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).
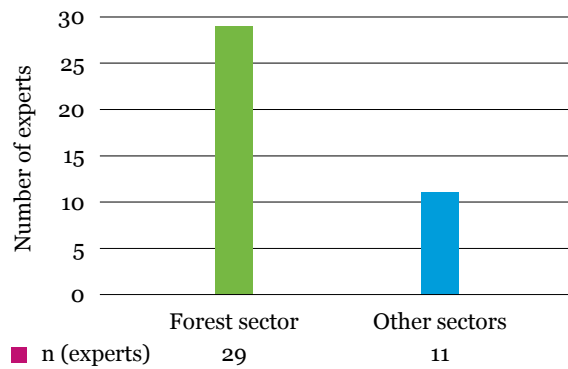
Figure 3. Number of experts interviewed from inside and outside the forest sector.

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.