



United States
Department of
Agriculture

Forest Service

Gen. Tech. Report
WO-81

Technical Guide

August 2009

Conference Proceedings: Forest Criteria and Indicators Analytical Framework and Report Workshop

**May 19-21, 2008
Joensuu, Finland**





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Executive Summary

In May 2008, the Finnish Forest Research Institute; the Montréal Process; the International Institute of Tropical Forestry; the Forestry Department of the Food and Agriculture Organization of the United Nations; the Finnish Ministry of Agriculture and Forestry; and the Forest Service, U.S. Department of Agriculture, sponsored a workshop to address the current status of forest status reporting by countries. More specifically, the workshop examined the use by decisionmakers and citizens of forest reports that have used criteria and indicators (C&I) to document current biological, social, and economic trends relevant to the sustainable management of a country's forests. In many cases, expectations for these reports have not been met. Discussion was devoted to how such reports could be improved based on current decisionmaker and citizen use of the reports.

Workshop Conclusions

Judging the success of current reports must be tied to initial expectations for the reports. In some cases, countries developed C&I in response to international commitments. The C&I reflect decisionmaker, scientist, and citizen understanding of key important data, and over time, trends important to making forest policy decisions for the sustainable management of those forests. In some cases, expectations were met with the collection of C&I data and providing access to that data on Web sites. In other countries, it was hoped that the reports would reshape citizens' and decisionmakers' dialogue on forests by providing broader and trusted data relevant to the currently polarized dialogue on forests. A number of studies in countries indicate that these forest sustainability reports, although valued, are not meeting decisionmaker, public, or Government expectations.

Suggestions for improving the reports include the following:

- Making the reports more Web based and easier to navigate.
- Providing more analysis, conclusions, or "stories" within the reports.
- Focusing on key elements of sustainable management.
- Including compelling messages or stories that capture what the C&I data indicate.
- Developing a stronger analytical framework for the use of the C&I.

The implementation of these recommendations will require decisionmaker and citizen understanding and support.

Importance of the Workshop

In 1992, the United Nations Conference on Environment and Development, or Rio Earth Summit, assembled 108 heads of State and proclaimed a world commitment to sustainable development. Key focuses were forests and Agenda 21, a comprehensive blueprint for

global, national, and local action. Within Agenda 21 is a pledge by countries to develop C&I that would allow them to measure progress toward the goal of sustainable development.

The forestry profession around the world responded with the development of C&I for sustainable forest management. Many countries are on their third generation of C&I-based reports. Over the years, this work has encouraged better collaboration between government and citizens, the initiation of periodic national forest inventories, the first country forest reports, a basis for certification schemes, and many other applications at subnational levels. This workshop was one of only a few collaborative meetings over the past 15 years between regional blocks of countries in an effort to share information and tools to improve this important and expensive work.

Workshop Organization and Results

The workshop was opened by Dr. Heikki Granholm (Finnish Ministry of Forestry) and Jari Parviainen (Director, Finnish Forest Research Institute), who provided a general background on the development of criteria and indicators (C&I), sustainability reporting, applications in Finland and a welcome to Finland and the Finnish Forest Research Institute. Rob Hendricks provided a review of the specific purposes of the workshop.

A series of papers was presented on how country forest sustainability reports are being used by decisionmakers and stakeholders and on tools for improving these sustainability reports. Following the presentation of the papers, workshop participants were given the opportunity to discuss the ideas presented by the speakers.

Jari Parviainen presented an overview of what forest sustainability reporting was designed to accomplish and the different approaches taken by countries to design and present these reports. These materials include full documents, summary reports, information brochures, etc., fashioned for different audiences and user circumstances.

Claire Howell from Australia shared the findings of a formal communication survey they conducted while planning for their third in a series of 5-year National Assessment Reports. For the purposes of this workshop, the findings of the survey established the need to critically examine how reports are actually being received by users. Their 2007 study produced 29 recommendations that helped shape Australia's 2008 *State of the Forests Report*. The suggestions addressed report presentation, value to stakeholders, content and tone, timeliness, and several paradoxes. The paradoxes documented the tension between reports that provide an analysis of data trends and those that do not, the analysis of data trends and those that do not, and the willingness of stakeholders to participate in the sustainable forest dialogue based on both approaches. Another tension identified exists between reports that focus on discussion of scientific rigor and data quality at the expense of effective and compelling reports on the actual condition of the country's forests.

Dr. Prem Chand Kotwal of India took the workshop down a different communication avenue by pointing out that the application of C&I for sustainable forest management is focused in India at the State and the forest management unit (FMU) level. This presents communication as a community of place challenge rather than a community of interest challenge as many developing countries tend to view the issue. Work in the last decade has been in 6 Indian States and 14 FMUs.

Regarding the Indian situation, foresters must work with remote, many times illiterate, highly forest-dependent people. Each group of people has its own way of understanding and defining sustainability, commonly thinking of the long run as seven generations. With his talk and use of many handout examples, Dr. Kotwal spoke of the need for being context specific, using printed material in the form of graphic presentation books, and using games to illustrate points. At a higher scale, the development of a sustainability index based on the C&I has proven the best way to work with decisionmakers for improvement of operational efficiency and budget allocation.

David George, who works for the Remote Sensing Applications Center of the Forest Service, U.S. Department of Agriculture, in Salt Lake, UT, spoke from the point of view of a technologically oriented institution interested in making geographic data available and usable to stakeholders. Their challenge is the distribution of massive amounts of data to audiences in formats appropriate to their use. Until this is achieved, billion dollar databases must be considered of little value.

The use of commercial Web sites presents a huge opportunity to present forest information to a large public audience. What the Government has been able to put on the popular Goggle Earth site provides many useful lessons about the kind of data that appeals to the general public. The Forest Service and National Park Service data now presented on Google Earth were the result of protracted negotiations to find common ground between commercial and Government perceptions of public interest and need. Mr. George also discussed other avenues for getting information to the public, such as data clearinghouses, syndicated services, and collaborative and interactive map services. Merely posting your data or reports on a Web site usually is not sufficient.

Jesus San-Miguel-Ayanz of the European Commission (EC) provided an overview of how the new European Forest Data Center (EFDAC) of Europe is organized. The EFDAC has been established by the EC to become the focal point for forestry information in Europe and to provide policy-relevant information to decisionmakers and stakeholders. It builds on previous initiatives of the EC and the European countries and puts together the largest databases and information systems on forest information in Europe. These EFDAC resources include data and information from the following:

- European Forest Information and Communication Platform, where people can find information on forest resources in Europe coming from the national forest inventory systems.
- European Forest Fire Information System.
- Forest Focus database, which contains data on forest conditions.

These databases enhance the ability of Europe to respond to international commitments, such as the Convention on Biological Diversity and the Ministerial Conference on the Protection of Forests in Europe. As there is no European forest policy, forest policy is the responsibility of the individual countries.

With Simon Bridge, we came back to a C&I expert. Simon shared the lessons Canada has learned through a study about how well the public received reports on Criteria and Indicators of Sustainable Forest Management, the last of which was published in 2005. Despite publication of professional-looking documents and their dissemination to most forest stakeholder leaders, feedback about the reports included the following:

- Poorly targeted audiences.
- Difficult to find information.
- Did not provide access to alternative analysis.
- Had too many indicators to easily use.
- Some information could be found more easily in nongovernmental organization and other agency documents.

Although the report was in hard copy and on the Web to browse, it is clear the report must change to be relevant. The issue is the same as that in India, only the circumstances are different. Simon proposed the answer can be seen by examining the evolution of the Web in the last 10 years.

Richard Guldin presented the group with a problem. Although the initial set of national reports on sustainable forests proved, in many ways, to be popular and useful in describing the current state of forests from ecological, economic, and social perspectives, we have fallen short in being able to answer a key question. Are our country's forests more sustainable today than they were when the last report was published? With the increased public interest in sustainability in all aspects of our economy, will we be able to tell our story? He asked whether we should continue to focus on C&I definitions and data or whether we need to spend more time on an explicit model or framework to help tell better tell a story using forest trend data. If this line of thinking is correct, where do we go with it?

Marcus Lindner reminded the workshop participants that since the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, sustainable development has been part of the political agenda. The question on the table is whether the ecosystem goods and services we need can be delivered at the required levels. Responding to this question requires improved decision-support tools. He presented two approaches to assessing sustainability impacts. Both are quantitative integrative assessment approaches that allow for analysis of tradeoffs using indicators data. The tools offer transparent and comprehensive scientific frameworks for supporting decisionmaking processes and providing valuable background material for discussing potential resource use conflicts.

Keith Reynolds illustrated the utility of a logic-based model approach for evaluating the sustainability of forests and their benefits using the Montréal C&I. He discussed the roles of science and policy in this effort and the application of C&I in a logic-based approach to an analytical model. He then presented a prototype logic framework for using C&I in assessing sustainability, explaining the policy choices that must be made in its construction, and elaborated on some lessons learned along the way.

Örjan Jonsson presented the group with a very practical application of the modeling and communication ideas presented by other speakers: the Food and Agriculture Organization of the United Nations' traffic light system. The purpose of the traffic lights was to shed more light on the complexities of sustainable forest management and stimulate additional analyses and debate, thus promoting decisionmaking and action for further progress toward sustainable forest management. Although initially controversial, the traffic lights have come to be an accepted and effective monitoring tool for illustrating complex issues in an easy-to-grasp manner.

Aljoscha Requardt summarized two aspects of the data analysis problem. First was a way to evaluate international information priorities and capacities using the pan-European C&I for sustainable forest management (SFM) as a baseline. He covered where to find which forest data, information priorities, the key indicators, and assessment and reporting activities. Second was a presentation of insights into the theory of C&I analytic networks, pointing out and discussing new aspects relevant for the implementation of C&I as a

useful instrument for identifying different cause-and-effect relationships and conflicts of interests within SFM. Both approaches help tell the story about forest resources and the multiple dimensions relevant to assessing SFM.

He concluded that network analysis is an appropriate tool to depict and analyze different cause-and-effect mechanisms between different SFM indicators. Network analysis can be applied to identify and define different scenarios for solving conflicts of interests in multipurpose forest management. He also stated that network analysis can help define and improve monitoring strategies and concepts further enabling progress and achievements toward sustainable forest management.

Ricardo Umali presented another model for an analytical assessment tool of C&I. He uses the word “model” in two ways. The first use of the word refers to a designed process to identify for whom C&I data are to be used. The second use refers to forest audits as a systematic and pragmatic management performance measurement tool. The paper’s focus is on the second “model” and how this is currently applied in the Philippines. The approved set of Philippine C&I is formally used by the Government in the performance evaluation of various types of FMUs. The C&I system provides the necessary tools to integrate the largely fragmented view of SFM. It also enables decisionmakers to analyze the different components of SFM and the intertwining and intricacies that exist among them.

Workshop Discussions

Monday's Discussion

(Group discussion after communication papers)

The workshop opened with a number of talks on the purpose of national and local forest sustainability assessments, how and whether stakeholders were using those assessments, and decisionmaking and innovative ideas for sharing forest assessment data with government decisionmakers and the public. Flipchart notes on the immediate reaction to the presentations included the following observations:

- It is fine to talk about the optimum use of the Web for communication, but people in the developing world are without computers.
- Many developing countries use intermediaries to interpret reports to local people.
- Information rather than data sharing is what we are talking about.
- We need a way of determining whether we are sustainable, which, after all, is what our stakeholders are interested in.
- We need to reassess the validity (effectiveness) of the entire criteria and indicators (C&I) reporting process. What is its role in information sharing for decisionmaking or determining whether we are sustainable?
- Data privacy, security, and the Web present a problem with many governments. We need to consider this in this discussion, as national Government data may not be allowed to be on the Web because of security.
- What do we mean when we say forest assessment data must be better structured for downloading by a user?
- This is all well and good, but the cost of Web updates is high as is the cost of high-speed servers.
- Audiences, even different age groups, differ in how they get their knowledge. So, what is the role of the print media versus the Web for communication in reaching different audiences?
- In what form would one make data public in a way that facilitates people's ability to analyze it? Said another way, how could one make databases available for "custom" analysis?
- Stakeholders and decisionmakers want to relate data to other variables to understand cause and effect. It is our job to help them do this.
- How are we to actually "promote" the public use of data and utilization of new available tools to analyze that data?
- We really need a way of delivering a set of core indicator data, continuously updating it, making it a living process.

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- We need to keep national correspondents engaged so they can serve as proponents and maintainers of the forest sustainability “discussion.”
 - The audience for forest data increases as one gets closer to the local level. Increasing the use of national assessments requires making disaggregateable report data available in a form useful to people at the subnational to local level. How could this be done?
 - Some stakeholders do not trust government reports and this influences their use of the reports. One of our tasks is to establish the “honesty” of the data or convince people of its reliability.
 - C&I provide a useful framework for a compendium of national forest data.
 - From an International Tropical Timber Organization (ITTO) perspective, report writers need to have more access to resource data rather than project data. This influences how reports are presented to stakeholders.
 - Most of us are not aware of the kind of systems available for collecting and presenting constantly changing data.
 - There is bureaucratic resistance to new ideas or getting the reports published that has to be overcome. One participant with years of experience suggested the following:
 - Do not ask for permission.
 - Lower the profile of the release.
 - Stay away from any mention of goals, targets, etc.
 - Some of our fears do not play out and may actually turn out to be a positive outcome.

These comments were grouped into five topics, listed in the following text, for two break-out groups to choose from, discuss, and make recommendations on. The groups chose to address topics 1 and 3.

1. How do you overcome barriers to public participation final reports?
2. How do you connect “expert” with public opinion and desires in a report?
3. How do we optimize the availability of data/information with the tools available?
4. Recommend communication tools we feel are the most effective (e.g., a press release, science/policy dialog papers).
5. How do we help link forest data to other sectors?

Topic 1

How Do You Overcome Barriers To Public Participation in Final Reports?

Group 1

A significant barrier to public participation is the inability to engage environmental nongovernmental organizations (NGOs) to comment on, use, and endorse a report. It is difficult to get NGOs to share their mailing lists to help focus forest report distribution. They perceive participation to be potentially risky on their part, which is a subset of the trust issue.

If Web comments are a sought for part of a forest report, is it necessary for a government to respond to any or all the comments? For example, if a government actually solicits comments or contributions to a forest report, is there an implied commitment to respond?

To address this issue, stakeholder groups have been created in some countries. Australia's Montréal Process Implementation Group (MIG) is an example. The dialog in the stakeholder meetings does not create a commitment to act. Stakeholders help set the framework for dialog. In the United States, the Roundtable on Sustainable Forests sponsored a "Multiple Perspectives" workshop specifically aimed at allowing NGOs to speak on how they interpret the indicator data. Australia used similar "Multiple Perspectives" meetings. The dialog that followed was productive and the results were published. Finland also has formed a stakeholder group.

Establishing an electronic means to comment on forest reports is a workable approach to gathering public input on or seeking contributions to a forest assessment. Creating a response capability, either one-to-one or in an electronic discussion forum, is something the group thought would be useful. This could take the form of "discussion threads."

If we are actually serious about generating increased use of forest reports, we actually need to provide better ways for people to use them. The workshop speakers presented a number of ideas. The use of prepackaged software that enables a stakeholder to analyze data and to pump data into some kind of map form would vastly increase the usefulness of forest assessment reports. It was maintained that providing people an opportunity to use data is another means of increasing user trust in the data.

Regarding bureaucratic objections to publicly accessible data, if resource inventories are paid for by public funds, then there is strong justification for defending why data should be available for public analysis. Prudent caution, however, may be required to help avoid misuse or misinterpretation of the data and information. The Ministerial Conference on the Protection of Forests in Europe (MCPFE) forest data was made available to the public in June 2008 and much of the U.S. national forest inventory data is already available on the Web.

The question of resources for making resource data more accessible is perplexing. While a lot of money is spent to collect and compile data, all too often very little funds are allocated to ensure the data is available to the public. The reality is, inaccessible and poorly used data is infinitely ineffective and expensive.

Group 2

One strategy to overcome the political barriers to public participation or data accessibility is the "slow rollout" of a forest report, perhaps indicator by indicator. Each indicator is presented as it becomes available rather than the massive release of a full report. This will help avoid commonly required senior management approvals that often result in delays or modification of "sensitive" parts of the report. The report stays "under the radar screen." Another way to report is again to not focus on "the report" but rather on multiple products of the report.

The U.S. State of Oregon made the forest indicators “property” of citizens, not the Oregon Board of Forestry. The Board developed guiding principles of how people could use the Oregon forest indicators. Although the Board took the role as the lead for reporting, it encouraged others to do their own reports using the same indicators. Oregon makes all data sources freely available to anyone who wants to report. It also encourages others to report on individual indicators, which, in the end, provided some justification for the State to collect the data. The resulting multiple reports also provide a venue for multiple view points on sustainable forest management (SFM).

Another option discussed is hiring an independent third party to write the report and then presenting it to multistakeholder groups for validation. An example is the U.S. Heinz Center’s *The State of the Nation’s Ecosystems 2008*, which is available at <http://www.heinzctr.org/publications/index.shtml>. Only after validation and buy-in did it become the national report. Stakeholder groups in the United States were also asked to interpret and point out the “so whats” of the forest sustainability report. This input was published as a separate *Multiple Perspectives Report* as a companion to the *USA 2003 Forest Sustainability Report*.

In British Columbia, any discussion of implications to Government policy is avoided. Information is presented as objectively as possible. Every effort is made to avoid political spin or suggested Government action.

It is recognized that a means of interpreting forest trends should be provided to the interested public. This could begin by presenting interpretation as “an additional layer” of data, starting with “what the Government thinks.” Other stakeholders would then be asked to present what they think. France created a steering committee of invited stakeholders for a discussion of the indicators. Users say they want interpretation of the data, although some stakeholder surveys are equivocal as they reveal a divide among readers about the value of interpreting information. Some readers prefer “objective” independent reports with no interpretation. One person said the term “value neutral” should be dropped. The European Union (EU) provided the key trends and conditions in its report but did not include an interpretation of whether the trends were “good” or “bad.” The report was not “interpreted.” The United States and British Columbia provided “objective” reports of the data and information—conditions and trends.

A clarification of the roles and responsibilities of the stakeholders would help with public participation. Many stakeholders do not know how to participate. Clarification also helps build political buy-in when reports are released (provides support from below).

National reports often do not accurately reflect local conditions, the point where buy-in is most often achieved. Unless national forest reports can be disaggregated to subnational political divisions, we are living with a natural barrier to stakeholder interest, report use, and participation. One such local condition is that many of the world’s counties are multilingual. The real challenge then is to provide reports in languages users can understand and scaled data relevant to their situation. This is where the use of intermediaries to interpret reports for local people serves as an important tool.

Last, we need to keep in mind that funding is an important issue. Even the Indian report was possible only because of ITTO funding.

Topic 3

How Do We Optimize the Availability of Data/Information With the Tools Available?

This issue may be more one of avoiding bad practices or not continuing known poor practices. For example, we all know it is not very helpful to mount large forest assessments on the Web in PDF format because many people cannot find the data they are interested in. Such documents are not searchable with many Adobe readers, so we need a common understanding about what “good” practices are and then we must follow them. Making data available in Excel spreadsheets or other downloadable formats when the forest assessment is made available is a “good” practice we should encourage, in addition to searchable documents. Downloadable maps and graphs/figures, with the pertinent metadata embedded, should also be encouraged.

When, on the other hand, data are used for making political or financial decisions, appropriate protection is probably needed to prevent intruders from manipulating data and affecting future decisions. The group agreed that information protection is important but there are technical solutions to this issue. For example, users might have to register for the use of certain categories of data that are more sensitive than other categories of data.

Regarding making indicator data easy to find, is there anything “wrong” with publishing a Wikipedia article for each indicator? The ability to write about specific indicators and provide links to related articles may be a useful way to build presence on the Internet for C&I. This gets back to creating a viable presence on the Web for C&I. The Wiki format also presents an opportunity to solve a number of accessibility, public trust, comment, and report contribution challenges.

Blogs can also be a useful way to create Web interest in forest assessment reports. When people begin to talk about things, it creates an increased form of public awareness (or “buzz,” as it is called in Hollywood). When more people are talking about a topic in Internet forums, chat rooms, and blogs, it, in turn, generates more hits and the Web sites and topic continue to rise in popularity.

If people actually cannot find our reports on the Web, links among Web sites are a powerful way to build higher rankings for forest report Web sites for Google or Yahoo search engines. Asking multiple groups to provide links back to the report(s) will boost report “findability” and popularity. This is a strategy that could be implemented by forest research groups or organizations in addition to forest assessment and C&I report shops. The key is seeing Web visibility itself as a legitimate “spokesman” for the forestry community.

In some European countries, individual countries are relying on the MCPFE or the EU to publish information that summarizes the situation in that country. Individual country reports are only prepared by six countries.

The groups did not have time to address topics 2, 4, and 5.

Tuesday's Discussion

Papers on “Methods for Interpreting C&I Trend Data Relating to Forest Condition” were presented. This was followed by Simon Bridge leading a group to address the following question: In order to use models to improve reporting on SFM, what do we need to pay attention to? Participants identified the following general concerns. The numbers indicate the relative interest in the topic.

13—Relationship between indicators.

13—Communication/audiences/keeping it simple.

11—Stakeholder input.

11—Telling the SFM story/what motivates action by the readers.

6—Data quality/get over the hangup on precision—just do it.

1—Transparency.

•—Institutional capacity.

Three breakout groups addressed three of the questions.

Group 1

Relationship between indicators

We need to keep all the indicators developed by countries or groups of countries, while working with stakeholders with different interests in forests. We also should be able to select the most appropriate indicators to tell stories relevant to key issues. We should not be building fresh indicators for each issue. We need, therefore, a robust set of indicators that allow us to tell stories about the most compelling current, and changing, issues. Models can help us select the few indicators that will best work for each story to be told and understand the linkages between them. The word “story” is used here as shorthand to indicate a simple and nontechnical description of what forest data appears to say.

The topic of forest energy provides a good example. Some groups are concerned that reports will overfocus on the energy issue while neglecting the progress and needs in other areas such as biodiversity. Maintaining a robust set of indicators and tracking them over time will allow us to “go back” to former issues and provide updates on their current status. The ability to wiggle one variable that may cause others to wiggle—or not—is an important feature of sensitivity testing provided by a good model. Models can, therefore, help us understand different scenario effects on forests conditions and trends. The relative difference between scenarios and their effect may be more useful information than the specific levels of the conditions themselves.

A model can establish a framework for stakeholder discussions. A formal framework, which organizes thinking, helps several groups understand how their thoughts overlap or do not. C&I models help accomplish the following:

- Tell a story and aid in comprehension.
- Understand the source of vulnerabilities and threats that may be occurring or may emerge down the road.

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- Understand the implications of management activities or decisions.
 - Reveal or prioritize expenditures.

The papers touched on several kinds of models, each with some utility. The difference between a completely specified “systems science based” model and a model that reflects the values of stakeholders was pointed out. The more stakeholders become engaged and the more diverse their perspectives are, the more likely that the agreed-upon model will look much like a systems model.

Past experience with large deterministic optimization models (or simulation models), as experienced by the Forest Service in its 1980s forest planning process, has led many people to be wary of their utility. People approached such models with an expectation that the “right” answer would emerge, and it often did not. The results of these models are too complex and could not be simplified enough to inform the average citizen or decisionmaker.

As an alternative, one virtue of sophisticated logic models is their transparency. People can understand the model’s results and the answers they are getting. The transparency of these models encourages trust on the part of the users. Logic models help one understand what data mean (at the data level) and what the collective contribution of the indicators is to overall conditions. Simulation models are different and a less useful application for the analysis of C&I in sustainability reports. As an example application, a key question may be how bioenergy impacts might affect other key indicators. The inputs that feed the bioenergy may also have linkages back to key sustainability indicators.

It is important that decisionmakers not regard a model as the surrogate for a decision. Decisionmakers should not abdicate their responsibilities to model results. What must be remembered is that simulation models are built on data and assumptions. A decisionmaker needs to understand the implications of those to model solutions. Model outputs should be the beginning of the decision process, not the end of the decision process.

In the EU, there is strong interest in building biological diversity models. An important question is the kind of indicators that should be provided as possibilities for consideration by biological diversity advocates. Forest area, difference between growth and removals, protected forest areas, share of production, and employment are potential indicators. Bio-diversity advocates, however, appear to be interested in only a couple of these—growth and removal balances and the area of protected forests. If we can use models to help demonstrate why a richer, larger suite of indicators (considerations) are really important, then the models will have some utility. If only a couple of indicators are used to track biological diversity, then when other complex questions arise—such as bioenergy—we will be unable to model important tradeoffs between energy, biological diversity, and other important resource considerations.

The most challenging task in forest assessment reporting (C&I) processes is figuring out how to take the information from a whole set of indicators to construct a few compelling stories for stakeholder and policymaker consumption. Forest assessment (C&I) work should exist in a modeling world somewhere between heavy-duty simulation/optimization models

and no modeling at all. An important aspect to the question, therefore, is positioning forest assessment client needs against the perceived needs of heavy-duty modeler advocates. Presently we are “floating around in a 67- (the number of Montréal Process indicators) indicator soup.” As already pointed out, models could help make some sense of what appears to be unconnected and lacking in relationships. The models could help organize and illuminate report writer, stakeholder, and decisionmaker thinking. Sometimes, just the architecture of the model itself has a substantial impact on the understanding of the complex situation. No one is capable of understanding all the indicator interconnections, while a model can bring more meaning to the interconnections. Simply the construction of a model can help to illuminate indicator relationships.

Model building is often best started with just a few people in a room. Working through subsequent iterations of the modeling building exercise with successively larger groups is a useful approach to completing a model. Is it possible to take a few indicators, put some data in, and then let the users test the model to see how it works? The important point is the construction of a model in bite-sized pieces.

A common perception is that models can be used to balance competing interests for a relatively defined period of time. Today’s world, however, can be characterized as too dynamic given climate change, changing international markets, consumptions, etc., for such a perception. The notion of what “sustainable” means in such a changing environment is difficult to understand and so models may be a great help.

Group 2

Communication/audiences/keeping it simple

As report writers, more attention must be paid to the various audiences we expect or hope will read and use our forest assessment reports. We have long understood the need to identify audiences (general public, specific stakeholders, policymakers, etc.). However, many report writers are confused regarding the way to best present reports to instill use and action by those audiences. If one stakeholder group (e.g., decisionmakers) is understood, insufficient attention is given to the reality of multiple and differing stakeholder report needs, such as the data relevant to subnational stakeholders. Each audience has its own particular needs and indicators of interest. It is apparent that data need to be filtered from the stakeholder rather than our point of view. We need to be aware of the task the audience, or reader, needs to accomplish with the information provided. The difficulty of selecting a “core” set of indicators quickly surfaced in this discussion as it was clear that each audience would choose different key indicators.

Professional communicators have long preached the need to keep public communication simple by distilling messages to three or four most important groups of indicators. Holistic messages work best, taking into account all views of all stakeholders. Messages such as “it is sunny” or “it is rainy,” green or red light, as an overall message has proven successful with audiences. Links to detailed data or information can supplement such short messages. Human health indicators are a useful analogy; practical applications include the EU’s “smiley faces” and the Food and Agricultural Organization of the United Nations’ (FAO’s) traffic lights. With that said, it is very difficult to arrive at that simple message.

We need to pay more attention to how and for what reason we want to communicate.

- Can SFM indicators be presented like the Dow Jones Industrial Average?
- Can we get society to accept the indicators of SFM?
- Informing and educating must be designed as a form of communication.
- Last, users need to be able to find or easily discover your messages (the report).

A systematic way to identify the key audiences might be the following:

- Identify the stakeholders who helped develop the indicators that began with the question “What do you need to know?”
- Conduct reader surveys, be cognizant of the linguistic capabilities of an audience, use multiple products for different audiences, seek constant reader feedback, and look for new audiences (e.g., school kids; provide FAO Forest Resources Assessment-designed folders of information to schools).
- Have materials (explanatory material or a process) on hand for people who are new to the report.
- Establish focus groups—use them to identify currently important indicators and to test communication products and results (e.g., test a new Web site with focus groups).
- Communicate a C&I model but do not explain to audiences the details of a model; keep it internal.

A communication plan should be developed to assist users in accomplishing their tasks with the report’s information. The report should accomplish the following:

- Provide information that—
 - Informs decisionmaking.
 - Helps move toward more sustainable outcomes.
- Identify the links between political commitments, report information, and policy development.
- Remove stakeholder questions about the credibility of report and address the following:
 - Provide unbiased reporting.
 - Serve as an honest broker of information.
 - Provide an opinion on the meaning of the data, but also provide an opportunity for others to express their opinions and manage that process so that it leads to action.
- Embrace reports produced by third parties—treat them as advice to the Government.
- Clearly target the product to the intended audience.

As a guide to the identification of key messages, the following approach should prove to be useful:

- Remember that communication is a two-way street—you should present information but also listen to your audience.
- Use a model to help explain what indicator data is saying—it will help with developing messages; however, a model should not be the part of message.

-
- Plan on multiple reporting products—provide the right information to the right audiences, but make sure facts and interpretation stay the same.
 - Use your communication to promote discussion among stakeholders.
 - Focus on the question, “are forests managed sustainably?”
 - Provide details to those who want them, but provide these details farther down in the report (i.e., headlines, and then the details or links to the details).
 - Simplifying your message is the key.
 - Expect there to be a clash between those who do and those who do not want interpretation or values in the report.
 - Link reporting to policy.

Group 3

Telling the SFM story/what motivates action by the readers

In some countries, public trust in government reporting is an important issue that can be improved by the following:

- Stakeholders helping with data collection and interpretation of the data adds to the report’s credibility. For example:
 - The Woodland Trust in the United Kingdom is doing an ancient tree hunt (inventory).
 - Bird counts, amphibian counts.
 - Tree Atlas of Ontario.
- Getting stakeholder participation from indicator selection through the reporting writing process. People in a community will have more trust in the information in a report if someone they know has been involved in the report’s preparation.

If we are to communicate with nontechnical audiences, we should emphasize the social and cultural dimensions of sustainable forestry. As an example, the Finnish Government commissioned a well-regarded nonforester to write a book entitled *My Forest: Full of Life*. The author used indicator data to tell stories of all the aspects of forests, focusing on the cultural connection between people and forests. The book is distinguished by the following:

- The author is a prominent, respected person.
- The book is written in personal terms with little jargon.
- The author speaks from the heart.
- The author appeals to emotions (the Al Gore effect).

Report options for a public with limited education, language barriers, limited access to computers, etc., also need to be considered in this discussion. Elements to be factored into a communication strategy include the following:

- Use of a comic book format.
- Diversity of people (dialect, level of education).
- Basic economic needs.

It has been said before, but it should be repeated: we need to better understand our audiences. Countries such as Australia, Finland, Canada, and the United States have already undertaken steps to understand those audiences. We need to do the following:

- Be effective salespeople for the use of forest sustainability reports; we cannot expect the audience to come to us. We have to understand our customers and design products they will buy.
- Be ready with an “answer” that addresses a need.
- Understand what the decisionmakers want.
- Understand what the environmentalists want.

If it is too difficult to develop multiple products for many audiences, one strategy to address the problem is the presentation of data with tools that enable independent stakeholder analysis. Tools such as Goggle’s Motion Chart and the Forest Service’s Forest Inventory and Assessment Forest Inventory Data Online system are examples. This allows the report user to reassemble data by community of place (scale) and community of interest (focus on particular indicators or indicator relationships, etc.) and analyze it according to his or her needs.

The ultimate purpose of forest reporting is to guide policy adaptation. To that end, it is important to sort issues from nonissues to ensure that decisionmakers’ time and energy are spent effectively. Clear stories on areas where action is needed should be presented by crafting stories—

- About topics that everyone agrees on.
- About matters where education is needed.
- On conflict issues.

Early analysis will help specify the kind of modeling that may be required to provide help with this task.

The probability of attracting media attention to the report can be greatly enhanced if a high official hosts a workshop or announces the release of a report. It makes forest sustainability an important topic and makes people take notice. Examples include the following:

- The Finnish Prime Minister hosting a workshop.
- A Welsh cabinet Minister announcing the relapse of the C&I report.
- The Australian Prime Minister announcing the release of the Australian report.
- Working with stakeholders to endorse a report through their organization’s newsletters:
 - The U.S. Roundtable on Sustainable Forests.
 - Australia’s Montréal Process Implementation Group.

Workshop Photos



Background and Purpose of the Workshop

Rob Hendricks¹

Introduction

Before I begin, I would like to thank the people who were instrumental in making this workshop a reality. The first is Jari Parviainen, who has been very supportive, offered to host the workshop, and is always willing to share ideas. Ewald Rametsteiner in Vienna probably had the greatest impact on the objectives and agenda. Aljoscha Requardt, who has been a new contributor to the agenda, served as a persistent prodder and a great help with speaker suggestions. I also want to acknowledge Steve Johnson, who was responsible for the International Tropical Timber Organization's participation, Simon Bridge for intellectual stimulation, Markus Leir for efficient organization, and Rich Guldin for funds. Last, I want to include the Finnish Ministry of Forestry for the reception last night and a splendid series of activities and dinners planned for the next few days.

The Purpose of the Workshop

For the next 3 days, we will explore two important but thus far inadequately addressed topics key to the future of forest reporting. The first is whether country forest sustainability reports are accomplishing what they were designed for and need to do. That is, whether they influence the dialog on forests and forest policy at the country level. More bluntly, are they effective and worth the substantial expense of collecting and reporting national forest trend data? We will hear from a few people that those reports may not be accomplishing what they were designed for. The second, and a related question, is what does all of this forest indicator trend data tell us? Are the forest reports using indicators meaningful to stakeholders and can they, or we, construct compelling stories for the public and decisionmakers regarding the sustainable management of our forests? The Montréal Process countries have raised these questions and are formally discussing how to address them.

It has been 15 years since the forest management community embraced sustainable forest management as a goal and the notion that a set of indicators was the best way to move forward toward that goal. In those 15 years, groups of countries have established sets of criteria and indicators, countries have produced State of the Forest (actually at the international, national, and subnational levels) reports, revised their first sets of indicators, and now are producing the second or third edition of those reports.

This year, 2008, is a good time to reflect on where we have traveled in this process. In a few countries, ministers are asking whether all this effort is producing anything of value.

¹ U.S. Department of Agriculture, Forest Service.

Many stakeholders and rank-and-file foresters continue to find it difficult to understand how national-level trend data can be useful, or at least do not understand how they might use such data even at high policy levels. In some countries, where excellent reports have been produced, criteria and indicators (C&I) remain primarily a research function with little use by stakeholders, policymakers, or land managers. In many developing countries, the use of C&I for reporting has never been really accepted and adequate resources never allocated to producing forest sustainability reports. Last, the people who were involved in the development of C&I are retiring or moving on to other things. New people are expected to take the reins and know where to go with all of this. Some fear political support for the use of C&I is waning, so there is a need to breathe fresh life into forest reporting.

In 2006, a conference was held in Poland to kick-start lagging collaboration among the active C&I processes. It was a very interesting conference that revealed two aspects of forest reporting that seemed to be bothering forest sustainability practitioners in the countries. One was the effectiveness of forest C&I reports and the audiences they were to serve. The second was the difficulty of using C&I data to construct compelling “stories” of what was happening in, or to, the forests regarding sustainability that laypeople and politicians could believe and understand.

The organizers of this workshop have assembled a knowledgeable group of people expert in indicator analysis and the subsequent communication of information learned from such analysis. The topics were selected to stimulate your thoughts, not provide the answers to the previously stated questions. Exploring the best way to address the questions is your task. After a first set of presentations, we will reconvene in two or three groups to discuss what we have heard, share our own experiences, capture the collective wisdom of the group, and then record those thoughts so we can share them with our colleagues around the world.

As one organizer of the workshop, let me make a request that, during our discussions, we stay way from generating policy-sounding statements, position statements, or requests for additional funding. What we want on the flipcharts are thoughts relevant to the workshop questions we can implement ourselves at home, if we actually believe in the need and can give those actions priority.

Forest Reporting and Smarter Communication

Forest reporting and smarter communication will be the first topic, with Finland presenting an overview of the purposes of forest sustainability reporting. Australia will then present us with the first challenge we are here to address: how well the sustainability reports are being used. We will then hear five speakers who will share some of what is already being explored that addresses the challenges revealed in Australia’s report to us. Simon Bridge will tie it up as a segue to group discussion of what we have heard. We encourage you to share ideas you have brought with you as our goal is to capture practical suggestions for how to apply the ideas.

While I have the floor, I would like share the experience that drives my interest in this subject. I am constantly asked to share good sustainable forest management or C&I Web

sites. Despite the existence of many forest sustainability sites and years of publishing reports, people who ask my advice appear to know little of C&I and apparently their Google searches have not provided them with what they feel they need.

I conducted a little experiment. I selected 10 C&I indicators as topics for a Google search such as “forest fragmentation.” In all cases, Google did not produce one C&I forest report hit. The hits were nongovernmental organizations, a few research and commercial sites, and Wikipedia. A year ago, I did this for “sustainable forest management” and got no direct hit. Simon Bridge and I had a conversation about this and he took the initiative and wrote a Wikipedia “sustainable forest management” article. As of May 2008, a search for sustainable forest management gets the Wikipedia article as first on the search list.

On reflection, very little of the public appears to know these C&I sustainability reports exist. If they do know, they have difficulty finding them. I can only conclude that our work is invisible to the nonexpert. As one possible solution, perhaps indicator reports should be loaded up as individual Wikipedia articles. If that is not the answer, we must find another way to share information that is easy for the public government analyst to find and understand. We need to remember, as Jari will point out in his talk, that neither the public nor policymakers are technical experts or people with much time to spare.

Those who have discovered forest sustainability reports commonly say they are overwhelmed by hundreds of pages of indicator data. To make such data digestible, we try to turn it into information with a display of statistics from the data. This is a great help, but we are still left with the need to ponder the chart to gain meaning from the information.

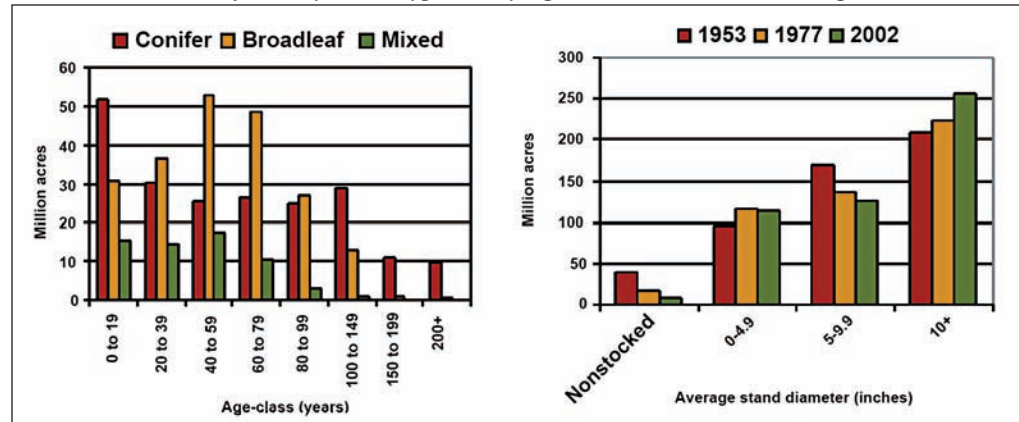
	Forest	Timber-	Volume			Growth			Removals			Mortality		
	land	land	Total	Softwoods	Harwoods	Total	Softwoods	Harwoods	Total	Softwoods	Harwoods	Total	Softwoods	Harwoods
NORTH														
1987 RPA	169,734	158,215	190,420,000	49,312,000	141,108,000	5,597,865	1,336,020	4,538,870	2,749,270	750,303	1,998,967	1,257,972	375,237	882,883
Trended	173,055	161,505	200,516,022	49,012,946	151,503,076	5,559,012	1,272,554	4,286,457	2,716,138	736,013	1,980,125	1,544,596	424,834	1,119,762
RPA differs by	-2%	-2%	-5%	1%	-7%	1%	5%	6%	1%	2%	1%	-23%	-13%	-27%
1977 RPA	168,682	157,099	166,080,000	45,649,000	120,431,000	5,432,232	1,601,771	3,830,461	2,536,785	713,432	1,823,353	1,181,795	328,259	853,536
Trended	169,281	157,416	166,661,417	43,967,206	122,694,211	4,944,007	1,305,849	3,638,158	2,408,621	662,051	1,746,570	1,173,083	318,131	854,951
RPA differs by	0%	0%	0%	4%	-2%	9%	18%	5%	5%	7%	4%	1%	3%	0%
1970 RPA	175,918	158,128	148,466,000	40,431,000	108,035,000	5,001,636	1,373,338	3,628,298	2,267,397	603,216	1,664,181	1,131,016	335,737	795,279
Trended	169,726	159,157	151,094,515	42,941,358	108,153,157	4,546,436	1,274,451	3,271,985	2,229,579	635,174	1,594,405	1,025,752	294,745	731,008
RPA differs by	4%	-1%	-2%	-6%	0%	9%	7%	10%	2%	-5%	4%	9%	12%	8%
1963 RPA	170,536	160,441	130,862,000	35,133,000	95,729,000	4,487,570	1,241,346	3,246,224	1,959,562	541,613	1,417,949	969,443	296,749	672,694
Trended	171,559	162,590	128,412,315	34,214,498	94,197,817	4,409,833	1,117,737	3,292,096	1,943,681	578,846	1,364,835	1,134,456	377,208	757,248
RPA differs by	-1%	-1%	2%	3%	2%	2%	10%	-1%	1%	-7%	4%	-17%	-27%	-13%

Stakeholders say it is hard to digest and glean meaning from it all. Too much data, tables, and charts just do not do it for most people. They cannot see what an expert sees in the data.

That led me to notice, as others have, a new free Web tool called Google’s Motion Chart.² This tool is being offered as a means to easily display large volumes of Excel data in a manner that can be comprehended by the nontechnical expert. Consider the typical bar chart or table resented in most reports for communicating complicated time-series data and how inadequate they are.

² A description of Google’s Motion Chart can be found at <http://www.google.com/ig/directory?type=gadgets&url=www.youcalc.com/apps/1238149110412/igoogle.xml>.

Indicator 2.—Extent of Area by Forest Type and by Age-Class or Successional Stage.



The obvious value of the Motion chart is that it allows change through time to be seen as motion. In addition, rather than working in two dimensions as with a typical chart, we can display two to five variables, all of which we can see change through time. More importantly, we can observe a cause and effect among the variables. This tool can help us do that in addition to simplifying our presentations. This is a good segue to the next workshop topic, better analysis of trend data.



The So What?—Finding Meaning in Trend Data

Next, we are going to tackle methods for interpreting forest C&I trend data. In the United States, many of our scientists are frustrated that people are trying to use the C&I without explicit systems models to examine the relationships among indicators and the forest sector to other sectors. The scientists want to talk about thresholds, weights, goal sets, missing indicators, and optimizations. The public wants an answer to the simple question, “is our use of the forest sustainable?” considering all of the criteria.

Rich Guldin will introduce the subject and then we will hear an overview of what Europe has been doing in this area. Five speakers will present different analytical models developed for a range of applications at different scales. This speaker list might lead you to believe we presume models are needed, with their thresholds, weights, and indicator linkages. However, during the subsequent discussion, let's ask the question of whether we should assume this.

Workshop Outcomes

Before I conclude, I would like to cover what we want as the workshop's outcomes. They include the following:

- Maintenance of C&I process collaboration.
- Reenergizing of the intellectual thinking devoted to the use of C&I and its purpose.
- The capture of emerging ideas in forest report communication and indicator analysis and sharing them with our colleagues around the world.
- A more sophisticated, useful, accessible, and compelling next generation of forest assessment reports.

At this time, let me ask if there are any questions or concerns. Is everyone comfortable with the format of the workshop and our planned objectives?

Thanks for coming, and let's have a great and productive workshop.

The Use and Audiences of National Forest Sustainability Reports

Jari Parviainen¹

Introduction

Reporting and communication regarding forests and forestry for national purposes as well as for international conventions, instruments, and bodies is increasing. The introduction, 15 years ago, of criteria and indicators (C&I) for monitoring sustainable forest management (SFM) comprehensively broadened the view on aspects of SFM and the possibilities for reporting on the state of forests. The national reports based on C&I provide a balanced compendium of information on the status and trends of sustainable forest management.

The national forest reports can provide simultaneous and useful information for forest policy and forest management as well as for forest research and education purposes regarding all elements of sustainability. As a broad overview, the national forest reports can also provide a useful communication tool for both policymakers and the general public.

The production of such comprehensive reports is often expensive. There are, however, no real surveys available on how the public users and other customers of forest information view or utilize those reports. Recently, some feedback from Finland, Canada, the United States, and Australia has been collected.

In addition to the reporting on the forest sector's needs, forest indicators have also been used by other sectors in their reporting. This has resulted in overlapping efforts among stakeholders and authorities. In order to reduce the reporting burden and to avoid overlapping work, clarifications are needed on how the reports can simultaneously serve various goals and how the reporting processes, such as gathering the information, timing of reporting, and cooperation between the agencies, are organized.

In order to refine how the national forest reports are used, this article will explore the following:

- How and for what purposes the reports are being used.
- Who are the main users and audiences of the reports?
- Experiences in how to present the results in reports.
- In what ways the reports are most effectively used in communication; as an example, the Finnish national report.

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The material for this article is based on the review of national (nine country reports representing the Ministerial Conference on the Protection of Forests in Europe [MCPFE], Montréal, and International Tropical Timber Organization [ITTO] processes) reports presented for the Inter C&I Process Harmonization Workshop in 2006 in Białowieża (Parviainen and Lier 2006 and table 1 as appendix A) and on the experiences of the use of the recently published national report on the state of Finland's forests (Finland, Ministry of Agriculture and Forestry 2007a).

Some Characteristics of the National Forest Reports

Survey of Nine Country Reports in 2006

Generally, the regional frame of C&I has been followed for the formulation of the country reports, although it has been adjusted to each country's situation. Country modifications have led to variation in the numbers and interpretation of indicators. In some countries, additional indicators have been introduced, such as in Switzerland, where forest certification has been used as a separate indicator. The complete set of indicators could not be fully applied in all the countries. For example, due to the lack of information, especially for quantitative indicators, the ITTO countries could only report some of the ITTO indicators.

Appendix A presents information regarding the compilation, audiences, and uses of the country reports as expressed in the reports' preface, introduction, or goal settings.

Most of the country reports of the MCPFE and Montréal Processes are compiled as illustrative presentations with graphs, tables, and photos and are primarily aimed at providing communication tools for professionals and experts as well as for public audiences. On the other hand, several reports of the Montréal Process countries and also the reports from ITTO countries are mainly aimed at reporting purposes for the experts and professionals.

The country reports are compiled in various ways: by a group of scientists or group of various experts and other stakeholders and the work is coordinated by governmental authorities or experts. For the Swiss and Austrian reports, various scientists have been responsible for the writing of each of the indicators. In the United States, a multistakeholder forum has been created, called Roundtable on Sustainable Forests, which oversaw the compilation of the report and, therefore, showed commitment to the process.

State of Finland's Forest 2007 Report

The *State of Finland's Forests 2007 Report* is the third national report; the first report was published in 1997 and the second in 2000. The 2007 report includes first-time time trends within certain indicators during the last 10 to 20 years and also long-time series, particularly since the 1920s (when the first national forest inventory in Finland was conducted).

The 2007 report is structured according to the Pan-European Criteria and Indicators agreed upon by the MCPFE in Lisbon in 1998 and amended in Vienna 2003. The report is

based on all the available data from statistical surveys (e.g., national forest inventory data, Forest Statistics Information Service of the Finnish Forest Research Institute [METLA]) conducted by various agencies (e.g., METLA, the Forestry Development Center, the Finnish Environment Institute, and the regional forest centers and environment centers).

A broad multistakeholder steering group for the compilation of the report was nominated by the Ministry of Agriculture and Forestry. This ensured that the necessary political commitment was integrated in the reporting. The report was formulated by scientists and experts from METLA.

Key findings of each of the six criteria are presented together as an executive summary and repeated separately at the beginning of each criterion chapter. Each criterion chapter includes as an introduction the qualitative indicators concerning the overall policies, institutions, and instruments followed by quantitative indicators with statistics, informative tables and maps, and photos. Through this way, the linkages from policy to the implementation and changes in forest practices and forest structures could be created. A short separate chapter on the Finnish forests and forest management in a nutshell has been provided in order to illustrate the boreal, privately family owned forest conditions in Finland.

The report was released in July 2007 with its presentation to the Minister of Agriculture and Forestry. At the same time, a press release with the most important graphs was launched, followed by a distribution of the report for the main forest-related stakeholders and policymakers in Finland. An international and Finnish press release was launched on the occasion of the fifth MCPFE in Warsaw (Finland, Ministry of Agriculture and Forestry 2007a and appendix B). In November 2007, the report was introduced as a poster presentation in the conference, and the printed report was also available for the participants and for distribution.

In addition, several general articles for professional and public magazines were written on the main findings of the state of the Finnish forest development with comparison to the European forest development as presented in the MCPFE report (MCPFE/UNECE/FAO 2007).

In April 2008, a stakeholder panel was organized in Helsinki in order to review how the national 2007 report has been used and to attain feedback from the users regarding the report.

Use and Audiences of the National Forest Sustainability Reports

It can be concluded from the findings of nine country reports that the main users of those reports are government officials, who need the reports as a source of basic national information source for providing data for international sustainability reports, forest policy dialog, and presenting the status of forests in their countries. At an international level, the reporting is mainly aimed at monitoring the progress of the implementation of commitments. The main global conventions and processes including forest issues are UNFF²,

² United Nations Forum on Forests.

CBD³, CSD⁴, OECD⁵, UNFCCC⁶, and MCPFE⁷. Often, the national reports provide more information than is required for international purposes; this is because the reports are also used for national purposes and therefore often go into great detail.

The main national use is also governmental. The applications of the country forest reports are to assist the forest policy formulation, setting goals and monitoring the implementation of national forest programs and policies. Political commitment on the national level is essential for the development and implementation of the C&I. The national reports have also been a framework for federal, regional, and local applications such as regional forest programs.

Being a compendium of information from various sources and sectors related to forests, the national reports encourage significant stakeholder participation. Forest C&I are also included in other related sector reports and activities, such as water, energy, mining, biodiversity, agriculture, and public health. The national report can, therefore, considerably help improve the understanding and coordination between the sectors. In the other sectors' reports, often only a few forest indicators or combined indicators have been used.

In Finland, as a country producing forest products mainly for export, the national forest sustainability report has very often been distributed among the customers and stakeholders in customer countries for informing on the state of forest conditions. While the national report has been compiled in consensus with various stakeholders including also the environmental nongovernmental organizations, the view represents officially accepted broad understanding on the forest conditions.

The national forest reports are important for various educational purposes. In Finland, reports have been used in vocational education and at universities. Furthermore, it has been recommended to distribute the reports to teachers of biology and geography in primary schools or other schools for general education.

There are numerous examples of the operational uses of criteria and indicators in forest management and certification. For these purposes, the most important is the data and the information presented as indicators, but not necessarily compiled in the form of a national report. Through C&I, the concept "sustainable forest management" can be made both visible and understandable in a very concrete way—in other words, a transfer from the paper to the field.

Within the MCPFE, the Pan-European Operational Level Guidelines are designed for subnational applications at a practical level and can be used for management guidelines for forest owners, employees, and contractors as well as for communication, educational purposes, and assisting in attaining the certification.

³ Convention on Biological Diversity.

⁴ Commission on Sustainable Development.

⁵ Organisation for Economic Co-Operation and Development.

⁶ United Nations Framework Convention on Climate Change.

⁷ Ministerial Conference on the Protection of Forests in Europe.

In forest certification, the standards for sustainable forest management are set by open stakeholder consultation. Two global certification systems, PEFC⁸ and FSC⁹, are in operation. PEFC is based on the internationally agreed concept on sustainable forest management (thematic areas of nine regional C&I processes) and internationally used rules and procedures on certification processes. The FSC certification system uses 10 general principles of good forest stewardship.

Country forest reports and the use of C&I sets are excellent examples of science/policy interfacing. The main elements of the compilation of the country reports are research results and the information gathered by monitoring the forests and forest resources. The reporting process has also highlighted several weaknesses and information gaps, which have influenced the launching of new research topics, harmonizing the terms and definitions and linkages, collaboration with other sectors, and strengthening data collection procedures and capacities.

Research networks and institutes such as IUFRO¹⁰, EFI¹¹, UNU¹², IPGRI¹³, CIFOR¹⁴, and IIASA¹⁵ are closely linked with the MCPFE, Montréal, and ITTO processes and forest policy discussions. One result of this collaboration is the participation of the scientific community through research and conferences in the followup of the implementation of the MCPFE resolutions.

Forest sustainability reports also have significant influence on research policies and strategies. In Europe, many COST¹⁶ actions have been created according to the developments of C&I and related reporting. Examples are COST Action E 27 (PROFOR) on the “protected forest areas in Europe—analysis and harmonization” and the COST Action E 43 on “harmonizing of national forest inventories in Europe: techniques for common reporting.”

How To Present the Results in the Reports

There are diverse views on whether the results in national reports should be presented as neutral “value free” or as “value based,” (the latter including recommendations and political messages). For instance, in the country reports of Austria and Switzerland, political recommendations have been made for the whole forestry sector and also recommendations for the required actions for individual indicators have been provided.

In the country reports of Australia and Finland, data are presented without value-based interpretations. This allows the readers to judge the findings themselves as to whether

⁸ Programme for the Endorsement of Forest Certification Schemes.

⁹ Forest Stewardship Council.

¹⁰ International Union of Forest Research Organizations.

¹¹ European Forest Institute.

¹² United Nations University.

¹³ International Plant Genetic Resources Institute.

¹⁴ Center for International Forestry Research.

¹⁵ International Institute for Applied Systems Analysis.

¹⁶ European Cooperation in Science and Technology.

a trend in a particular indicator is positive or not, depending on their own perspectives and preferences. The value-free indicator data are also more applicable for other sectors' reports. In the evaluation panel of Finland's 2007 report, the value-free interpretation was favored, but clear messages should be given on the trends and the linkages between the policy setting and implementation/changes in forest conditions. On the other hand, there is a need to concentrate on the essential indicators (in other words, on the few relevant indicators for setting the forest policy goals).

Means for Communication—As an Example, the *State of Finland's Forests 2007 Report*

The evaluation panel of the *State of Finland's Forests 2007 Report* considered the sustainability report as a very important effort because of three aspects: (1) showing long-term trends and changes in the forests, (2) integrating the forest policy goals and decisions with the measurable indicators, and (3) making a continuous base for the international comparability. The main users of the Finnish forest report are governmental officers in various ministries and at regional levels as well as forest industry, forest communication people, forest scientists, and educational users.

The data compiled for the report are uniquely important, while the sustainability report is the only one where the quantitative and qualitative indicators are put together in the same context. The main forest data source in Finland is, however, the Statistical Yearbook of Forestry maintained by METLA (Finnish Forest Research Institute 2007a), but it does not contain the descriptive (qualitative) indicators; this means the development and analysis of forest policy processes, programs, and decisions. The major part of the compiling work for the *State of Finland's Forests 2007 Report* consisted of updating and gathering information from various sources for the descriptive part of the indicators.

The report itself has been used and applied mainly for international communication and reporting. The report serves as a databank, especially for the governmental officials at an international level but also at national and regional levels.

Within Finland, the comprehensive forest sustainability reports are not well suited for public information on forests, while plenty of various other information sources on forests are available. In order to make the reporting on sustainable forestry attractive for public audiences and decisionmakers, it is necessary to reduce the text to a minimum and add illustrative aspects such as maps, photos, simple figures, and graphs, and concentrate on a few key indicators.

A brochure with a reduced selected set of indicators (12) showing graphically the main characteristics regarding the status of Finland's forests has been positively received by the top-level policymakers. Often the most effective method of communication is the direct oral presentation of the key indicator trends for policymakers through forest visits and/or presentation in seminars or other occasions. In Finland, this is possible due to the high economic and societal value of forests and forestry and high interest of policymakers regarding the forests. Most of the policymakers are also private forest owners.

The communication by press release of the 2007 forest report in conjunction with the MCPFE conference was successful. Public interest was raised by comparing the Finnish forest situation, especially the protected forests issues, with the European situation. Several regional newspapers throughout Finland reported on these findings, illustrating it using a colorful picture (Keski-suomalainen 2007). The feedback on the articles regarding the report's main findings has been very positive, and the feedback led to a wide public discussion in Finland on the forest issues (Finnish Forest Research Institute 2007b, Parviainen 2007, and Statistics Finland 2007).

The communication people consider Internet-based communication as the main tool for the dissemination of the information regarding forest sustainability. The original forest data as numbers is most valuable, while it allows the modifications and illustrations of information for various purposes and audiences.

Conclusions and Recommendations

The information gathered by indicators regarding forest sustainability is important and unique, providing a balanced compendium of information; however, the report itself has a limited use. The main users of national forest reports are governmental officials and scientists who need the data for international sustainability reports, tools for forest policy and strategies, public information on forests, impact on forest research, and other research initiatives.

While demand for various reporting is increasing, the aim should be that the forest indicators information can be reported and verified and then used for many different purposes. The use of forest indicators in other sectors' reports is very important for synergies and awareness of forest issues. In the other sectors' reports, only a few forest indicators and combined indicators are used.

Currently, the forest sustainability indicator sets are not flexible enough to provide the required data for several new, timely, and important forest and environmental topics (for example, wood-based bioenergy or public wood products procurement reporting). These requirements call for customer-oriented forest data collection and reporting, where the information should be proportional to the other forest indicators. There is a need to communicate with other sectors which forest indicators could be selected in order to give a balanced and focused view on the forests and its uses.

Various reports are needed also for various audiences. For professionals and experts, comprehensive reports are the most suitable and useful formats, but for public audiences and top-level policy decisionmakers, reports with simple messages and a reduced number of selected indicators are more relevant. A reduced set of forest indicators are also required by the other sectors for their report formulation.

Appendix A

The Use and Audiences of National and International Sustainability Reports According to the Survey in 2006

	MCPFE			Montréal Process			ITTO		
	Austria 2004	Switzer- land 2005	Finland 2007	United States 2003	Australia 2003	Japan 2003	Malaysia 2003	Philippines 2005	Ghana 2004
Compilation									
Stakeholder panel	x	x	x	x	x	x	x	–	–
Ministries	x	x	x	x	x	x	x	x	x
Scientists	x	x	x	x	x	x	x	x	x
Main audience									
Experts, professionals	x	x	x	x	x	x	x	x	x
Public information	x	x	x	x	x	–	–	–	–
Main goal mentioned in report									
Tool for forest policy and strategies and forest management	x	x	x	x	x	x	x	x	x
Providing data for international sustainability reports	(x)	(x)	(x)	x	x	x	x	x	x
Forest certification	–	x ¹⁷	x	–	–	x	x	–	–

ITTO = International Tropical Timber Organization. MCPFE = Ministerial Conference on the Protection of Forests in Europe.

Source: Parviainen and Lier (2006).

¹⁷ Additional indicator.

Appendix B

Press Release by the Finnish Ministry of Agriculture and Forestry

1 November 2007, Helsinki

Improved State of Finnish Forests Discussed at the MCPFE in Warsaw

The state of Finland's forests has improved over the past 15 years. This is the message of the report presented at the Ministerial Conference on the Protection of Forests in Europe (MCPFE) in Warsaw on 5-7 November 2007. Over the past 40 years, the volume of the growing stock has increased by more than 40 percent while the utilization rate of forests has also been on a high level. The biological diversity of forests has attracted a great deal of attention, and today this is a parallel and complementary objective alongside with wood production.

Based on the measurements of defoliation (i.e., loss of needles due to air pollutants), the state of Finnish forests is satisfactory and has remained quite stable. In the past 20 years, forest fires or storms have caused no extensive damages in forests.

The *State of Finland's Forests 2007 Report* is one of the main contributions of Finland to the MCPFE in Warsaw. "I consider this report a most important situation review of our forests. The report will be presented at the Ministerial Conference in Warsaw as a good example of how sustainable forestry can be realised in practise," says the Finnish Minister of Agriculture and Forestry Sirkka-Liisa Anttila.

In recent years, the protection of biological diversity has been one of the key areas in forest management. The focus on forest biodiversity and the new forest management methods introduced in Finland have slowed down the endangerment of certain forest species since the 1990s. The forest area protected under various protection programs and decisions has tripled over the past 30 years.

In forest policy, the forest energy issues have received a great deal of emphasis in the context of the discussions on climate change. Wood-based fuels represent about one-third of the total energy consumption. Forests also function as significant carbon sinks. Increased knowledge highlights the social and cultural role of forests. Instead, the economic profitability of forestry has not improved even if the volume and annual increment of the wood resources have continued to grow.

The *State of Finland's Forests 2007* is the third report in which the state of Finnish forests has been assessed using the criteria and indicators of sustainable forest management. Now the application of these indicators constitutes a time series which spans more than 10 years. Even if changes in forests are slow, the indicators already distinguish in forest operations and management certain main trends and to make comparisons concerning, in particular, the impacts of forest policy decisions. The report was compiled at the Finnish Forest Research Institute on the basis of indicators agreed on by a broadly based group of experts.

Source: Finland, Ministry of Agriculture and Forestry (2007b).

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Examination of the Reporting Problem: We Need a Better Way

Claire Howell¹

Introduction

It is a considerable challenge to report concisely and comprehensively on the diverse and complicated ecological, economic, and social processes related to the sustainable management and conservation of forests while also capturing the interest of a range of target audiences. Australia's 2008 *State of the Forests Report* (SOFR) is the third 5-year review; it describes Australia's public and private forests that strive to meet this challenge. The report, which was released in May 2008 by the Montréal Process Implementation Group (MIG) for Australia with the assistance of the Australian Government Bureau of Rural Sciences and Australia's National Forest Inventory, meets Australia's domestic and international obligations to make forest information publicly available. Australia's 2008 SOFR is based on Australia's Montréal Process framework of criteria and indicators (C&I) and builds on the successes achieved and challenges encountered in the preparation of the 1998 and 2003 reports.

Review of the Communication Strategy for Australia's *State of the Forests Report 2003*

Australia's internationally recognized 2003 SOFR contained an extensive range of ecological, social, and economic information describing Australia's publicly and privately managed forests. Preparing comprehensive national forest reports depends on the willingness of key Government and industry contributors to create and submit data that can be aggregated at a national level. The investment to prepare the 2003 SOFR was substantial, involving upwards of 100 people from Australian, State, and territory Government agencies and organizations over more than 18 months. Understanding the impact of, relevance of, and accessibility to information in the 2003 SOFR was necessary for the potential value and benefits of subsequent editions to be fully realized.

Following the release of the report, and the subsequent domestic review of Australia's framework of indicators of sustainable forest management in 2005/06, a review of the 2003 SOFR communication strategy was undertaken. The primary focus of the review was to address communication-related aspects of the report, including its use and usefulness.

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Following a workshop with SOFR staff, the review was undertaken in two stages:

- Stage 1. Consultation with key stakeholders—including existing users, existing contributors, and potential users.
- Stage 2. Analysis of target audience. The communication strategy review identified a range of issues relating to the report's presentation, value to key stakeholders, structure, content, tone, and timeliness. It also noted several paradoxes. A main area of division was that some stakeholders sought a value-free report without analysis, interpretation, or commentary while others thought the lack of analysis and discussions on the implications for sustainability meant the report was less useful or relevant. However, the review also noted that the perceived value returned to contributors from interpretation, or lack thereof, in the report may affect their willingness to be involved in the future. A related issue was the apparent concern for scientific rigor and data quality at the expense of effective reporting on the current state of forests.

The diminishing appeal of large, printed documents as a key information resource was identified at several points in the review, with a recommendation that subsequent reports be dramatically smaller and more summary in nature.

The use of the Montréal Process framework of C&I was supported. However, some stakeholders found the structure less relevant or logical than a thematic approach and found it difficult to locate particular information.

The 5-year reporting timeframe is an explicit acknowledgement of the often slow processes of change in forests and the considerable effort and expense required to compile a comprehensive suite of nationally aggregated forest-related data. While this was recognized in the review by some stakeholders who were reluctant to see the reporting cycle shortened, many others felt the report was outdated for much of its 5-year life. An option to redress some of the data-currency issues by providing an online resource of the most up-to-date information as it is collected was discussed.

The key findings of the communication strategy review were to—

- Create greater value for existing industry and Government stakeholders from the report's core data via a strong, accessible online presence.
- Use both the online presence and existing subsidiary products to engage with the wider community.
- Replace the current printed report with an online searchable Web site and portal to other forest information resources and sources (stakeholder links).
- Publish a visually appealing, short, printed state of the forests summary with simple graphics and maps that can be used as a means of communication with interested and informed stakeholders.
- Phase out the current printed species factsheets and replace them progressively with topical theme-based factsheets for inclusion in the Bureau of Rural Sciences' "Science for Decision Makers" series.

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- Include a balanced range of stakeholder commentary as snapshot narratives of the report content to allow readers to draw their own conclusions and link the indicators to relevant Government policies.
 - Undertake a high-profile launch of the new Web site and subsidiary products in 2008 and actively promote to stakeholders new or updated site content as it is posted.
 - Clarify and simplify the branding of the report and subsidiary products to strengthen the recognition of the national forest inventory.
 - In the longer term, research the options for building on the Web site presence to deliver further value to a range of stakeholders.
 - Communicate the key review findings that will be implemented to interviewees and other key stakeholders to begin the process of consultation about change.

Australia's *State of the Forests Report 2008*

In March 2007 members of Australia's MIG, including forest policy managers from Australian, State, and territory Governments; national research organizations; and private forest grower organizations, discussed the findings of the communication strategy review of the 2003 SOFR. Members agreed to findings that enhanced the capability of SOFR to reach key national and internal audiences, including a more concise edition in 2008 and the development of a much improved Web site capability. The review findings strongly influenced the work program, design, and ancillary communication products of the 2008 report.

The SOFR 2008 is now complete. An online, fully searchable Web site, "Forests Australia," has been developed to house the report. The Web site is linked to national, State, and territory reports relevant to SOFR and domestic forest sustainability reporting. As recommended by the review, the site is separate from, rather than embedded within, the Australian Government Department of Agriculture, Fisheries and Forestry Web site. The site, therefore, creates a direct link to the general community, independent of intermediaries. Relevant Web links or URLs for sustainability reports, forest land use review reports, State-based *State of the Forests Reports*, and other appropriate publications will be directly accessible from the Forests Australia Web site. The site is being developed as the principal repository of national forests data and as a portal to other forest information resources, thereby delivering relationship-building and information-provision benefits to stakeholders and meeting a range of visitor access needs. Mapping and data analysis tools are being established on the site to enable data interrogation and packaging to suit user needs. The homepage has a simple design so that users can find information easily.

The MIG decided against the review findings to replace the printed full report completely with an online version but reduced the number of copies printed. The printed full 2008 report is shorter than the 2003 report (250 pages compared to 382 pages). This reflects both a tighter writing style and the reduction in the number of Australian indicators of sustainable forest management, from 74 to 44.

The executive summary of the SOFR 2008 has been published as a separate visually appealing, short, printed report; this meets a key finding of the review. Summary forest information is available through the departmentwide “Australian Agricultural Industries 2008 at a Glance.”

As recommended by the review, data from the 2008 SOFR have been used to develop eight thematic double-sided glossy brochures that form part of the suite of 2008 SOFR products. The themes are Forest Type and Extent, Employment, Conservation, Sustainable Yield, Carbon, Fire, Certification, and Water. Each theme is investigated further, with analysis and discussion, than is afforded in the main report. These products, along with updated forest profiles describing the major national forest types, have been well received by policy and education sectors and the general community.

Including stakeholder commentary as snapshot narratives to provide further analysis and links to Government policies was not supported by the MIG as this was viewed as compromising the independent and technical nature of the report.

The involvement of the respective federal ministers in the launch of both the 1998 SOFR and 2003 SOFR elevated the profile of the reports and attracted media attention that provided useful promotional opportunities. The 2008 report was also launched by the federal Minister for Agriculture, Fisheries and Forestry, which again generated valuable media exposure for the report.

Conclusion

The Government was not bound by the findings of the review in their entirety. Rather, each could be viewed on its merits, especially since the time between the two reports meant that some issues raised were no longer as relevant. In general, however, the substantive findings have remained relevant and have been largely accepted. Furthermore, the overall process was viewed as positive by the key stakeholders in the production of the 2008 report.

Many of the findings of the review of the 2003 SOFR were strongly endorsed by the MIG. The contradicting findings, where some stakeholders sought to keep the report value free to let readers make the analysis and interpretation while other stakeholders wanted analysis and interpretation included (for example, to determine the implications for forest sustainability), cannot both be met. The decisions to retain the report as a value-free product and prepare a series of thematic Forest Fact brochures should help accommodate both points of view. The decision not to include stakeholder commentary does not preclude these narratives from being told in a separate forum and upholds the value-free nature of the report.

A challenge in implementing some of the findings relating to the Internet is the reality that the work has been undertaken by the Australian Government in collaboration with State and territory agencies and organizations. As such, there are guidelines relating to the development of Government-based Internet sites, including the edict to minimize the

potential plethora of Government sites and the requirement to comply with Government protocols in using existing sites, which can often lead to complex hierarchies within the one site. All of these guidelines have required careful consideration in the development of the Forests Australia Web site.

Notwithstanding the many challenges raised by some of the findings in the review, almost all have been addressed in the preparation for the release of the 2008 SOFR and affiliated Web site, with the expectation that this report and its associated communication products will meet the needs of a broader stakeholder group.

Acknowledgments

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Criteria and Indicators for SFM Through Community Participation for Communicating Sustainable Development of Forests

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Abstract

In India, the involvement of communities in jointly managing the State-owned forests initiated in 1990. Since then, 20.02 million ha forests (out of 67.7 million ha) are being jointly managed by 106,482 Joint Forest Management Committees. The criteria and indicators (C&I) approach for monitoring the sustainability of forests is being attempted through a national set of C&I in the Bhopal-India (B-I) process. The Indian Institute of Forest Management initiated this process in 1999 with 8 criteria and 43 indicators. Based on the national set of C&I, the forest management unit (FMU)-level indicators evolved, involving the communities in 12 FMUs and covering three main tropical forest types in the country (namely teak, sal, and miscellaneous) through an International Tropical Timber Organization-sponsored research project. This paper describes the operational approach of C&I application at the FMU level through community participation and working out the Sustainability Index.

Background

Scientific forest management in India initiated around 1860 and has gradually grown toward the concept of sustained yield, meaning thereby to harvest equivalent to the annual increment and leaving behind the forest stock to accrue the growth for further annual harvest. In economic terms, it is expressed as using the interest and retaining the capital to accrue the interest annually for further use. There has been a system of “Forest Working Plan/Management Plan” at the forest management unit (FMU) level based on this concept. These plans are prepared for a period of 10 years as per the guidelines of the National Working Plan Code.

Over the years, the concept of sustained yield has been broadened to include the sustainable management of a variety of forestry goods, such as nontimber forest products, and also services addressing environmental, economic, and social aspects. Accordingly, the forest policies have been updated. India has enunciated three Forest Policies (1894, 1952, and 1988) for the sustainable development of its forest resources. The current Forest Policy (MoEF 1988) envisages having one-third of the land area under forest

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and tree cover. It also envisages Joint Forest Management (JFM) with the participation of communities in and around forests for the protection and management of forests and benefit sharing. A total of 106,482 Joint Forest Management Committees (JFMCs) were formed and jointly managing 20.02 million ha of forest area (MoEF 2007). The principal aim of the National Forest Policy is to ensure environmental stability and maintenance of ecological balance, including atmospheric equilibrium, which is vital for the sustenance of all life forms—human, animal, and plant. The derivation of direct economic benefit must be subordinated to this principal aim. The participation of community in planning, decisionmaking, implementing, and monitoring the sustainable development of forests is important. The criteria and indicators (C&I) framework are found useful in this regard. In India, the national-level C&I came in the form of Bhopal-India (B-I) process in the 1999. The State Governments were requested to adopt this approach for the sustainable development of forest resources in the country. How to go about it was the question before the forestry sector and, to address this, the Indian Institute of Forest Management took a leading role in developing a national set of C&I and evolved FMU-level indicators, involving communities to ensure the sustainable development of forest resources in India. This has been applied in 4 States on a pilot basis in 12 FMUs covering main tropical forest types of the country (teak, sal and miscellaneous). (See table 1.)

Table 1.—*Operational framework of C&I for sustainable forest management.*

Level	Organization	Function	Development
Strategic	National SFM cell at MoEF, Gol, and IIFM, Bhopal	National Forest Policy/National Forestry Action Program National set of C&I (Bhopal-India process) National Working Plan Code Technical and financial support and liaison with State SFM Cells Monitoring, assessment, and reporting on SFM at national level	National set of 8 criteria and 37 indicators finalized as Bhopal-India process in accordance with the National Forest Policy Incorporation of C&I in National Working Plan Code in process
Tactical	State-level SFM cell	State Forest Policy State Working Plan Code Coordination with Forest Divisions Monitoring, assessment, and reporting on SFM at State level	State-level cells on SFM initiated to work as per national C&I with appropriate modifications Incorporation of C&I in State Working Plan guidelines I
Operational	FMU-Forest Division	Working Plan of Division Development and application of C&I at FMU level Monitoring, information, and documentation	Refining people's indicators to suit the FMU Incorporation of C&I in working plans Enhancing capacity
Grassroots	JFMCs	Microplan Working groups at JFMC level Observation, data/information	Sensitization of communities on sustainable development of forests Evolving people's indicators Developing capacity for monitoring through indicators

C&I = criteria and indicators. FMU = forest management unit. IIFM = Indian Institute of Forest Management. JFMC = Joint Forest Management Committees. MoEF = Ministry of Environment and Forests. SFM = sustainable forest management.

People's Indicators

Communities were sensitized during field-based workshops, which were well participated by them. The concept of good forest, bad forest, forest goods and services, conservation, and social aspects attached with the forest, etc., were discussed with the community members during the sensitization workshops. Different pedagogy, such as games, exercises, field visits, etc., were used to convey the various aspects of forest management and needs for a practically feasible system for monitoring the sustainability of forests. The participating community members were facilitated for focused group discussion to arrive at the draft set of indicators based on the national set of 8 criteria and 43 indicators. These are subjected to field validation by the groups visiting the nearby forests. Thus, the people's indicators are evolved. These are having scientific basis and are simple such that the community members are able to observe and record the data/information. These are discussed with the forest officials for refinements. Working groups are formed at the FMU level consisting of communities and front-line foresters for periodic recording of the data/information of the identified indicators. These are communicated to forest officials for further analysis to work out the sustainability of forests at the FMU level and necessary corrective measures. (See table 2.)

Table 2.—*Developing people's indicators at the FMU level.*

Process	Objective	Tools	Outcome
Sensitization—C&I of B-I process	Orientation toward need for assessing direction of change, understanding concept of SFM and C&I	Facilitated discussions, context-specific and local analogies, and games highlighting the forests as a source for the availability of several forest goods and services	Understanding the working definition of SFM, need and importance of C&I as monitoring tools for SFM
Participatory development of FMU-level indicators	Evolve site FMU-level indicators based on local knowledge and experience involving all actors	Focused group discussions, brainstorming sessions, presentations, and discussion	Draft set of FMU-level indicators
Field validation of draft set of indicators	Field verification of draft set of indicators	Field visits, transects, presentations, and discussion	Draft indicators are verified, locally relevant indicators based on local knowledge and experience
Communication of the evolved C&I to authorities	Refinement of evolved C&I as per objectives of management	Discussion and presentation with higher authorities on the evolved C&I	Finalization of FMU-level indicators by the authorities

B-I = Bhopal-India. C&I = criteria and indicators. FMU = forest management unit. SFM = sustainable forest management.

Minimum Acceptable Standards

Minimum acceptable standard (MAS), or norm, defines the sustainable/optimum level of that particular indicator. This is the threshold value that needs to be achieved for an indicator for monitoring progress toward SFM. For achieving sustainability, the threshold value needs to be crossed. MAS, thus, is the separator line that segregates between what is sustainable and unsustainable. MAS for different indicators can be defined and described in four different ways, as follows:

-
- 1. Baseline Values.** The baseline or benchmark is the reference point from which the trend or change is projected with respect to SFM. This baseline describes the status of the indicators at the time of data collection. The first sets of data collected in the FMU through departments or by the community, survey, and observation of the researcher constituted the baseline for the subsequent data collection.
 - 2. Average Values.** The indicators for which it is difficult to reach on the fixed norm due to lack of defined benchmark. The data of the previous 3 to 5 years were used to find out the average value and were chosen as the norm.
 - 3. Published Standard Values.** The published values and data available from authentic sources can be used as standard values or MAS. The comparison of the yearly values of the indicators was done with the published national/world average values to reach the acceptable standard value.
 - 4. Values Arrived as a Result of Discussion Among Different Stakeholders.** In some cases, it is difficult to reach agreement on a concluding norm/standard value. Therefore, the values are arrived on after discussion among the stakeholders, including community members, based on their experience and wisdom and hence have been accepted as norm.

The values arrived based on the above were used to assign weightage for assessing the sustainability index (SI) of the FMU. Assessed the SI of the FMU indicating periodic changes, which is based on the periodic data collected against the identified indicators.

Norms for the Indicators of the FMU

The data of identified indicators are compared against the norms, which are either quantitative or qualitative. The norms of the indicators of the South Seoni FMU are given in table 3.

Table 3.—*Norms of identified indicators of the FMU. (1 of 2)*

Indicator	Norm
Criterion 1: Maintenance/increase in the extent of forest and tree cover	
1.1. Total forest area (ha) Reserved forest, protected forest, unclassified forest	One-third of the geographical area should be under forest and tree cover. No decrease in forest area of the FMU.
1.2. Area under various forest types (teak, sal, miscellaneous)	The area under respective forest types should be maintained.
1.3. Forest area under encroachment	There should be no encroachment in the forest area.
1.4. Percentage of forest with secured boundaries Number of boundary pillars	All the forest areas are surveyed and mapped and well demarcated on the ground.
1.5. Change in area of forest cover—dense, open, and scrub forests; pastures and deserts	There should be no reduction in the area of dense forest and attempts should be made to convert open and scrub forests into dense forest.
1.6. Change in tree cover outside forest area	Tree planting needs to be encouraged on nonforest land, community land, and along roads/rails/canals, etc.
Criterion 2: Maintenance, conservation, and enhancement of biodiversity	
2.2. Species diversity (a) Number of animal species (b) Number of plant species	The existing species of animals, plants of a unit area (PA/FMU) should be maintained.
2.2. (a) Status of locally representative animal species	The existing locally significant animal species should be protected and their status enhanced.
2.1. (b) Status of locally representative plant species	The existing locally significant plant species should be protected and their status enhanced.
Criterion 3: Maintenance and enhancement of forest health and vitality	
3.1. Status of regeneration Established seedlings (average number/ha)	The number of seed origin seedlings should be recorded to determine the state of natural regeneration. The numbers/range may vary as per FMU-level working plan prescriptions.
3.2. Area affected by forest fire (ha)	Forest fire management should be an integral part of the forest working (management) plan and efforts should be made to minimize and manage the forest fires and the losses.
3.3. Area protected from grazing (ha)	Forest areas under regeneration operations should be notified as closed area for livestock grazing. In other areas which are open to grazing, the number of livestock should be restricted to the carrying capacity of the area. For this purpose, the carrying capacity of such areas needs to be assessed.
Criterion 4: Conservation and maintenance of soil and water resources	
4.2. (a) Duration of water flow in the selected seasonal streams (months)	The flow periodicity of major streams need to be recorded at periodic intervals and should be mapped for reporting.
4.2. (b) Water level in wells in the vicinity, (up to 5 km) of forest area in summer	The average ground water level in wells during past the 3 to 5 years should be recorded to indicate the state of forest management and rainfall pattern of the region.
Criterion 5: Maintenance and enhancement of forest resource productivity	
5.1. Growing stock of wood	The benchmark/standard MAS for growing stock of major forest types needs to be identified and the state of the growing stock should be compared with these standards.
5.3. (a) Efforts toward enhancement of forest productivity area brought under high-technology plantations (ha)	Enhancement of the productivity of forests through the use of quality seeds, planting material, best-management practices, and other inputs in afforestation and reforestation activities. Therefore, the extent of the area under high-tech plantations indicates investment in SFM.
5.3. (b) Forest plantation (ha)	Plantation of indigenous tree species to enhance the forest cover density.

Table 3.—*Norms of identified indicators of the FMU. (2 of 2)*

Indicator	Norm
Criterion 6: Optimization of forest resource utilization	
6.1. (a) Recorded removal of timber (utilization of wood [timber in CMT])	The annual collection should not exceed the average annual increment produced by the growing stock. The total removal by all means should be compared with the annual prescribed yield under the FMU Working Plan.
6.1. (b) Recorded removal of fuel wood (number of stacks)	Proper recording of fuel wood collected from the FMU by the community should be made. Only fallen and dead branches and twigs to be collected by the forest-dwelling communities. The total removal by all means should be compared with the annual prescribed yield under the FMU Working Plan.
6.1. (c) Recorded removal of bamboo (number and notional tonnes)	An effort should be made to meet the local bamboo requirement. The total removal by all means should be compared with the annual prescribed yield under the FMU Working Plan.
6.2. Recorded removal of locally important NTFP (Tendu [<i>Diospyros melanoxylon</i>] leaf—number of standard bags)	The annual collection of nontimber biomass should not exceed the average annual production and the average production of the division should be maintained. The total removal of NTFPs by all means should be compared with the annual prescribed yield under the FMU Working Plan.
6.7. Contribution of forests to the income of forest-dependent people (%)	The contribution of forests to the income of forest-dependent people should be maintained/enhanced.
Criterion 7: Maintenance and enhancement of social, cultural, and spiritual benefits	
7.1. (a) Number of JFMCs and area(s) protected by them Number of JFMCs Area protected (ha)	The forest area of the FMU, to the extent possible, should be under participatory management regime.
7.1. (b) Status of people's participation in management and benefit sharing Participation of members in JFM meetings (%)	A high percentage (at least 60%) of participation and regular meetings held. Women's and self-help groups' participation is critical for success.
7.3. (a) Extent of cultural/sacred groves (number of tree species traditionally/religiously protected)	Information on area/species and the communities involved in the conservation and maintenance should be documented and communities be encouraged and supported in their efforts.
Criterion 8: Adequacy of policy, legal, and institutional framework	
8.2. Number of forest-related offences	The number of forest-related offences should show a declining trend.
8.4. Human resource capacity-building efforts (number of training events and people attending)	Adequate and appropriate training modules for each level of officials, communities, and other stakeholders should be planned and implemented.
8.5. (a) Forest resource accounting net benefits (INR) Recorded, unrecorded, all	Detailed data on different products and services and their values should be maintained as per the valuation methods to develop the guidelines for the purpose.
8.5. (b) Budgetary allocations to the forestry sector Total budget of FMU (INR in lakhs)/ allocation of funds for forest protection (INR)	Budget allocation should be as per the requirement given in the FMU Working Plan.

Note: The code numbers used for the indicators are as per the national set of criteria and indicators. Some of the national-level indicators are not applicable to the FMU.

CMT = cubic meters of timber. FMU = forest management unit. INR = Indian Rupee. JFM = Joint Forest Management. JFMC = Joint Forest Management Committee. MAS = minimum acceptable standard. NTFP = nontimber forest product. PA = Protected area.

Methodology for Development of Sustainability Index

Tabulation of Data

FMU-level indicators are identified based on the national set of 8 Criteria and 37 indicators (B-I process) and the site-specific indicators. Periodical data are collected from communities and records of the FMU. The periodicity of observations/recording data of indicators varies from 1 year (such as incidences of forest fires) to 10 years (such as standing stock of forest at the time of revision of the working plan). Data of some indicators remain more or less static (area of the FMU). Out of 32 indicators at the FMU level, the data of 13 indicators were collected from the primary source; the remaining data were collected from secondary sources (records/reports).

Scoring of Indicators

The performances of indicators are measured against the MAS. The score reflects the achievement of the indicators toward or away from sustainability. For some indicators, the performance is calculated considering the changes taken place from the baseline data. Baseline data are the first year's data collected, also called the reference point. Further direction of change and progress toward or away from sustainability is assessed against the frame of reference.

The scoring is done on a 100-point scale. The score of 50 is considered as the sustainable value and anything beyond 50 is considered as sustainable. Anything below 50 is considered as unsustainable forest condition.

Assigning Weights to Criteria

The eight criteria are developed by the B-I process through a series of discussions and consultations with experts and other involved stakeholders to address the ecological, economic, and sociocultural aspects of SFM. All the eight criteria collectively provide a comprehensive definition of SFM and are equally important. Thus, equal weights are assigned to all the eight criteria. Hence, all the criteria are assigned a weight of 12.5 to sum up to 100.

Assigning Weights to Indicators

The indicator navigates the transition toward sustainability. Each indicator has its own importance, but a suite of indicators provides clear picture to monitor a criterion. Each indicator is weighted as per its perceived importance within the criterion, which is specific to the FMU and community wisdom. The total weight of the indicators of each criterion is scaled in a 100-point scale.

Assessing Sustainability of FMU

The data collected for indicators were tabulated and processed using specially developed software, FORMACS (2007).

Developing Sustainability Index

The calculation of the SI was based on the following equation:

$$SI = \frac{\sum \{(WC_1 \times C_1), (WC_2 \times C_2), \dots, (WC_n \times C_n)\}}{\sum (WC_1, WC_2, \dots, WC_n)}$$

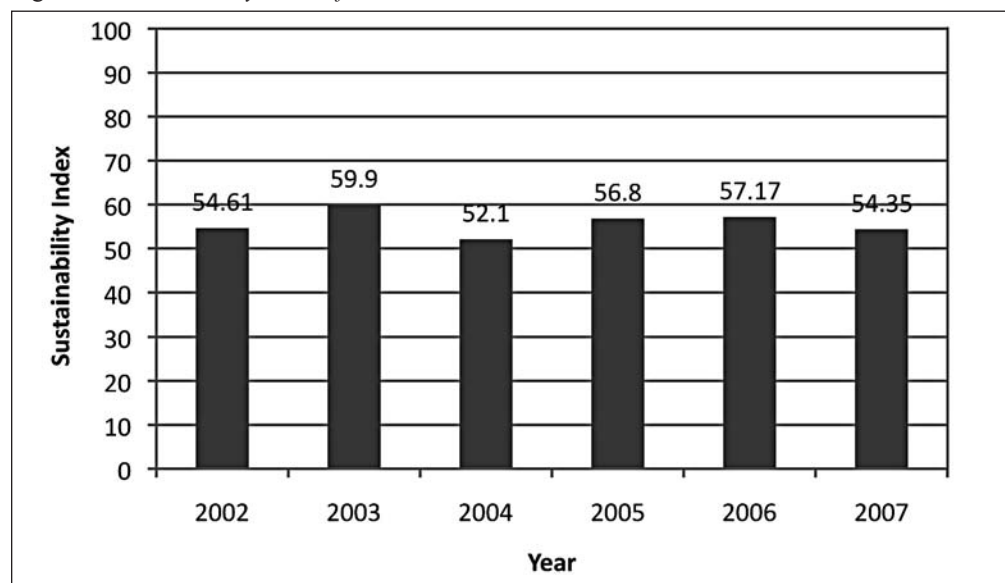
Where SI = sustainability index; WC_n = weight of the n th criterion; and C_n = score of the n th criterion, where C_n is calculated as:

$$C = \frac{\sum \{(WI_1 \times I_1), (WI_2 \times I_2), \dots, (WI_n \times I_n)\}}{\sum (WI_1, WI_2, \dots, WI_n)}$$

Where WI_n = weight assigned to n th indicator under the respective criteria and I_n = score of the n th indicator under the respective criteria.

The SI is calculated in the scale of 1 to 100, with 50 being the minimum value toward sustainability. The higher the value above 50, the better the sustainability of the forest. (See figure 1.)

Figure 1.—Sustainability index of South Seoni.



Factors Responsible and Remedies Suggested

The low value of the SI during the assessment year can be evaluated with the help of the poor performance of the indicators. Indicators that did not meet full compliance to the desired norms are addressed with collective intervention to make them performing indicators. The factors responsible for the downfall of an indicator can be identified and the remedial measures adopted. This improves the status of the declining indicators.

Conclusion

The indicators evolved at the FMU level are quantitative and qualitative in nature. The data/information of the identified indicators were collected from department records, published data, and interaction with community and field observations. The periodicity of the data varies with the indicators. These are ranging from once in every year to the 10th year. Variation is justified due to its gestation period and the periodicity of such data collected and reported. In many cases, the indicators evolved at the FMU level do not have adequate data. A systematic approach was developed and followed for data collection, reporting, and use in the SI calculations at the FMU level. In the case of the South Seoni FMU (fig. 1), it is evident that in the year 2004, 11 out of 32 indicators performed below in comparison to the previous year and hence influenced the overall SI of that particular year. However, these indicators improved in subsequent years (2005 onward) due to the good performance of these indicators and, hence, improved the SI of the FMU. The SI is one of the best ways of knowing and maintaining the sustainability of forests at the FMU level with necessary corrective measures to achieve the sustainability of forest resources.

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Using the Web To Display Natural Resource Data

David George¹

Why Are We Talking About This?

Governments and other organizations acquire and report on, at significant cost, massive amounts of geospatial and tabular data describing the condition and location of natural resources. These data sets describe everything from topography, hydrology, vegetation, and biology to transportation, ownership, economics, and land use over various geographic areas. These basic data sets are further analyzed and modeled to derive information such as ecological health and conditional trends. Stakeholders in the comprehensiveness, accessibility, and comprehension of the data include international organizations, Government decisionmakers, resource managers, scientists, advocacy groups, and ordinary citizens. Distributing the data widely in an audience-appropriate appropriate format is a formidable task. It is, however, a critical component in realizing its full value.

There are several key factors that affect our ability to distribute the data widely and effectively:

- The proliferation of commercial as well as governmental outlets for information.
- Public trust in the data.
- Raising awareness of the availability of the information.
- How to make the information compelling and useful to multiple audiences by delivering it at different levels of abstraction and granularity.
- Understanding your audience and their needs.
- Establishing your data as comprehensive and authoritative through disclosure of its characteristics and origin.
- The expectation that information be deliverable and reachable on the Web.

Geospatial technology, such as a Geographic Information System, is a powerful tool for organizing and presenting resource data so users can discover and interact with it based on a visual reference to a location on the earth. It is especially effective when used as the initial user interface to provide a jumping-off point to other types of information, such as statistics, tables, photographs, and text. Geospatial technology presented in a Web environment places the information before a huge audience which can access it with common search and viewing tools, such as online map services, Google, and Google Earth. The Forest Service Geospatial Service and Technology Center and Remote Sensing

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Applications Center use these technologies to distribute resource information and forest management decision alternatives internally and to the public.

Presentation, Search, and Discovery of Data on the Web

A challenge in making your report or data an effective tool for the public and decision-makers is making them aware that it exists. Even when data is posted on the Web, it still may not be very easy to find. You can increase the odds by making it more visible—think of hanging a bigger sign out in front of your store to attract more customers. Web search engines are constantly sending out small applications, called Web bots or Web crawlers, which traverse the entire World Wide Web looking for information, recording it, and bringing it back. The reason a Google search is so quick is that Google maintains what is essentially a copy of the Web in various data centers around the world. When you submit a search query it is very rapidly processed, returning links to several Web sites fitting your needs. By placing a multitude of descriptive keywords in the code for your Web site, both generic and specific, which the Web bots will dutifully record and store when they visit, you can make sure that when a search query is submitted, your data will be high on the list of results. For a criteria and indicators report, for instance, one could include in the list each indicator in the report as well as generic references, such as “biodiversity information.” That way, both those aware of the report and those who are not could find it easier. Another strategy is to partner with an existing high-traffic site, such as Google Earth, to host your data or provide a link to your site.

Once your site has been found, you can further enhance the experience by making it easy to navigate and discover the information it contains. A site search capability and a site map both help get what you want quickly. By monitoring which areas of the site are accessed, and how often, you can get guidance on how to arrange the site so people see what they came for as soon as possible. Through monitoring searches you may discover people are using your site in ways which are different from what you planned. This can give you valuable information about the needs of your users. For example, the U.S. National Park Service found that lots of people were looking for information on good places to hold weddings in national parks. The Park Service was not aware there was a strong demand for this information. They discovered a new way of serving their users with information they would not have thought to provide otherwise.

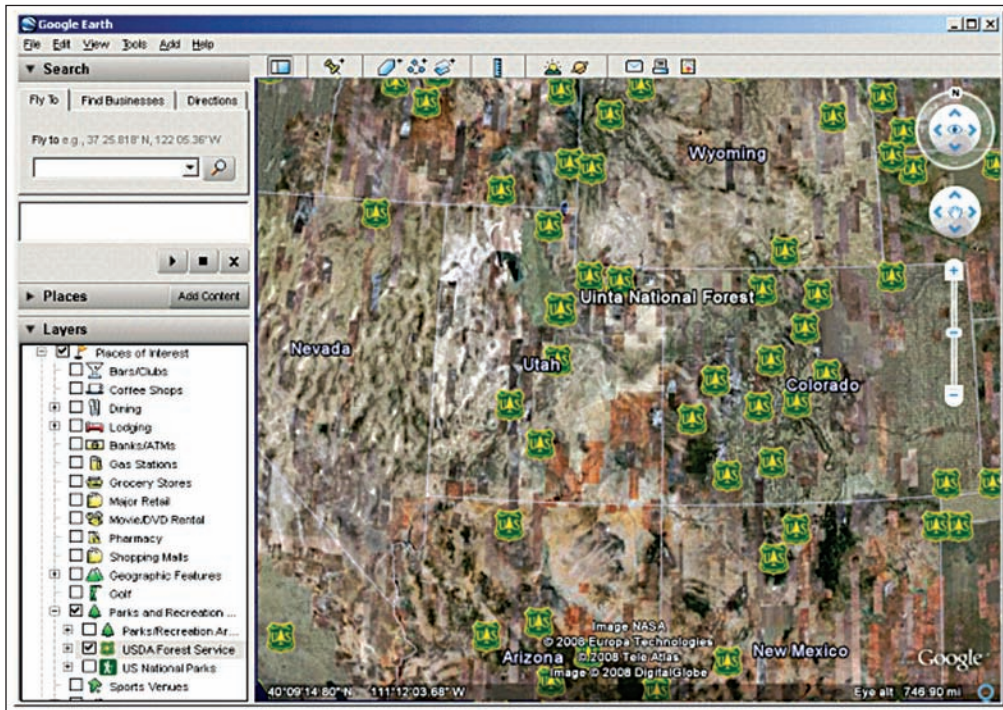
Selected Examples

The following examples demonstrate concepts related to the key factors stated previously as well as lessons learned.

Forest Service Data on Google Earth

The Forest Service has immensely increased its public visibility by placing a few layers on Google Earth. (See figure 1 for an example of a Google Earth Web page.) This was accomplished by placing boundaries, recreation sites, and administrative offices on the main Google Earth site. This is a great opportunity in a number of ways:

Figure 1.—Example of a Google Earth Web Page.



1. It gives the agency a presence on the leading geospatial Web site in the world, with an estimated 200,000,000 users.
2. If presented correctly, it is a great learning tool for people who wish to explore the natural resources for which the agency is responsible.
3. It also provides a platform for nesting relevant information such as assessment reports (e.g., forest cover data, wildlife and fire) in terms of current status and trends.

Depending on the scale at which it is viewed, the user sees a Forest Service logo representing each unit, or, after zooming in closer, line work and symbols representing boundaries and sites. Clicking on a logo produces a popup menu of other links, which lead to Web sites for making reservations at recreation sites, the individual forest Web site, the national Forest Service Web site, or a data clearinghouse where the data being viewed (along with other data) can be downloaded. The information is presented at levels of detail which increase as you look closer or drill down through links to other Web sites. The complexity increases along with the scale. The user controls the amount of information received, so multiple levels of interest can be accommodated. The same principle could be used at the regional, State, or province level with equal success.

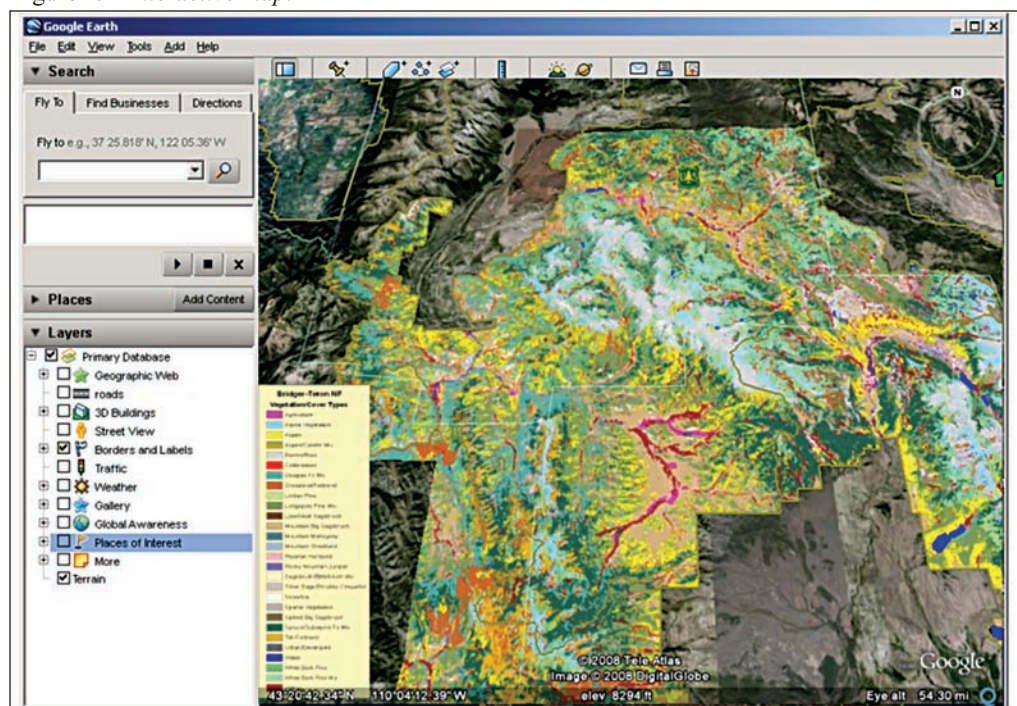
Lessons Learned While Dealing With the Owners of a Commercial Data Site

The configuration in figure 1 was arrived at after protracted discussions with Google. We were given a quick lesson in the difference between the commercial and Government business models on the Web. The first point to clear up was that we were not comfortable having our recreation sites associated with advertisements for other services in the

same area, which they proposed to display concurrently with our data. We assumed that, since they were interested in hosting the recreation data set, they would leap at the chance to host many other data sets which our researchers and forest managers felt were vitally important. It took us a while to understand and accept that our “vital” data was not as important to them as it was to us. The recreation site data is attractive to Google because it lets the user actually do something more than just look at the data. The popups direct the user to recreation opportunities as well as more detailed information about the prospective destination. Providing the data download capability lets the user take the data and interact with it as he or she wishes. As an example, hosting our nationwide forest type map on their site did not fit with their business model unless it was combined with some other information which showed a trend over time, allowed the user to take action, or inquire further. We thought the data was very interesting on its own and we assumed their users would agree, making it a hugely popular offering on the site. They helped us realize that, in that form, it applied to a limited community, not the general interest user, which is the level they are shooting for. Their interest is drawn by data which tells a compelling story—also see the “Global Awareness” tab in the Google Earth legend.

All is not lost, however. There is an easy way to distribute your data for viewing in Google Earth without Google hosting it for you. You can provide a link or a file which, when executed, runs Google Earth on the user’s computer and displays your custom data set in that environment. This display is much more engaging than old-style schematic maps. These files can be enhanced with popups, links, and legends and can also run movies of mapped time-series data. They are easily accessible on a Web site or can even be delivered through e-mail. Forest Service examples of these files are available at <http://fsgeodata.fs.fed.us>. I used Google Earth as an example (fig. 2) because it is a highly used, well-known, and understood tool. There are other ways to share resource data.

Figure 2.—Interactive map.



Data Clearinghouses

A data clearinghouse, or warehouse, is an environment where users can search for, assess, and obtain data. It is designed to provide data to users who wish to analyze or manipulate it on their own. It can also serve as a way to organize access to other sites and data warehouses. The Forest Service maintains a data clearinghouse at <http://fsgeodata.fs.fed.us>.

Syndicated Services

Syndicated Web services are meant to be consumed, or called, by other Web services or applications. They can be used as simple, straightforward data sources, or they can receive complex parameters from the requesting application, which result in specialized output generated in real time. They are often not designed to be accessed directly through a Web browser. They act as an online data source for other applications, or contribute content to other Web sites in what is referred to as a “mashup.” A mashup is a Web service which consists of a combination of self-published services and services which are provided by others. You can easily set up a syndicated service to make your data available to other services as maps, graphs, and tables. In a sophisticated implementation, your service could contribute context-appropriate output based on the geographic or topical context of the viewer. A Finnish user viewing someone else’s site about European forest issues could automatically be presented with information from your site on forest conditions in Finland, for instance.

Collaborative and Interactive Map Services

The defining feature in a collaborative site is the opportunity for users to correspond or collaborate with the site publisher or other users. This may take the form of submitting comments, topic-related forums where users can see comments from others and engage in a dialog, amending site contents, or submitting new data to the site. This format requires closer management and may need someone to play the role of moderator. There is also the implicit understanding that, if a user submits comments, there is someone who is reading and responding to them. The Forest Service has used this format to collect public comments during the forest planning revision process. Users can indicate the area on the map about which they wish to comment by clicking on it or drawing a box around it on the screen. They then fill out a comment form which is submitted to the plan revision team along with the geographic area referenced in the comment (fig. 3). For an example, see <http://maps.fs.fed.us/btnf>.

Interactive map services also can allow the user to query a database and see the results reflected on a map which is generated in real time. The results can then be printed or stored and used as a guide or map when visiting the forest. The Uinta National Forest, in the State of Utah, uses an interactive map service to help the public find out what types of motorized and nonmotorized access are allowed in different parts of the forest. The site can be found at http://maps.fs.fed.us/ta_jsp/r4/uinta/Map.jsp.

A similar application would be one which maps or graphs values of indicators, selected by the user; generates a screen display in real time; and then prints or stores the resulting graphic output.

Figure 3.—Forest Service interactive map and comment form.

Comment Form

Select the Plan Option and Geographic Area for which you would like to comment:

Plan Option:

Geographic Area:

Cliff Creek Description: Located in the Bridger-West Division of the Bridger-Teton National Forest, south of the Gros Ventre Wilderness and adjacent to the Willow Creek and Hickey Basin areas.

☐ I agree with the way this Geographic Area is being managed in the Existing Plan (Existing Plan % will be submitted).

☒ I do not agree. I would rather see the following Access/Development Levels applied in the proposed proportions below:

Please mark the percentage of the currently selected Geographic Area to which each Access/Development Level should apply.

If you would also like to propose specific location(s) within this Geographic Area where each change should be made, use the text box to describe the location(s).

Geographic Area Access/Development Levels	Existing Plan	Proposed Percent
Wilderness - Wilderness is a congressionally designated special area, managed with special regulations and for purposes that include preserving wildlife, ecological, scientific, educational, and other values. Other forest activities can take place here, subject to legal constraints. Examples include primitive recreation, rafting, research, livestock grazing, maintenance of existing water developments, wildland use fire, and restoration activities such as weed control.	0.0%	0.0%
Non-motorized Backcountry - Large natural areas that may have non-motorized trails but no motorized trails or roads. Activities that would be compatible with this land category include all of the land uses listed for wilderness, with the addition of active wildlife or fisheries improvement projects, mechanical transport such as mountain bikes, and lesser constraints on the construction of permanent facilities. An example constraint discussed among team members: mechanical treatment of fuels may be compatible with backcountry only if no long-term ground disturbance is needed. Treated areas should appear as undisturbed natural areas after the work is completed, with stumps cut low to the ground and other things that are covered in standards/guidelines. Obvious roads and ground disturbances are not compatible with a backcountry environment. Mechanical and motorized tools for project work are compatible where these are the best/only way to complete necessary vegetation management. This includes over-snow skidding, use of chain saws, use of aircraft and other methods that do not leave a long-lasting footprint on the ground.	74.02%	74.02%
Motorized Backcountry and Areas Accessed by Primitive Roads - Areas that have a mostly natural appearance with access by both motorized and non-motorized trails, as well as unimproved roads/trails.	3.21%	3.21%

Map: Bridger-Teton Forest Plan Revision Maps. The map shows the location of Cliff Creek within the Bridger-Teton National Forest. An inset map shows the location within the state of Montana.

Geographic Area Name: Cliff Creek

Metadata

Metadata, literally “data about the data,” is a key concept in fielding a credible data distribution system regardless of the delivery method. It can be included as a file accompanying graphic data or as an appendix to textual material. It serves several important functions:

- It tells users what the data set is, where it came from, who created it, and how and when it was created.
- It gives information on the geographic coverage, units of measure, and geodetic characteristics of the data.
- It provides information on how the data is organized, the schema, domain of allowable values for each attribute, and the data dictionary.
- It can explain models that were used to produce derivative data sets as well as the contributing data sets used.
- It lets users assess the appropriateness of the data for their needs.
- It can be indexed to provide sophisticated spatial and text search capabilities to aid in discovery on the Web.
- It can help build confidence and trust in the data through transparency and disclosure.

Summary

- Geospatial and Web technology bring opportunities for increasing the use and understanding of natural resource data. To date, these technologies have been underutilized to present resource information.
- Data on the Web is more interesting and compelling if it tells a story, if you can interact with it, or if it leads you into other levels and areas of inquiry.
- A nested information organization scheme, using different levels of complexity and abstraction in the same data set, allows many communities of users to interact with the data according to their own needs.
- Merely posting a report or data set on a Web site is usually not sufficient to make it accessible to most audiences. By using descriptive keywords and organizing your site according to how it is used, you can increase the visibility of your data on the Web.
- Public confidence in reports and data can be enhanced. Metadata increases the utility and helps establish the credibility of your data.

Forest Reporting on Web 2.0: A Conversation, Not a Lecture

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Canada's National Reports on Sustainable Forest Management— Rooted in Web 1.0, but Starting To Branch Out

The production, announcement, and distribution of Canada's national reports on criteria and indicators (C&I) of sustainable forest management (SFM) have not changed much over the past decade or so. As a result, readers in today's Web-enabled world find it challenging to use the framework and the information to its full potential.

Canada's most recent report, subtitled *National Status 2005*, was released in 2006 by the Canadian Council of Forest Ministers (CCFM 2006). This report provides information on all of the indicators in the national C&I framework. A shorter booklet, highlighting key trends and conditions, was also produced as a companion to the longer technical report.

Several traditional channels were used to announce and distribute the report and booklet. Printed versions of the report were mailed to over 700 readers and the booklet was mailed to over 4,000 readers. Provincial and territorial Governments also distributed the report to staff and other interested parties within their jurisdictions. The use of the Web, however, was limited to posting electronic versions of the printed report and booklet on the CCFM Web site (www.ccfm.org). Some nontraditional approaches to announcing the report were tried, including electronic distribution lists, blogs like SFMindicators.org, and news aggregators like Digg.com. One innovative approach was to create an article on sustainable forest management on Wikipedia.org with links to Canada's new national report along with links to national C&I reports from other countries.

Feedback from readers on the 2005 CCFM C&I report has been mixed. Reader surveys are still ongoing, but preliminary results suggest that, while people like the shorter booklet, the full report is not being used. There appear to be several reasons for this, including the following:

- The report is not clearly targeted at key audiences; hence, most potential readers are unaware of the report or how to use it.
- Readers are overwhelmed by the volume of information in the report and find it too difficult to find the specific information they seek.
- Readers want easy access to the source data to perform their own analysis.

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- The information is frequently not up to date because the interval between reports is too long.
 - Readers want an integrated, overall assessment of progress toward SFM, but a lack of clear benchmarks for indicators makes that difficult.
 - Readers can find similar information more easily from other Government and nongovernment reports.

While more feedback from readers is still to come, it is becoming clear that to improve the effectiveness of future C&I reports, the CCFM must do the following:

- Improve the utility and delivery of C&I information by continuously engaging readers and understanding their needs. Reader engagement cannot be something that is carried out once every few years. The readership may change over time, and the information needs are always in flux. Moving forward, the CCFM must focus relentlessly on the task the reader is trying to complete.
- Increase the accessibility of information to readers by using simple, interactive, and highly adaptable or tailored reporting formats. Posting a PDF version of the paper report on the Web is no longer acceptable. Readers tend to be extremely task focused and impatient. It must be as easy as possible for readers to find and use the information they need.
- Reduce the reporting burden by improving links to other reporting mechanisms (produce once, but use many times). For example, the CCFM C&I Web site is just one of several Canadian Government Web sites offering “authoritative” national information on Canada’s forests. The information offered on each Web site is presented in a slightly different way but ultimately all comes from the same sources. Improving links among reporting mechanisms can help relieve some of the strain on already-taxed resources.
- Encourage greater stakeholder participation in the SFM debate. The presentation of information should not be a monolog from Government but rather a discussion with readers.

While there are many potential solutions to these challenges, adapting C&I reporting to the evolving nature of the World Wide Web, particularly Web 2.0, should be part of the solution.

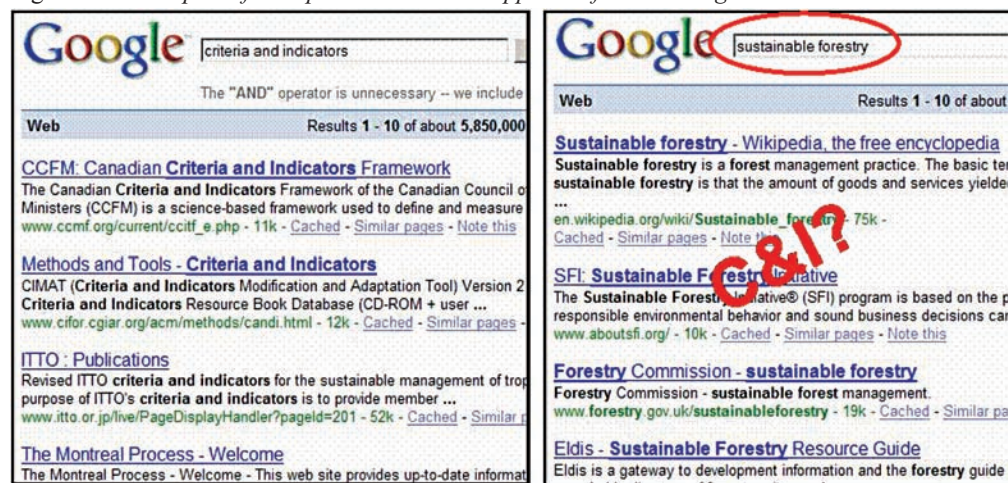
What Is Web 2.0?

What is the difference between Web 1.0 and Web 2.0? You’ve probably heard the terms but no consistent definitions. Kevin Maney, a prominent tech blogger and editor at *USA Today*, has said, “Web 2.0 seems to be like Pink Floyd lyrics—it can mean different things to different people, depending on your state of mind.” The best way to describe the difference may, therefore, be through the use of examples.

The CCFM's current use of the Web for national C&I reporting might be called "post and browse." Reports that were originally designed in paper format are posted on a Web site using Adobe's Portable Document Format (PDF). The hope is that people searching the Web with Google or other search engines will find the site and read the reports. The Web site essentially functions as an archive or a document repository.

The first problem with this approach is that it does not lend itself to being found by people using search engines. Search engines, like Google, rank pages based on several criteria and present an ordered list of results for the search terms used. Thoughtful Web site design is required to ensure that a Web site rises to the top of this list for any given search term. About 60 percent of searchers will click on one of the first three search results returned by a search engine. Ninety percent will click on one of the first 10 results. If a site appears below the top 10 search results, its chances of being found are extremely small. Being found using the right keywords is also very important. A search on Google for "criteria and indicators" will return the CCFM Web site as the first search result. Unfortunately, people are much more likely to search for terms like "sustainable forestry," and, with this term, the CCFM Web site does not appear in even the top 200 search results. (See figure 1.)

Figure 1.—Examples of the "post and browse" approach for searching on the Web.

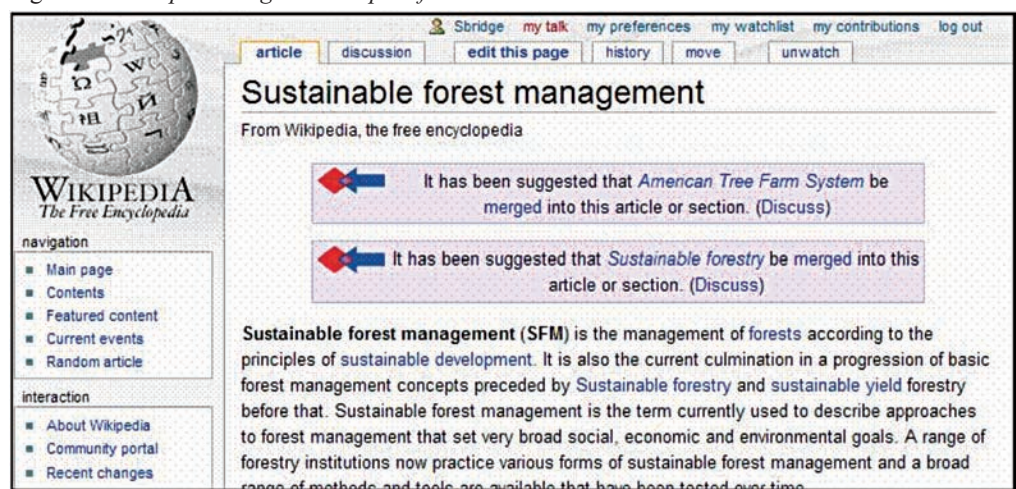


The second problem with this approach is that it does not cater to the way that people expect to be able to use the Web today. The days of post and browse are fast disappearing. Today's Web is much more about collaborative cocreation of content. We are moving away from Web sites as information silos, unconnected to the world around them, and toward Web sites as sources of content and functionality. Today's successful Web sites are designed to allow participation. Today's successful Web sites are not just document repositories; they are virtual spaces where conversations occur and insight, intuition, and knowledge are shared. This is Web 2.0.

One of the best examples of this new type of Web site is Wikipedia.org (fig. 2). For those who do not know, Wikipedia is an online encyclopedia that anyone can edit. Wikipedia.org employs only a dozen or so full-time employees to maintain the software and the database behind it. All of the content—over 10 million articles in over 260 languages—

has been contributed by its readers. Because of the collaborative way in which they are produced, Wikipedia articles tend to rise to the top of Google's search results list very quickly. For example, the Wikipedia article on sustainable forest management debuted in March 2006. Shortly thereafter, it could not be found on Google with a search for the phrase "sustainable forest management." By November 2006, however, it was in the top 50 search results. By September 2007, it was number 26 and by May 2008, it was the number one search result. More recently, the sustainable forest management article in Wikipedia has even begun to appear at the top of search result lists for other search terms, like "sustainable forestry."

Figure 2.—Wikipedia: a good example of Web 2.0.



Blogs are another participatory medium and Web 2.0 example. Blogs are a great way to send a message out to a large audience. But, unlike traditional Web sites, readers can respond to posts or other reader's comments. This offers a great opportunity for a conversation to take place. Specific blog search tools like Technorati.com even allow one to track how many times specific phrases are mentioned in the blogosphere, offering an interesting way to track the pulse of specific issues. Similarly, social bookmarking, or tagging, on sites like Delicious is becoming a popular way to share information, and social networking sites like Facebook, MySpace, or LinkedIn are extremely popular sites to connect with others in order to co-create and share content.

Thus, we can see that where Web 1.0 sites tried to define the reader experience and published information for people to observe, Web 2.0 sites create platforms for readers to co-create their own services, communities, and experiences.

How Can C&I Reporting Be Adapted to Web 2.0?

Adapting C&I reporting to what many of today's readers expect from the World Wide Web can help the CCFM meet its reporting objectives, but it requires changing perceptions about the Web in several ways.

Shift Thinking—Provide a Service, Not a Product

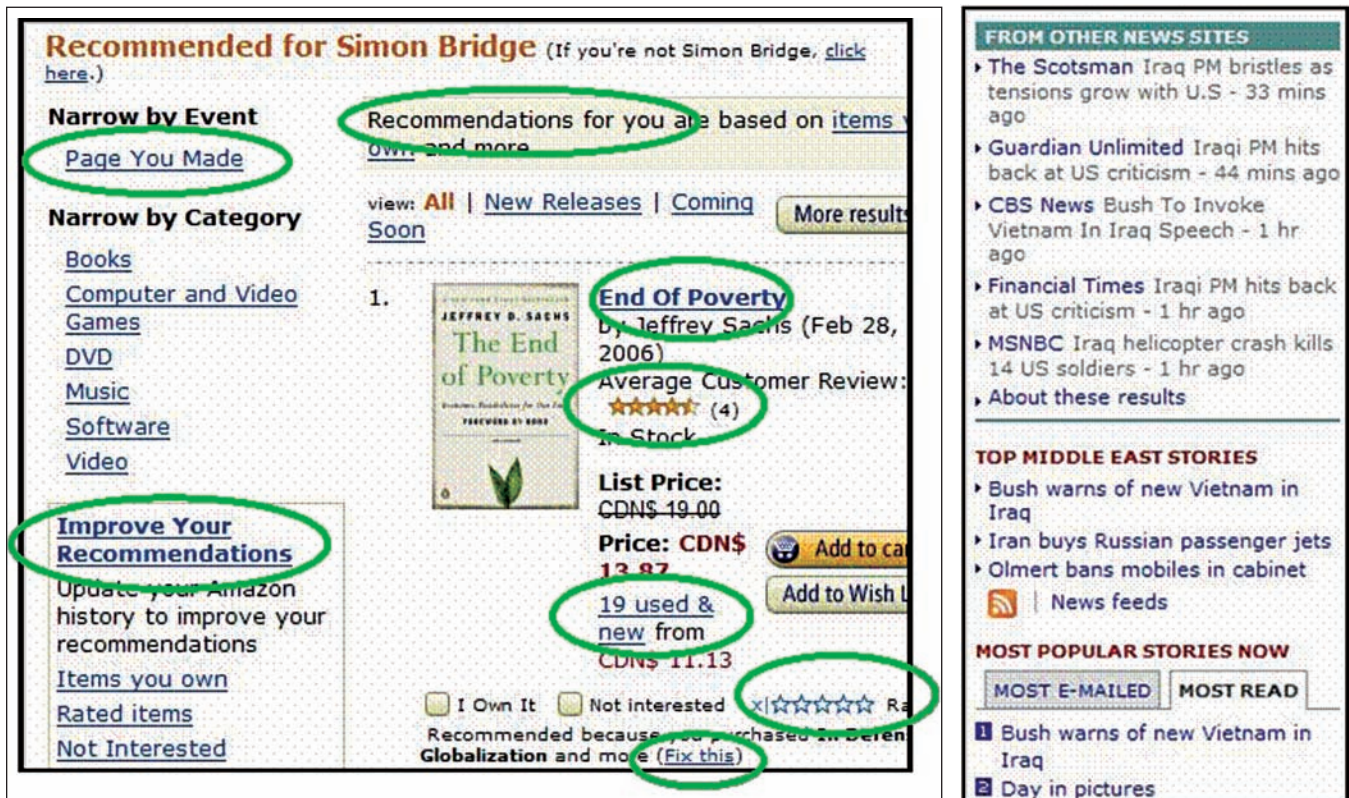
As was mentioned earlier, the CCFM's past use of the Web for C&I has been as a document repository—a place to find products, namely, the C&I reports. Thinking needs to shift toward providing a service, and if the service is to provide information on Canada's progress toward SFM, then we need to think about how to increase the use of information by readers. There are basically two ways to do this. First, attract more readers to the Web site. This means having quality content that people want along with effective site design that takes into account considerations like easy navigation, search optimization, etc. Second, make it easy for readers to take the information and repackage it for their community of interest. For example, provide access to the raw data in a form that can easily be imported into and manipulated by common applications (like Google maps) for redisplay on other Web sites. Another example might be to provide readymade PowerPoint slides with key information about each indicator that policy analysts or others can quickly incorporate into their own presentations.

Provide Unique Data Sources That Get Richer as More People Use Them

Why is it that Amazon.com is far and away the biggest retailer of books on the Internet today, much bigger than other book sellers like Barnes & Noble or Chapters? After all, they all started with the same data set—the list of book titles with ISBN numbers and other basic book information. The answer lies in the fact that Amazon.com has made a science out of getting its customers to add more value or content to the basic data it starts out with—and, most of the time, customers do not even know they're doing it. For every book found on Amazon.com, the customer can rate the book, write a review, or comment on someone else's review. The customer can even sell their own copy of the book. Customers are also presented with recommendations for other books they might enjoy and offered the opportunity to improve the recommendations by telling Amazon.com what books they already own, what related items they like, and what books they are not interested in. The result is an extremely rich customer experience, which leads to more customer visits. Amazon.com has made it very difficult for others with the same basic database of book titles to compete because Amazon's customers are constantly adding additional content (and value) to its database. (See figure 3, left panel.)

In addition to allowing customers to add their own content, it is important to provide easy access to ancillary information. The BBC does this on its news Web site by providing easy access to not only its own stories, but also to the same story as reported by other news organizations. With regard to C&I reporting, this could mean providing links to background material, other popular indicators, or similar indicators reported by provinces, certified forest companies, or even other countries. Just 5 years ago, this type of activity would have set communication experts' heads spinning. Back then, it was all about controlling the user experience and keeping the user on your site. With Web 2.0, much greater emphasis is placed on reputation and trust, and one way to develop that trust is to be seen as a transparent purveyor of information. (See figure 3, right panel.)

Figure 3.—Left: Amazon.com invites customers to add content. Right: The BBC invites readers to access the same story on other news sites.



Readers Want Control—Make It Easy To Hack Your Data

The United Nations Development Programme has produced its *Human Development Report* for many years. In many ways, it was similar to C&I reports—full of facts and tables but not very interesting or too difficult to interpret for many readers. Then, they made their data available on the Internet, and Hans Rosling developed his Gapminder software to view the data in a totally new way. Suddenly, the information was not only more accessible to readers but also engaging, exciting, and informative. As hard as we try to make our reports exciting and engaging for our readers, someone else out there can probably do a better job. So, give readers access to the data in a form that is easy to manipulate and let them co-create new products for you.

Harness Collective Intelligence

In today's world of blogs, news aggregators, social bookmarking, and social networking, readers are deciding what is important through votes, links, blog posts, and tags. Furthermore, readers are using these social indicators as a form of search engine to find the information that is relevant to them. Readers follow popular blogs, click on the stories with the most votes, and explore Web pages others have tagged with the same keywords that they use. So, make it easy for your readers to blog, digg, tag, or send your C&I information to a friend. Every story at the bottom of most news Web sites today has links that make it easy for readers to post the story on various social sites. Indicator reports

could benefit from the same type of links. Similarly, allow readers to be alerted when new content becomes available by using services like Really Simple Syndication (RSS) feeds.

Trust Readers as Co-Developers

Readers today expect to be able to help co-create content on the Web. They are presented with the opportunity on so many sites today that they are really turned off when it is not there. Rating indicators, writing comments, entering into discussions with other readers, and adding new data, examples, or personal stories are all examples of how indicator reports on the Web could allow readers to co-create content. As readers add content, you will learn a lot about their needs, which means you can improve the site or add functionality on a regular basis. Just remember to use tracking metrics to see if the new functions are working. Some people worry that constantly changing the Web site will be confusing to readers, but they need not be concerned. Readers have become accustomed to this. You'll notice that you do not see very many software or Web site release versions anymore, because companies now consider their software or Web site to be in perpetual "beta" stage. It is always being improved.

Plan for Multiple Devices

By 2010, it is estimated that there will 3 billion mobile phones in use across the globe; that's four times the number of personal computers that will be in use and three times more than the number of television sets. People expect to be able to get their information in multiple ways. Mobile search, in particular, is really taking off. Many news organizations now offer the option of receiving the news via podcast, e-mail, alerts, text message, or RSS news feed. (See figure 4.) C&I reports must provide information in many formats. A PDF file is really hard to read on a BlackBerry.

Common Challenges To Address

Changes such as those described previously are difficult for organizations to deal with, particularly Governments. There are several challenges that often must be addressed before these types of changes to national reporting on C&I can be implemented.

Organizational Culture (Process vs. Outcome)

In many Government agencies, the emphasis has often been on completing the process rather than obtaining the best result. Consequently, reports may be produced that are read by only a few people. But this is changing. With C&I reporting in Canada, for instance, a greater effort is being made to try to understand the tasks that readers want to accomplish with the information provided. This should make future reporting products easier to use, better suited to reader needs, and more supportive of organizational objectives.

Figure 4.—*Information is available in many formats.*



Bilingual Requirements

In countries like Canada, where there is more than one official language, or in countries where multiple languages are customarily used, information presented on Government Web sites must be multilingual. This has presented challenges to the use of new Web 2.0 tools. For example, if a Government hosts a blog or discussion board and readers comment, must those comments always be translated? Similarly, must all contributions to a wiki hosted by a Government be translated? Besides the obvious factor of cost, the time required for translation often removes the spontaneity of conversations, which can evolve very quickly on the Web.

Fear of Giving Up Control

Rather than define the reader experience and published information for people to observe, Web 2.0 sites create platforms for readers to co-create their own services, communities, and experiences. This necessarily means relaxing control on what is published and Government agencies, quite rightly, worry about what will be said on their Web sites. The challenge is moderating the input received from readers and setting up effective criteria to determine what is acceptable input and what is not. For example, the Workplace Safety and Insurance Board (WSIB) of Ontario now runs an annual student video contest where high school students are invited to create videos on workplace safety. Not every video that is submitted is accepted for display on the Web site, but those that are accepted are eligible to win prizes and the students share the videos extensively with one another. By relaxing control over its Web content a little bit, the WSIB has been able to provide content that is meaningful to its intended audience and has a much broader reach.

Fear of Failure

For many managers in Government, Web 2.0 is complicated, unknown territory. Add to that a culture of doing things absolutely right the first time, and it is not surprising that some managers perceive Web 2.0 projects as risky ventures. Oftentimes, managers are used to the traditional ways of producing Web products—spend a year gathering input from all the stakeholders to generate a list of requirements, then prioritize the list and come to a loose agreement on the features of phase 1, for release the following year. In many cases, though, it is better to simply start small, and if it does not work, you have not failed—you’ve learned how not to do it. So, try again until you get it right. As usage grows, you can change or add features, learning as you go.

Proving Return on Investment

Oftentimes, Web managers use “hits” or “page views” as a measure of the Web site’s success, but these measures are not always well suited to proving the return on investment. It can be difficult to know if any of your Web site’s visitors actually stayed to look around or, conversely, if they had to return multiple times because they could not find the information they sought the first time. Remember, the vast majority of people come to your Web site to do something specific, and they want to get in and out as quickly as possible.

Identifying the most important tasks that people come to your Web site to complete, and helping them do so as quickly as possible, will be critical to the success of your Web site.

Canadian Provinces Are Beginning To Adapt Their Reporting to the New Web

Some Canadian provinces are beginning to adapt their C&I reporting to the Web 2.0. Here are two examples:

1. British Columbia: <http://www.for.gov.bc.ca/hfp/sof/2006/>.
2. Quebec: <http://www.mrnf.gouv.qc.ca/publications/enligne/forets/criteres-indicateurs/accueil.asp>.

In both cases, the C&I reports have been developed primarily as Web products. Although printed versions are available, they are really secondary. Both Web sites are easy to navigate, provide access to raw data, and, in the case of British Columbia, have a discussion board where readers can talk about the report.

Conclusion

It is worthwhile concluding with the following remarks made several years ago by a group of media executives. When they were asked how traditional media organizations could best respond to the “threat” posed by the Internet, they said the following:

- Give readers access to raw content as a means of providing greater transparency and accountability.
- Provide tools and become a platform for reader-generated rather than firm-generated content.
- Redesign all content to be a conversation rather than a monolog.
- Treat advertising as content, too.
- Use new distribution forms, including peer-to-peer networks.
- Adapt content forms and schedules to reader demands.

Newspapers in particular have recognized that readers use newspapers, magazines, and the Web in different ways for different reasons. Canada’s *Globe and Mail* newspaper, for example, has reorganized the way it delivers information by utilizing each medium’s inherent strengths: the Web to break the news and host dialog; newspapers to reinforce comprehensive packages of what readers need to know daily—complete with indepth interpretation, context, and analysis; and magazines to deliver long-form journalism that can be taken in over time.

Governments producing C&I reports should learn from the changes media organizations have had to undergo in order to survive.

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Telling the Story of Sustainable Forests: Is It More Than Publishing Another C&I Report?

Richard Guldin¹

The Problem

The initial set of national reports on sustainable forests was quite popular and useful in describing the current state of forests from ecological, economic, and social perspectives. In the country reports by Montréal Process countries, information was readily available for some indicators, not only for describing the current condition but also for reporting on recent trends. On other indicators, information had to be collected for the first time to describe the current condition. As countries look forward to releasing the next round of national reports in 2009 or 2010, the fresh data presented will lead to new questions; chief among them is, “Are our country’s forests more sustainable today than they were when the last report was published?”

In a previous paper (Guldin and Heintz 2006), Ted Heintz and I discussed a set of questions that emerged following the release of the *National Report on Sustainable Forests—2003* (USDA Forest Service 2004). We received a number of comments from scientists regarding the apparent lack of a well-defined model or framework to help readers understand the linkages among indicators. Some of those comments lamented not having a “systems” model. Ecologists, economists, and social scientists each wanted a “systems” model drawn from their own discipline, thinking that was the most appropriate perspective for evaluating sustainability. In addition to these comments, there was substantial public discussion about the *meaning* of the information we reported. Many questions were raised for which there was no clear answer, despite all the data assembled and indicator descriptions. Some of these broader questions included the following:

- Are forests in the United States currently sustainable?
- Are the forests in the United States being managed in ways that meet the Montréal Process criteria for sustainable forest management (SFM)?
- How should we assess the extent to which a criterion is being achieved when some of its indicators are improving while others are declining?
- How can one group see an indicator trend as an “improvement” while another group sees the same indicator trend as a “worsening” of the sustainability situation?
- How do the conditions and processes addressed by these indicators affect forest conditions and processes that are not addressed by these indicators?

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- What policies, management practices, and other factors best explain the most positive trends? The most negative?
 - What changes in policies and management practices are needed to better achieve sustainability in U.S. forests?

Over the past several years, as I've become more deeply immersed in sustainability activities, worked on criteria and indicators (C&I) for the Montréal Process and International Tropical Timber Organization, and discussed the importance of C&I with colleagues and interested parties in the United States and around the world, I've found that these questions were not unique to the United States. Citizens in other countries were asking their leaders many of the same questions. Indeed, some of those questions helped shape the agenda for this workshop.

In recent years, there has been a significant increase in the visibility of sustainability as an issue in many natural resources sectors. For example, searching CAB Abstracts for publications that mentioned "sustainable" or "sustainability" in their abstracts yielded 3,162 hits for the year 2003 compared to 6,127 hits from January 2007 to March 2008 (the most recent 15 months). Increasing emphasis is also apparent in related fields, such as energy production and consumption, transportation, construction, and the chemical industries. In all these fields, sustainability is discussed at multiple scales—community, landscape, national, regional, and global. In academia, colleges are creating new degree paths that lead to undergraduate degrees and graduate programs in sustainability. Arizona State University has created a School of Sustainability. In the United States, the National Academy of Sciences has inaugurated a "sustainability science" program. New journals have popped up that focus on sustainability—both print and on line.

With the increased public interest in sustainability and with the proliferation of messengers and messages about sustainability in agriculture, water resources, energy, manufacturing, ad infinitum, what steps can we take to tell our stories about the sustainability of our forests?

What Are the Key Questions?

Several recommendations have been made about ways to make forest sustainability reports more understandable and more meaningful to readers. Other papers presented today will go into the details of several alternative approaches to analyze data and to develop and tell stories about the status and trends in SFM. This initial paper focuses on two broader questions:

- Is continued focus on C&I by us technical experts misplaced? Instead, should we focus our energies on telling more compelling stories about the changes we are observing and how they affect the long-run sustainability of our forests?
- Is an explicit model or framework needed to organize thinking and provide a foundation for developing and telling stories about SFM based on the indicator reports? And, if so, what kinds of models or frameworks exist that might be useful?

Is Continued Focus on C&I by Technical Experts Misplaced?

For the past decade, most of the discussion among forestry experts concerned with sustainability has been on selecting the right criteria and the best indicators to address those criteria.

Following the Rio summit in 1992, the focus rightly was on discussing the key objectives for forest management. By the 2003 International Conference on the Contribution of Criteria and Indicators for Sustainable Forest Management: The Way Forward in Guatemala City, it was becoming apparent that the several global processes focusing on sustainable forests had arrived at a shared set of seven or eight criteria; the number depended on whether the extent of forests was displayed separately and whether legal and institutional frameworks to support sustainability were seen as distinctly different from the socioeconomic criterion. But, in large part, the more than 100 countries in attendance concurred that conserving biological diversity, maintaining productive capacity, maintaining healthy forests, conserving soil and water, understanding forests' contributions to global cycles, and maintaining the contributions of forests to societies and economies were all important dimensions of sustainability for forests.

Although global agreement emerged about the criteria for SFM, much work continued on selecting, defining, and refining the specific indicators used to measure progress under each criterion. Because ecosystems differ around the world—tropical to temperate to boreal—it made sense to shape the indicators to reflect the nature of the ecosystems we are attempting to sustain. No less important, dialog among the technical experts also continued on selecting the best indicators of socioeconomic conditions and legal/institutional conditions necessary for sustainable forests. The fact is that there remain significant differences in socioeconomic conditions and legal/institutional arrangements around the world and indicators are needed that are sensitive to these differences.

While the technical experts were working hard on selecting, defining, and refining indicators, did sustainability—the concept and the message—pass us by? Have we been so focused on the C&I as ends in themselves that we have missed the opportunity to shape the discussion about sustainable forests and our contributions to the larger questions of sustainable development? In some cases, I believe we have.

In the United States, for example, we have the Roundtable on Sustainable Forests. With over 100 participating members, the Roundtable on Sustainable Forests is an open and inclusive process committed to the goal of SFM on public and private lands in the United States. Roundtable participants include public and private organizations and individuals committed to better decisionmaking through shared learning and increased understanding. The roundtable's primary activity to date has been the implementation of an internationally agreed upon set of C&I for the purpose of developing a shared understanding of current forest conditions and a baseline against which to mark future progress toward sustainability. To this end, the roundtable focused much of its attention on identifying and evaluating the quality of data that can be used to assess the state of the Nation's forests and providing input on the production of the *National Report on Sustainable Forests 2003*. In doing so, the roundtable stimulated a national discussion of SFM and served as

the catalyst for more collaborative data management relationships among several Federal agencies.

Since the completion of the U.S. national report in 2003, the challenge for the roundtable has been to shift its focus from improving the data and the C&I themselves to a focus on motivating private landowners and public land managers to implement more SFM practices. Crafting and communicating messages about the need to improve forest health, for example, that actually motivate landowners to change management activities and policymakers to make new policy has been difficult. It is more comfortable for technical experts to work over the data in new and novel ways and to refine indicators so they are more meaningful to us. It is less comfortable to move out into the public domain to engage with landowners, land managers, investors, industrialists, and public officials about the need for changes to promote sustainability when many of them are not yet convinced that changes are needed now to improve conditions in the long term. Yet, it is imperative that we do so.

Is our experience in the United States similar to the experience in other countries? Has the inward focus on the C&I themselves dissipated energy that could have been used in outreach to the public with key messages about sustainability? I suspect that it has.

So what should we do? To begin with, I think we should stop referring to our national reports on sustainable forests as “C&I reports.” When we refer to the reports in that way, I believe that we emphasize the wrong thing. What should be emphasized is sustainability of our forests. Hagan and Whitman (2007) said:

Indicator selection and use is primarily a social process, to be informed and supported by data and science. Indicators are not about the numbers as much as they are about an open social conversation about forest values. To be useful, the selection and use of forest indicators must be embedded in a larger, ongoing, adaptive social process for pursuing sustainability. Sustainability is not an endpoint, but rather an ongoing social process that integrates and adapts to new knowledge and changes in societal values.

Our job as technical experts is to bring the indicator results to this ongoing social process of pursuing sustainability. In this context, indicators are signposts to help the public mark our progress along the pathway to sustainability. The report’s key messages should focus on the broader sustainability story, not the C&I themselves. The report needs to tell stories about sustainability. Some indicators might be *part* of the sustainability story, but indicators should not be *the* sustainability story. We need to help craft messages and tell stories, based on the data, which motivate and inspire readers to take action on their tract, in their community. Sustainability is a social process, not a technical indicator process.

Would an Explicit Model or Framework Help Us Tell Stories About SFM?

Kemp and Martens (2007) argue that the heart of sustainability is the attempt to link and seek balance between economic development and the environment. Therefore, they posit that sustainability requires a new model—different from the models that have driven economic development and societies in the 19th and 20th centuries. But what kind of model? Their thesis is that the model must be able to deal with the complexity of the multiple interactions of economic development and the environment. Furthermore, the model must be able to accommodate the following (Martens 2006):

- Different scales, including of time, of space, and of function.
- Multiple domains (e.g., environmental, economic, social), and the dynamic nature of the multiple interactions and balances among the domains, including the uncertainties in the interacting systems.
- Multiple interpretations, which arise from the multiple interests with stakes in the outcomes and their differing perspectives.

The desired outcome of such a model is better understanding of the fundamental character of interactions between forests and society—at different scales—with special attention to the complex evolution of the forest-society-economy system in response to multiple and interacting stresses (after Kates *et al.* 2001).

Pragmatists are probably wondering what developing such a model could mean to C&I processes now. The sets of C&I are complete. I believe that there are several reasons why a model or framework is important for C&I processes, even at this point in time.

- A model or framework helps to expose the underlying assumptions and values behind a set of criteria and their indicators. U.S. representatives to the Montréal Process Working Group (MPWG) engaged in the process of choosing and defining C&I based on a combination of science and public values important to the United States and to U.S. forest sector stakeholders from our ongoing social process about forest sustainability in the United States. Representatives from other countries appeared to be balancing the same kinds of interests and reflecting social processes, too. The rich dialog that ensues leads to consensus about criteria and indicators. The MPWG members reveal their collective assumptions and values in the “rationale” statement for each criterion and indicator. But these “rationale” statements are so brief that they cannot capture all the meaning nor do they integrate upward, bringing together the interrelationships among indicators across several criteria. A more complete and integrated model might provide a stronger basis for understanding the values and connecting with stakeholders who share those values, increasing the relevance of the C&I to social processes fostering sustainability.
- A model or framework helps to position the dialog about sustainability at the intersection of environmental, social, and economic discourse. Many of the comments received on the 2003 U.S. report suggested that the set of indicators was not “properly” grounded in the ecological sciences. The people who provided comments—mostly

scientists—were approaching the C&I as if only the environmental domain mattered and as if the scientific method were the only legitimate process for determining “importance” and therefore the selection of indicators. The notion that the concept of sustainability can be defined and implemented in a “scientific” manner is dangerous, because values, opinions, and social influences are an inextricable part of both sustainability and of science (Lélé and Norgaard 1996). What is needed is a model or framework that is both broad—capable of spanning all three domains—and integrative—able to account for the complex interrelationships among C&I from different domains. Unsustainable situations typically arise when a single domain dominates or excludes the other domains from the model/framework used to create the stories and decisionmakers. Therefore, moving from unsustainable to SFM requires models that integrate values and assumptions from all three domains to inform in the social processes fostering sustainability.

- A model or framework can help create useful linkages to other sectors. Evaluating the contributions of forests to the environmental, economic, and social domains in the same way that the contributions of the agricultural sector or other industrial sectors are evaluated can help investors and policymakers make choices impacting multiple sectors. Sometimes, forest sustainability receives less attention from investors and policymakers because equivalent metrics of productivity or performance are lacking. Models of activity and responses in the forest sector, particularly where management activities are translated into economic and social benefits, can help put forests on a more equal footing with agriculture or other development activities for investor dollars and policymakers’ attention. A good recent example is the debate in the energy sector about the role of biofuels—whether starch-based ethanol from the agricultural sector or cellulosic ethanol from the forestry sector is more sustainable in the mid to long run. Having models that are consistent across forestry, agriculture, and related sectors will help advance the dialog and mitigate or avoid inadvertent impacts of public policies or private investments on forests and the people that depend upon them for their livelihoods.
- The model or framework helps to promote consistent interpretation of information across scales. A model also helps ensure consistent implementation and interpretation. Consistency is a virtue—both from a spatial and temporal perspective. Consistency from place to place promotes credibility and comparability—the situation at location *X* really is different from the situation at location *Y*. Spatial consistency from the community to the landscape to the national scales is also an important spatial contribution of a good model. Consistency through time also promotes comparability—the situation at time *T1* really has changed since the last observation at *T0*. Models that ensure consistency and comparability across multiple scales better inform the social processes discussing sustainability and create support for C&I data collection and analyses.
- A model will help distill information in the C&I for interested publics. The lay public has difficulty understanding the meaning of 40 to 70 indicators. Sustainability advocates need to distill the indicator information into a few powerful stories about conditions and trends in forests that the public can understand. By linking assumptions and values to indicators, a model or framework can help tailor the content and focus the delivery to people who share those values and interests.

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- A model can help guide the future evolution of indicators. Clarifying indicators to make them more useful should only be done in the context of the original assumptions, values, logic, and concepts that guided the original developers. If the choice is made to change the indicators, that decision will be much clearer if the original assumptions, values, logic, and concepts were well documented in a model or framework and the effects of the intended revisions to indicators can be evaluated in those contexts.

These are the characteristics that I believe we should seek in models or frameworks proposed for C&I. Because the dialog about forest sustainability is inherently a social process where changing conditions—economic, social, and ecological—affect forests in both expected and unexpected ways, the models or frameworks must be more integrative and robust than the traditional single-domain models that countries used to guide policies and progress in the 19th and 20th centuries.

What Lies Ahead for Foresters Advocating Sustainable Forest Management?

Orr (2002) laid out four challenges to sustainability, stemming from the premise that current lifestyles and inequities in lifestyles are unsustainable from environmental, economic, and social perspectives. Therefore, he posits that change is inevitable and the central question is “whether the transitions will be done with more or less grace and whether the destination is desirable or not. The barriers to a graceful transition to sustainability, whatever forms it may take, are not so much technological as they are social, political, and psychological.” Orr (2002) goes on to describe four specific challenges:

1. We need more accurate models, metaphors, and measures to describe the human enterprise relative to the biosphere.
2. We need a marked improvement and creativity in the arts of citizenship and governance.
3. We need to inform the public through greatly improved education.
4. We need to recognize that the challenge of sustainability is to solve a series of problems that cannot be solved by rational, logical methods alone but rather by “higher methods of wisdom, love, compassion, understanding, and empathy.”

I believe that we are on Orr’s pathway toward forest sustainability. The C&I are useful measures to describe the human enterprise relative to forests. We are searching for more accurate models and metaphors to help us translate the changes being observed into deeper meaning and connection to values held by society.

Regarding Orr’s second challenge, the fact that a legal/institutional criterion is actively being discussed speaks to recognition that governance issues are vital issues for forest sustainability. For the past 18 months, the Montréal Process countries have had an active dialog about the best indicators to use for our Criterion 7: Legal, institutional, and economic framework for forest conservation and sustainable management. Furthermore, the emerging interest by the Food and Agriculture Organization of the United Nations

to include some legal and institutional information in the 2010 Global Forest Resource Assessment speaks to this challenge also.

Regarding Orr's third challenge, the need to improve communication about the meaning of the changes being observed through our use of C&I has been recognized. But I think we are still babes learning to walk when we need to be teenagers building our speed and stamina for the race ahead of us. Faster progress toward SFM depends on our ability to do a better job of telling stories and educating the public.

Regarding Orr's fourth challenge, I think we have stumbled by assuming that rational, logical solutions through science are all that we need to achieve forest sustainability. If new silvicultural methods, new reforestation machinery, or better satellite imagery were all that were needed to achieve sustainable forests, then we would be much farther along the pathway toward sustainability than we are today. No, we need to look to higher levels of understanding to deal with the complexities of forest sustainability. Logical, rational, scientific solutions appeal to the head. We also need to appeal to the heart to solve forest sustainability issues. The mindset that pursues "get all that you can" from forests today ignores the needs of future generations, and it is only our love for our grandchildren and our aspirations that they will also be able to enjoy forests can break that mindset. To achieve sustainable forests, we leaders need to be inspiring as well as rational and logical. We need stories that move hearts as well as move minds.

Conclusions and Recommendations

The time has come to shift some energy from C&I themselves to using the information generated by C&I to motivate changes in forest management. Although additional refinements of indicators will be helpful, the rapid emergence of public dialog about sustainability in multiple sectors means that foresters need to refocus more of their energy on telling stories about the changes we are observing in forests and the changes that are needed in society to obtain a more sustainable future.

Improved models or overarching frameworks can help us bridge from the technical work of indicators to the social discourse that needs to occur. Writing the rationales for selecting indicators, exploring the assumptions and values behind indicators, and documenting the linkages assumed to exist among indicators provides a clearer picture of the concepts and thinking behind why indicators—individually and as a set—were chosen. There are too many downsides and too many opportunities foregone from not having models or overarching frameworks. Effort is warranted now to remedy this situation.

But having models and frameworks is only a midpoint in the process, not the desired end. More important is using improved understanding and insights generated by models and frameworks to build compelling stories about where we are along the pathway toward sustainability and what changes are needed to accelerate the transition toward sustainable forests. The limiting factors at this point are not so much our technical abilities to manage forests in sustainable ways. Rather, the limiting factors are more in our collective wills to change mental models, social goals, and political will to management forests sustainably.

Overcoming these limiting factors takes more than a good set of C&I. It takes messages that inform social discourse, question existing mental models of “good” forest management, elevate the outlooks of forest stakeholders, and boost our collective aspirations for leaving healthy, productive, and diverse forests for future generations. Creating these messages and using them to advance social discourse takes lots of energy. I hope that you will lend your energy to these endeavors because we all are needed to help move people and policymakers, communities, and countries around this globe toward sustainable forests for us who are here now and for future generations.

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Sustainability Impact Assessments of Policy Changes—Recent Development of Analytical Modeling in Europe

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Introduction

Sustainability has recently become an important component in policymaking, but in forestry it has been a major concept for a long time. As early as the mid-17th century, the negative influence of forest utilization practices and the needs for future generations for the continued use of these resources had been observed. Forestry can therefore be considered as the first science that explicitly incorporated concerns about safeguarding finite natural resources for future generations (Wiersum 1995).

The terms “sustainability” or “sustainable development” are nowadays more broadly understood as “meeting the needs of the present without compromising the ability of future generations to meet their own needs” (WCED 1987). Since the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, the sustainable development concept has entered the political agenda. This was reinforced by the 2005 World Summit on Sustainable Development, which declared that—to be effective—action on sustainability must involve cooperation across three sustainability dimensions: environment, society and, economy. Firbank *et al.* (2007) interpreted these three dimensions in the following way: “The economic issue at the heart of sustainable development relates to whether present or proposed rates of resource use and consumption can be sustained at levels that maintain current standards of living (Solow 1993). The environmental issue is whether or not the ecosystem goods and services we need (such as food, water regulation, landscape quality) can be delivered at the required levels (Reid *et al.* 2005). The social issue is whether resource use and consumption promote human well being (UNDP 2005).”

In 1999, sustainability impact assessment (SIA) was introduced by the European Union Commission to identify possible economic, environmental and social effects of trade agreement outside the European Union (EU) in anticipation of the World Trade Organization round of negotiations. This standard was later expanded to cover also other policy developments (European Commission 2002). The EU Strategy for Sustainable Development adopted by the European Council in Göteborg in June 2001 postulated the need “to judge how policies contribute to sustainable development.” Additionally, the full effects of a policy proposal need to be carefully assessed, including estimates of its economic, environmental, and social impacts inside and outside the EU.

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In response to these needs, ex-ante SIA methods have been developed in Europe. They are understood as a formal procedure to analyze potential effects of new policies before their adoption and seek to identify possible economic, environmental, and social effects of proposed policies and their consequences with respect to sustainable development (Tscherning *et al.* 2008). In general, impact assessment (IA) supports decisionmaking and tries to ensure that potential development options are environmentally and socioeconomically sound. IA deals with identifying, predicting, and evaluating the foreseeable impacts, both beneficial and adverse, of public and private policy-related development activities. IA is concerned with alternatives and mitigation measures and aims to optimize positive impacts and eliminate or minimize negative ones. It therefore differs from goal-oriented oriented impact evaluation, which assesses the effectiveness of policy options in reaching a defined policy target (Tscherning *et al.* 2008).

The aim of this paper is to present recent developments in assessing sustainability impacts in forest management and the forest-based sector. This work stems from two large European integrated research projects, SENSOR (2004-2008) and EFORWOOD (2005-2009), which both develop tools for ex-ante SIA.

The SENSOR Project

The SENSOR² project aimed at delivering ex-ante sustainability impact assessment tools (SIAT) for policy support that fully integrate social, economic, and environmental impacts of policy-driven land use changes at the European scale (Helming *et al.* 2008). SIAT was developed as a metamodel, in which policy options together with global socioeconomic trends are translated into land use scenarios, which were simulated at 1-km² grid resolution for the area of the EU. Based on qualitative and quantitative indicator analyses, impacts of the simulated land use scenarios on social, environmental, and economic sustainability issues are assessed at the regional scale. Valuation of these impacts was based on the concept of multifunctionality of land use (Helming *et al.* 2008).

The focus of SENSOR was not on the forestry sector only but on all economic sectors and activities that are involved in land use. At the European level, these sectors included agriculture and forestry as main sectors and, in addition, transport and energy infrastructure, rural tourism, and nature conservation (Helming *et al.* 2008).

The basic approach in SENSOR to ex-ante assess policy impacts on land use was to (1) link policy options with land use changes; (2) link land use changes with environmental, social, and economic impacts; and (3) provide a valuation framework of these impacts in the light of sustainable development. To achieve the first step, a modeling chain was developed (Jansson *et al.* 2008a). In the chain, a forest resource model (EFISCEN) was connected to a macroeconomical model (NEMESIS), an agricultural sector model (CAPRI), and a land use allocation model (CLUE-S). By using this approach, a sector-

² SENSOR: Sustainability Impact Assessment: Tools for Environmental, Social and Economic Effects on Multifunctional Land Use in European Regions. See <http://www.sensor-ip.eu/>.

specific policy could be introduced in one of the models and its impacts on land use could be determined for the whole economy and all sectors at the same time with great detail.

In the second step, land use changes were linked to environmental, social, and economic impacts. For this purpose, about 40 indicators were selected, which were considered to be sensitive to land use changes. The indicators were selected such that each of the sensitive impact issues of the European Impact Assessment Guidelines (CEC 2005) could be described with at least one indicator (Helming *et al.* 2008). Indicators related to the forest land use and forestry are shown in table 1.

Table 1.—*Indicators included in the SIAT related to forest land use and forestry.*

Dimension of sustainability	Impact issue	Indicator
Environmental	Water quality and resources	Water abstraction rate Water retention capacity
	Soil quality and resources	Soil erosion risk by water Soil organic carbon content Soil erosion risk by wind
	Climate change	Carbon stocks and sequestration CO ₂ emission
	Renewable and nonrenewable resources	Biomass potential
	Biodiversity	Deadwood Spatial cohesion
	Environmental risks	Forest fire risk
Social	Employment and labor markets	Unemployment in agriculture, hunting, forestry, and fishing Employment in agriculture, hunting, forestry, and fishing
	Public health and safety	Exposure to forest fire risk
	Tourism pressure	Recreational pressure from tourism
	Landscape identity	Change of visual attractiveness
Economic	Competitiveness, trade, and investment flows	Net flow of traded goods in the forestry sector
	Operating costs and conduct of business	Labor costs in the forestry sector
	Specific regions and sectors	Value added in the forestry sector

SIAT = sustainability impact assessment tool.

Sources: Bach *et al.* (2008), Farrington *et al.* (2008), Petit *et al.* (2008).

Each indicator was linked to land use as modeled within the modeling chain. These linkages took many different forms; e.g., the deadwood indicator was built within the forestry sector model EFISCEN (Verkerk *et al.* N.d.), while the forest fire risk indicator was a qualitative rule-based model using expert knowledge to link changes in land use type and management with changes in forest fire risk (Bach *et al.* 2008).

In the third step, an approach was developed to answer the question of whether a change in an indicator actually matters. Sustainability limits were defined for each indicator, which defined the point beyond which unacceptable consequences were likely to occur (Bertrand *et al.* 2008). Furthermore, the assessment of impacts on individual indicators was translated into an integrated assessment. All impact indicators were therefore assigned to one or more land use functions, which represented the goods and services provided by the different land uses that summarize the most relevant economic, environmental, and societal issues of a region (table 2). The land use functions enabled, finally, the assessment of policy impacts across sectors and dimensions of sustainability and at various levels of spatial aggregation.

Table 2.—*Land use functions used in SENSOR to assess policy impacts across sectors and dimensions of sustainability and at various levels of spatial aggregation.*

Societally oriented	Economically oriented	Environmentally oriented
Provision of work	Residential and land-independent production	Provision of abiotic resources
Human health and recreation (spiritual and physical)	Land-based production	Support and provision of biotic resources
Cultural (landscape identity, scenery, and cultural heritage)	Transport	Maintenance of ecosystem processes

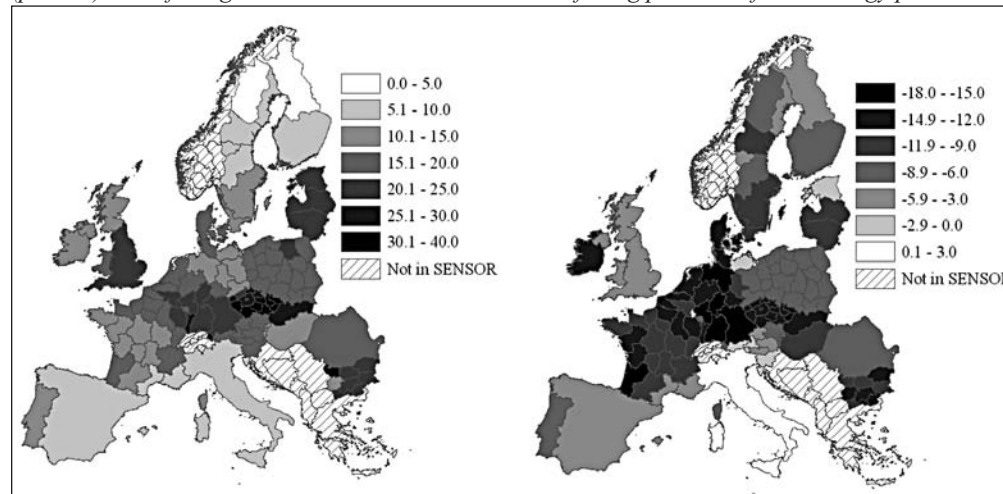
Source: Perez-Soba et al. (2008).

Based on these three steps, the SIAT enables a policymaker to quickly analyze a range of potential land use policies on their impacts on sustainability in Europe. Policies that are analyzed included in the SIAT include the following (Kuhlman *et al.* 2008):

- Options to promote the production and consumption of energy from biomass.
- Options to reform the common agricultural policy (CAP) and reinvest saved funds in research and development.
- Extending Natura 2000 areas for biodiversity.
- Afforestation of abandoned agricultural land.

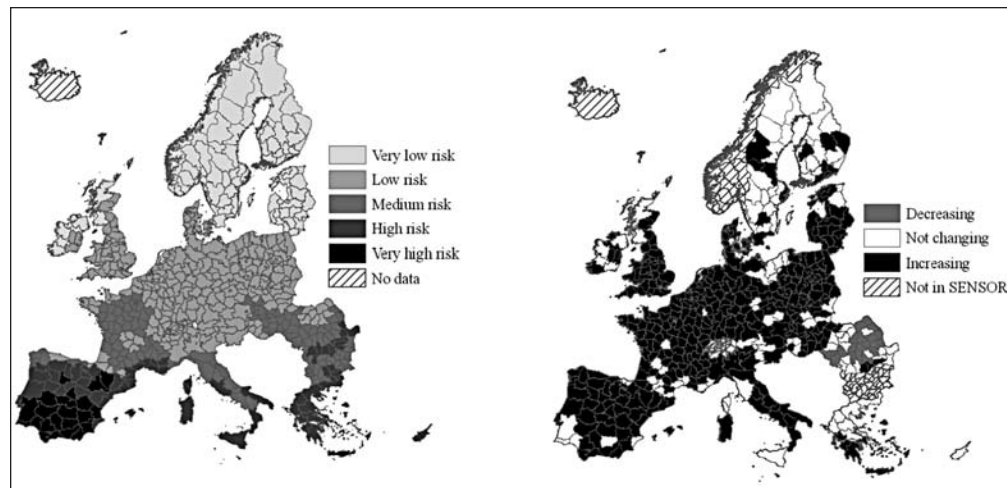
We present here the impact of two potential policies as an example for the approach developed within SENSOR. In figure 1, the impacts are shown of increasing harvest levels to the maximum potential and extracting harvest residues on the amount of deadwood in European forests. The amount of deadwood decreases in most regions across Europe, indicating that intensified forest management for producing bioenergy could negatively affect forest biodiversity (Verkerk *et al.* N.d.). In figure 2, the impacts on forest fire risk are shown of abolishing agricultural price support and single farm and area payments within the CAP and reinvesting saved funds into research and development. Major reforms in the CAP result in the abandonment of agricultural land (Jansson *et al.* 2008b) and this increases the risk of forest fire across Europe (Verkerk and Lindner, unpublished data).

Figure 1.—*The amount of deadwood (ton ha⁻¹) without policy changes in 2025 (left) and change (percent) when felling levels are increased to maximum felling potentials for bioenergy production.*



Source: Verkerk et al. (N.d.).

Figure 2.—Forest fire risk due to climate (left) and change in risk in 2025 (right) due to land use change as a result from abolishing the common agricultural policy for the post-2013 European Union financial perspective and reinvesting the released funds on research and development.



Source: Verkerk and Lindner (unpublished data).

The EFORWOOD Project

The aim of the EFORWOOD³ project is to build a decision-support tool for evaluating forest industrial activities against their impact on sustainable development. The approach, as shown in figure 3, addresses all aspects of sustainability (i.e., economic, environmental, and social aspects) and assesses them not only for forest resource management but for complete forest value chains, including forest resource management, forest-industry interactions, consumption, and end-of-life of wood based products. EFORWOOD is concentrating on the forest-based sector but is based on the idea of developing a general method to assess the sustainability impact of complete industrial sectors (or parts thereof).

The tool developed in EFORWOOD is called Tool for the Sustainability Impact Assessment (ToSIA) of Forest-Wood Chains (FWCs). ToSIA calculates material flows through the production processes of the FWC and links them with sustainability indicators (Lindner *et al.* 2007). Within the EFORWOOD project, information on 27 main indicators with more than 100 subindicators are collected, covering all three pillars of sustainability (table 3). ToSIA can apply data from a range of data sources. Within EFORWOOD, official statistics provide the input data; in other cases, the data are derived from model outputs of process-specific or partial wood-chain models. Expert judgments also will be considered in the lack of more robust information. Metadata inform about the quality and the source of the data is also collected and transparently presented within the ToSIA concept.

The sustainability analysis within ToSIA is done by selecting, weighing, and analyzing indicator values for alternative FWCs. By comparing FWCs, it is possible to assess the relative sustainability impacts of FWCs and the tradeoffs between different sustainability

³ EFORWOOD: Sustainability Impact Assessment of the Forestry—Wood Chain; 6th EU Framework Programme; Environment Thematic Priority: 6.3 Global Change and Ecosystems. See www.eforwood.com.

indicators can be identified. ToSIA allows decisionmakers to analyze sustainability impacts of changes due to deliberate actions (e.g., in policies or business activities) or due to external forces (e.g., climate change, global markets). Target user groups of the tool are the European Commission, the forest-based industries, policymakers and civil servants at national and regional levels, nongovernmental organizations, and researchers. ToSIA is suitable for identifying hotspots in value chains that can contribute to improved sustainability. ToSIA is primarily designed to give answers to “What if?” questions. For example: What if the EU introduces new policies on, e.g., energy/transport/recycling/

Figure 3.—Scheme showing the sustainability indicators (social, environmental, and economic indicators) linked to different processes along the forest-wood chain.

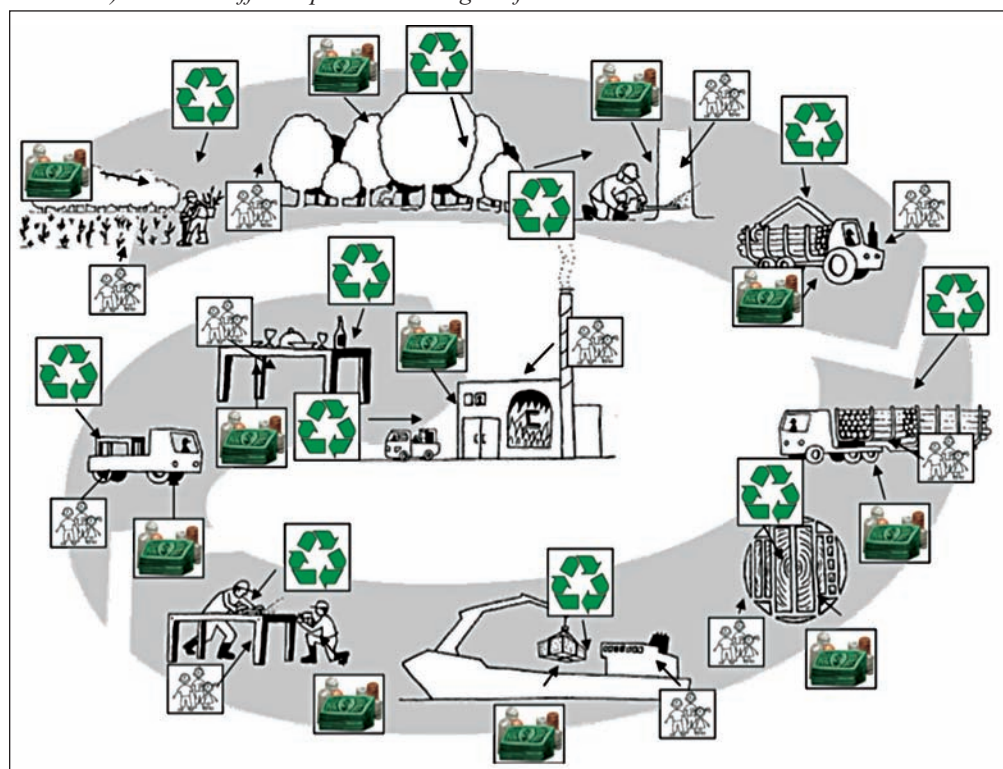


Table 3.—FWC-sustainability indicators developed in EFORWOOD*.

Economic indicators	Social indicators	Environmental indicators
(1) Gross value added	(10) Employment	(18) Energy generation and use
(2) Production cost	(11) Wages and salaries	(19) Greenhouse gas emissions and carbon stock
(3) Trade balance	(12) Occupational safety and health	(20) Transport
(4) Resource use, including recycled material	(13) Education and training	(21) Water use
(5) Forest sector enterprise structure	(14) Corporate social responsibility	(22) Forest resources
(6) Investment and research and development	(15) Quality of employment	(23) Soil condition
(7) Total production	(16) Provision of public forest services	(24) Water and air pollution
(8) Productivity	(17) Consumer behavior and attitudes	(25) Forest biodiversity
(9) Innovation		(26) Forest damage
		(27) Generation of waste

FWC = forest-wood chain.

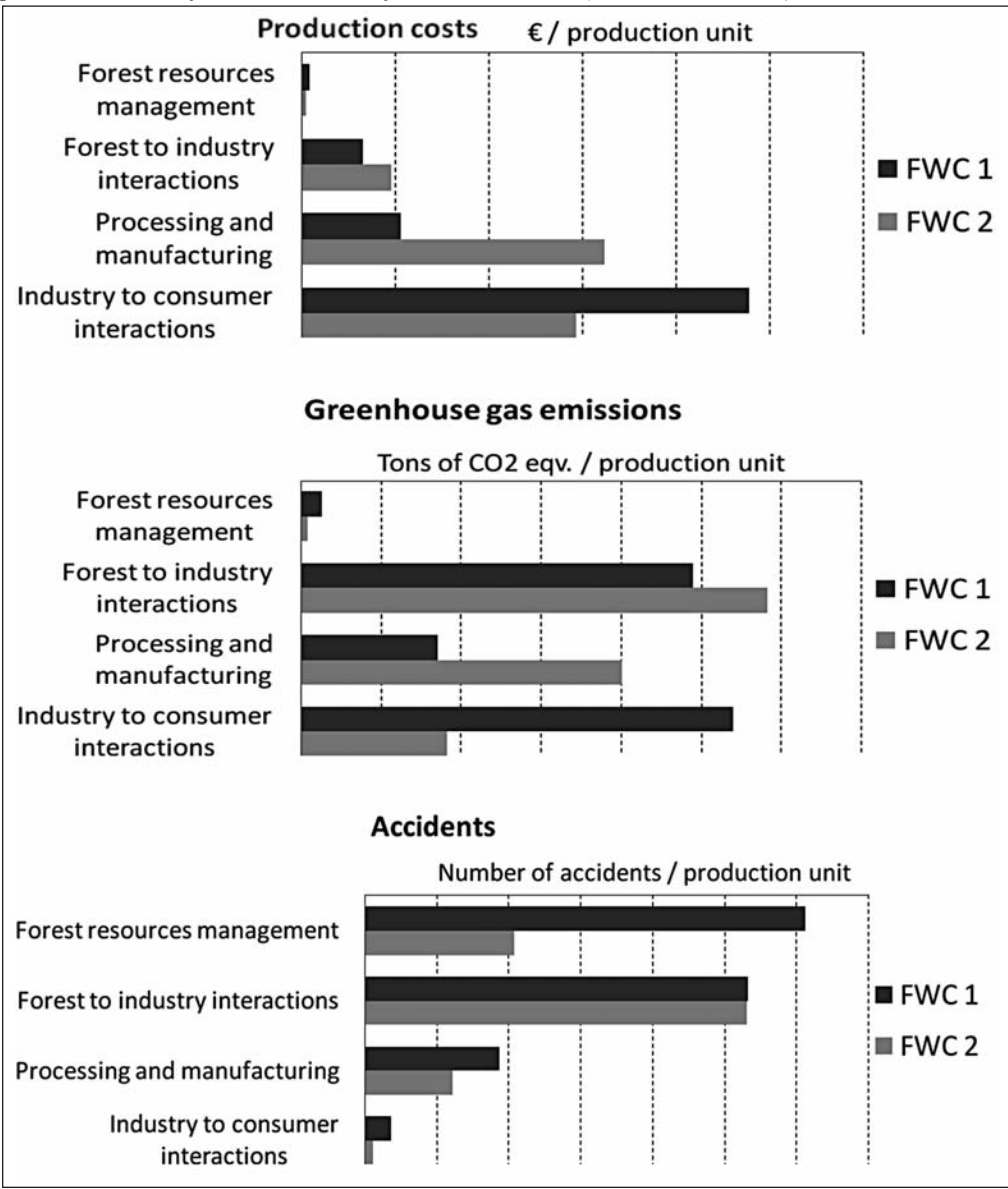
* All the main indicators listed here contain several subindicators.

Source: Rametsteiner et al. (2008).

habitat protection? What if the consumption of wooden frames in houses is doubled? What if global market changes or oil price doubles? All these external drivers affect the FWCs and will lead to sustainability impacts. Figure 4 illustrates with three example indicators how the resulting FWC alternatives will impact indicator values that are aggregated for parts of the FWC.

ToSIA is very scalable and can operate at different levels, within defined system boundaries. In the EFORWOOD project, a number of case study applications will be implemented. These include single chains studying the material flow of relatively simple and concise FWCs, case studies with a regional focus that consist of ensembles of multiple FWCs, and a European FWC analysis operating at the country scale.

Figure 4.—Example indicator values for the three sustainability dimensions calculated per unit of product consumed for two alternative forest value chains (FWC 1 and FWC 2).



Each of the case study applications will implement selected scenario applications. The scenarios are compared to two contrasting baseline reference futures, which are constructed on the basis of different Intergovernmental Panel on Climate Change *Special Report on Emissions Scenarios* (Nakicenovic and Swart 2000). A1 describes a future world of rapid economic growth, global population that peaks in midcentury and declines thereafter, and the rapid introduction of new and more efficient technologies. The B2 storyline and scenario family describe a world in which the emphasis is on local solutions to economic, social, and environmental sustainability. It is a world with continuously increasing global population, intermediate levels of economic development, and less rapid and more diverse technological change than in the A1 storylines. The scenarios that are developed above these reference future assumptions, including changes in EU bioenergy policy, set-aside areas, demand for wood-based products, and technological productivity.

ToSIA allows decisionmakers to calculate the scenario effects in terms of aggregated indicator values for total FWCs or their parts with defined system boundaries. This can be presented, e.g., as total sustainability impact for a national forest-based sector. Furthermore, a methodology is currently under development to link the sustainability indicators to the different products produced in the selected forest value chains. Indicator values can also be calculated per product unit, which makes it then easier to compare sustainability impacts for alternative FWCs (cf. fig. 4).

To be able to analyze and evaluate the various calculated indicator values of the FWCs, ToSIA will incorporate submodules for multicriteria analysis (Mendoza and Martins 2006) and cost-benefit analysis (Nas 1996). They will allow users to weight and analyze the results in a systematic manner.

Conclusions

Implementing European policy targets on securing sustainable development objectives for important economic sectors will require improved decision-support tools. Two approaches to assessing sustainability impacts were presented. Both are quantitative integrative assessment approaches utilizing environmental, social, and economic sustainability indicators (Ness *et al.* 2007). While the SENSOR project is focusing on sustainability impacts of changes in land use based on a modeling chain of macroeconomic, sectoral, and land use models, EFORWOOD is focusing on the SIA of complete forest value chains spanning from forest resource management to the end-of-life of wood products. The tools allow decisionmakers to analyze tradeoffs between indicators as impacted by changes in policies or other external drivers. The tools offer transparent and comprehensive scientific frameworks for analyzing complex sustainability impacts, thus supporting decisionmaking processes and providing valuable background material for discussing potential resource use conflicts such as the tradeoff between increased use of forest resources for bioenergy and the protection of biodiversity in forests.

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Logic-Based Evaluation of Forest Ecosystem Sustainability¹

Keith M. Reynolds², Sean N. Gordon², and K. Norman Johnson³

Introduction

In this paper, we have three objectives: (1) to illustrate the utility of a logic-based approach to evaluating the sustainability of forests and their benefits using the Montréal criteria and indicators (C&I), (2) to identify the roles of science and policy in this effort, and (3) to illustrate the application of C&I with a prototype model designed for the *U.S. 2003 Report* (USDA Forest Service 2004). To accomplish these objectives, we present a prototype logic framework for using C&I in assessing sustainability, highlight the policy choices that must be made in this construction, and discuss some of the lessons we learned along the way.

Criteria and Indicators

Prabhu *et al.* (2001) describe C&I as “information tools in the service of forest management” in the sense that they “can be used to conceptualize, evaluate, implement, and communicate sustainable forest management.” For the purposes of this paper, we follow the definitions of C&I given by Prabhu *et al.* (1999a). In addition to C&I, it is also necessary for subsequent discussion to define measurement endpoints. Some Montréal indicators are simple; their definition suggests an obvious one-to-one correspondence between an indicator and a metric for that indicator. However, definitions of some Montréal indicators are more complex in the sense that they represent a synthesis of two or more data elements, which we refer to as measurement endpoints.

Any indicator or criterion implies a model and set of assumptions that relates the indicator to more complex phenomena and comes with an obligation to make explicit both the metric and the underlying model (Adriaanse 1993, Hammond *et al.* 1995). Relatively little research to date has focused on developing formal representations of indicators and their interrelations as a basis for actually evaluating sustainable forest management (SFM) despite recent widespread interest in developing and applying C&I for evaluating SFM (Prabhu *et al.* 2001). However, a few efforts have been experimenting with the use of semantic networks and similar types of representation (Colfer *et al.* 1996, Haggith *et al.* 1998, Prabhu *et al.* 1999b). In this paper, we consider the use of a logic-based network

¹ This paper is an abbreviated version of Reynolds *et al.* (2003a) but with the addition of results from a prototype model.

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representation for evaluating the Montréal C&I as a way to cope with the semantic vagueness inherent in natural language (Zadeh 1976). Our primary objective is to show how representation in formal logic can help reveal the myriad decisions involved at the science/policy interface of SFM as well as enhance the transparency and consistency of evaluations.

Montréal Criteria and Indicators

The Montréal specifications provide relatively clear definitions of biophysical, socioeconomic, and institutional attributes requiring evaluation (WGCICSMTBF 1995). However, design of evaluation procedures that allow interpretation of the Montréal C&I is one of the major technical issues that remain to be resolved (Raison *et al.* 2001). The design of any model that purports to evaluate sustainability with respect to a set of C&I must necessarily incorporate value judgments and other subjective elements (Prabhu *et al.* 2001), and this is no less an issue for biophysical aspects as it is for socioeconomic ones (Lélé and Norgaard 1996). We discuss several specific aspects of subjective design elements in the context of logic models in the Model Design Issues section.

Conceptual Frameworks

Sustainability is fundamentally a human construct (Franklin 1993). Hence, any discussion of resource sustainability is strongly conditioned by human values and objectives. Following Davis *et al.* (2001), six elements are needed to assess the sustainability of values in which we are interested:

1. Specific conditions or outcomes to be sustained (the indicators).
2. A measure for each condition or outcome.
3. Calculation of the level of the indicator over some time period using the selected measure.
4. A frame of reference for gauging sustainability.
5. Methods for assessing sustainability (sustainability check).
6. A monitoring program.

Both science and policy are needed to apply this framework. Policy decisions are needed to select the values of interest and the methods for assessing sustainability. Science is needed to specify indicators and measurement endpoints, develop reference conditions (e.g., step 4), and specify a monitoring plan. Successfully completing these tasks requires the joint effort of policymakers and scientists, with significant interaction between the two groups.

Representation of what we think we know about ecosystems often is problematic and, while scientific frameworks are valuable organizing tools (Johnson *et al.* 1999), a basic difficulty is that the framework concept itself is ill defined. What constitutes a useful framework? Too often, the term connotes a conceptual model with no well-defined,

underlying syntax, so the problem specification is semantically vague at best and unintelligible at worst. One way to cope with semantic vagueness (lexical uncertainty) is by constructing a formal logic with well-defined syntax and semantics. Interpretation of data by a logic processor can then provide a consistent evaluation of system states and processes represented in the model.

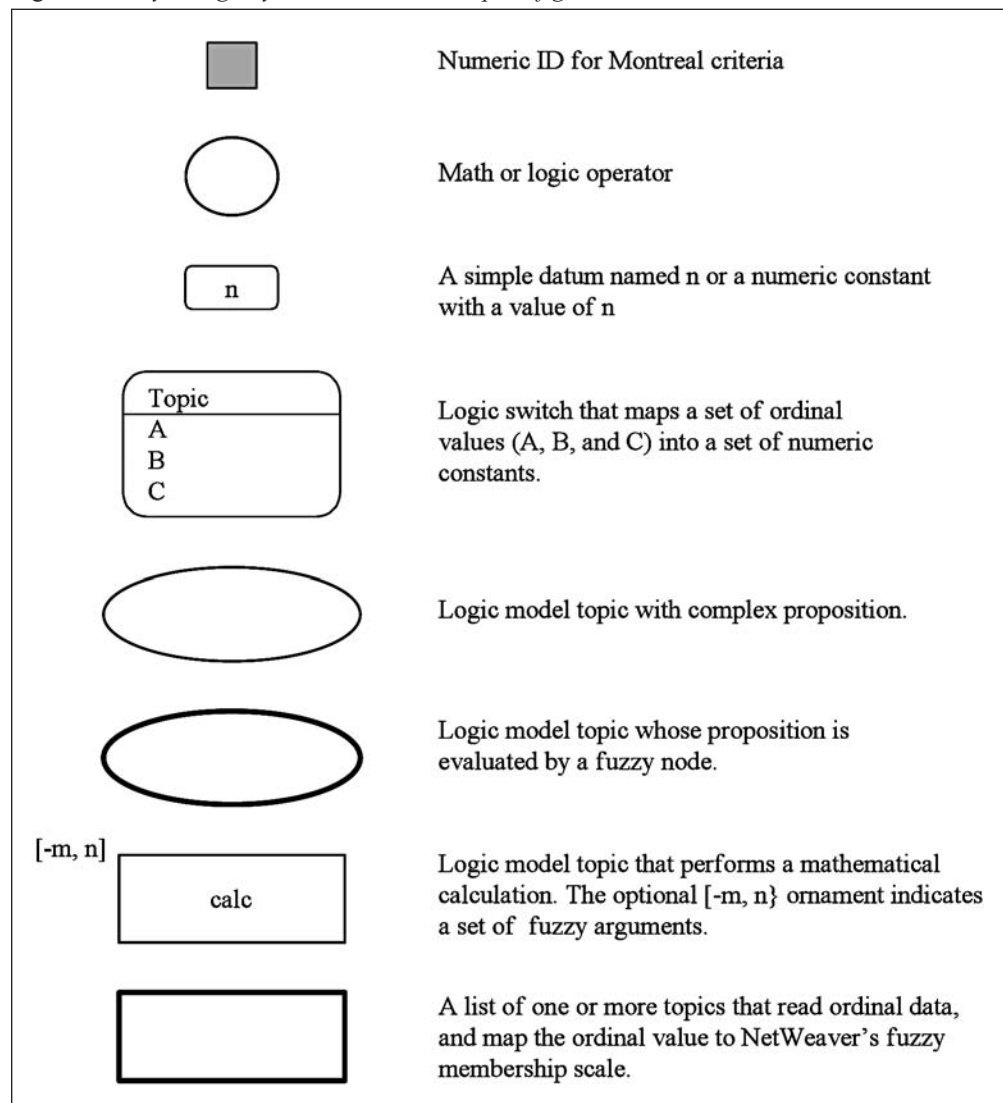
Using Logic Models as Design Frameworks

Logic models (or knowledge bases) provide a formal specification for organizing and interpreting information, and are a form of metadatabase. As a metadatabase, a logic model helps ensure consistency in interpretation of data across time and space. Such models can be designed for broad geographic application by taking some care in their design. In our design of a specification for evaluating SFM, we use the NetWeaver Developer system (Rules of Thumb, Inc., North East, PA) that represents a problem in terms of propositions about topics of interest and their logical interrelations. In the design of a NetWeaver model, a topic for analysis is translated into a testable proposition. For example, if the topic is forest sustainability, the associated proposition might be as simple as “The forest ecosystem is sustainable.” The statement of the proposition by itself is inherently vague because sustainability is an abstract concept. However, the full formal logic specification underlying a proposition makes the semantic content of the proposition more clear and precise (figs. 1 and 2). The biophysical, socioeconomic, and framework topics (fig. 2) are logical premises of forest sustainability. The proposition about forest ecosystem sustainability evaluates as *true to the degree that* integrity of the biophysical environment, suitable socioeconomic conditions, and a suitable institutional framework exist. The phrase, “true to the degree that” emphasizes that strength of support for propositions in logic models is evaluated by “evidence-based reasoning.” This form of reasoning can be implemented with fuzzy math (Reynolds *et al.* 2003a), a branch of applied mathematics that implements qualitative reasoning as a method for modeling lexical uncertainty (FuzzyTech 1999).

The logical discourse on forest ecosystem sustainability is extended by providing a logic specification for each premise. Each iteration of discourse extends the logic structure another level deeper by defining a logic specification for each topic in the previous level. The process generally proceeds from abstract to concrete propositions, with premises of a particular proposition tending to be less abstract than that proposition. Eventually, each logic pathway ends in a premise, or set of premises, each of which can be evaluated by reference to data. Pathways in a logic model can thus be construed as a cognitive map of the problem that provides a formal data specification. However, this specification not only describes what data are to be evaluated but how the data are to be interpreted and synthesized to arrive at conclusions.

The semantics of a logic model are easily conveyed to broad audiences in graphic form. A group of specialists, representing diverse disciplines, can easily collaborate on the design of a complex logic model, because the structure and its graphic representation provide an effective basis for organizing discussion. During model evaluation, conclusions and

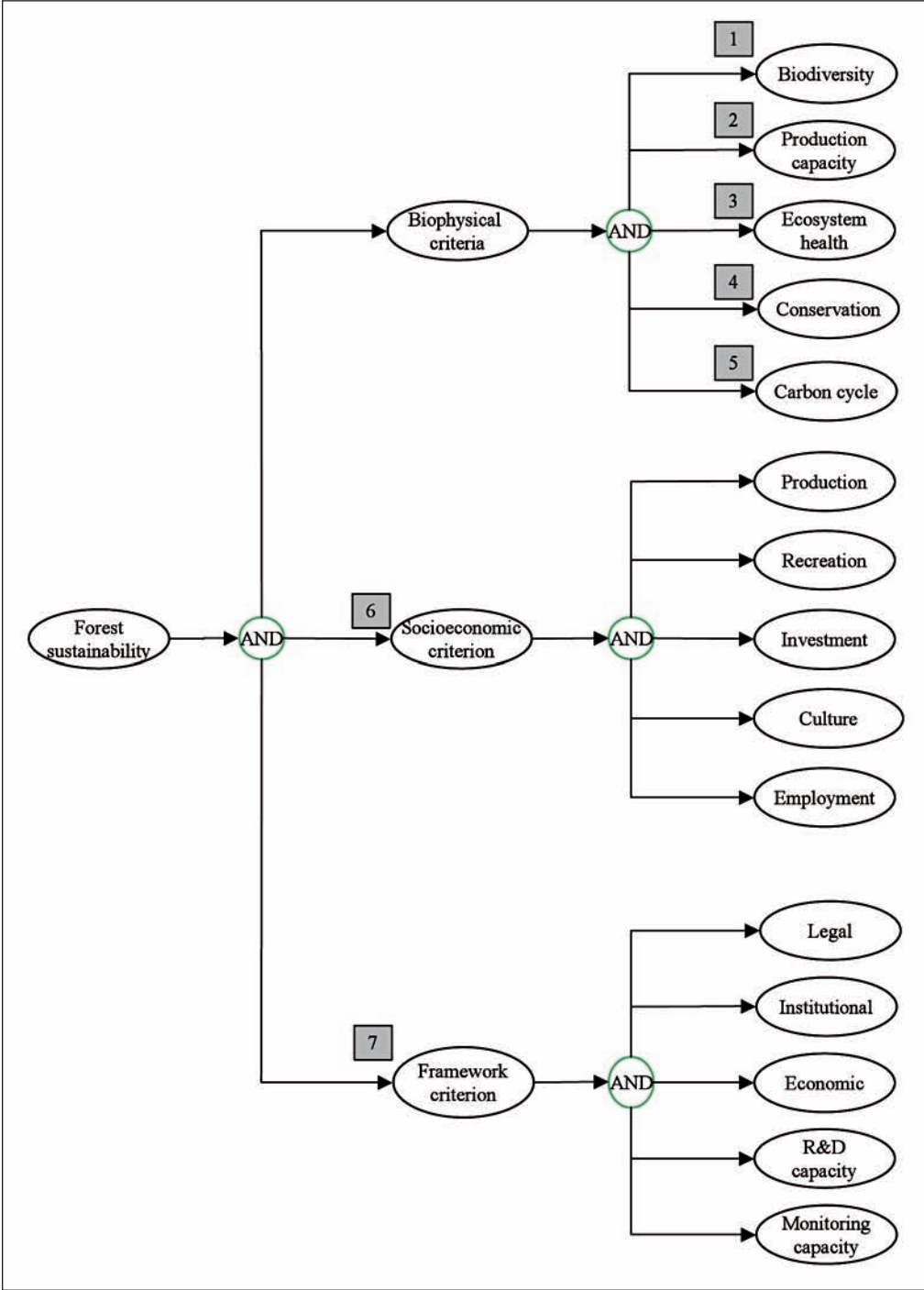
Figure 1.—Key to logic symbols used in subsequent figures.



explanations of their derivation are intuitively traced through the evaluated state of a logic model to communicate effectively with both policymakers and other interested parties. Effective communication between model designers, scientists, and policymakers is especially important in the context of designing a logic model for evaluating SFM, because many aspects of model design reflect important policy decisions concerning how sustainability is to be evaluated.

The design of logic models involves both interpretation of data and synthesis of information. Here, we focus on the synthesis dimension. One of the more significant challenges that has emerged for all countries preparing and presenting national reports on SFM is how to distill the volumes of information collected into the kinds of major conclusions that policymakers and, ultimately, the public care about. For example, the Montréal Process specifies nine indicators concerned with biodiversity. A few of these biodiversity

Figure 2.—Partial logic specification for evaluating the sustainability of a forest ecosystem. Each premise has its own logic specification that may extend many more levels. NetWeaver knowledge bases are graphically built from modular components like this, simplifying incremental development of complex models. Only the first three levels of network structure are illustrated.



indicators involve dozens of measurement endpoints that must be synthesized to generate an index for the indicator. However, even if we take for granted that suitable indexes exist for the nine Montréal biodiversity indicators, there is still the question, “What does this set of indexes tell us about the status or trend of biodiversity?” Formal logical argument, structured in terms of successive levels of conclusions and premises, as discussed previously, can provide useful answers to such higher order questions by imposing levels of organization that succinctly “tell a story” in relatively intuitive terms.

Prabhu *et al.* (2001) emphasize the need for transparency in models that evaluate C&I for SFM because any such model embodies important policy decisions in its specification and depends on value judgments and critical assumptions that require documentation. For example, the specific arrangement of C&I within a logic framework reflects value judgments concerning the relative importance of components being evaluated and thus constitutes an important policy decision. We have already mentioned how the graphical representation used in logic models facilitates discussion on the design of models and the derivation of conclusions. Equally important, such a framework also can provide an extensive set of documentation attributes for each topic in a model, including description of the proposition, explanation of the proposition, technical authorities, literature citations, and assumptions.

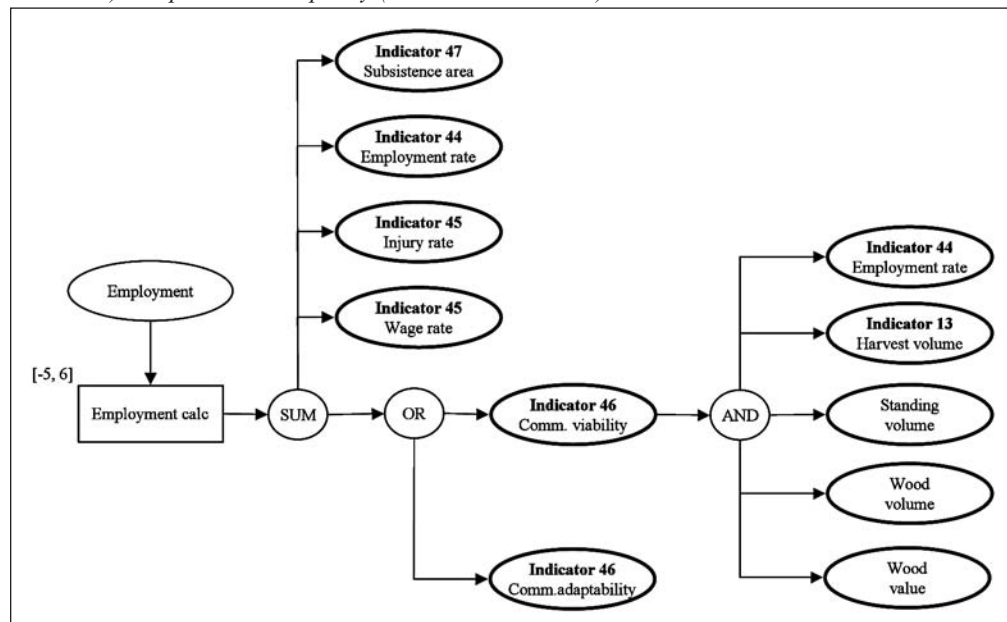
Model Design Issues

Implications of Model Organization

Most representations of C&I for evaluating SFM are arranged hierarchically (Prabhu *et al.* 2001), and this is true in the case of the Montréal C&I (WGCICSMTBF 1995). However, Prabhu *et al.* (2001) emphasize the value of a more general network representation such as that used in logic models, which allows cross-linkage among indicators and perhaps other intermediate topics. In our current prototype of the Montréal C&I logic, e.g., evaluation of community viability (indicator 46) depends on indicators 13 and 44 as well as data elements related to other indicators (fig. 3). This ability to represent interdependencies among indicators means that the logic can account for both mutual dependencies and tradeoffs.

The organization of topics within the current Montréal design specification has important policy implications. For example, many colleagues have found the highest level organization (fig. 2) quite acceptable, but an alternative representation is quite possible (fig. 4), and these two representations of sustainability would produce very different evaluations. The five biophysical criteria in the current specification are subsumed under the biophysical topic (fig. 2). This specification effectively asserts that the collective evidence from all biophysical criteria is equal, in terms of strength of evidence for sustainability, to the collective evidence from criterion 6 or criterion 7. The alternative representation (fig. 4) puts much greater emphasis on the biophysical criteria, asserting that the collective evidence of each biophysical criterion (1 to 5) is equal to that for criterion 6 or criterion 7.

Figure 3.—Logic specification for evaluation of the employment topic under the socioeconomic criterion (criterion 6). Community viability depends on (e.g., is cross-linked to) indicators 13 and 44 as well as data elements of other biophysical indicators related to wood production (indicators 29 and 31) and production capacity (indicators 11 and 12).



Synthesis of Information

Evaluation of any criterion for SFM involves multiple indicators. Therefore, the definition of a criterion (Prabhu *et al.* 1999a) stresses the need for integration of information in evaluating any SFM criterion. In the case of the Montréal C&I, the integration of information may, in fact, extend many levels deep (e.g., figs. 2 and 4). The specifications of the employment topic (fig. 3) and biodiversity (criterion 1, fig. 5) illustrate another design issue with significant policy implications: the choice of how to integrate information. The most commonly used logical operators for combining elements in NetWeaver are AND, OR, and SUM. That a logic model requires us to explicitly assign an operator at each synthesis step reveals critical information that is often left undefined in less formal descriptions.

The computation implemented by the NetWeaver AND operator effectively evaluates the set of topics that are arguments to the operator as limiting factors. That is, the result of the AND operation is constrained by the least favorable component. A three-legged stool is a useful visual analogy to the AND operator: if one leg is removed (a line of evidence evaluates as fully false), the stool topples.

The SUM operator, commonly associated with calculations in the Montréal logic model, effectively asserts that the topics in the set of arguments to the SUM operator can compensate for one another. For example, in the evaluation of the ecosystem diversity topic (fig. 5), if the proposition for indicator 2 evaluates as unsupported, but propositions for indicators 3, 4, and 5 evaluate as fully supported, then the strength of evidence for suitable ecosystem diversity evaluates to 0.75 on a scale of [0, 1].

Figure 4.—An alternative (partial) logic specification for evaluating the sustainability of a forest ecosystem. In this representation, biophysical criteria assume more importance compared to figure 2.

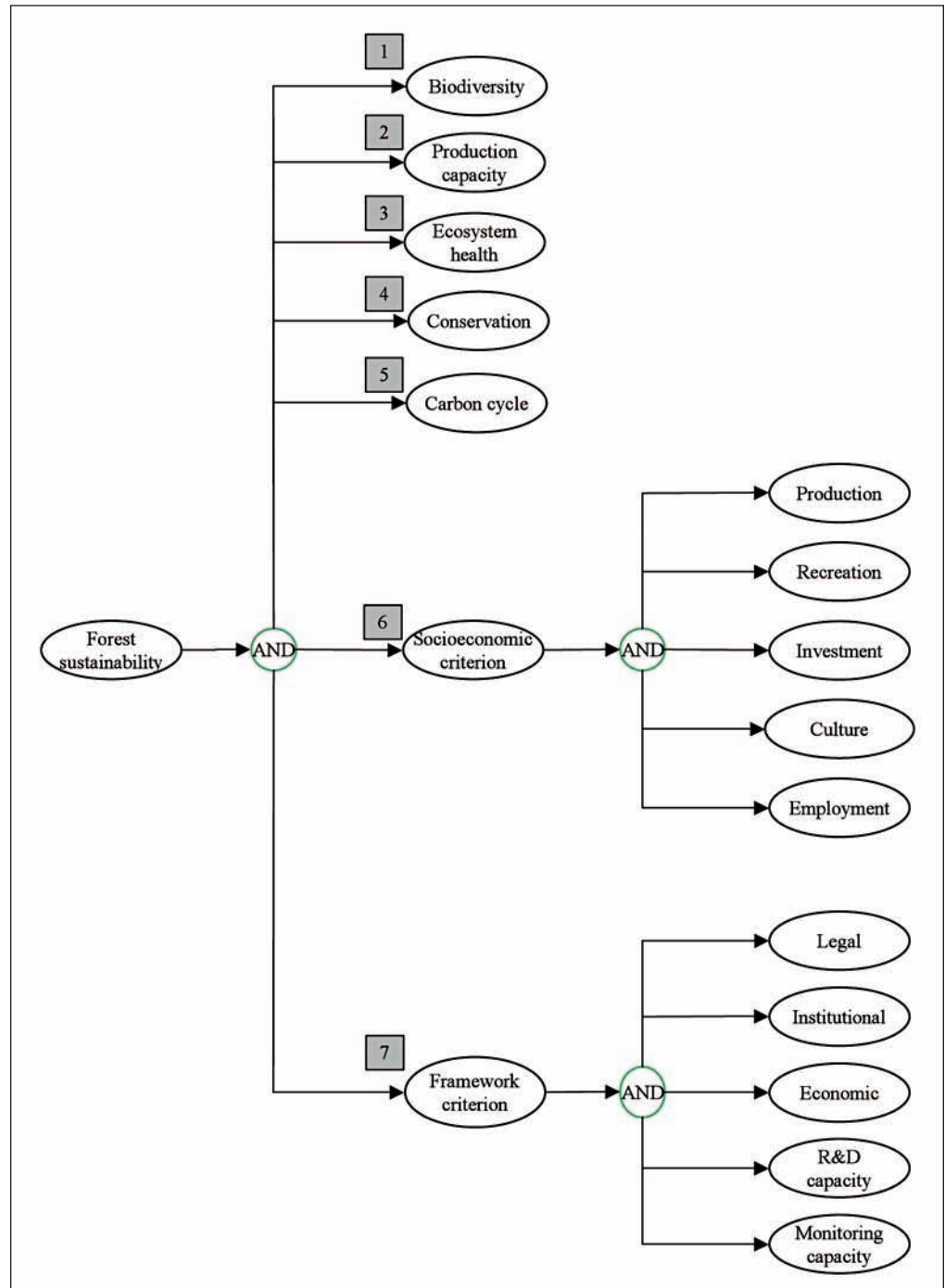
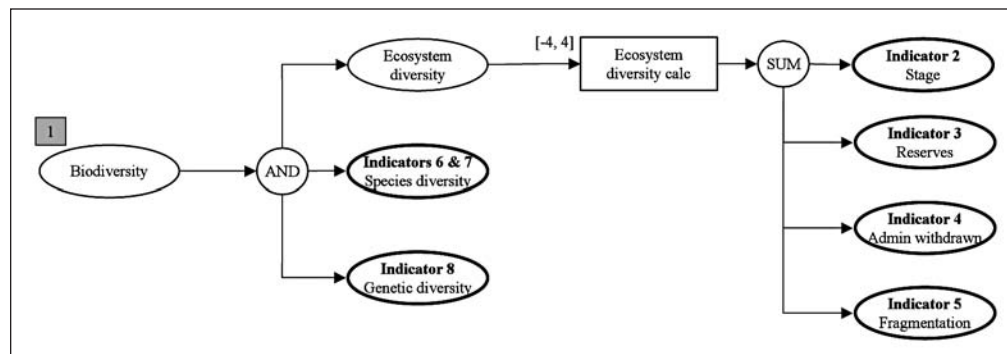


Figure 5.—Additional level of detail of the logic specification for the biodiversity criterion, illustrating the AND and SUM operators which represent different philosophies about how information combines.



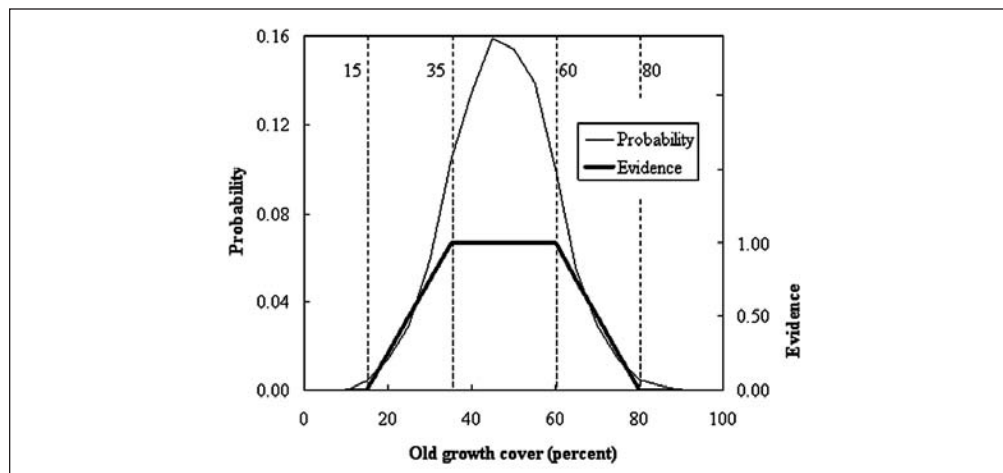
The OR operator is the functional opposite of AND. In this case, the three-legged stool is magical and will continue to support weight as long as any one of the legs is functional. Figure 4 uses an OR operator to combine community viability with community adaptability: socioeconomic goals are likely to be met if either the community can continue sustainably as it is or it can successfully adapt to new conditions.

Reference Conditions for Quantitative Measures

“Possibly one of the biggest challenges facing researchers currently is the identification and quantification of ... [reference conditions]” for SFM indicators or more specific measurement endpoints (Prabhu *et al.* 2001). In the context of endpoint evaluation, reference conditions provide a context for inferring the meaning of observed values at step 4 in the process of Davis *et al.* (2001). Perhaps more often than not, the specification of reference conditions for interpreting observed values of endpoints used in evaluation of SFM will require scientifically based judgments in lieu of more precise calculations. Fuzzy membership functions provide an effective approach to representing such qualitative or semiquantitative relations (Zadeh 1976). Figure 6 demonstrates a fuzzy membership function that compares old-growth forest cover to its probable historical extent. Scenarios evaluated that are clearly outside the historical range of less than 20 or greater than 80 percent receive values of zero in the model, while those in the 40-to-60-percent range receive full credit (+1) and remaining intermediate values receive partial credit.

Reference conditions for evaluating some endpoints might be applicable to a national-level application of C&I. However, it is probably much more typical that reference conditions will need to vary with biogeographic or socioeconomic context. The examples we present subsequently decompose the U.S. national analysis into more homogeneous regions that have been delineated for purposes of the Forest Service’s periodic Resources Planning Act (RPA) assessment.

Figure 6.—Deriving a fuzzy membership function for the suitability of old-growth forest cover from statistical information. The probability curve shows the estimated probability density for old-growth forest in the Oregon coast range for the past 3,000 years (adapted from Wimberley and Spies in Davis et al. 2001, p. 12). The superimposed fuzzy membership function maps percent cover values into a measure of suitability. Dashed reference lines indicate thresholds used to define reference conditions for the fuzzy membership function.



Other Design Issues

The previous three subsections have addressed some of the most fundamental issues of logic design in the C&I context. Other important issues that we will simply mention here, but perhaps discuss in the presentation, include the following:

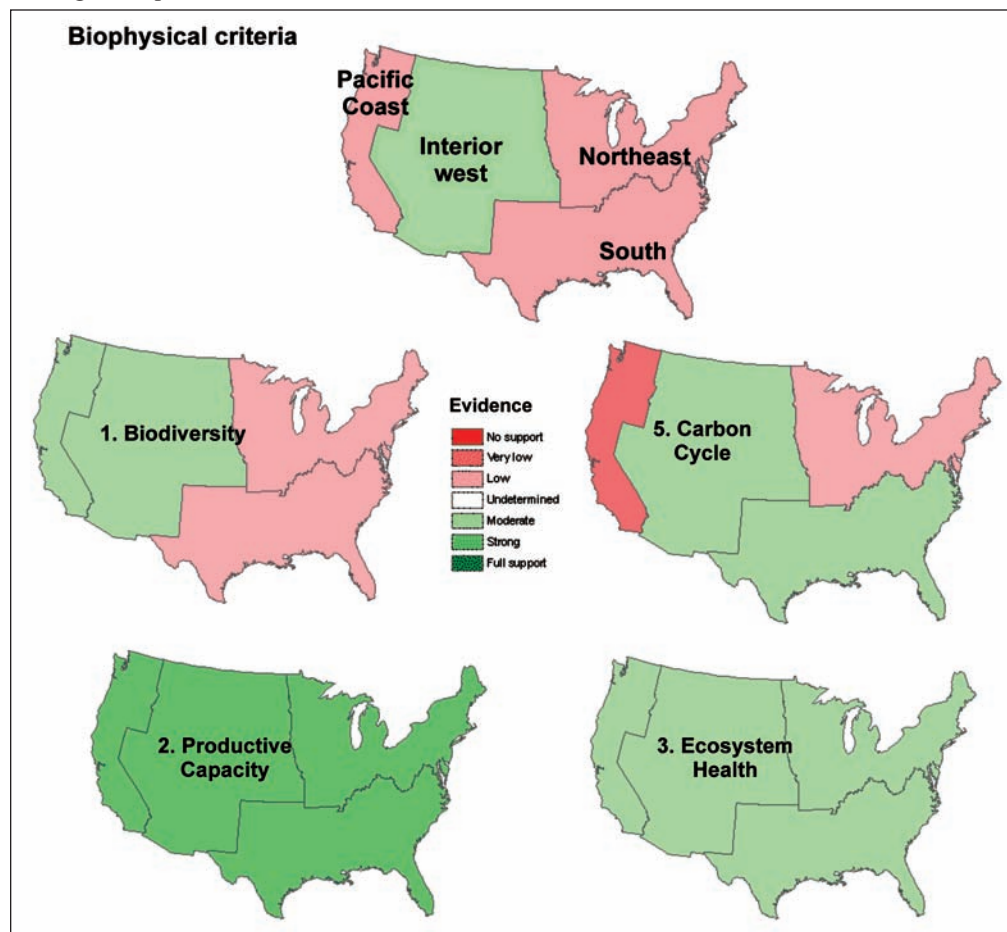
- Weighting topics.
- Use of qualitative measures.
- Reliability of data.
- Precision of available knowledge.
- Availability of data.

Examples of Model Application to Date

An initial prototype application was developed in 2002, covering criteria 2 and 6 (fig. 2) and based on earlier draft versions of the first U.S. national report (USDA Forest Service 2004). Reynolds *et al.* (2003b) demonstrated a small portion of the prototype, focusing on modeled interdependencies related to forest productive capacity. Since publication of the national report, we have continued to compile data for a larger prototype covering criteria 1, 2, 3, 5, and 6. In the following text, we only offer a broad overview of current prototype results because the full model contains so many logic topics and data elements that a detailed description is far beyond the scope of this brief report.

Figure 7 presents a synthesis of the five biophysical criteria (fig. 2), but with the conservation criterion ignored due to lack of data. Many indicators for these criteria were evalu-

Figure 7.—Evaluation of Montréal criteria 1, 2, 3, and 5 by Resources Planning Act regions, based on data from the 2003 U.S. national report (USDA Forest Service 2004). Criteria 1, 2, 3, and 5 are biodiversity, productive capacity, ecosystem health, and global carbon cycling, respectively. Evaluation of criterion 4 (conservation) was disabled for this example due to most data being missing at the present time.

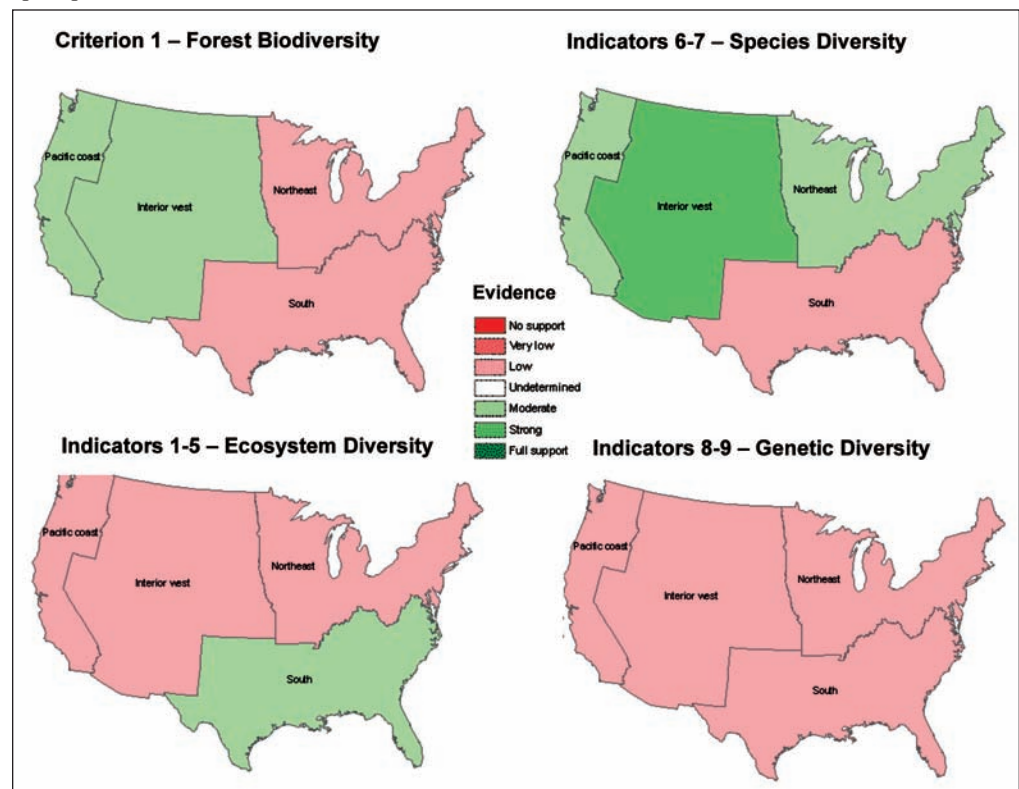


ated by reference to observed values from the previous RPA assessment and, therefore, are based on interpretation of trend. However, we note some interesting exceptions to interpreting trend in the following text.

Figure 8 provides a further decomposition of forest biodiversity (criterion 1) in terms of indicators organized into subcriteria. Figure 9 repeats the information presented in figure 8 but in the native modeling environment of NetWeaver. The NetWeaver interface offers a convenient way to “drill down” through the evaluated state of the logic structure (fig. 9) to trace the derivation of conclusions.

Figure 10 provides a further decomposition of the evaluation of contributions to the global carbon cycle (criterion 5). All indicators for this criterion were evaluated by reference to observed values from the previous RPA assessment and, therefore, are based on interpretation of trend. Use of trend data in this criterion proved to be problematic in part because

Figure 8.—Evaluation of Montréal criterion 1 (biodiversity) by Resources Planning Act regions, based on data from the 2003 U.S. national report (USDA Forest Service 2004). Results for biodiversity (criterion 1 in fig. 7) are further decomposed into the subsets of indicators that make up its premises.



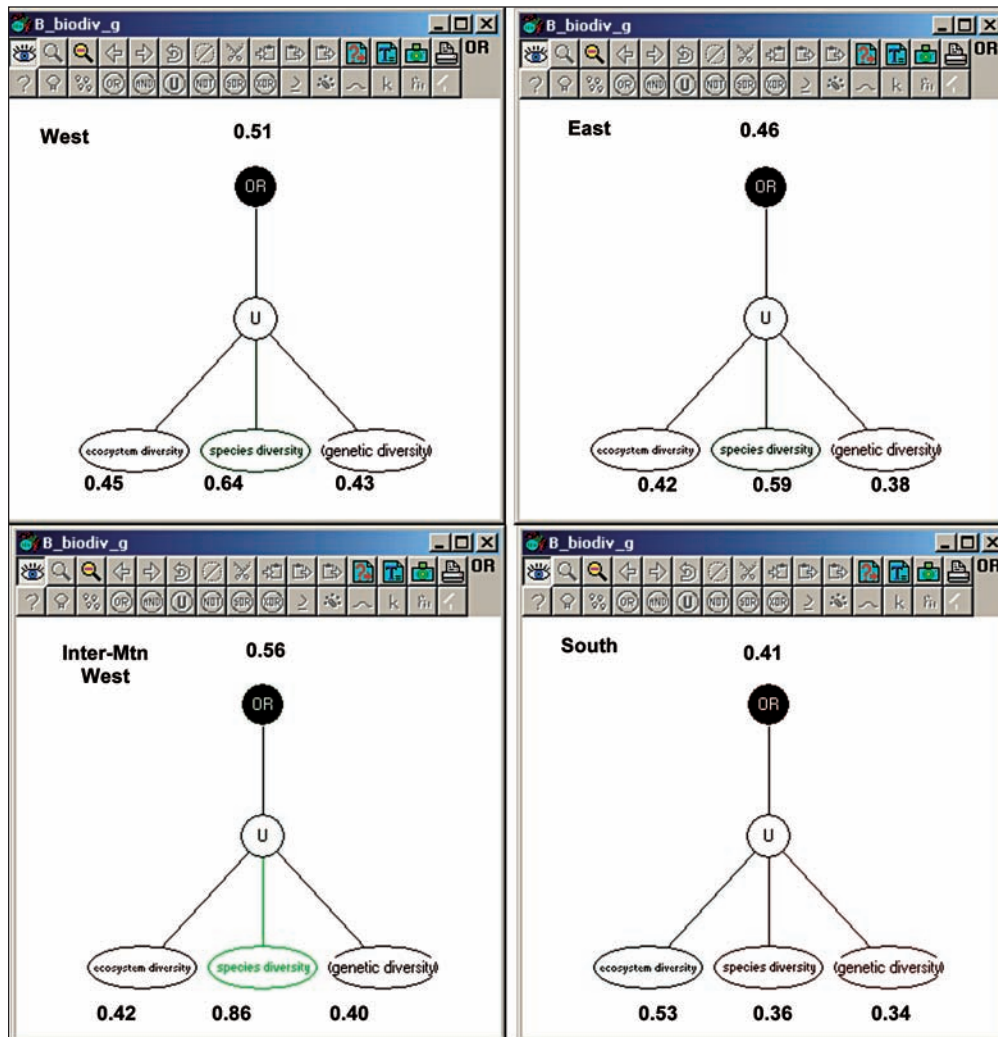
there was a strong shift in timber production from the west coast to the Southeast United States over the period being evaluated.

Figure 11 shows the overall synthesis for the socioeconomic criterion, based on sub-criteria for production capacity, employment, recreation, and investment. The cultural sub-criterion under this criterion was ignored due to lack of data.

As noted, not all indicators were evaluated in terms of trend. A few examples, relative to evaluating biodiversity (criterion 1), include the following:

- For indicator 2 (extent of area by forest type and by age class or successional stage), data based on three size classes (sawtimber, pole timber, seedling/sapling) were used as surrogates for successional stage. The 2003 report (USDA Forest Service 2004) states that “A balance of forest types at diverse successional stages is considered essential to providing forest landscapes that are both sustainable and capable of providing desired outcomes for both wildlife and human use.” Therefore, instead of using data from a previous year as a reference, we evaluated the data against Hill’s index, which combines the percentages in all three size classes into an index of evenness.
- For indicator 3 (extent of area by forest type in protected area categories as defined by the International Union for Conservation of Nature or other classification systems), we

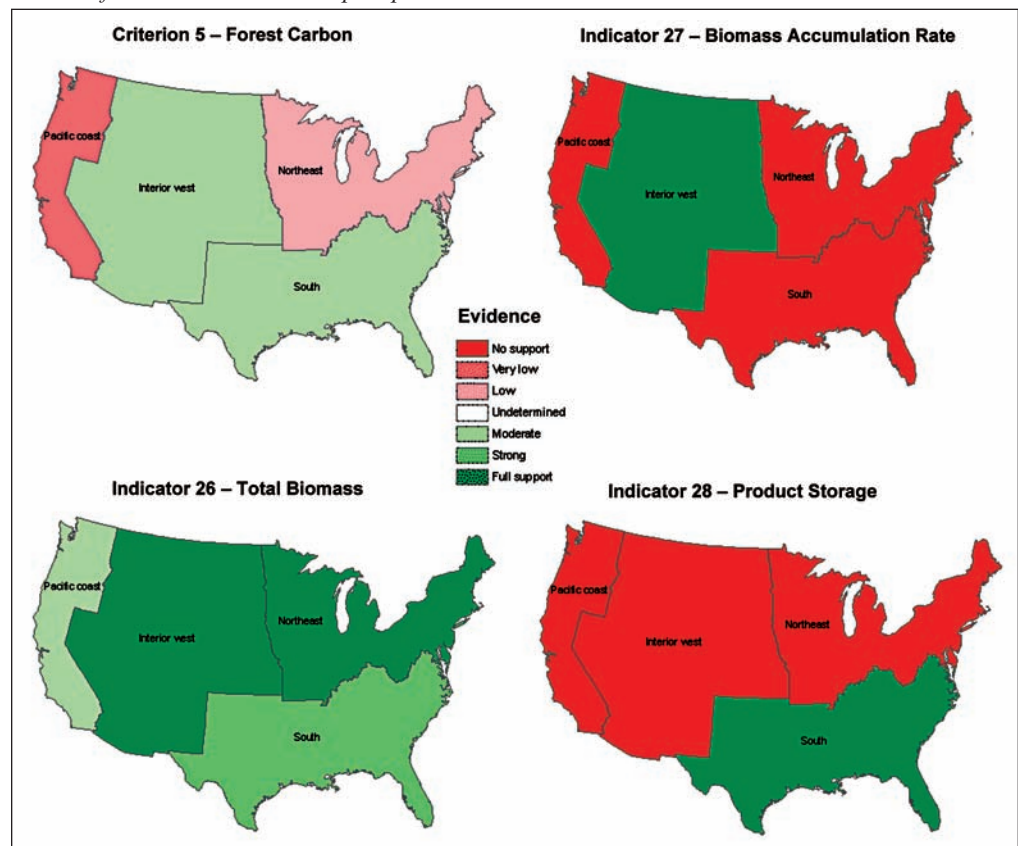
Figure 9.—An alternative view of figure 8, illustrating the NetWeaver representation of the biodiversity criterion and the subsets of indicators that make up its premises. Color coding of logic topics corresponds to the strength of evidence, which is also indicated in the figure, next to each topic.



used a reference range (± 2 percent) centered around 10 percent protected area for each forest type, which has been widely adopted in international fora (e.g., the World Parks Congress in 1992).

- For indicator 7 (status of forest dependent species at risk of not maintaining viable breeding populations), we evaluated the proportion of area within an RPA region containing species designated as at risk of extirpation, specifying a reference range of 5 to 20 percent, corresponding to evidence scores of 1 and 0, respectively.
- For indicator 8 (number of forest dependent species that occupy a small portion of their former range), the 2003 U.S. report uses species range reductions based on NatureServe data. Species range reduction is based on species extirpations by State. To calculate regional numbers, we calculated a weighted average of extirpations based on the State's percent of total regional forest area. Here, we used a reference range of 0 to 10 extirpations, corresponding to evidence scores of 1 and 0, respectively.

Figure 10.—Evaluation of Montréal criterion 5 (contribution to global carbon cycling) by Resources Planning Act regions, based on data from the 2003 U.S. national report (USDA Forest Service 2004). Results for carbon cycling (criterion 5 in fig. 7) are further decomposed into the subsets of indicators that make up its premises.

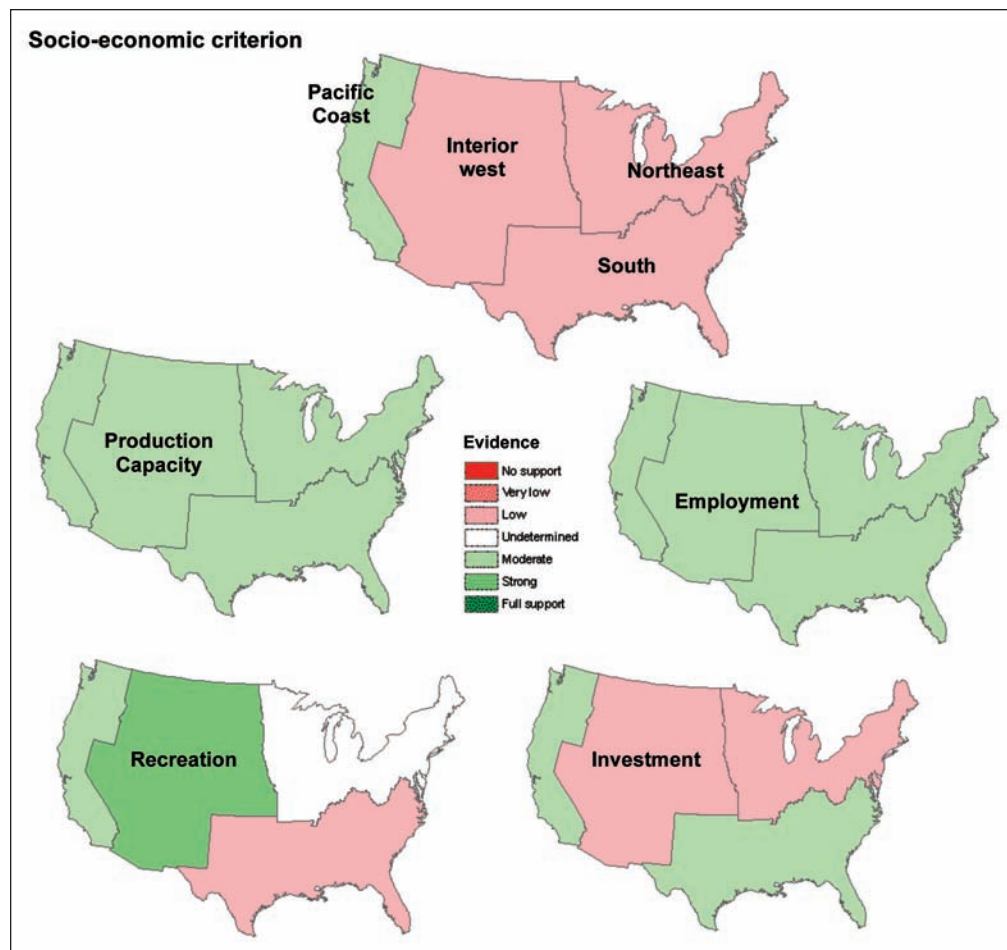


The previously stated examples of more absolute reference conditions in the current prototype logic were only intended as examples. However, it seems quite possible that sensible reference ranges for these, and probably other, indicators could be developed by thoughtful deliberation between policymakers and scientists. Finally, there are other avenues for developing reference ranges that deserve further attention. For example, the question of what harvest volume (removals, indicator 13 under productive capacity) is sustainable has been debated since the concept of sustained yield forestry was first introduced. For national assessments, the traditional approach in the United States has been to compare removals with net growth. It may be easier to specify reference ranges for normalized metrics, such as ratios of measurement endpoints for two or more indicators (e.g., harvest measures versus measures of net growth).

Some Lessons Learned

- Many aspects of evaluating sustainability cannot be answered by science alone. Policymakers have a critical role to play in model design.
- Data on SFM is a necessary, but not a sufficient, condition for setting policy.

Figure 11.—Evaluation of Montréal criterion 6 (socioeconomic well-being) by Resources Planning Act regions, based on data from the 2003 U.S. national report (USDA Forest Service 2004). The topmost map shows the overall evaluation of socioeconomic benefits, and other maps represent subcriteria, which are treated as premises of criterion 6. Evaluation of cultural benefits (an additional subcriterion of criterion 6) was disabled for this example due to most data being missing at the present time.



- Semantic vagueness is an important issue in evaluation of C&I for SFM.
- The collection of topics, and the manner in which they are evaluated, depend on geographic scale.
- Desired future conditions are not a suitable basis for evaluating sustainability.

Recommendations

The issue of whether or not to interpret indicators of SFM has been hotly debated for at least the past 10 years. This issue needs to be resolved. There is no escaping the basic problem that any such analysis cannot be executed with anything approaching perfect objectivity; judgment, which is inherently subjective, is an essential ingredient when

knowledge is less than perfect. If senior scientists and policy analysts, with decades of training and experience in the subject matter pertinent to SFM, are unwilling to interpret and synthesize data on sustainability to help develop policy recommendations, then who can, considering the substantial scientific and technical knowledge requisite to any informed decisions on this topic? Scientists and policymakers should not shrink from bringing logical rigor to the task of assessing SFM for fear that their models are wrong. As Box (1979) pointed out, they are, but such models can nonetheless constructively sharpen the necessary public discourse.

If there is agency-level interest in further developing a logic-based approach to interpretation and synthesis of national C&I, then—

- A good next step would be a national-level policy review of model organization and strategies for interpreting and synthesizing sustainability information.
- We need to accept the need for reference conditions and shift a portion of the scientific and technical energy on indicator measurement to developing them.

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“Traffic Lights”—A Screening Tool To Present Complex Findings

Örjan Jonsson¹

Background

At the request of its member countries, the Food and Agriculture Organization of the United Nations (FAO) has been carrying out global forest resources assessments since 1946, practically since FAO was formed. Global forest resources assessment reports have been published at periodic intervals. The latest of these reports, global *Forest Resources Assessment 2005* (FRA 2005), was published in 2006. More than 800 people were involved in the process, including 172 officially nominated national correspondents and their teams.

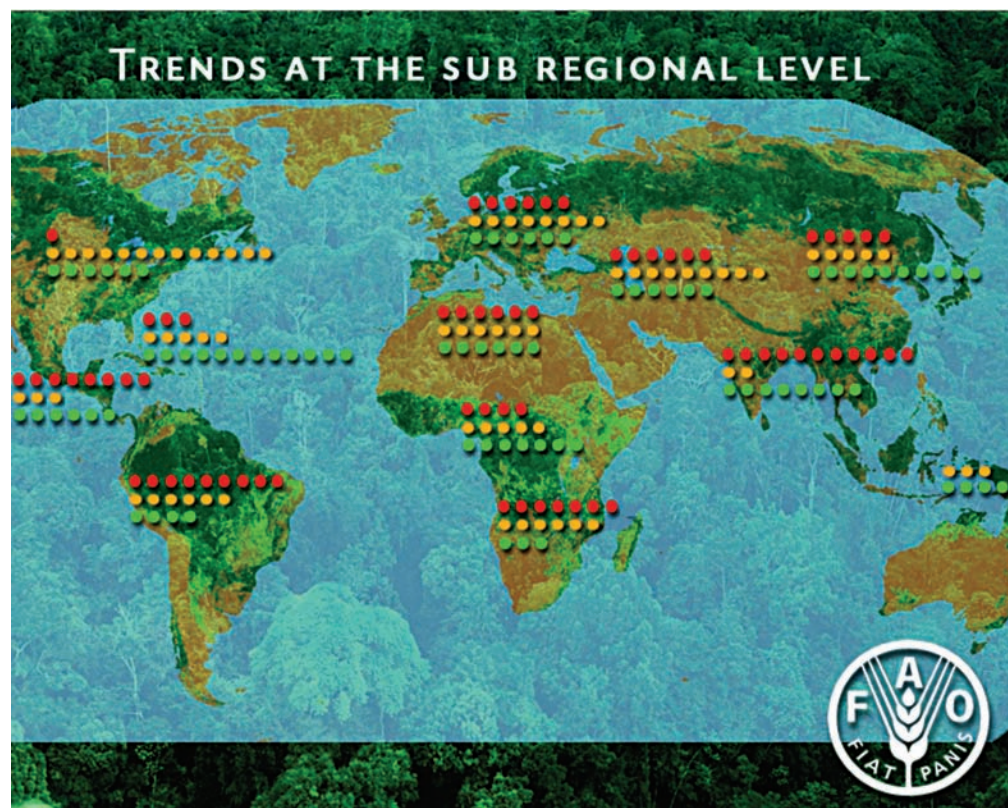
In FRA 2005, forest-related information was collected and analyzed from 229 countries and territories for three points in time: 1990, 2000, and 2005. The information collected covered about 40 forest-related variables, adding up to about 400 data variables to be reported on. The results were conveyed in a 300-page main report containing 20 global tables, 229 country reports, and key findings.

The assessment showed that forests are managed for a variety of uses and values, but how well are they managed? What does the information provided by countries tell us about the overall progress toward sustainable forest management (SFM) on the global, regional, and subregional scales? It was obvious that there was need to find an effective way to answer these questions and a way to convey the results to policymakers and to the general public in an easy-to-grasp manner.

For the first time in the history of global forest resources assessments, an attempt was made in FRA 2005 to present trends more broadly, covering the following six broad topics: extent of forest resources, biological diversity, forest health and vitality, productive functions of forest resources, protective functions of forest resources, and socioeconomic functions (often referred to as six of the seven thematic elements of SFM, the seventh being legal policy and institutional framework).

The purpose was to shed more light on some of the complexities of SFM and stimulate additional analyses and debate, thus promoting decisionmaking and action for further progress toward SFM.

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Methodology

Variable Selection

For each of the six broad topics, two to five variables were selected based on relevance to the topic and on information availability for the variable. No relative weighting of variables was applied.

Twenty-one variables were selected in total (table 1). Some are derivations of the variables reported by countries; e.g., carbon stock per hectare is derived from total carbon stock and forest area.

An increase in the value of a variable is generally interpreted as making a positive contribution to the topic (with the exception of area of forest affected by fire, insects, and diseases or other disturbances) and thereby to SFM.

The extent to which this assumption holds depends on local or national circumstances. For example, an increase in forest area is likely to be seen as a positive development in most countries, but, where it is a result of abandonment of agricultural land and declining rural populations, it may not be seen as positive by policymakers or society.

Four variables were selected for analysis of the extent of forest resources: area of forest, area of other wooded land, total growing stock, and carbon stock in forest biomass (per hectare).

Table 1.—List of variables selected for synthesis assessment by thematic area.

Thematic element	FRA 2005 variables or derivatives	Unit
Extent of forest resources	Area of forest	ha
	Area of other wooded land	ha
	Growing stock of forests	m ³
	Carbon stock per hectare in forest biomass	tonnes/ha
Biological diversity	Area of primary forest	ha
	Area of forest designated primarily for conservation of biological diversity	ha
	Total forest area excluding area of productive forest plantations	ha
Forest health and vitality	Area of forest affected by fire	ha/year
	Area of forest affected by insects, diseases and other disturbances	ha/year
Productive functions of forest resources	Area of forest designated primarily for production	ha
	Area of productive forest plantations	ha
	Commercial growing stock	m ³
	Total wood removals	m ³ /year
	Total NWFP removals	tonnes/year
Protective functions of forest resources	Area of forest designated primarily for protection	ha
	Area of protective forest plantations	ha
Socio-economic functions	Value of total wood removals	US\$/year
	Value of total NWFP removals	US\$/year
	Total employment	person years
	Area of forest under private ownership	ha
	Area of forest designated primarily for social services	ha

The biological diversity is represented by the variables of area of primary forest, areas designated for conservation of biological diversity, and total area of forest excluding productive forest plantations. While it is recognized that productive forest plantations may provide some biological diversity conservation values compared with other types of land cover, this is not the primary management purpose and these values are often limited. Primary forests are usually associated with high levels of biological diversity, particularly in tropical regions, but in temperate and boreal ecosystems, primary forests can present a limited number of species and may not be a good indicator of biological diversity per se. Yet, area of primary forest is an important indicator of the status of the forest ecosystem as a whole.

Forest health and vitality is described by two variables indicating the area affected by fire, insects, diseases, and other disturbances. Within this theme, stable or decreasing values are seen as a positive contribution to SFM. It is recognized that a number of forest ecosystems are dependent on fire to maintain their vitality and regenerative capacity (particularly in boreal zones). However, fires frequently run wild and destroy large areas of forest, resulting in soil erosion and desertification—a serious threat to sustainable use of resources.

For the productive functions, the following variables were taken into account: area of forest designated for productive purposes, area of productive forest plantations, commercial growing stock, total wood removals, and nonwood forest product removals for the four categories of products for which information availability is highest. The productive function seeks to address the need to maintain an ample and valuable supply of primary forest products while at the same time ensuring that production and harvesting are sustainable and do not compromise the management options of future generations. Thus, an increase in wood removals may not be positive in all cases, as the level of removals may not be sustainable.

The protective functions are depicted by two variables indicating the total area of forest used primarily for protective functions and the area of forest plantations managed for protective purposes.

Socioeconomic functions cover a wide range of forest benefits to mankind. The variables selected for this analysis included level of private ownership; area of forest designated for recreation, education, and other social services; total employment in forests; and total value of removals. The level of private ownership is a somewhat ambiguous variable. In some situations, an increase in this variable may be seen as a benefit for SFM, indicating devolution of management responsibility and control to individuals or communities. In other cases, it may mean that forest property rights are being transferred from State or communal ownership and concentrated in the hands of relatively few within the community.

Information Availability

Many countries were not able to provide complete data for all variables or for each point in time. The extent to which countries could report on this limited set of variables also provides an indication of data availability and reporting capacity for the wider range of uses and values that societies expect of forests. However, presenting data as regional aggregations overcame some of the limitations in data availability on regional and sub-regional scales. Poor-quality, outdated, or missing data are common problems in natural resource or environmental management. Effective analysis and synthesis can be used to expose weaknesses in data and identify those areas in which information collection efforts can be targeted to improve decisionmaking.

Rules were created for handling gaps in data in the regions and subregions as follows. Information availability was determined as the sum of the area of forest of those countries reporting on a given variable, expressed as a percentage of total forest area in the region or subregion. It was rated high if the reporting countries together represent 75 to 100 percent of the total forest area, medium if the countries represent 50 to 74 percent, and low if the percentage is 25 to 49 percent. If the reporting countries together accounted for less than 25 percent of the total forest area in the region, no findings were presented owing to insufficient data.

Presentation of Results

The change rate for variables on the subregional scale was expressed as the compound change rate in percent per annum for the period 1990 to 2005 (1990 to 2000 for area of forest affected by fire; area of forest affected by insects, diseases, and other disturbances; total employment; and area of forest under private ownership). Thus, the rate was based on two different estimates, the accuracy of which was unknown. An arbitrary threshold of ± 0.50 percent per year was selected for all variables in order to highlight large changes and to distinguish cases in which a difference between the two estimates may indicate an actual change from those in which the difference may not be statistically significant.

Simple, three-colored traffic light matrices were prepared to visualize change rates in the variables listed under each broad topic for a particular region. These indicate trends in the selected variables over time and the progress they reflect toward SFM. Trends can thus be positive, negative, or reflect no major change (± 0.50 percent per year) for each of the 21 variables.

Results were presented at the global, regional, and subregional levels and related to key statistics for each theme (table 2).

Approach and Limitations

Several disclaimers must be advanced regarding the methodology presented in this paper: The analysis is clearly sensitive to the selection of variables, which was subjective and may not be valid in other contexts or scales. The options for variables were limited by the set of FRA 2005 reporting tables and further reduced by the information availability for several of these. In addition, there is a high covariation between some variables, which must be considered before drawing far-reaching conclusions. It should also be noted that the variables included in the analysis do not address all aspects of SFM. For example, information on the seventh broad topic or element of SFM was not collected and analyzed. Indications of positive or negative values for trends can be argued in several cases, particularly if the trend is seen in a bigger policy perspective. For example, the loss of forest area can be positive if agricultural development and efforts to improve food security and self-sufficiency are national priorities. The aggregation of trends by region and subregion obscures positive or negative trends in individual countries. Results cannot therefore be seen as applicable to individual countries in any region.

The methodology used to illustrate these key trends does not take into account value judgments or variations in stakeholder perceptions of forest benefits and the relative importance of different variables. The objectives of this study were to provide an example of how existing information, in this case, collected as part of FRA 2005, could be used in an initial analysis of progress toward SFM and to stimulate further discussion and more detailed analyses.

Table 2.—Trends toward sustainable forest management at the global level.

Thematic element	Trends in FRA 2005 variables or derivatives	Data availability	1990–2005 Annual change rate (%)	1990–2005 Annual change	Unit
Extent of forest resources	● Area of forest	H	-0.21	-8 351	1 000 ha
	● Area of other wooded land	M	-0.35	-3 299	1 000 ha
	● Growing stock of forests	H	-0.15	-570	million m ³
	● Carbon stock per hectare in forest biomass	H	-0.02	-0.15	tonnes/ha
Biological diversity	● Area of primary forest	H	-0.52	-5 848	1 000 ha
	● Area of forest designated primarily for conservation of biological diversity	H	1.87	6 391	1 000 ha
	● Total forest area excluding area of productive forest plantations	H	-0.26	-9 397	1 000 ha
Forest health and vitality	● Area of forest affected by fire	M	-0.49	-125	1 000 ha
	● Area of forest affected by insects, diseases and other disturbances	M	1.84	1 101	1 000 ha
Productive functions of forest resources	● Area of forest designated primarily for production	H	-0.35	-4 552	1 000 ha
	● Area of productive forest plantations	H	2.38	2 165	1 000 ha
	● Commercial growing stock	H	-0.19	-321	million m ³
	● Total wood removals	H	-0.11	-3 199	1 000 m ³
	● Total NWFP removals	M	2.47	143 460	tonnes
Protective functions of forest resources	● Area of forest designated primarily for protection	H	1.06	3 375	1 000 ha
	● Area of protective forest plantations	H	1.41	380	1 000 ha
Socio-economic functions	● Value of total wood removals	L	0.67	377	million US\$
	● Value of total NWFP removals	M	0.80	33	million US\$
	● Total employment	M	-0.97	-102	1 000 pers. yrs
	● Area of forest under private ownership	M	0.76	2 737	1 000 ha
	● Area of forest designated primarily for social services	H	8.63	6 646	1 000 ha
H = High (reporting countries represent 75–100% of total forest area) M = Medium (reporting countries represent 50–75% of total forest area) L = Low (reporting countries represent 25–50% of total forest area) ● = Positive change (greater than 0.50%) ● = No major change (between -0.50 and 0.50%) ● = Negative change (less than -0.50%) – = Insufficient data to determine trend					

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Conclusions and Recommendations

The analyses were limited by the variables and data available in the FRA 2005 reporting tables. Many relevant parameters were not included, owing to lack of information at the global level, and a more detailed analysis must take into consideration the varying conditions between regions and countries.

Nevertheless, the traffic lights have proven to be an effective monitoring tool and one way of illustrating a complex issue (and complex answers) in an easy-to-grasp manner. In FRA 2005, the traffic light provided a global picture of key trends and should be seen as one illustration of progress, or lack of progress, toward SFM. Despite initial reluctance/criticism of the idea, the traffic light tool has been used in other reports; e.g., the *State of Europe's Forests 2007*. From today's perspective, it is likely that an advanced version of the traffic light tool will be used to analyze progress toward SFM also in FRA 2010.

C&I Reporting and C&I Analytic Networks

Aljoscha Requardt¹

Introduction

The primary intention of the workshop is to talk about forest information communication and extracting meaning from forest trend data. The following paper relies basically on the outcomes of a study by Requardt (2007). The paper summarizes briefly the evaluation of international information priorities and capacities, taking the pan-European criteria and indicators (C&I) for sustainable forest management (SFM) as a baseline (see Aspect A). In addition, this paper gives insights into the theory of C&I analytic networks, pointing out and discussing new aspects relevant for the implementation of C&I as a useful instrument for identifying different cause-and-effect relationships and conflicts of interests within SFM (see Aspect B). By showing how to define key indicators, both approaches help moving forward to tell the story about forest resources and the multiple dimensions on assessing SFM.

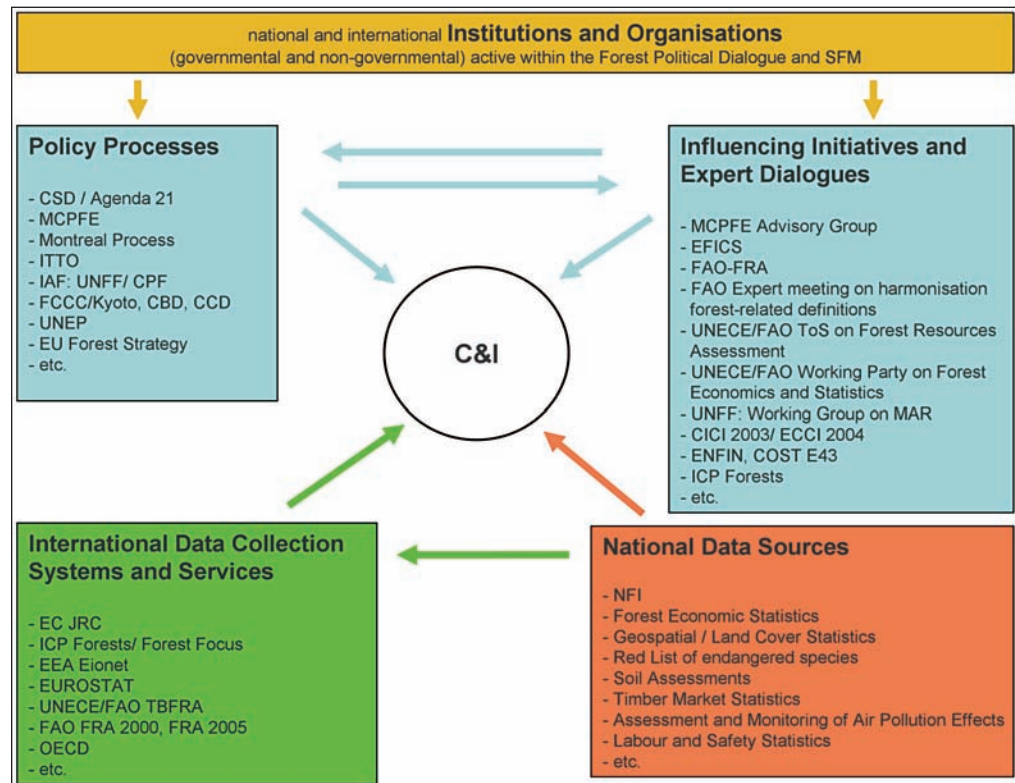
Aspect A. C&I Reporting—Data Potentials and Priorities at the International Level

Where to find which forest data? What are the information priorities, the key indicators, we focus on in our pan-European monitoring, assessment, and reporting activities?

At the fourth Ministerial Conference on the Protection of Forests in Europe (MCPFE) in 2003, a revised set of pan-European C&I were adopted as a common policy instrument for evaluating and reporting on SFM at the pan-European and national levels. Data collection and reporting is carried out at the pan-European level and primarily based on national-level data collection systems. National forest inventories in European countries are a primary source of information. However, the gap analysis (Sollander 2001) and the Liechtenstein case study (Requardt 2003) have shown that other sources are also essential for C&I reporting, in particular for indicators that cover socioeconomic aspects. Countries already collect and report lots of data in order to fulfill several other international commitments and information requirements in the context of SFM (see EEA). Numerous organizations and networks at the European or international levels, such as the United Nations Environment Programme, The World Bank, the Food and Agriculture Organization of the United Nations (FAO), the United Nations Economic Commission for Europe (UNECE), the Organisation for Economic Co-Operation and Development (OECD), Eurostat, the European Commission Joint Research Centre (JRC), the European Economic Area (EEA), and the European Forest Institute (EFI), collect relevant national data sets.

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Figure 1.—C&I information network.



Source: Requardt (2007).

One objective of the study by Requardt (2007) was to analyze “where to find which forest data.” By taking the pan-European C&I as a baseline, data potentials were structured according to different international data sources and responsible institutions, providing some first overview about the information priorities at the pan-European level.

A comprehensive list of international data sources relevant for the reporting on the pan-European C&I was compiled, structured, and analyzed according to the C&I requirements. The list of 81 sources in total can be regarded as (1) representative of pan-European activities of monitoring, assessment, and reporting on SFM and (2) a C&I structured update of the MCPFE document *Where to Find Forest Data* (MCPFE 2002).

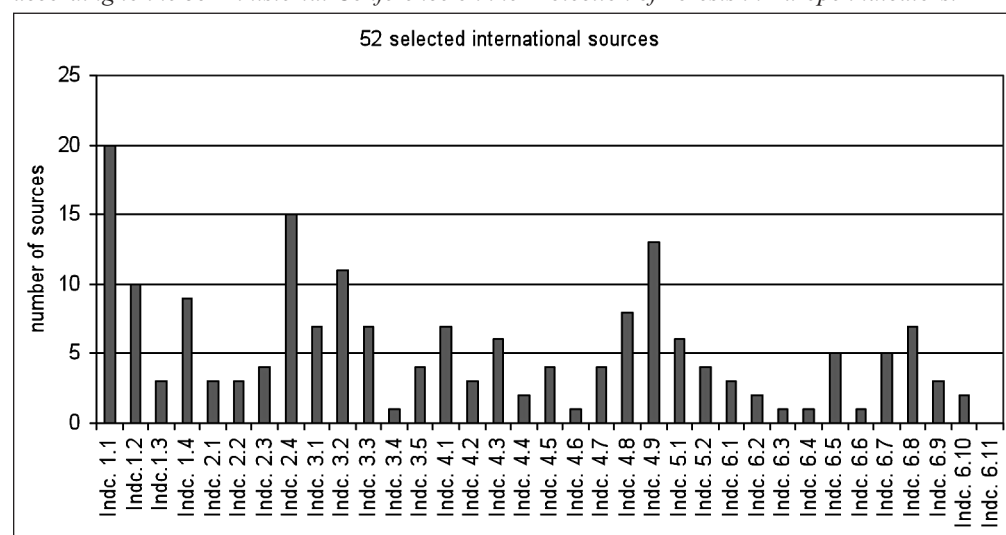
Although the quantitative amount of sources and, therefore, the amount of available data sets per indicator does not mean that one single source would not be sufficient for adequate data supply, it can be recognized that some C&I are notably more covered than others. According to the selected list of international data sources and with respect to the 35 quantitative indicators, nine core indicators² and eleven deficit indicators³ were identi-

² Core indicators: 1.1 Forest area, 1.2 Growing stock, 1.4 Carbon stock, 2.4 Forest damage, 3.1 Increment and fellings, 3.2 Roundwood, 4.8 Threatened forest species, 4.9 Protected forest, 6.8 Trade in wood.

³ Deficit indicators: 1.3 Age structure and/or Diameter distribution, 3.4 Services, 4.4 Introduced tree species, 4.6 Genetic resources, 6.2 Contribution of forest sector to GDP, 6.3 Net revenue, 6.4 Expenditures for services, 6.6 Occupational safety and health, 6.9 Energy from wood resources, 6.10 Accessibility for recreation, 6.11 Cultural and spiritual values.

fied. These do not only describe the pan-European information priorities but also the current international capacities to monitor, assess, and report on the various aspects of SFM. In addition, they can be considered to indicate varying *validity* of different indicators to monitor but also to implement SFM at the pan-European level.

Figure 2.—Data potentials and information priorities at the pan-European level, structured according to the 35 Ministerial Conference on the Protection of Forests in Europe indicators.



Source: Requardt (2007).

The indicator that is covered most using one criterion can be regarded as the key indicator to describe the respective SFM relevant theme. Concerning criterion C1 (*Forest Resources*), indicator 1.1 *Forest area* is most covered within the pan-European monitoring, assessment, and reporting. As expected, it can be regarded as the central indicator of all 35 indicators. The monitoring, assessment, and reporting on criterion C2 (*Health and vitality*) concentrates mainly on indicator 2.4 *Forest damage*, specifically covering data sets on forest fires. For the criterion C3 (*Productive functions*), indicator 3.2 *Roundwood* and for criterion C4 (*Biodiversity*) indicator 4.9 *Protected forests* are notably more covered than other indicators of the respective criterion. Although neither of the two indicators of criterion C5 (*Protective functions*) is identified as a core indicator, more data sets are currently available according to indicator 5.1 *Protective forest—soil, water, and other ecosystem functions*. Concerning criterion C6 (*Socioeconomic functions*), it can be clearly seen that none of the 11 indicators is defined as a core indicator. However, the indicators 6.7 *Trade in wood* and 6.8 *Wood consumption* are the most covered. This indicates that the current international monitoring, assessment, and reporting on the socioeconomic aspects of SFM are focused rather on the timber market aspects than on any other socioeconomic aspect. It can be concluded that current capacities at the international level to report on indicators like 6.3 *Net revenue*, 6.4 *Expenditures for services*, 6.6 *Occupational safety and health*, 6.9 *Energy from wood resources*, or 6.11 *Cultural and spiritual values* are rather limited.

Data completeness as described by the MCPFE report *State of Europe's Forests 2007* (MCPFE 2007) partly matches very well with the data potentials and deficits described by Requardt (2007). Differences can be explained, as the views on analyzing data potentials and deficits were different. Within the study of Requardt (2007), the focus was set on the international level whereas the MCPFE analysis on data completeness focused rather on the national level.

In addition to the overview of indicator data coverage on the international level, the study by Requardt (2007) also shows which sources and institutions are the most relevant within the pan-European monitoring, assessment, and reporting on SFM. UNECE, FAO, and OECD have high potentials to cover several of the 35 indicators. Also relevant are Eurostat, EEA, EFI, and the European Commission JRC. Furthermore, it can be recognized that only a few sources can be regarded as multiresources covering four or more SFM criteria. Typical multiresources are, e.g., the FAO Forest Resources Assessment 2000/2005 and the OECD Compendium of Environmental Data. However, most sources are very specific sources covering only one particular aspect that is relevant to SFM and the pan-European C&I (e.g., the International Union for Conservation of Nature Red List of threatened species or the EFI Database on Forest Disturbances in Europe). Moreover, it can be said that some sources are directly relevant while others are rather indirectly relevant to monitoring, assessment, and reporting on SFM. Directly relevant means that the source origin and background are explicitly related to forests or forestry. Indirectly relevant means that sources are of different nonforest scope and content but cover one or two SFM relevant aspects, like the IEA Energy Statistics, the International Labour Organization LABORSTA, or the OECD Labor Market Statistics.

Differences between global-level sources and particular European-level sources can be recognized as well. These differences occur, e.g., in the spatial resolution of available data sets, as most of the sources collect or maintain data sets only for those countries and regions that are listed members of the specific organization (see, e.g., differences between European Union, UNECE, OECD, or United Nations sources). The different coverage is often also expressed by differences in scope and content of the explicit source, which again influences the method of collecting the data. Some sources (e.g., the Joint Forest Sector Questionnaire [JFSQ]) collect national data sets directly at the national level while others (e.g., EEA European Environment Information and Observation Network or The World Bank World Development Indicators) receive national data sets indirectly from another international source. Reviewing the list of sources, it can be concluded that especially multiresources collect and disseminate data sets in joint data cooperation initiatives—facilitating data collection on a harmonized and streamlined basis. Joint data cooperation, e.g., is ongoing within the joint monitoring of the ICP Forests/Forest Focus, the data collection of the OECD Compendium of Environmental Data, the JFSQ maintained by Eurostat, UNECE, FAO, and International Tropical Timber Organization or also the joint UNECE/FAO/MCPFE data collection processes toward the MCPFE in 2002 and in 2007. However, although data synergies exist partially between the different sources, the thematic focus or the scope of most sources is often different and specified. As a result, available data sets—and, therefore, also the data collection processes—are not necessarily comparable. Even if the same indicators are covered, there are often dif-

ferences in spatial and temporal resolution or in applied definitions and terms. The use of potential synergies might therefore be limited.

The hypothesis of the International Conference on the Contribution of Criteria and Indicators for Sustainable Forest Management: The Way Forward in 2003 (FAO 2003) can be under-lined and confirmed—assuming that (1) “...the capacity for C&I reporting depends on the technical and organisational capacity on national and international level” and (2) “...little new data need to be generated or collected. It is simply a question of connecting disjointed information strands and collating or processing the information that exists in those strands” (CICI 2003).

The future challenge lies in the improvement of the technical and financial capacities for managing and processing the large amount of data sets from various sources for various purposes. Using synergies between different national data sources as well as between national and international data collection initiatives and also building harmonized bridges between various reporting obligations are fundamental to guaranteeing that efforts in SFM reporting and data assessment are not duplicated. The harmonization and streamlining of data supply and data demands as well as the improvement of data evaluation processes are the keys to making certain core information available on a comparable basis. Implementing SFM at all levels requires reliable, comparable, and clear structured information that is effectively supplied to various users responsible for policy and decisionmaking.

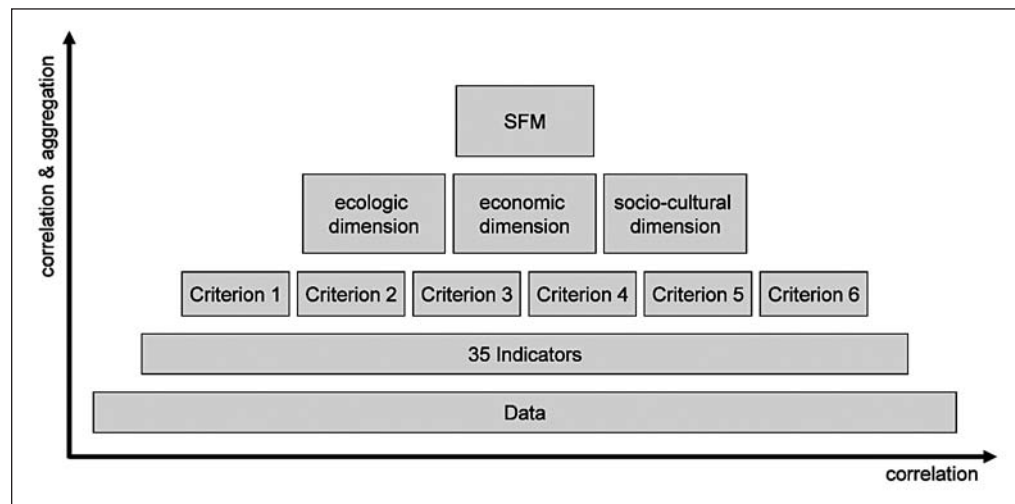
Aspect B: C&I Analytic Networks—Modeling the Multiple Dimensions of SFM

What are all the forest reports about if we do not understand and know much about the multiple cause-and-effect relationships between reported criteria and indicators?
What are the key indicators to focus on in our forest management programs and monitoring activities?

In consideration of the multiple definitions of sustainability, the viewpoints about the importance of alternative sustainability objectives are always relative. The ecologic, economic, and social-cultural dimensions of sustainability display various attributes of high complexity and connectivity. Nothing can be managed in a convenient isolation. The interconnectedness of the social, economic, and ecological dimensions within the concept of sustainability or also within SFM is widely acknowledged and recognized. Shields *et al.* (2002) argued that there is an ordered relationship between sustainability objectives and its measures—either in hierarchical order or in a means-end correlation network. According to that theory and adapted to the objectives of the study by Requardt (2007), the diagram in figure 3 describes the correlation of the concept of SFM and its tools to measure its objectives. Correlation is given (1) either in form of hierarchical aggregation interlinking the SFM measurement elements between the different levels of aggregation or (2) in horizontal correlation interlinking individual measurement elements within one level.

Mendoza and Prabhu (2003) applied a “cognitive mapping” and Wolfslehner *et al.* (2005) a so-called “analytic network process” to show cross-indicator linkages of sustainability indicators at the forest management unit (FMU) level. The theory behind this is that criteria or indicators seldom impact sustainability by themselves (Mendoza and Prabhu 2003).

Figure 3.—Correlation model: SFM and its measurement components.



Source: Requardt (2007).

With respect to the pan-European C&I, it can be presumed that the 6 criteria and 35 quantitative indicators are not standing somehow alone disconnected in a certain context but are rather interlinked, forming an intricately network of complex relationships under the concept—the three dimensions—of SFM.

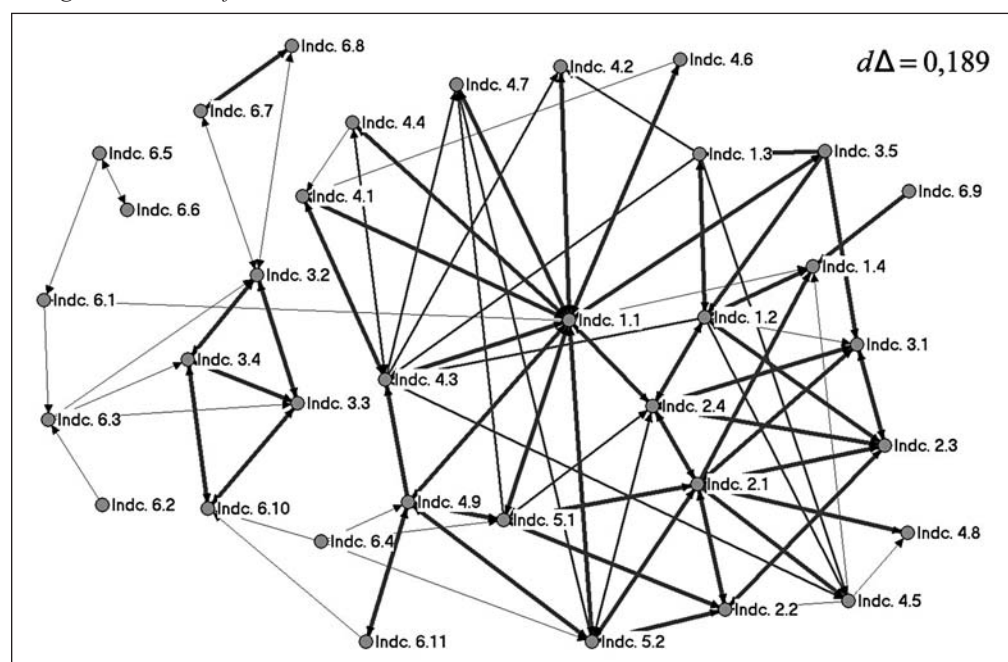
The major objective of the study by Requardt (2007) was to depict and analyze the correlation and cross-indicator interlinkages of the 35 pan-European indicators describing different cause-and-effect mechanisms between different SFM aspects. By applying approaches of one-mode network analysis (see Wasserman and Faust 1994), the indicators' individual relationship, function, interaction, or its validity within the entire set of pan-European indicators were analyzed. By this, core (central) indicators, standalone indicators, groups, or subgroups of indicators were identified to describe the correlation structures and validity of individual indicators but also of indicator groups within the entire indicator set.

Network correlation maps yield descriptive rather than prescriptive results. They facilitate the representation of highly complex elements in an organized and structured diagram or model. In addition to the model, several analytical network parameters can be calculated in order to verify results and evaluation gained from generated correlation maps. The most relevant network parameters are density and centrality.

The density reflects the relation between most possible or potentially possible relationships within a network of a certain number of nodes (in this case, 35 indicators), regardless of the direction of relation. It informs about the overall connectivity within a network. The centrality or connectivity of an indicator is described by the number of relations within a network. The most-applied parameter within undirected networks to describe centrality is the Indegree or the Outdegree. The Indegree reflects how far the indicator receives a link and the Outdegree informs how far the explicit indicator sends a link to another indicator.

The information on which the pan-European indicator is linked to which other indicator within the study by Requardt (2007) relies basically on the indicator descriptions provided by the MCPFE C&I background document (MCPFE 2002). According to this document, the 35 indicators form a directed network in which a link from one indicator to another does not necessarily imply that there is a link (connection) also in the other direction.

Figure 4.—Criteria and indicators (C&I) correlation network depicting the relationships between the 35 pan-European indicators as indicated in the Ministerial Conference on the Protection of Forests in Europe C&I background document (MCPFE 2002). Thin lines describe further possible linkages to stimulate further discussions.



Source: Requardt (2007).

According to the MCPFE C&I background document, the indicators are not all inter-linked. It is shown that the MCPFE indications of indicator linkages partly remain rather incomplete. The network model reveals that mainly the socioeconomic indicators like 6.3 *Contribution of forest sector to GDP*, 6.3 *Net revenue*, 6.4 *Expenditures for services*, or 6.5 *Forest sector workforce* are disconnected or rather isolated compared to some other indicators which are very central (e.g., 1.1 *Forest area*, 1.2 *Growing stock*, 2.1 *Deposition of air pollutants*, 2.3 *Defoliation*, 2.4 *Forest damage*, 4.9 *Protected forests*, or 5.1/5.2 *Protective forests*). As expected, the most central indicator is indicator 1.1 *Forest area*.

According to general network theory, a network is called “complete” when each indicator is linked to each of the other indicators within the network. A complete network has a network density of $d\Delta = 1$. This is only a theoretical indication that is almost never the case in larger complex networks. To strengthen C&I interconnectivity, the study by Requardt (2007) gives some further suggestions to set pan-European indicators into relation. The indicator network model (see fig. 3) has been supplemented at least for those indicator correlations which seem to be reasonable and missing within the MCPFE background

document. In particular, an attempt was made to interlink those indicators which are not interlinked or which are more isolated from other indicators, like the socioeconomic indicators.

To strengthen C&I interconnectivity, and therefore to support C&I implementation in the long term, it is required that possible indicator linkages will be discussed and modeled for different forest sector scenarios at different scales and for different forest regions.

Methodological approaches for defining and modelling C&I networks and setting different aspects of SFM into relation include, e.g., the following:

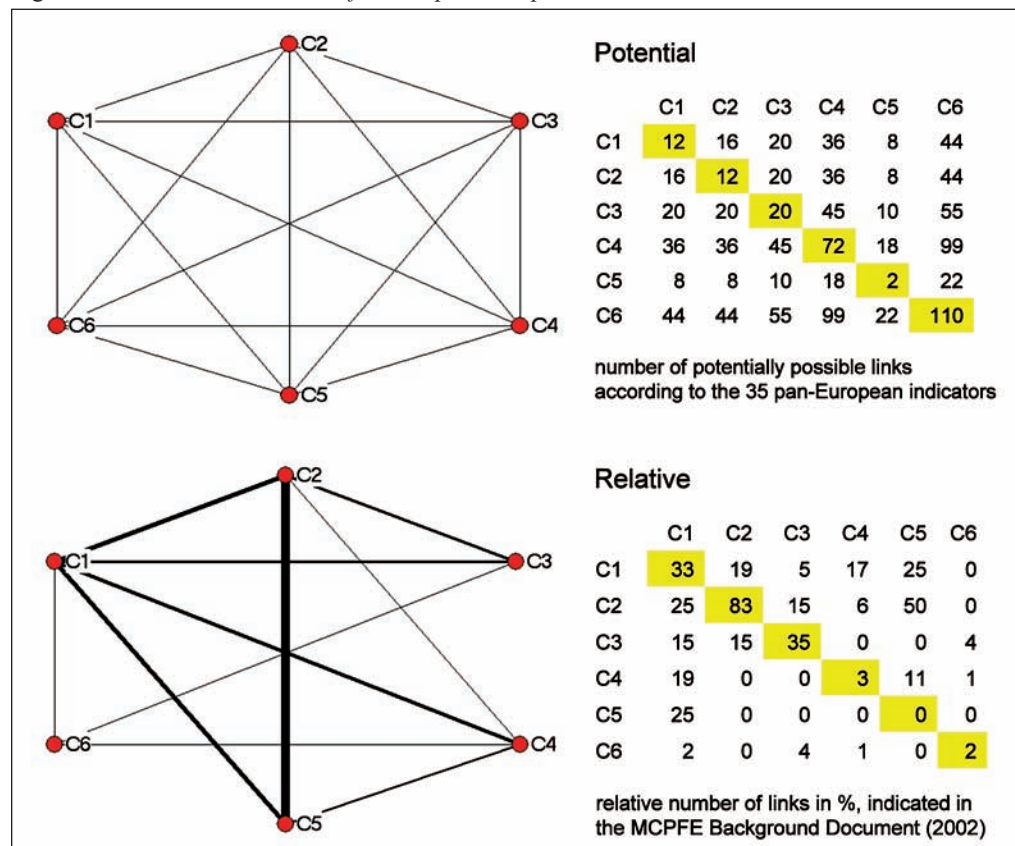
Story telling	“Spelling out the relationships is as vital to sustainability as identifying C&I” (Guldin and Heintz 2006). Story telling can be used not only to entertain but also to explain. It enables describing certain matter of facts or assumptions within a certain context. It is possible, e.g., to describe the logic of different cause-and-effect relationships between various aspects of SFM by telling a simple story. Such a story can start with some very basic indicators and simple relationships and end with lots of details and high complexity. Stories, e.g., can be clustered according to certain themes, like telling a story about forest carbon stock, forest biodiversity, or forest health and vitality. The six pan-European criteria can be taken as a first thematic cluster.
Delphi survey	Delphi surveys are an effective approach for gathering various expertises and find the most common denominator on common issues. A Delphi survey is a structured group interaction process that is directed in rounds of opinion collection and feedback. Opinion collection is achieved by conducting a series of surveys using questionnaires. The result of each survey will be presented to the group and the questionnaire used in the next round is built upon the result of the previous round (Delbecq <i>et al.</i> 1975). Wolfslehner (2005) applied a Delphi survey to indicate correlations of FMUL indicators relying on the expertise of various stakeholders and actors. Generally, it has to be considered that, even within a Delphi survey, the results are only as valid as the opinions of the experts involved.
Multicriteria decisionmaking	Widely regarded as useful to define different priorities in consideration of different objectives are different approaches of Multicriteria decisionmaking (MCDM) (see, e.g., Kangas 1992, Mendoza and Prabhu 2003, Tarp and Helles 1995). The generic process of MCDM is to (1) identify objectives and alternatives, (2) develop criteria or attributes, (3) weight criteria or attributes, (4) rank alternatives, and, finally, (5) choose one alternative (see Yazdani 2002). The combination between MCDM and approaches of network analysis seems to be feasible for setting priorities and defining linkages between various aspects/dimensions of SFM; e.g., as described by the pan-European C&I (see also Mendoza and Prabhu 2003, Wolfslehner <i>et al.</i> 2003, Yazdani 2002).
DPSIR concept	Applying the DPSIR concept allows indicating whether an indicator is a Driving force, a Pressure, a State, an Impact, or a Response indicator. The DPSIR concept was applied by, e.g., the OECD, CSD, and EEA (in different forms) to develop and cluster their indicator sets. Structuring the pan-European indicators according to the DPSIR concept would not only clarify the indicator relationships and linkages; it would also strengthen the general understanding of each indicator meaning and purpose.
Data modeling	Data modeling is the process of creating a data model by applying a data model theory to create a data model instance. Approaches of regression analysis, dynamic modeling, and/or cluster analysis are appropriate approaches to assess, describe, evaluate, and finally verify the multiple interdependencies or cause-and-effect relationships between various SFM aspects taking into account various data.

Linking C&I systems/initiatives	Linking different indicator systems/initiatives, e.g., by applying the approach of C&I network modeling, facilitates depicting and analyzing multiple relationships between (1) different land use systems (such as between agriculture, water/marine systems, and forests) and/or (2) different policy sectors and actions at different levels. There are several indicator sets in place developed by different initiatives and organizations. Specifically, sustainability and environmental indicators are developed and implemented at different levels. Comparing different indicator sets with, e.g., the pan-European C&I for SFM, it can be recognized that there are often common indicators. Common indicators provide the interface for linking different indicator systems with each other. The following indicators systems could be linked, e.g., with the pan-European C&I for SFM: • CSD Indicators of Sustainable Development. • <i>Forest area (%)—Naturalness.</i> • <i>Wood Harvesting Intensity.</i> • World Bank WDI. • <i>Forest area (%).</i> • <i>Net forest depletion (% of GNI).</i> • OECD Key Environmental Indicators. • <i>Actual harvest/productive capacity.</i> • <i>Area and volume distribution of forests.</i> • <i>Forest area management and protection.</i> • EU Sustainable Development Strategy Indicators. • <i>Forest increments and fellings.</i> • <i>Forest trees damaged by defoliation.</i> • <i>Designated areas—EU habitat directive.</i> • <i>Red list index for European species.</i> • EEA SEBI 2010 European Biodiversity Indicators. • <i>Growing stock.</i> • <i>Net annual increment and annual fellings, etc.</i>
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C&I = criteria and indicators. CSD = Commission on Sustainable Development. DPSIR = Driving force-Pressure-State-Impact-Response. EEA = European Economic Area. EU = European Union. FMUL = floating multiplier. GNI = gross national income. OECD = Organisation for Economic Co-Operation and Development. SEBI = Streamlining European Biodiversity Indicators. SFM = sustainable forest management. WDI = World Development Indicators.

Regarding possible linkages between the 35 pan-European indicators, the study by Requardt (2007) questions the assumption that all 6 SFM criteria are mutually interlinked to each other (see fig. 4). Taking into account the indicator correlation network as indicated by the MCPFE C&I background document and comparing the number of linkages with the potentially possible number of linkages, the highest correlation strength is given between criteria C2 (*Health and vitality*) and C5 (*Protective functions*). Criteria C1 (*Forest resources*) and C2 (*Health and vitality*) and criteria C1 (*Forest resources*) and C5 (*Protective functions*) are also strongly interlinked. On the other hand, no correlation is indicated between criteria C6 (*Socioeconomic functions*) and C5 (*Protective functions*) and between C3 (*Productive functions*) and C4 (*Biodiversity*). To interlink these criteria, potential indicator correlations would be, e.g., interlinkages between the indicator 6.4 *Expenditures for services* and 5.1/5.2 *Protective forests* or also between 3.5 *Forests under management plan* and 4.9 *Protected forests*. The marginal role of, e.g., criterion C6 and its socioeconomic indicators are also reflected by the numbers of possible intralinkages within each criterion. According to the 11 indicators of criterion C6, only 2 of 110 potentially possible intralinkages are described by the MCPFE background document, namely the correlation between the indicators 6.7 *Wood consumption* and 6.8 *Trade in wood*. Instead, relative high intraconnectivity is described for the indicators of criterion C2 (*Health and vitality*), realizing about 80 percent of the potentially possible intralinkages.

Figure 5.—Correlation network of the six pan-European criteria.



Source: Requardt (2007).

The observation of criteria linkages leads to two different assumptions. The first assumption is that the different correlations between the different SFM aspects were not fully considered or favored for different reasons during the process of developing the MCPFE C&I background document. The second assumption is that it is simply a matter of fact that certain indicators, such as some socioeconomic indicators or the biodiversity indicators, are less interlinked or intralinked within the concept of SFM, as they can be regarded rather as a “by product” of primarily managing and maintaining forest resources, taking into account only the objective of timber production, the protective functions, and taking care about forest health and vitality.

As mentioned, C&I networks are directed networks, meaning that a link from one indicator to another does not necessarily imply that there is a link in the other direction. These kinds of cause-and-effect relationships between the different SFM aspects but also the complexity of multiple cause-and-effect relationships are contrary to the so-called “wake theory.” The wake theory assumes that all SFM aspects, such as forest biodiversity, forest health and vitality, or protection functions, are mutually provided in the wake of forestry that focuses primarily on timber production (see Dieterich 1953, Glück 1982, Rupf 1960). In recent years, the wake theory has been more and more replaced (see Glück 1982) by the concept of multipurpose forest management (see Denzler 2002, Schütz 2001).

Multipurpose forest management or multifunctionality describes a concept where forests are considered to serve several purposes, such as timber production, nature protection, protective functions, or socioeconomic functions, at the same time in one FMU. Due to the rising importance of ecological and social aspects in multipurpose forestry, a strict distinction formerly drawn between production forests, protection forests, and nature conservation has become more blurred today (Rametsteiner 2000). However, in contrast to both these theories, and, in particular, to the wake theory, the example of criteria correlations clearly shows that some SFM aspects are more correlated to each other than to others and that the benefits of SFM do not only depend on the sustainable production of timber resources.

The question that arises in this context is, how far is it actually possible to consider all SFM aspects and related objectives (e.g., described by the pan-European C&I) mutually in one management concept at the same time and in one FMU? Or, can it even be assumed that the concept of multipurpose forest management is only a theoretical concept that is often limited in its implementation as it is “fragile” to too many conflicts of interests? Multipurpose forest management often leads to conflicts of interests that require decisions to be made between different options by different stakeholders (see also Rat für Nachhaltige Entwicklung 2004). The understanding of cause-and-effect mechanisms and their key indicators is crucial in defining appropriate forest management concepts that take into account different policy objectives.

It can be concluded that network analysis is one appropriate tool to depict and analyze different cause-and-effect mechanisms between different SFM aspects; e.g., described by the pan-European C&I. Network analysis can be applied to recognize and define different scenarios for solving different conflicts of interests that might arise in a multipurpose forest management.

Furthermore, it can be concluded that C&I network analysis is not only an appropriate tool to analyze different management scenarios and to define different management concepts, it also helps to define and to improve explicit monitoring strategies and concepts that enable assessment of progress and achievements toward defined management priorities and objectives. Promoting and achieving transnational objectives based on multilateral policy agreements requires reliable and comparable data. Monitoring, assessment, and reporting activities should, therefore, strengthen their capacities to provide harmonized reliable data sets, especially for defined key indicators—indicators which can be regarded as central in achieving SFM.

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Developing Country Application of the Analytical Assessment Tools

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The Philippine Criteria and Indicators and Applications

This paper provides a model for an analytical assessment tool of criteria and indicators (C&I). The word “model” is interpreted and used in two ways. The first refers to a designed process to make clear for whom and for what is to be done in the use of C&I data. The second use refers to forest audit as a systematic but pragmatic management performance measurement tool. The paper’s focus is on the second model and how this is currently applied in the Philippines.

The Philippines’ C&I system is a systematic adaptation of the International Tropical Timber Organization’s (ITTO) model refined within the context of the country’s forestry situation. These C&I are a product of consultations amongst relevant Government agencies and forest stakeholders and are applied for reporting, monitoring, evaluation, and decisionmaking at the national, local, and management unit levels.

Specifically, the purpose of the Philippine set of C&I is to provide the Government through the Department of Environment and Natural Resources (DENR) and forest managers within the country an improved tool for assessing changes and trends in forest conditions and forest management systems. The C&I provide a means of assessing progress toward the attainment of the objective set under Executive Order 318, otherwise known as “Promoting Sustainable Forest Management in the Philippines” and toward to the commitment to ITTO’s Year 2000 Objective.

Using the C&I as management tools provides forest managers with a framework for understanding, planning, and implementing improved forest management techniques. They will have an enhanced ability to comprehensively assess whether the forests under their care are moving toward or away from sustainable forest management (SFM). This also helps policy and decisionmakers in developing policies and necessary actions to further strengthen SFM, focusing on aspects where knowledge is still deficient, and in identifying those areas which are in need of assistance.

The approved set of Philippine C&I is formally used by the Government in the performance evaluation of various types of forest management units (FMUs) through a Memorandum Order issued by the DENR in 2007. The Philippine C&I have seven criteria, as follows:

Criterion 1, Enabling Conditions for Sustainable Forest Management; Criterion 2, Extent and Condition of Forests; Criterion 3, Forest Ecosystem Health; Criterion 4, Forest

¹ Sustainable Ecosystems International Corporation.

Production; Criterion 5, Biological Diversity; Criterion 6, Soil and Water Protection; and Criterion 7, Economic, Social, and Cultural Aspects.

Criterion 1 has a total of 11 indicators that are mainly descriptive in nature. Criterion 2 is composed of six indicators. In Criterion 3, there are two indicators identified. Criterion 4 has a total of 12 indicators that were designed to relate to the flow of forest produce. There are a total of seven 7 indicators that were identified in Criterion 5. Criterion 6 is composed of five indicators. A total of 14 indicators are identified for Criterion 7. A total of 56 indicators make up the Philippine C&I system. These are all applicable at the national level. At the FMU level, 52 indicators are considered appropriate for the Philippine forestry situation.

National, State, and FMU Use of Indicator Data in Decisionmaking

At the national and local Government units, the indicator data are largely used for reporting, evaluation, and decisionmaking for SFM. National reports on the status of SFM have been prepared by the Forest Management Bureau under the DENR to determine indicators progressing toward or away from SFM. A comprehensive baseline report was formulated in 2003 and updated in 2005 with assistance from ITTO. Comparative analysis of the reports showed indicators which should be strengthened toward SFM and the remedial policy and institutional and management measures that should be taken. The updating of the *Philippine Forestry Baseline Report* made available updated information to help the Government assess the country's status regarding its progress or regress vis-à-vis SFM. C&I in effect provided guidelines for sound forestry decisionmaking.

Analysis of C&I from national reports strengthened national capability for SFM in general and helped identify projects and interventions to guide the country toward SFM. Policy and institutional reforms as critical components can ensure enabling conditions for the application of the C&I system.

Table 1 summarizes changes on SFM which are highlighted in the national reports of 2003 and 2005.

Table 1.—*National-level progress on SFM by key indicators.*

Toward SFM	Away from SFM
Policy and legal framework	Resource base
Institutional framework	Integrated land use plans
Information management	Permanent forest estate
IEC for awareness	Forest investment
Resource assessment	Forest protection
Planning procedures	Damage by human activities
Long-term strategies	Monitoring and evaluation
Management guidelines	Ecosystem diversity
Harvesting procedures	IUCN species
Participation of communities and indigenous people	Soil and water conservation
Forest dependents	GDP and other economic contribution
Conservation procedures	Forestry employment
Reduced impact logging	Wood production
	Timber trade
	Processing efficiency

GDP = gross domestic product. IEC = Information, education and communication. IUCN = International Union for Conservation of Nature. SFM = sustainable forest management.

Most of the indicators indicating movement away from the objective of SFM relate to the continued decline of the forest resource base and its contribution to economic development in the Philippines. This decline was discussed and the underlying causes are further elaborated in the problem tree analysis of the reasons for slow overall progress toward SFM. Considerable efforts have been made at various levels to move toward SFM effectively. While there are good forest policies and procedures, enabling legislations and implementing mechanisms remain weak.

The national C&I reports are also submitted to international organizations like the ITTO and United Nations bodies and processes as a commitment to SFM. It is anticipated that, in the near future, there will be a common harmonized framework and format for C&I reports and data requirements. Such reports provide effective forest management tools for the country reporting of progress on SFM at national and FMU levels, determination of indicators and other factors hampering SFM, and identification and formulation of remedial measures to achieve goals and targets on SFM and the Objective 2000 commitment to ITTO. They also generate necessary mechanisms for verifying and evaluating the C&I system through appropriate audit and other analytical tools and procedures.

The C&I and audit systems are now widely accepted by the country's forestry sector. The C&I framework is now effectively used and incorporated in the DENR-Forest Management Bureau (FMB) fundamental policies, plans, and guidelines such as the Revised Master Plan of the Forestry Sector, Omnibus Forestry Guidelines, Government Plan of Action, and the Forest Logic Model. These national guidelines, considered as a road map for forestry management and development in the Philippines, used C&I as basis for monitoring and evaluation of priority projects and the impacts of forest intervention.

Proposed afforestation and reforestation projects applying for host country approval under the Clean Development Mechanism are evaluated against the general sustainable development criteria outlined in DENR Administrative Order No. 2005-17 and more specific criteria (indicators for which have also been identified), prescribed by the FMB of the DENR acting as the lead agency of the Technical Evaluation Committee for Afforestation and Reforestation Project Activities under the Philippine Designated National Authority.

The C&I system provided the country with the necessary tools to integrate the largely fragmented view of SFM. It made available an appropriate framework and effective analytical tools to consolidate and analyze complexities of managing tropical forest. It also enabled decisionmakers to analyze the different components of SFM and the intertwining and intricacies that exist among them. Armed with these tools and a more holistic view of SFM, the Government, especially the decisionmakers, would be able to process data and information more effectively. It will help them identify indicators and other factors hampering SFM and enable them to prescribe remedial measures to ensure the achievement of SFM objectives.

Enhanced ability to analyze the relevant data and information also led to more effective and relevant forestry policies and management interventions both at the national and FMU levels. The presence of information and data and the standard means to analyze them provided the country and the different forestry players and stakeholders with a common

yardstick by which to measure the country's status vis-à-vis SFM at any given time and location. It also defined the proper roles and responsibilities the various stakeholders must play in order to reach the common goal of enhanced and sustainable management of the country's tropical forests.

Analytical Tool for Forest Evaluation at the FMU Level

The Philippines' auditing system of SFM at the FMU level (the Timber Management License Agreement [TLA], Industrial Forest Management Agreement [IFMA], Community Based Forest Management Agreement [CBFMA], and other types of management units with tenure on public forest lands), has been developed as the main vehicle for the evaluation of performance and monitoring of FMUs. It is an internal audit by independent forest auditors to assess SFM performance and to serve as a management tool to FMU managers by providing remedial measures to indicators and criteria that fail in meeting norms for SFM.

The Philippine C&I system is used for auditing SFM performance of the FMU. All 7 criteria and 52 indicators applicable to the country will be audited.

The Philippine audit system for SFM at the FMU level can also be used to conduct performance evaluation for each of the specific criteria or combinations of criteria as a management tool to determine certain aspects of the forest management system. Or, a particular forest management aspect can be selected and their applicable indicators can be verified for compliance to norms. The applicable scores per indicator can be used to compile scores and can be aggregated for performance pertaining to the specified forest management aspect.

An audit manual was designed and formulated to provide guidelines and procedures for implementing an appropriate Philippine audit system for C&I with focus on audits for SFM performance at the FMU level. The main implementation framework includes what should be audited (C&I and their verifiers/norms), who should audit and be audited, the methods to be used, the frequency of audit for the agencies auditing or certifying, and the means to verify the results of assessments. While the goal is SFM performance evaluation, the audit system should be able to link with future timber certification schemes to be developed for the country.

The audit manual, including the verifiers and norms for the 52 indicators at the FMU level, was formulated under the technical assistance provided by ITTO under PD 225/03 Rev. 1 (F): Development and Institutionalization of an Appropriate System of Criteria and Indicators for SFM in the Philippines. These were subjected to intensive consultations and meetings with various concerned stakeholders, including forest operators and communities as well as concerned agencies, nongovernmental organizations, and professional forestry organizations. These were also pilot tested in selected FMUs. The recommendations from stakeholders and results of pilot testing constitute the main inputs to the final manual approved by the Government. Since the norms are specific to each FMU situation

and hence vary from different FMUs like annual allowable cut, silvicultural prescriptions, biodiversity, and soil and water protection methods, they are set for specific FMUs to be audited in consultation with the forest operators prior to audit.

The assessment model uses appropriate norms to determine SFM in each of the 52 indicators at the FMU. Verifiers and means of verification are provided for each of the norm. As an example, table 2 cites the norms and verifiers used for indicators 4.1 and 4.2 of Criterion 4 on Forest Production.

Table 2.—*Sample norms and verifiers for assessment of indicators.*

Criteria	Indicators	Verifiers	Norms
Criterion 4: Forest Production	Indicator 4.1 Extent and percentage of forest for which inventory and survey procedures have been used to define the quantity of the main forest products	Extent and percentage of forest for which inventory and survey procedures have been used to define the quantity of the main forest products (area and volume control per Philippine selective logging system)	100% inventory and survey or acceptable equivalent for annual logging setup per timber harvesting regulations
	Indicator 4.2 Actual and sustainable harvest of wood and nonwood forest products	Harvesting level of timber and other forest products	FMU annual allowable cut for timber and other forest and nonforest products as indicated in the annual OP

FMU = forest management unit. OP = operating plan.

Verification and assessment of compliance to measurable norms (qualitative and quantitative) of indicators and compiling for the seven criteria will be done using a scoring system for degree of compliance or noncompliance with required norms dealing on procedures, documents, policies, or management prescriptions.

Based on the scoring system shown in table 3, the FMU has to show compliance to SFM norms for all seven criteria but may fail in compliance with certain specific indicators. The aggregate score per criteria can be summed to indicate overall SFM performance of the FMU. The sum for all points per criteria will be added to evaluate the overall FMU performance on SFM based on the following cumulative categories: good performance, poor performance, and failure. The procedural framework for auditing the Philippine C&I system is shown in figure 1.

The results of auditing SFM performance at the FMU level are presented in an audit report with the summary of scoring for C&I and final grading results for SFM performance. Management aspects which meet or do not the desired norms are highlighted. Remedial measures and recommendations are made as a guide to decisionmaking for indicators that do not meet the expected norms. The complete audit reports for the pilot FMUs can be requested from the FMB of the Philippines (the contact person is Director Romeo T. Acosta). The audit results for the Surigao Development Corporation (SUDECOR) timber concession are summarized in the next section.

Figure 1.—Procedural model for analytical assessment using C&I.

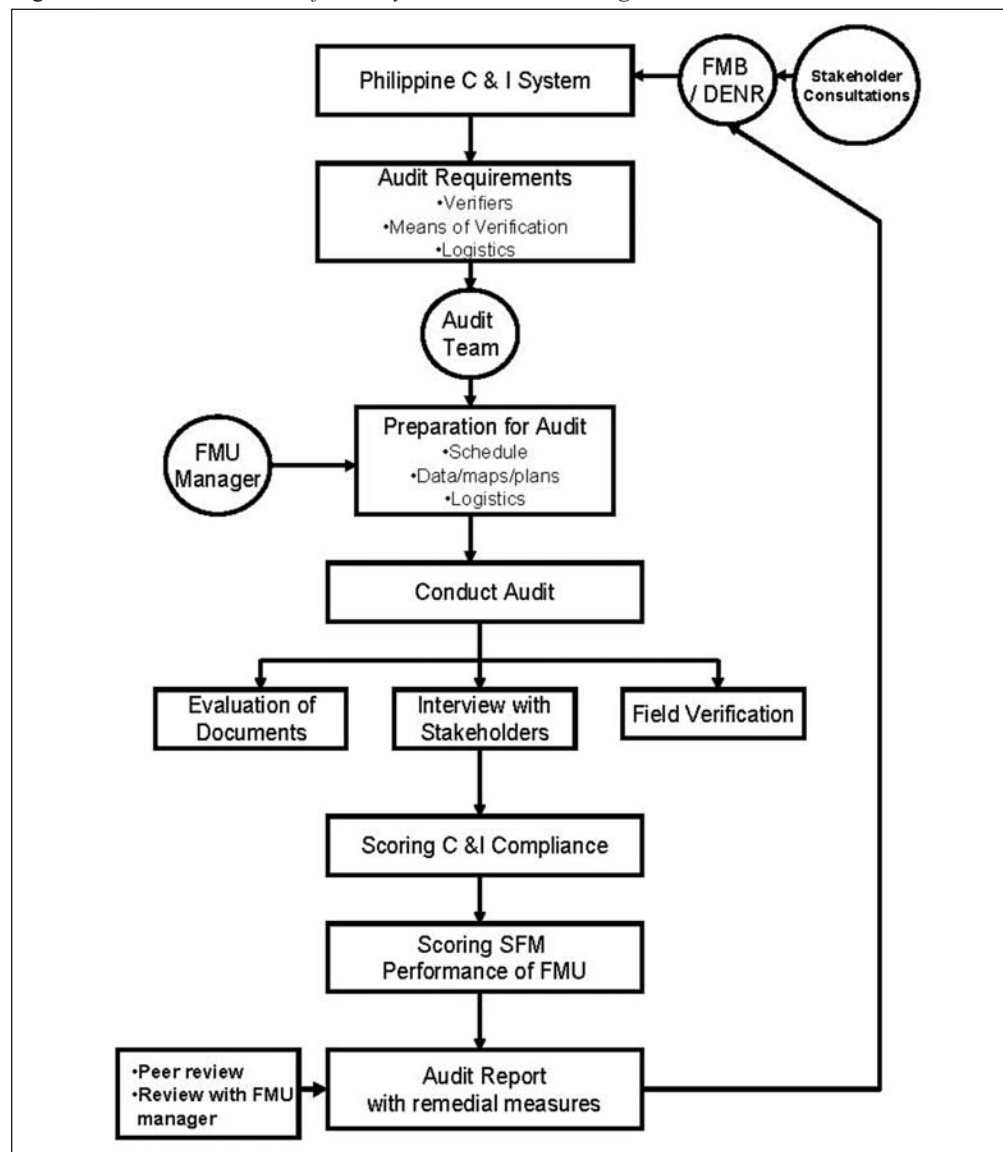


Table 3.—Scoring system for forest audit.

Indicators	Criteria	SFM performance
Full compliance with norm—3 points	Criteria 1 (9)—27 points	Good performance—104-156
Partial compliance with minor corrective measures—2 points	Criteria 2 (6)—18	Poor performance—51-103
Partial compliance with major corrective measures—1 point	Criteria 3 (2)—6	Failure — 1-50
Noncompliance—0 point	Criteria 4 (12)—36	
	Criteria 5 (5)—15	
	Criteria 6 (4)—12	
	Criteria 7 (13)—39	
Each indicator will have the scores for compliance with norms. A maximum point per indicator is 3.	The total maximum points for all 52 indicators of SFM are 156, broken down based on number of indicators per criteria: The FMU has to show compliance to SFM norms for all seven criteria but may fail in compliance with certain specific indicators.	The aggregate score per criteria can be summed to indicate overall SFM performance of the FMU.

FMU = forest management unit. SFM = sustainable forest management.

Pilot Testing and Operational Application of Forest Auditing

The audit manual and its procedures had been pilot tested in selected FMUs to demonstrate the proper application of auditing systems useful to the country to carry out its mandates on SFM. This can further lead to national competence for internal and future external certification of forest product sources and processing employed. It was also pilot tested in the selected FMUs focusing on timber management.

The final manual for forest auditing of FMUs can be downloaded from <http://www.forestry.denr.gov.ph>, which includes Annex 2 on the final Philippine C&I and Annex 3, Guide to Auditing SFM Based On Philippine Criteria and Indicators (verifiers and norms are indicated).

The audit team employed three major methodologies in ascertaining compliance to norms: the review of relevant documents, the conduct of interview with concerned agencies and stakeholders, and actual field verification of FMUs' compliance to SFM norms for all the applicable 7 criteria and 52 indicators.

One of the FMUs subjected to this pretesting activity was SUDECOR. The company is the holder of Timber License Agreement No. 56-1, which was awarded on June 1986 and will expire on June 2011. It is located within the Province of Surigao del Sur and forms part of the proclaimed timber corridor of the country to support the wood requirements of the wood-based industry.

Generally, SUDECOR was able to meet most of the norms provided for by the C&I for SFM. SUDECOR gathered full points for criteria 2, 3, and 6 and relatively good scores for the rest of the criteria. There was substantial compliance of SUDECOR in some of the indicators/norms even if existing TLA policies do not require them to do it. Policy gaps include participatory planning in all levels, carbon stock measurements, monitoring of rare and threatened species of flora and fauna, and monitoring biodiversity in production areas.

On the other hand, the management aspects which did not meet full compliance to the desired norms have something to do with IEC (1.7), participatory planning (1.10), consultation with stakeholders (7.14), full compliance to pre- and postharvesting operations (4.10), enrichment planting (4.12), wildlife monitoring (5.4), optimum utilization of wood products (7.2), nonfunctioning sawmill facility (7.3), and workers' health and safety measures (7.8). Remedial measures were recommended to improve forest management and decisionmaking in these aspects and incorporated in their management plans. The SUDECOR timber concession was the first FMU to have a long-term 25-year SFM plan using the C&I framework approved by the Government. Their medium-term and yearly operational plan incorporated most of the SFM indicators at the FMU level.

Another ITTO project, Project PD 167/02 (F) Rev.2 "Integration of Forest Management Units (FMU) into Sustainable Development Units (SDU) through Collaborative Forest Management in Surigao del Sur, Philippines," was recently completed and produced an action plan in a sustainable development unit comprising watersheds and ecosystems from mountain to coast in Surigao del Sur, Philippines. The action plan is based on the C&I framework and format for monitoring and evaluation. It is currently under implementation

by organized stakeholders within the context of collaborative forest management developed in the project.

The audit system using the Philippine C&I was recommended by stakeholders and approved by the Government for application in the performance evaluation and reporting of FMUs, including community-based forest agreement areas. A Memorandum Order from the DENR Secretary dated July 12, 2007, formalized this regulatory requirement under Section e, which states that “regular performance evaluation of tenure instrument holders shall be conducted using the C&I for Sustainable Forest Management.”

Demands/Needs for C&I and Information at the FMU Level: Forest Operators and Communities

Forest utilization and management are conducted mainly in Government forest lands through the granting of appropriate tenure instruments for exploiting resources on a sustainable basis for 25 years, renewable for another 25 years. Two tenure instruments or long-term stewardship/leases are in place to grant local communities and other stakeholders the right to manage and use forest resources: the CBFMA and the IFMA. The majority of these areas are forest lands formerly managed by corporations under the TLA, which are no longer being issued. As TLAs expire, the forest lands become open for application by local communities as CBFMA or IFMA. Former commercial forest operators can also opt to convert their lease to an IFMA when their tenure expires.

A major change affecting the management of forest lands is the passage of the Indigenous Peoples' Rights Act of 1997 (Republic Act 8371), wherein ancestral domains of indigenous people (IP) are recognized and the rights over these lands vested upon them. The rights take the final form of a Certificate of Ancestral Domain Title wherein primary ownership of the land is now with the IP. The IP's rights include the exploitation of the resources within these lands, subject to Government regulations, foremost of which is the need to have an approved Ancestral Domain Sustainable Development and Protection Plan.

The right to harvest forest resources is subject to Government rules and regulations on timber harvesting, selective logging, annual allowable cut, prelogging and postlogging operations, forest protection, community services, and environmental compliance. Thus, in the past, tenured licensees in public forest lands (e.g., TLA, IFMA, CBFMA, etc.) need information that are mainly silvicultural or purely forestry in scope and cover the most important data necessary to formulate a framework forest management plan and a yearly operational plan for submission to the Government.

Information for management decisionmaking and regulation at the FMU level were expanded recently by the use of C&I mostly at indicator levels to satisfy Government regulations on FMU performance, which now uses C&I as compared to traditional methods which do not consider other aspects of SFM. There is need for about 52 qualitative and quantitative indicators to use C&I as management tools for sound forest management decisions at FMUs.

In most cases, the FMUs do not have comprehensive and updated baseline data on appropriate or existing indicators in a particular FMU. Due to a lack of mandate to gather all indicators, it is expected that they may not be complete in certain FMUs, particularly CBFMA areas operated by communities and indigenous people. Indicators for Criterion 5, Biological Diversity; Criterion 6, Soil and Water Protection; and Criterion 7, Economic, Social, and Cultural Aspects, generally do not have adequate information/data at the FMU level. In view of this, only indicators with sufficient data are audited and the scoring system is adjusted accordingly. Time is given for FMUs to complete their information requirements for the next auditing periods.

During the pilot testing and consultation meetings for forest auditing, several key recommendations were made by stakeholders to improve the gathering and evaluation of C&I data, as follows:

- There is a need to provide policy or some applicable mechanism to oblige the conduct of certain activities. These include (1) demarcation of physical boundaries; (2) identification and protection of endangered, rare, and threatened species; (3) monitoring of biodiversity; (4) setting aside forest sites for research, education, and recreation; and (5) measurement of carbon storage in forest stands. Other indicator data that are currently not being collected by FMUs will not be available for adequate and timely decision. The indicators/activities cited are not required for reporting nor evaluation purposes at present; however, there are existing procedures such as map and ground delineation of forest boundaries, monitoring of biodiversity with Biodiversity Monitoring System (BMS) International Union for Conservation of Nature procedures for threatened species, etc., and measurement of carbon stock.
- Indicator 1.1 on existence and implementation of policies, laws, and regulations to govern forest management has been added at FMUs since they often formulate their own policies and procedures in forest management consistent with DENR and local Government unit (LGU) national and local policies. The suggestion to include Indicator 5.5 (measures for in situ and/or ex situ conservation of the genetic variation within commercial, endangered, rare, and threatened species of forest flora and fauna) to FMU indicators does not have sufficient technical basis. Genetic variation requires comparative large-area national analysis as FMU evaluation confined to small FMUs, even TLAs, can only provide biodiversity assessment at ecosystem and species levels.
- For analysis of C&I data, there is a need to clarify existence, adequacy, appropriateness, acceptability, and other qualitative indicators and their associated measurable norms. Qualitative indicators should be predetermined with FMUs since these are specific to particular FMUs. For example, 100 technical personnel maybe adequate for a big TLA based on their absorptive capacity and plans, while this may dwindle to 10 for a smaller IFMA or CBFMA.
- There is concern among stakeholders for the inclusion of data for other land uses such as forest grazing, tree plantation, agroforestry program, etc., under the SFM/C&I system. These are already included as part of integrated area systems provided areas are part of a permanent forest estate (PFE) but have not been properly understood.

Tree plantations in PFEs have always been a vital component of the C&I system and counted in all indicators pertaining to timber products utilization, harvesting, etc.

The above recommendations were incorporated in the final revisions of the Philippine C&I and the auditing manual.

Aside from using C&I and relevant information incorporated in the framework and operational management plans of forest operators and communities, the Government also uses these management tools for conducting regular performance evaluation for compliance to SFM and other contractual obligations for tenure on public forest lands.

Forest operators and communities also use C&I data for their own internal management and decisionmaking. For instance, the TLA of SUDECOR implemented the guidelines formulated in their SFM plan to minimize or enhance biodiversity and soil/water conservation during logging and other forest operations. Communities concentrate on the livelihood and upliftment of socioeconomic conditions amongst beneficiaries and stakeholders in their areas of forest operations. The rates of returns from forest operations have been calculated mostly for public good than for individual forest tenure holders, which is a contentious issue prior to the acceptance of the C&I system.

Successful Ways To Deliver Forest Data to FMU Stakeholders

The use of the global Internet has been proven as an effective mechanism for delivering online timely forest data to stakeholders. The Government maintains Web sites such as <http://www.forestry.gov.ph> and <http://www.denr.gov.ph>, which provide updated information on the forestry sector encompassing most of the indicators for the Philippines at national, regional, provincial, and municipal levels. The Philippine C&I system and questionnaires, the manual for forest auditing and associated guides, and forest policies and legislations can also be downloaded at the first Web site cited.

The FMB also distributes printed copies of the Annual Forestry Statistics to concerned and interested stakeholders.

The development of a user-friendly C&I Geographic Information System (GIS) and database management system facilitated access and analysis of information to help decisionmakers make timely and relevant conclusions. The Management Information System (MIS) installed the baseline and other data gathered for monitoring, evaluation, and determination of progress toward SFM both at the national and FMU levels and the succeeding updates.

The computerized C&I GIS and database system principally used MS (LGUs) access interfaced with various thematic maps derived from ground and aerial forest survey/inventory, satellite imagery analysis, and GIS analysis. The formulated database system is a flexible and user-friendly system that can be customized to cater to different FMU situations and can accommodate the preservation of previous data for historical record and

reference, which is useful for tracking development and trends. The system also supported and reinforces the overall FMB MIS for the national and FMU levels. Forestry operators and stakeholders can request digital copies of the MIS database from the FMB.

A training of selected FMU representatives knowledgeable about computers, FMB-MIS personnel, and technical personnel from selected DENR field and central offices on the use and operation of the C&I GIS and Database System was also conducted under a project assisted by ITTO.

The Government and professional organizations also conducted training on existing procedures to gather and analyze data on indicators for Criterion 5, Biological Diversity; Criterion 6, Soil and Water Protection; and Criterion 7, Economic, Social, and Cultural Aspects, which generally do not have adequate information/data at the FMU level.

Additional Reading

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Sustainability and Technology, Group for (SusTec)–ITTO. October 2002a. Completion Report: ITTO Project PD 35/96 Rev. 2 (F): Conservation and maintenance of biological diversity in tropical forests managed primarily for timber production, Surigao del Sur, Philippines.

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SusTec. February 2008. Project Completion Report: Integration of forest management units (FMU) into a sustainable development unit (SDU) through collaborative forest management in Surigao del Sur, The Philippines.

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Appendix: Presentations

Welcome: Forest C&I Analytical Framework and Report Workshop

Heikki Granholm

Welcome: Forest C&I Analytical Framework and Report Workshop

Heikki Granholm

Joensuu 19 May 2008



Finland's National Forest Programme 2015; priorities

- Securing a competitive operating environment for the forest industry and forest management;
- Enhancing the climate- and energy-related benefits of forests;
- Protecting the biological diversity and environmental benefits of forests;
- Promoting the use of forests as a source of culture and recreation;
- Strengthening skills, expertise and acceptability of the forest sector;
- Promoting sustainable forest management in international forest policy.

2



Evolution of C&I

- 1990s Canadian initiatives, ITTO initiatives
- In Europe:
 - Helsinki Ministerial Conference 1993 -> C&I work
 - Pan-European Criteria, Indicators and Operational Level Guidelines for SFM 1998
 - Improved Pan-European Indicators 2002
- Montreal Process, Tarapoto, etc.
- ISCI seminar 1996
- 7 common elements for SFM, adopted at UNFF4



3



Progress in Finland

- Active promoter of C&I at international and national levels
- First set of national indicators developed in 1996 (64 quantitative and 103 descriptive indicators)
- Second set published in 2000 (35 quantitative and 12 descriptive)
- Third set published in 2007 (5 covering overall policies, 12 qualitative and 35 quantitative)

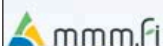


4



Impacts of C&I work

- Facilitate definition and concept of SFM
- International competition and cooperation
- Linkages to management level criteria, e.g. certification
- Consensus building at various levels
- Raise the importance of monitoring, assessment and reporting
- Improved information management and reporting
- Science - policy collaboration



5



Future challenges / Questions

- Improved linkages between policy planning and monitoring, e.g. through nfp
- Linkages to other sets of indicators (sd, bd, etc.)
- Increased need for criteria for various end-uses: biofuels, bioenergy, public procurement, etc. (standard and quantification of impacts; national vs. operational levels) do C&I have a role to play?
- Improved information management
- Improved communication



6



Background and Purpose of the Workshop

Rob Hendricks¹



www.mind.org



Background and Purpose of the workshop

Joensuu, Finland
May 19-21, 2008

Rob Hendricks
US Forest Service



www.mind.org



The purpose of the workshop

Explore two topics:

- Whether the reports are effective and how to improve them
- What meaning can be gained from indicator data

¹ U.S. Department of Agriculture, Forest Service.



www.fhpi.org

It is time to reflect



- It has been 15 years since beginning of C&I
- Two sets of indicators
- Third iteration of national reports
- Ministers are asking whether all this effort is producing anything of value



www.fhpi.org

Just where are we?



In some countries C&I reports:

- A legislated assessment and management tool
- Primarily a research function
- Have never really taken off

New people are taking the reins



www.fci.org

Poland workshop -- 2006



Purpose: To explore areas of possible collaboration

- Harmonization of terms
- How forest reports are actually being used
- Logic models for C&I



www.fci.org

Poland Outcomes

- The value of C&I for understanding, reporting on and promoting SFM has yet to be maximized
- Difficulty of using C&I data to construct compelling stories
- Well supported and visible theory behind indicators is needed
- Methods of analyzing indicator data (the development of systems models)
- Innovative and compelling presentations of
- Meaningful stories



www.fciaf.org

Forest Reporting and Smarter Communication



- Finland -- Overview on purposes of reports
- Australia -- Challenge we are here to address
- Three speakers describe new ideas
- Simon Bridge – Web 2



www.fciaf.org

My Personal Experience



- People constantly ask me for good sites
- Google searches provide poor results
- Experimented with C&I topics, i.e. fragmentation, forest biodiversity etc.
- No hits in first 20
- Exception, Wikipedia article on Sustainable Forest Management



www.mfcl.org

Who is the audience?



- The interested public
- Do they know who we are? **NO**
- How will they look for us? A Goggle search
- For any C&I trend topic, will they find us? **NO!**
- will they “stick” with us? **Probably not!** Too complicated and boring
- Will they find the answer “are we sustainable”?
No!



www.mfcl.org

Various ways to make a point



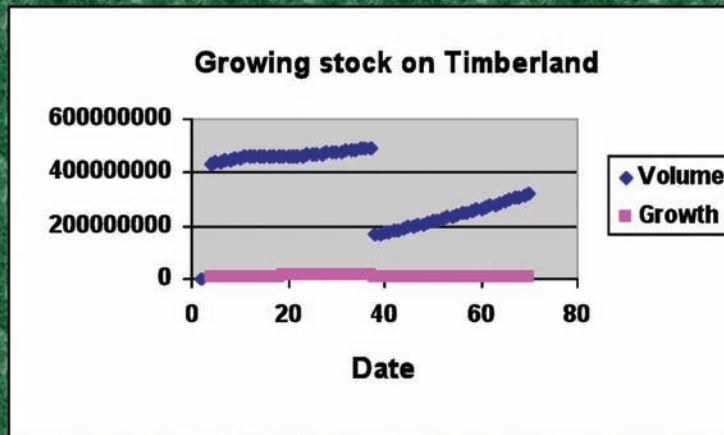
Growing stock on Timberland

Species	Year	Volume	Growth
Thousands cubic feet			
Softwood	1955	432,141,263	8,118,464
Softwood	1956	435,497,337	8,314,660
Softwood	1957	439,034,392	8,500,704
Softwood	1958	442,921,705	8,688,633
Softwood	1959	446,993,646	8,888,555



www.nipcl.org

Various ways to make a point



www.nipcl.org

Various ways to make a point



How about this?

The so what, finding meaning in trend data?

Trendalyzer

- Allows very complicated to be presented simply
- Forces a presentation in 3+ dimension -- pressure and trend
- Opportunity for a compelling story



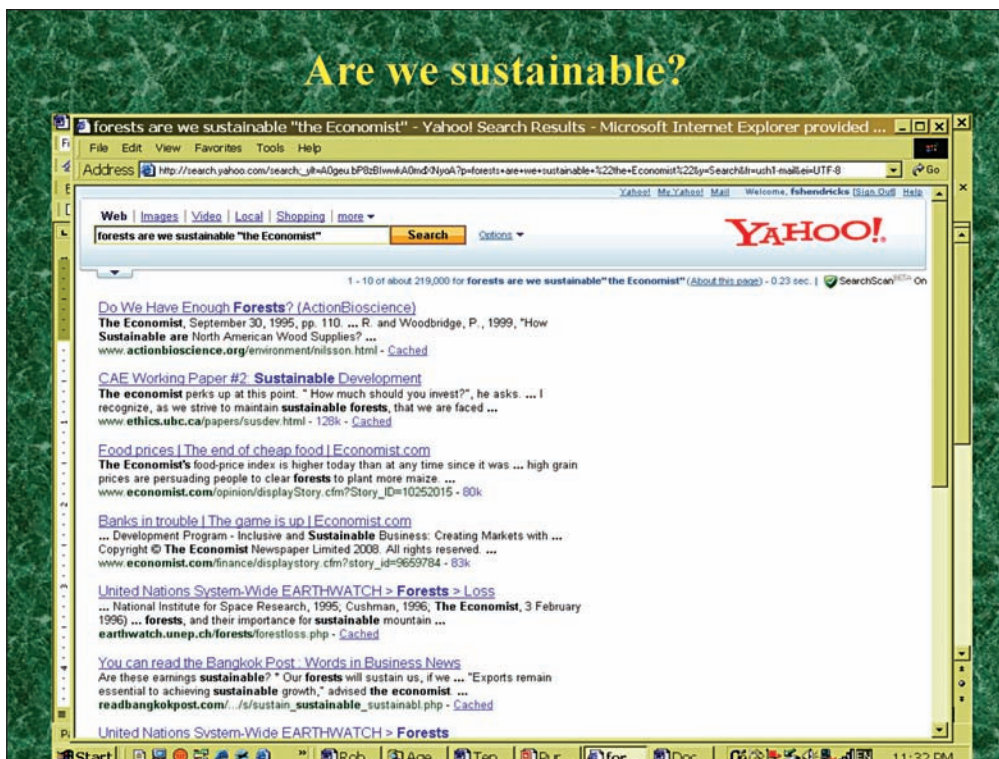
www.infc.org

The so what, finding meaning in trend data?



- Scientists are frustrated
 - systems models to examine the relationships
 - thresholds, weights, goal sets, missing indicators and optimizations
- The public wants an answer to a simple question -- are we sustainable?

Are we sustainable?





www.iied.org

The so what



- Rich Guldin will introduce the topic
- We will hear what is going on Europe
- Four approaches to the use of models



www.iied.org

Workshop outcomes



- Maintenance of C&I process collaboration.
- Reenergizing of the intellectual thinking devoted to the use of C&I and its purpose.
- The capture of emerging ideas in forest report communication and indicator analysis and sharing them with our colleagues around the world.
- More sophisticated, useful, accessible and compelling next generation of forest assessment reports.



www.fhpi.fs.fed.us

Any Concerns?



The Use and Audiences of National Forest Sustainability Reports

Jari Parviainen¹



The use and audiences of national reports

Questions to be answered

- 1) how and for what purposes the reports are being used,
- 2) who are the main users and audiences of the reports,
- 3) experiences in how to present the results in reports, and
- 4) in what ways they are the most effectively used in communication

¹ Director, Finnish Forest Research Institute, Yliopistokatu 6, FIN-80100 Joensuu, Finland. Phone: +358 10 2113010. E-mail: jari.parviainen@metla.fi.



Material for analysis

I. The review of national (nine country reports representing MCPFE, Montreal and ITTO processes)

reports presented for the Inter C&I Process Harmonization Workshop in 2006 in Bialowieza

II. State of Finland's Forests 2007

Evaluation on the use of the report by stakeholder panel in April 2008
Experiences in communication

Jan Parviamen 6/25/09
METLA

I. Review of nine country reports in 2006

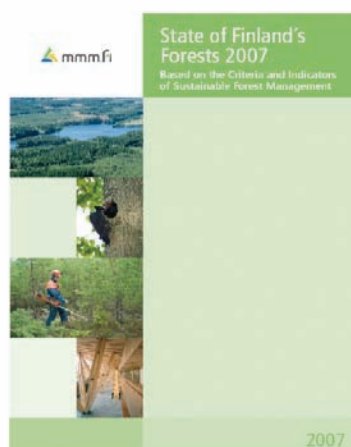
- MCPFE countries:
 - Austria 2004
 - Switzerland 2005
 - Finland 2005 (2007)
- Montreal process countries:
 - USA 2003
 - Australia 2003
 - Japan 2003
- ITTO countries:
 - Malaysia 2003
 - Philippines 2005
 - Ghana 2004



Jan Parviamen 6/25/09
METLA

Characteristics of the national reports

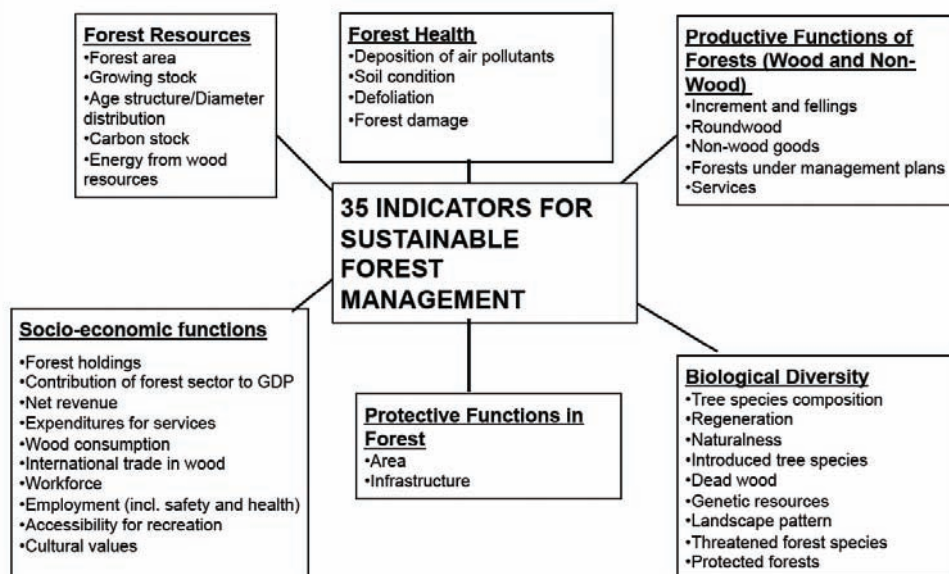
1. C&I provide a balanced compendium of information on SFM
2. C&I provide broader view than the traditional statistics
3. Compilation in various ways
4. Reporting requirements are increasing



Jan Parviainen 6/25/09

METLA

1. C&I provide a balanced compendium of information on SFM



Pan-European indicators for SFM 2003

Jan Parviainen 6/25/09

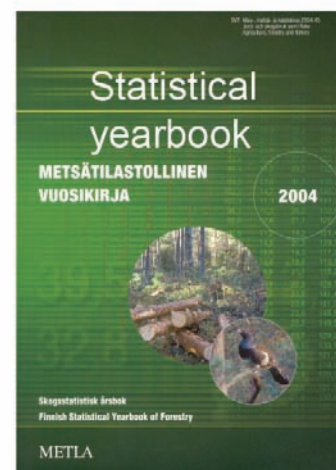
METLA

2. C&I broader view than the traditional statistics

Trends, descriptive indicators
Combination with politics



Tables, figures, original
data



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METLA

3. Compilation in various ways

- group of scientists and other stakeholders (panel)
- group of experts coordinated by governmental authorities
- by ministries



Jan Parviainen 6/25/09

METLA

4. Reporting requirements are increasing, not only for forest purposes

- overlapping efforts, more coordination required,
- new aspects, comprehensive reporting is
- expensive, forest indicators asked for other sector's report



Jan Parviainen 6/25/09

METLA

Use and audiences of national reports

- Main users are governmental officials
- Linkages with other sector's reports
- For informing the customers on the state of forests
- Educational purposes
- Forest management and certification
- Excellent tools for science/policy interface

Jan Parviainen 6/25/09

METLA

Main users are governmental officials



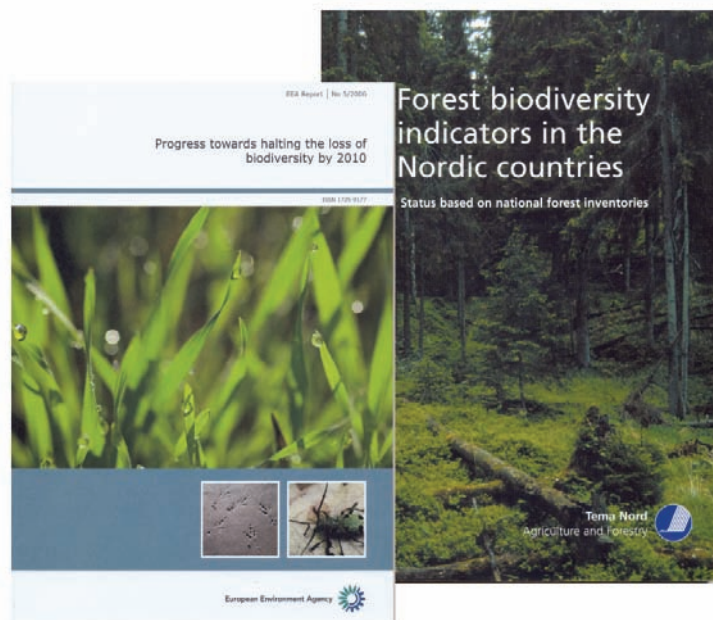
- the basic reservoir for reporting and forest policy dialogue
- presenting status of forests for national and international use

Jari Parviainen 6/25/09

METLA

Linkages with other sector's reports

only few indicators,
not the whole set



Jari Parviainen 6/25/09

METLA

For informing the customers on the state of forests

Important
for exporting
countries,
such as
Finland



*"In a way, the forest is
one of the family."*

Timo and Raine Huusela, Pudasjärvi



Jari Parviainen 6/25/09

METLA

Educational purposes



Jari Parviainen 6/25/09

METLA

Forest management and certification

**“sustainable forest management”
can be made both visible and
understandable—transfer from the
paper to the field**



Jan Parvianen 6/25/09

METLA

Forest certification



PEFC is based on the internationally agreed concept on sustainable forest management (thematic areas of nine regional C&I processes) and internationally used rules and procedures on certification processes.



The FSC certification system uses ten general principles of good forest stewardship.



Jan Parvianen 6/25/09

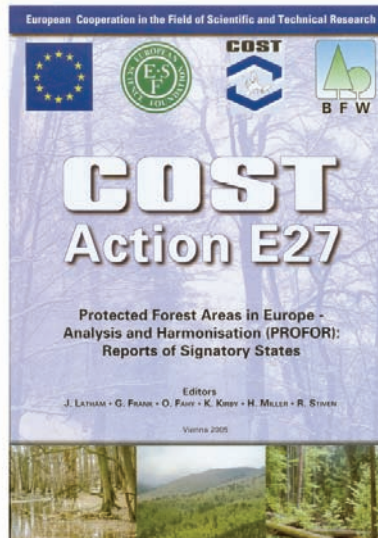
METLA

Excellent tools for science/policy

Reporting highlights information gaps

Goal setting of new research agenda

Harmonizing the terms and definitions



Jan Parvainen 6/25/09

METLA

How to present the results?

- Value-free or value-based interpretations
- Diverse views : Austria and Switzerland with political recommendations
Australia and Finland without value-based interpretations
- The evaluation panel of Finland's report:
value- free attitude favored, but clear messages on trends and their linkages to policy
- Other sector's reports need value-free data for their own applications

Jan Parvainen 6/25/09

METLA

II State of Finland's Report 2007

Experiences on communication:

- Third report (1996, 2000 and 2007)
- Multistakeholder steering group
- Clear summaries by criteria
- Presented personally to the Minister supported by a press release
- Articles with compare to the MCPFE report results
- Press release on the occasion of fifth MCPFE in Warsaw



Jari Parviainen 6/25/09

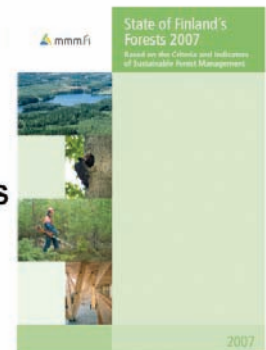
METLA

II State of Finland's Report 2007

Experiences on communication:

Report is considered as a very important because of three aspects:

- 1) showing long-term trends and changes in the forests,
- 2) integrating the forest policy goals and decisions with the measurable indicators
- 3) making a continuous base for the international comparability

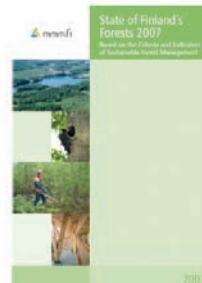


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METLA

Experiences on communication: State of Finland's Forests 2007

- Report as such not well suited for public information on forests
- A brochure with reduced set of indicators positively received by policy makers



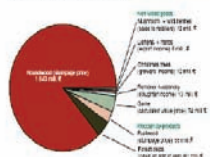
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Reduced sets of indicators for public audience

Non-wood goods and services provided by forests

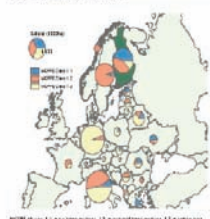
Agri-tourism, forest berries, mushrooms, medicinal herbs, etc. are examples of non-wood goods and services provided by forests. The non-wood goods and services provided by forests are valued by the public, but they are not included in the national accounts.



Source: State of Finland's Forests 2007, Forest Statistical Yearbook of Finland 2007

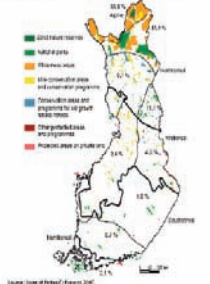
Protected forests in Finland

The area of strictly protected forests in Finland is 2.1 million ha, which is 10% of the total area of forests. In addition, there are 0.8 million ha of forests in Finland under restricted use.



Source: State of Finland's Forests 2007, Forest Statistical Yearbook of Finland 2007

The national protection programme and decisions in Finland have contributed to the increase in the area of protected forests throughout the last 30 years. In Finland, the area of protection (by year) is not based on forest, but on the state of strictly protected forests in the region in Europe.



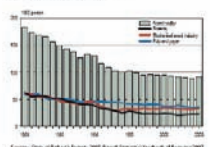
Source: State of Finland's Forests 2007



Source: State of Finland's Forests 2007, Forest Statistical Yearbook of Finland 2007

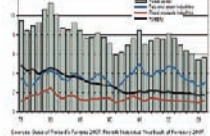
Employment and contribution

of forest sector to GDP in Finland
In 2006, the forest sector contributed 4% of all people employed in Finland. As a result of the modernization of harvesting and extension of the production process of the forest sector as well as increasing the number of people employed in the forest sector has decreased since the early 1990s.



Source: State of Finland's Forests 2007, Forest Statistical Yearbook of Finland 2007

In 2006, the forest gross domestic product (GDP) at market prices was 10 billion euros. The share of the forest sector in GDP was about 4% per year. The importance of forestry has decreased with the diversification of the economy.



Source: State of Finland's Forests 2007, Forest Statistical Yearbook of Finland 2007

METLA and mmmfi

Source: State of Finland's Forests 2007, Forest Statistical Yearbook of Finland 2007

State of Finland's Forests 2007 Based on the Criteria and Indicators on Sustainable Forest Management

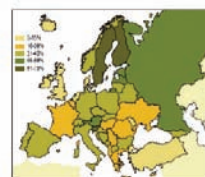


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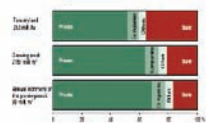
Reduced sets of indicators for public audience

Finland - the most extensive forest cover in Europe
Forests cover 75% of Finland's land area, 22.7 million ha, which is more extensive than any other European country.



Forest ownership in Finland

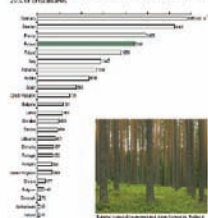
About 50% of Finland's forests are privately owned. The average size of a private forest holding is about 16 ha. State-owned forests, about 25%, are mainly located in northern Finland.



In the peripheral growth zones in southern and eastern Finland, about 40% of all forests are in private ownership. Private forests produce about 70% of the timber and pulpwood harvested annually by the forest industry.

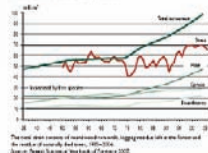
Growing stock volume

In 2004, the total growing stock volume in Finland was 289 billion m³ of sawn logs, the highest value in the EU. The total volume of growing stock in Finland has increased since the 1960s and is now 40% higher than four decades ago. The annual increment of growing stock in Finland was 10.5 billion m³ in 2004. About 70% of the growing stock consists of boreal pine, 30% of boreal spruce and 15% of broadleaves.



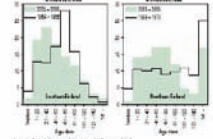
Increment and fellings in Finland

The annual increment of growing stock in Finland has since the 1960s exceeded removals by 20-30%.



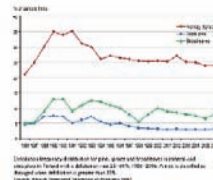
Age structure of forests in Finland

The current age structure of forests in Finland is the result of the rise of forest productivity in the beginning of 1900s and its increased need for raw materials, spruce and pine, and changes in harvesting methods. Because of large consumption areas in northern Finland there are more forests over 80 years old.



Forest health

The health status of forests in Finland is satisfactory and has remained stable. In Finland, defoliation is primarily caused by aging, natural die-back, weather and climate conditions and damage due to fungi and insects.



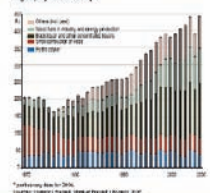
Carbon stock of forests in Finland

The amount of CO₂ sequestered in the soil in Finnish forests is currently estimated to be about 12,500 million tonnes, of which about 1,500 million tonnes are in the soil of spruce forests and about 20,000 tonnes in the soil of peatlands. The amount of carbon sequestered in energy plantations is about 2,500 million tonnes of carbon dioxide. Nearly half of the CO₂ sequestered in Finland has been sequestered by modern forests.



Renewable energy and the use of wood-based fuels

In 2006 the use of renewable energy in Finland increased sharply, by 10% compared to 2005. Wood-based fuels accounted for 30% of the total energy production in Finland. The share of wood-based fuels of the total energy production in Finland was 20%, which is one of the highest proportions in the world.



Jan Parviainen 6/25/09

METLA

Experiences on communication: State of Finland's Report 2007

- Report as such not well suited for public information on forests
- A brochure with reduced set of indicators positively received by policy makers
- Press release, interviews and articles are been succesful

Jan Parviainen 6/25/09

METLA

Interviews



Konstantin von Teuffel on vierailut Joensuussa useita kertoja. Hänen mielestään kaupunki on oivallinen paikka Euroopan metsäinstituutin pääkonttorille. KUVA: KIMMO KIRVES



Metsän Joensuun yksikön johtaja Jari Parviainen on antanut valtion panoksensa Jari-julkaisun Euroopan metsien tila 2007 -raportin valmisteluun. KIRJA: KIMMO KIRVES

Jan Parviainen 6/25/09

METLA

Press release

Suomi on metsänsuojelun

Tuoreen raportin mukaan Suomessa on Euroopan metsien kesken erittäin suuri osuus metsänsuojelusta. Osaamista myös pitämällä hyvää huolia metsänsuojelusta.

Suomen metsien tila on Euroopan metsien tilan raportissa 2007. Raportissa on selvitetty, miten metsänsuojelu on Suomessa. Raportissa on selvitetty, miten metsänsuojelu on Suomessa. Raportissa on selvitetty, miten metsänsuojelu on Suomessa.

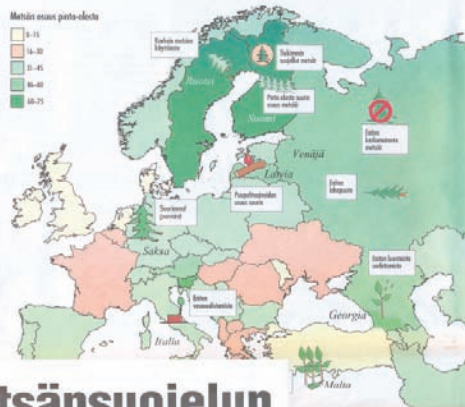
Vuonna 2007 Suomessa on ollut metsänsuojelun osuus 15 prosenttia. Tämä on Euroopan metsien tilan raportissa 2007. Raportissa on selvitetty, miten metsänsuojelu on Suomessa. Raportissa on selvitetty, miten metsänsuojelu on Suomessa.

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METLA

Metsäntutkimuskeskus, Skogsforskninginstitutet, Finnish Forest Research Institute, www.metla.fi

Articles



Jari Parviainen

Suomi suojelee hyvin metsiään

Puut ovat pohjoismaiden onnellisin ja kaunein luonnonvarain. Ne ovat myös eläimistöä ja kasvistoa suojelevia. Suomessa metsien suojelu on ollut erittäin korkealla tasolla viimeisten 30 vuoden aikana.

Uusi tutkimus osoittaa, että Suomessa metsien suojelu on ollut erittäin korkealla tasolla viimeisten 30 vuoden aikana. Tämä on ollut mahdollista osittain siksi, että Suomessa metsien suojelu on ollut erittäin korkealla tasolla viimeisten 30 vuoden aikana.

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Metla Bulletin 2/2007

Jan Parviainen 6/25/09



Finland takes care of forest biodiversity

Jari Parviainen

Biodiversity in Finnish forests has been linked after in various ways. Due to extensive nature conservation programmes and strict management of commercial forests, the pace at which certain species in Finnish forests are being threatened has slowed down. The area of protected forests in Finland is amongst the largest and the level of protection is the strictest in Europe.

These results are included in the newest "State of Europe's Forests 2007" report, published at the beginning of November in Warsaw at the Ministerial Conference on the Protection of Forests in Europe (MCPFE). In parallel with the emphasis on biodiversity, the volume of the growing stock over the past 40 years has increased more than 40% in spite of the high utilization rate. On average, annual growth in Finland amounts to 45–70 % of the annual increment of the growing stock.

The 8th Ministerial Conference on the Protection of Forests in Europe (MCPFE) was held in Warsaw at the beginning of November 2007. A 2007 report on the state of Europe's forests, based on the quantitative indicators common to all Europe, has been compiled for the conference. A parallel report on the forests in Finland was published during the summer 2007, and its forest data are included in the European report. Hence, we can now also make comparisons about the state of Finland's forests compared with other European countries.

Metla Bulletin 2/2007

METLA

Experiences on communication: State of Finland's Report 2007

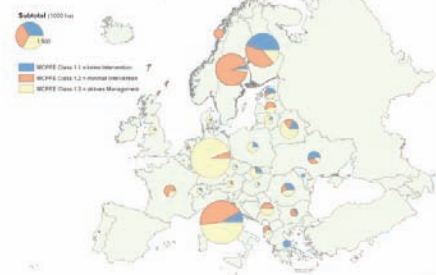
- Report as such not well suited for public information on forests
- A brochure with reduced set of indicators positively received by policy makers
- Press release and articles are been succesful
- The comparision of Finnish situation to the European situation has raised much interest

Jan Parviainen 6/25/09

METLA

Articles comparison with European situation succesful

Waldschutzflächen für Biodiversität und die Verteilung der Schutzkategorien 1.1-1.3 in Europa



"Suomen metsien suojelumäärät ovat Euroopan suurimmat, ja suojelu on otettu huomioon."

Ennen metsien suojelun aloitusta Suomessa, en ollut suojelusta mitään kuullut. Nyt on selvää, että suojelu on otettu huomioon. Suomessa suojelun määrä on 9,24 prosenttia, mikä on 4,6 prosenttia enemmän kuin Euroopassa keskimäärin. Tämä on hyvä asia, koska se tarkoittaa, että metsät ovat paremmin suojella.

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Eurooppalaiset valtiot, joihin suojelun määrä on merkittävä (%):



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Jan Parviainen 6/25/09

METLA

Experiences on communication: State of Finland's Report 2007

- Report as such not well suited for public information on forests
- A brochure with reduced set of indicators positively received by policy makers
- Press release and articles are been succesful
- The comparision of Finnish situation to the European situation has raised much interest
- The internet based communication is the main tool to disseminate the information, findings, graphs and other material (descriptive indicators)

Jan Parviainen 6/25/09

METLA

Internet: www.metla.fi/metinfo: www.forest.fi

- **Point of view: Finland's forest protection is the strictest in Europe**
The area of protected forests has been tripled during 30 years. The protected area is among the most extensive in Europe, writes Dr. (For), Mr. Jari Parviainen.
- Director, Finnish Forest Research Institute, Joensuu Unit
- The first protection areas in Europe were established nearly 150 years ago, often for religious reasons. Either the protected sites were considered holy, or they were protected as the hunting grounds of the nobility – or to maintain exceptionally beautiful natural areas.
- The activity was at its highest during the 1980's and 1990's. As a result, the most valuable sites are by now under protection and new, strictly protected forest areas are very rarely established in Europe.

Unified classification of forest protection

The spectrum and the strictness of protection vary greatly between the European countries. This is because there is much variation in the forest growth.

[Area and share of strictly protected forests in certain European countries 26.55 Kb](#)

[The strictness of forest protection in certain European countries 26.88 Kb](#)

Jari Parviainen 6/25/09

METLA

Communication: conclusions

The communication people consider:

the internet based communication as the main tool
for the dissemination of the information regarding
forest sustainability.

The original forest data as numbers is most valuable,
while it allows the modifications and illustrations of
information for various purposes and audiences.

The comparison of country situation to other countries
helps the users to understand the messages

Jari Parviainen 6/25/09

METLA

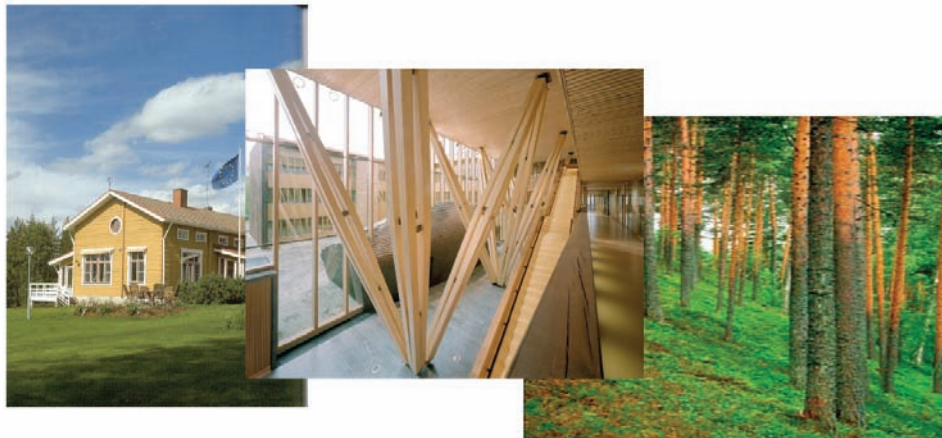
Summary of the presentation:

- The information gathered by indicators **is important and unique**, however, the report itself has a limited use
- While demand for various reporting is increasing, the aim should be that the information can be reported and verified **once**, and then used for many different purposes.
- These requirements call for customer oriented forest data collection and reporting, such as **wood based bioenergy or public wood products procurement** reporting
- Various reports are needed also for various audiences. For professionals and experts **comprehensive reports** are the most suitable and useful, but for public audiences, top level policy decision makers and other sectors simple messages and **reduced number of selected indicators** are more relevant

Jari Parviainen 6/25/09

METLA

Thank you very much



Contact: Jari Parviainen
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email: jari.parviainen@metla.fi

Jari Parviainen 6/25/09

METLA

Examination of the Reporting Problem: We Need a Better Way

Claire Howell¹



Australian Government
Bureau of Rural Sciences

Examination of the Reporting Problem

We need a better way!

Forest C&I Analytical Framework and Report Workshop, Finland 19-21 May 2008

Claire Howell



DEPARTMENT OF AGRICULTURE, FISHERIES AND FORESTRY



Australian Government
Bureau of Rural Sciences

Overview of Presentation

- Brief background on national forest reporting in Australia
- External Communication Review of 2003 State of the Forests Report (SOFR)
- Review Recommendations
- Implementation for 2008 SOFR Report
- Opportunities and Threats
- Conclusion

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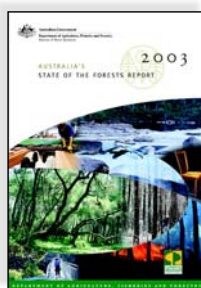
¹ Manager, National Forest Inventory, Bureau of Rural Sciences, Australian Government Department of Agriculture, Fisheries, and Forestry.



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Australia's 5-yearly State of Forests Reports - 1998, 2003 and now 2008



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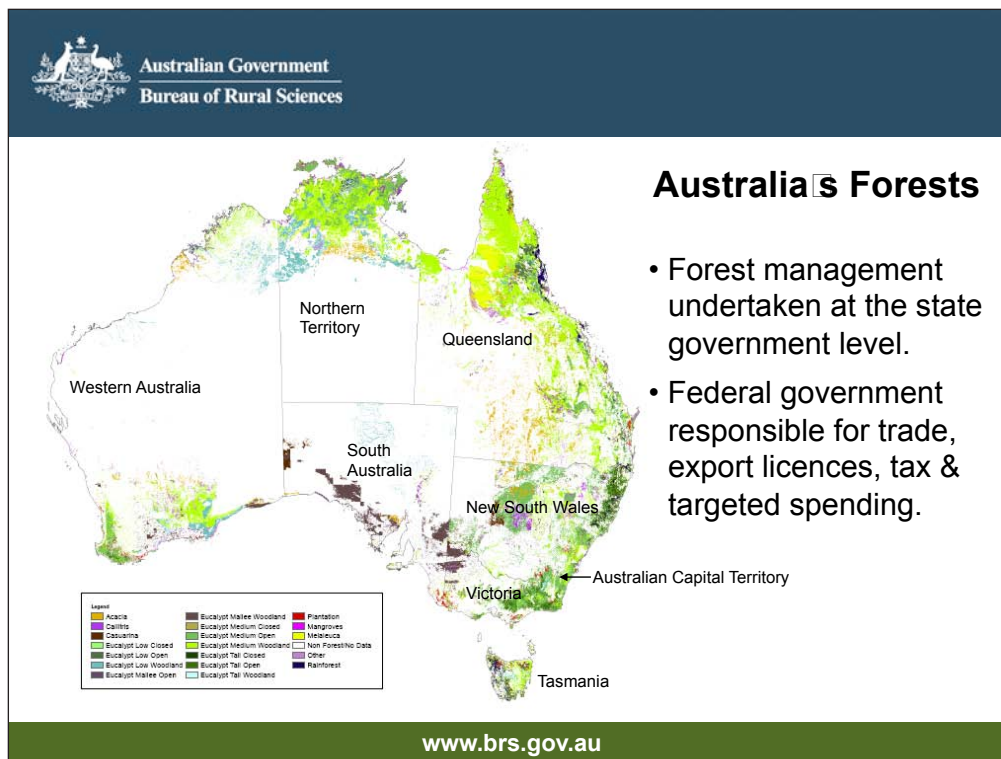
Introduction

- 1992 National Forest Policy obligation to prepare 5-yearly State of the Forests Reports
- 1994 Australia adopted the Montreal Process
 - Montreal Process Implementation Group for Australia
- 1998 SOFR implicitly based on the MP C&I framework
- 2003 SOFR explicitly based on the MP C&I framework

All national level forest reporting is dependent on the contribution of data by states and territories, and therefore very much on the relationship between all parties



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Montr^{al} Process Framework of Criteria & Indicators

1. Biodiversity
2. Productive Capacity
3. Ecosystem Health
4. Soil & Water
5. Carbon
6. Social & Economic Benefits
7. Regulatory Framework

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State government adoption of C&I

- State governments have increasingly adopted elements of the C&I framework for jurisdictional reporting
- Domestic indicator review of 2005/06 generated strong understanding of the national C&I framework
- Ownership in the national process because of the links to the State systems
- The 2008 national report was smoother compared to 2003 and 1998 reporting processes

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National Report

Western Australia
Forest Management Plan



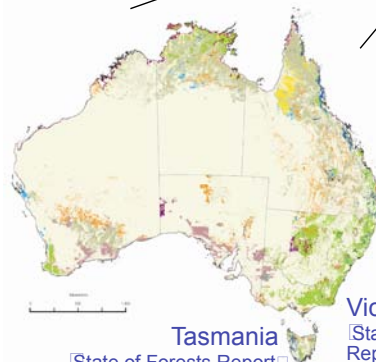
Tasmania
State of Forests Report



Victoria
State of Forests Report



New South Wales
SEEing Reports



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Review of 2003 State of Forests Report

Terms of reference:

- Consult with key stakeholders about the usefulness of the report
- Seek views on possible improvements in format and presentation
- Identify subsidiary products to coincide with the release of the 2008 Report
- Analyse the target audience
- Provide suggestions for broadening the audience and engaging with that audience

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Review Process

Stage One: Key clients and contributors perception of the report

- Identify range of stakeholders (current contributors, current users, potential users)
- Branding/communication audit
- Stakeholder interviews □ 8 -10 existing priority stakeholders
- Interim report with stakeholder feedback and future options

Stage Two: Explore and develop future options with target audience

- Stakeholder interview □ additional five interviews
- Final report

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Stakeholders (Contributors and Users)

Internal ☐ Minister, Department Head, Policy Divisions, Parliamentary committees

Other Federal Government ☐ Environment, Trade, Science, Education, Industry, Tourism, Transport, Regional Services, Embassies, Bureau of Statistics, Bureau of Economics, Greenhouse Office, Research Corporations

International ☐ MP, UN, FAO, ITTO, APFC, MCPFE, OECD, WTO, CBD, UNCCC

State/Regional ☐ State agencies (see Federal equivalents), Catchment Management Authorities, Landcare, Local government, Schools

Lobby Groups ☐ Farmers, Forest Industry, Pulp & Paper, NGOs

Academia ☐ Universities, national and state research organisations

Media ☐ rural and regional press, national press, forest magazines

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Findings of the Review

Reporting obligations:

- ☐ Meets international obligations ✓
- ☐ Domestic ? (Australian Government says that it does)

Presentation: Hardcopy report produced to highest standards ✓

Value to Stakeholders:

- ☐ Internationally - Best practice reporting ✓
- ☐ Domestically: Comprehensive for nationally aggregated but not enough detail ?? (*Are the data too packaged??*)

Stakeholder information needs:

- ☐ Competes alongside other sources that meet stakeholder needs ?? (*again, are the data too packaged??*)
- ☐ Range of topics identified but not clear if they're in the report ????

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Findings: Forest Topics of interest to stakeholders

- | | |
|--------------------|------------------------|
| 1. Bushfires | 12. National Parks |
| 2. Climate change | 13. Plantation forests |
| 3. Economics | 14. Resources |
| 4. Employment | 15. Reforestation |
| 5. Farm Forestry | 16. Social impacts |
| 6. Feral Animals | 17. Soil erosion |
| 7. Forest Products | 18. Sustainability |
| 8. Forest Industry | 19. Tourism |
| 9. Forest Usage | 20. Water |
| 10. International | 21. Weeds |
| 11. Land | 22. Wood production |

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Findings: The Case for Change

- The Report needs to create greater stakeholder value
- Broad agreement that SOFR has a role as a comprehensive source of nationally aggregated forest data
- Some stakeholders (data providers) want value free presentation of the information ...and to leave that for others to analyse ie. discussion if there is a change, but not why
- BUT other stakeholders want the analysis (suspect they are not the data providers)

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Findings: Report structure, content and tone

- 400 pages is neither user friendly nor environmentally friendly
- Diminishing utility of big publications: a smaller more summary hardcopy report is desirable
- C&I Framework isn't always logical (overlap in some criteria)
- Concise readable text with graphs and tables in context
- Too much focus on data gaps and deficiencies
- Tension between presenting the data and progressing into some form of data analysis
- Timeliness: perception the report is old for much of its 5-year life, though contributors reluctant for timeframe to be reduced

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Recommendations of the Review

1. Create greater value to existing stakeholders via a strong, accessible online presence with core data
2. Engage with the wider community using the internet and subsidiary products
3. Searchable SOFR website and portal to other forest information
4. Glossy Executive Summary with photos

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Recommendations of the Review

5. Produce annually updated summary products (eg. Forests at a Glance) & a product placement marketing strategy
6. Develop theme-based forest fact sheets
7. Prepare stakeholder commentary as snapshot narratives
8. Involve the federal Minister in launching SOFR products, and actively promote new/updated web content to stakeholders
9. Simplify the branding of the Report
10. Investigate developing a website with a queriable, scaleable, real-time database with linkages to other data (viz: Canada, Finland, Japan)

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Recommendations of the Review

☐ widening stakeholder access

Engaging with the following:

- General community
- Students (and a section for teachers)
- Media
- Environmental movement
- Other industry sectors

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Forests Australia Website

Simple structure

Self guiding

Searchable keywords

Links to State/Territory sustainability reports

Links to other forest research sites

Analysis & mapping capacity

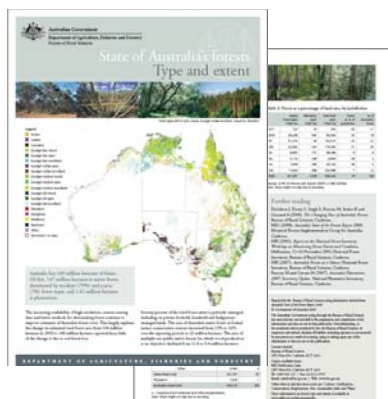


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Forest Fact Sheets



Forest Type & Extent



Employment



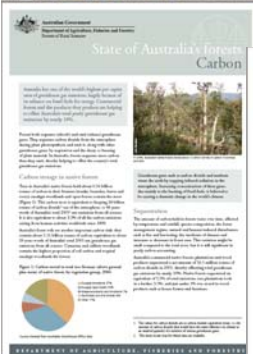
Conservation



Sustainable Yield

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Carbon



Fire



Certification



Water

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Review Recommendations Not Supported

1. Stakeholder Narratives

Here's what our stakeholders say

 - A healthy way to engage with key stakeholders

Decision: Untested so not to be pursued at this stage
2. Value Free or Analysis and Interpretation

Decision: Remain independent, but work with others to take up this task



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Opportunities and Threats for C&I reporting in Australia



Threats

- ☐ Increased productivity in public service (less \$\$)
- ☐ High staff turnover (loss of corporate knowledge)
- ☐ Varying levels of senior management support for C&I
- ☐ Varying levels of individual commitment to C&I, especially by those in positions of influence
- ☐ C&I still perceived by many as an overhead, rather than integral, to forest management, though changing at the forest management level



Opportunities and Threats for C&I reporting in Australia



Opportunities

- ☐ RFA Act 2002 ☐ *the (federal) Minister must cause to be established a comprehensive and publicly available source of information for national and regional monitoring and reporting in relation to all of Australia's forests*☐
- ☐ States increasingly adopting C&I approach for reporting
- ☐ Strong coordination between national and state agencies with responsibilities for forest management and reporting
- ☐ Increasing demand for evidenced-based policy
- ☐ Rapid advances in internet technologies



Conclusions

- A valuable exercise □ forced us to assess our stakeholders and identify potential new ones
- Implemented most of the recommendations, many of which pointed to a standalone simple but comprehensive website, a smaller report and ancillary communication products
- Didn't agree to all recommendations
- Released the report in the first-half of the year
- Reinforced the importance of the relationship with the data-providing stakeholders

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Australia's State of the Forests 2008

- Forests Australia website built but not yet live □ nor fully developed
- A much smaller hardcopy report, written in simple language (also coincides with a change from 74 to 44 indicators)
- Eight thematic summaries (Forest Fact sheets)
- Glossy Executive Summary □ Bookmark, CD with report
- Minister launching the 2008 Report on Wednesday 21 May





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www.daff.gov.au/forestsaustralia



Thank You

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Criteria and Indicators for SFM Through Community Participation for Communicating Sustainable Development of Forests

Prem Chand Kotwal¹

Criteria and Indicators for SFM through community participation for communicating sustainable development of forests

By

Dr. P.C. Kotwal

Professor, Faculty of Technical Forestry

Indian Institute of Forest Management, Bhopal, India

At

Forest C&I Analytical Framework and Report Workshop

Finnish Forest Research Institute, METLA

May 19-21, 2008

Background

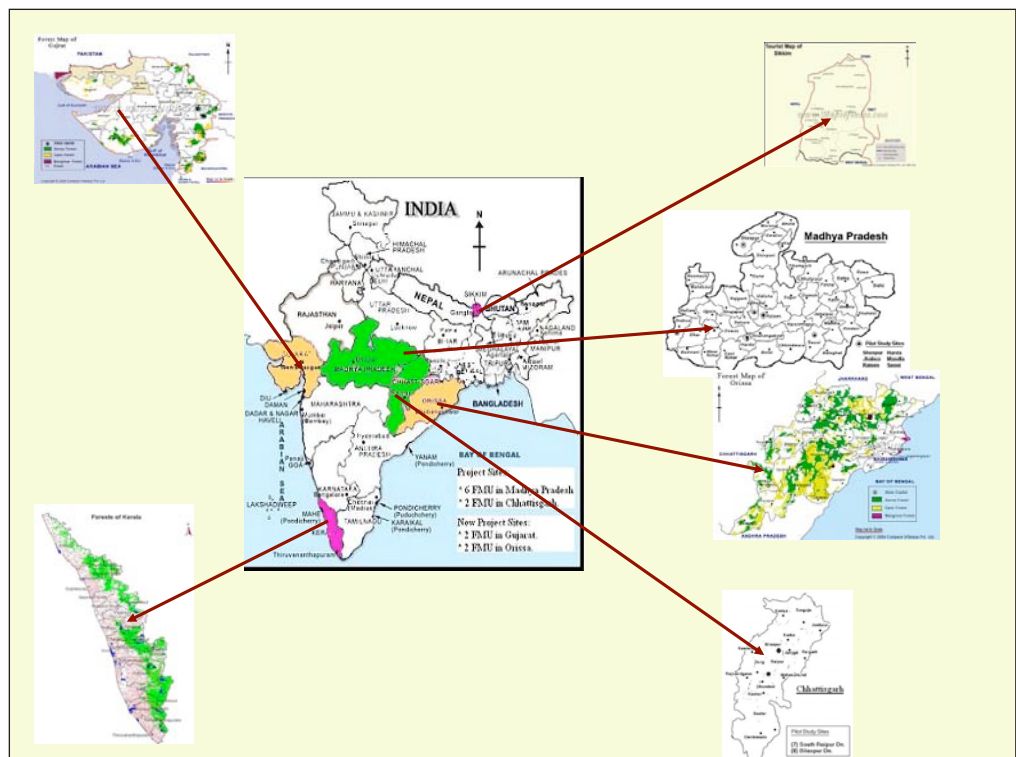
- The current Forest Policy (1988) envisages having 1/3rd of the land area under forest and tree cover
- The principal aim of the National Forest Policy is to ensure environmental stability and maintenance of ecological balance including atmospheric equilibrium, which is vital for sustenance of all life forms, human, animal and plant. The derivation of direct economic benefit must be subordinated to this principal aim.
- It also envisages Joint Forest Management (JFM) with participation of communities in and around forest for protection, management of forests and benefit sharing.
- About 20 million ha of the forests of the country are jointly managed by 1,06,482 Joint Forest Management Committees (JFMCs).
- There has been a system of 'Forest Working Plan/Management Plan' at the Forest Division level (Forest Management Unit) prepared for a period of 10 years as per the guide lines of National Working Plan Code.



¹ Professor, Faculty of Technical Forestry, Indian Institute of Forest Management, Bhopal, India.

C&I approach in SFM, India

- In India the national level Criteria and Indicators(C&I) came in the form of Bhopal-India(B-I) Process in the year 1999 and refined in subsequent years (2005,2008).
- The Indian Institute of Forest Management (IIFM) evolved Forest Management Unit (FMU) level indicators involving communities
- Being applied in 6 States on pilot basis in 14 FMUs covering main tropical forest types of the country (Teak, Sal Miscellaneous and Himalayan).



Operational frame work of C&I for SFM

Levels	Organization	Function	Development
Strategic	National SFM cell at MoEF, GoI + IIFM,	☒ National Forest Policy/ National Forestry Action Programme ☒ National set of C&I (Bhopal-India Process) ☒ National Working Plan Code ☒ Technical and financial support and liaison with State SFM Cells ☒ Monitoring ,assessment and reporting on SFM at National level	☒ National set of 8 criteria and 37 indicators finalized as Bhopal-India process in accordance with the National Forest Policy ☒ Incorporation of C&I in national working plan code in process

Operational frame work of C&I for SFM

Contd...

Tactical	State level SFM Cell	☒ State Forest Policy ☒ State Working Plan Guide lines ☒ Coordination with Forest Divisions ☒ Monitoring ,assessment and reporting on SFM at State level	☒ State level cells on SFM initiated to work as per national C&I with appropriate modifications. ☒ Incorporation of C&I in State Working Plan guide lines.
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Operational frame work of C&I for SFM			Contd...
Operational	Division (FMU)	☒ Working Plan of Division ☒ Development and application of C&I at FMU level ☒ Monitoring, information and documentation	☒ Refining people's indicators to suit the FMU ☒ Incorporation of C&I in working plans. ☒ Enhancing capacity
Grassroots	Management Committees (JFMC)	☒ Micro-plan ☒ Working Groups at JFMC level ☒ Observation, data/information	☒ Sensitization of communities on sustainable development of forests ☒ Evolving people's indicators ☒ Developing capacity for monitoring through indicators

Peoples' Indicators (FMU level)

- People's have their own way of understanding and defining sustainability of resources
- They foresee the forest resources up to Seven Generations,
- Forest dwelling communities: Mostly Illiterate, poor, High dependency on forest and remote from the developed areas.
- The approach of developing People's indicators and its use in communicating the sustainability of forest at higher level have done through;



Developing people's indicators at FMU level

Process	Objective	Tools	Out come
Sensitization - C&I of Bhopal-India Process	Orientation towards need for assessing direction of change, understanding concept of SFM and C&I	Facilitated discussions, context specific and local analogies, games highlighting the ever existence of forests and sustainable availability of forest goods and services	Understanding working definition of SFM, need and importance of C&I as monitoring tools for SFM
Participatory development of FMU level indicators	Evolve FMU level indicators based on local knowledge, experience involve all actors	Focused Group Discussions, brain storming sessions, presentation and discussion	Draft set of FMU level indicators

Developing people's indicators at FMU level ... contd.

Process	Objective	Tools	Out come
Field validation of draft set of indicators	Field verification of draft indicators	Field visits, transects, presentation and discussion	Draft indicators are verified, locally relevant indicators based on local knowledge and experience
Communication of the evolved C&I to higher authorities	Refinement of evolved C&I as per objectives of management	Discussion, presentation with higher authorities on the evolved C&I	Finalization of FMU level indicators by the authorities

Minimum Acceptable Standards (MAS):

Minimum Acceptable Standard (MAS) or norm, defines the sustainable/ optimum level of that particular indicator. This is the threshold value that needs to be achieved for an indicator for monitoring progress towards SFM. MAS for different indicators can be defined and described in four different ways as follows:

Baseline values: Baseline or benchmark is the reference point from which the trend or change is projected with respect to SFM. This baseline describes the status of the indicators at the time of data collection.

Average values: The Indicators for which it is difficult to reach on the fixed norm due to lack of defined benchmark, the data of previous 3-5 years was used to find out the average value and chosen as norm.

Published Standard values: The published values and data available from authentic sources are used as standard value or MAS.

Values arrived as a result of discussion among different stakeholders: In some cases it is difficult to reach on a concluding norm/standard value. Therefore the values are arrived after discussion among the stakeholders including community members on their experience and wisdom and hence has been taken as norm.

Norms for the indicators of the FMU

The data of identified indicators are compared against the Norms which may be qualitative/quantitative.

Indicators	Norm
Criteria 1: Maintenance/increase in the extent of forest and tree cover	
1.1 Total Forest Area (ha) Reserved forest, Protected forest, Unclassified forest	1/3 of the geographical area should be under forest and tree cover. No decrease in forest area of the FMU
1.2 Area under various Forest types Teak, Bamboo, Miscellaneous	The area under respective forest types should be maintained
1.3: Forest area under encroachment	There should be no encroachment in the forest area
1.4 Percentage of forest with secured boundaries No. of boundary pillars	All the forest areas are surveyed and mapped, well demarcated on the ground.
1.5 Change in area of forest cover - dense, open and scrub forests, pastures and deserts	There should be no reduction in the area of dense forest and attempts should be made to convert open and scrub forests into dense forest.
1.6 Change in tree cover outside forest area	Tree planting needs to be encouraged on non-forest land, community land and along road/ rail/ canal etc.

Data of Indicators

FMU level indicators were identified based on the national set of 8 Criteria and 37 indicators (B-I Process) beside identifying site specific indicators. Periodical data were collected from communities and records of the FMU. The periodicity of observations / recording data of indicators varies from one year (such as incidences of forest fires) to 10 years (such as standing stock of forest at the time of revision of the working plan). Data of some indicators remain static (Area of the FMU).

Out of 32 indicators the data of 13 indicators are of primary nature and remaining are collected from the records/reports.

Data on identified Indicators of the FMU (South Seoni)

Indicators	2002	2003	2004	2005	2006	2007
Criteria 1: Maintenance/increase in the extent of forest and tree cover						
1.1 Total Forest Area (ha)	-	119327.39	119327.39	119327.39	119327.39	119327.39
Reserved forest	-	93673.49	93673.49	93673.49	93673.49	93673.49
Protected forest	-	25653.90	25653.90	25653.90	25653.90	25653.90
1.2 Area under various Forest types						
Teak	33899.52	31868.57	31868.57	31868.57	31868.57	31868.57
Bamboo	32010.90	34003.72	34003.72	34003.72	34003.72	34003.72
Miscellaneous	60661.55	50966.67	50966.67	50966.67	50966.67	50966.67
Others	6769.36	15705.56	15705.56	15705.56	15705.56	15705.56
1.3: Forest area under encroachment	51.49	51.49	51.49	51.49	51.49	51.49
1.4 Percentage of forest with secured boundaries No. of boundary pillars	1423	1524	1615	2122	2122	2122
1.5 Change in area of forest cover - dense, open and scrub forests, pastures and deserts						
Dense Forest (ha)	-	82835.24	82835.24	82835.24	82835.24	82835.24
Open forest (ha)	-	29226.11	29226.11	29226.11	29226.11	29226.11
Blank forest (ha)	-	2350.54	2350.54	2350.54	2350.54	2350.54
1.6 Change in tree cover outside forest area	589910	616410	616410	616410	616410	616410

Assessing Sustainability of FMU

The units of different data of the indicators are different such as numbers, ha, NT, cmt, and the like . Therefore all the units are converted into 100 point scale for uniformity.

Scoring of indicators:

The performances of indicators are measured against the MAS. The score reflects the achievement of the indicators towards sustainability as well as its deviation from MAS. This is used to identify the needed intervention/ management for corrective measures.

Assigning weights to Criteria:

Equal weightage was assigned to all the eight criteria, since these criteria are equally important to achieve the sustainable development of forests. Hence, all the criteria are assigned a weight of 12.5 to make total of 100.

Assigning weight's to indicators:

Each indicator is weighted as per its perceived importance within the criterion, which is specific to the FMU and community wisdom. Total of weight of indicators of each criterion was again fixed at 100 only within the weightage of 12.5 .

Developing Sustainability Index:

Collected data were computed using specially developed Software, FORMACS (2007).

The value of SI reflects forestry conditions, the higher value indicates the better situation. The lower value of the SI during the assessment year 2004 can be evaluated with the help of poor performing indicators. These poor performing indicators can be addressed with corrective intervention to make it performing indicators.



Conclusion

- Indicators evolved at FMU level are of quantitative and qualitative in nature
- The data were collected from department records, published data, and interaction with community and field observations
- Qualitative data, which is also important looking to the social aspects attached with forest situation in the FMU, were collected through community interaction
- Periodicity of the data varies with the indicators. These are ranging from once in every year to 10th year.
- In many cases the evolved indicators do not have adequate data.
- The periodic data collection and reporting require a systematic approach in quantifying and use in the SI calculations
- In the case of south Seoni FMU (Fig. 1) it is evident that in the year 2004, 11 out of 32 indicators performed below in comparison to the previous year and hence influenced the overall SI of the FMU.
- The SI is one of the best ways of communicating the sustainability of the forests to policy makers to improve the efficiency and budgetary allocation.



Using the Web To Display Natural Resource Data

David George¹

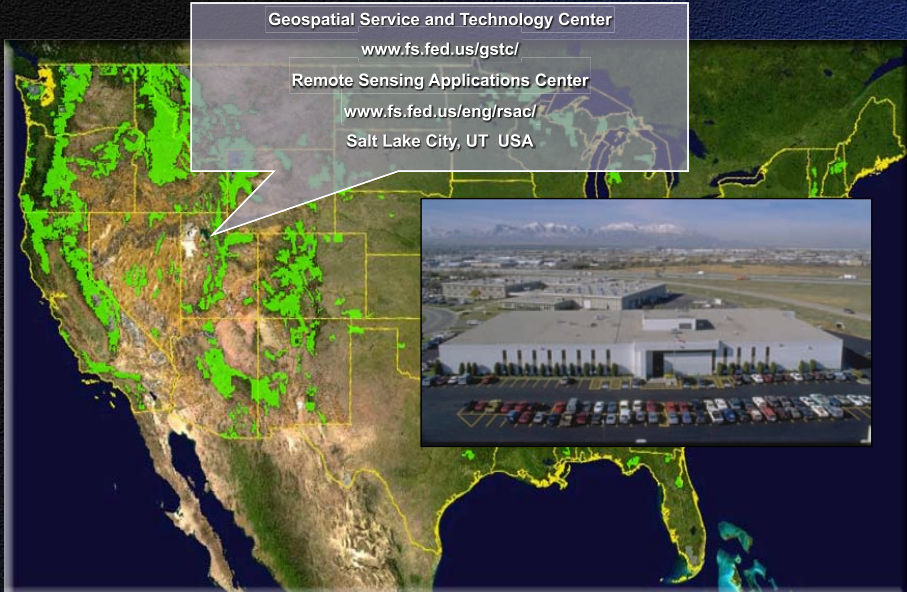


Using the Web to Display Natural Resource Data

David George
United States Department of Agriculture--Forest Service
Geospatial Service and Technology Center
Remote Sensing Applications Center
Salt Lake City, UT USA
dgeorge01@fs.fed.us



Where I'm From...



Geospatial Service and Technology Center
www.fs.fed.us/gstc/
Remote Sensing Applications Center
www.fs.fed.us/eng/rsac/
Salt Lake City, UT USA

¹ U.S. Department of Agriculture, Forest Service, Geospatial Service and Technology Center, Remote Sensing Applications Center, Salt Lake City, UT. E-mail: dgeorge01@fs.fed.us.

Using the Web to Display Natural Resource Data

- Why are we talking about this?
- Key Factors for Effective Information Sharing
- Our Resource Information is Geospatial
- Presentation, Search and Discovery
- Case Study: Google Earth and the U.S. Forest Service
 - ♦ Google hosted maps and links
 - ♦ Data sharing via Google Earth
- Other Methods
 - ♦ Clearinghouses, Syndication, Collaboration & Interaction
- Metadata

Why Are We Talking About This?

- We (governments and others) have a tremendous investment in natural resource data
- To realize its full value the data should be seen and used as widely as possible
- Information can be presented in multiple ways to target specific audiences



Key Factors for Effective Information Sharing

- The proliferation of commercial as well as governmental outlets for information
- Public trust in the data
- Raising awareness of the availability of the information
- Making your information compelling and useful to multiple audiences by delivering it at differing levels of abstraction and granularity
- Understanding your audience and their needs
- Establishing your data as comprehensive and authoritative through disclosure of its characteristics and origin
- The expectation that information will be delivered on the web



Most of our resource information is **Geospatial**...

- ...because the important resources we monitor have a physical location on the earth
- ...and can be mapped.
- We collect, store and analyze our data in Geographic Information Systems (GIS)
- A geospatial interface is a good organizing tool to provide access to other types of information



42°37'41.68" N
112°12'28.37" W



Presentation, Search and Discovery



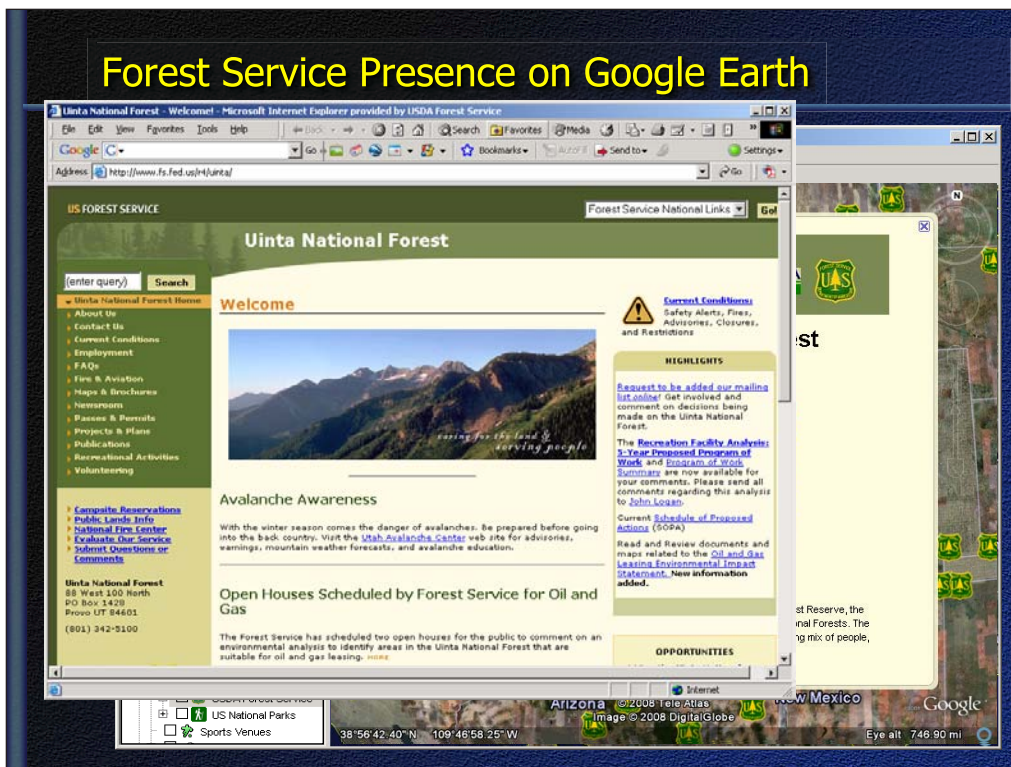
- Make it easier for people to find your website
 - ◆ Keywords, partnering
- Optimize the way people find information within your website
 - ◆ Monitor how your site is being used
 - ◆ This can lead to unexpected discoveries about how people use your information
 - Example: U.S. National Park Service discovered the public was searching for possible wedding sites in national parks



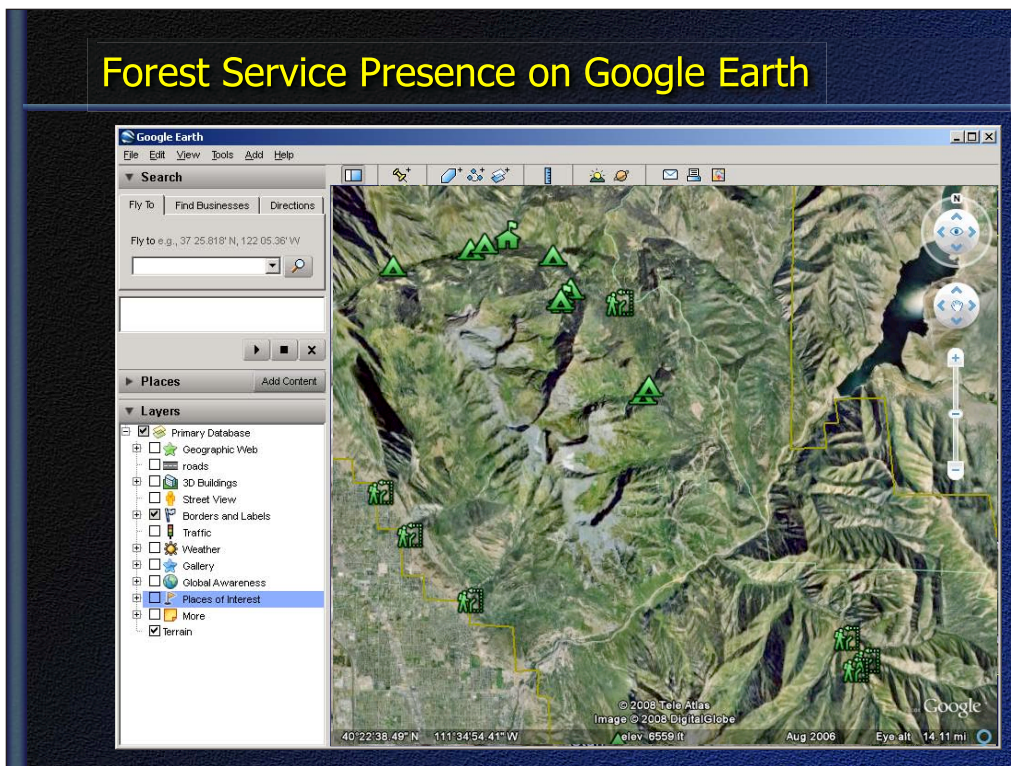
Earth and the Forest Service...

- Our experience
 - ◆ Partnering with Google raised our visibility ... a lot
 - ◆ Private industry works differently, and much faster, than we do
 - ◆ Google has different ideas than we do about which information is interesting or important

Forest Service Presence on Google Earth



Forest Service Presence on Google Earth



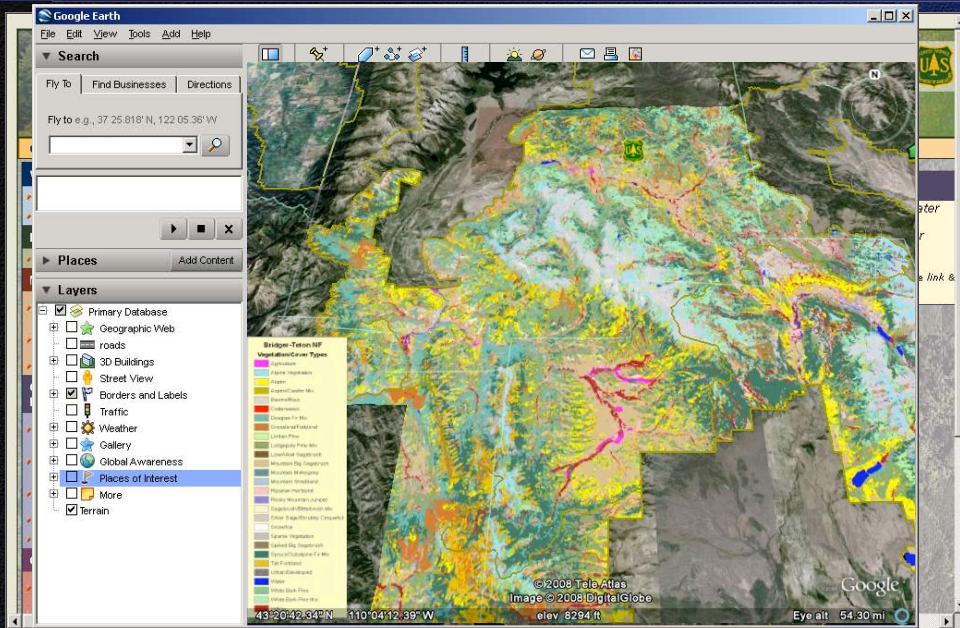
Lessons Learned

- There are differences between government and commercial business models on the web.
- Nesting—aim for the general interest user on the top level—let them control the complexity and amount of information they receive
- Use a scenario that encourages action or tells a story

Google Earth and the Forest Service...

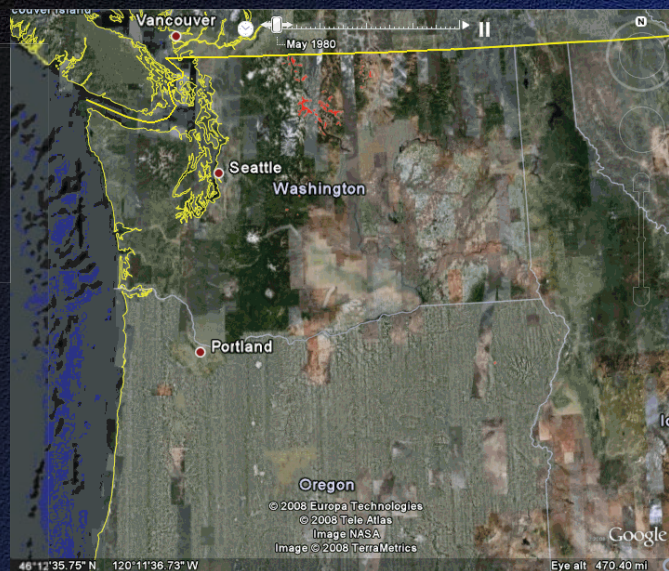
- Our experience
 - ◆ Partnering with Google raised our visibility ... a lot
 - ◆ Private industry works differently, and much faster, than we do
 - ◆ Google has different ideas than we do about which information is interesting or important
 - ◆ We can share data via Google—even if Google is not interested in hosting it...

Sharing Data using Google Earth



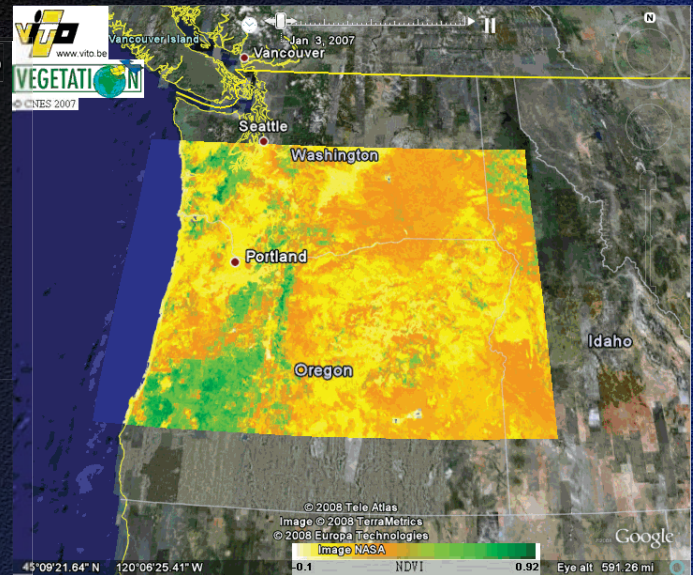
Time Series Animation of Data

- Spruce Budworm outbreak—USA, Pacific Northwest
- Mapping via aerial sketchmapping
- 1979 to 2007



Time Series Animation of Data

- Seasonal greenup and senescence- USA, Pacific Northwest
- Data from SPOT satellite (10 day composites)
- January – December 2007



Loss of Open Space

- ~6,000 acres of open space are lost each day
- www.fs.fed.us/openspace/



Example: 42 years of change.

Open Space Conservation

Forest Service Home | About the Forest Service

Browse by Subject: you are here: Home

- National Strategy
- Loss of Open Space
- Success Stories
- Resources & Tools
- Cooperating Across Boundaries

Open Space Conservation

Latest News:

- The [Open Space Conservation Strategy](#) has been released.
- The [National Forests on the Edge](#) report has been released.

Google Earth and the Forest Service...

● Our experience

- ◆ Partnering with Google raised our visibility ... a lot
- ◆ Private industry works differently, and much faster, than we do
- ◆ Google has different ideas than we do about which information is interesting or important
- ◆ We can share data via Google—even if Google is not interested in hosting it...
- ◆ And there are many other ways to share and show information on the web...

Data Clearinghouse (Warehouse)

One-stop access to:

- reports
- charts
- graphs
- databases
- maps
- imagery
- metadata



<http://fsgeodata.fs.fed.us/>

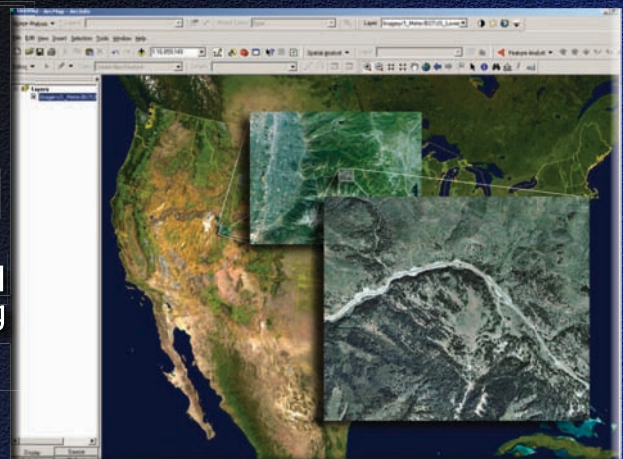
Syndicated Services

- These services are called by other services or applications
- Contribute content to other web sites to make what is called a "Mashup"
 - A mashup is a service or application that is constructed from other services and applications
- Simple or complex
 - Can provide just a picture or document
 - Can provide custom outputs in real time
- For example...

Syndicated Service--Image Server

Provides:

- Imagery, Maps, and Terrain (various resolutions)
- Meant to be used by other applications
- Takes in location and scale from the calling application



Collaborative and Interactive Map Services

- Provides the opportunity for users to correspond with the site publisher or other users
 - ◆ Submit comments
 - ◆ Online forums
 - ◆ Amend site contents
 - ◆ Submit new data
- We are using this method of information presentation in our forest management plan revision process...



Forest Management Plan Revision—Public Collaboration

Comment Form

Select the Plan Option and Geographic Area for which you would like to comment:

Plan Option: **Revising Plan**

Geographic Area: **Cliff Creek**

Cliff Creek Description: Located in the Bridger-West Division of the Bridger-Teton National Forest, south of the Gros Ventre Wilderness and adjacent to the Willow Creek and Hoback Basin areas.

☐ I agree with the way this Geographic Area is being managed in the Existing Plan (Revising Plan % will be submitted).

☐ I do not agree. I would rather see the following Access/Development Levels applied in the proposed proportions below:

Please mark the percentage of the currently selected Geographic Area to which each Access/Development Level should apply.

If you would also like to propose specific location(s) within this Geographic Area where each change should be made, use the text box to describe the location(s).

Geographic Area Access/Development Levels	Existing Plan	Proposed Percent
Wilderness: Wilderness is a congressionally designated special area, managed with special regulations and for purposes that include preserving wildlife, ecological, scientific, educational, and other values. Other forest activities can take place here, subject to legal constraints. Examples include primitive recreation, outfitting, research, livestock grazing, maintenance of existing water developments, wildland use fire, and restoration activities such as weed control.	0.0%	0.0%
☐ I propose specific location(s) within this GA where this change should occur.		
☐ The location doesn't matter to me or I don't know what location to propose.		
Non-motorized Backcountry: Large natural areas that may have non-motorized trails but no motorized trails or roads. Activities that would be compatible with this land category include all of the land uses listed for wilderness, with the addition of active wildlife or fisheries improvement projects, mechanical transport such as mountain bikes, and fewer constraints on the construction of permanent facilities. An example constraint discussed among team members: mechanical treatment of fuels may be compatible with backcountry only if no long-term ground disturbance is needed. Treated areas should appear as undisturbed natural areas after the work is completed, with stumps cut low to the ground and other things that are covered in standards/guidelines. Obvious roads and ground disturbances are not compatible with a backcountry environment. Mechanical and motorized tools for project work are compatible where these are the best/only way to complete necessary vegetation management. This includes over-ripe skidding, use of chain saws, use of aircraft and other methods that do not leave a long-lasting footprint on the ground.	76.02%	76.02%
☐ I propose specific location(s) within this GA where this change should occur.		
☐ The location doesn't matter to me or I don't know what location to propose.		
Motorized Backcountry and Areas Accessed by Primitive Roads: Areas that have a mostly natural appearance with access by both motorized and non-motorized trails, as well as unimproved camp sites.	3.21%	3.21%
☐ I propose specific location(s) within this GA where this change should occur.		
☐ The location doesn't matter to me or I don't know what location to propose.		

Bridger - Teton Forest Plan Revision Maps

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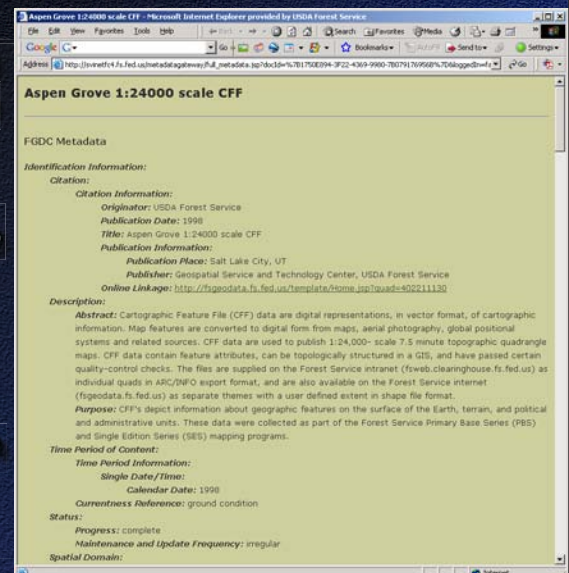
GeographicArea Name
Cliff Creek

Metadata and Credibility

- Metadata is data about the data
 - ◆ Tells users what the dataset is, where it came from, who created it, how and when
 - ◆ Gives information on the geographic coverage, units of measure and geodetic characteristics of the data
 - ◆ Provides information on data organization, schema, domain of allowable values for each attribute and the data dictionary
 - ◆ Explains models that were used to produce derivative datasets, as well as the contributing datasets used
 - ◆ Lets users assess the appropriateness of the data for their needs
 - ◆ Can be indexed to provide sophisticated spatial and text search capabilities to aid in discovery on the web
 - ◆ Can help build confidence and trust in the data through transparency and disclosure

Metadata and Credibility

- There are International Standards Organization (ISO) standards for metadata documents
- You can include links to other documents or web sites – nested complexity
- They can be indexed and accessed by search engines – Yahoo, Google, etc.



Summary

- Web and GIS technologies can increase the use and understanding of resource data
- Information on the web is more compelling if it tells a story, is interactive and encourages further inquiry
- You can increase the likelihood of people finding your information on the web
- Organization of your website should be optimized to match usage patterns
- You can build confidence in your data by sharing information about its characteristics

Kiitos / Thank you

Kysymyksiä / Questions?



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The European Forest Data Center (EFDAC): Ongoing Initiatives on Data Dissemination at the EU Level

Jesus San-Megye-Anyanz¹

1

The European Forest Data Center (EFDAC)
- on going initiatives on data dissemination at the EU level -

J. San-Miguel-Ayanz



Forest C&I Analytical Framework and Report Workshop - Joensuu - May 19-21

Outline2

- ☐ Forestry in the European Union (EU)
- ☐ Data needs in the EU
- ☐ Datasets at EU level
- ☐ Forest information systems in the EU
- ☐ Description of the systems
 - ✓ EFICP (European Forest Information and Communication Platform)
 - ✓ EFFIS (European Forest Fire Information System)
 - ✓ Forest Focus database (European database on forest condition)
- ☐ Summary

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¹ Senior Researcher, European Commission, EC-Joint Research Center, ISPRA.

- No Forest policy exists at the EU level – forestry is competence of the EU Member states (currently 27).
- Regulations on forest monitoring (forest fires and forest condition) existed until recently (2006).
- Competence on forestry aspects shared by several European Commission (EC) services.
- International Data Providers for the EC are JRC and ESTAT.

- Data are needed at the EU level for compliance with international conventions (e.g. MCPFE, CBD);
- Needs on information on forest arise in relation to other policy areas (Kyoto protocol, UNCCC, Biomass Action Plan, Biofuels Action Plan, Biodiversity Action Plan, Com. on disaster response, Com. on disaster prevention).
- EU focal point on forestry information recently created – the European Forest Data Center (at JRC).

- Forest condition
 - 4 databases on soils (Belgium), foliar chemistry (Austria), defoliation (Germany) and intensive monitoring (Netherlands) until 2003.
 - Currently the **Forest Focus Database** (at JRC) holds and maintain all the validated datasets (1987-2006).
- Forest fires
 - Until 2000, the common core database at DG AGRI
 - From 2000, the **European Forest Fire Information System (EFFIS)** at JRC holds data from 1986 to 2007.
- Forest resources (annual production and trade)
 - Data collected in the Joint Forest Sector Questionnaire (JFSQ), (FAO, ITTO, UNECE, ESTAT) are available at ESTAT.
 - NFI derived data at the **European Forest Information and Communication Platform (EFICP)**
 - **European forest/non-forest maps (1990 ▫ 2000 ▫ 2006) → FRA2010 Remote Sensing Survey**

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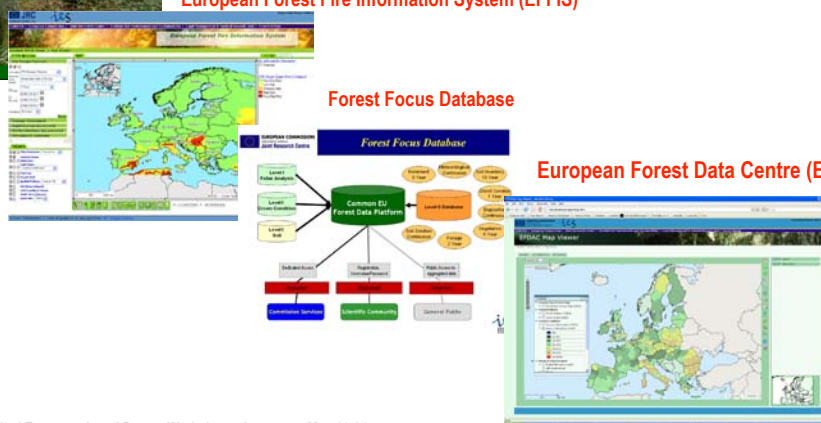
European Forest Information & Communication Platform (EFICP)



European Forest Fire Information System (EFFIS)

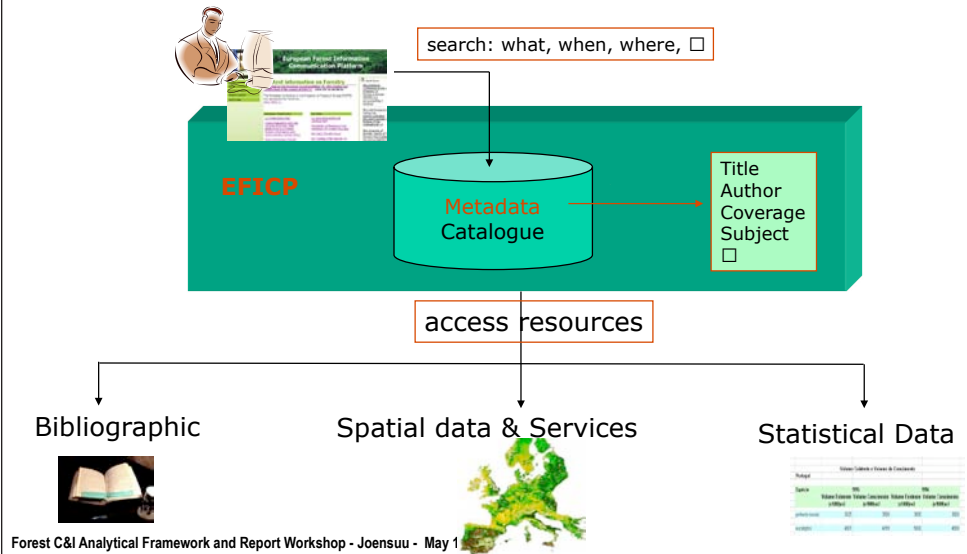
Forest Focus Database

European Forest Data Centre (EFDAC)

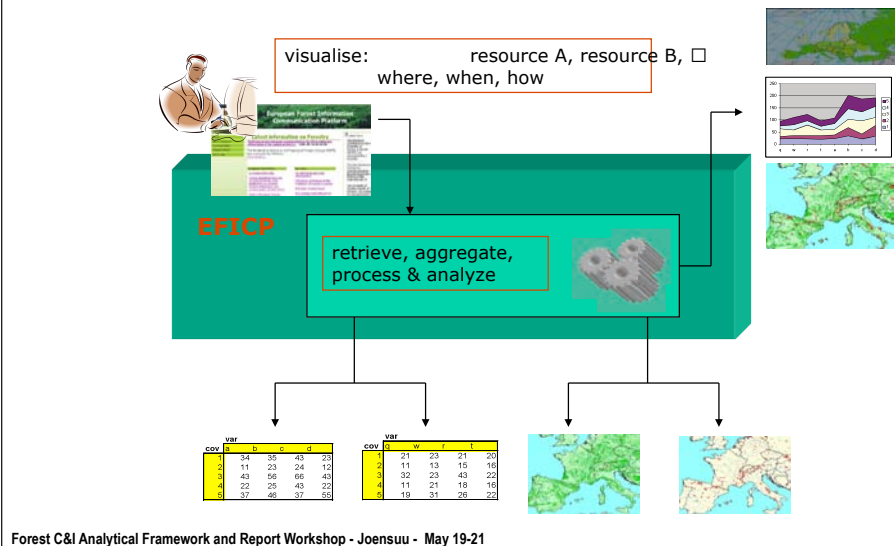


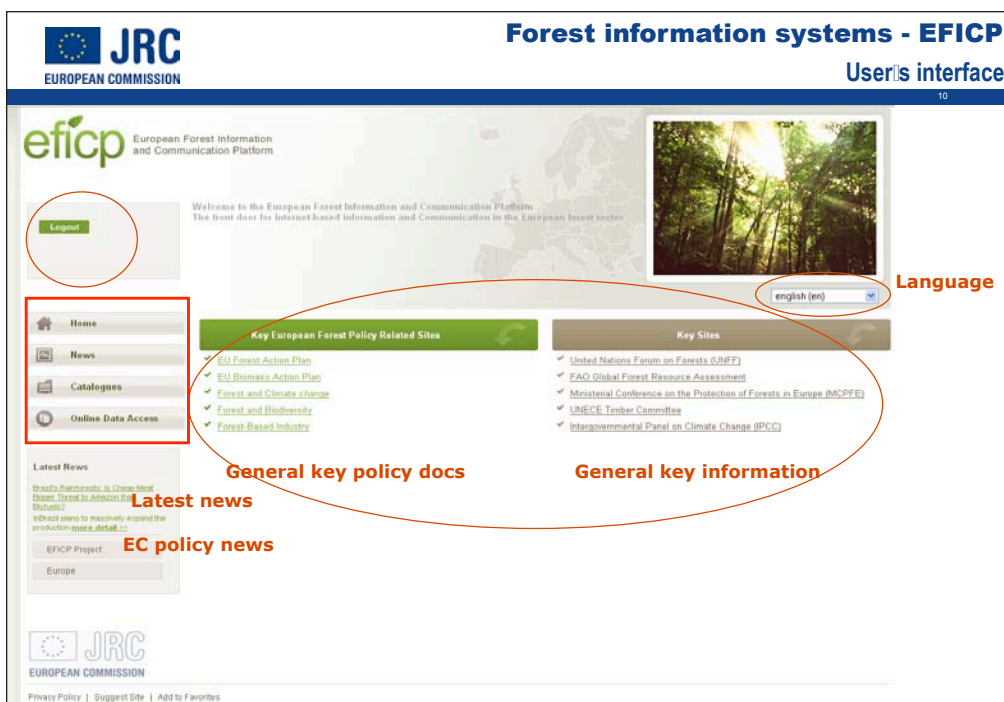
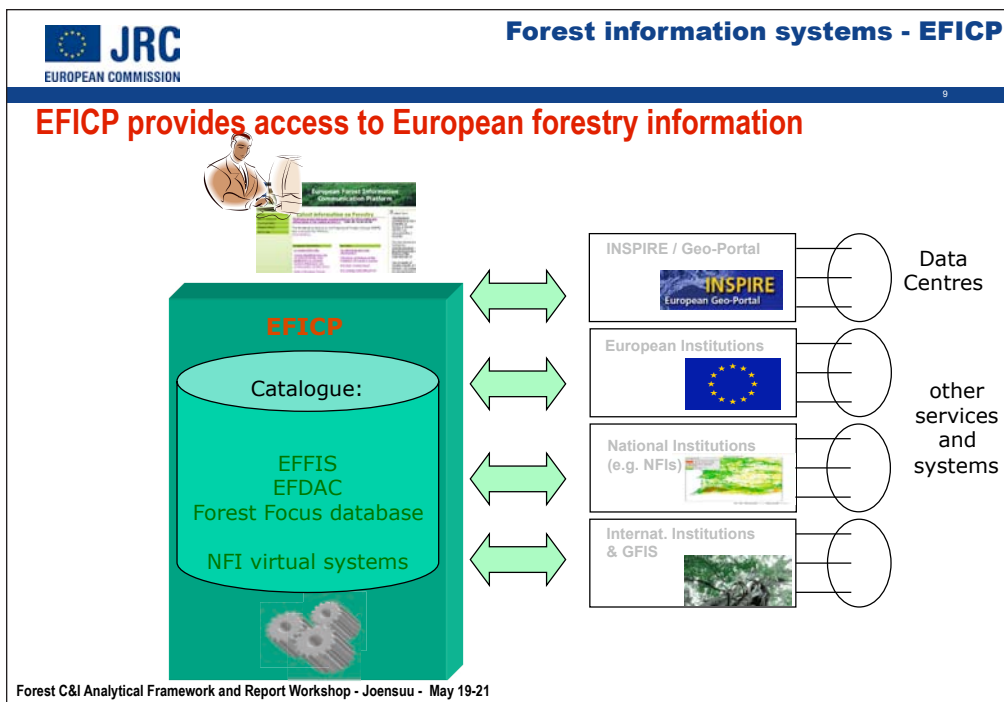
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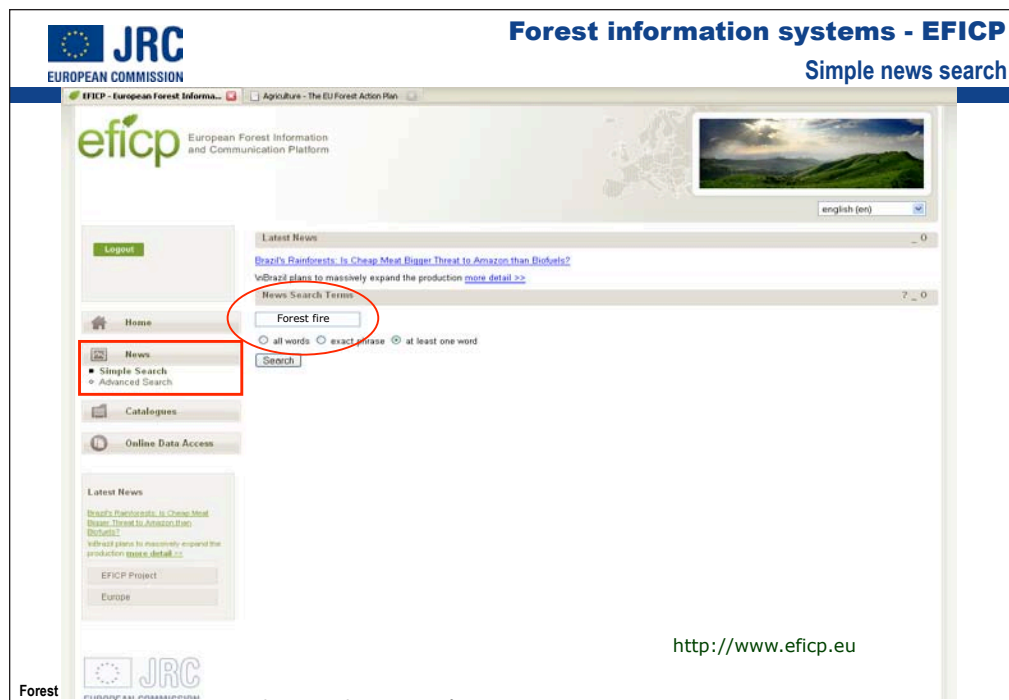
Resources Search and Discovery



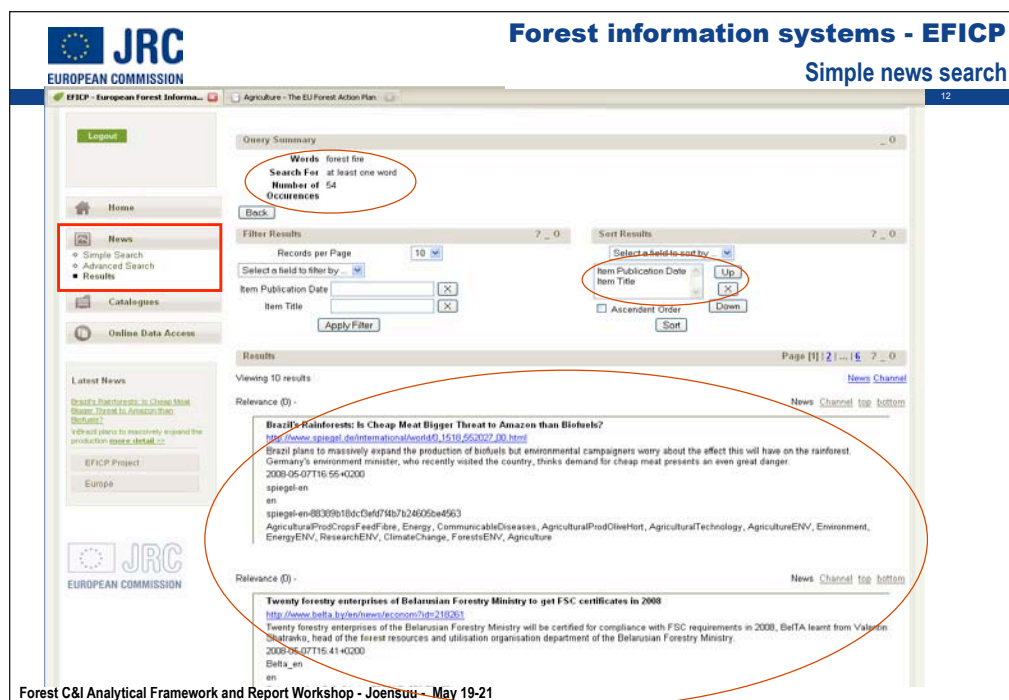
Data Access, Analysis and Visualisation







http://www.eficp.eu



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Forest information systems - EFICP

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Biodiversity
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production space detail...

EFICP Project

Europe

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Item Title X

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Sort

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Viewing 10 results

Relevance (0) -

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Channel Description Europe Media Monitor (EMM) Alerts are based on a match of news item text against a predefined set of around 650 category definitions, described by 16,000 keyword patterns and combinations. The news items are gathered from around 1000 sources all over the world on a regular basis. The Alert System processes the information immediately when a new item has been found. The selection and placement of stories are determined automatically by a computer program. This site is a joint project of DG-JRC and DG-COMM. The information on this site is subject to a disclaimer (see http://europa.eu/genreinfo/legal_notices_en.htm). Please acknowledge EMM when reusing this material.

Channel Link <http://press.jrc.it/News/BriefAlertEdition/all/EFICP.htm>

Channel LastBuildDate Wed, 07 May 2008 16:56:05 CEST

Channel Title EMM Alert EFICP

Item Title Brazil's Rainforests: Is Cheap Meat Bigger Threat to Amazon than Biofuels?

Item Link <http://www.spiegel.de/international/world/0,1518,563027,00.html>

Item Description Brazil plans to massively expand the production of biofuels but environmental campaigners worry about the effect this will have on the rainforest. Germany's environment minister, who recently visited the country, thinks demand for cheap meat presents an even greater danger.

Item Publication Date 2008-05-07T16:55+0200

Item Source spiegel-en

Language en

Item GUID spiegel-en-08309b18dc6af74b7b24205ae4563

Item Category AgriculturalProdCropsFeedFibre, Energy, CommunicableDiseases, AgriculturalProdOliveHort, AgriculturalTechnology, AgricultureENV, Environment, EnergyENV, ResearchENV, ClimateChange, ForestsENV, Agriculture

Relevance (0) -

News Channel top bottom

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production space detail...

EFICP Project

Europe

eficp European Forest Information and Communication Platform

Search Term

Free text box

search for metadata in English

all words exact phrase at least one word

Database

Metadata Data

Documents

Software

Themes and Graphs

Events

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Brazil's Expansion in Cheap Meat
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Europe

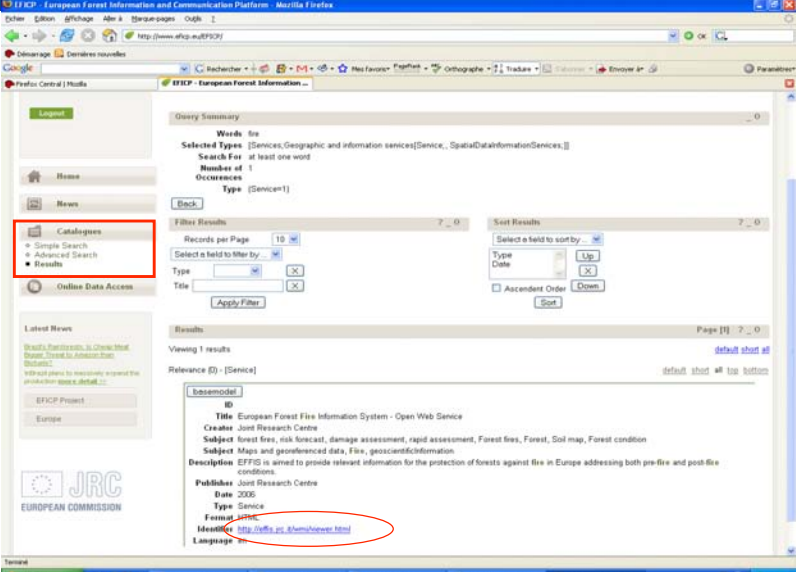
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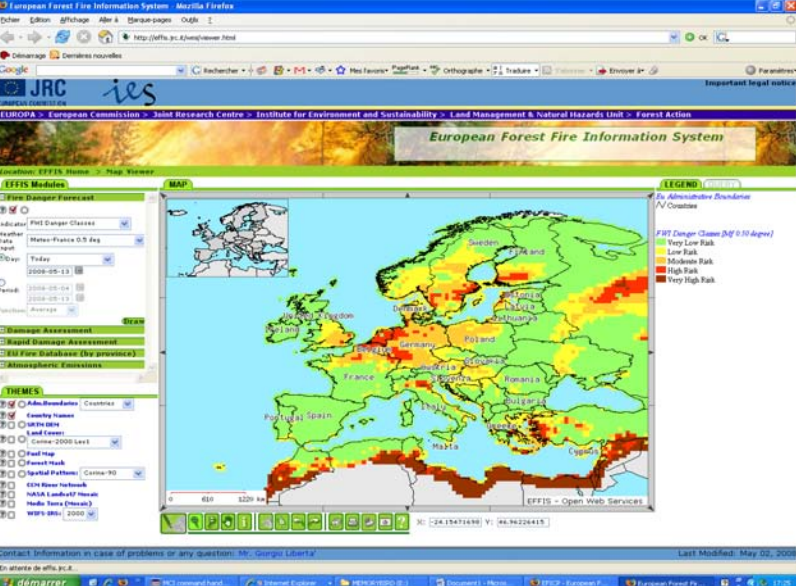
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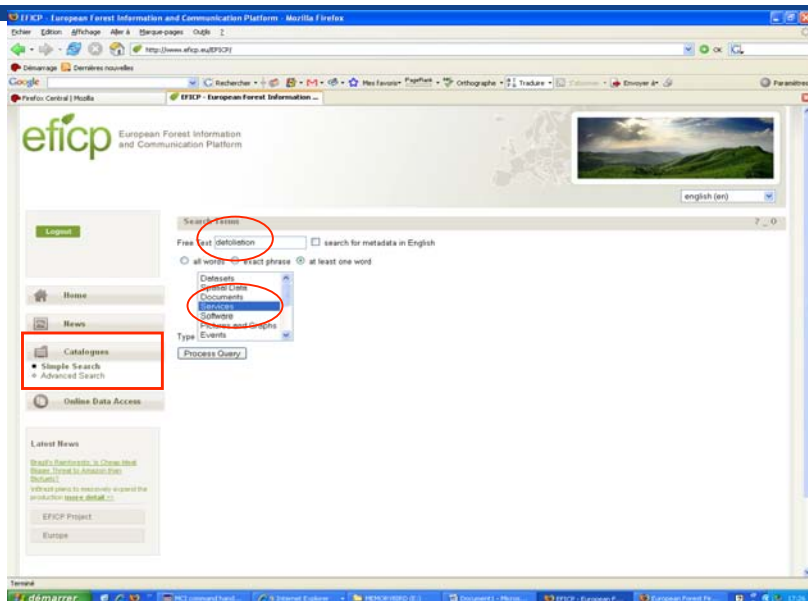
JRC
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Forest information systems - EFICP

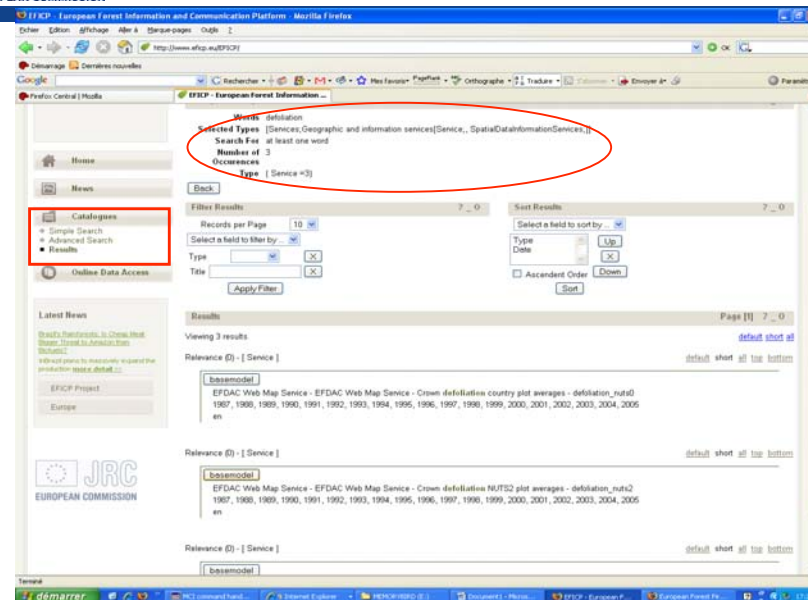
Catalogue search access to web mapping services



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JRC
EUROPEAN COMMISSION

Forest information systems - EFICP

Catalogue search

EFICP - European Forest Information and Communication Platform - Mozilla Firefox

http://www.eficp.eu/EFICP/

EFICP - European Forest Information

Results: Viewing 2 results

Reference [0] - [Service]

basemodel

Title: EFDAC Web Map Service - EFDAC Web Map Service - Crown defoliation NUTS2 plot averages - defoliation_nuts2

Subject: defoliation, environment, crown, forest, conditions, forest environment, forest ecology, condition, EFDAC

Reference System: EPSG 4326, EPSG 4326

Description: Web Mapping Service for the European Forest Data Centre - Average crown defoliation map derived from Forest Focus database Level 1 plots (systematic network of observations points arranged on a grid throughout Europe at a spacing of approximately 10km x 10km). The map shows the NUTS2 average tree defoliation level (in % of crown) observed in the plots visited in the year 2000.

Abstract: Web Mapping Service for the European Forest Data Centre - Average crown defoliation map derived from Forest Focus database Level 1 plots (systematic network of observations points arranged on a grid throughout Europe at a spacing of approximately 10km x 10km). The map shows the NUTS2 average tree defoliation level (in % of crown) observed in the plots visited in the year 2000.

Publisher Contact Information: andrea.cama@ec.europa.eu

Publisher: Joint Research Centre of the European Commission

Date: 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005

Type: Service

Service Type: WMS

Identifier: http://eficp.eu/eficpmapserver/eficp_defoliation_nuts2

Language: en

Spatial Coverage: north: 7.80057e+05, south: 489760, west: 645512, east: 856304e+05

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Forest information systems - EFICP

Catalogue search

EFICP - European Forest Information and Communication Platform - Mozilla Firefox

http://www.eficp.eu/EFICP/

EFICP - European Forest Information

Layers:

- Crown defoliation
- NUTS2
- plot averages
- NUTS

WGS84 X: 250 Y: 500

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Layers:

- Crown defoliation
- NUTS2
- plot averages
- NUTS

WGS84 X: 3344 Y: 51154

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Europe

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Catalogue search | access to web mapping services

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EFDAC MapViewer

LOCATION: EFDAC Home > Map Viewer

Search for

Scale 1: 20463310

0 450 900 km

Result

Crown defoliation survey plot averages for all sampled trees

Name	Nuts Code	Defoliation (%)	Number of Plots (avg)	Year(s)
Österreich	AT	5.84	130	2000

Nuts Level 2

Name	Nuts Code	Country Nuts Code
Stemmark	AT22	AT

Contents

- Forest/Non-Forest Map
- Landscape Pattern of Forest
- Forest Condition
 - Crown defoliation (2000) plot averages for all sampled trees
 - None (0 - 10%)
 - Slight (10-15%)
 - Slight (15-20%)
 - Slight (20-25%)
 - Moderate (>25-60%)
 - Severe (>60 - 100%)
 - Dead (100%)
 - Crown discoloration (2000) plot averages for all sampled trees
- Physical Environment
 - Digital Elevation model
 - Hill Shade Relief
 - Rivers
- Administrative Boundaries
 - Country
 - Nuts Level 1
 - Nuts Level 2
 - Nuts Level 3
- Urban Environment

Query Builder

Layer Information

ies

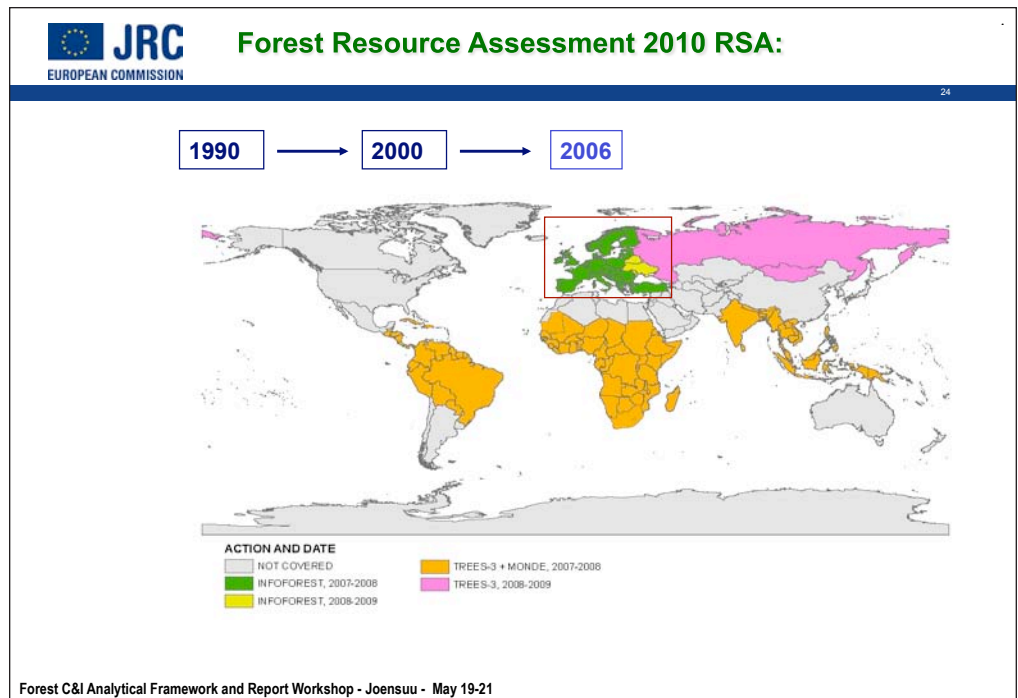
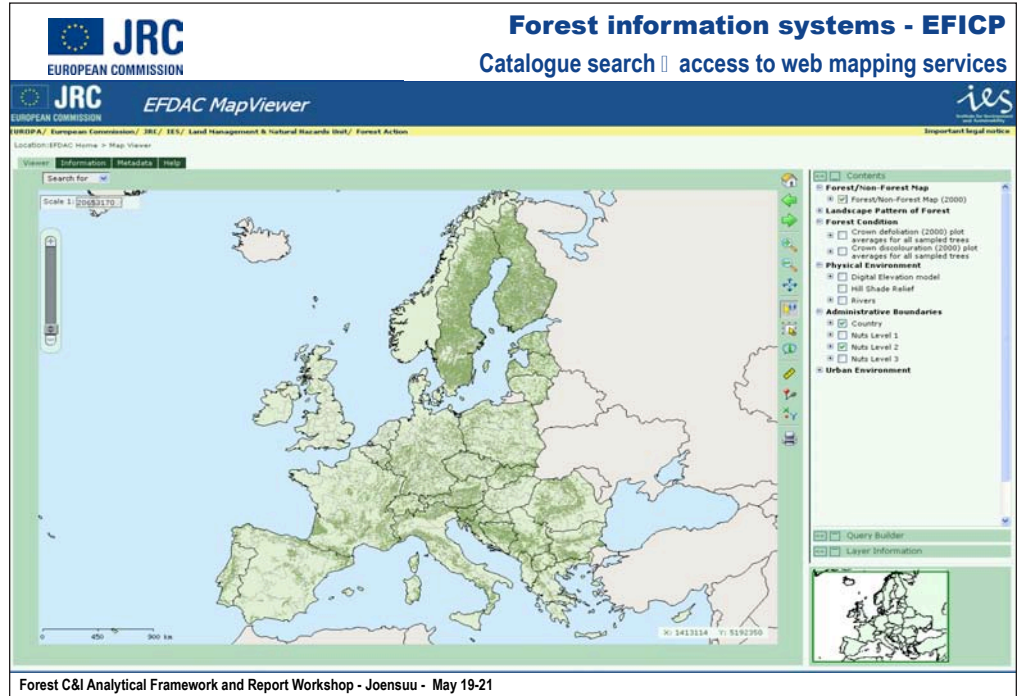
Important legal notice

0 450 900 km

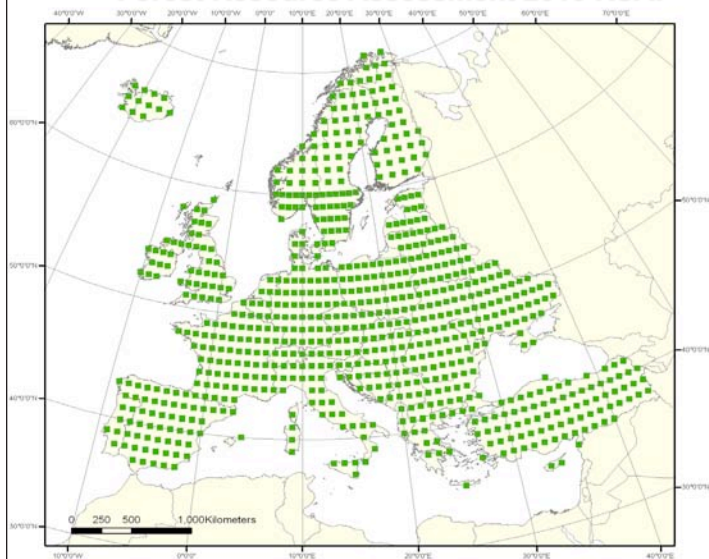
X: 2456830 Y: 5394536

p.mapper

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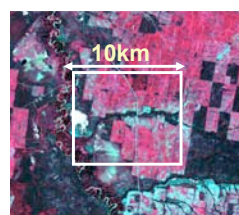


Forest Resource Assessment 2010 RSA:



**Systematic Samples with
units at 1°x 1°lat/long**

above 60° every 2°



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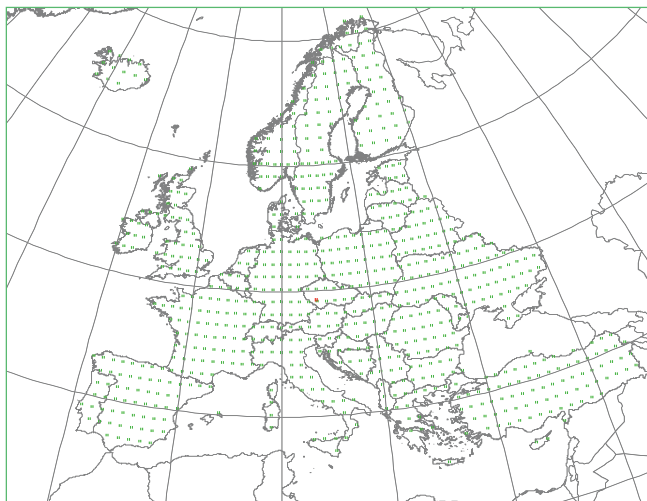
FRA 2010 RSA for EUROPE:

Country	# samples		
AL	3	IS	12
AT	12	IT	35
BA	7	LT	9
BE	4	LU	1
BG	11	LV	9
BY	28	MD	2
CH	5	MK	3
RS+ME	10	NL	4
CY	2	NO	36
CZ	10	PL	40
DE	44	PT	8
DK	6	RO	28
EE	6	SE	48
ES	53	SI	2
FI	32	SK	6
FR	65	TR	81
GR	14	UA	75
HR	6	UK	34
HU	11		
IE	11	<i>total</i>	773

**Systematic Samples with
units at 1°x 1°lat/long**

above 60° every 2°

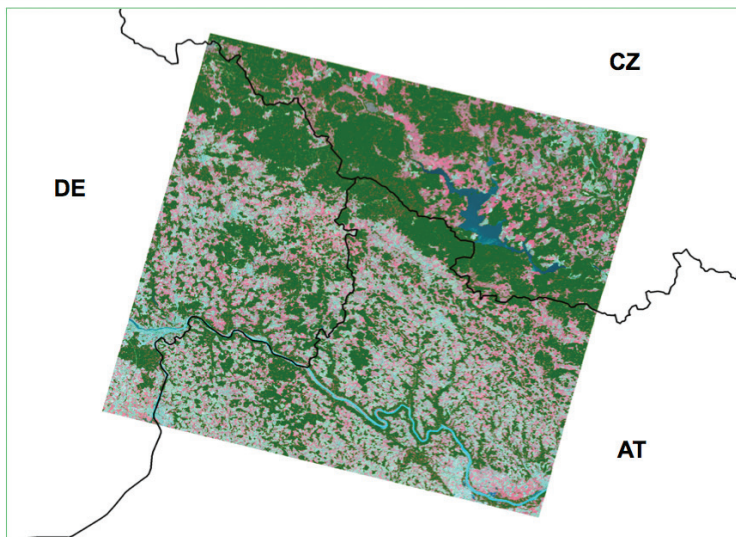
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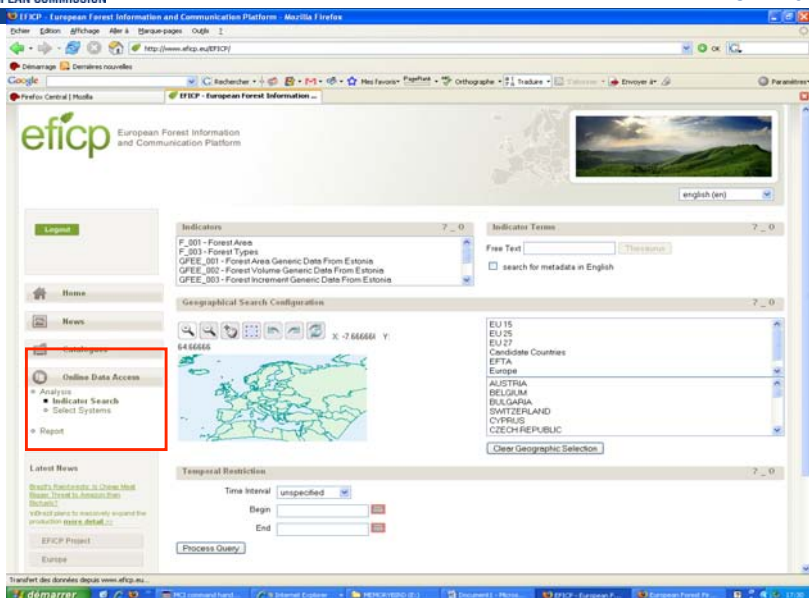


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<http://forest.jrc.it/ForestMap/>

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Forest information systems - EFICP

On-line data access

EFICP - European Forest Information and Communication Platform - Windows Internet Explorer

http://www.eficp.eu/EFICP/

EFICP - European Forest Information and Communication Platform

Relevance (0) - [StatisticalDataResource, Dataset]

default short all top bottom

basemodel

ID
Title F_001 - Forest Area
Creator JRC NFI System
Creator Contact Information JRC NFI System
Subject F_001_F_001
Subject Forest Area
Description JRC NFI System - F_001 - Forest Area, Measurement information
Table Of Contents Forest Area
Quality Data quality information
Publisher Contact Information JRC NFI System
Publisher JRC-NFI-EUROSTAT
Date 1998
Type StatisticalDataResource, Dataset
Format XML
Format Extent SDMX
Identifier http://139.191.145.8081/NFI_SYS_EUROSTAT_1998_H0/seedices/EFICPSDMX
Language EN
Spatial Coverage

Temporal Coverage 1998
Rights Use rights information
Access Rights Option A

Relevance (0) - [StatisticalDataResource, Dataset]

default short all top bottom

basemodel

ID
Title F_003 - Forest Types
Creator JRC NFI System
Creator Contact Information JRC NFI System
Subject F_003_F_003
Subject Forest Types
Description JRC NFI System - F_003 - Forest Types, Measurement information
Table Of Contents Forest Types
Quality Data quality information
Publisher Contact Information JRC NFI System
Publisher JRC-NFI-GR

(12 items remaining) Downloading picture http://www.eficp.eu/EFICP/getMap?compdb=SelectContext&RGRAND=1210345395681304PUTUPFORM

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On-line data access

EFICP - European Forest Information and Communication Platform - Mozilla Firefox

http://www.eficp.eu/EFICP/

EFICP - European Forest Information and Communication Platform

english (en)

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- Select Systems
- Restrict Dimensions

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Query Summary

Words [F_001#Forest Area#Forest Area Distribution NFI SYSTEM]

Words

Number of 11 Occurrences

Type [Dataset#11, StatisticalDataResource#11]

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Filter Results 7_0

Records per Page 10

Select a field to filter by

Type X

Title X

Apply Filter

Sort Results 7_0

Select a field to sort by

Up

Down

Accented Order

Sort

Indicators to Analysis 7_0

Clear All

Clear Selected

Process Query

Results

Page 1/2 7_0

Viewing 10 results

normal all

Transfert des données depuis www.eficp.eu

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Forest information systems - EFICP

On-line data access, analysis, and report generation

EFICP - European Forest Information and Communication Platform - Mozilla Firefox

http://www.eficp.eu/EFICP/

Google | Recherche | Paramètres | Orthographe | Traduction | Imprimer | Partager

Profex Central | Mozilla

EFICP - European Forest Information

english (en)

Report Preview

[Switch to Configuration Area View](#)

EFICP Report

INDICATOR by CO

Forest Area by Country from EUROSTAT national data

Build Report

Choose Analysis

Select an Analysis to Insert

Summary of selected analysis

Legend

Insert After

Select a node to insert after

Insert

Order Report Blocks

Order Report Blocks

Up

Down

Back

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On-line data access, analysis, and report generation

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Google | Recherche | Paramètres | Orthographe | Traduction | Imprimer | Partager

Profex Central | Mozilla

EFICP - European Forest Information

english (en)

Report Preview

[Switch to Configuration Area View](#)

EFICP Report

INDICATOR by COUNTRIES

Forest Area by Country from EUROSTAT national data

Build Report

Choose Analysis

Select an Analysis to Insert

Summary of selected analysis

Legend

Insert After

Select a node to insert after

Insert

Order Report Blocks

Order Report Blocks

Up

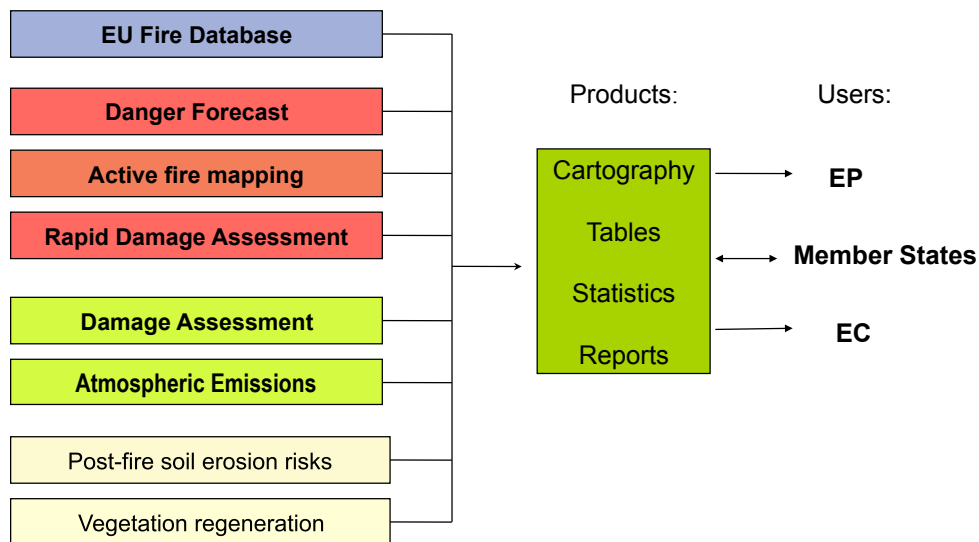
Down

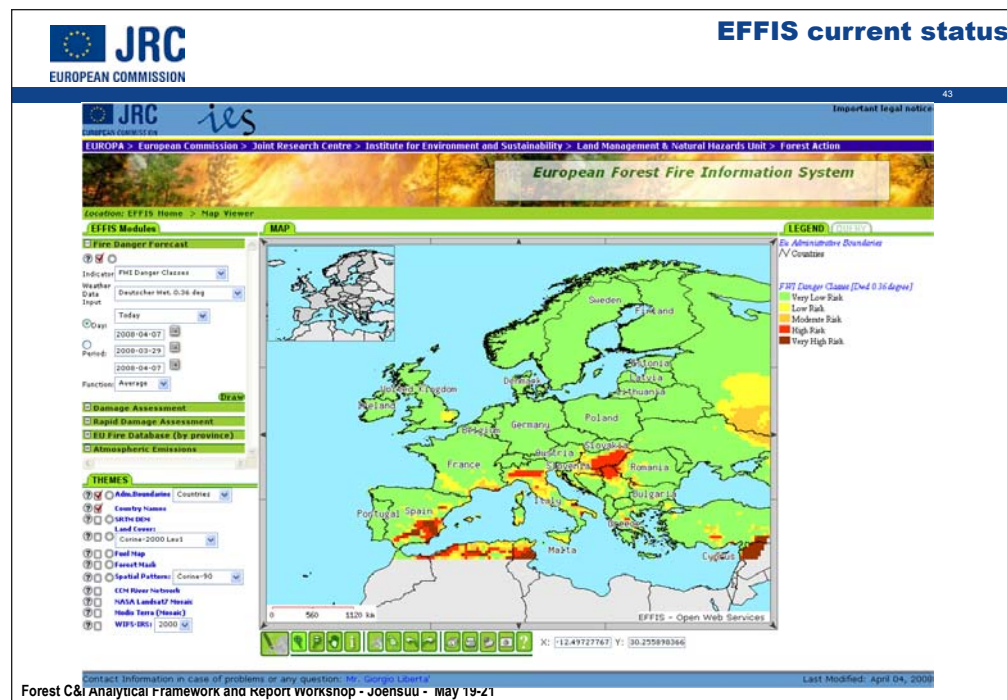
Back

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- EFICP is an INSPIRE compliant system, that is, EFICP follows the INSPIRE metadata specifications and the INSPIRE guidelines for system interoperability.
- EFICP provides access to all the systems declared in the EFICP metadata catalogue and all the open interoperable systems accessible through internet.
- EFICP provides access to EU systems and data on forest resources (currently the NFI virtual system and EFDAC), forest fires (EFFIS), and forest condition (Forest Focus database).
- In all cases, the spatial data available through EFICP are aggregated data derived from the EU databases. No point or plot data are or will be available from EFICP.
- EFICP permits the access to documents, statistical data and spatial data through multiple inter-system protocols, and allows the analysis of these data and the preparation of reports.
- EFICP will be integrated in the EFDAC and will complement the system regarding the access to remote databases.





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EFFIS current status

EFFIS Network & EU Fire Database

44

Country	Joined EFFIS	Data from - to	Number of years
Portugal	2000	1985 - 2005	22
Spain	2000	1985 - 2006	22
France	2000	1985 - 2006	22
Italy	2000	1985 - 2006	22
Finland	2000	2004 - 2005	2
Germany	2000	1994 - 2006	13
Greece	2000	1985 - 2004	20
Bulgaria	2002	2006	1
Cyprus	2002	2000 - 2006	7
Romania	2002	2004 - 2005	2
Austria	2003		0
Czech Republic	2004	2004 - 2006	3
Hungary	2004	2002 - 2007	6
Latvia	2004	2004 - 2006	3
Lithuania	2004	2004 - 2006	3
Poland	2004	1993 - 2006	14
Slovenia	2004		
Slovakia	2004	2004 - 2006	3
Sweden	2004	1996 - 2006	11
Turkey	2004	2005 - 2005	1
U. K.	2005		0
Croatia	2006	1996 - 2006	11
Estonia	2006	2005 - 2006	2
Switzerland	2006		0
Montenegro	2007		0
FYROM	2008		0

- Joint Member States & EC effort
- 26 Countries, 22-1 years
- Individual fire event records delivered yearly by MS
- About 1.7 million records

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FIRE TIME

Date and Time of first alert
Date and Time of first intervention
Date and Time of fire extinction

WHERE ?

FIRE LOCATION

Country
NUTS level 3 code (province)
NUTS level 5 code (commune)

HOW ?

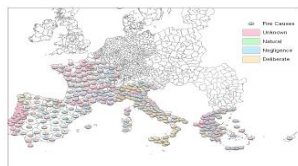
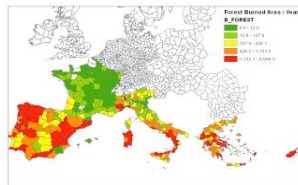
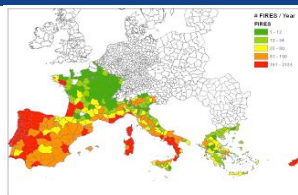
FIRE SIZE

Total Burned Area
Forest Burned Area
Non Forest Burned Area

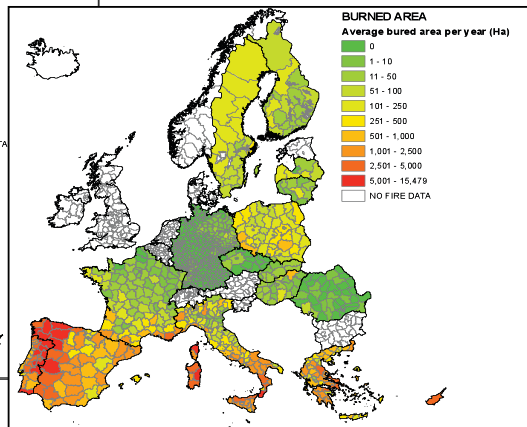
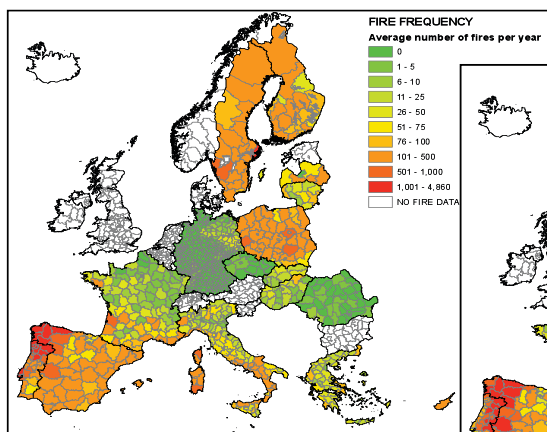
WHY ?

FIRE CAUSES

Presumed cause (4 classes)



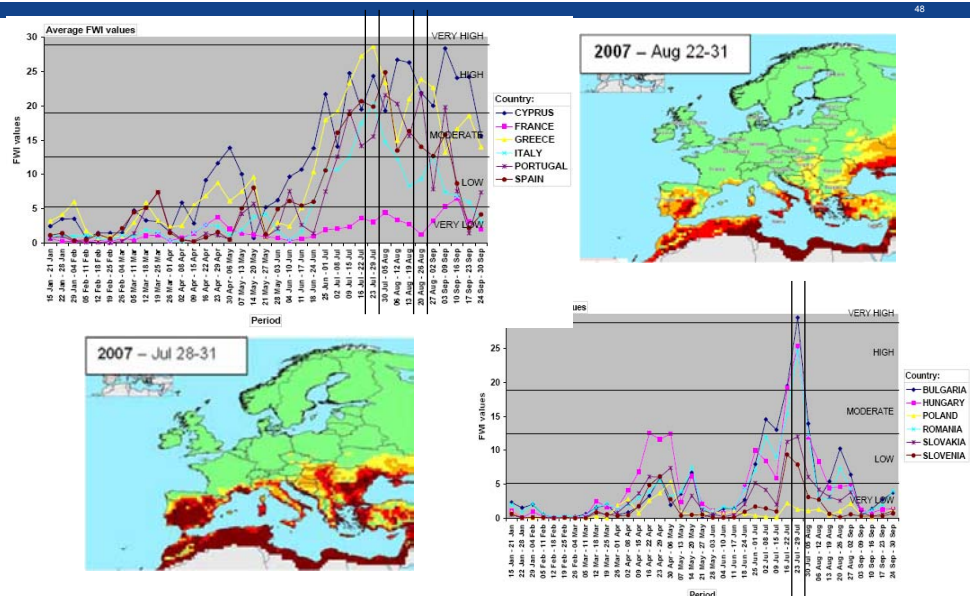
About 65,000 wildfires & 500,000 ha per year in EU





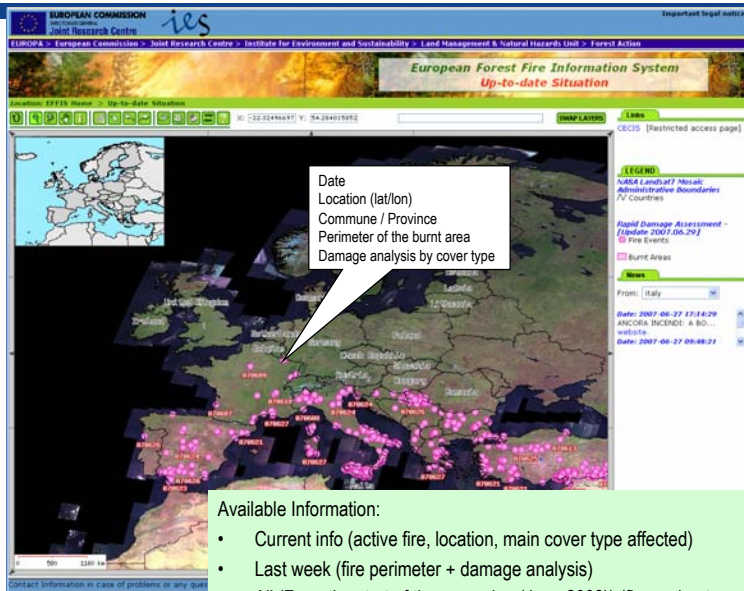
Improvement to 3 day forecast with higher spatial resolution (7 km approx)

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EFFIS ☐ Up-to-date situation Rapid Damage Assessment



Forest C&I Analytical Framework and Report Work

EFFIS current status Rapid fire damage assessment

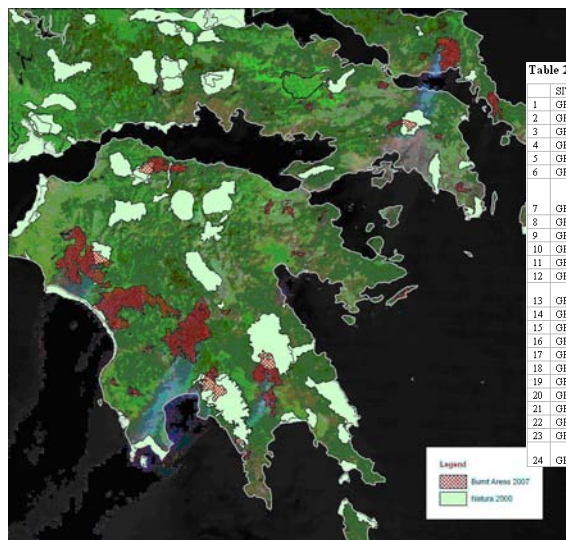
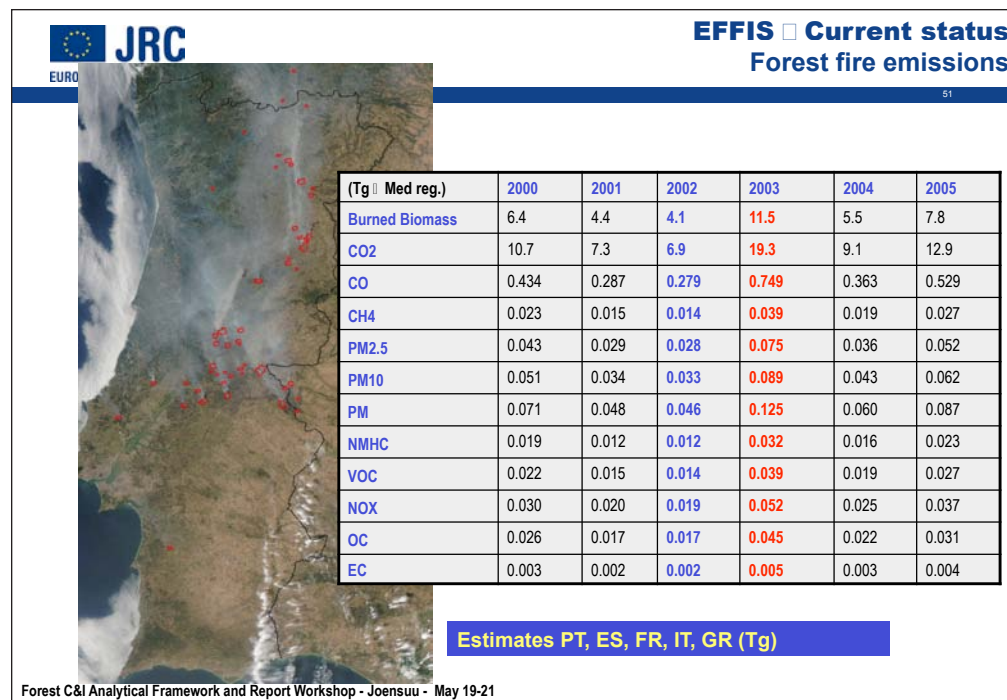


Table 2 Natura2000 sites directly affected by forest fires in Greece

	SITECODE	SITENAME
1	OR1230002	PIERIA ORI
2	OR1340001	ETHNIKOS DRYMOS PRESFON
3	OR1430001	OROS PILO KAI PARKATIA THALASSIA ZONI
4	OR2120009	ORI TSAMANTA, FILIATRON, FARMAKOVOUNI, MEGALI RACHI
5	OR2130008	OROS MITSIKELI
6	OR2210001	DYTIKES KAI VORIOANATOLIKES AKTES ZAKYNTHOU DELTA ACHELOU, LIMNOTHALASSA MESOLONGIOU-AITOLIKOU KAI EKVOLES EYINOU, NISOI ECHINADES, NISOS PETALAS, DYTIKOS ARAKYNTHOS & STENA KLEISOURAS
7	OR2310015	FARAGGI VOURAIKOU
8	OR2320003	ORI MARMAS KAI KLOKOS, FARAGGI SELINOUNTA
9	OR2320005	ZOUMFATA-AOIOS CHARALAMPOS-MARMAS-KLOKOS
10	OR2320010	OROPEDJO FOLOS
11	OR2330002	OLYMPIA
12	OR2330004	THINES KAI PARALIAKO DASOS ZACHAROS, LIMNI KAIIFA, STROFYLIA, KAKOVATOS
13	OR2330005	LIMNES YLIKI & PARALIMNI - SYSTIMA VOIOTIKOU KIFISSOU
14	OR2410001	KOILADA KAI EKVOLES SPERCHEIOU - MALIAKOS KOLPOS
15	OR2440002	OROS PARNONAS (KAI PERIOCHI MALEVIS)
16	OR2530006	AKROKORINTHOS
17	OR2530003	LAOKADA TRYFIS
18	OR2540005	OROS TAYGETOS
19	OR2550006	OROS TAYGETOS - LAOKADA TRYFIS
20	OR2550009	OROS PARNITHA
21	OR3000001	VOREIA CHIOS KAI NISOI OINOUSES KAI PARAKTIA THALASSIA ZONI
22	OR4130001	ANATOLIKI KRA
23	OR4220011	DRAPANO (VOREIOANATOLIKES AKTES) - PARALIA GEORGIPOULIS - LIMNI KOURNA
24	OR4340010	

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EFFIS ☐ **Current status**
Coordination ☐ **dissemination activities**

- Bi-annual EFFIS network meeting (Brussels, Ispra)
- Update of the EFFIS EU Forest Fire Database
- Provision to UNECE EU Forest Fire Statistics



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MONITORING DATA: Data Collection



Distribution of Level I and Level II Plots

- **Level I (1987-2006)**
~5700 plots, crown condition data.
- **Level II (1994-2006)**
~860 plots, data from 10 different surveys.



Level II Plot measuring tree run-off

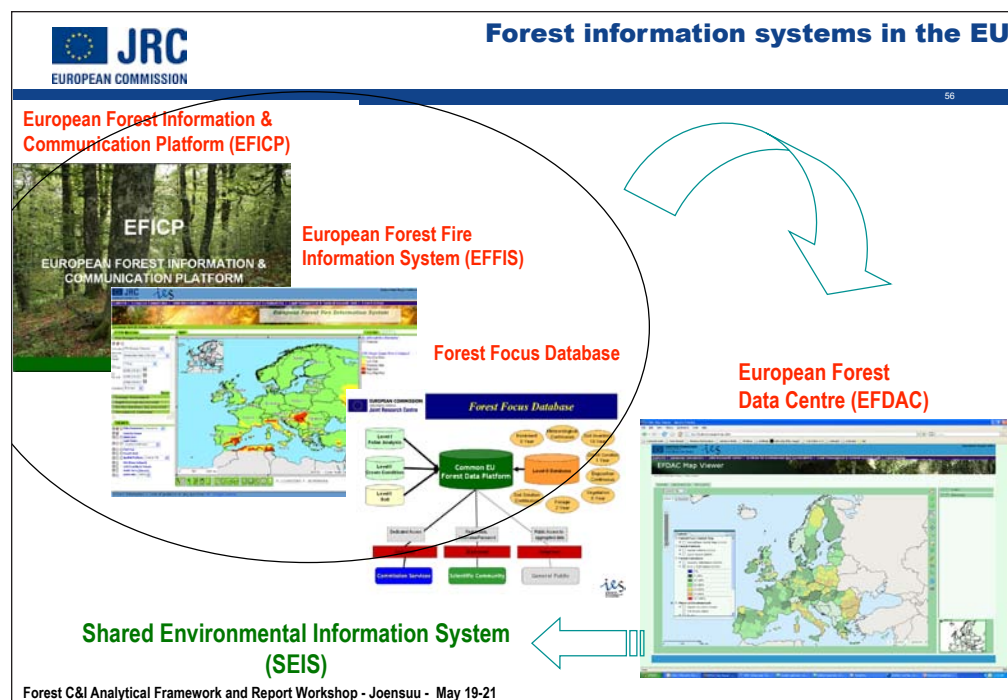
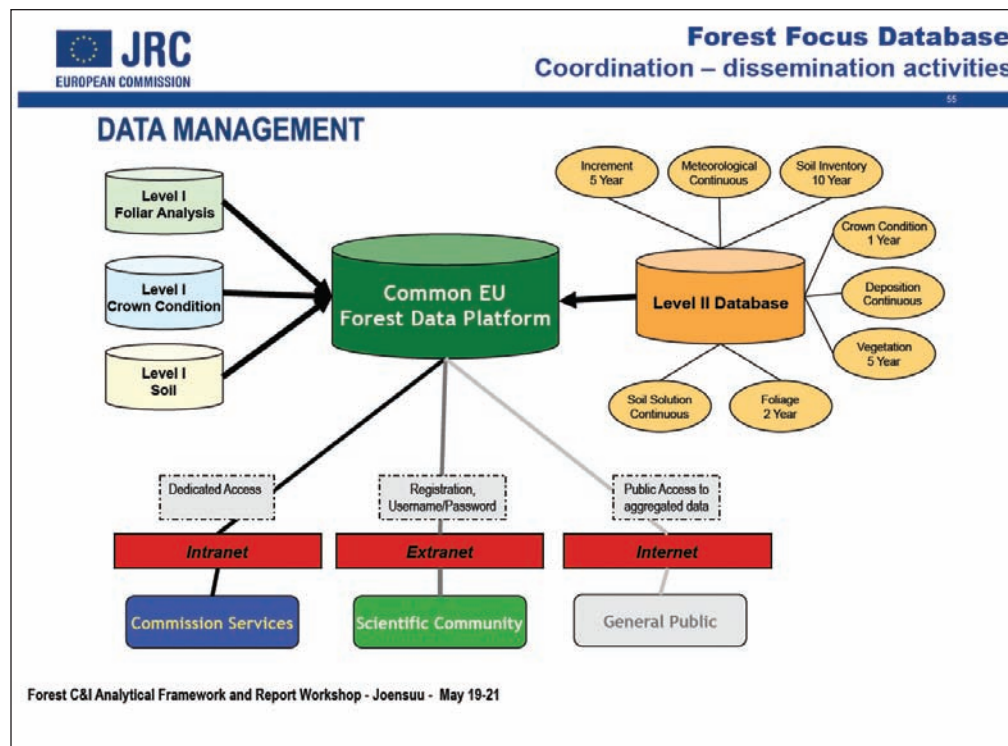
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MONITORING DATA: Scope

SURVEYS CONDUCTED	LEVEL I	LEVEL II
CROWN CONDITION	annually	all plots
FOLIAR CHEMISTRY	once until now	1497 plots
SOIL CHEMISTRY	once until now	5289 plots
Soil Solution Chemistry		continuously
Tree Growth		every 5 years
Ground Vegetation		every 5 years
Atmospheric Deposition		continuously
Ambient Air Quality		continuously
Meteorology		continuously
Phenology		several times per year
Remote Sensing		Preferably at plot installation



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- EFICP is an INSPIRE compliant system, that is, EFICP follows the INSPIRE metadata specifications and the INSPIRE guidelines for system interoperability.
- EFICP provides access to EU systems and data on forest resources (currently the NFI virtual system & EFDAC), forest fires (EFFIS), and forest condition (Forest Focus database - EFDAC).
- EFFIS is an INSPIRE compliant (centralized) system for on-line information on forest fires intended to provide support to forest fire and civil protection services in the countries, to EC services, and to the European Parliament.
- Forest Focus database is a centralized system of forest condition information. It is not INSPIRE compliant regarding metadata.
- Forest Focus database and it is not open to the public, and only accessible to each country for its own datasets.
- Overall objective of the EC is the integration of all the systems into a single European Forest Data Center (EFDAC).
- EFDAC will provide access to all EU information on forest resources, forest condition, and forest fires.

Thank you for your attention

Forest Reporting on Web 2.0: A Conversation, Not a Lecture

Simon Bridge¹



Forest reporting on Web 2.0: A conversation, not a lecture!

Simon Bridge
Natural Resources Canada □ Canadian Forest Service

Forest C&I Analytical Framework and Report Workshop
Finnish Forest Research Institute
May 19-21, 2008
Joensuu, Finland

 Natural Resources Canada Ressources naturelles Canada





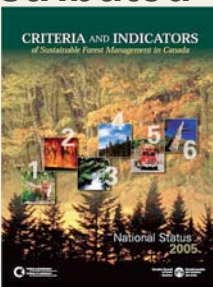
Canada's C&I report widely distributed

Products

- 2005 report (print, pdf, HTML)
- Key trends and conditions booklet

Distribution and Announcement

- Mailed report to ~700 readers
- Mailed booklet to ~4000 readers
- Provinces distributed within their jurisdictions
- Announced via e-distribution lists, blogs, Digg.com,
- Linked from Montreal Process web site, Wikipedia



2

 Natural Resources Canada Ressources naturelles Canada May 19-21, 2008 C&I Report Workshop, Finland



¹ Acting Head, Forest Information Strategy Section, Natural Resources Canada—Canadian Forest Service, 580 Booth Street, Ottawa, ON, Canada K1A 0E4. Phone: +1 613 947 9034. E-mail: sbridge@nrcan.gc.ca.



But the report is not widely used

- Preliminary feedback suggests that readers like the overall content, but have difficulty using the information:
 - Report is not clearly targeted at key audiences □ hence low awareness of utility of C&I
 - Too hard to find the information they are looking for
 - Want access to source data to perform their own analysis
 - Information not up to date □ reporting too infrequent
 - Too many indicators □ confusing
 - Lack of benchmarks - No integrated assessment
 - Similar info is more easily accessible from other government and NGO reports
 - Too many reporting requirements □ eats up resources

3



Natural Resources
Canada

Ressources naturelles
Canada

May 19-21, 2008

C&I Report Workshop, Finland

Canada



Reporting must change to be relevant

- Improve utility and delivery of C&I info by engaging readers and understanding their needs
- Increase accessibility to information by readers by using simple, interactive and highly adaptable or tailored reporting formats
- Reduce reporting burden by improving linkages to other reporting mechanisms (produce once □ use many times)
- Encourage stakeholder participation in SFM debate □ a conversation, not a lecture from government

Adapting to an evolving WWW may be part of the solution

4



Natural Resources
Canada

Ressources naturelles
Canada

May 19-21, 2008

C&I Report Workshop, Finland

Canada



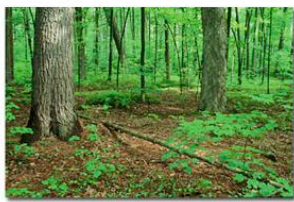
Current C&I web use: ☐ Post & browse ☐

Selected Publications

Canadian Criteria and Indicators Framework

Framework Documents

- [Defining Sustainable Forest Management in Canada: Criteria and Indicators 2003](#) (PDF, 2.81 MB) — Describes Canada's revised C&I Framework
- [Criteria and Indicators review 2003](#) — Information and documents related to the CCFM C&I review
- [Defining Sustainable Forest Management: A Canadian Approach to Criteria and Indicators 1995](#) — Description of C&I framework



Reports

- [New - Criteria and Indicators of Sustainable Forest Management in Canada: Key Trends and Conditions 2005](#) (PDF, 2 MB)
- [New - Criteria and Indicators of Sustainable Forest Management in Canada: National Status 2005](#) (PDF, 11.4 MB) - 2005 report on sustainability using the CCFM framework
- [Criteria and Indicators of Sustainable Forest Management in Canada: National Status Criteria and Indicators 2000](#) (PDF, 3.39 MB) — Report on sustainability using the CCFM framework
- [Criteria and Indicators of Sustainable Forest Management in Canada: Technical Report 1997](#) (PDF, 1.37 MB) — Describes Canada's capacity to measure sustainability
- [Criteria and Indicators of Sustainable Forest Management in Canada: Progress to Date 1997](#) (PDF, 1.37 MB) — Describes Canada's capacity to measure sustainability

5

 Natural Resources Canada Ressources naturelles Canada May 19-21, 2008 C&I Report Workshop, Finland 



But hard to find, hence not browsed!



The "AND" operator is unnecessary -- we include

Web Results 1 - 10 of about 5,850,000

[CCFM: Canadian Criteria and Indicators Framework](#)
The Canadian Criteria and Indicators Framework of the Canadian Council of Ministers (CCFM) is a science-based framework used to define and measure sustainable forest management. [www.ccmf.org/current/ccif_e.php](#) - 11k - [Cached](#) - [Similar pages](#) - [Note this](#)

[Methods and Tools - Criteria and Indicators](#)
CIMAT (Criteria and Indicators Modification and Adaptation Tool) Version 2
Criteria and Indicators Resource Book Database (CD-ROM + user ... [www.cifor.cgiar.org/acm/methods/candi.html](#) - 12k - [Cached](#) - [Similar pages](#) - [Note this](#)

[ITTO : Publications](#)
Revised ITTO criteria and indicators for the sustainable management of tropical forests. [www.itto.or.jp/live/PageDisplay/Handler?pagelid=201](#) - 52k - [Cached](#) - [Similar pages](#) - [Note this](#)

[The Montreal Process - Welcome](#)
The Montreal Process - Welcome - This web site provides up-to-date information on the Montreal Process.



Web Results 1 - 10 of about 1,000,000

[Sustainable forestry - Wikipedia, the free encyclopedia](#)
Sustainable forestry is a forest management practice. The basic tenet of sustainable forestry is that the amount of goods and services yielded from a forest should not exceed the forest's capacity to regenerate. [en.wikipedia.org/wiki/Sustainable_forestry](#) - 75k - [Cached](#) - [Similar pages](#) - [Note this](#)

[SFI: Sustainable Forestry Initiative](#)
The Sustainable Forestry Initiative® (SFI) program is based on the premise that responsible environmental behavior and sound business decisions can lead to a more sustainable future. [www.aboutsfi.org/](#) - 10k - [Cached](#) - [Similar pages](#) - [Note this](#)

[Forestry Commission - sustainable forestry](#)
Forestry Commission - sustainable forest management. [www.forestry.gov.uk/sustainableforestry](#) - 19k - [Cached](#) - [Similar pages](#) - [Note this](#)

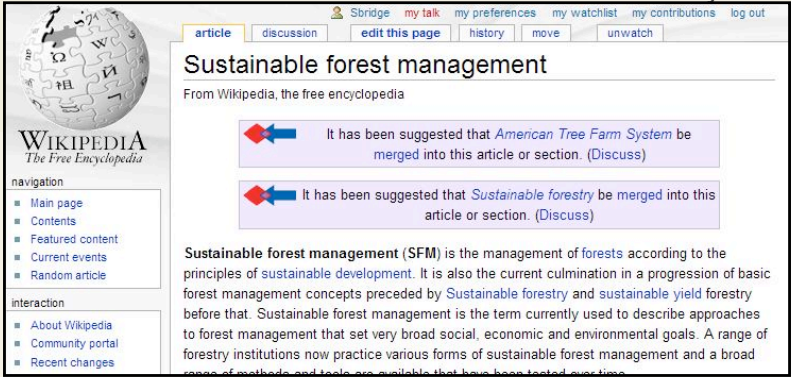
[Eldis - Sustainable Forestry Resource Guide](#)
Eldis is a gateway to development information and the forestry guide to sustainable development.

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Web 2.0 users are much more sophisticated

- Post and browse → collaborative co-creation
- Info silos → sources of content and functionality



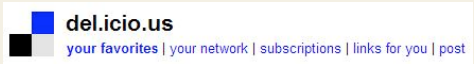
7


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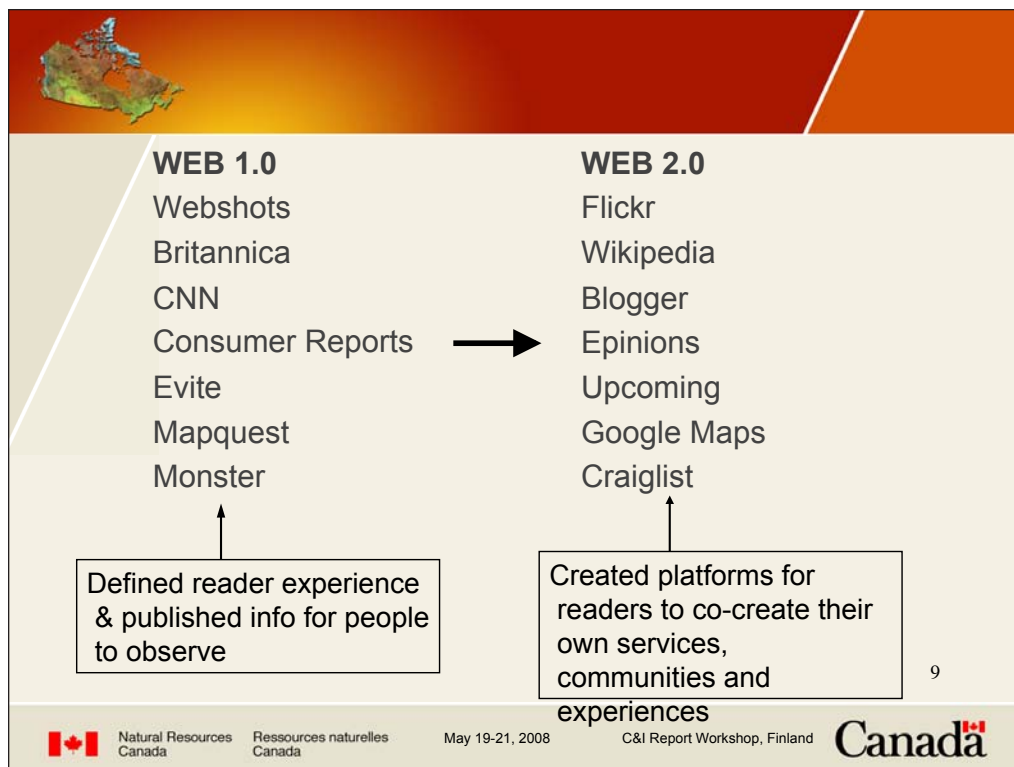
Examples of Web 2.0

- Blogs □ Don't publish, participate!
- Tagging, folksonomy
- Social networking




8


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What can we learn from Web 2.0 sites?

1. Shift thinking □ the web is a platform to provide a service, not a document archive
2. Provide unique data sources that get richer as more people use them
3. Readers want control □ make it easy to remix/mashup/hack data
4. Harness collective intelligence
5. Trust readers as co-developers (perpetual beta web site)
6. Plan for multiple devices

10

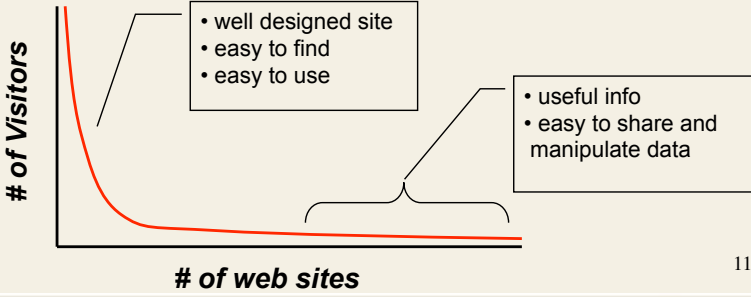
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Shift Thinking ☐ provide a service, not a document archive

If the service is to provide info on SFM, then you need to think about how to increase the use of your info by readers.

1. More visitors to your site
2. Your info used on other sites



of Visitors

- well designed site
- easy to find
- easy to use

- useful info
- easy to share and manipulate data

of web sites

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Provide unique data sources that get richer as more people use them

- Readers add value/content
- Harder for others to compete using same base data
- More visitors because of rich experience

Examples:

- Barnes and Noble vs. Amazon.com
- Mapquest vs. Google Maps



Recommended for Simon Bridge (If you're not Simon Bridge, click [here](#).)

Narrow by Event
[Page You Made](#)

Recommendations for you are based on items you own and more

Narrow by Category
[Books](#)
[Computer and Video Games](#)
[DVD](#)
[Music](#)
[Software](#)
[Video](#)

view: [All](#) | [New Releases](#) | [Coming Soon](#) [More results](#)

1. **End Of Poverty**
by Jeffrey Sachs (Feb 28, 2006)
Average Customer Review: **4.0 stars (4)**
List Price: **CDN\$ 19.00**
Price: CDN\$ 13.97
19 used & new from CDN\$ 11.13
[Add to cart](#)
[Add to Wish List](#)

[I Own It](#) [Not Interested](#)
Recommended because you purchased or viewed [Globalization and more \(Fix this\)](#)

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Provide unique data sources that get richer as more people use them

Incorporate ancillary data sources

E.g.

- Background material
- Links to most popular indicators
- Links to other sites

FROM OTHER NEWS SITES

- ▶ **The Scotsman** Iraqi PM bristles as tensions grow with U.S - 33 mins ago
- ▶ **Guardian Unlimited** Iraqi PM hits back at US criticism - 44 mins ago
- ▶ **CBS News** Bush To Invoke Vietnam In Iraq Speech - 1 hr ago
- ▶ **Financial Times** Iraqi PM hits back at US criticism - 1 hr ago
- ▶ **MSNBC** Iraq helicopter crash kills 14 US soldiers - 1 hr ago
- ▶ [About these results](#)

TOP MIDDLE EAST STORIES

- ▶ Bush warns of new Vietnam in Iraq
- ▶ Iran buys Russian passenger jets
- ▶ Olmert bans mobiles in cabinet

News feeds

MOST POPULAR STORIES NOW

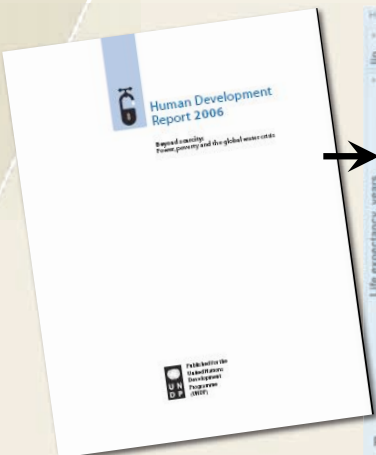
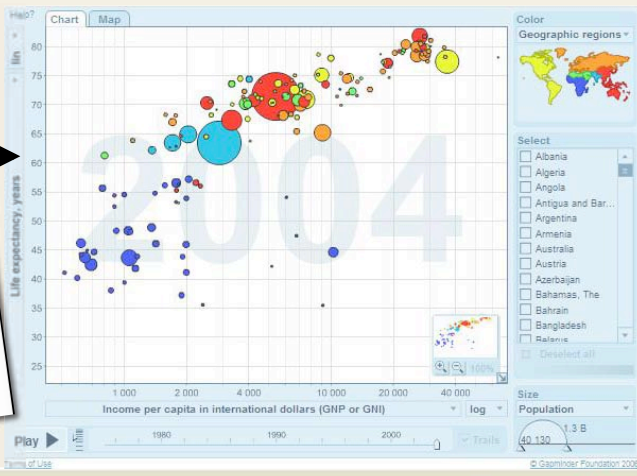
[MOST E-MAILED](#) [MOST READ](#)

- 1 Bush warns of new Vietnam in Iraq
- 2 Day in pictures


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Readers want control ☐ make it easy to hack data


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Harness collective intelligence

- We, the media ☐ Readers decide what's important
- Make it easy to blog, digg, tag, or send info to a friend



- Alert readers to new information with news syndication



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Trust readers as co-developers

- Allow readers to co-create content
- Add functionality to web site all the time ☐ perpetual beta
- Include tracking metrics to see if new functions are working

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Canada



Plan for multiple devices

- Desktop computers
- Blackberries
- Cell phones

PRODUCTS AND SERVICES

 **Podcasts**
Full programmes and highlights to download

 **E-mail news**
Sign up to a range of newsletters

▶ E-mail FAQs

 **Alerts**
Download the news ticker and alerts service

▶ Alerts help

 **Mobiles**
Get the top stories, wherever you are

 **News feeds**
Let the news come to you

17

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Common Barriers to overcome

- Organizational culture (process vs. outcome)
- Multilingual requirements
- Proprietary software contracts
- Fear of giving up control
- Fear of failure
- Proving return on investment

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Examples of reports that are adapting

- Quebec (<http://www.mrnf.gouv.qc.ca/publications/enligne/forets/criteres-indicateurs/accueil.asp>)
- British Columbia (<http://www.for.gov.bc.ca/hfp/sofi/>)

The State of British Columbia's Forests

We encourage readers to constructively discuss progress towards sustainable forest management, including comments on other readers' submissions. We welcome general comments on the report, and suggestions for improving future editions.

We intend to publish all comments, including critical comments, except those that are disrespectful or inappropriate.

[Click to Add Your Comments and Suggestions](#)

19



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Concluding Remarks

Media execs on threat posed by the Internet

- Give readers access to raw content as a means of providing greater transparency and accountability;
- Provide tools and become a platform for reader generated rather than firm generated content;
- Redesign all content to be a conversation, rather than a monologue;
- Treat advertising as content too;
- Use new distribution forms, including peer-to-peer networks;
- Adapt content forms and schedules to reader demands.

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**Telling the Story of Sustainable Forests:
Is It More Than Publishing Another C&I Report?**

Richard Guldin¹

Telling the Story of Sustainable Forests: Is it More than Publishing Another C&I Report?

Dr. Richard Guldin

Director, Quantitative Sciences &
Montreal Process Working Group Representative
Forest Service, Research & Development, Washington, DC USA

Forest C&I Analytical Framework and Report Workshop
20 May 2008



The Problem

- 🍁 Increased public interest in sustainability
- 🍁 Proliferation of messengers and messages about sustainability

🍁 ***What steps can we take to tell our stories and shape public discourse about the sustainability of our forests?***



20 May 2008

2

¹ Director of Quantitative Sciences, U.S. Department of Agriculture, Forest Service, Research and Development, Washington, DC.



Two Key Questions

- ❖ Is continued focus on C&I by technical experts misplaced ?
- ❖ Is an explicit model or framework needed to organize thinking and provide a foundation for developing and telling stories about sustainable forest management (SFM) ?

20 May 2008 3



Is Continued Focus on C&I Misplaced?

- ❖ Technical emphasis on refining indicators continues
- ❖ More emphasis needed in shaping sustainability dialog and motivating change

20 May 2008 4



Is Continued Focus on C&I Misplaced?

 Hagan and Whitman (2007) said:

“Indicator selection and use is primarily a social process, to be informed and supported by data and science. Indicators are not about the numbers as much as they are about an open social conversation about forest values. To be useful, the selection and use of forest indicators must be embedded in a larger, ongoing, adaptive social process for pursuing sustainability. Sustainability is not an endpoint, but rather an ongoing social process that integrates and adapts to new knowledge and changes in societal values.”



20 May 2008

5



Would an Explicit Model or Framework Help Us Tell Stories About SFM?

 Heart of sustainability is linking and balancing

- Economic development
- Social & cultural development
- Environment

 New model needed for 21st Century

- Multiple scales
- Multiple domains
- Multiple interpretations



20 May 2008

6



What Kind of Model?

- ✦ Any model is necessarily an abstraction of reality, yet retaining the essential elements of reality
- ✦ Not a mathematical model; not a process model
- ✦ A strategic “value proposition” model that makes explicit:
 - The values that sustainable forest management creates for clients, and how C&I help measure/track the values
 - Makes crystal-clear the different values being created by SFM for the different clients
 - A set of value propositions that together create a necessary and sufficient reason for continued C&I reporting



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7



Desirable Model Attributes

- ✦ Exposes underlying assumptions and values
- ✦ Positions dialog at intersection of environmental, social and economic domains
- ✦ Helps create linkages to other sectors
- ✦ Promotes consistent interpretation of information across scales
- ✦ Distills information for interested publics
- ✦ Guides future evolution of indicators



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8



Four Challenges for Foresters Advocating SFM

- ❖ We need more accurate models, metaphors, and measures to describe the human enterprise relative to the biosphere
- ❖ We need a marked improvement and creativity in the arts of citizenship and governance
- ❖ We need to inform the public through greatly improved education
- ❖ We need to recognize that the challenge of sustainability is to solve a series of problems that cannot be solved by rational, logical methods alone, but rather by “higher methods of wisdom, love, compassion, understanding, and empathy.”



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9



Concluding Remarks

- ❖ Time to shift some energy from refining C&I to fostering more dialog about SFM
- ❖ Improved models are need to help bridge from C&I data to the social discourse needed
- ❖ We need to build compelling stories about SFM that
 - Inform social discourse
 - Question existing mental models of “good” forest management
 - Elevate the outlooks of forest stakeholders
 - Boost our collective aspirations for leaving healthy productive, diverse forests for future generations.
- ❖ Creating these messages and using them to advance social discourse takes lots of energy



20 May 2008

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Sustainability Impact Assessments of Policy Changes— Recent Development of Analytical Modeling in Europe

Marcus Lindner¹, Risto Päivinen¹, Hans Verkerk¹, Taru Palosuo¹, and Tommi Suominen¹



Sustainability impact assessments of policy changes □ recent development of analytical modeling in Europe

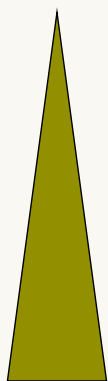
Marcus Lindner, Risto Päivinen, Hans Verkerk,
Taru Palosuo, Tommi Suominen
European Forest Institute, Joensuu



www.eforwood.com

Introduction – Sustainability Assessments

The sustainability concept evolved over the centuries



- Sustainable yield of forest resources (Hans Carl von Carlowitz; 1713)
- Sustainable world system (Dennis L. Meadows; 1972: The Limits of Growth)
- Sustainable development (Brundtland Report 1987)
- Environmental, social, and economic pillars of sustainability (cf. EU sustainable development strategy, Gothenburg 2001 and EU Council decision 2006)

2008: Sustainable resource use AND sectoral value chains

¹ European Forest Institute, Joensuu, Finland. E-mail: marcus.lindner@efi.int

What are the effects of policy decision on social, economic and environmental sustainability?

Two large European Integrated [research] Projects study this question with analytical tools

- SENSOR develops science-based forecasting Sustainability Impact Assessment Tools (SIAT). They allow the assessment of land use policy effects on sustainable development at regional scale for Europe.
 - Forestry is covered as one of six sectoral land uses
- EFORWOOD develops a Tool for the Sustainability Impact Assessment (ToSIA) of Forestry-Wood Chains.
 - The complete forest value chains are covered, including forest resource management, forest-industry interactions, consumption and end-of-life of wood based products

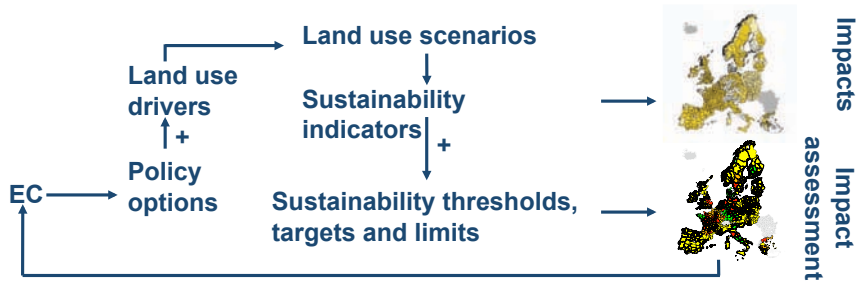
SENSOR: Sustainability Impact Assessment of multifunctional land use



Impact assessment



Agriculture Forestry Nature Conservation Transport Infrastructure Energy Tourism



Social Economic Environment

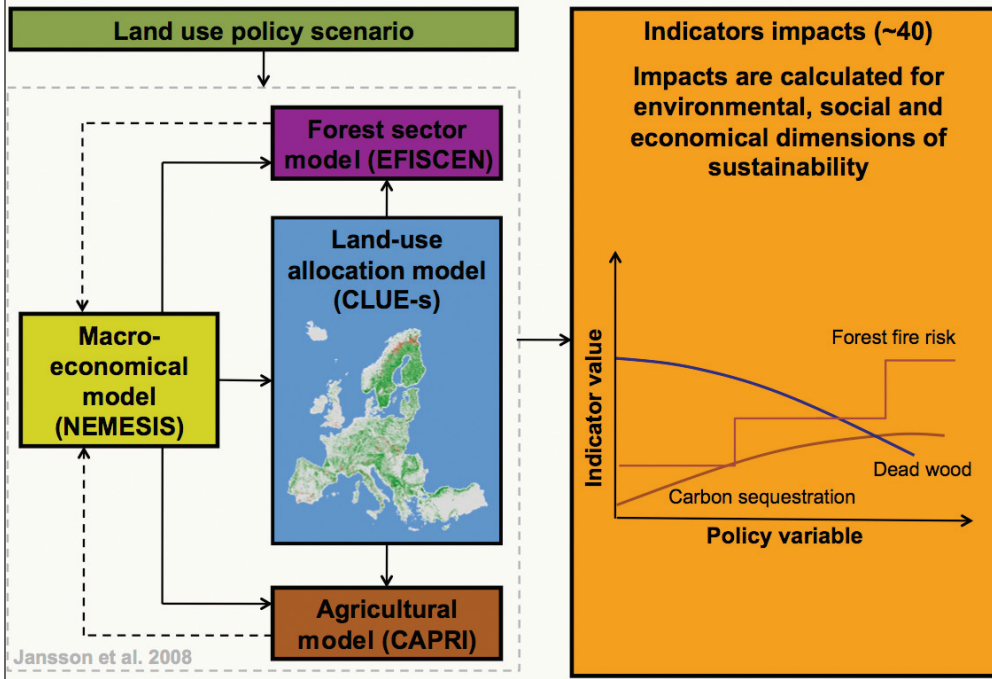
6/25/09

www.sensor-ip.eu

5

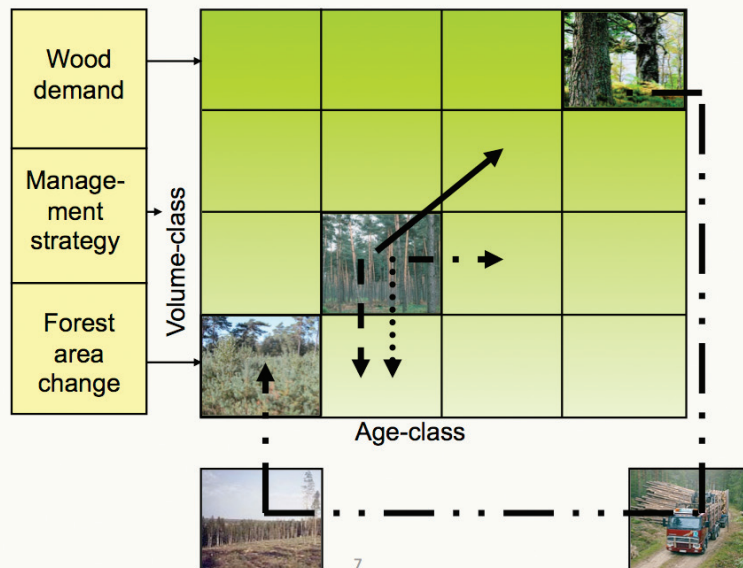


SENSOR Model Framework





EFISCEN modelling framework



7/9/09

7



Further work on forest indicators

- Include social and economical indicators in EFISCEN
- Indicator selection criteria
 - ☐ Relevant indicators (e.g. MCPFE)
 - ☐ Compatible with EFISCEN structure
- Selected indicators:



Deadwood

6/25/09



Carbon stock



Fellings and increment



Biomass revenue

8

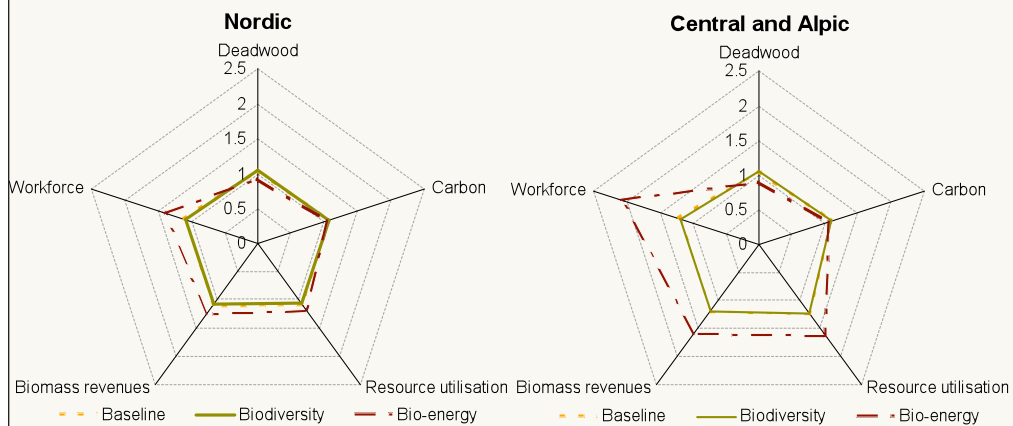


Workforce



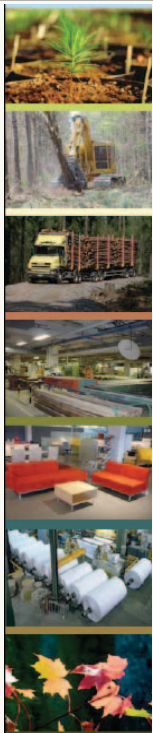
Example of indicator impacts

- Normalised indicator impacts in 2030
- Baseline (2005) = 1



6/25/09

9



The EU Integrated Project

EFORWOOD

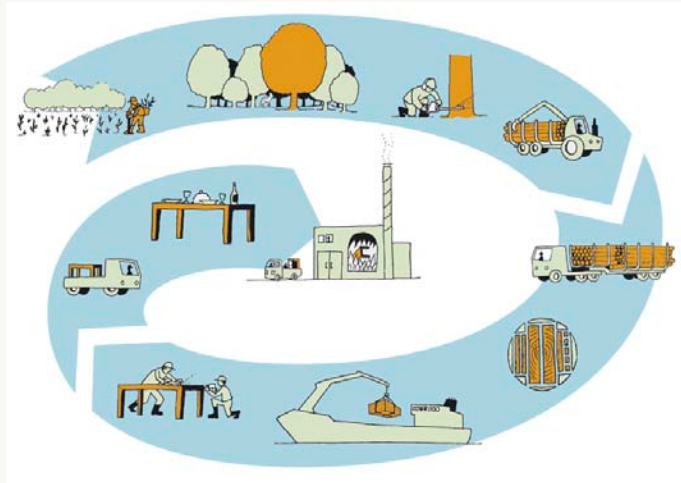
Tools for Sustainability Impact

Assessment of the Forestry-Wood Chain



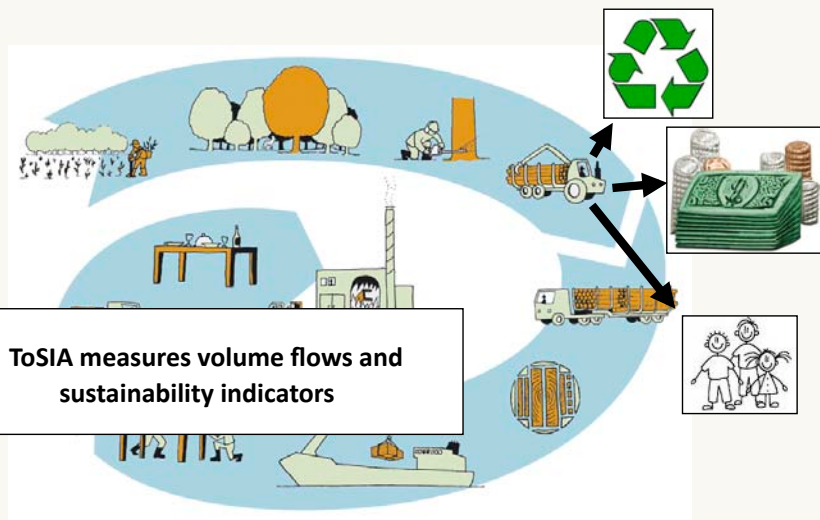
Main project objective is to develop a Tool for the Sustainability Impact Assessment (ToSIA) of Forestry-Wood Chains (FWC)

ToSIA approach to Sustainability Impact Assessment of Forest-Wood Chains



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www.6jolmo0q.com

ToSIA approach to Sustainability Impact Assessment of Forest-Wood Chains



www.eforwood.com
www.6jolmo0q.com



Indicator development (Ewald Rametsteiner et al.)

Based on:

- already existing European & international sustainability indicator Sets

EU-SIA Guidelines	32 topics	--	--
Eurostat □ SDI	15 level 1- indicators	47 level 2- indicators	99 level 3 □ indicators
MCPFE	---	---	35 indicators
CSD	15 themes	40 sub-themes	60 indicators
PAIS	5 themes	16 issues	57 indicators

www.efi.int

Sustainability Indicators



Economic

Gross value added

Production costs

17.1. Area of forest and other wooded land
17.2. Growing stock
17.3. Balance of net increment and annual fellings

Investment and
research &
development



Environmental

Energy generation and use

Greenhouse gas emissions
and carbon stocks

and freight

pollution

Generation of waste

Forest biodiversity

Forest resources



Social

14.1. Greenhouse gas
emissions

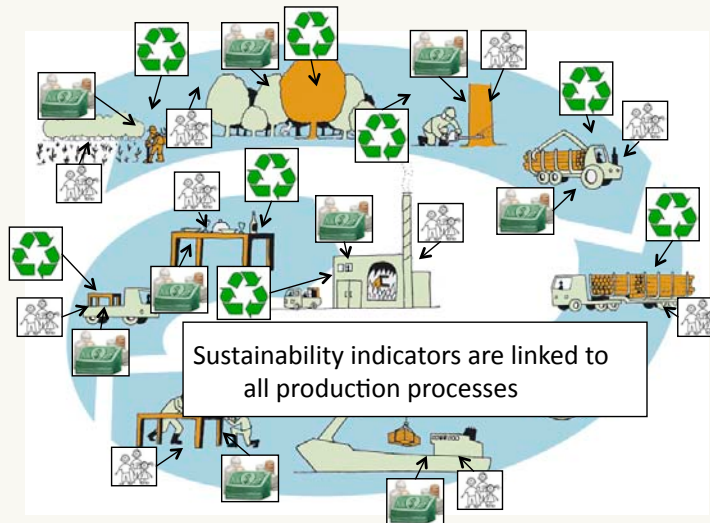
14.2. Carbon storage

14.3. Greenhouse gas
balance

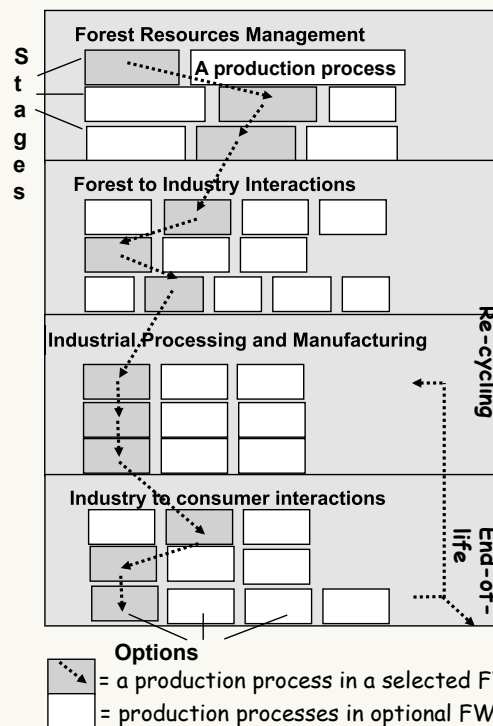
Education and
Training

www.e4orwood.com
www.6101MOOQ.com

ToSIA approach to Sustainability Impact Assessment of Forest-Wood Chains



www.eforwood.com
www.6101MOOQ.COM



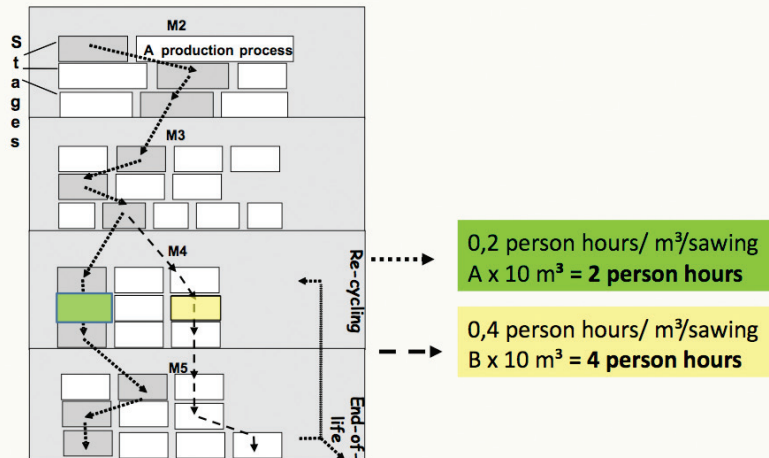
The analytical framework

FWC is a chain of processes

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Sustainability Indicator Calculation

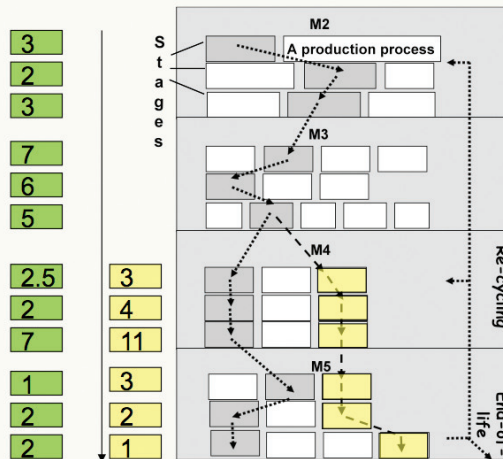
1. Take indicator value per unit of reference flow
2. Multiply with material flow through a process
3. = sustainability indicator value for the process



Aggregation of indicator results

Employment (ID 003895)

- Identify same indicator for different processes in calculated chains
- Sum up indicators of the same ID in a calculated chain



TOTAL 42.5 person hours

50 person hours

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Sustainability Impact Assessment

Impact of changing material flow A to material flow B
on social indicator [employment]

Employment hours B - employment hours A =

$$50 - 42.5 = + 7.5$$

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How to compare changes in different indicator values?

If the impact on employment is + 7,5 h but at the same
time waste generation increases +2%,

is the total impact positive or negative?

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Sustainability Impact Evaluation

Multi-Criteria Analysis (MCA)

compares apples and oranges



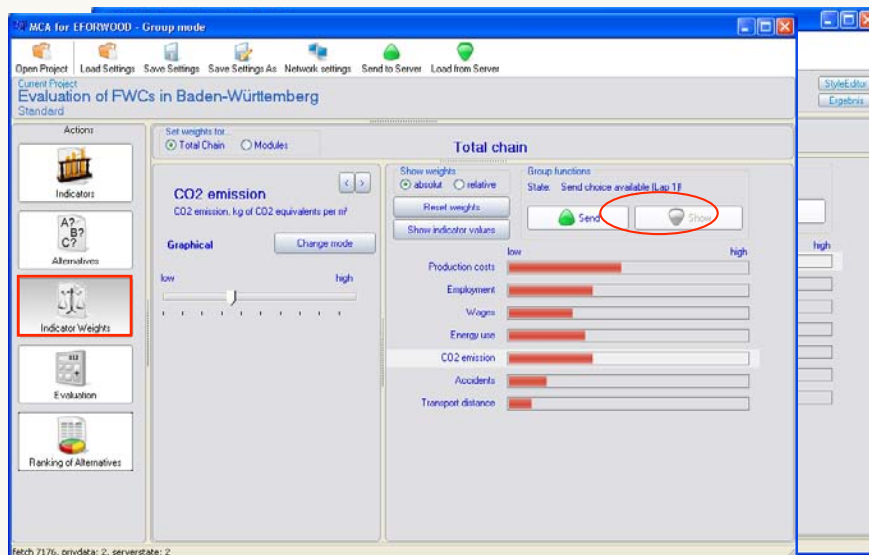
Cost-Benefit Analysis (CBA)

Converts apples and oranges into €



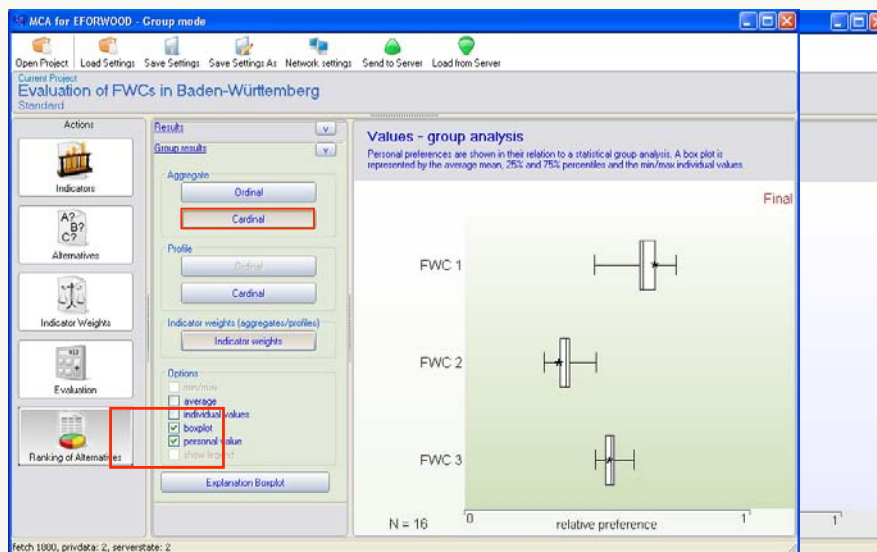
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Software for Weighting of indicators



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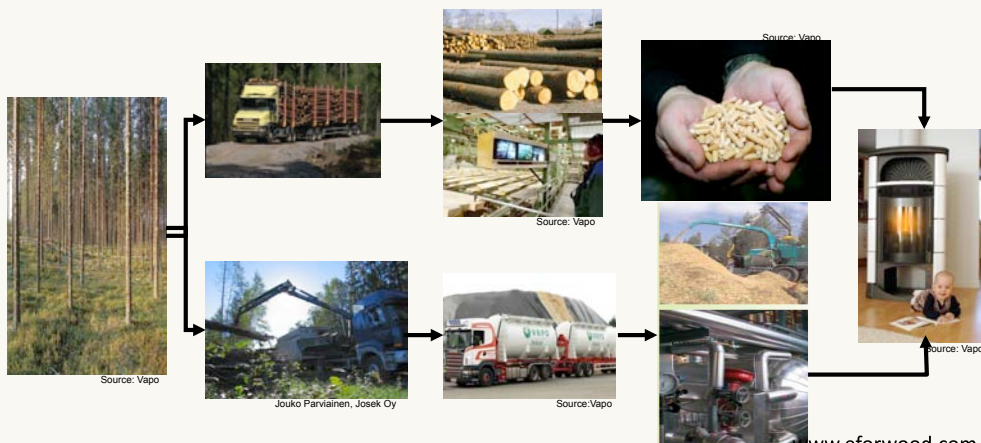
Software for Ranking of alternatives



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ToSIA application: comparing two different bio-energy supply chains for heating a private household

- 1) Production of pellets ☐ used in single family homes
- 2) Chipping of biomass ☐ used in single family home via district heating



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Results of the comparison

a) effects of additional extraction of forest biomass on sustainability

Indicator		P Chain	P&C Chain	increase in %	Unit
1. Production costs		318 737	595 078	87	euro
3. Total heat consumption		5 604 318	1 6491 609	194	MJ
4. Employment		0,99	2,18	120	person a
7. Greenhouse Gas Emissions		63	126	101	tons CO2 eqv.
8. Maintenance of soil quality		0	5 382	n.a.	kg
9. Transport	9.1 transport distance	272 416	363 846	34	tkm
	9.2 freight transported	1 679	2 822	68	tons
10. Energy	10.1 energy use	1 942 126	2 348 295	21	MJ
	10.2 heat generation	6 404 935	20 725 555	224	MJ

Based on:

- one reference year (2007)
- a certain land area (1803 ha)

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ToSIA results

a) Pellet and Chips chain
b) Pellet chain

Indicator	P & C Chain	P Chain
GHG bal.	↑	→
Employment	↗	→
Energy bal.	↑	↓
Costs	↑	→
Soil maint.	↓↑	↑

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ToSIA perspectives: How you look at things makes a lot of difference!



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Different ToSIA perspectives at sustainability impact assessment

I will become
a nice table...



□ forest-defined □

I used to
live in
Northern
Sweden...



...in my earlier
lives I had
other careers



□ product-defined □

We grew up
only 35 km
from here...



I will be read
in downtown
London!

□ industry-defined □

Conclusions on Tool for Sustainability Impact Assessment (ToSIA)

- Quantitative approach to sustainability assessment
- Trade-offs between different aspects of sustainability
- Flexible tool - User can select : system boundaries, indicators, weights ...
- Quality of assessment depends on quality of data



More Conclusions ...

- Transparent treatment of stakeholder preferences
- Designed for the demands of policy makers
- Many other potential applications





Logic-Based Evaluation of Forest Ecosystem Sustainability

Keith M. Reynolds¹, Sean N. Gordon¹, and K. Norman Johnson²



Logic-based Evaluation of Forest Ecosystem Sustainability

Keith M. Reynolds, USDA Forest Service
Sean N. Gordon, USDA Forest Service
K. Norman Johnson, Oregon State University



USDA Forest Service

PNW Research Station



Acknowledgments

- USDA Forest Service Washington Office
 - ✓ National Forest System, Ecosystem Management
- Pacific Northwest Research Station
 - ✓ Human and Natural Resource Interactions RD&A Program



USDA Forest Service

PNW Research Station



¹ U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

² Oregon State University, College of Forestry, Department of Forest Resources.



Objectives

1. Illustrate the value of a logic-based approach in designing a formal specification to evaluate the National criteria and indicators.
2. Highlight the roles of science and policy in this effort.
3. Demonstrate the current prototype.



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Background

- Knowledge bases and logic modeling
- Analysis
- Model design issues



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Logic models

- A form of meta database
- A formal logical representation of how to evaluate information
- Networks of interrelated topics
- Mental map
- Executable specification



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Forms of uncertainty

- Probabilistic uncertainty
 - ✓ Uncertainty of events
- Linguistic uncertainty
 - ✓ Uncertainty about the definition of events
 - Vagueness or imprecision
 - ✓ A proposition is the smallest unit of thought to which one can assign a measure of strength of evidence

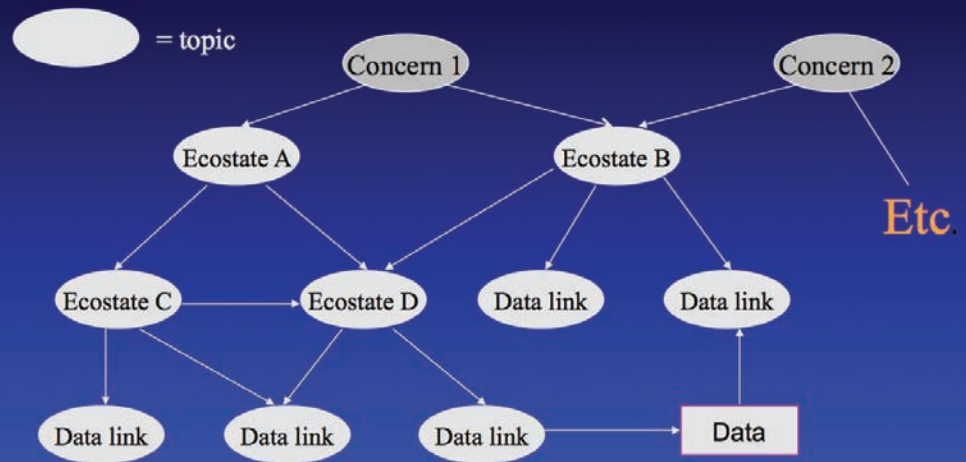


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Logic networks



Logic topics

- Each topic evaluates a proposition
- Attributes of a topic
 - ✓ Name (e.g., biodiversity)
 - ✓ Proposition (e.g., biodiversity is being maintained)
 - ✓ Strength of evidence for the proposition
 - ✓ A formal logic specification (e.g., a proof)
 - ✓ Documentation
 - Explanation, source, citations, assumptions

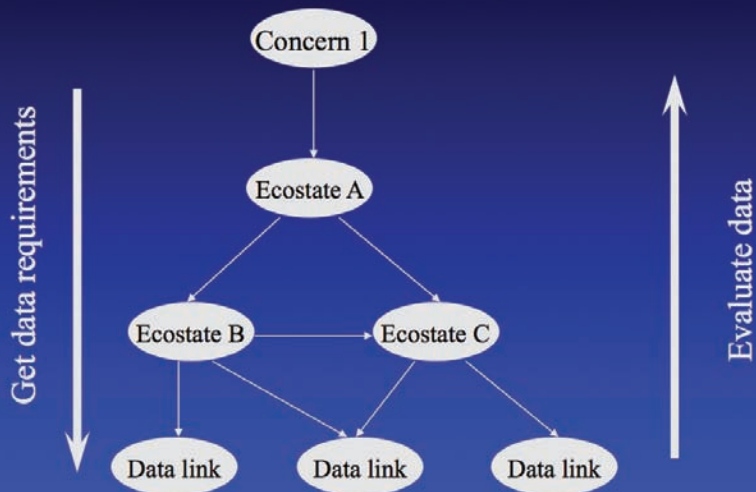


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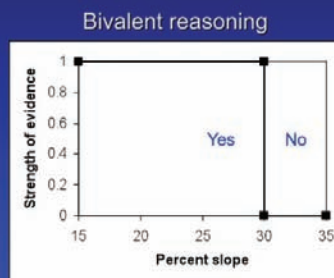
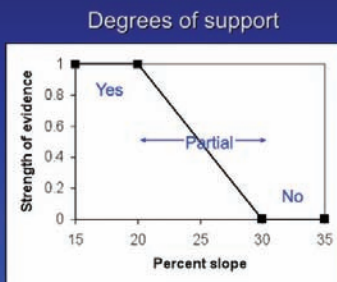


Logic processing



Strength of evidence

An example: slope is suitable for tractor logging.



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Evaluation of national C&I

- The Montreal specifications provide relatively clear definitions of biophysical, socioeconomic, and framework attributes requiring evaluation (WGCICSMTBF 1995) ...
- But, design of evaluation procedures that allow interpretation of the National C&I is one of the major technical issues that remain to be resolved (Raison et al. 2001).



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Conceptual framework (Davis et al., 2001)

1. Specified conditions or outcomes to be sustained (the indicators).
2. A measure for each condition or outcome.
3. Calculation of the level of the indicator over some time period using the selected measure.
4. A frame of reference for gauging sustainability.
5. Methods for evaluating sustainability (sustainability check).
6. A monitoring program.
7. A formalism that supports requirements 1 to 6.



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Logic models as design frameworks

- Logic models (knowledge bases) provide a formal specification for organizing and interpreting information.
- Problem represented in terms of propositions about topics of interest and their interdependencies.
- Topics translated into propositions.
- Lexical uncertainty.



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Logic models as design frameworks (continued)

- Need for transparency (Prabhu et al. 2001)
 - ✓ Models embody important policy decisions.
 - ✓ Models depend on value judgments and critical assumptions that need clear documentation.
- Explanation
 - ✓ Graphic representation is an effective basis for organizing discussion and for evolution of design.
 - ✓ Communication between scientists and policy makers.
 - ✓ Communication with interested publics.



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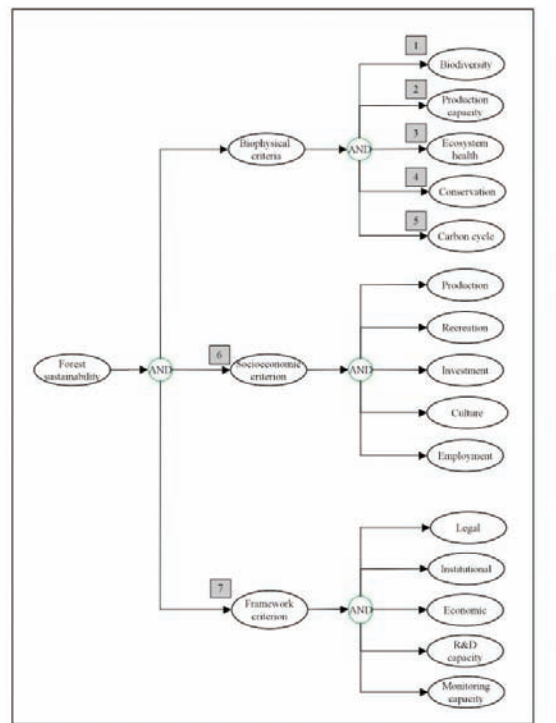
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Design issues: model organization

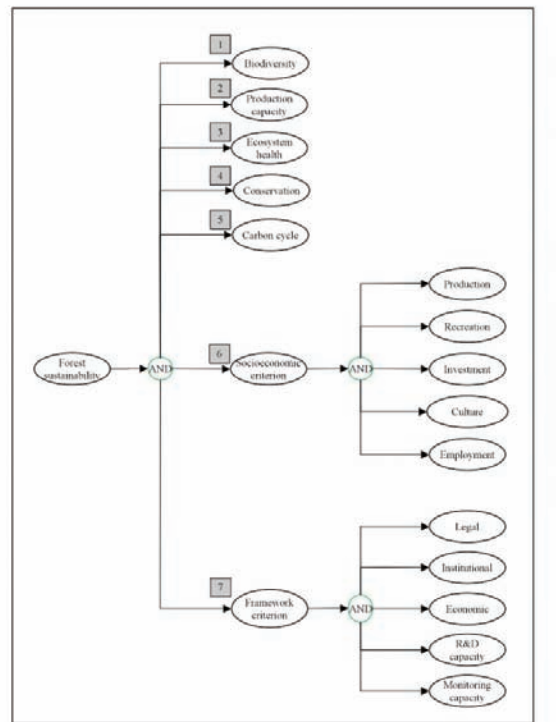
Basic organization
of topics.

For example,
evaluation of
criteria in the
current prototype.

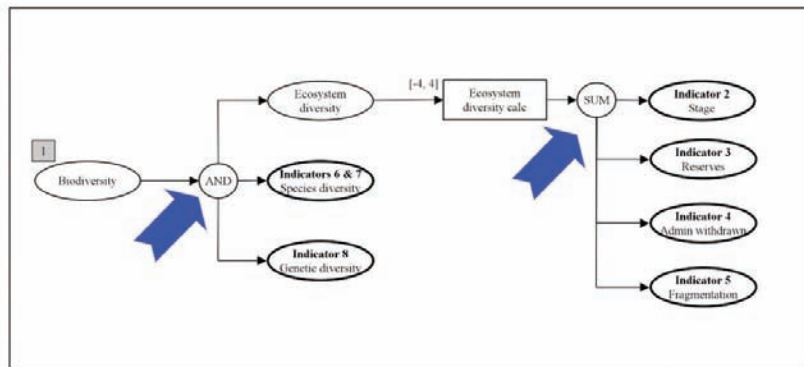


Design issues: model organization

An alternative
organization with
very different
emphasis on
criteria.

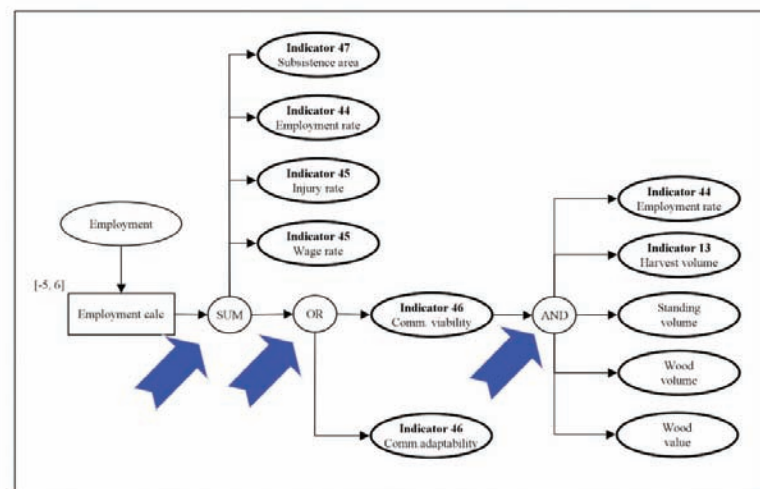


Design issues: synthesis



- AND operator: arguments evaluated as limiting factors.
- SUM operator: arguments contribute incrementally to evaluation and can compensate.

Design issues: synthesis



Another example, including the OR operator.



Design issues: weighting

- Intrinsic weights
 - ✓ Each topic in a NetWeaver logic model has an intrinsic weight attribute.
 - ✓ E.g., set weight attribute on any network to adjust its contribution of evidence to a proposition.
 - ✓ Bad idea: part of specification, but not obvious.
- Explicit weights
 - ✓ Better, but add another layer of subjectivity.
 - ✓ Some valid purposes, however.



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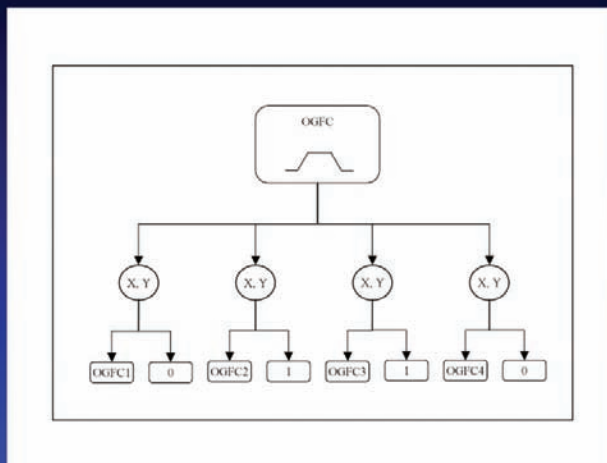


Design issues: reference conditions

- Each elementary network evaluates a measurement endpoint against reference conditions.
- Lack of reference conditions is a basic problem for many measurement endpoints.

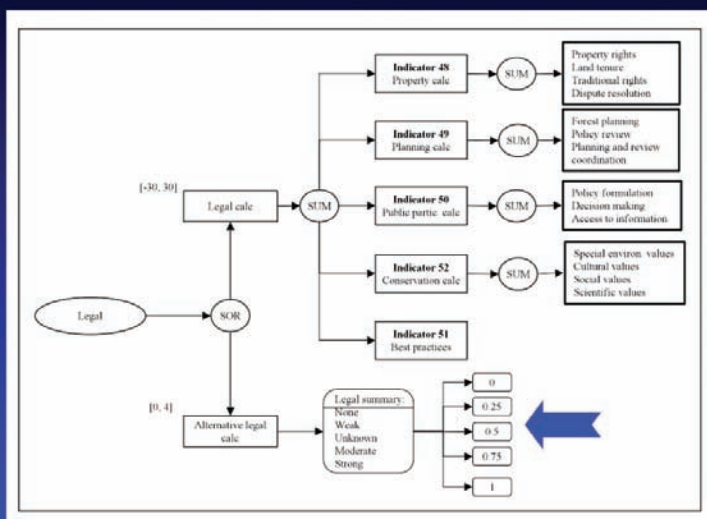


Design issues: reference conditions



Implementation of a elementary network to evaluate measurement endpoint against reference conditions.

Design issues: qualitative measures



Outcomes evaluated on an ordinal scale.



Design issues: reliability of data

- Reliability of data for evaluation of National C&I.
 - ✓ Stochastic, rather than lexical, uncertainty
- Formal representation of stochastic uncertainty is problematic in the context of a logic model.
 - ✓ Not addressed in the current Montreal C&I prototype.
- Possible solution
 - ✓ Adjusting network weights with a normalized metric such as standard error of the mean.
 - ✓ Problems: availability, unknown error correlations



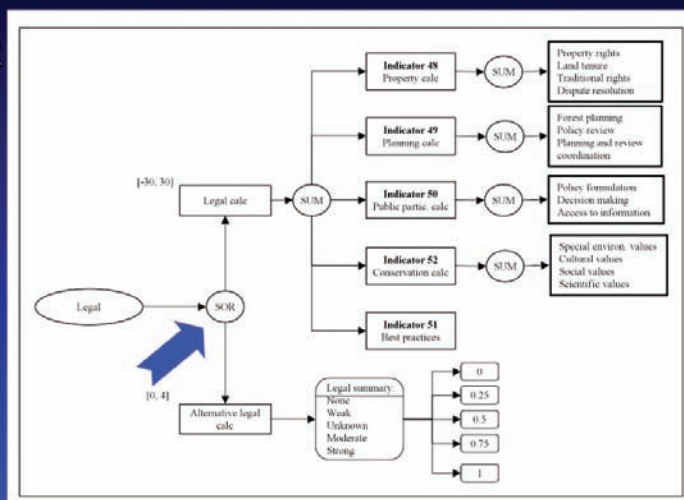
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Design issues: precision of knowledge

Sequential OR (SOR) to specify multiple alternative pathways in order of preference.





Peer review

- John Gordon, Yale
- Jerry Franklin, UW
- Norm Johnson, OSU
- Hal Salwasser, OSU
- Richard Haynes, PNW
- Darrel Kenops, R6
- Gloria Brown, R6
- Dick Phillips, R6
- Sara Crim, R6
- Jon Martin, R6
- Denise Lach, OSU
- Gordie Reeves, PNW



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Criterion 5. Maintenance of forest contribution to global carbon cycles

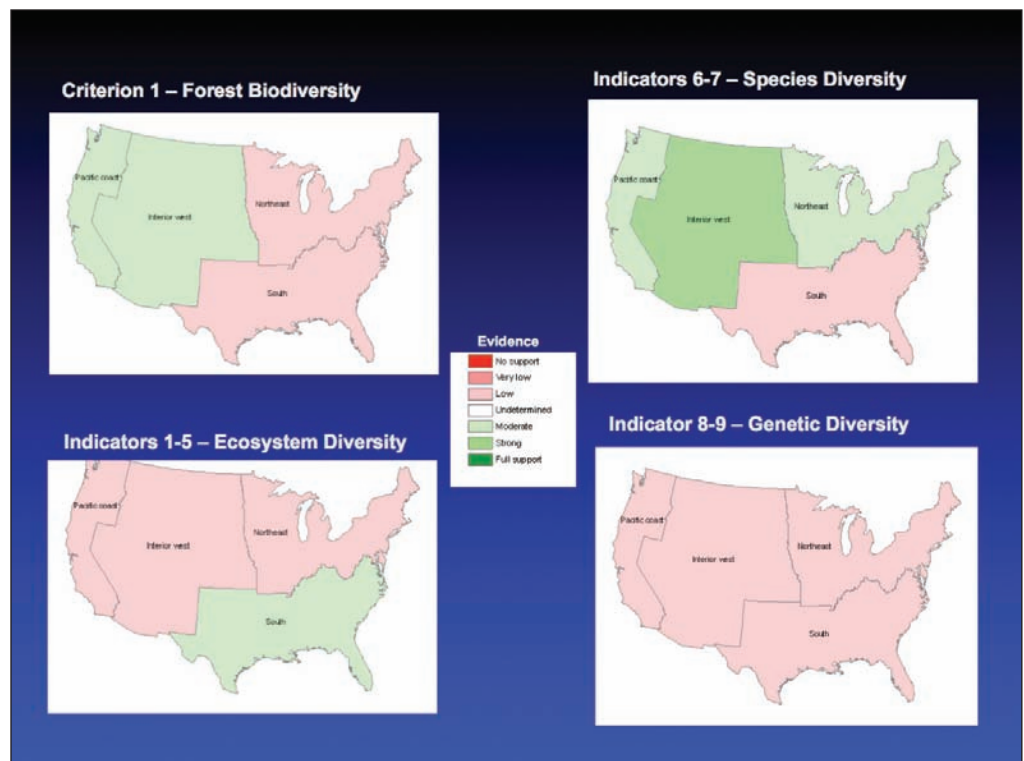
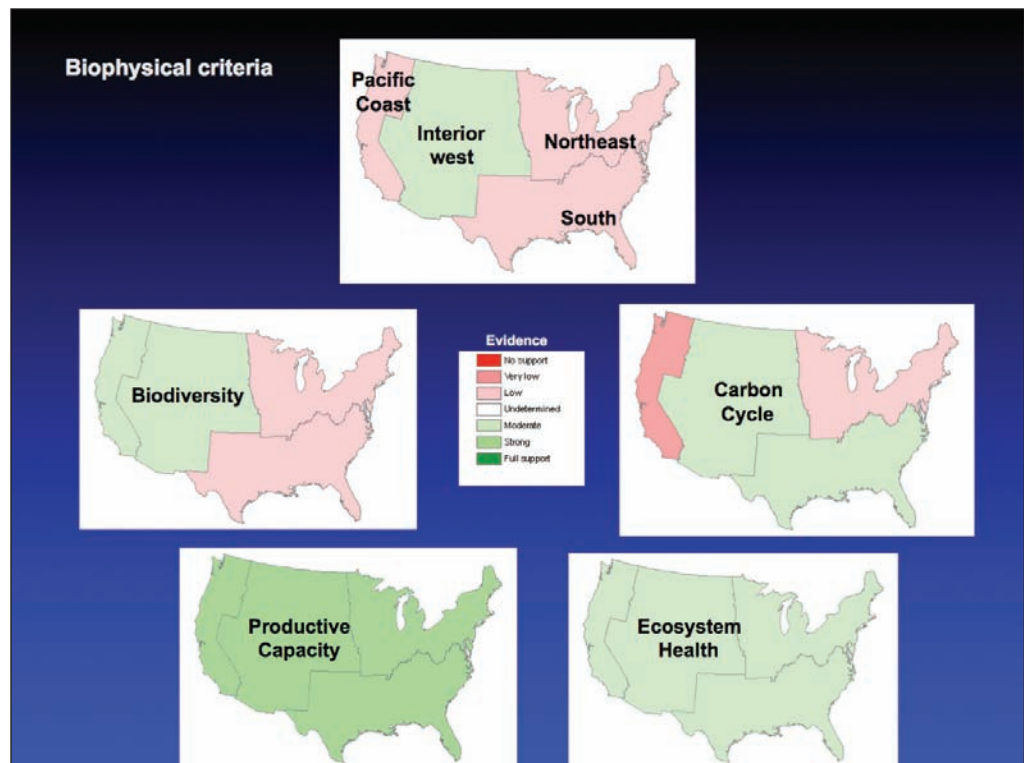
- Criterion 5 includes three indicators:
 - ✓ Total forest ecosystem biomass and carbon pool.
 - ✓ Contribution of forest ecosystems to the total global carbon budget, including absorption and release of carbon (standing biomass, coarse woody debris, peat and soil carbon).
 - ✓ Contribution of forest products to the global carbon budget.



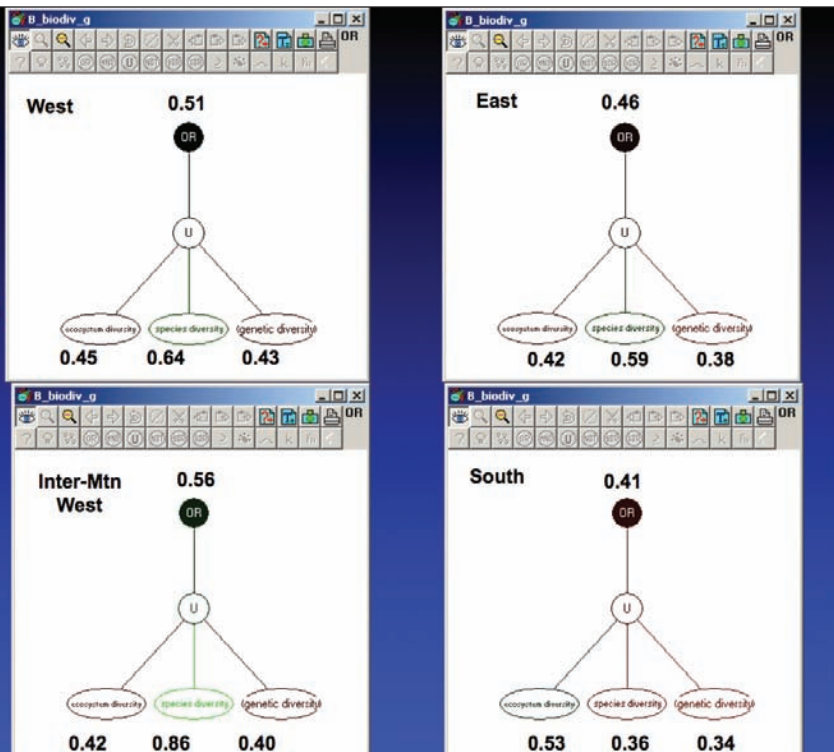
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Criterion 1 – Forest Biodiversity



Criterion 5 – Forest Carbon



Indicator 26 – Total Biomass



Indicator 27 – Biomass Accumulation Rate



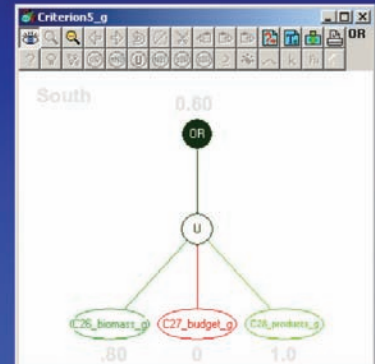
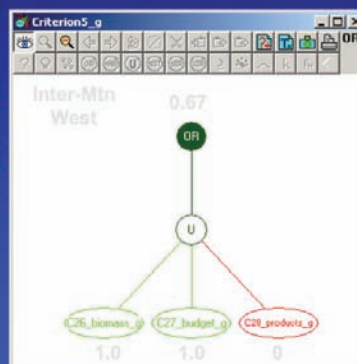
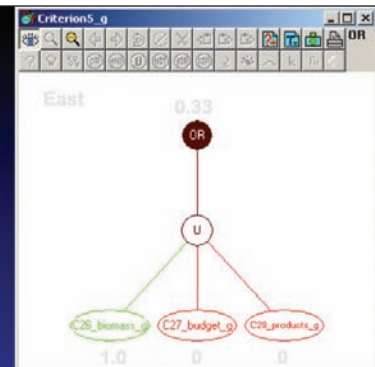
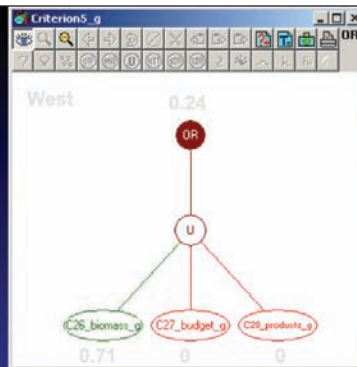
Indicator 28 – Product Storage



Socio-economic Indicators



Criterion 5 – Forest Carbon





Some observations

1. Lexical uncertainty is an important issue in evaluation of many measurement endpoints.
2. Many aspects of evaluating sustainability cannot be answered by science alone.
3. Acquiring data on sustainability is necessary, but not sufficient, for setting policy or management evaluation.
4. Evaluating sustainability is not the same as defining desired future conditions.
5. Evaluating the state of sustainability and deciding how to respond are separate but interdependent decision processes.
6. The clearest, and most critical, role of science is in development of reference conditions.



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 - ✓ Pacific Northwest Research Station
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“Traffic Lights”—A Screening Tool To Present Complex Findings

Örjan Jonsson¹

□Traffic lights□ □A screening tool to present complex findings

□rjan Jonsson
FAO, Forestry Department



¹ Food and Agriculture Organization of the United Nations, Forestry Department.

Global Forest Resources Assessment 2005

Progress towards sustainable forest management

147



Global Forest Resources Assessment 2005

Progress towards sustainable forest management

147

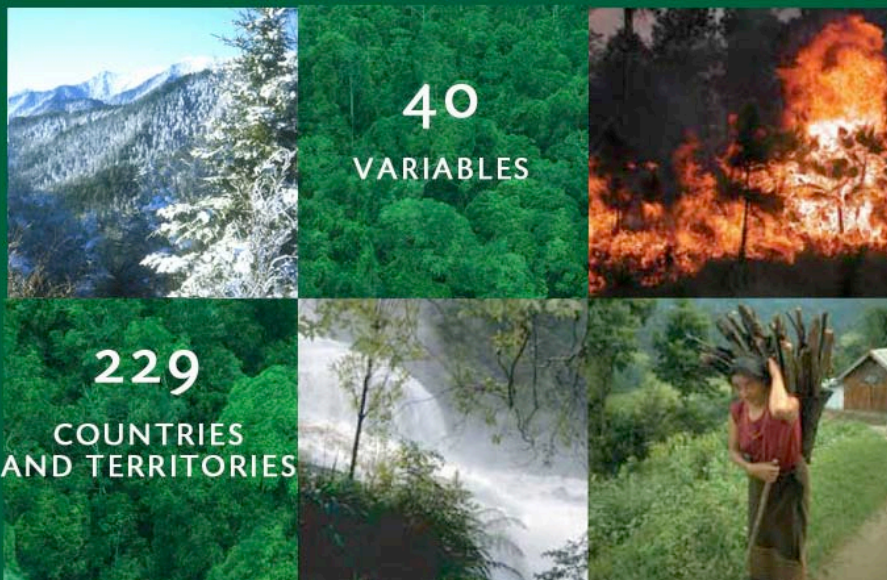


Global Forest Resources Assessment 2005

Progress towards sustainable forest management

FAO
FORESTRY
PAPER

147

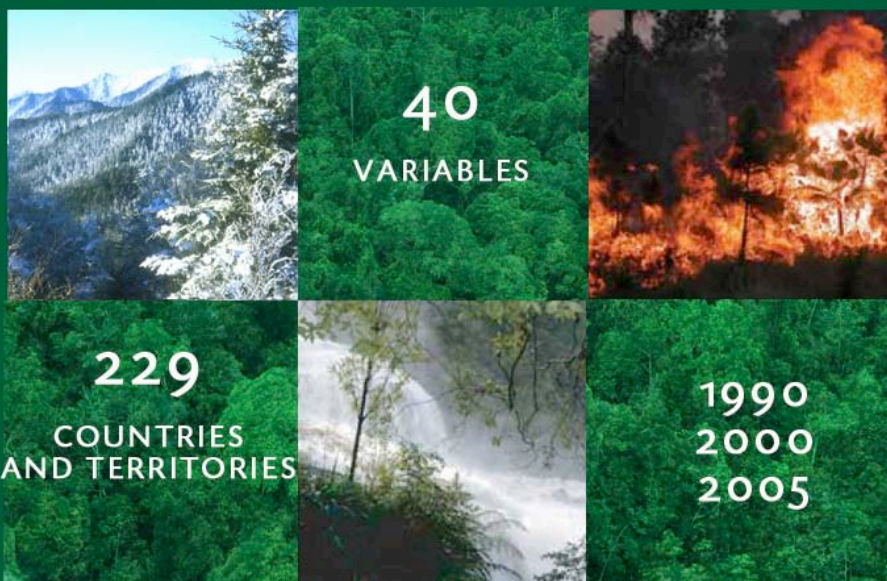


Global Forest Resources Assessment 2005

Progress towards sustainable forest management

FAO
FORESTRY
PAPER

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Need for a simplified overview

- The concept ☐ Sustainable Forest Management ☐
- Simplified ☐ screening tool ☐
- Assessment of progress towards goal/ trends across time
- Global/Regional/Subregional comparisons and analysis

Variable selection

- Relevance to the topic
- Data availability
- No weighting applied

Data analysis

- Information availability an issue
- Rules for handling data gaps
 1. High = 75-100% of forest area
 2. Medium = 50-74% of forest area
 3. Low = 25-49% of forest area
 4. Insufficient data = less than 25%

Data analysis (cont.)

- Compound change rate % *per annum* (accuracy unknown)
- Arbitrary threshold $\pm 0.50\%$ /year



Trends towards sustainable forest management at the global level

Thematic element	Trends in FRA 2005 variables or derivatives	Data availability	1990-2005 Annual change rate (%)	1990-2005 Annual change	Unit
Extent of forest resources	Area of forest	H	-0.21	-8 351	1 000 ha
	Area of other wooded land	M	-0.35	-3 299	1 000 ha
	Growing stock of forests	H	-0.15	-570	million m³
	Carbon stock per hectare in forest biomass	H	-0.02	-0.15	tonnes/ha
Biological diversity	Area of primary forest	H	-0.52	-5 848	1 000 ha
	Area of forest designated primarily for conservation of biological diversity	H	1.87	6 391	1 000 ha
	Total forest area excluding area of productive forest plantations	H	-0.26	-9 397	1 000 ha
Forest health and vitality	Area of forest affected by fire	M	-0.49	-125	1 000 ha
	Area of forest affected by insects, diseases and other disturbances	M	1.84	1 101	1 000 ha
Productive functions of forest resources	Area of forest designated primarily for production	H	-0.35	-4 552	1 000 ha
	Area of productive forest plantations	H	2.38	2 165	1 000 ha
	Commercial growing stock	H	-0.19	-321	million m³
	Total wood removals	H	-0.11	-3 199	1 000 m³
	Total NWFP removals	M	2.47	143 460	tonnes
Protective functions of forest resources	Area of forest designated primarily for protection	H	1.06	3 375	1 000 ha
	Area of protective forest plantations	H	1.41	380	1 000 ha
Socio-economic functions	Value of total wood removals	L	0.67	377	million US\$
	Value of total NWFP removals	M	0.80	33	million US\$
	Total employment	M	-0.97	-102	1 000 pers. yrs
	Area of forest under private ownership	M	0.76	2 737	1 000 ha
	Area of forest designated primarily for social services	H	8.63	6 646	1 000 ha

H = High (reporting countries represent 75-100% of total forest area)
M = Medium (reporting countries represent 50-75% of total forest area)
L = Low (reporting countries represent 25-50% of total forest area)

● = Positive change (greater than 0.50%)
● = No major change (between -0.50 and 0.50%)
● = Negative change (less than -0.50%)
- = Insufficient data to determine trend

© FAO 2006

Themes and variables	Africa			Asia			Europe			North and Central America			Oceania	South America
	Eastern and Southern	Northern	Western and Central	East	South and Southeast	Western and Central	Caribbean	Central	North	Caribbean	Central	North		
Extent of forest resources														
Area of forest	● H	● H	● H	● H	● H	● H	● H	● H	● H	● H	● H	● H	● H	● H
Area of other wooded land	● M	● L	● H	● H	● M	● H	● H	● H	● H	● M	● H	● H	● L	● L
Growing stock of forests	● H	● H	● H	● H	● H	● H	● H	● H	● H	● H	● H	● H	● H	● M
Carbon stock per hectare in forest biomass	● H	● H	● H	● H	● H	● H	● H	● L	● H	● H	● H	● H	● H	● M
Biological diversity														
Area of primary forest	● H	● H	● L	● H	● H	● H	● H	● M	● H	● H	● H	● H	● H	● H
Area of forest designated primarily for conservation of biological diversity	● H	● H	● L	● H	● H	● H	● H	● M	● H	● H	● H	● H	● H	● H
Total forest area excluding area of productive forest plantations	● H	● H	● L	● H	● H	● H	● H	● M	● H	● H	● H	● H	● H	● H
Forest health and vitality														
Area of forest affected by fire	-	-	-	● H	● H	● H	● H	● M	-	● H	-	-	-	● H
Area of forest affected by insects, diseases and other disturbances	-	-	-	● H	● L	● M	● H	-	-	● H	-	-	-	● M
Productive functions of forest resources														
Area of forest designated primarily for production	● H	● H	● L	● H	● H	● H	● H	● M	● H	● H	-	-	-	● H
Area of productive forest plantations	● H	● H	● L	● H	● H	● H	● H	● M	● H	● H	● H	● H	● H	● H
Commercial growing stock	● H	● L	● L	● H	● M	● H	● H	● M	● H	● H	-	-	-	● M
Total wood removals	● H	● H	● H	● H	● H	● H	● H	● H	● H	● H	● H	● H	● H	● H
Total NWFP removals	-	-	-	● H	● L	● M	● H	● L	-	-	-	-	-	● M
Protective functions of forest resources														
Area of forest designated primarily for protection	● H	● H	● L	● H	● H	● H	● H	● M	● H	● H	-	-	-	● H
Area of protective forest plantations	● H	● H	● L	● H	● H	● H	● H	● M	● H	● H	● H	● H	● H	● H
Socio-economic functions														
Value of total wood removals	-	● L	-	● H	● H	● H	-	● L	● H	● M	-	-	-	● H
Value of total NWFP removals	-	● M	-	● L	● M	● H	● H	● L	● H	● M	-	-	-	● M
Total employment	● L	● M	● L	● H	● M	● H	● H	● H	● M	● H	● H	● H	● H	-
Area of forest under private ownership	● H	● H	● H	● H	● H	● H	● H	● M	● M	● H	-	-	-	-
Area of forest designated primarily for social services	● H	● H	● L	● H	● H	● H	● H	● M	● H	● H	-	-	-	● H

TRENDS AT THE GLOBAL LEVEL



TRENDS AT THE SUB REGIONAL LEVEL



Thematic element	Trends in FRA 2005 variables or derivatives	Data availability	Asia		
			East	South and Southeast	Western and Central
Extent of forest resources	Area of forest	H	H	H	H
	Area of other wooded land	M	H	M	H
	Growing stock of forests	H	H	H	H
	Carbon stock per hectare in forest biomass	H	H	H	H
Biological diversity	Area of primary forest	H	H	H	H
	Area of forest designated primarily for conservation of biological diversity	H	H	H	H
	Total forest area excluding area of productive forest plantations	H	H	H	H
Forest health and vitality	Area of forest affected by fire	H	H	H	H
	Area of forest affected by insects, diseases and other disturbances	M	H	L	M
Productive functions of forest resources	Area of forest designated primarily for production	H	H	H	H
	Area of productive forest plantations	H	H	H	H
	Commercial growing stock	M	H	M	H
	Total wood removals	H	H	H	H
	Total NWFP removals	M	H	L	M
Protective functions of forest resources	Area of forest designated primarily for protection	H	H	H	H
	Area of protective forest plantations	H	H	H	H
Socio-economic functions	Value of total wood removals	H	H	H	H
	Value of total NWFP removals	L	H	L	M
	Total employment	H	H	M	H
	Area of forest under private ownership	H	H	H	H
	Area of forest designated primarily for social services	H	H	H	H

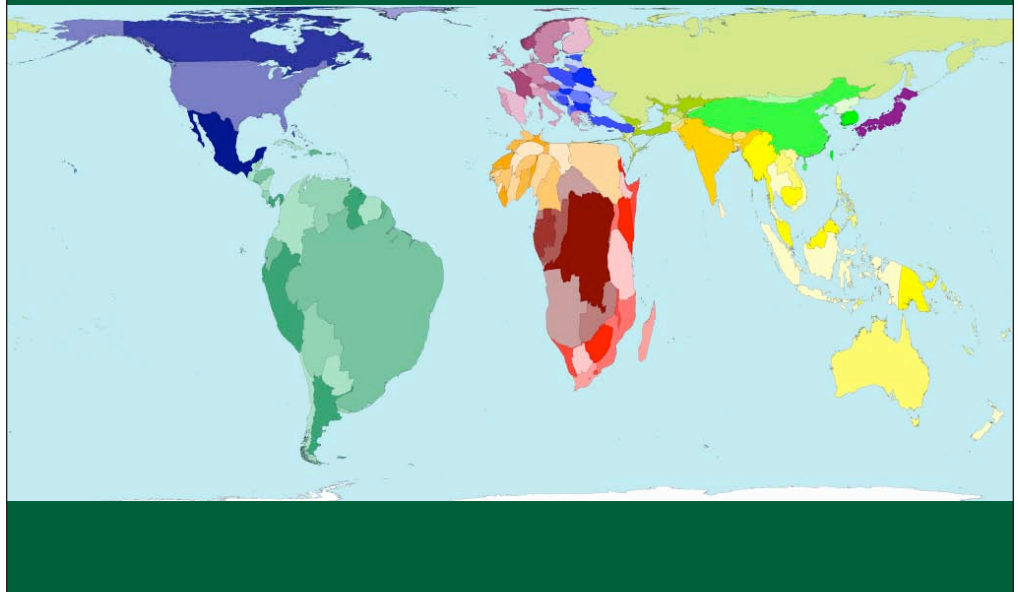
Approach and limitations

- Subjective variable selection that may not be relevant for all countries or at different scales
- FRA variables do not address all aspects of sustainable forest management
- Covariation
- Low quality, out of date or missing data
- Value judgement on 'positive' or 'negative' trends
 - Forest area, wood removals, employment, area conserved for biodiversity
- Trends by region obscures positive or negative trends in individual countries

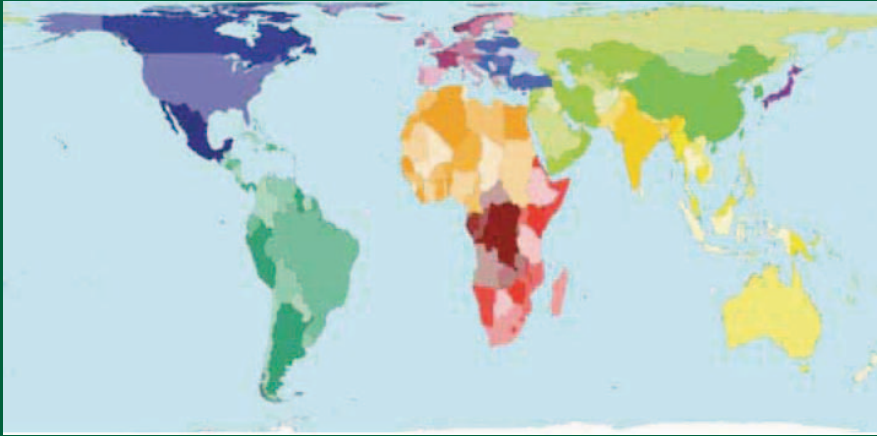
Concluding remarks

- Proven effective monitoring tool
- Adopted tool in other reports (MCPFE 2007)
- Advanced version in FRA 2010?

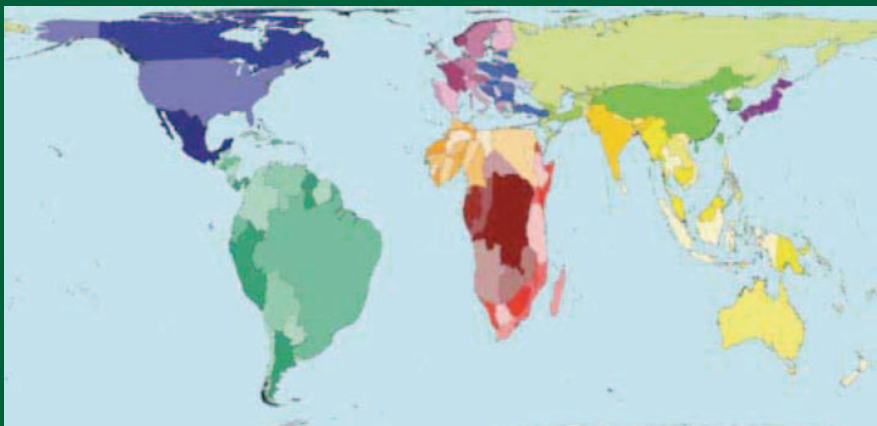
Territory size shows the proportion of worldwide forest found there in 2000



Land area of countries across the world



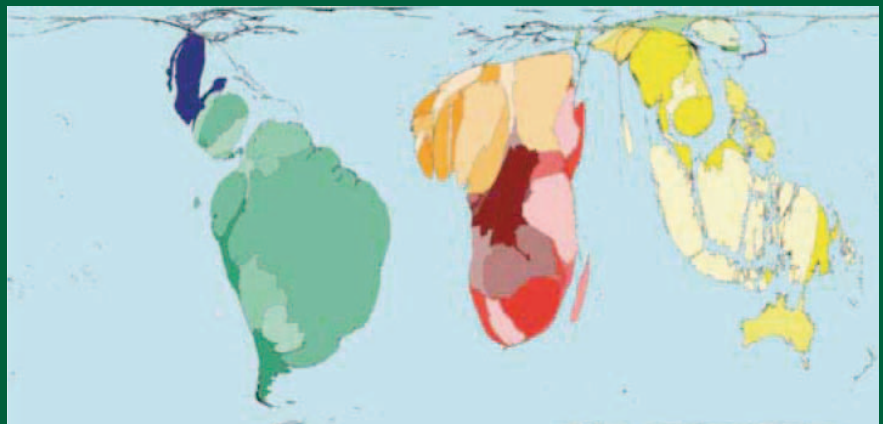
Amount of forest area in each country (Territory size shows the proportion of worldwide forest)



Amount of forest growth



Amount of forest loss



C&I Reporting and C&I Analytic Networks

Aljoscha Requardt¹



C&I Reporting & C&I Analytic Networks

Dr. Aljoscha Requardt

University of Hamburg (UHH)/ Johann Heinrich von Thünen-Institute (vTI)
Institute for World Forestry

www.worldforestry.de

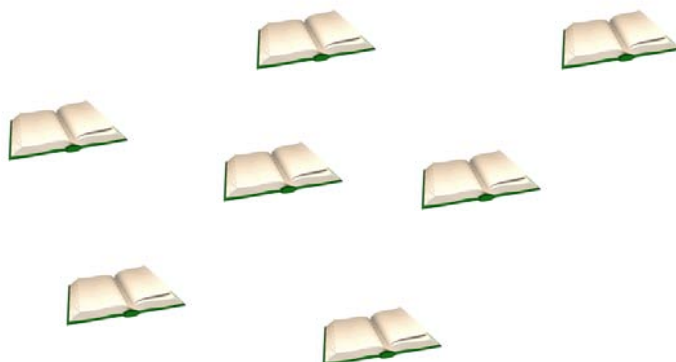
C&I Workshop, Joensuu/Finland, 19-21 May 2008



C&I Reporting

Where to find which forest data?

What are the information priorities, the **key indicators**, we focus on in our pan-European monitoring, assessment and reporting activities?



¹ Institute for World Forestry,
University of Hamburg, Germany.
E-Mail: a.requardt@holz.uni-hamburg.de.





6 Criteria und 35 quantitative Indicators

C1	Forest Resources & Carbon
1.1	Forest area
1.2	Growing stock
1.3	Age structure and/or diameter distribution
1.4	Carbon stock

C2	Health & Vitality
2.1	Deposition of air pollutants
2.2	Soil condition
2.3	Defoliation
2.4	Forest damage

C3	Productive Functions
3.1	Increment and fellings
3.2	Roundwood
3.3	Non-wood goods
3.4	Services
3.5	Forests under management plans

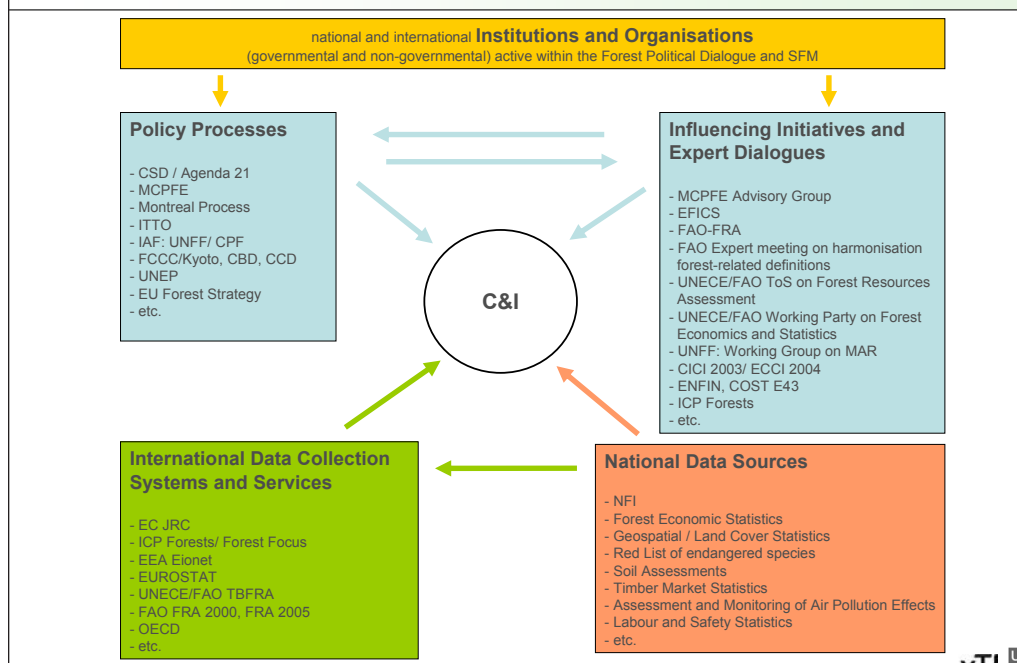
C4	Biodiversity
4.1	Tree species composition
4.2	Regeneration
4.3	Naturalness
4.4	Introduced tree species
4.5	Deadwood
4.6	Genetic resources
4.7	Landscape pattern
4.8	Threatened forest species
4.9	Protected forests

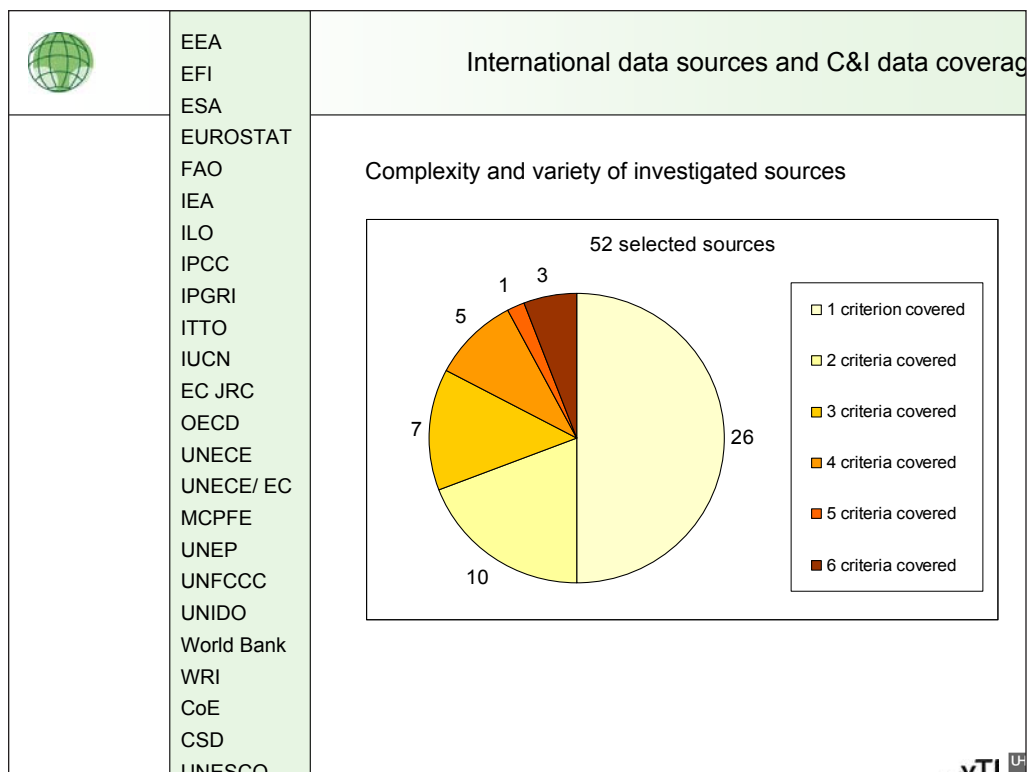
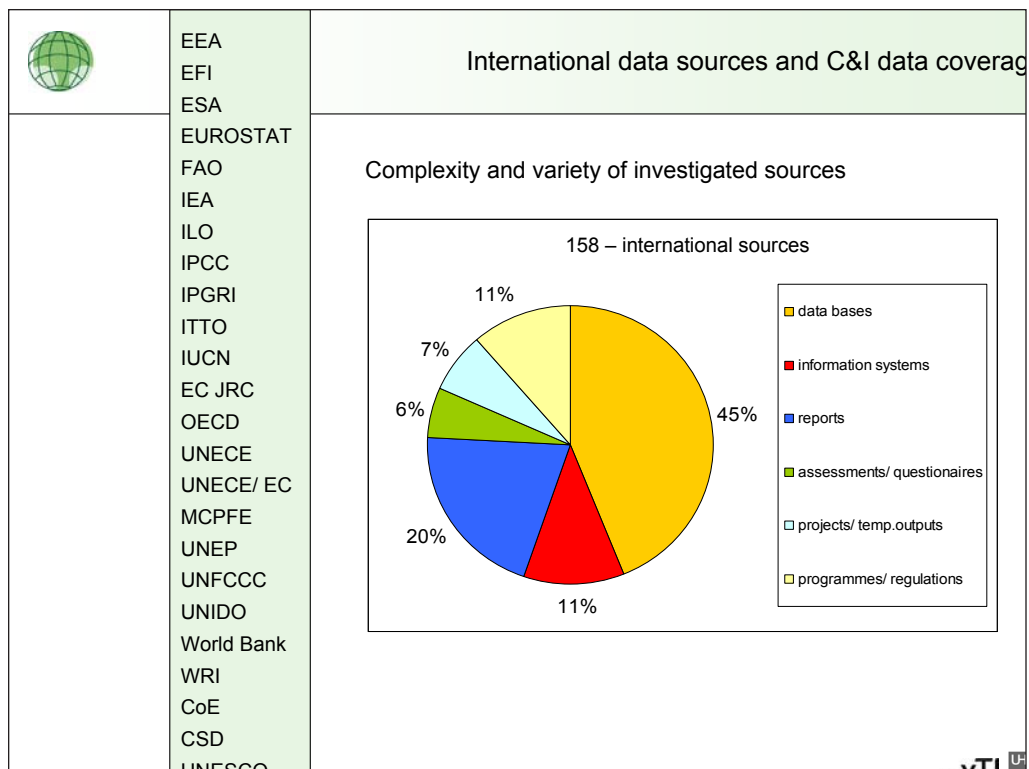
C5	Protective Functions
5.1	Protective forests – soil, water and other ecosystem functions
5.2	Protective forests – infrastructure and managed natural resources

C6	Socio-Economic Functions
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

C&I Workshop, Joensuu/Finland, 10-14 May 2008

A. Reuqardt

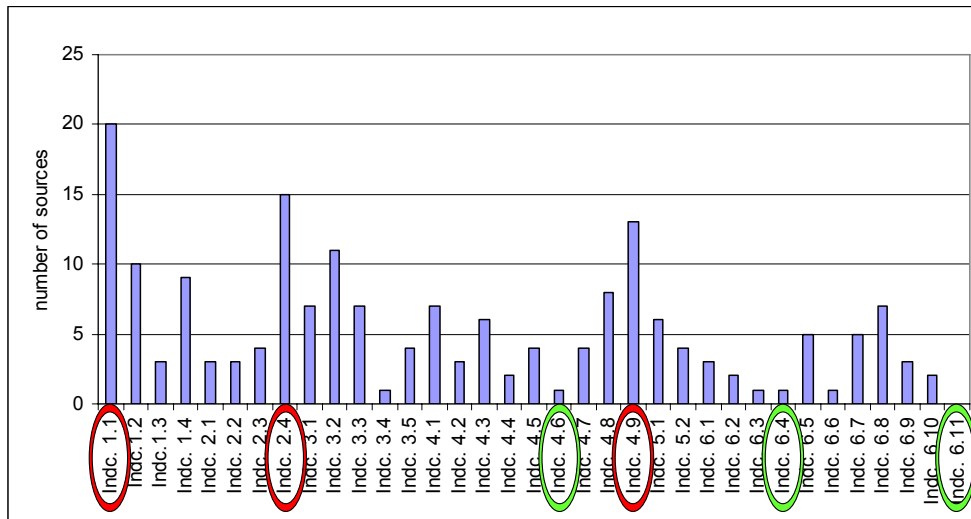






International data sources and C&I data coverage

Indicator coverage - 52 selected international sources

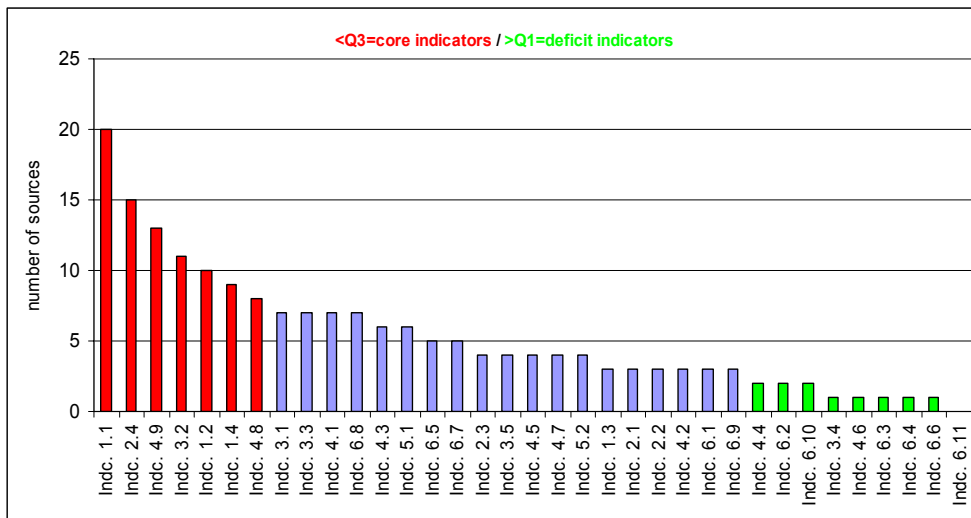


VTU



International data sources and C&I data coverage

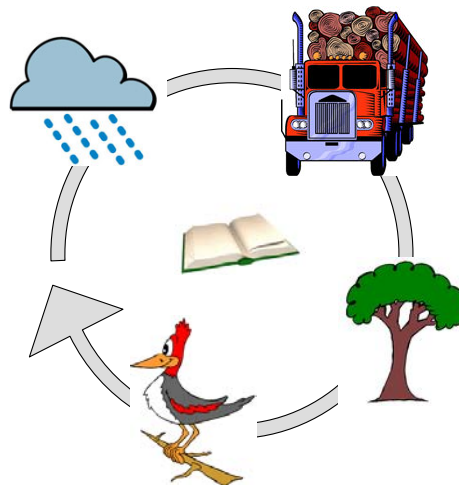
Indicator coverage - 52 selected international sources



VTU



What are all the forest reports about, if we don't understand and know much about the multiple cause and effect relationships between reported criteria and indicators?



vTI U+



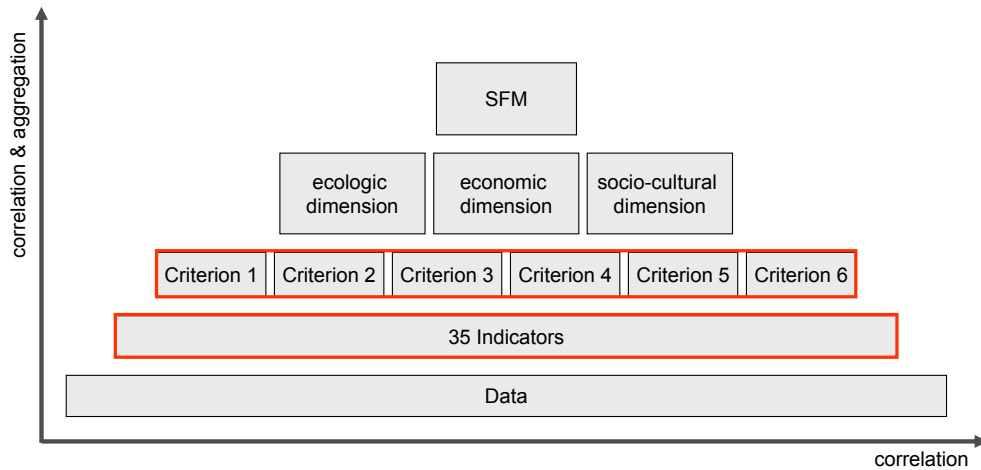
A deeper look at the world reveals many relationships and component systems that are important to the operation and viability of the total system, even though they are not immediately obvious. A **systems view** is, therefore, required for capturing and **understanding essential relationships**.

(Hartmut Bossel, IISD 1999)

vTI U+



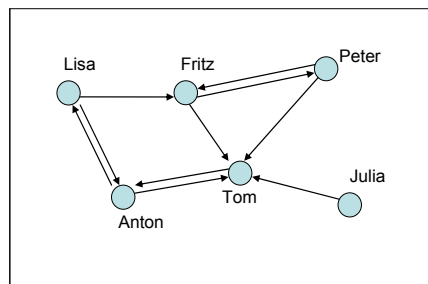
Correlation - SFM and its measurement components



Modelling C&I Networks – applying approaches of Social Network Analysis

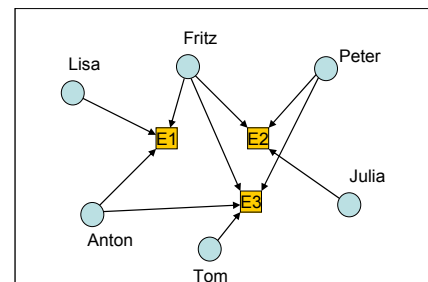
One Mode Network

	N1	N2	Nn
N1			
N2			
Nn			



Two Mode Network

	N1	N2	Nn
S1			
S2			
Sn			





Modelling C&I Networks – applying approaches of Social Network Analysis

One Mode Network

	N1	N2	Nn
N1			
N2			
Nn			

Two Mode Network

	N1	N2	Nn
S1			
S2			
Sn			

Ties:

- binary (0/1)
- signed +/-
- ordinal
- directed or bonded

VTU



Modelling C&I Networks – applying approaches of Social Network Analysis

One Mode Network

	N1	N2	Nn
N1			
N2			
Nn			

Two Mode Network

	N1	N2	Nn
S1			
S2			
Sn			

Dyad $\binom{N}{2} = (N^2 - N) / 2$

Density $D\Delta_k = \frac{\sum_{i=1}^N \sum_{j=1}^N x_{ijk}}{N(N-1)}$

Centrality $C_D(n_i) = d_i = \sum_j x_{ij} = \sum_j x_{ji}$

Indegree $id_j = \sum_{i=1}^N x_{ij} = x_i$

Outdegree $odj = \sum_{j=1}^N x_{ij} = x_i$

Betweenness-Centrality $C_B(n_i) = \sum_{j < k} \sum_k b_{jk}(n_i)$

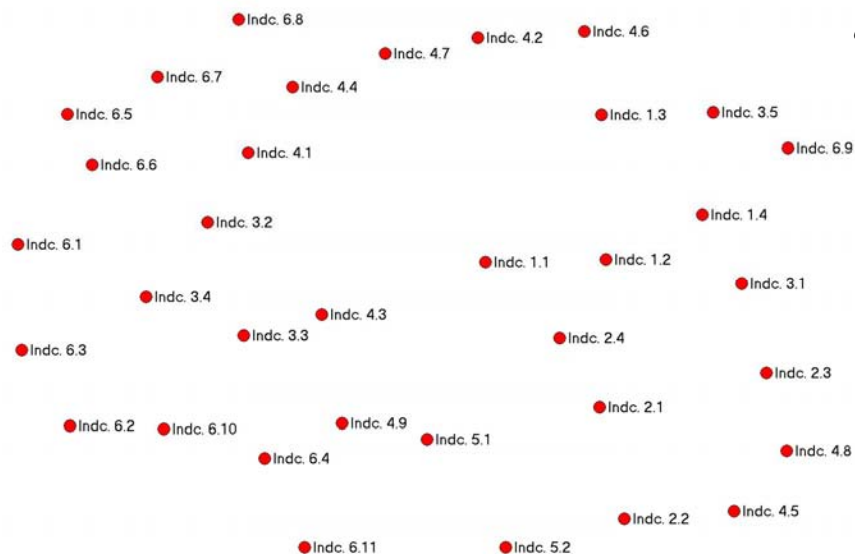
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C&I Networks

Correlation Network of the 35 pan-European Indicators – **Disconnected**

$$d\Delta = 0,0$$



C&I Workshop, Joensuu/Finland, 19-21 May 2008

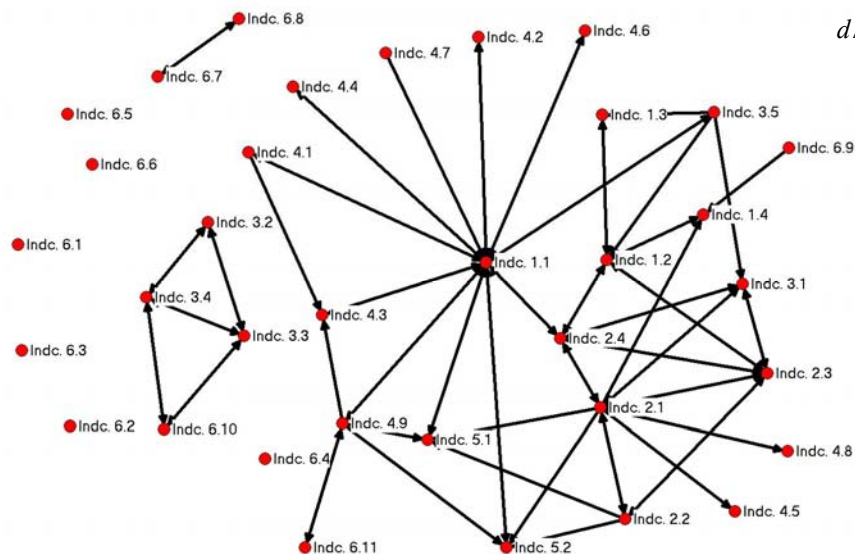
A.Requardt



C&I Networks

Correlation Network of the 35 pan-European Indicators – **MCPFE C&I Background Document (2002)**

$$d\Delta = 0,124$$



C&I Workshop, Joensuu/Finland, 19-21 May 2008

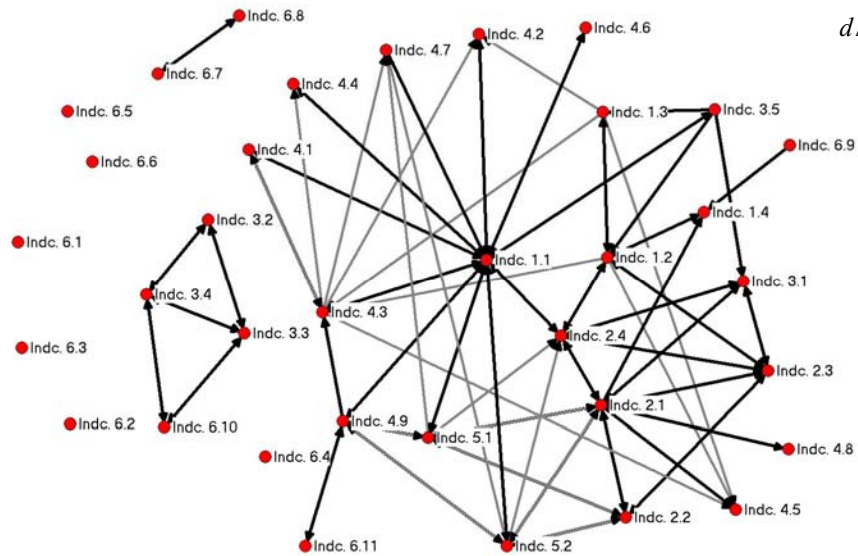
A.Requardt





Correlation Network of the 35 pan-European Indicators – MCPFE C&I Background Document (2002)

$$d\Delta = 0,159$$



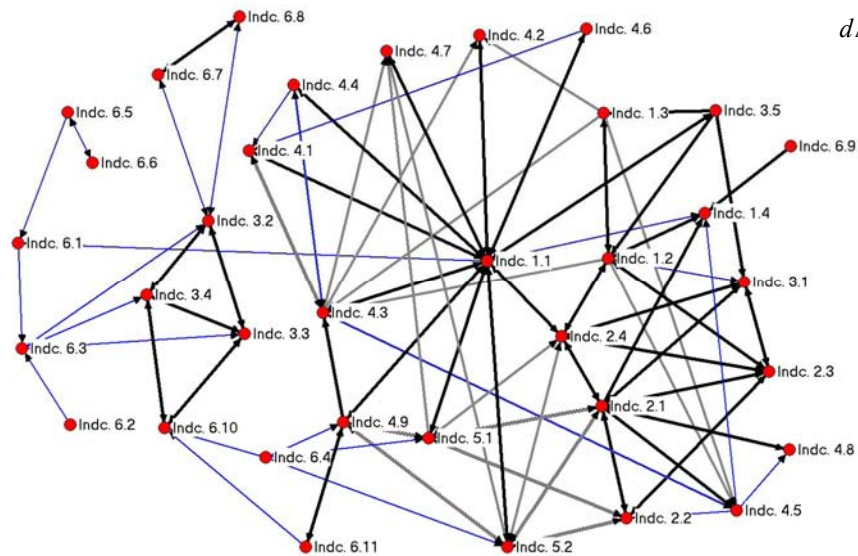
C&I Workshop, Joensuu/Finland, 19-21 May 2008

A.Requardt



Correlation Network of the 35 pan-European Indicators – Enhanced 1

$$d\Delta = 0,189$$



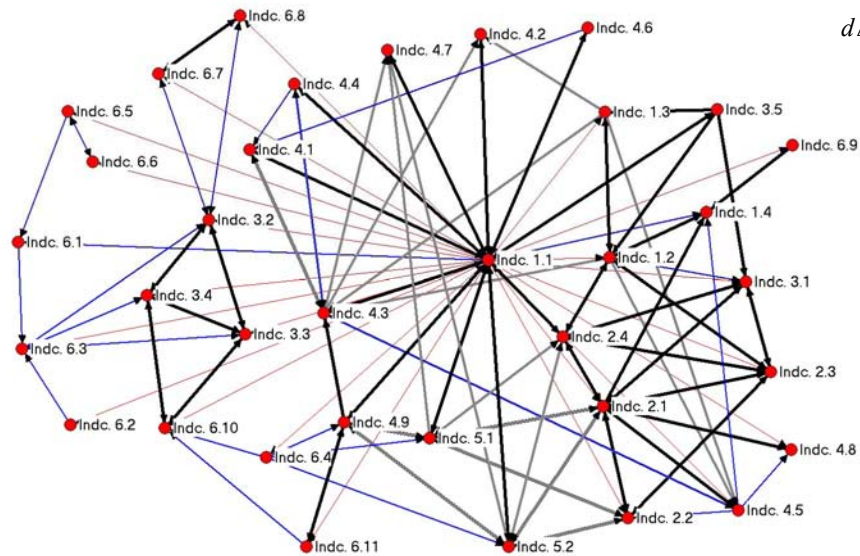
C&I Workshop, Joensuu/Finland, 19-21 May 2008

A.Requardt





Correlation Network of the 35 pan-European Indicators – Enhanced 2

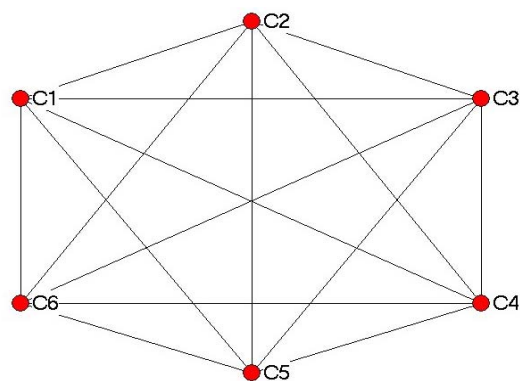
 $d\Delta = 0,227$

C&I Workshop, Joensuu/Finland, 19-21 May 2008

A.Requardt



Correlation model – pan-European criteria (Theory)



Potential

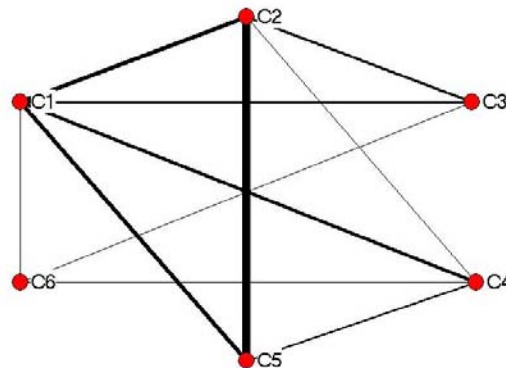
	C1	C2	C3	C4	C5	C6
C1	12	16	20	36	8	44
C2	16	12	20	36	8	44
C3	20	20	20	45	10	55
C4	36	36	45	72	18	99
C5	8	8	10	18	2	22
C6	44	44	55	99	22	110

number of potentially possible links
according to the 35 pan-European indicators





Correlation model – pan-European criteria (Indicated)



Relative

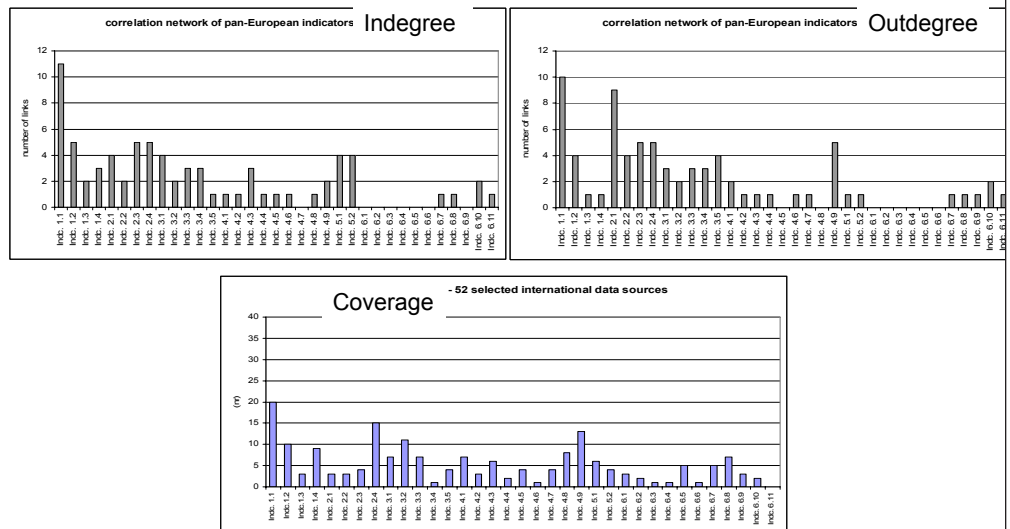
	C1	C2	C3	C4	C5	C6
C1	33	19	5	17	25	0
C2	25	83	15	6	50	0
C3	15	15	35	0	0	4
C4	19	0	0	3	11	1
C5	25	0	0	0	0	0
C6	2	0	4	1	0	2

relative number of links in %, indicated in the MCPFE Background Document (2002)

vTI U4



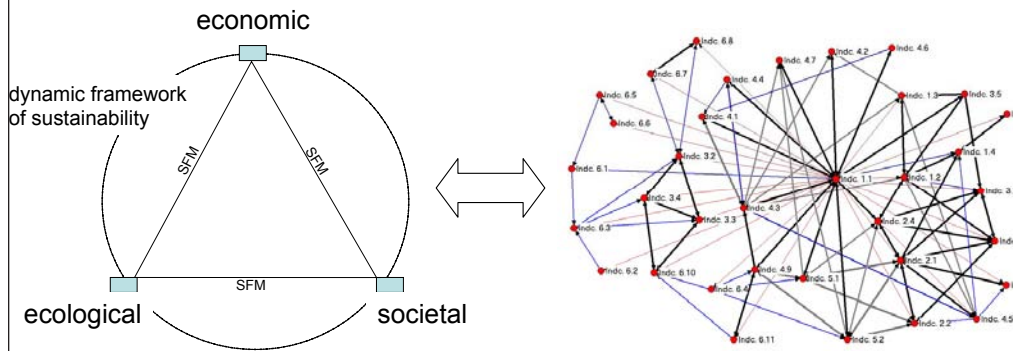
Indication of indicator validity – Correlation?!



vTI U4



How to define C&I Networks



VTU



How to define C&I Networks

6.7 Wood Consumption

6.8 Trade in wood

3.2 Roundwood

6.9 Energy from wood resources

3.2 Increment and fellings

1.1 Forest area

1.2 Growing stock

1.4 Carbon stock

4.5 Deadwood

1.3 Age Structure/Diameter distribution

4.1 Tree species composition

Story Telling



VTU



How to define C&I Networks

6.7 Wood Consumption

6.8 Trade in wood

3.2 Roundwood

6.9 Energy from wood resources

3.2 Increment and fellings

1.1 Forest area

1.2 Growing stock

1.4 Carbon stock

4.5 Deadwood

1.3 Age Structure/Diameter distribution

4.1 Tree species composition

Delphi-Study



VTU



How to define C&I Networks

6.7 Wood Consumption

6.8 Trade in wood

3.2 Roundwood

6.9 Energy from wood resources

3.2 Increment and fellings

1.1 Forest area

1.2 Growing stock

1.4 Carbon stock

4.5 Deadwood

1.3 Age Structure/Diameter distribution

4.1 Tree species composition

MCDM

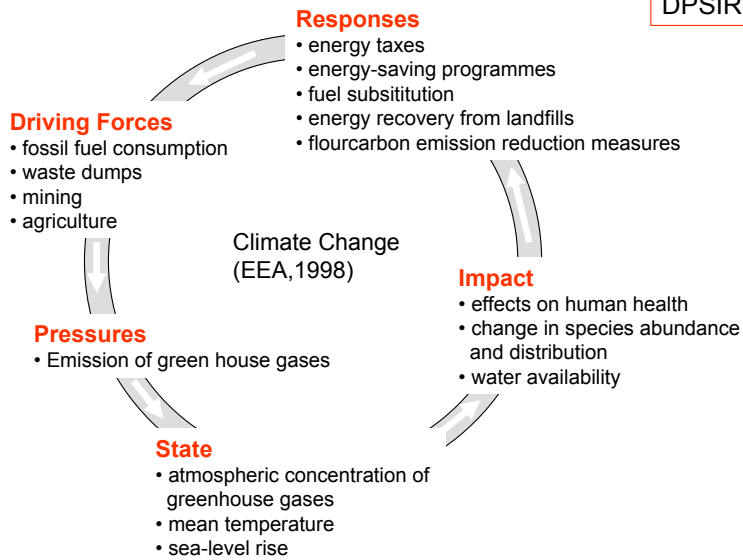


VTU



How to define C&I Networks

DPSIR - Concept

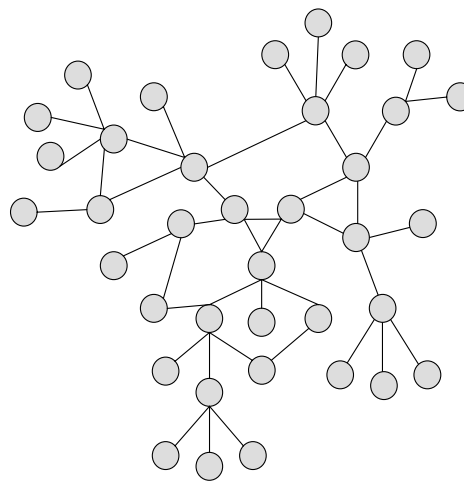
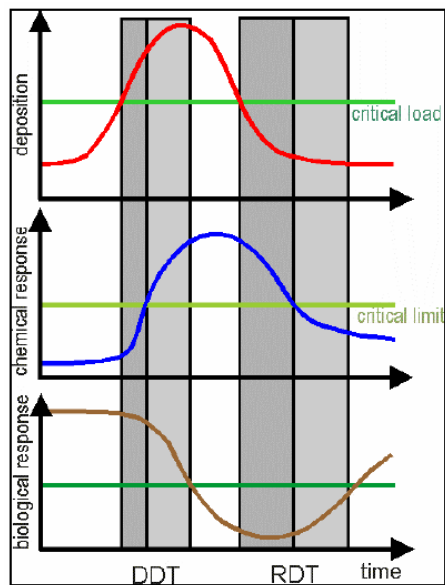


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How to define C&I Networks

Data Modelling



VTU

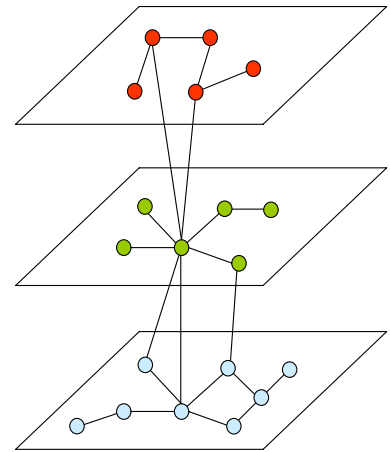


How to define C&I Networks

Modelling linkages between different

➤ indicator systems

- CSD Indicators of Sustainable Development
 - World Bank WDI
 - OECD Key Environmental Indicators
 - EEA Indicators (CSI)
 - EU Sustainable Development Strategy Indicators
 - EU/EEA Agri-Environmental Indicators
 - EU/EEA European 2010 Biodiversity Indicators
-
- MCPFE C&I for SFM



VTU U



How to define C&I Networks

Modelling linkages between different

➤ environmental/ land use systems

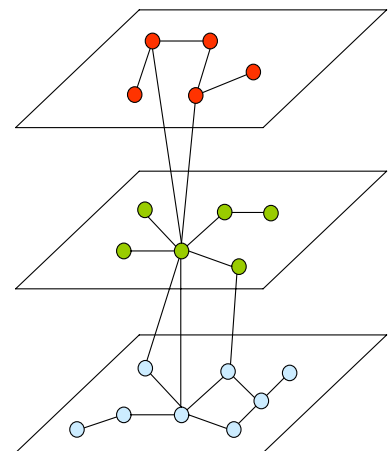
• agriculture



• water/marine systems



• forests



VTU U

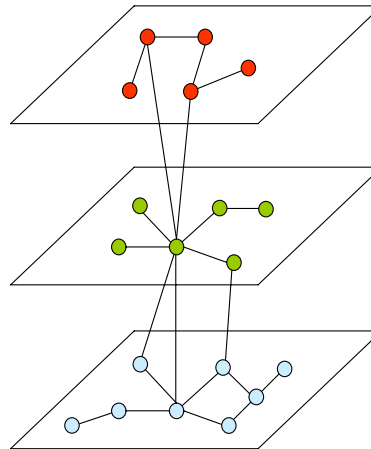


How to define C&I Networks

Modelling linkages between different

➤ policy sectors/ level

- European/Global level
- National/Regional level
- FMU level



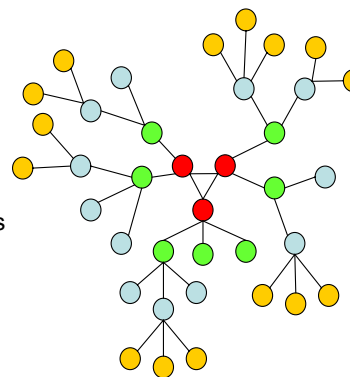
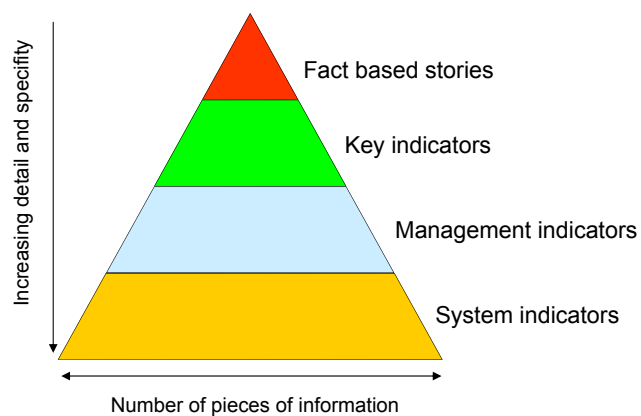
VTU U-



How to define C&I Networks

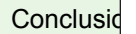
Mutual relationships of systems and their sub-systems

Drawback: complexity increases exponentially

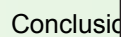
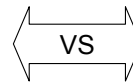


Paraphrasing Albert Einstein:
Indicator sets should be as simple as possible, but not simpler.

VTU U-



Theory of C&I Networks



- a) to strengthen the understanding of each indicator meaning and purpose.
- b) to understand different relationships between multiple dimensions of SFM.
- c) to implement SFM in consideration of different conflicts of interests at different scales and within different forest regions.
- d) to set priorities within Monitoring, Assessment and Reporting processes (aspect: data quality, data comparability etc.)

vTI 



Thank you!

Developing Country Application of the Analytical Assessment Tools

Ricardo M. Umali¹



R@Umali

CRITERIA & INDICATORS for Sustainable Forest Management

Forest C & I Analytical Framework and Report Workshop

May 19 □ 21, 2008 Joensuu, Finland



Developing Country Application of the Analytical Assessment Tools

Ricardo M. Umali
Sustainable Ecosystems International Corp.
Philippines



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Model for an analytical assessment tool of C&I

- The word "model" is interpreted and used in two ways.
- The first to a designed process for whom and what is to be done in the use of C&I data.
- The second to forest audit as a systematic but pragmatic management performance measurement tool.
- The focus is on the second "model" and how this is currently applied in the Philippines.

¹ Sustainable Ecosystems International Corporation.

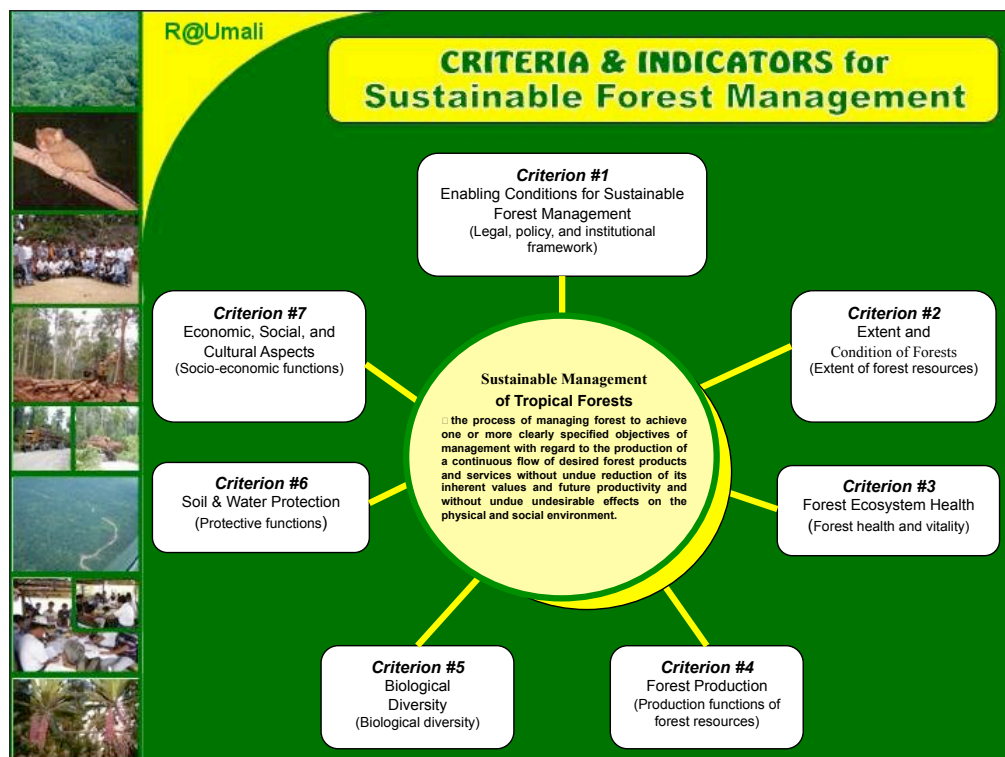


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ORIGIN

- The Philippines C&I is a systematic adaptation of the ITTO model refined within the context of the country's forestry situation.
- Foreign technical assistance
- Product of consultations amongst relevant government agencies and forest stakeholders





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PHILIPPINE INDICATORS

 **Criterion 1** has a total of ten (11) indicators and mainly descriptive in nature. **Criterion 2** is composed of Six (6) indicators. In **Criterion 3**, there are two (2) indicators identified. **Criterion 4** has a total of twelve (12) indicators that were designed relate to the flow of forest produce. There are a total of seven (7) indicators that were identified in **Criterion 5**. **Criterion 6** is composed of five (5) indicators and a total of fourteen (14) indicators identified for **Criterion 7**.

 A total of **56 indicators** compose the Philippine C and I. These are all applicable at the national level. At the **FMU level 52 indicators** are considered appropriate for the Philippine forestry situation.



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C&I APPLICATION

-  For reporting, monitoring, evaluation, and decision-making at the national, local, and management unit levels
-  Government regulation for FMU performance evaluation (analytical assessment tool, forest audit)
-  As management tool for decision-making of forest managers and communities, preparation of plans (SFM and operations)



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NATIONAL LEVEL REPORTS



**National Report of the Philippines:
Criteria and Indicators for Sustainable
Management of Natural Tropical Forests**

Updated March 2005

March 2003

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Criterion 6: Soil and Water 30

Criterion 7: Economic, Social and Cultural Aspects 32



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National Level Progress of SFM Key Indicators

TOWARDS SFM

- Policy And legal framework
- Institutional framework
- Information management
- IEC for awareness
- Resource assessment
- Planning procedures
- Long-term strategies
- Management guidelines
- Harvesting procedures
- Participation of communities / IPs
- Forest dependents
- Conservation procedures
- Reduced impact logging

AWAY FROM SFM

- Resource base
- Integrated land use plans
- Permanent forest estate
- Forest investment
- Forest protection
- Damage by human activity
- Monitoring and evaluation
- Ecosystem diversity
- IUCN species
- Soil / water conservation
- GDP and other economic contribution
- Forestry employment
- Wood production
- Timber trade
- Processing efficiency



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NATIONAL REPORTS

- Submitted to international organizations like the ITTO and United Nations bodies and processes as commitment to SFM.
- Provide effective forest management tools for the country reporting of progress on SFM at national and FMU levels, determination of indicators and other factors hampering SFM, and identification and formulation of remedial measures to achieve goals and targets on SFM and Objective 2000 commitment to ITTO.
- It is anticipated that in the near future there will be a common harmonized framework and format for C&I reports and data requirements.



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NATIONAL DECISION-MAKING

- The C&I framework is used in DENR-FMB fundamental policies, plans and guidelines such as the Revised Master Plan of the Forestry Sector, Omnibus Forestry Guidelines, Government Plan of Action (GPOA), and the Forest Logic Model.
- These national guidelines, considered as road map for forestry management and development in the Philippines, used C&I as basis for monitoring and evaluation of priority projects and the impacts of forest intervention.
- Proposed afforestation and reforestation projects applying for host country approval under the Clean Development Mechanism are evaluated against the Philippines C&I

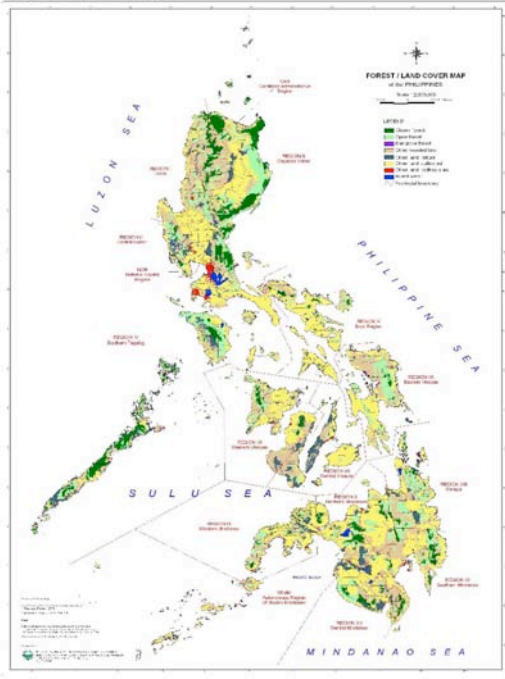
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Changes in the extent (area) of the permanent forest estate

- The Philippine Forestry Statistics of 2003 indicate that actual forest cover is around 7.168 million hectares or 24 % of total land area of the country. In the baseline report the forest cover remained constant at 5.4 million hectares or 18% of total land area since there was no new inventory or assessment conducted since 1997. Recently, the FMB and NAMRIA, both DENR agencies, interpreted and classified LANDSAT TM images from 2001-2003 to come out with this new estimate.
- Due to the methodology of using satellite imagery to inventory forest cover, the estimated 7.168 million hectares of forests can be broken down into the following main categories: Closed forest, 2.5 million hectares; Open forest, 3.58 million hectares; Mangrove, 155 thousand hectares; and Plantations, 274 thousand hectares. The closed and open forests are further subdivided into forest types of broadleaf, mixed, and coniferous. Plantation are classified further into broadleaf, coniferous, and mangrove.

Trends & Assessment

Figure 1. Forest Cover Types





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Analytical tool for forest evaluation at FMU level

- The forest audit system of SFM at the FMU level has been developed as the main analytical tool for the evaluation of performance and monitoring of FMUs.
- It is an internal audit by independent forest auditors to assess SFM performance and to serve as management tool to FMU managers by providing remedial measures to indicators and criteria that fail in meeting norms for SFM.
- The Philippine C&I system is used for auditing SFM performance of the FMU. All 7 criteria and 52 indicators applicable to the country will be audited.





GUIDELINES FOR AUDITING SYSTEM FOR ITTO C&I






PRESENTED BY:

INTERNATIONAL TROPICAL TIMBER ORGANIZATION



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AUDIT TERMS

Forest audit simply means the examination of existing evidences and data on various aspects of SFM to determine if they comply with required audit norms.

A Norm is the reference value of the indicator and is established for use as a rule or a basis for comparison. By comparing the norm with the actual measured value; the result demonstrates the degree of fulfillment of a criterion and a compliance with a principle.

A Verifier is the source of information for the indicator or for the reference value for the indicator.



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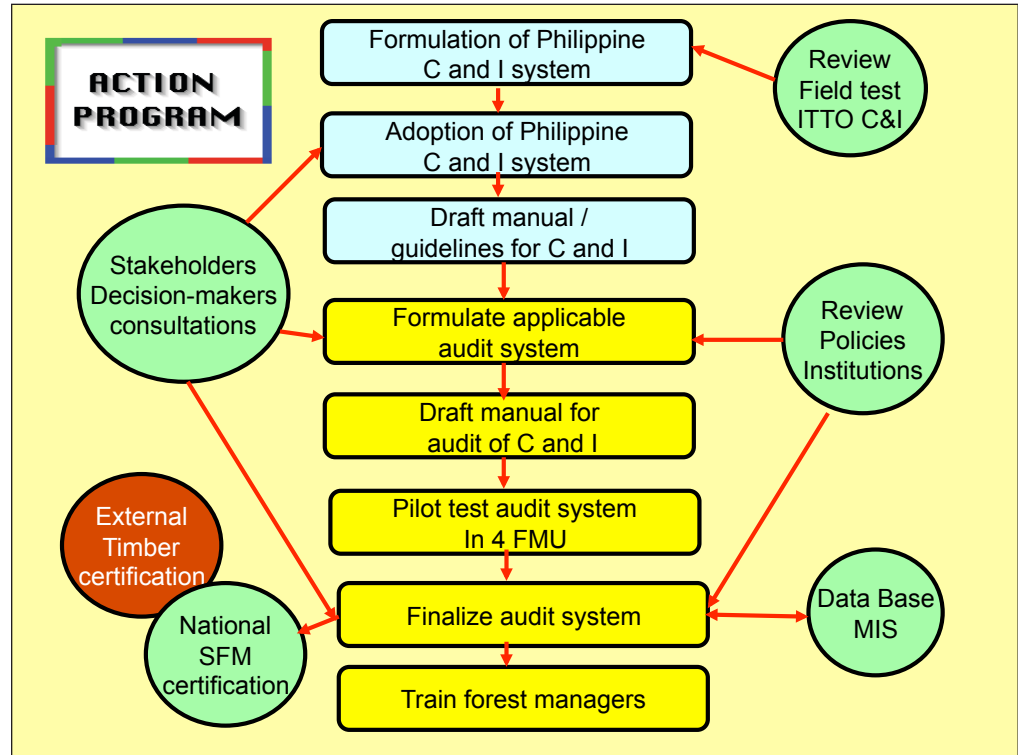
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Audit Manual

- An audit manual was designed and formulated to provide guidelines and procedures for implementing an appropriate Philippine audit system for C and I with focus on internal audit for SFM performance at the FMU level.
- The main implementation framework includes what should be audited (C and I and their verifiers / norms, who should audit and be audited, the methods to be used, the frequency of audit for the agencies auditing or certifying, and the means to verify the results of assessments.
- The assessment model uses appropriate norms to determine SFM in each of the 52 indicators at FMU. Verifiers and means of verification are provided for each of the norm.
- While the goal is for SFM performance evaluation, the audit system should be able to link with future timber certification scheme to be developed for the country.

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ANNEX 4. AUDITING FORM	1 pp

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Manual formulation including norms and verifiers	
• Technical assistance provided by ITTO under PD 225/03 Rev. 1 (F): Development and Institutionalization of an Appropriate System of Criteria and Indicators for SFM in the Philippines • Intensive consultations and meetings with various concerned stakeholders including forest operators and communities as well as concerned agencies, NGOs, and professional forestry organizations. • Pilot tested in selected FMUs. • A Memorandum Order from the DENR Secretary dated July 12, 2007 formalized the regulatory requirement for use of C&I for performance evaluation	



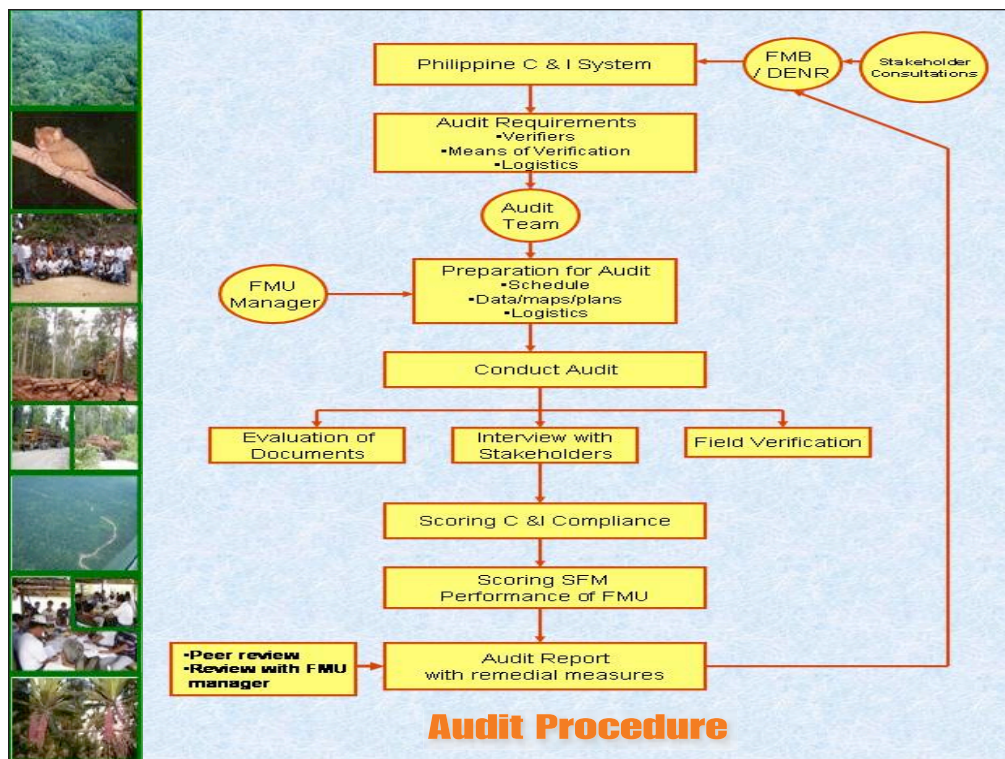


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MAIN STEPS IN AUDITING

1. Preparatory audit activities which may include a scoping visit, analysis of available documentation of the FMU to be audited, and inception meetings with FMU management and stakeholders
2. Identify gaps on documentation
3. Main audit - data collection, field checks, interviews, assessment
4. Audit report on criteria and indicators and its review (by the audited, external peer review panel, etc.)
5. Based on scoring system, compile the points for each indicator per criteria. The FMU has to show compliance to SFM norms for all 7 criteria but may fail in compliance with certain specific indicators.
6. Performance evaluation report



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Measurable Norms

- Verification and assessment of compliance to measurable norms (qualitative and quantitative) of indicators and compiling for the 7 criteria will be done using a scoring system for degree of compliance or non-compliance with required norms dealing on procedures, documents, policies, or management prescriptions
- Based on scoring system the FMU has to show compliance to SFM norms for all 7 criteria but may fail in compliance with certain specific indicators. The aggregate score per criteria can be summed to indicate overall SFM performance of the FMU. The sum for all points per criteria will be added to evaluate the over-all FMU performance on SFM based on the following cumulative categories: good performance; poor performance; failure.
- The results of auditing SFM performance at FMU level are presented in an audit report with the summary of scoring for criteria and indicators and final grading results for SFM performance. Management aspects which meet or do not the desired norms are highlighted Remedial measures and recommendations are made as guide to decision-making for indicators that do not meet the expected norms.

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SCORING SYSTEM

INDICATORS	CRITERIA	SFM PERFORMANCE
Full compliance with norm □ 3 points Partial compliance with minor corrective measures □ 2 points Partial compliance with major corrective measures □ 1 point Non-compliance □ 0 point,	Criteria 1 (9) □ 27 points Criteria 2 (6) □ 18 Criteria 3 (2) - 6 Criteria 4 (12) □ 36 Criteria 5 (5) □ 15 Criteria 6 (4) □ 12 Criteria 7 (13) - 39	Good performance 104-156 Poor performance 51-103 Failure 1-50
Each indicator will have the scores for compliance with norms A maximum point per indicator is 3.	The total maximum points for all 52 indicators of SFM are 156 broken down based on number of indicators per criteria: The FMU has to show compliance to SFM norms for all 7 criteria but may fail in compliance with certain specific indicators.	The aggregate score per criteria can be summed to indicate overall SFM performance of the FMU.

       	R@Umal CRITERIA & INDICATORS for Sustainable Forest Management AUDITING SFM FOR SPECIFIC CRITERIA OR COMPONENTS		
	 The Philippine audit system for SFM at FMU level can also be used to conduct performance evaluation for each of the specific criteria or combination of criteria as management tool to determine certain aspects of forest management system.  Or a particular forest management aspect can be selected and their applicable indicators verified for compliance to norms.  The applicable scores per indicator can be used to compile scores and can be aggregated for performance pertaining to the specified forest management aspect.		

RELEVANT INDICATORS FOR FOREST MANAGEMENT PLANNING	SCORES
Indicator 1.9 Capacity and mechanisms for planning sustainable forest management and for periodic monitoring, evaluation and feed-back on progress	2
Indicator 1.10 Public participation in forest management planning, decision making, data collection, monitoring and assessment	3
Indicator 1.11 Existence of forest management plans.	3
Indicator 2.1 Extent (area) and percentage of total land area under comprehensive land use plans.	2
Indicator 4.5 Existence and implementation of:(a)Forest harvesting/operational plans (within forest management plans); and (b)Other harvesting permits (small, medium and large scale permits without forest management plans)	3
Indicator 4.8 Long-term projections, strategies and plans for forest production	3
Indicator 6.1 Extent and percentage of total forest area managed exclusively for the protection of soil and water.	1
Indicator 7.13 Extent to which indigenous knowledge is used in forest management planning and implementation	1
Indicator 7.14 Extent of involvement of indigenous people, local communities and other forest dwellers in forest management capacity building, consultation processes, decision making and implementation.	2
From the above example, the maximum points for 9 indicators is 27 and the FMU can be rated as poor performance with total of 20 points when compared to maximum. Indicators 6.1 and 7.13 have partial compliance with norms that will require major corrective measures.	20

AUDIT REPORT

SECTIONS	CONTENTS
1.Executive Summary	Brief statement on audit results and performance evaluation
2.Introduction	•FMU (name, location, size, tenure) •Audit team •Date and duration of assessment
3.Methods for auditing	•Review of documents •Interviews with agencies and stakeholders •Field verification of compliance
4.Results of assessment	•Summary of scoring for criteria and indicators •Final grading results for SFM performance
5.Summary of observations	•Management aspects which meet the desired norms •Management aspects which do not meet the desired norms
6.Recommendations for improvement of sustainable forest management	•Recommendations for improving existing mode of operational procedures for the 7 criteria and specific indicators •Proposed remedial measures for indicator score with partial compliance with major corrective measures
7.Conclusion	•Concluding summary statement



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Sample norms and verifiers for assessment of indicators

Criteria	Indicators	Verifiers	Norms
Criterion 4: Forest Production	Indicator 4.1 Extent and percentage of forest for which inventory and survey procedures have been used to define the quantity of the main forest products	Extent and percentage of forest for which inventory and survey procedures have been used to define the quantity of the main forest products (area and volume control per Philippine selective logging system)	100% inventory and survey or acceptable equivalent for annual logging set-up per timber harvesting regulations
	Indicator 4.2 Actual and sustainable harvest of wood and non-wood forest products	Harvesting level of timber and other forest products	FMU Annual Allowable Cut for timber and other forest and non-forest products as indicated in the Annual OP



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Links and Sources

- The final manual for forest auditing of FMUs can be downloaded from www.forestry.denr.gov.ph which includes Annex 2 on the final Philippine C&I and ANNEX 3 Guide to Auditing SFM Based On Philippine Criteria and Indicators (verifiers and norms are indicated).
- The complete audit reports for the pilot FMUs can be requested from the Forest Management Bureau of the Philippines



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Data Needs for FMU and Gaps

- Information needs at the FMU level were expanded recently by the use of C&I mostly at indicator levels to satisfy government regulations on FMU performance which now uses C&I as compared to traditional methods which do not consider other aspects of SFM. There is need for about 52 Qualitative and quantitative indicators to use C&I as management tools for sound forest management decisions at FMUs.
- Data for preparation of annual operational plan and long-term SFM plan
- In most cases, the forest management units do not have comprehensive and updated baseline data on appropriate or existing indicators in a particular FMU. Due to lack of mandate to gather all indicators it is expected that they may not be complete in certain FMU particularly CBFMA areas operated by communities and indigenous people
- Indicators for Criterion 5, Biological Diversity; Criterion 6, Soil and Water Protection; and Criterion 7, Economic, Social, and Cultural Aspects generally do not have adequate information / data at the FMU level. In view of this, only indicators with sufficient data are audited and the scoring system is adjusted accordingly. Time is given for FMUs to complete their information requirements for the next auditing periods.



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PILOT TESTING

- The audit manual and its procedures had been pilot tested in selected FMUs to demonstrate the proper application of auditing systems useful to the country to carry out its mandates on SFM. This can further lead to national competence for internal and future external certification of forest product sources and processing employed.
- One of the forest management unit subjected to this pre-testing activity was Surigao Development Corporation (SUDECOR).



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PILOT TESTING

- SUDECOR was able to meet most of the norms provided for by the criteria and indicators for SFM. SUDECOR gathered full points for criteria 2, 3, and 6, and relatively good scores for the rest of the criteria.
- There was substantial compliance of SUDECOR in some of the indicators/norms even if existing TLA policies do not require them to do it.
- Policy gaps include participatory planning in all levels, carbon stock measurements, monitoring of rare and threatened species of flora and fauna, and monitoring biodiversity in production areas.



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ITTO PROJECT REPORTS

ITTO PROJECT PD 35/96 Rev. 2 (F)
CONSERVATION AND MAINTENANCE OF BIOLOGICAL DIVERSITY IN TROPICAL FORESTS MANAGED PRIMARILY FOR TIMBER PRODUCTION SURIGAO DEL SUR, PHILIPPINES

COMPLETION REPORT

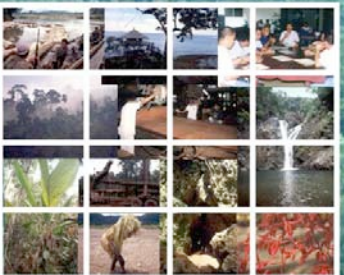


OCTOBER 2002

SUSTAINABLE ECOSYSTEMS INTERNATIONAL CORP.
INTERNATIONAL TROPICAL TIMBER ORGANIZATION

PD 35/96 Rev. 2 (F)
CONSERVATION AND MAINTENANCE OF BIOLOGICAL DIVERSITY IN TROPICAL FORESTS MANAGED PRIMARILY FOR TIMBER PRODUCTION SURIGAO DEL SUR, PHILIPPINES

SUSTAINABLE FOREST MANAGEMENT PLAN



OCTOBER 2002

SUSTAINABLE ECOSYSTEMS INTERNATIONAL CORP.
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Successful ways to deliver forest data to FMU stakeholders

- The use of the global Internet has been proven as an effective mechanism for delivering on-line timely forest data to stakeholders.
- The government maintains websites such as www.forestry.gov.ph and www.denr.gov.ph which provide updated information on the forestry sector encompassing most of the indicators for the Philippines at national, regional, provincial, and municipal levels
- www.namria.gov.ph for geographic and statistical information on natural resources and environment
- The Forest Management Bureau distributes printed copies of the Annual Forestry Statistics to concerned and interested stakeholders.

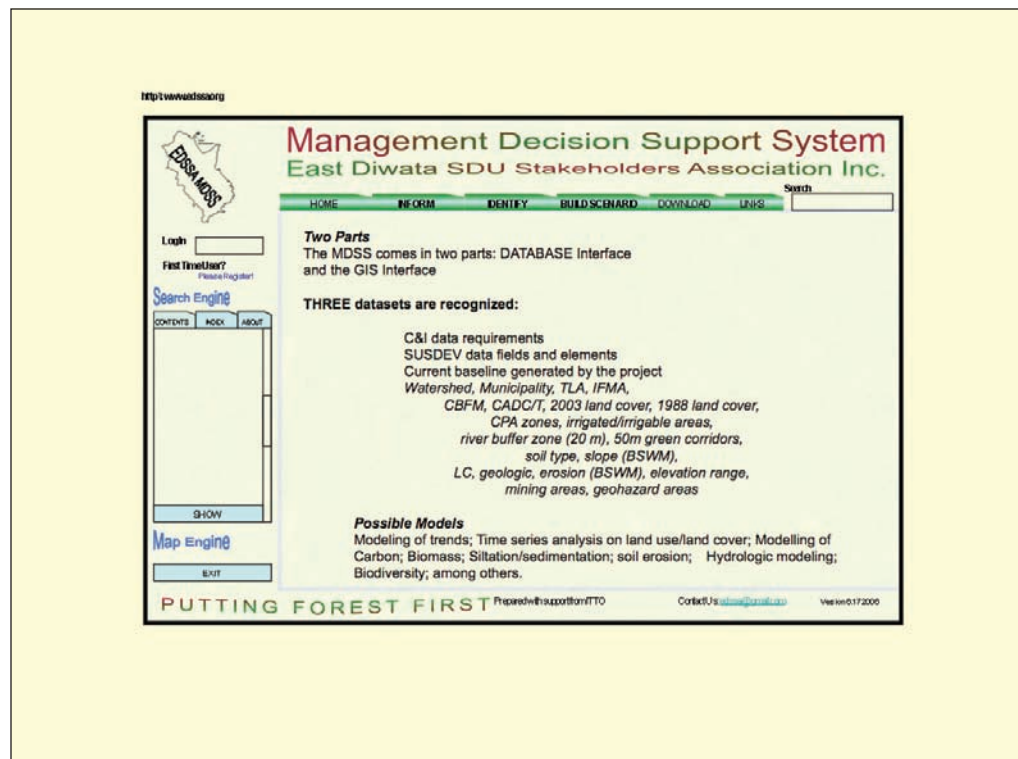


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C&I MIS /GIS

- The development of user-friendly C&I GIS and database management system facilitated access and analysis of information to help decision makers make timely and relevant conclusions. The MIS installed the baseline and other data gathered for monitoring, evaluation, and determination of progress towards SFM both at the national and FMU levels and the succeeding updates.
- The computerized C&I GIS and database system principally used MS Access interfaced with various thematic maps derived from ground and aerial forest survey / inventory, satellite imagery analysis, and GIS analysis.





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Training

- A training of selected FMU representatives knowledgeable in computer, FMB □ MIS personnel, technical personnel from selected DENR field and central offices, on the use and operation of the C&I GIS and Database System was also conducted under a project assisted by ITTO.
- The government and professional organizations also conducted training on existing procedures to gather and analyze data on indicators for Criterion 5, Biological Diversity; Criterion 6, Soil and Water Protection; and Criterion 7, Economic, Social, and Cultural Aspects which generally do not have adequate information / data at the FMU level.



