C&I. It was also highlighted that not all pan-European indicators are suitable for an assessment of sustainable forest management as they provide background or context information only.

National/sub-national perspectives on C&I implementation

Since its introduction, the pan- European C&I have been used in a variety of ways in the different countries across Europe, e.g. monitoring, reporting, data collection, communication, policy formulation and other fields of application. During this session, on the basis of presentations by France, Montenegro, Russian Federation and Turkey, countries shared their experiences and demonstrated the varied application of the C&I for SFM at the national level.

The shared national experiences revealed that, different national socio-economic conditions, legal, policy and institutional settings as well as a varying level of awareness, human capacities and available resources are the major reasons for the different approaches to implementing C&I among the countries. Furthermore, during the discussion, several issues were raised:

- The driving force to initiate and carry forward the process of C&I implementation is not only the political will and commitment, but also the **cost-effectiveness** of collecting and analysing the information structured according to the indicators. Even though information on the cost-effectiveness was not available for some of the countries, it was noted that the cost-benefit ratio of implementation is not favourable for some of the indicators and this requires further exploration. However, the cost and consequences of not implementing the C&I for SFM should be also taken into consideration.
- The respective roles of **data verification** and **validation** were also discussed, and some examples from the countries were given, highlighting the importance of information credibility in the process of C&I implementation at the national level.
- The idea of **composite indicators** was highlighted by a few participants, focusing on the need to measure progress of specific policy issues (e.g. biodiversity, profitability, protection) and have a balanced conversation/dialogue between interested parties (e.g. policy makers, researchers)
- Another aspect that was raised during the discussion concerned the fundamental question of **evidence-based policy making** and how it C&I can help **move from policy agenda setting to monitoring**.
- Although the pan-European criteria and indicators are not intended for use at the forest management unit level, the **indirect impact on forest management practice** was discussed. In particular, the importance of integrating international needs into national, sub-national and, when possible, forest management unit (FMU) level data collection systems was underscored.

Sustainable forest management and criteria and indicators are also used at sub- national level. In this context, a case study from Germany was presented. It revealed that the C&I use at sub- national level in Germany is at an advanced stage due to the use and consideration of both the pan-European C&I and the derived sub-national sets. In the framework of the CI-SFM project, the different modes of C&I implementation have been explored

and the project's findings from the national assessments were presented. The discussion afterwards was mainly focused on the use of the C&I by other sectors, emphasizing the need to establish linkages between other sectors' requirements and enquires (e.g. land use, land-use change and forestry and the Convention on Biological Diversity).

Synthesis of the cumulative findings and lessons learnt from the past

During this session, the cumulative findings from the CI-SFM project were presented. The major focus was on the current status of C&I implementations and the main trends associated with the various fields of applications. The findings presented were seen by the majority of those who took the floor as a good basis for further improvement and advancement of the pan-European C&I implementation. The discussion revolved around two main aspects:

- **Objectives of the pan-European C&I** many participants agreed on the use of the criteria and indicators in providing a common description of sustainable forest management. When they were drafted, the current indicators were expected by some to be used primarily in a national context and not for international comparisons. However, assessment of sustainable forest management in an international context was now welcomed by many experts. An emphasis was placed also upon the need for defining clear long-term objectives and thresholds. It is clear that the C&I can serve as an assessment tool, but this will require a broad agreement on a common interpretation of the indicators to reach a common understanding and identify the benefits of such an approach.
- **Communication with and provision of information to other sectors**- the reflections were centred on the challenging task of communicating forest relevant information to the other sectors. Communication is about listening as well as talking, and the different audiences should be taken into account, e.g. who is our target audience and what are their demands? However, many agreed that communication is a two way process and posed the question of how the other sectors try to harmonize their definitions with the forest sector.

The future of the pan-European C&I set in a changing policy environment

In order to examine the future of the pan-European set in a changing policy environment, the major focus of this session, including two panel discussions, was on identifying the needs and potentials for further improvement and enhancement of criteria and indicators and their applications.

Expert panel on forest information use

The objective of the expert panel on forest information use was to provide a platform for experts in the field to share their views and opinions and to stimulate discussions in relation to the expectations of institutions, organizations or processes which may have use or need for forest indicator information, inside and outside the forest sector. In particular, the focus was on how the forest sector could supply better information to meet the biodiversity, energy, private owners and for statistical demands.

The C&I for SFM are seen by the environmental sector more as a tool for the forest sector. And progress towards inter-sectoral co-operation between different sectors on European level can be noticed, namely in the SEBI[3] process. The SEBI process, involving different sectors e.g. environmental, forest and the agricultural sector, aimed at assessing progress towards the goals of the Convention on Biological Diversity and was built around its focal areas and addresses key policy questions for decision makers. According to the panelist the development of the 26 specific biodiversity indicators was seen as challenging, because of the different sectors' objectives and goals.

Considering more closely the specific needs of other sectors on forest information and recent policy developments in the European forest sector in relation to sustainable wood fuel production, a panelist noted challenges for the forest sector in general and the C&I for SFM in particular. According to the panelist, end users and consumers ask whether biomass is sustainably produced or not. This question is difficult to answer, partially because wood fuel is imported also from outside Europe. But a few key indicators (for instance

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3   SEBI: Streamlining European Biodiversity Indicators

related to biodiversity and carbon neutrality) as well as chain of custody might prove sufficient.

The European forest owners' organisation uses key figures of C&I for SFM for dialogue and communication of forest sector trends and changes of forests and their management. Nevertheless, convincing the general public that European forests are sustainably managed remains a challenge.

Another panelist expressed the need for better communication between the different data providers to minimize uncertain data quality and inefficiency of data provision (e.g. data on biodiversity was mentioned). Concerns were raised on the reporting period of 5 years, which is applied currently, as annual data were needed for "green accounting" purposes. Comprehensive and realistic time series over a longer time period were suggested by the panelist in order to make significant statements about changes and trends, which could lead to a more focused discussion on achieved targets towards SFM.

According to the panelists future challenges for the pan-European C&I set include ecosystem services, value of natural capital, green jobs and green economy, sustainably produced biomass and finding the right label for SFM.

Expert panel on future prospects of C&I development

The expert panel on future prospects of C&I development, represented by two national experts and by PEFC[4], provided a platform for discussions on the further development and implementation of the pan-European C&I for SFM. Attention was given to the future structure and content of the pan-European set as well as the future of the set in a changing policy environment.

The panelists were asked how the quality of the indicators could be improved. The panelists noticed challenges for a subset of the indicators, due to the fact that those indicators are not assessed by national forest inventories or that national statistics are not compiled on these indicators. In order to tackle this challenge, the panelists see the need to further develop methodology, terminology and definitions in order to improve the quality of the

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4   PEFC: Programme for the Endorsement of Forest Certification

pan-European C&I for SFM. The MCPFE technical guidelines were mentioned in that context.

On the question of whether the quality of each indicator is still sufficient to cover current and future needs the panelists see the need to revise the set and to verify if an indicator is producing relevant and meaningful information. The panelists see also the need to include new indicators (e.g. certified forest area, volume of illegally logged timber, budget for research on climate change adaptation) and/or modifying existing ones in order to maintain a viable, up-to-date and widely accepted indicator set. Nevertheless, the panelists proposed moderate changes to the C&I for SFM. Furthermore, the need to develop composite indicators to address specific policy and emerging issues (e.g. future energy needs) was raised and emphasized by the panelists.

The discussions continued on the need to compare the costs of revising, expanding and implementing a new C&I for SFM set with the benefits in terms of improved policy, information and communication. The participants stressed that it might be difficult to identify current emerging needs, and that these would not be "emerging needs" in the future. In addition, the importance of data interpretation (jointly with other sectors) and the need to monitor trends over time was strongly emphasized.

The panelists were asked how in their view a misinterpretation of an indicator under different objectives could be avoided. The panelists see the difficulties in finding a common interpretation for C&I as regards to definitions and targets. Therefore, the panelists see the need to define common objectives and corresponding targets for the C&I for SFM.

Finally the panelists were asked if they see the indicators as a meaningful tool to provide overall holistic picture on SFM for a country. The panelists stressed the need for comprehensive time series over a longer time period to make significant statements about changes and trends, which could lead to a more focused discussion on achieved targets of a country and its short-and long-term objectives.

Following these panel discussions, the forum was informed that on 20 September 2013 the European Commission had proposed a new EU Forest Strategy which responds to the new challenges facing forests and the forest sector. The new Strategy gives a new framework in response to the **increasing demands** put on forests and to significant **societal**

and political changes that have affected forests over the last 15 years. It incorporates the following major principles: sustainable forest management, resource efficiency, and global forest responsibilities, promoting sustainable consumption and production of timber products. In this context, the European Commission is working on developing sustainability criteria for biomass which would assure that the raw material (wood, or other biomass, etc.) comes from a sustainable source.

Conclusions and the way forward

This session aimed at exploring the way forward of how the forest sector could supply information and how the pan-European C&I for SFM could be further integrated and adapted to address cross-sectoral needs at the different levels. The session started with presentations of the CI-SFM project's recommendations for the C&I implementation at pan-European, national and sub-national levels.

CI-SFM project's recommendations for implementation at national and sub-national levels

Regarding the recommendations for implementation at national and sub-national levels, the discussion centred upon the following issues, which will be taken into consideration for the final version of the report.

- **Integrate and involve other sectors to future C&I for SFM workshops:** This would allow for strengthening cross-sectoral linkages, enhancing information provision to the other sectors and hence reducing the possibility of indicator misinterpretation by the other sectors. Nevertheless, the use and the objectives of the indicator set have to be first clearly defined.
- **Sequence of activities (i.e. workshops):** The timing of the future workshops is important, especially in relation to national and sub-national levels. It would be advisable to conduct some workshops before a potential revision of the indicator set. This would stimulate and prepare the participants to take a part also in the revision process. Once the revision is completed, it would be beneficial to continue national level consultation to raise awareness and explain any potential change.

- **The Legally Binding Agreement and the pan-European indicator set:** It remains to be clarified how the pan-European indicator set would be affected by a potential legally binding agreement, in light of the outcomes of the currently ongoing negotiation process.
- **Integrate and involve forest owners:** It would be desirable to involve the forest owners in relevant meetings and discussions. However, the question is whether they would be interested in such information and what level. This could be further explored.
- **Smart use of the criteria and indicators**-economise on studies and research in order to connect the different forest sector layers correctly.

CI-SFM project's recommendations for C&I implementation at pan-European level

There were several comments in relation to the recommendations for C&I implementation at pan-European level:

- **Objectives of the set:** The working definition consists of five major applications, which would serve as a basis for the discussions when reviewing and defining the objectives of the pan-European set. In addition, it was noted that it would be advisable to provide also guidance for implementing C&I for SFM at national level. Furthermore, it was emphasised that the pan-European criteria and indicators set is only one of the SFM tools and that this should be taken into account when the other tools are discussed.
- **Revision of the set:** The majority of the participants widely acknowledged the need for revising the pan-European C&I due to various challenges associated with the current use and implementation of the C&I (e.g. emerging new issues and policy developments, lack of data for some of the indicators, suitability for an assessment of SFM, overburdening in reporting duties, lack of cross-sectoral communication). This should go hand in hand with developing updated guidelines to improve both data collection and interpretation. Preferably, the criteria should remain unchanged since they are established in the currently negotiated legally binding agreement on forests in Europe and provide the conceptual frame for SFM. Furthermore, the revision of the

indicators should be considered very carefully in terms of the different levels of advancement of the countries. It also noted that the indicators were developed also to monitor implementation of the commitments made during the MCPFE process (MCPFE declarations and resolutions), and this should be taken also into consideration.

- **Build bridges to other sectors:** Most of the participants agreed that the set is not well known outside the forestry society and it needs active interventions outside the forest sector. It was recommended to find a common ground and communicate and explain forest sector concepts to the other sectors (e.g. sustainable forest management vs. ecosystem approach or forest functions vs. ecosystem services). Moreover, it is important to develop C&I tools and information materials for the different audiences and different sectors. The need for develop the forest indicator partnership was also strongly underscored.

Outlook for further research

- The presentation and the followed discussion on the outlook for further research and development of the pan-European C&I for SFM concerned mainly the following aspects:
- Composite indicators (e.g. aggregating sub-indicators/parameters) and their potential role in addressing specific policy challenges
- Congruent indicator sets (e.g. compare and contrast sectoral/cross-sectoral C&I sets) and transmission of C&I applications on different levels
- Exploring mechanisms and stimulating debates on assessment procedures for SFM (including indicators for impact assessments)
- Process of C&I revision, mainly in relation to stakeholder participation, political and social aspects of C&I development and potential instruments for C&I development and revision
- Towards a new logical framework, incorporating inter-sectoral concepts , clearly defined targets and goals before preceding data collection and well-established linkages between quantitative and qualitative indicators

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