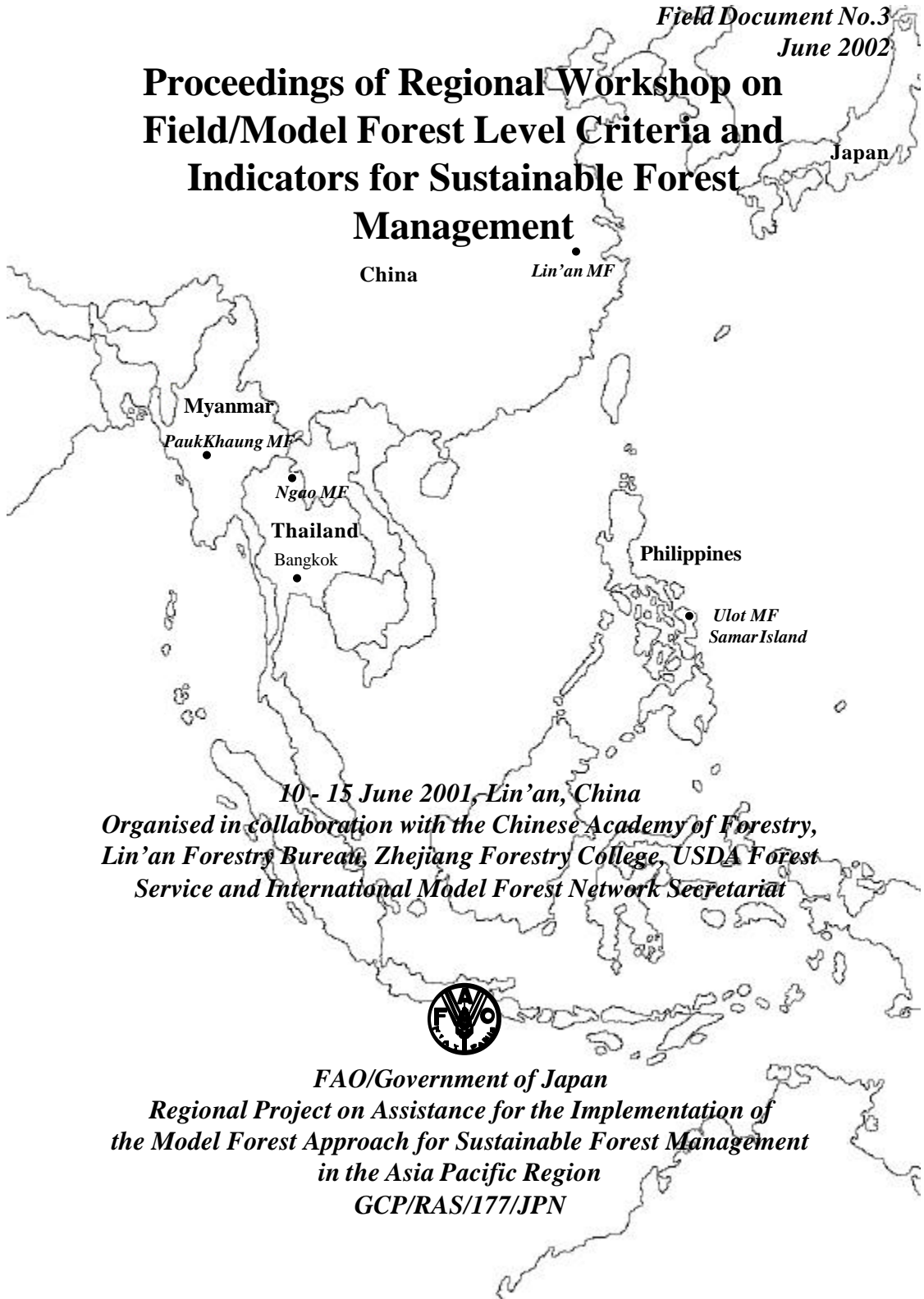


GCP/RAS/177/JPN
Field Document No.3
June 2002

Proceedings of Regional Workshop on Field/Model Forest Level Criteria and Indicators for Sustainable Forest Management



China

Lin'an MF

Japan

Myanmar

Pauk Khaung MF

Ngao MF

Thailand

Bangkok

Philippines

Ulot MF

Samar Island

10 - 15 June 2001, Lin'an, China

Organised in collaboration with the Chinese Academy of Forestry,
Lin'an Forestry Bureau, Zhejiang Forestry College, USDA Forest
Service and International Model Forest Network Secretariat



FAO/Government of Japan
Regional Project on Assistance for the Implementation of
the Model Forest Approach for Sustainable Forest Management
in the Asia Pacific Region
GCP/RAS/177/JPN

This Field Document is one of a series of publications prepared during the implementation of the FAO/Government of Japan Regional Project on Assistance for the Implementation of the Model Forest Approach for Sustainable Forest Management in the Asia Pacific Region (GCP/RAS/177/JPN, or Regional Model Forest Project, RMFP).

The RMFP is funded by the Government of Japan and executed by the Food and Agriculture Organisation (FAO) of the United Nations. It is based at the FAO Regional Office for Asia and the Pacific in Bangkok, covers four countries, i.e. China, Myanmar, Philippines and Thailand, and will run for 30 months (February 2000 to July 2002). The project aims to assist the four countries to strengthen national and community-level capacities in the development and implementation of field-level model forests, and thus contribute to their efforts to use and manage their forest resources on a sustainable basis. The field-level model forests will promote partnerships among stakeholders in the planning, use and management of the model forests; "best practices" for SFM, taking into account the multiple uses and functions of forests, diverse demands of the stakeholders, need to balance economic, social and environmental considerations, and special needs and priorities of each country; and local, national and regional networks to facilitate collaboration and cooperation among agencies and persons involved in SFM. It will also provide technical, training and other support; and assist in the development of appropriate field manuals and guidelines.

The conclusions and recommendations given in this Field Document are those considered appropriate at the time of its preparation. They may be modified in the light of further knowledge gained in the subsequent stages of the Project.

The designations employed, and the presentation of the materials and maps in this document, do not imply the expression of any opinion whatsoever on the part of the FAO, the Government of Japan, the RMFP or the four Project countries concerning the legal status of any country, territory, city or area, or if its authorities, or concerning the delimitations of its frontiers or boundaries.

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Field Document No.3
June, 2002

Proceedings of Regional Workshop on Field/Model Forest Level Criteria and Indicators for Sustainable Forest Management

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10 - 15 June 2001, Lin'an, China
Organised in collaboration with the Chinese Academy of Forestry,
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Service and International Model Forest Network Secretariat



FAO/Government of Japan
Regional Project on Assistance for the Implementation of
the Model Forest Approach for Sustainable Forest Management
in the Asia Pacific Region
GCP/RAS/177/JPN

RMFP Publications

A. Field Documents

1. Proceedings of Inception Workshop of Regional Model Forest Project. 21-26 May 2000, Lin'an, China.
2. Proceedings of 2nd Regional Model Forest Workshop - "Participatory Process - Developing Partnerships That Work". 19-22 February 2001, Lampang, Thailand.
3. Proceedings of regional workshop on "Field/Model Forest Level Criteria and Indicators for Sustainable Forest Management". 10-15 June 2001, Linan, China.

B. Working Papers

1. Guidelines for Field Level Criteria & Indicators for Model Forests. August 2001. (Output of regional workshop on "Field/Model Forest Level Criteria and Indicators for Sustainable Forest Management". 10-15 June 2001, Linan, China.)
2. General guidelines for Measurement of Indicators in Model Forests. June 2002. (Output of Regional Workshop to Develop Guidelines for Measurement of Model Forest Level Indicators for SFM. 22-27 April 2002, Lampang, Thailand.) (*in press*)

C. Miscellaneous Papers

1. The FAO/Japan Trust Fund Regional Model Forest Project. By Hon Tat Tang, Chunqian Jiang, Kyaw Htun, Adriano Nava Jnr and Jira Jintanugool. Paper presented at 4th International Workshop on Model Forests for Field-level Applications of Sustainable Forest Management, 23-27 October 2000, Yamanashi Prefecture, Japan.

D. Newsletters - *News on the Model Forest Approach to Sustainable Forest Management*

1. October 2000
2. January 2001
3. April 2001
4. July 2001
5. October 2001
6. January 2002
7. April 2002

Foreword

Sustainable forest management (SFM) has always been a main goal in the use and management of forests. In the past, when timber production was often the main output from the forest, sustainable timber production was commonly used as an indicator of SFM, or of sustainably managed forests. However, this is clearly quite inadequate, and the status of the many other outputs, including functions of forests, must be properly reflected in assessing and expressing the sustainability (or otherwise) of managed forests.

The development of criteria and indicators (C&I) for SFM gained prominence during and after the United Nations Conference on Environment and Development (UNCED) in 1992. Among the C&I and related initiatives that followed were the Helsinki, Montreal and Tarapoto Processes, the Inter-Governmental Panel (and the succeeding Forum) on Forests (IPF/IFF), and work by the International Tropical Timber Organisation (ITTO), and others.

Much of the work to date has been on C&I at the national level. However, we must ensure that the situation at the field level is consistent with the situation at the national level. Therefore, it is just as important to develop and apply C&I for SFM at the field level.

One of the outputs of the FAO/Government of Japan Regional Model Forest Project (RMFP, GCP/RAS/177/JPN) is the preparation, testing and evaluation of C&I for SFM in the model forest areas. The 2nd Project Steering Committee (PSC) meeting of the RMFP in February 2001 in Chiangmai, Thailand, recommended that the theme for the 3rd regional model forest workshop, that will precede the 3rd PSC meeting in Myanmar in November 2001, be '*C&I for Sustainable Model Forest Management.*'

As all four RMFP countries are still in the early stages of C&I work, a workshop on '*Field/Model Forest Level Criteria and Indicators for Sustainable Forest Management*' was convened from 10-15 June 2001 in Linan, China, supported by resource persons from Canada, USA, Japan, China, Malaysia, RECOFTC (Regional Community Forestry Training Centre) and CIFOR (Centre for International Forestry Research, to discuss the concepts, issues, constraints and opportunities of C&I, particularly at the field/model forest level, and to develop practical guidelines to be used by the RMFP countries. The "Guidelines for Field Level Criteria & Indicators for Model Forests" was the main output of the workshop, and was published as RMFP Working Paper No. 1 and distributed to the four MF Project countries.

The report of the workshop, which includes these Guidelines as Annex 5, and the papers presented, is being published here as the Proceedings of the Workshop as RMFP Field Document No.3.

We would like to thank the Government of Japan for their generous funding of the RMFP; the Government of China for hosting the C&I workshop; the USDA Forest Service and International Model Forest Network Secretariat for co-sponsoring the workshop and providing resource persons; RECOFTC, CIFOR, Chinese Academy of Forestry (CAF) and Forestry Department, Peninsular Malaysia for providing resource persons; CAF, Lin'an Forestry Bureau and Zhejiang Forestry College for providing invaluable organisational and other support; Mr. Martin von Mirbach for being the lead resource person; and all the participants for their active inputs into the workshop.

(Tang Hon Tat)
Chief Technical Adviser
FAO/Japan Regional Model Forest Project
(GCP/RAS/177/JPN)

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GLOSSARY

C&I	Criteria and indicators
CF	Community forestry
CIFOR	Centre for International Forestry Research
FAO	Food and Agriculture Organisation of the United Nations
FMU	Forest management unit
ITTO	International Tropical Timber Organisation
LLI	Local level indicators
PFE	Permanent forest estate
RECOFTC	Regional Community Forestry Training Centre for Asia and the Pacific
SFM	Sustainable forest management

PART 1. REPORT OF REGIONAL WORKSHOP

REPORT OF WORKSHOP

INTRODUCTION

The *Workshop on Field/Model Forest Level Criteria and Indicators for Sustainable Forest Management* was held from 10-15 June 2001 in Lin'an, Zhejiang Province, China. The workshop was organised and sponsored by the Regional Model Forest Project (RMFP) in collaboration with the Chinese Academy of Forestry (CAF), Lin'an Forestry Bureau (LFB), Zhejiang Forestry College (ZFC), USDA Forest Service and the International Model Forest Network Secretariat (IMFNS).

The programme of the workshop is shown in **Annex 1**. Mr. Jiang Chunqian of China was elected to be the chairperson of the workshop. The other workshop officials are shown in **Annex 2**.

About 30 representatives (**Annex 3**) from the four RMFP countries (China, Myanmar, Philippines and Thailand), and resource persons from Canada, China, Forestry Agency of Japan (FAJ), USDA Forest Service, Regional Community Forestry Training Centre (RECOFTC), CIFOR/Nepal, and Forestry Department, Peninsular Malaysia participated in the workshop.

Welcoming addresses were made by Mr. Tang Hon Tat, Chief Technical Adviser of the RMFP, Mr. Song Chuang, Vice President of the CAF, Mr. Wang Lianzhi of the State Forestry Administration (SFA), Mr. Xing Zuirong of the Forestry Department of Zhejiang Province, and Mr. Weng Dongcao, Mayor of Lin'an City who also opened the workshop.

The structure and programme of the workshop were discussed and endorsed by the workshop participants. Field visits to several model forest (MF) activities were conducted during the workshop (**Annex 4**). The aim of the workshop was to share experiences in the development of criteria and indicators at the field level, and provide guidance for the development of criteria and indicators for the MF projects in Lin'an (China), Paukhaung (Myanmar), Ulot Watershed (Philippines) and Ngao (Thailand). The main outputs of the workshop are a set of guidelines for C&I development (**Annex 5**), and 12-month work plan for this purpose.

The presentations and outputs at the workshop will be compiled and published as a Working Paper of the RMFP. The main observations and recommendations of the workshop were as follows.

OBSERVATIONS AND RECOMMENDATIONS

A. Sessions 1 and 2

The following presentations were made:

1. An introductory address on field-level indicators of SFM in model forest: opportunities and challenges, *by Mr. Martin von Mirbach.*
2. Development of criteria and indicators for SFM in China, *by Dr. Jiang Zeping.*
3. Development of criteria and indicators for SFM at forest management unit level: a case study of Toungoo Forest District (Myanmar), *by Associate Professor Kyaw Htun.*
4. Development and application of criteria and indicators for SFM: the Philippine experience, *by Mr. Adriano Nava Jr, and Mrs. Isabelita Austria*
5. Thailand's experiences on the development of criteria and indicators for SFM, *by Mr. Jira Jintanugool and Thannarin Na Nakorn.*

At the end of the presentations and discussions, a synthesis and discussion on the guidelines for MF level C&I was facilitated by Mr. Martin von Mirbach.

Among the observations made by the workshop were:

- There are many possible approaches to developing C&I at the MF level and no single 'correct' way.
- There are considerable differences in the forest resource, management and use situations in the four MF Project countries.
- All the four MF Project countries have developed (but not necessarily adopted) national level C&I. In China, the national level C&I are based on the Montreal Process framework, in Myanmar and Philippines they are based on the ITTO framework, and in Thailand they are based on the ITTO and ASEAN frameworks.
- China has begun to develop and test C&I at the regional level, Myanmar at the MF level (but not at the Paukhaung MF) and the Philippines at the community level. But none has begun such work within the respective MF areas associated with the RMFP.
- In China, owing to the vast extent of the country, sub-national C&I may be based on the Montreal Process or ITTO C&I, depending on the particular circumstances.
- In Myanmar-
 - an additional criterion and appropriate indicators for forest plantations were identified, mainly in anticipation of seeking certification for their plantation timbers;
 - a preliminary testing of FMU level C&I was conducted at the Toungoo forest district in February 2001, and two other forest districts have been

designated for testing. Both the national and FMU C&I contain many indicators that need to be reviewed, screened and reduced; and

- there has been little interest in community forestry processes in areas where forest resources are still abundant.
- The Philippines has developed their local level C&I for Community-Based Forest Management (CBFM), and produced a guidebook and manual for field testing of these CBFM-level indicators. These experiences should be useful and applicable in the development of C&I for the Ulot Watershed MF.
- Partnerships and local communities have important roles in the development of indicators.
- Although there may be common C&I among MFs, each set of C&I should be determined for a specific MF.
- Forest management units (FMUs) can vary in scale among and within countries.
- Standards of Performance (SOP) can provide a benchmark against which a particular indicator is measured. If the SOP is assessed in the field and found to have been attained, this means that the indicator has been satisfied.
- The linkages among criteria, indicators and verifiers are not always clearly established, and can result in reduced appreciation of the purpose and need for the C&I processes.
- It is important to ensure that the common terms used in the development and application of C&I are understood in the same way by all concerned.
- There is much to be gained by sharing knowledge, information and experiences in C&I development, testing and application, among the four MF Project countries.

The workshop also made the following recommendations/suggestions:

1. It is very important for MFs to be clear about why they are doing work on C&I, what are the desired outcomes and who are the intended audience/partners.
2. The development of partnerships among stakeholders, including local communities, must be an integral part of the development of C&I for MFs.
3. Consideration of C&I developed at the FMU level must take into account the scale of the FMUs concerned (as they can vary considerably).
4. Clear linkages should be established among criteria, indicators and verifiers so that the purpose and need for the C&I processes can be better appreciated.
5. The common terms used in the development and application of C&I should be clearly and consistently defined, and disseminated.
6. Knowledge, information and experiences in C&I development, testing and application should be actively shared among the four MF Project countries.
7. In Myanmar, there is a need to review, screen and reduce the national and FMU C&I to more realistic numbers; and build capacity and increase awareness of SFM and community forestry among local communities.

Report of Workshop

8. The experience of the Philippines in testing their local level C&I at the CBFM level should be very useful in the development of C&I for the Ulot Watershed MF.

B. Sessions 3 and 4.

The following presentations were made:

1. Developing and using local level indicators of sustainable forest management: experiences from the Canadian Model Forest Network (CMFN), *by Mr. Martin von Mirbach, CMFN representative.*
2. Developing local unit criteria and indicators – learning from failure, defining success. A management perspective, *by Ms. Phyllis Green, USDA Forest Service.*
3. Criteria and indicator application in Japan, *by Ms. Makiko Uemoto, Forestry Agency of Japan.*
4. Development and application of criteria and indicators for sustainable forest management in Malaysia, *by Mr. Chin Yue Mun, Forestry Department, Peninsular Malaysia.*
5. Developing and filtering village level criteria and indicators in Yunnan, South West China, *by Ms. Karen Edwards, RECOFTC.*
6. Criteria and indicators-based sustainable forest management – a field experience (in Nepal), *by Mr. Mani Ram Banjade, CIFOR field researcher.*

Following the presentations and discussions, country group sessions were held to identify the main approaches, methods, ideas or recommendations that they would consider for use in their MFs, as well as the resources, tools or information they would need. The outputs were presented to plenary. These outputs and discussions were taken into consideration in the preparation of the guidelines for C&I development for MFs (**Annex 5**).

Among the observations made by the workshop were:

- Criteria at the MF level usually tend to be consistent with national level criteria.
- The attributes considered in selecting indicators often include being relevant, reliable, meaningful and affordable. However, no indicator will have all these attributes, and it would be necessary to decide on the relative priority of these attributes, or modify the indicators as necessary.
- No single indicator can reflect the status of the forest, and it is necessary to use a group of indicators for this purpose.
- In Myanmar and Malaysia, SOP have been developed as useful verifiers of some indicators.
- Having too many indicators per criterion would make their measurement difficult or unrealistic, and having too few may render them ineffective in

reflecting the status of the criterion concerned. A balance between some “*core*” indicators and other “*non-core*” indicators should be considered.

- The development of C&I can be a long and arduous process, requiring the involvement of all interested parties.
- Analytical tools to help track and organise data, and assess sustainability are available.
- In assessing sustainability, we need to recognise our starting point, changes that take place over time, and where we are heading.
- A systems approach is extremely beneficial in handling the complexity of economic, social and ecological relationships.
- Trade-offs have to be framed and understood in assessing sustainability.
- Further research on the development and/or application of analytical and monitoring tools is needed.
- The development of regional C&I assessment procedures for the four RMFP MFs should be considered.
- A multi-stakeholder and multi-disciplinary approach in developing partnerships and C&I for the MF is essential.
- Participatory approaches are essential for effective C&I development.
- Assessment of C&I developed at various levels by independent third parties can provide useful suggestions for improvement.
- Although the C&I and forest certification processes may share some common features, they are different initiatives.
- Whilst recognising that there are many important stakeholders in each MF, it is important to explicitly acknowledge the special role and contribution of local communities, and ensure their meaningful participation in the MF and C&I development processes.
- Building trust among all the stakeholders is critical to ensure the successful development of MFs, and of C&I for the MFs.
- It is important to acknowledge the potential contribution of community knowledge, use and management of the forest, and promote its inclusion in the C&I development process.
- Working and communicating effectively with communities requires particular skills, which forest department staff often have not been trained in.
- The C&I process is an adaptive system.
- The committee or group working on C&I need not be formal.
- Whilst indicators or measurements can change with time, their linkages with the appropriate criteria should always be clearly established.
- Conflicts of interest or priorities among partners are an important issue in the development of C&I.

Report of Workshop

The workshop also made the following recommendations/suggestions:

1. The number of indicators per criterion should be kept to a realistic number, consisting of “core” and “non-core” indicators.
2. The number of indicators per criterion should be balanced.
3. In selecting indicators, the uses and users of the indicators, and cost-effectiveness should be given proper consideration.
4. The use of existing data and related initiatives should be maximised in the development of C&I.
5. Forest departments should train their staff in the particular skills required for effective working and communicating with communities, and C&I development, and/or secure the services of specialists in these fields.
6. The special role and contribution of local communities in the sustainable management of MF should be explicitly acknowledged, and their meaningful participation in the MF and C&I development processes actively solicited.
7. Special efforts should be made to address conflicts of interest or priorities among stakeholders, and to build trust among all the stakeholders to ensure the successful development of MFs, and of C&I for the MFs.

C. Sessions 5 and 6. Preparation of draft guidelines for field level C&I for MFs

(The discussions in these sessions were aimed at providing feedback for the proposed C&I guidelines)

Session 5

Benefits and desired outcomes of C&I at the MF level (plenary discussion)

Approaches to selecting C&I at the MF level were presented and discussed. The participants listed and discussed the benefits and desired outcomes of C&I at the MF level. When carried out at the actual MFs, the list should be clustered and prioritised.

Participatory methods (mini-workshop led by Karen Edwards and Mani Ram Banjade)

Methods of facilitation were presented and discussed. A “game” was conducted involving all the participants to demonstrate various aspects of facilitating participation, including the role and possible impacts of consultation (or lack of consultation) in decision making, adjustment or adaptation of actions to accommodate the limitations of one’s partners, usefulness of “games” as an “ice-breaker”, etc. Among the methods of facilitation discussed were:

- invite participants to post their ideas on the wall;
- inviting every participant to say something in turn (“go around”), if the discussion is dominated by a few persons;
- use pictures, maps or other means to include people who cannot read and write, e.g. seasonal calendars, phases of the moon;

- construct time lines or oral histories to get people to think about past conditions;
- never make assumptions about why people do not participate – find out why;
- regroup larger groups into smaller groups with similar concerns;
- assign numbers to groups to break up into clusters;
- ensure that everyone provides input (in writing, or drawing) before the discussion begins;
- ensure that people’s inputs can be seen in the results;
- activities and games can enliven meetings, and include learning at the same time;
- create an environment in which people’s inputs are not judged;
- vary the location of meetings, e.g. in the forest;
- do “disaster” as well as “vision” scenarios;
- if stakeholders do not attend, go out and visit them; and
- use “hands-on” activities to encourage experimentation and learning from experience.

Session 6. Identification and role of partners and partnerships

The participants were divided into two groups, each of which listed the potential partners, and their expected contributions and benefits from the C&I process. The outputs were then presented and discussed in plenary. Potential partners included:

- local communities/farmers
- community organisations or associations
- forest dependent associations and businesses
- local and environmental NGOs
- forest and other government departments
- timber companies/enterprises
- academic and research institutions
- military
- tourism organisations
- bi/multi-lateral donors
- media
- youth organisations
- influential individuals (e.g. religious leaders, monks)
- other individuals

There were some differences of opinion over whether, and which, potential partners should be included (or excluded) from the C&I development process.

Report of Workshop

Among the expected benefits were:

- better living environment
- improved environment for business (tourism, NWFP)
- improved local management measures/practices
- opportunity for dialogue and networking
- improved cooperation and involvement to get work done easier
- goodwill enhanced to help set the rules, respect for leadership
- reduced policy conflicts
- assure that environmental and conservation issues are being addressed
- check and feedback on forest practices
- sustained flow of forest products and functions
- bridging knowledge gap, and improving information flow
- scientific credibility and recognition
- achieve donors' objectives
- additional resources (financial, technical, etc)
- improved security

Not all of the benefits listed above are applicable to all potential partners.

Screening of indicators

Using the C&I on Soil and Water Conservation from the ITTO and Montreal Process C&I, the process of screening the indicators was carried out. The participants agreed that the screening matrix compiled from the Canadian Model Forest Network (CMFN) experiences was more suitable for their use than the CIFOR screening matrix. Further, they also decided that out of the 11 attributes/questions in the CMFN matrix, only four need be used, i.e.

- Relevant – Does the indicator tell us something meaningful about the criterion?
- Responsive – Is it responsive to management actions?
- Measurable – Is the indicator measurable at an appropriate scale, and with sufficient accuracy to be useful?
- Cost-effective – Is there the necessary commitment to measure, monitor and report on this indicator?

However, one attribute/question from the CIFOR screening matrix may be useful, i.e.

- Important and therefore selected as “Priority”? (Yes/No).

There was insufficient time to attempt reducing the total number of indicators, and to identify a few “core” indicators. This should be done at the proposed MF level C&I workshops.

1830–1900 Meeting of national project counterparts, RMFP, FAO and FAJ

The opportunity was taken to have a short meeting of the four national project

counterparts (NPCs), RMFP CTA, FAO–China and FAJ, to discuss project matters. Among the matters discussed were the priority action to be taken by all NPCs and the RMFP in the final year of the Project, the 3rd PSC meeting and MF workshop in November in Myanmar, and the project evaluation mission in early 2002.

Wed 13 June (0730 – 1830) Field exercise (*for notes on field visits, see Annex 4*)

Visits were made to:

- a hickory forest at Tongshanxia village, Maxiao township
- 18 *Longtan* (waterfalls) Natural Forest Protection and Utilisation Project, Mt. Qingliangfeng Nature Reserve. Following the field visit, a discussion on various aspects of the development was held with the investor and township leader. After that, the participants had a short discussion about possible indicators for the eco-tourism area.

Thursday 14 June Field exercise (*for notes on field visits, see Annex 4*)

Visits were made to:

- *Linlong Forest Farm*
- *High yield Lei bamboo demonstration plantation at Qingyun Town*

Following the field visits, a discussion on the possible indicators for the areas concerned was conducted.

D. Session 7

Review and finalise guidelines for MF indicators

A draft of the guidelines prepared by the lead facilitator and the drafting committee was reviewed by the participants in a plenary session. Following discussion of various parts of the draft, decisions were made regarding their amendment or exclusion. A final draft was then prepared by the lead facilitator.

E. Session 8

Discussion and adoption of report of the workshop, including the guidelines

The Report of the Workshop, including the Guidelines for Field-level C&I for Model Forests, was discussed, amended and endorsed by the participants.

F. Session 9

Country action plans and next steps

Based on the Guidelines for Field-level C&I for Model Forests, each of the four RMFP countries prepared a proposed action plan for July 2001–May 2002. These action plans were presented, discussed, and suggestions made for consideration by the respective countries concerned. Detailed costings of the activities in the action plans will be prepared by the NPCs and their staff, and submitted to the CTA, RMFP as soon as possible (within the next two weeks) with a request for funding support.

CONCLUDING REMARKS


The participants felt that the workshop has been very useful in increasing their understanding of the C&I processes, and of the action needed to develop C&I for MFs. The contributions of all the resource persons, and their sponsoring agencies, were very useful and much appreciated. Mr. Tang, on behalf of the RMFP and the participants, thanked all the resource persons and their sponsors for their invaluable contribution, and Mr. Martin von Mirbach in particular for being an excellent and dedicated lead facilitator. He also thanked the Chinese Academy of Forestry, Lin'an Forestry Bureau and Zhejiang Forestry College for hosting and very efficiently organizing the workshop. Last, but not the least, he thanked Mr. Jiang Chunqian and his colleagues who formed the workshop secretariat, Ms. He Yiling, Mr. Xie Jialu and Mr. Liu Dan, for their very hard work during the week.

Mr. Jiang, Workshop Chairperson, thanked all the participants for their contributions to a successful workshop. On behalf of the Chinese Government and the host organisations, he thanked the RMFP and project countries for holding the workshop in Lin'an. He also thanked all the resource persons for their very effective and valuable contributions. He then closed the workshop.

Confirmed by:



Associate Professor Jiang Chunqian
Chairperson of Workshop



Date

Annex 1. Workshop programme

Sat 09 June	Arrival of participants at Lin'an. 1900 Dinner
Sun 10 June	0800 – 0830 Registration 0830 - 0900 Opening of workshop Addresses by: <ul style="list-style-type: none">- Regional Model Forest Project- Chinese Academy of Forestry- State Forestry Administration- Forestry Bureau of Zhejiang Province- Mayor of Linan City 0900 – 0930 Refreshments break 0930 – 0940 Election of workshop officials SESSION 1 0940 - 1200 0940 – 1000 Introduction of participants Aim and outputs of workshop 1000 – 1100 Introductory address: <i>Field level indicators of SFM in model forests – opportunities and challenges</i> , by Martin von Mirbach 1100 – 1200 Structure and programme of workshop Adoption of workshop programme 1200 – 1300 Lunch National and field level C&I (<i>each presentation will be allotted 45 minutes and, therefore, should focus on the key issues encountered in developing the principles, criteria and indicators for SFM, particularly at the field or operational level. A guideline/format for presentations has been sent out separately. The hard copy of the presentations, which will be distributed at the workshop and later compiled into a “workshop proceedings”, can include more detailed descriptions and discussions on your C&I work and experiences, but these details should be skipped in the presentation.</i>) SESSION 2 1300 – 1800 1300 – 1345 <i>Development of criteria and indicators for SFM in China</i> , by Dr. Jiang Zeping. 1345 – 1430 <i>Development of criteria and indicators for SFM at forest management unit level – a case study of Toungoo Forest District (Myanmar)</i> , by Associate

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- Professor Kyaw Htun.
- 1430 – 1515 *Development and application of criteria and indicators for SFM – Philippine experience*, by Mr. Adriano Nava Jr and Ms. Isabelita Austria
- 1515 – 1545 Refreshments break.
- 1545 – 1630 *Thailand's experiences on the development of criteria and indicators for SFM*, by Mr. Jira Jintanugool and Mr. Thannarin Na Nakorn.
- 1630 – 1800 Synthesis and discussion on guidelines for model forest level C&I.
- 1900 Dinner
- Mon 11 June **SESSION 3 0830 - 1200**
- 0830 – 0915 *Developing and using local level indicators of sustainable forest management: experiences from the Canadian Model Forest Network (CMFN)*, by Mr. Martin von Mirbach, CMFN representative.
- 0915 – 1000 *Developing local unit criteria and indicators – learning from failure, defining success. A management perspective*, by Ms. Phyllis Green, USDA Forest Service.
- 1000 – 1030 Refreshments break
- 1030 – 1115 *Criteria and indicator application in Japan*, by Ms. Makiko Uemoto, Forestry Agency of Japan.
- 1115 – 1200 *Development and application of criteria and indicators for sustainable forest management in Malaysia*, by Mr. Chin Yue Mun, Forestry Department, Peninsular Malaysia
- 1200 – 1300 Lunch
- SESSION 4 1300 - 1800**
- 1300 – 1345 *Developing and filtering village level criteria and indicators in Yunnan, South west China*, by Ms. Karen Edwards, RECOFTC.
- 1345 – 1430 *Criteria and indicators-based sustainable forest management – a field experience (in Nepal)*, by Mr. Mani Ram Banjade, CIFOR field researcher.
- 1430 – 1500 Briefing on group sessions
- 1500 – 1530 Refreshments break
- 1530 – 1615 Group discussions on relevance of case studies to their MF guidelines
- 1615 – 1700 Presentation of group discussion highlights

- 1700 – 1800 Synthesis and discussion on guidelines for model forest level C&I.
1900 Dinner
- Tue 12 June **Preparation of draft guidelines for field level C&I for model forests**
- SESSION 5 0830-1200**
0830 – 0845 Introduction to the objectives for the day
0845 – 0930 ANTICIPATED BENEFITS AND DESIRED OUTCOMES OF C&I AT THE MODEL FOREST LEVEL
Plenary discussion
0930 – 1030 TOOLS FOR PARTICIPATION Mini-workshop (led by Karen Edwards and Mani Ram)
1030 – 1100 Refreshments break
1100 – 1215 APPROACHES TO SELECTING CRITERIA AND INDICATORS AT THE MODEL FOREST LEVEL.
SCREENING INDICATORS
Lunch
- SESSION 6 1300-1700**
1300 – 1500 WORKING EFFECTIVELY WITH PARTNERSHIP/COLLABORATIVE APPROACHES TO C&I
1300 – 1430 Discussions in working groups
1430 – 1500 Report back to plenary
1500 – 1530 Refreshments break
1530 – 1700 DEVELOPING GUIDELINES FOR IDENTIFYING FIELD TESTING AND IMPLEMENTING MODEL FOREST LEVEL INDICATORS
Facilitated plenary discussion
Summary and guidance for Day Four
1800 – 1900 *Meeting of national project counterparts, RMFP, FAO and FAJ, other relevant staff/persons.*
1900 Dinner
- Wed 13 June 0730 – 1730 Field visits.
1900 Dinner
- Thu 14 June 0730 – 1230 Field visits.
1230 – 1330 Lunch

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SESSION 7 1330-1700

1330 – 1700 Review and finalise guidelines for model forest indicators.

1900 Dinner

Fri 15 June

SESSION 8 0800-1600

0800 – 1300 Discussion and adoption of report of workshop, including guidelines.

Country action plans and next steps (leading to presentation of progress reports at 3rd MF workshop, November 2001, Myanmar).

1300 – 1400 Lunch

Check out and leave for Hangzhou

Sat 16 June

Depart for home



Annex 2. Workshop officials

Workshop chairperson: Mr. Jiang Chunqian

Workshop Co-secretaries: Mr. Tang Hon Tat
Ms. Isabelita Austria

Workshop Secretariat: Mr. Liu Dan
Ms. He Yiling
Mr. Xie Jialu

Lead facilitator: Mr. Martin von Mirbach

	Session chairpersons:	Session rapporteurs:
Sunday 10 June		
Opening ceremony & election of officials:	Mr. Jiang Chunqian	
<i>Session 1</i> (0940-1200):	Mr. Jiang Chunqian	Mr. Tang Hon Tat
<i>Session 2</i> (1300-1800):	U Kyaw Htun	Dr. Jiang Zeping
Monday 11 June		
<i>Session 3</i> (0830-1200):	Mr. Adriano Nava Jr.	Thailand
<i>Session 4</i> (1300-1800):	Mr. Jira Jintanugool	U Kyaw Htun
Tuesday 12 June		
<i>Session 5</i> (0830-1200):	Ms. Phyllis Green	Mr. Leo Poculan
<i>Session 6</i> (1300-1700):	Ms. Karen Edwards	Mr. Mani Ram Banjade
Wednesday 13 June		
Field trip (0730-1730)	LFB/LFC/CA	Mr. Leo Poculan & Mr. Chin Yue Mun
Thursday 14 June		
0730 – 1230 Field trip	LFB/LFC/CAF	U Kyaw Htun/Thailand
1230 – 1330 Lunch		
<i>Session 7</i> (1330 - 1700):	Mr. Jiang Chunqian	Mr. Chin Yue Mun
Frisay 15 June		
<i>Session 8</i> (0800 – 1200)	Mr. Jiang Chunqian	Mr. Tang Hon Tat

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Annex 4. Notes on field visits

Wed 13 June (0730 – 1830).

Visits were made to:

- a hickory forest at Tongshanxia village, Maxiao township. Individual trees in the 124 ha of hickory forest are allocated to individual households to manage. After 4-5 years of high-yield management, output of hickory nuts has increased from 300 kg/ha to 523 kg/ha in 2000. Hickory is the main source of income for the farmers, and in 2000, it reached 1,650 yuan per capita, or 41.5% of the total per capita income of the village. The total hickory forest area in Lin'an county is about 20,000 ha (or 60% of the total hickory area in China), with a maximum output of 6,000 tons, or 70% of the total national production.
- *Eighteen Longtan* (waterfalls) Natural Forest Protection and Utilisation Project, Mt. Qingliangfeng Nature Reserve. This area lies at the eastern boundary of the Lin'an MF, near Zhechuan village, Maxiao township. Until 1999, the natural forest at the foot of 18 Longtan belonged to Zhechuan village, and the villagers used to collect timber and other products from the forest. In 1999, in order to protect the plants and wildlife, an area of 1,400 ha was incorporated into the Nature Reserve. After three years of protection, the forest condition has improved and the number of plant and animal species has increased.

After visiting the area in 1999, a Lin'an businessman decided to invest in developing the area for eco-tourism. An agreement was signed between the investor, the township and the village administration for the development. To date, a paved footpath has been built from the base of the mountain to the first of the eighteen waterfalls (about one hour walk). A hotel (80 person capacity) and four restaurants (1,000 person capacity) have been constructed at the base of the mountain, and the access road from the main road improved and maintained by the investor.

The villagers are provided with an annual subsidy of 30 yuan per ha for not collecting any forest produce within 100 metres of the scenic spot. Each of the four villages has appointed one forest guard (each paid 2,400 yuan per year by the investor) to patrol the protected area.

Development cost to-date is 6-7 million yuan, and total expected investment is 20 million yuan, within the next two years. 120,000 visitors (mainly from Hangzhou, Shanghai and other nearby cities) are expected per year, and since the end of February 2001 (3.5 months) about 40,000 tourists have visited the area. The entrance fee is 48 yuan per person per day (half rate for students), or 24 yuan per half day. 70% of the entrance fee goes to the investor, 10% to the township administration, 10% to the

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village administration, 7% for park administration, and 3% for development of the nature reserve. The investor expects to recover his investment within three years. There are five similar eco-tourism projects developed or being developed in the county.

Thursday 14 June field exercise

Visits were made to:

- *Linlong Forest Farm*

This farm was established as a collective tree farm in 1978 (pre-Reform) with a total area of 318 ha. Since 1984, forest cover in the farm area has increased from 30% to 90%, and standing volume from 2,000 m³ to 32,000 m³. The main activity of the forest farm has been to develop timber forests (200 ha from 1978-87, with 100 ha of Chinese fir). The forest farm serves as a demonstration for the farmers, and provides Chinese fir and bamboo seedlings, and technical advice free-of-charge to the farmers.

Declining timber prices and concern over the impacts of mono culture plantations on biodiversity and soil erosion, led to the farm (with supervision from the CAF, ZFC and LFB—all Lin'an MF partners) beginning to test various agro-forestry practices (e.g. Chinese fir/mao bamboo/crop, Chinese fir/broadleaf species, *Paulownia*/tea/crop, *Magnolia amobna/Actinidia chinensis* (kiwi fruit)/crops). At present, the first combination is deemed most profitable by the farmers. According to Director of the Forest Farm (Mr. Qian Huachun), the forest farm is almost self-supporting, and only receives government funds for state-implemented projects. Since the forestry reform (1979), no new collective forest farms at the township level have been established, and the emphasis has been on encouraging forest farming at the village level using a variety of approaches (industry, collective farms, private farms). The farm is a MF partner, and they hope that their involvement in the MF project will enable them to identify new, appropriate and relevant technology or systems from elsewhere.

- *High-yield Lei bamboo demonstration plantation at Qingyun Town*

In the past ten years, 10,000 ha of bamboo have been planted in Lin'an county, including 7,000 ha on barren hills, increasing forest cover from 64% to 75% of the 46 bamboo species/varieties present, only six are commercially cultivated. *Lei* bamboo has become the main income source for farmers, with a per capita contribution of 2,488 yuan. 60,000 of the 100,000 households in the county are involved in bamboo cultivation.

Concerns over the success of the bamboo cultivation include impacts of the monoculture plantations on biodiversity, increased pests, soil degradation caused by

fertiliser application, cultivation on steep land (>25 degrees slope) and resulting soil erosion. The LFB is trying to persuade farmers to plant commercial timber forests or the smaller diameter bamboo (used for producing dried bamboo shoots, which does not require as-frequent digging of the soil during harvesting) on slopes greater than 25 degrees. The RMFP is providing some support to the Lin'an MF (through the CAF, LFB, ZFC and Bamboo Association) to study some of these impacts and to develop more sustainable practices.

Annex 5. Guidelines for field-level C&I for model forests

These guidelines were developed by participants at the *Workshop on Field/Model Forest Level Criteria and Indicators for Sustainable Forest Management*, which took place in Lin'an, China from 10-15 June 2001. They are intended for use by the four model forests in the FAO/Government of Japan Regional Model Forest project.

1. Introduction

Since the early 1990s there has been a growing number of initiatives aimed at identifying C&I of sustainable forest management (SFM). These initiatives are intended to:

- provide a common understanding of what is meant by SFM;
- provide a common framework for describing, assessing and evaluating a country's progress toward sustainability at the national level;
- help provide a reference for policy-makers;
- provide a basis for international cooperation aimed at supporting SFM; and
- help clarify ongoing dialogues related to international trade in products from sustainably managed forests.

Much of the initial interest in criteria and indicators arose from a need to report both nationally and internationally on progress made towards SFM. However, it soon became apparent that the ability to demonstrate national advancement towards SFM rests largely with actions that are carried out at the field level. If these actions are to be assessed it will require indicators that are particularly suited to local needs.

A MF is a place where the best SFM practices are developed and tested at the field level. At the heart of each MF is a group of partners having different perspectives on the social, economic and environmental dynamics within their forest – perspectives that are necessary to make more informed and fair decisions about how to manage the forest.

A MF is ideally suited to develop and effectively apply widely acceptable indicators of SFM at the local level because of its broad partnership base and perspectives representing a diversity of forest values. For this reason MFs around the world have responded to the challenge of developing and implementing criteria and field-level indicators of SFM.

2. Basic elements of the MF approach to C&I

2.1 Scale

MF work on C&I will be primarily focused at the scale of each MF area. For some indicators, however, it will be necessary to use a different scale. For example, indicators of water quality may be most practical at the watershed scale, and indicators of community well-being most meaningful when applied to specific communities. In these cases, it may be more appropriate to report on case studies within the MF area rather than to try and measure the indicators across the entire MF. When using case studies, however, it should be kept in mind that the overall intent is to make SFM meaningful at the MF level. Therefore, care should be taken to balance case studies with information that is more fully representative of the MF as a whole.

2.2 Role of partners and partnerships

Partnerships are key to the success of MFs, and to the success of C&I work carried out by MFs. MF partners can make valuable contributions to C&I work at the field level in a number of significant ways:

- a) They provide perspectives to ensure that the framework of C&I encompasses the full range of forest values.
- b) They bring specific information that can assist in the identification of relevant indicators.
- c) They can assist in gathering data and in forest monitoring.
- d) They can help to communicate to the people they represent about SFM.

All MF partners should have an opportunity to be involved in selecting, refining, testing and implementing field-level C&I. MFs should also seek to form alliances with new partners that have not necessarily been involved in the past, but who have specific contributions to make.

MFs will normally use all three of the following methods for ensuring broad involvement in the C&I process, as well as other methods that they may devise:

- a) formation of a MF committee for work on C&I;
- b) holding one or more workshops or special events at which a broad range of interests are included, including ones that are not regular contributors to the model forest; and
- c) specific outreach to targeted stakeholders or sectors of society.

MFs should seek input from as broad a group as possible, and should consider inviting representatives from the following interests, which is not intended to be a definitive list:

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- Forest department
- Other governmental agencies
- Timber enterprises
- Other forest-dependent businesses
- Federations of forest-dependent associations (Philippines)
- Sub-stations of the Central Administration (Thailand)
- Collective members (China)
- Farmers
- Tourism organizations
- Local communities
- Military
- Environmental NGOs
- Students
- Youth organizations
- Academic institutions
- Religious leaders
- Influential individuals
- Donors

It is important for the MF to seek to ensure that the people who participate in the process are able to effectively represent a particular interest. Participants should be informed at the outset what their role will be in the process, both in terms of the degree of commitment expected as well as the decisions that will be taken. It may be important to specify that the MF does not in any way supplant existing legislated authority and responsibility.

In order to secure commitment from participants it is important to ensure that there is some benefit to the participant. This can include access to information, enhanced credibility and profile, participation in joint projects, access to resources, the chance to influence decision-making and the opportunity to form good working relationships with other agencies and stakeholders. While it can be helpful to offer these benefits as an incentive to encourage broad participation, care must be taken to avoid raising false expectations, and to deliver any commitments that are offered.

Finally, it will be extremely important for MFs to make sure that multistakeholder events are carried out in a way that respects and accommodates the different ways that people engage effectively in consultation processes. MFs can avail themselves of

resources to help them with participatory learning, and should especially seek to support and build on local capacity in this regard. Some of the considerations to be addressed include:

- creating a balanced environment that is not dominated by one individual or group;
- creating environments in which minority or dis-empowered interests feel comfortable about participating;
- accounting for cultural and gender differences; and
- recognizing and accounting for different learning styles.

MFs are encouraged to be innovative in how they conduct meetings, allowing for flexibility in meeting format, timing and location. Games and other active exercises can help to vary the pace of meetings, and provide opportunities for participants to discuss and reflect on the process itself.

2.3 Role of networking and information-sharing

The strength of MFs lies in the strengths of their partnerships, and in their relationships with other collaborators. MFs should seek to expand and build upon these formal and informal networks wherever possible. Where there are existing initiatives that are relevant to C&I MFs should strive to collaborate with and add value to these initiatives.

In particular, MFs should collaborate closely with national level C&I initiatives. MFs can benefit from the information, experience and knowledge gained as a result of national-level initiatives, and by associating with national initiatives can achieve greater profile and credibility. At the same time, national initiatives can benefit greatly by collaborating with MF C&I initiatives, since these field-level activities can result in valuable information and case studies relevant at the national level. As well, MFs can serve as test sites to explore methods and approaches that can be applied more broadly.

MFs should also seek to work with local level or community-based initiatives that are relevant to C&I, such as community-based assessment, objective-setting and forest monitoring programs.

MFs are in an ideal situation to knit together the insights and experience gained through community-based (bottom up) approaches with the information and benefits that result from national level (top down) initiatives.

3. Outcomes and desired impacts

Although there is a general appreciation within the forestry community of the significance of C&I as a tool to measure progress towards SFM it is important as well for MFs and MF partnerships to be clear about their specific interests in C&I. This is because experience in other MFs has shown that there are many possible applications for C&I, but that the appropriate approach to C&I development will be influenced by the intended application. As well, MF partnership members will in many cases not be familiar with the concept of C&I, and a discussion of desired outcomes or benefits can be a useful way for model forest partnership committees to understand and support the concept.

Possible benefits or long-term impacts of C&I in MFs might include the following:

Improved management planning

- Framework to ensure that the full range of values is addressed
- Framework to set baselines and targets
- Improved on-the-ground practices
- Ability to set priorities for further actions
- Prioritization of needs for resources

Review, assessment and analysis

- Tool to link actual performance with stated goals and objectives
- Assessment of the benefits that forests provide to people
- Structured way of examining activities
- Tool for self-assessment
- Identify gaps in information
- Tool for adaptive management

Consistency, comparability and comprehensiveness

- An objective perspective that includes in its scope the full range of forest values
- A common language; a shared framework
- Ability for stakeholders to see how they are contributing to national goals
- Comparability to internationally credible standards
- Identify commonalities among model forests, as well as their uniqueness

Accountability

- Link actual performance with stated goals and objectives

- Increased transparency
- A framework for healthy debate

Capacity building

- Strengthened visibility and profile for model forests
- Communication to the public about SFM
- Enhanced collaboration and learning from others

Planning for the future

- Set priorities for future action
- Identify priorities for financial resources and assistance needs
- Set priorities for research efforts
- Design specific activities to promote community well-being

Enhanced well-being

- Ensure healthy ecosystems
- Promote social benefits and community well-being
- Generate economic benefits

At an early stage in the C&I process the MF should call on its partnership to discuss the potential benefits of C&I. One way to do this is to gather as many ideas as possible about the potential benefits of C&I (such as in a brainstorming exercise) and then to prioritize them. At the end of this exercise the MF should have a clear statement of intent about why it is working with C&I, and a clear focus for its work. This statement of intent will help to focus and guide C&I activities.

Statements of intent that can be derived from the efforts of other MFs include the following:

- C&I will be used by the MF and its partners to guide forest management planning.
- The MF will use C&I to monitor the implementation, success and impacts of its projects.
- The MF will use C&I to measure and report on the overall state of forest health and SFM in the MF area.
- The MF will use C&I to communicate to the public about what SFM means and its relevance in the MF area.
- The MF will use C&I to measure and record the success of its partnership.

It is important that the statement of intent be strongly supported by all partners, so as to ensure that there is a high degree of commitment to the C&I initiative. The statement can be used to help develop specific work plans, and will also influence the selection of appropriate indicators. For example, if the primary intent is to guide forest management planning then the indicators will be directly related to management actions, but if the intent is to communicate about SFM then the best indicators to use will be the ones that are most meaningful to the chosen audience.

4. Principle tasks in developing and refining indicators for MFs

4.1 Adopting a framework of criteria

Criteria are important because they outline the broad categories of issues that are included in the concept of SFM, linking ecological, social and economic considerations in a single framework. MFs will use as a starting point the criteria that have been adopted (or provisionally accepted) for use at the national level, which are generally adapted from internationally recognized ITTO or Montreal Process frameworks. These criteria will in many cases need to be modified slightly in order to make them more relevant at the model forest level, but it is important to show where the linkages exist. If, for example, a model forest decides to delete one of the national criteria or to reword it substantially, then the model forest should demonstrate how the issues addressed under the deleted or altered criterion are being addressed in the new framework.

4.2 Assembling an initial set of indicators

When beginning the indicator selection process it is usually better to be inclusive, and to start with a long list of indicators. This increases the likelihood of capturing suggestions for indicators that will be most useful at the model forest level. Any or all of the following three approaches can be used:

- a) National indicators. It can be useful to consider the national indicators developed for both the ITTO and the Montreal Process frameworks, regardless of which particular framework has been adopted as the national framework. Both frameworks have distinctive approaches to the selection of indicators. However, many national-level indicators may not be relevant or practical at the model forest scale.
- b) Other indicators. There are a number of sets of indicators that have been identified as relevant at the sub-national scale, including indicator sets developed for other model forests and examples such as the CIFOR generic template of indicators. There will be many useful indicators included in these lists.
- c) Model forests can choose to solicit suggestions for indicators directly from their partnership members. This can, for example, be done in a workshop format,

when participants agree on a set of values or goals pertaining to each criterion, and are then asked to suggest ways to measure the extent to which that value or goal is being achieved. For example, under the criterion ‘Soil and water’ a group of workshop participants might agree on the following goal: ‘Ensure the continuous supply of safe drinking water.’ The indicator to measure whether this goal is being achieved might be the degree of protection from logging activities in critical headwaters.

4.3 Refining and screening indicators

It will always be necessary to reduce the number of indicators, and this is best done through a screening process that assesses each indicator according to a number of factors. Model forests can do this by assembling a master list of indicators resulting from step 4.2 above, and then assessing each indicator according to several factors. The sample set of questions below has been adapted from work done by the Canadian Model Forest Network and CIFOR:

1. **Understandable:** Is the indicator readily understandable to the appropriate audience?
2. **Relevant:** Does the indicator tell us something meaningful about the criterion?
3. **Responsive:** Is it responsive to management actions, and will it show trends over time?
4. **Measurable:** Is the indicator measurable at an appropriate scale, and with sufficient accuracy to be useful?
5. **Cost-effective:** Is the cost of measuring this indicator justified by the value of the information it provides?
6. **Critical:** Does the indicator provide insight into an important issue of concern, and is therefore a priority for the model forest?

These questions can be answered with a yes/no or a simple scoring method. It will be possible to eliminate a great many indicators as a result of this screening process, but any scoring system has biases in it and should not be relied upon to produce a comprehensive final set of indicators. The screening process can produce a “short list” of indicators, which will then need to be discussed and refined further. In many cases model forests will choose to begin their data collection efforts on an even smaller core set. In this case there should be efforts made to ensure that the core set reflects the full range of criteria, even if only in a preliminary manner.

4.4 Gathering data and assessing the feasibility of indicators

No matter how carefully the indicators have been screened in the selection process described in Section 4.3 there will almost always be unforeseen difficulties in getting reliable information on certain indicators. That’s why the phase of data gathering includes provision for further refinement of the indicators.

Report of Workshop

Data gathering can refer to new data collection (such as through field monitoring programs) or simply getting access to existing data. Existing data has the significant advantage of being considerably cheaper to compile compared with gathering new data, especially field data. As well, existing data often includes historical records, making it possible to show long-term trends.

Attached as an appendix to these guidelines is a sample checklist for data requirements. This checklist is normally filled out when the refined set of indicators has been agreed to, and it requires people to consider technical aspects of the indicator (how it will be measured, its accuracy, etc) as well as to identify roles and responsibilities for data collection.

Model forests should also consider innovative ways to gather data, such as establishing volunteer citizen's monitoring programs. These can be cost-effective and very informative.

4.5 Evaluating and interpreting data

In order for data to become meaningful it must be evaluated and interpreted. There is no single way to do this, since it depends on the indicators, the data obtained and the purpose of collecting the data in the first place. Quantitative data can be analyzed in detail, and can be given a numerical rating and compared with other scores. Qualitative or descriptive information, on the other hand, can be interpreted more generally, as telling part of the "story" of SFM.

5. Action Plan for C&I development, July 2001-July 200

Each model forest will prepare and implement an action plan for carrying out the steps described above, using the following format and common outputs:

Activity	Schedule	Person/group responsible	Expected output	Resources needed	Source of assistance
			Statement of intent (deadline Oct 31/01)		
			Refined set of indicators (deadline Oct 31/01)		
			Action plan for gathering data (deadline Oct 31/01)		
			First status report on core indicators (deadline May 31/02)		
			First report on implementation of C&I (deadline May 31/02)		
			Draft 2002/03 Workplan (deadline May 31/02)		

Adopted by unanimous support of the participants at the Workshop on Field/ Model Forest Level Criteria and Indicators for Sustainable Forest Management, Lin'an, China, June 15, 2001, 9:15am.

Sample checklist for data requirements

1. General information	
Higher-order information	<i>criterion, critical element, etc, that the indicator relates to</i>
Indicator	
Unit of measure	<i>If the indicator is not already expressed in this way</i>
Description	<i>simple description of why the indicator is relevant/important</i>
2. Relationship to management planning	
Value or goal	<i>value or goal associated with the indicator</i>
Objective or target	<i>objective, target, threshold, range, etc</i>
Policy requirements	<i>policies, legislation or regulations that relate to the indicator</i>
3. Measurement and monitoring protocols	
Scale	<i>the scale that is most appropriate to that indicator</i>
Interval	<i>the frequency with which the information will be gathered and updated</i>
precision required	<i>degree of precision required</i>
Sampling protocol	<i>How the data is to be gathered (sample plots, survey returns, etc)</i>
4. Data specifications	
Location	<i>agency that has the data</i>
Format	<i>technical specifications if computerized</i>
Availability	<i>note any restrictions</i>
Reliability	<i>note any gaps or inconsistencies</i>
Progress to date	<i>include current status</i>
Baseline	<i>any baseline measurements that are available</i>
Research needs	<i>note work that needs to be done to address inadequacies</i>
5. Responsibilities	
Lead person or agency	<i>responsible for ensuring that the data is acquired in a usable format</i>
Project leader	<i>for field work; this person may be different from the above</i>
Data management	<i>agency responsible for data storage on an ongoing basis</i>
Cost	<i>direct and in-kind; labour, equipment and other</i>
Agency(ies) to bear or share costs	

PART 2. PRESENTATIONS

**Field-level indicators of sustainable forest management
for Model Forests - opportunities and challenges**

by

Martin von Mirbach
Canadian Model Forest Network

Field-level indicators for MFs

<p>1</p> <p>Field-level indicators of sustainable forest management for Model Forests: opportunities and challenges</p>	<p>2</p> <p><i>Two things we know ...</i></p> <ol style="list-style-type: none"> 1. C&I are recognized at national and international levels as increasingly important tools to measure progress towards SFM. 2. MFs are founded upon partnerships of diverse interests working towards implementing practical approaches to SFM.
<p>3</p> <p><i>Our challenges ...</i></p> <ol style="list-style-type: none"> 1. Make C&I locally relevant and applicable <ul style="list-style-type: none"> ● Apply C&I processes to MFs 2. Use partnership approaches to strengthen approaches to SFM using field-level indicators <ul style="list-style-type: none"> ● Apply MF forest processes to C&I 	<p>4</p> <p><i>Making C&I locally relevant</i></p> <p>Potential benefits of field-level C&I:</p> <ul style="list-style-type: none"> ● Monitor the effectiveness of forest management plans ● Improve knowledge of SFM ● Show respect for diverse interests and values ● Assist in meeting forest certification requirements ● Improve public appreciation for SFM ● Contribute to national-level C&I reports
<p>5</p> <p><i>However ...</i></p> <ul style="list-style-type: none"> ● All of these benefits are possible, <i>but they cannot be achieved equally effectively with one single approach to C&I</i> 	<p>6</p> <p><i>Different outcomes ... different needs</i></p> <ul style="list-style-type: none"> ● Monitor the effectiveness of forest management plans <ul style="list-style-type: none"> ➢ <i>Indicators clearly related to management actions</i> ● Improve knowledge about SFM <ul style="list-style-type: none"> ➢ <i>Indicators that address key questions</i> ● Show respect for diverse interests and values <ul style="list-style-type: none"> ➢ <i>Indicators that have support from stakeholders</i>

<p>7</p> <p><i>Different outcomes ... different needs</i> (cont.)</p> <ul style="list-style-type: none"> ● Forest certification <ul style="list-style-type: none"> ➢ <i>Indicators that meet certification requirements</i> ● Improve public appreciation for SFM <ul style="list-style-type: none"> ➢ <i>Indicators that are relevant and understandable</i> ● Contribute to national C&I reports <ul style="list-style-type: none"> ➢ <i>Consistency with national frameworks</i> 	<p>8</p> <p><i>Therefore ...</i></p> <ul style="list-style-type: none"> ● Choices need to be made ● Priorities need to be determined ● Partners will have differing views about priorities ● Conflicts are inevitable
<p>9</p> <p><i>Bottom up or top down?</i></p> <p>Which approach is better?</p>	<p>10</p> <p><i>CIFOR Principles</i></p> <ol style="list-style-type: none"> 1. Community well-being is assured 2. People's well-being is assured 3. Forest landscape health is assured 4. The external environment is supportive of sustainable community forest management
<p>11</p> <p><i>ITTO Criteria</i></p> <ol style="list-style-type: none"> 1. Enabling conditions for SFM 2. Forest resource security 3. Forest ecosystem health and condition 4. Flow of forest produce 5. Biological diversity 6. Soil and water 7. Economic, social and cultural aspects 	<p>12</p> <p><i>Montreal Process Criteria</i></p> <ol style="list-style-type: none"> 1. Conservation of biological diversity 2. Forest ecosystem productive capacity 3. Forest ecosystem health and vitality 4. Conservation of soil and water resources 5. Forest contribution to global carbon cycles 6. Provision of multiple socio-economic benefits 7. Legal and institutional framework

Field-level indicators for MFs

<p>13</p> <p><i>Top down vs. bottom up</i></p> <ul style="list-style-type: none"> ● Bottom up <ul style="list-style-type: none"> ➢ Community support ➢ Greater local relevance ● Top down <ul style="list-style-type: none"> ➢ Consistency ➢ International credibility <p>Challenge is to combine the strengths of both approaches MFs are ideally situated to do this</p>	<p>14</p> <p><i>The need for interdisciplinary methods and approaches</i></p> <ul style="list-style-type: none"> ● Technical expertise needed: <ul style="list-style-type: none"> ➢ Forestry, soils and hydrology ➢ Biology, botany and wildlife management ➢ Social sciences and economics ● Other knowledge required: <ul style="list-style-type: none"> ➢ Traditional forest-related knowledge ➢ Public opinions, attitudes, views and beliefs <p>MF partnerships are an ideal forum for interdisciplinary collaboration</p>
<p>15</p> <p><i>Using partnership approaches for C&I</i></p> <p>Always try to:</p> <ul style="list-style-type: none"> ● Use partnership relationships to support work on field-level indicators ● Ensure that C&I initiatives provide tangible benefits to partners 	<p>16</p> <p><i>Reasons for participatory approaches</i></p> <ol style="list-style-type: none"> 1. Affected interests have a <i>right</i> to be meaningfully involved 2. Diverse interests have valuable information (a <i>better</i> plan) 3. Up-front involvement improves the credibility and <i>political acceptability</i> of the plan 4. Generates increased interest, awareness and commitment (<i>greater impact</i>)
<p>17</p> <p><i>Symptoms of ineffective participation</i></p> <ul style="list-style-type: none"> ● Participants not invited ● Participants invited, but don't attend ● Participants attend and lose interest ● Participants attend but don't participate ● Participants participate, but are not effective <ul style="list-style-type: none"> ➢ Not constructive ➢ Not representative of a broader interest 	<p>18</p> <p><i>Barriers to effective participation</i></p> <p>Practical barriers</p> <ul style="list-style-type: none"> ● People are already stretched to the limit ● Inadequate resources ● Inadequate skills <p>Communications barriers</p> <ul style="list-style-type: none"> ● Technical jargon ● Cultural barriers

<p>19</p> <p><i>Understanding the tensions between different interests</i></p> <ul style="list-style-type: none">● Governmental agencies● Economic interests● Scientific/academic interests● Non-Governmental Organizations● Communities	<p>20</p> <p><i>Conclusions</i></p> <ul style="list-style-type: none">● All interests are valid● All interests should be incorporated in C&I work● No single tool will meet the needs of all interests<ul style="list-style-type: none">➢ Set priorities➢ Adopt multiple approaches
<p>21</p> <p><i>Conclusions (cont.)</i></p> <ul style="list-style-type: none">● Understand your audience<ul style="list-style-type: none">Who will use what you do?What will they do with it?What impact do you hope they'll have?● Build the right tools● Keep it simple	

Development of criteria and indicators for sustainable forest management in China

by

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1. Introduction

The forestry industry in China is facing the difficult task of finding a balance between environmental improvement and maintaining forest production at levels that satisfy the forest product and services needs of its large and increasing population. Combined with inadequate forest resources and lower and worsening comparative benefits of forestry, SFM is the only solution.

The development of C&I for forest protection and sustainable management is an important step in the implementation of the *Forestry Action Plan for China's Agenda 21*, the blueprint for China's forest industry towards the twenty-first century. It is essential to formulate China's C&I on the basis of its specific conditions. Thus, whilst there are nine regional C&I processes underway worldwide, including the Montreal and Helsinki processes and C&I developed by the ITTO, China established a research group in 1995 to develop C&I for SFM specifically in China. Under the leadership of the State Forestry Administration, the formulation of C&I was put into effect by the Sustainable Forestry Research Centre of the CAF. With the involvement of experts from various fields, a provisional *Framework for C&I for Protection and Sustainable Management of China's Forests* was developed (see **Annex 1**), and is now undergoing testing.

Since 1997, the identification and testing of C&I at the sub-national level has been conducted in three typical forestry zones, i.e. Yichun of Heilongjiang Province, Zhangye of Gansu Province, and Fenyi of Jiangxi Province, representative of the northeastern State forestry zone, northwest dryland forestry zone, and south collective forestry zone, respectively. Testing of the C&I is also funded by the UNDP Project *Capacity Building, Research and Extension for Sustainable Forest Management* and a number of experts, both national and international, have been involved in the activities.

To enable better reporting of indicators, it is important to encourage both formal and informal bilateral and multilateral activities and cooperation, amongst interested countries. Such cooperation will assist in overcoming problems such as a lack of common definitions of some key forest management terms and concepts for forest resource assessment; and inadequate knowledge and techniques. China will be interested in activities such as co-operative research projects and information exchange.

2. SFM C&I at the national level in China

The formulation of C&I in China, following the three principles of being unanimous, feasible and operational, is required to meet specific Chinese conditions, while keeping track with international trends in C&I development (mainly the C&I framework adopted by the Montreal Process). The overall national level focus is mainly on the process of developing C&I definitions, taking account of the wide differences in population density, social and economic status and natural setting, forest types, quality and quantity of forest resources, and management levels in the various areas in China. The implementation, monitoring, testing and data collection tools of indicators should be based on the specific conditions in the various areas.

There are 8 criteria and 65 indicators in the *Framework for C&I for Protection and Sustainable Management of China's Forests* (see **Table 1**). Of the 65 indicators, 18 are ready to be implemented, 35 require some research and development, and 12 require long-term research and development. The Framework indicates the urgency of developing techniques and means for identification of indicators, testing and data collection.

Table 1. China's framework for SFM C&I, and comparison to the Montreal Process

Criterion	China's Framework				MP Indicators	
	Specifications	No. of indicator				
		Total	Type*			
		A	B	C		
1. Biological diversity	Conspicuous contradiction	11	5	4	2	9
1.1 Ecosystem	between protection and development	6				5
1.2 Species		2				2
1.3 Genetics	Vast man-made forests, with mono-silviculture Common fragmentation of forests	3				2
2. Productive capacity	Productive capacity should be maintained than increased Inadequate background data except for timber Severe human disturbance to forests, such as illegal cutting, over-grazing, etc.	8	4	3	1	5
3. Health and vitality	Focuses on forest fire, diseases & pests, and air pollution	5	0	3	2	3

Development of C&I for SFM in China

4. Soil and water	Common shifting cultivation on steep slope, severe soil degradation in plantations, inadequate fresh water resources, inefficient protection of forest under vegetation and litter	10	2	3	5	8
5. Carbon cycles	Inadequate knowledge and lack of relevant data	5	1	2	2	3
6. Multiple benefits	Indicator 6.1 includes	11	1	10	0	19
6.1 Growing and consumption	employment	5				10
6.2 Investment in forestry	Indicator 6.3 includes	3				4
6.3 Creation and culture, etc	social benefits	3				5
7. Legal and policy	Focuses on forest ownership, public	12	4	8	0	12
7.1 Legislation	involvement, human skills,	3				5
7.2 Policy	and compensation of forest	6				5
7.3 Economic framework	ecological functions	3				2
8. Information and technology		3	1	2	0	8
8.1 Measurement and monitoring		1				3
8.2 Research and development		2				5
TOTAL		65	18	35	12	67

* Indicator type: *A*-implementation now; *B*-requiring some R&D; *C*-requiring long-term R&D.

Note: Criterion 7 in the Montreal Process is divided into Criterias 7-8 in China's Framework.

Four problems have been identified in China's framework for SFM C&I:

- Some indicators need to be well defined, some are too general, such as Indicator 6.1.3.
- Some indicators need to be combined based on the relevance among indicators.
- Some terms are difficult to apply, such as the 'significantly deviated from historic range of variation' in Indicators 3.3 and 4.4; five or ten years instead may be more applicable.
- Lack of techniques and means for monitoring and testing of indicators.

A simple comparison between the Montreal Process and China's C&I framework shows that:

- a) Their C&I structures are quite similar, with 51 indicators shared by the two frameworks. However, only 7 indicators from criterias 6-7 in the Montreal Process are not included in China's framework, while there are 13 additional indicators.

- b) Criterion 7 in the Montreal Process is divided into Criteria 7 and 8 within China's framework, because some indicators belong to social science while others to technology.
- c) Indicators 6.5 (employment) and 6.3 (social benefits) in the Montreal Process are included in Indicator 6.1 and 6.3 in China's framework respectively.
- d) There are more indicators for soil and water conservation and investment of forestry in China's framework, while more for multiple benefits in the Montreal Process.

3. SFM C&I at the sub-national level in China

China has developed its sub-national C&I at two levels, i.e. the regional and FMU level. A FMU occupies a geographical area from a forest farm to compartment. However, there are different opinions on how to define a region, for example, some propose that a region is basically a watershed, while others suggest that it is an administrative unit. It is realistic that C&I at the regional level be developed on the basis of forest zones defined by the most recently up-dated *Forestry Zones in China* (refer to **Box 1**).

Box 1. Forest management goal in individual forestry zones in China

- 1) The North-east Forestry Zone is located in the north-eastern region. Forests are managed to provide environmental services as well as wood production.
- 2) The Three-North Dryland Forestry Zone is located in the dry areas in the north-western, central-northern, and north-eastern regions. Forest resources are mostly man-made, and managed mainly for windbreak and sand fixation, with a concern for regular fuelwood supply and water conservation in mountainous natural forests.
- 3) The Plain Farmland Forestry Zone is located in farmland areas mainly in the north-west and central-north Plains. Forest resources are mostly man-made and managed mainly for windbreak and shelter purposes for farmland, with a concern for the landscape and supply of fuelwood.
- 4) The Coastal Forestry Zone is located in the coastal provinces. Forest management is focused on the windbreak and landscape, as well as on the rehabilitation of salt lands.
- 5) The Upper and Middle Yangtze River Forestry Zone. Forests are mainly managed for water and soil conservation, as well as other environmental services.
- 6) The Eleven South Provinces Forestry Zone is located in sub-tropical China. Forests, with a high proportion of plantations and economically important trees, are mostly collective-owned, and are managed for the supply of wood/non-wood products, as well as for providing environmental and social services.

- 7) The South-west Sub-alpine Forestry Zone is mainly located in Sichuan and Yunnan Provinces. Forests are natural and will be managed as much as possible for the supply of wood products, under the assurance of ecological safety of the ecosystem, as well as for environmental protection.
- 8) The Hainan and South Islands Forestry Zone is located in tropical China. Forests are managed for the supply of forest products and soil and water conservation.
- 9) The Tibet No-forests Zone. Practices focus on combating desertification. Restoration of ecosystems is mainly through establishment of shrubs.

China is a vast country with a rich diversity of forests. Therefore, the C&I at the sub-national level should be specific to the local situation, deleting or adding indicators accordingly, from within the national framework. Indicators which are not measurable at the sub-national levels, should be deleted, although they are important at the national level. For example, forest contribution to the global climate has no significance at a small scale. Furthermore, to make an effective evaluation of C&I at the national level, it is necessary to weigh each indicator at the sub-national level according to the local objectives of forest management.

The draft C&I at the regional level developed for the three typical forestry zones are very similar to those at the national level, with each having 8 criteria (**refer to Tables 2, 3 and 4 and Annexes 2-4**). There are 77 indicators defined for Yichun with concern for the maintenance of forest productivity, 68 for Zhangye with concerns for environmental and social issues and forest types (soil and water conservation, farmland shelterbelt, and tree crop plantation), and 60 for Fenyi with attention to forest ownership, plantations and tree crops.

There are eight typical sites selected from the demonstration forest network (**see Table 5**), for testing of indicators at the FMU level, including a feasibility study of C&I and revision of indicators. Most FMU indicators are developed within Criterias 1-4.

4. Demonstration forest network

Six trends can be identified in the country's forest management strategies:

- i) Conservation of biodiversity gets high priority in forest management practices.
- ii) Man-made forests will become the most important sources of timber production.
- iii) Natural forests will be protected, especially those in the upper and middle reaches of rivers and watersheds.
- iv) The production basis for timber will move from the temperate north-eastern

Table 2. Indicators at the regional level (sub-national) in three typical forest zones

Criterion	National level indicators	Sub-national level		
		Fenyi Jiangxi	Zhangye Gansu	Yichun Heilongjiang
C1. Biodiversity	11	11	13	9
1.1 Ecosystem	6	6	9	4
1.2 Species	2	3	2	2
1.3 Genetics	3	2	2	3
C2. Productivity	8	9	8	12
C3. Health and vitality	5	3	8	3
C4. Soil and water	10	11	8	8
C5. Carbon cycles	5	3	4	5
C6. Multiple benefits	11	9	10	14
6.1 Growing and consumption	5	4	7	9
6.2 Investment of forestry	3	4	2	3
6.3 Recreation, culture, social etc.	3	1	1	2
C7. Legal and policy	12	10	10	18
7.1 Legislation	3	3	3	8
7.2 Policy	6	3	3	6
7.3 Economic framework	3	4	4	4
C8. Information and technology	3	4	7	8
8.1 Measurement and monitoring	1	1	3	3
8.2 Research and development	2	3	4	5
Total	65	60	68	77

Table 3. Comparison between regional indicators and the national framework

Criterion		C1	C2	C3	C4	C5	C6	C7	C8	Total
Jiangxi	Indicators shared	6	3	4	8	4	6	9	2	44
	% national total	55.0	63.0	80.0	80.0	80.0	55.0	75.0	67.0	68.0
Gansu	Indicators shared	6	3	4	4	4	5	9	3	38
	% national total	55.0	38.0	80.0	40.0	80.0	45.0	75.0	100	58.0
Heilongjiang	Indicators shared	7	8	3	7	4	10	8	3	51
	% national total	64.0	100	60.0	70.0	80.0	91.0	67.0	100	78.0

Table 4. Indicators at FMU level in three typical forest zones

Criterion	C1	C2	C3	C4	C5	C6	C7	C8	Total
Xishui, Zhangye, Gansu	8	3	2	5	3	4	3	0	28
Dagangshan, Fenyi, Jiangxi	10	5	4	8	3	8	9	0	47
Fenlin, Yichun, Heilongjiang	8	10	1	4	1	7	7	0	38

Development of C&I for SFM in China

Table 5. Demonstration forest network for SFM in China

Forest Zone	Location	Years	Issues focused
1. NE State For. Zone	Yichun, Heilongjiang	1997-	Protection of natural forest
	Mulin, Heilongjiang	1997-	Development of large state forest bureaus
2. Three-North Dryland. For. Zone	Zhangye, Gansu	1997-	Management of water conservation forest
	Pingshan, Hebei	1997-	Sustainable mountainous development
3. Plain Farmland For. Zone	/	/	/
Collective for. zones, incl. 4. Eleven S.P. For. Zone 5. U&M Yangtze For. Zone 6. Coastal For. Zone	Fenyi, Jiangxi	1997-	Collective-owned forest management
	Tonggu, Jiangxi	1997-	
	Lin'an, Zhejiang	1998-	Plantation management Sustainable mountainous development Forestry and forest industry
	Zhanjiang, Guangdong	1997-	
7. NW Sub-alpine For. Zone	/	/	/
8. Tropical For. Zone	/	/	/
9. Tibet No-forest Zone	/	/	/

region to the sub-tropical southern provinces, although the exploitation of forests in the south-west region will be speeded up with assurance of the environmental safety of the region.

- v) Shelterbelt systems focusing on soil and water conservation will continue to be strengthened, especially those in the vast arid and semi-arid areas, farmland areas in the plains, and coastal zones.
- vi) Non-wood products will be placed on the forest management agenda.

China is one of earliest countries involved in capacity building, research and extension for SFM in the world. Since 1997, a demonstration forest network for SFM has functioned, consisting of eight sample sites located in Heilongjiang, Hebei, Gansu, Jiangxi, Zhejiang, and Guangdong Provinces. Most recently, the Lin'an site in Zhejiang has become part of the International Model Forest Network for SFM initiated by Canada.

The aim of the demonstration forest network is to find a way to achieve sustainable forestry development by conducting relevant research, technique improvements,

and extension. At present, a model SFM plan has been developed for each site through investigation, analysis, and discussion. The identification and testing of C&I at the sub-national level has been conducted by the network as mentioned above. Meanwhile, extensive technical training has also been carried out at various levels.

5. Future cooperation with other countries

Major fields for future cooperation, including:

- Development of C&I at the sub-national level for SFM.
- Monitoring and evaluation of the C&I, including the system of information collection, analysis and exchange.
- Forest ecosystem characteristics, function and accounting systems, and methodologies to measure and integrate forest costs and benefits.
- Theory and technology for establishment and management of protective forest, especially for combating desertification, natural forest protection, and biodiversity conservation.
- Theory and technology for SFM, including the forest ecosystem management and participatory forest management.
- Establishment of regional integrated research, information network, and training.
- Evaluation and application of traditional knowledge on forestry.
- Priority projects recommended for future cooperation.
- Personnel training, scientific and technological exchanges and cooperations between China and other interested countries.
- Research on SFM in temperate, subtropical and arid/semi-arid regions.
- Establishment of a research, development and training centre on SFM for Asia.

6. Recommendations

1. Effort should be made amongst countries to develop common definitions of key terms and concepts of forest management and forest resource assessment.
2. Research and information exchanges are necessary among countries because of inadequate knowledge and techniques for SFM C&I.
3. For better reporting of indicators, it is necessary to encourage bilateral or multilateral activities or cooperation, both informal and formal, among countries.
4. It is essential to promote communication among countries by utilizing information technology.
5. Capacity building is an important issue for SFM. It is suggested research, development, and training centres could be established at a regional level. China

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will be interested in being involved in those activities, such as research projects, information and personnel exchanges.

6. Traditional knowledge is important to SFM, and should be documented, summarized, evaluated, and utilized. China has accumulated a wealth of traditional knowledge, and is willing to further cooperate with other countries based on equality and mutual benefit.
 7. Establishment of a fund on research and development, to promote research on SFM and personnel training.
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Annex 1
Provisional framework for C&I for protection and
sustainable management of China's forests

Indicator type: A-implementation now; B-requiring some R&D; C-requiring long-term R&D

China's framework			MP
Ref.	Indicators	Types	Ref.
1	Conservation of biological diversity		1
1.1	Ecosystem diversity		1.1
1.1.1	Extent of area by forest types relative to total forest area	A	1.1.a
1.1.2	Extent of area by forest type and by age class or successional stage	A	1.1.b
1.1.3	Area and percent of plantation by broadleaved species and conifer species	A	NA
1.1.4	Extent of area by forest type in protected area categories as defined by IUCN or other classification systems	B	1.1.c
1.1.5	Extent of area by forest type in protected area categories and by age class or successional stage	B	1.1.d
1.1.6	Fragmentation of forest types	C	1.1.e
1.2	Species diversity		
1.2.1	Number of forest dependent species	B	1.2.a
1.2.2	Status of forest dependent species at risk of not maintaining viable breeding populations, as determined by legislation or scientific assessment	A	1.2.b
1.3	Genetic diversity		1.3
1.3.1	Number of forest dependent species that occupy a small portion of their former range	B	1.3.a
1.3.2	Population levels of representative species from diverse habitats monitored across their range	C	1.3.b
1.3.3	Number of species which has been conserved by <i>ex situ</i> or <i>in situ</i> method	A	NA
2	Maintenance of the productive capacity of forest ecosystems		2
2.1	Area of forest land and net area of forest land available for timber production	A	2.a
2.2	Area and total growing stock of different forest type	A	NA
2.3	Ratio of different types of forest land in total forest land	A	NA
2.4	Total growing stock of forests for timber	B	2.b
2.5	Area and growing stock of plantations	B	2.c
2.6	Distribution of area and stock of forest for wood by age-class	B	NA
2.7	Annual removal of forest for timber should not exceed the annual growth of forests	A	cf. 2.d
cf.2.7	Annual removal of wood products compared to the volume determined to be sustainable	/	2.d
2.8	Annual removal of non-timber forest products (fur-bearers, berries, mushroom, game), compared to the levels determined to be sustainable	C	2.e

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3	Maintenance of forest ecosystem health and vitality		3
3.1	Area and percent of forest affected by process or agents beyond the range of historic variation	B	3.a
3.2	Area and percent of forest land subject to air pollution	C	cf. 3.b
cf 3.2	Area and percent of forest land subject to levels of specific air pollutants or ultraviolet B that may cause negative impacts on the forest ecosystem	/	3.b
3.3	Area and percent of forest land with diminished biological components indicative of changes in fundamental ecological process and/or ecological continuity	C	3.c
3.4	Enhancement of ability to predict impacts of human intervention on forests	B	7.5.d
3.5	Ability to predict impacts on forests of possible climate change	B	7.5.e
4	Conservation and maintenance of soil and water resources		4
4.1	Area and percent of forest land with significant soil erosion	B	4.a
4.2	Area and percent of cultivated land on slopes over 25 degrees which has been turned back into forest land	A	NA
4.3	Area and percent of forest land managed primarily for protective functions	A	4.b
4.4	Percent of stream kilometres in forested catchments in which stream flow and timing has significantly deviated from the historic range of variation	C	4.c
4.5	Percent of water bodies in forest areas with significant variance of biological diversity or physical and chemical properties from historic range of variability	C	4.f + 4.g
cf 4.5	Percent of water bodies in forest areas with significant variance of biological diversity from historic range of variability	/	4.f
cf 4.5	Percent of water bodies in forest areas with significant variance from historic range of variability in pH, dissolved oxygen, levels of chemical, sedimentation or temperate change	/	4.g
4.6	Controlled area and percentage of areas with soil and water losses by intensity	B	NA
4.7	Area and percent of man-made forest which has a serious degrading site index	C	cf. 4.d & 4.e
cf 4.7	Area and percent of forest land with significantly diminished soil organic matter and/or changes in other soil chemical properties	/	4.d

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cf 4.7	Area and percent of forest land with significant compaction or changes in soil physical properties resulting from human activities	/	4e
4.8	Area and percent of cultivated land/managed forest land on slope on which maintenance and conservation of soil and water resources have been taken into account according to regulations of the government	B	NA
4.9	Intensity, area and percent of protection of forest ground vegetation	C	NA
4.10	Area and percent of forest land experiencing an accumulation of persistent toxic substances	C	4.h
5	Conservation of forest contribution to global carbon cycles		5
5.1	Total forest ecosystem biomass and carbon pool, and if appropriate, by forest types, age class, and successional stages	A	5.a
5.2	Area and consumption of forests for energy resources and its contribution	B	NA
5.3	Production and consumption of forest products and their contribution	C	5.c
5.4	Area of deforestation and its contribution	B	NA
5.5	Contribution of forest ecosystems to the total global carbon budget, including absorption and release of carbon	C	5.b
6	Maintenance and strengthening of long-term multiple benefits of forests		6
6.1	Growing and consumption, including employment		6.1+6.5
6.1.1	Population rate and economic rate	A	NA
6.1.2	Supply and consumption of wood and non-wood products, including consumption per capita	B	6.1.c+6.1.f
6.1.3	Value and volume of wood and non-wood products production, including value added through downstream processing, and their value as percentage of GDP	B	6.1.a+ 6.1.b+ 6.1.d
NA	Degree of recycling of forest products	/	6.1.e
6.1.4	Direct and indirect employment in the forest sector and forestry sector employment as a proportion of total employment	B	6.5.a
6.1.5	Production efficiency rate, average wage rates and injury rates in major employment categories within the forest sector	B	cf.6.5.b
cf 6.1.5	Average wage rates and injury rates in major employment categories within the forestry sector	/	6.5.b
NA	Viability and adaptability to changing economic conditions, of forest dependent communities, including indigenous communities	/	6.5.c
NA	Area and percent of forest land used for subsistence purpose	/	6.5.d
6.2	Investment in forestry		6.3
6.2.1	Value of investment, including investment in forest growing, forest health and management, planted forests, wood processing, recreation and tourism	B	6.3.a

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6.2.2	Level of expenditure on research and development, education, and extension and use of new and improved technologies.	B	6.3.b+ 6.3.c
6.2.3	Rates of return on investment	B	6.3.d
6.3	Forest recreation and tourism, demands and assessment of culture, social and spirits		6.2+6.4
6.3.1	Value, area and percent of forest land managed for general recreation and tourism, in relation to the total area of forest land. Number and type of facilities available for general recreation and tourism.	B	6.2.a+6.2.b
6.3.2	Number of visitor days attributed to recreation and tourism, in relation to population and forest area	B	6.2.c
6.3.3	Area and percent of forest land managed in relation to the total area of forest land to protect the range of culture, social and spiritual needs and values	B	6.4.a
NA	Non-consumptive use forest value	/	6.4.b
7	Legal and policy protection systems		7.1-7.3
7.1	Legislation		7.1
7.1.1	Clarifies forest resource ownership	B	7.1.a
7.1.2	Institution for protection and management of forest resources	B	7.1.c+7.1.d +7.1.e
cf 7.1.2	Provide opportunities for public participation in public policy and decision-making related to forests and public access to information	/	7.1.c
cf 7.1.2	Forest management to conserve special environmental, cultural, social and /or scientific values	/	7.1.e
7.1.3	Strengthening administrative regulations in forest management	A	cf. 7.1.b
7.2	Policy		7.2
7.2.1	Management of forest by classified functions	A	NA
7.2.2	Public participation in forestry	B	7.2.a+7.2.b
cf 7.2.2	Undertaking and implementing periodic forest-related planning, assessment, and policy review including cross-sectoral planning and coordination	/	7.2.b
7.2.3	Developing and maintaining human resource skills	B	7.2.c
7.2.4	Adjusting the structure of forestry industry	B	NA
7.2.5	Developing and maintaining efficient physical infrastructure	B	7.2.d
7.2.6	Enforcing laws, regulations and guidelines	A	7.2.e
7.3	Economic framework		7.3
7.3.1	Investment and taxation policies and a regulatory environment in order to meet long-term demands for forest products and services	B	7.3.a
7.3.2	Establish forest ecological compensation system	A	NA
7.3.3	Establish fair trading on forest products gradually	B	7.3.b

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8	Information and technology support systems		7.4-7.5
8.1	Availability and extent of up-to-date data, statistics and other information important to measuring or describing indicators associated with criterias 1-7	A	7.4.a+7.4.b +7.4.c
cf 8.1	Scope, frequency and statistical reliability of forest inventories, assessments, monitoring and other relevant information	/	7.4.b
cf 8.1	Compatibility with other countries in measuring, monitoring and reporting on indicators	/	7.4.c
NA	Development of scientific understanding of forest ecosystem characteristics and functions	/	7.5.a
8.2	Development of methodologies to measure and integrate environmental and social costs and benefits into markets and public policies, and to reflect forest-related resource depletion or replenishment in national accounting systems	B	7.5.b
8.3	Evaluation of the contribution of science and technology	B	cf.7.5.c

Annex 2

Draft C&I for sustainable management of dry forests in NW China: a case of ZhangYe, Gansu Province

Criterion 1. Biological diversity

- 1.1 Ecosystem diversity
 - 1.1.1 Water resource conservation forest (WRCF)
 - a. Area and percent of WRCF and other vegetation types in Qilian Mountains in ZhangYe region
 - b. Percent of different dominant tree species stand of total area of WRCF
 - c. Area and percent of forest type divided by age-class or succession stage.
 - d. Area and percent of plantation and natural forest of WRCF
 - e. Area and percent of coniferous and broadleaved forest in plantation forest of WRCF
 - 1.1.2 Shelter belt (SB)
 - a. Area and percent of SB forest in farmland and area of plain
 - b. Percent of different structure types of SB of total area of SB
 - 1.1.3 Economy plantation (EP)
 - a. Area and percent of EP in area of plain
 - b. Percent of different species of EP of total area of EP
- 1.2 Species diversity
 - a. Change population site of WRCF species
 - b. Status of species at risk
- 1.3 Genetic diversity
 - a. Number of forest dependant species that occupy a small portion of their former range
 - b. Number of SB and EP types to keep production quality fertility and health

Criterion 2. Maintenance of productive capacity of forest ecosystems

- 2.1 WRCF
 - a. Percent of tending cutting area of total forest area
 - b. Total growing stock of WRCF and annual growth in a certain area
 - c. Annual removal of NTFPs to the volume determined to be sustainable
- 2.2 SB
 - a. Annual removal of tending cutting and regeneration cutting
 - b. Percent of regeneration area (including forest belt length) of total SB area
- 2.3 EP
 - a. Area and percent of harvest stand and non-harvest stand
 - b. Average output volume and potential output volume per area of different EP types

- c. Area and percent of stand needed to be regenerated of different EP types

Criterion 3. Maintenance of forest ecosystem health and vitality

3.1 WRCF

- a. Area and percent of forest affected by processes or agents beyond the range of historic variation in five years
- b. Area and percent of serious non-natural disturbance (cutting, grazing, etc.) and its frequency

3.2 SB

- a. Area and percent of diseases and pests species and degree of damage
- b. Area and percent of effect by non-natural disturbance

3.3 EP

- a. Area and percent of effect by insects and other natural damages
- b. Rate of decrease of economic production by natural damages
- c. Change of soil fertility
- d. Degree of damages caused by non-natural factors

Criterion 4. Conservation and maintenance of soil and water resources

4.1 WRCF

- a. Amount of water of WRCF in watersheds
- b. Percent of stream kilometres in forested catchments in which stream flow and timing has significantly deviated from the historic range of variation
- c. Change in sediment content in water flow from forest catchments
- d. Change of water quality in forest catchments
- e. Amount of forest litter and its water holding capacity

4.2 SB

- a. Evaluation of increasing benefits from SB
- b. Evaluation of SB effects under extreme wind water and other certain conditions

4.3 Soil erosion degree of EP

Criterion 5. Maintenance of forest contribution to global carbon cycles

- a. Area of forests
- b. Total forest ecosystem biomass
- c. Area of forest cutting and its contribution
- d. Absorption of carbon by forest

Criterion 6. Maintenance and strengthen of long-term multiple benefits to meet the need of society

- 6.1 Investment for maintenance for function of WRCF (sector, management unit, eg. funds from tending cutting, social support)

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- 6.2 Investment for development of SB
- 6.3 Recovery rate of investment
- 6.4 Opportunity provided and its percentage of direct/indirect employment by sex and minor nationalities
- 6.5 Improvement at management level
- 6.6 Area and facilities for forest recreation and tourism.
- 6.7 Extension and advantages of new and improved technology
- 6.8 EP
 - a. Amount and value of production possible to sell and additional value from processing
 - b. Ability for market prediction
 - c. Percent of EP production value in ratio of GNP in the region and the total village economic production value

Criterion 7. Legal and policy

- 7.1 Forest ownership
 - a. WRCF ownership according to Forestry Law, solution to conflict for forestland primary negotiation by the two sides, secondly handled by local government
- 7.2 Management
 - a. Implementation of management systems for WRCF
 - b. File management systems for WRCF, SB, EP
- 7.3 Policy
 - a. Education and social support for participant and social forestry
 - b. Supporting of new science and technology for improving forestry management
 - c. Improved structure of forestry education at all levels, with special attention to women and minority nationalities, and raising the quality of human resources
- 7.4 Investment policy
 - a. Favorable policy on tax
 - b. Establish forest ecology compensation system
 - c. Strengthen institution of voluntary forest funds
 - d. Expand commercial investment funds channel for forestry construction

Criterion 8. Information and technological supporting systems

Same as the indicators at the national level

Annex 3
Draft C&I for sustainable management of temperate forests in NW China: a case of YiChun, Heilongjiang Province

Criterion 1: Conservation of biological diversity

- 1.1. Ecosystem diversity
 - 1.1.1 Area and percentage of forest lands and other land types
 - 1.1.2 Percentage of area occupied by different dominant tree species and different original forest types relative to total forest area
 - 1.1.3 Percentage of area by forest types and by age classes
 - 1.1.4 Amount and percentage of area in various protected area
- 1.2. Species diversity
 - 1.2.1 Component and number of forest dependent species
 - 1.2.2 Status (rare, endangered, threatened or extinct) of forest dependent species and changes in population size of species at risk
- 1.3. Genetic diversity
 - 1.3.1 Number of forest species distinctly reduced in distribution range
 - 1.3.2 Stand amount and area of tree seed orchard and seed reserve for conserving or improving forest genetic resources
 - 1.3.3 Area and percentage of stand by plantation forest of exotic species

Criterion 2: Maintenance of productivity of forest ecosystems

- 2.1 Area and percentage of coniferous and broad-leaved forest in plantation forest
- 2.2 Area and percentage of commonweal and commodity forest
- 2.3 Total area forest land and net area for timber production
- 2.4 Area, standing volume and annual increment of major forest types
- 2.5 Area and percentage of forest by main site grades (site index or site types)
- 2.6 Land use of forest land (including area and percentage)
- 2.7 Total area and standing volume of timber production forest
- 2.8 The number and percentages of both annual harvesting amount of wood products and annual increment timber production forest
- 2.9 Area, standing volume and stock increment of plantation forest
- 2.10 Distribution of area and stock of forest land available for timber production by age-class
- 2.11 Distribution of, and changes in, the land base available for timber production are identified
- 2.12 Total amount and annual harvesting amount of NTFPs (e.g. seed, fruits, fern, medicinal materials, forest frog, fur, quarry etc.)

Criterion 3 : Maintenance of forest ecosystem health and vitality

- 3.1 Area and percentage of forest types affected by disease, pests (including mice)

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and its trend

- 3.2 Area and percentage of forest types affected by fire
- 3.3 Area and percentage of forest types affected by wind

Criterion 4: Conservation and maintenance of soil and water resources

- 4.1 Area and percent of forest managed for soil and water conservation in important river basins
- 4.2 Area and percent of forest land with significant soil erosion (different degree)
- 4.3 Area and percentage with above average soil and water losses improved
- 4.4 The degree, area and percentage of forest wetland ruined
- 4.5 Area and percent of farmland above 25 degrees converted to forests
- 4.6 Area and percent of farmland adopted water and soil conservation measures for cultivate land on slopes where measures of water and soil conservation should be taken
- 4.7 Percent and kilometer of streams in forest watershed in which stream flow and timing has significantly deviated from historic variation
- 4.8 Sedimentation of streams with significant variation from the historic range

Criterion 5: Maintenance of forests contribute to global carbon cycles

- 5.1 Area of forest and forest cover
- 5.2 Biomass of different forest types
- 5.3 Total carbon storage in forest and forest land
- 5.4 Amount of carbon absorbed by forest
- 5.5 Carbon emission by forest soil

Criterion 6: Maintenance and enhancement of longterm multiple benefits

- 6.1 Production and consumption
 - 6.1.1 Annual population growth rate and annual economic growth rate
 - 6.1.2 Annual allowable timber volumes for harvesting
 - 6.1.3 Supply and consumption of wood products
 - 6.1.4 Area and consumption of fuel wood
 - 6.1.5 Output, values and their value from processing of wood and non-wood products
 - 6.1.6 Direct and indirect employment in the forestry sector and forestry sector employment as a proportion of total employment
 - 6.1.7 Average wage, labor productivity and injury rates in major employment categories within the forest sector
 - 6.1.8 Wood price (in terms of tree species and timber assortment)
 - 6.1.9 Degree of recycling of forest products
- 6.2 Investment in the forestry sector
 - 6.2.1 Investment in forest growth, forest health management, regeneration,

- planted forests, infrastructure of forestry industrial, natural protected area, forest recreation and tourism
- 6.2.2 Investment in forest research, education, development and extension
- 6.2.3 Rates of return on the above investments
- 6.3 Social, cultural and spiritual values
 - 6.3.1 Recreation, outside visitors, area and percentages of forest land for general recreation and tourism in relation to total area of forest land
 - 6.3.2 Area and percentage of forest land managed in relation to the total area of forest land to protect the range of cultural, social and spiritual needs and values

Criterion 7: Legal, institutional and economic framework for SFM

- 7.1 System and statute
 - 7.1.1 Implementation of forest law
 - 7.1.2 Implementation of institution of forest right
 - 7.1.3 Implementation of institution of national forest resources protection and management
 - 7.1.4 Implementation of institution of national forest cutting quota
 - 7.1.5 Foundation and implementation of forest administrative management statute
 - 7.1.6 Foundation of institution of forest resource and wild animal resource monitoring
 - 7.1.7 Foundation and implementation of a regional forest ecological compensation system
 - 7.1.8 Foundation and implementation of regional technical order on forest management, protection, use, etc
- 7.2 Institution and policy
 - 7.2.1 Institution of cross-sectors participation in establishing ecological, environment protection, and construction planning
 - 7.2.2 Institution of multi-sectors participation in establishing total land use planning
 - 7.2.3 Policy of public participation in shaping forest policy
 - 7.2.4 Policy of development for forest environmental service functions
 - 7.2.5 Implementation of social safeguard system in national forest region
 - 7.2.6 Whether local government possesses favorable forest policy and its implementation effects
- 7.3 Economic system
 - 7.3.1 Forest investment policy of local government
 - 7.3.2 Favorable forest revenue policy of local government
 - 7.3.3 Policy of production, management and consumption of wood and non-wood products

7.3.4 Marketable distribution and scale of wood and non-wood products

Criterion 8: Information and technological supporting systems

Same as the indicators at the national level

Annex 4

**Draft C&I for sustainable management of sub-tropical forests in South China:
a case of FenYi, Jiangxi Province**

Criterion 1: Biological diversity

- 1.1 Ecosystem diversity
 - a. Ratio of plantation area (including mixed plantation) and natural forest area (including original forest and secondary forest)
 - b. Ratio of secondary area and natural forest area
 - c. Ratio of area of main plantation, divided by age-class
 - d. Percentage of shelter belt area in total area of forest stand
 - e. Percentage of different dominant tree species in plantation
 - f. Percentage of natural protection zone area in the total forest area
 - g. Percentage of regional forest community type in the total forest stand
- 1.2 Species diversity
 - a. Types and population of vertebrate and higher plants in forest
 - b. Number of rare, threatened, endangered, or extinct species, or the number of species protected by state or province
- 1.3 Genetic diversity
 - a. Number of species whose population decreases greatly inside the range of forest
 - b. Percentage of degraded genetic structure which need regenerating in plantation

Criterion 2: Maintenance of productive capacity of forest ecosystems

- 2.1 Area and percentage of forest land acting as shelter belt and protection land available for timber production
- 2.2 Total growing stock, annual growth and annual logging of various forest types.
- 2.3 Area and percentage of plantation on various forest site types
- 2.4 Percentage of area of 'ready to regenerate forest (including final cutting) in the whole forest area
- 2.5 Yield of non-woody forest products and their sustainable production
- 2.6 Mean economic yield and production potential per unit of economic forest

- 2.7 Ratio of mature forest area to near mature forest area
- 2.8 Area and percentage of continuous plantation
- 2.9 Area and percentage of tending felling

Criterion 3: Maintenance of forest ecosystem health and vitality

- 3.1 Area, percentage and extent of forest (including economic forest) impacted by processes or agents (wind, flood, fire, pest and disease, pollution) beyond the range of historic variation during mean rotation period of main forest species
- 3.2 Area and percentage of serious non-natural disturbance (cutting, grazing, etc) and its frequency and extent
- 3.3 Extent, area and economic loss of economic forest yield and quality caused by management

Criterion 4: Conservation and maintenance of soil and water resources

- 4.1 Area and location of water reservoir forest, WRCF and other forest types in the watershed
- 4.2 Area and length of the region, the amount of water conserved by the forest in the region, and soil erosion modulus
- 4.3 Input and duration in typical water body accumulated place, miles and per cent of flow stretching beyond the historic variation range in flooding and dry periods
- 4.4 Area, percent, and extent of protected undergrowth in forest
- 4.5 Area and percentage of sloping field where slope is above 25 degrees and the field is returned to forest
- 4.6 Status of water quality of forest stream and the location where water quality deviates greatly from national standard and the area of the location
- 4.7 Area and percentage of control region where soil and water loss are at medium degree
- 4.8 Erosion degree in economic forest (mean, highest and lowest)
- 4.9 Percentage of various land preparation in afforestation land, and the percentage of land preparation by burning
- 4.10 Area and percentage of natural forest (including secondary forest) on slopes above 25 degrees, and lithology of the slope comes from sandy crag, granite, slate, carbonate, etc.

Criterion 5: Maintenance of forest contribution to global carbon cycles.

- 5.1 Area of forest
- 5.2 Total forest ecosystem biomass and annual growth rate
- 5.3 Area of forest cutting and its contribution

Criterion 6: Maintenance and strengthening of long-term multiple benefit to meet the need of society

- 6.1 Structure of investment for afforestation
- 6.2 Structure and mechanism of investment for forest management and forest protection
- 6.3 Investment in forest education, research, development and extension
- 6.4 Opportunity and percentage of direct and indirect employment, especially for women and minority groups, provided by forest management
- 6.5 Area, percentage, performance and management of scenic forest (tourism, rest and other cultural requirement)
- 6.6 Improvement of management and experience in extension
- 6.7 Return from investment (state, group, company, forest-farm organization, forest farmer)
- 6.8 Application and extension of new technology (number, range and efficiency)
- 6.9 Quality, price and commodity rate of timber and other forest products and their processing value

Criterion 7: Legal and policy

- 7.1 Forest ownership according to 'Law of Forest'
- 7.2 Management
 - a. Health degree of forest rule (management mechanism, management type, tending supported by defined budget, supervision etc)
 - b. File management (catalogue management, and public reading)
- 7.3 Policy
 - a. Education and social support for participation and social forestry
 - b. Make the structure of forestry education better, giving special attention to women and the minority nationality, raising the quality of human resource.
 - c. Encourage scientific management of forest
- 7.4 Investment policy
 - a. Favorable policy on tax and interest
 - b. Strengthen of voluntary forest funds institutions
 - c. Range of forest ecology compensation system
 - d. Expand commercial investment funds for forestry development

Criterion 8: Information and technological supporting systems

- 8.1 Status of forest resource, ecology monitoring, benefit appraisal and measures
- 8.2 Establishment of C&I for SFM

- 8.3 Contribution rate of science and technology to forestry
- 8.4 Network of information on forest benefit and management and its application rate

Annex 5

Draft C&I at FMU level for sustainable management of water resource conservation forests in NW China: a case of Xishui Forest Farm, Zhangye, Gansu

Criterion 1. Biological diversity

- 1.1 Ecosystem diversity
 - a. Area and percentage of WRCF (water conservation forest) and other vegetation types in management unit
 - b. Percentage of different dominant tree species stand and forest types of total area of WRCF
 - c. Area and percentage of forest type by age class or succession stage
 - d. Area and percentage of plantation and natural forest of WRCF
 - e. Area and percentage of coniferous and broadleaved forest in plantation forest of WRCF
- 1.2 Species diversity
 - a. Change in population site of WRCF species
 - b. The status of species at risk
- 1.3 Genetic diversity
 - a. Number of forest dependant species that occupy a small portion of their former range

Criterion 2. Maintenance of productive capacity of forest ecosystems

- a. Percent of tending cutting area of total forest area
- b. Total growing stock of WRCF and annual growth in a certain area
- c. Annual removal of NTFPs to the volume determined to be sustainable

Criterion 3. Maintenance of forest ecosystem health and vitality

- a. Area and percentage of forest affected by an extreme disturbance in five years
- b. Area and percentage of serious non-natural disturbance (cutting, grazing, etc.) and its frequency

Criterion 4. Conservation and maintenance of soil and water resources

- a. Amount of water of WRCF in watersheds
- b. Percent of stream kilometres in forested catchments in which stream flow and timing has significantly deviated from the historic range of variation
- c. Change in sediment content in water flow from forest catchments
- d. Change of water quality in forest catchments
- e. Amount of forest litter and its water holding capacity

Criterion 5. Maintenance of forest contribution to global carbon cycles

- a. Area of forests
- b. Total forest ecosystem biomass
- c. Area of forest cutting and its contribution to global carbon cycles

Criterion 6. Maintenance and strengthening of long-term multiple benefits to meet the need of society

- a. Investment for maintenance of function of WRCF (sector, management unit, e.g. funds from tending cutting, social supporting)
- b. Opportunity and percentage of direct or indirect employment by sex and minority nationality
- c. Improvements at the management level
- d. Area and facilities for forest recreation and tourism

Criterion 7. Ownership and management

- 7.1 Forest ownership
 - a. Forest ownership according to forestry law, solution to conflict for forest land, primary negotiation by the two sides, secondly handled by local government
- 7.2 Management
 - a. Implement of management systems for WRCF
 - b. File management systems for WRCF

Annex 6

Draft C&I at FMU level for sustainable management of temperate forests in NE China: a case of Fenglin Forest Farm, Yichun, Heilongjiang

Criterion 1: Conservation of biological diversity

- (1) Percentage of area by forest type relative to total forest area
- (2) Percentage of area by forest type and by age classes

- (3) Fragmentation of forest types: percentage of area by forest types of cutting intention relative to total forest area (slashing, brushwood, natural secondary forest, over cut, virgin forest etc.)
- (4) Area and percentage of forest type in various protected area (core area, buffer and experimental area)
- (5) Density of forest road
- (6) Number of forest species where distribution range has been distinctly reduced
- (7) Stand area of seed tree orchard and seed reserve for conserving or improving forest genetic resources
- (8) Area and percentage of stand by plantation forest of exotic species

Criterion 2: Maintenance of productive capacity of forest ecosystems

- (1) Percentage of area by natural regeneration relative to plantation
- (2) Percentage of area and stock by coniferous to broad-leaved forest in plantation forest
- (3) Volume, standing volume per hectare and annual increment of major forest types
- (4) Area and percentage of forest by major site grades (site index or site types)
- (5) Area of forest by various management measures (e.g. thinning, pruning, fertilization and disease etc.)
- (6) Total area of forest land and the net area for timber production
- (7) Area and percentage of common-welfare and commodity forest
- (8) Distribution of standing volume for timber production forest by age classes
- (9) Area and volume of timber production by cutting pre year
- (10) Total amount and annual harvesting amount of NTFPs (e.g. seed, fern, fruits, mushroom, forest frog, medicinal materials, fur, quarry etc.)

Criterion 3: Maintenance of forest ecosystem health and vitality

- (1) Area and percentage of forest affected by fire, water, insects, disease etc. for the forest with significant variation from historic range over ten year period

Criterion 4: Conservation and maintenance of soil and water resources

- (1) Area of forest for soil and water conservation and the change of producing water in watershed
- (2) Area and percentage with above average soil and water losses improved
- (3) Changes in soil within forest watershed (river)
- (4) Area and percentages of forest land with soil erosion in different degrees

Criterion 5: Maintenance of forest contribution to global carbon cycles

- (1) Area of forest and forest cover

Criterion 6: Maintenance and enhancement of long-term multiple benefits to meet the needs of societies

- (1) Number of months for paying wages every year
- (2) Output, value and value added from the processing of wood products and non-wood products (including the percentage of their values by GNP)
- (3) Direct and indirect employment in the forestry sector and forestry sector employment as a proportion of total employment
- (4) Average wage and labor productivity in major employment categories within the forestry sector
- (5) Investment in the forestry sector: including investment in forest growth, forest health management, regeneration, fundamental construction, immobility capita and special investment for protected area management etc.
- (6) Investment in forest research, education, development and extension
- (7) Area and percentage of forest land managed in relation to the total area of forest land to protect the range of cultural, social and spiritual needs and values

Criterion 7: Legal, institutional and economic framework for SFM

7.1 System and statute

- (1) Implementation of insitution of forest rights
- (2) Implementation of institution of national forest cutting quota
- (3) Implementation of regional forest ecological compensation system

7.2 Economical system

- (1) Form of organizational management of forestry production
- (2) The structure of industries
- (3) Implementation of forest investment policy of government
- (4) Implementation of forest revenue favorable policy of local government

Annex 7

Draft C&I at FMU level sustainable management of sub-tropical forests in south China: a case of NianZhu Forest Farm, Fenyi, Jiangxi

Criterion 1: Biological diversity

1.1 Ecosystem diversity

- 1.1.1 Area and percentage of various forests (nature forest, plantation, protection plantation, timber-use plantation, and bamboo forest)
- 1.1.2 Area and percentage of WRCF (water resource conservation forest) and

other plant species

- 1.1.3 Percentage and distribution of dominant tree species on the forest (area of one kind tree species, and area of mixed tree species)
- 1.1.4 Area and percentage of plantation types divided by age-class
- 1.2 Species diversity
 - 1.2.1 Area and percentage of natural forest stand where population varies greatly.
 - 1.2.2 Area and percentage of protection zone
 - 1.2.3 Number of endangered animal species and number of endangered animal species which have been protected
 - 1.2.4 Population quantity in plantation (meddle-age plantation and near-mature plantation)
- 1.3 Genetic diversity
 - 1.3.1 Area and percentage of plantation brought forth by good breeding material (provenance, clone and family)
 - 1.3.2 Quantity of clone in plantation

Criterion 2: Maintenance of productive capacity of forest ecosystems

- 2.1 Annual growth amount and rate per unit of managed natural forest
- 2.2 Annual growth amount and rate of various plantation
- 2.3 Area and variation of forest stands on various site conditions
- 2.4 Interest and percentage of non-woody forest product
- 2.5 Area and percentage of tended forest and percentage of forest needed tending

Criterion 3: Maintenance of forest ecosystem health and vitality

- 3.1 Area and percentage of polluted (including pollution of acid rain, pesticide, and chemical fertilizer) forest (pH value, type of pesticide, quality of break)
- 3.2 Area and percentage of pest and disease affected forest (pest affected tree rate, the density of pest on a grass plant, loss of conifer, loss of biomass)
- 3.3 Forest area and stock volume destroyed by fire and disaster climate
- 3.4 Area and percentage of continued plantation

Criterion 4: Conservation and maintenance of soil and water resources

- 4.1 Area and percentage of lodging (less than 3-5ha)
- 4.2 Area and percentage of lodged forestland protected by soil and water conservation method in the whole lodged forestland required protection of soil and water conservation method
- 4.3 Way of land clearance before afforestation and the percentage of clearance by fire
- 4.4 Length of plant coverage at the border of forest and the rational length of plant coverage (biological corridor)

Development of C&I for SFM in China

- 4.5 Variation of deposit and exposure in the main water region
- 4.6 Variation of water quality in main water region
- 4.7 Area and percentage of natural forest (including secondary forest) whose slope degree is 40-above
- 4.8 Area and percentage of slope field whose slope degree is lower than 25 and farmland returned to forest

Criterion 5: Maintenance of forest contribution to global carbon cycles

- 5.1 Area and percentage of fired forest
- 5.2 Percentage of firewood (including people-used firewood and the fired area by the waste of used firewood)
- 5.3 Annual biomass increment and lodging

Criterion 6: Maintenance and strengthening of long-term multiple benefits to meet the need of society

- 6.1 Number of employee by forest (forest management, forest products chemical industry, tourism etc)
- 6.2 Percentage of forestry industry income in the whole industry
- 6.3 Interest in and percentage of, non-woody forest products
- 6.4 Area and percentage of scenic forest and forest connected by historic and cultural legend and forests needing protection
- 6.5 Education year of forest farmer and their improvement (through training during work)
- 6.6 Forestry information amount distributed to the public
- 6.7 Number of adopted new forestry techniques and its interest and percentage of interest earned by new forestry techniques
- 6.8 Forest management tax and percentage of tax in the whole income

Criterion 7: Support system for forestry sustainable management

- 7.1 Number and percentage of technicians employed to total employees
- 7.2 Investment of forestry protection to a unit forest area
- 7.3 Extension of new technology and number of trial projects
- 7.4 Density of forest roads
- 7.5 Investment of forest management per unit
- 7.6 Percentage of management persons to total employees
- 7.7 Number of case concerning violation of forest law and forest rule
- 7.8 Number and percentage of people who join in various forest communities
- 7.9 Healthiness and execution of village rule concerning forestry

Development of criteria and indicators for sustainable forest management at the forest management unit level: a case study of Toungoo Forest District

by

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1. Introduction

Population and economic pressure have led to the degradation and gradual depletion of forests, resulting in biodiversity loss, decreased soil fertility, erosion, and natural disasters such as floods, droughts, and landslides. Deforestation and degradation of forests have significant ecological, social, and economic implications, that are increasingly experienced in many parts of the world. The 1992 United Nations Conference on Environment and Development (UNCED) held at Rio de Janeiro, Brazil adopted the *Forest Principles* and *Agenda 21* which contain the basic guidelines for SFM. C&I for SFM were developed on a regional basis within the wider context of the *Forest Principles*, with the objective to analyze the status of forests and management practices applied at different levels. Today, *criteria*, which define the essential components of SFM, and *indicators*, which are ways to describe a criterion, have become a policy instrument for assessing and evaluating progress toward SFM.

Myanmar, a producing member country of the ITTO, initiated its first set of C&I at both the national and FMU levels in 1996 based on the ITTO's *Criteria for the Measurement of Sustainable Tropical Forest Management*, published in 1992. Myanmar revised its C&I in late 1998 to reflect the ITTO's revised set of C&I published in March 1998. All related institutions under the Ministry of Forestry were involved throughout the process of C&I development. The Forest Resource Environment, Development and Conservation Association (FREDA), a forestry-related NGO, also participated in developing Myanmar's C&I. The Japan Overseas Forestry Consultants Association (JOFCA) provided substantial input during the entire process in cooperation with the Forest Department (FD). The revised set of Myanmar C&I for SFM at both the national and FMU levels was completed in October 1999. A total of 7 criteria, 78 indicators and 257 activities have been identified at the national level, and 7 criteria, 73 indicators and 217 activities at the FMU level.

This paper presents the current efforts being made to test the national level C&I at the FMU level, using the Toungoo Forest District, and discusses the development of field/MF level C&I for the sustainable management of forests in Paukkaung MF Project Area. This project is being implemented with technical and financial assistance from the Regional Project on Assistance for the Implementation for the Model

Development of C&I: Toungoo Forest District

Forest Approach for Sustainable Forest Management in the Asia Pacific Region (GCP/RAS/177/JPN) in Myanmar.

2. C&I for SFM at the FMU level

There are four major stages involved in the C&I process - development, field-level testing, revision, and implementation. Myanmar is currently in its second stage and is testing the C&I developed for SFM of forest resources in Myanmar. The Toungoo Forest District was selected as a test site due to its long history of forest management practices and significant role in timber production. Based on the original C&I for SFM in Myanmar, Standards of Performance for forestry activities are specified at the FMU level with special reference to Toungoo Forest District, Bago Division. The original C&I for SFM in Myanmar is an ideal system; consequently, implementation of all the C&I will take time. Therefore, a subset of C&I for SFM for Natural Tropical Forests at the FMU Level in Myanmar containing field-applicable and essential activities was produced. The subset was essentially designed for forest management certification at the FMU level. This paper also elaborates on the Pre-assessment Checklist for Forest Management Certification, developed for the FMU level.

3. C&I for SFM at FMU level: a case study of Toungoo Forest District

3.1 Past management

After 1856, lower Myanmar was divided into five forest divisions for the purposes of forest management. Most parts of today's Toungoo Forest District were included in the then Sittaung Forest Division.

Management objective

The primary objective was to ensure the maximum extraction of all kinds of forest produce through practices that were consistent with scientific forest management, particularly sustainable yield and improvement of forests in the Division in accordance with sustainable yield principles.

Demand

The demands consisted mainly of the:

- regular supply of timber, fuel, bamboo and minor forest produce for local use. This demand was met to a considerable extent from unclassified forests and to a certain extent from accessible reserved forests in the Division; and
- supply of timber and other forest produce for commercial purposes. The demand was met mainly from the Bago Yoma forests, a legendary home for premier natural teak forests.

Methods of treatment

Reserved forests

Accessibility was a principal factor governing the method of treatment. All teak-bearing forests, except areas allotted to concentrated regeneration, were worked on the selection system. Extraction was followed by improvement felling in suitable and more productive areas. Concentrated regeneration was performed exclusively in areas prescribed in the Local Supply Working Circle. Regeneration in the Local Supply Working Circle took the form of full planting with suitable species in all areas, which were denuded of stock. Demarcation and repairs to boundaries of reserves, in addition to routine operations, namely forest reservation, girdling, thinning, improvement felling and selection marking for extraction of hardwood and boundary demarcation and repairs were to be annually implemented. Planting was done in areas where natural regeneration was unlikely to occur.

Unclassified forest

Limited hardwood extraction was carried out in accessible areas within the unclassified forests of the Division. Trade licenses with fixed girth limits by species were issued for areas where the stocking would be seriously jeopardized by shifting cultivation.

Formation of working circles

The following working circles were established:

- Teak Selection Working Circle
- Commercial Supply Working Circle
- Local Supply Working Circle
- Major Teak Selection Working Circle/Minor Teak Selection Working Circle
- Paddy Field Teak Working Circle/Teak Eradication Working Circle

Past yield

The past yield of forest products in Toungoo District is shown in **Table 1**.

Rights and privileges of forest dwellers to use forest produce

At the time of settlement of some reserves, certain areas of land referred to as 'exclude', were included in the statement of rights and privileges admitted in the reserves for local villagers' use. The rights to forest produce, which were normally given to the local villagers, included collection of household post, dead and dry firewood, bamboo, *shaw* (fiber), *thetke*, (a kind of long grass for roofing), honey, edible fruits etc. Grazing was also permitted. The FD issued tickets to rights-holders for certain kind of forest produce so that right-holders could be easily distinguished from those who were not legally permitted to collect forest produce.

Development of C&I: Toungoo Forest District

Table 1. Past average yield of forest products in Toungoo District (Hoppus Ton)

Sr.	Forest Products	North Toungoo Division	South Toungoo Division
		Average for 25 years between 1924-1925 and 1949-1950	Average for 11 years between 1921-1922 and 1932-1933
1	Teak	21,756	41,363
2	Hardwoods (reserved trees)	10,904	6,905
3	Hardwoods (unreserved trees)	9,196	5,988
4	Firewood	15,775	9,409

Source: South Toungoo Forest Division Working Plan (1933 - 1934 to 1947 - 1948) & North Toungoo Forest Division Working Plan (1949 - 1950 to 1958 - 1959)

3.2 Future management

Future management of the forest resources in Toungoo district has been detailed in the newly prepared *Forest Management Plan for Toungoo District* covering the period 1996-97 to 2005-2006.

Objective

The primary objective is to protect, conserve, manage and utilize the forest resources in Toungoo district on a scientific basis, within the context of SFM. The status of the current land use in Toungoo district is presented in **Table 2**. The total forest area constitutes about 73 % of the total area of the district, of 1,041,180 ha.

Growing stock

The number of trees of 2' and up in girth at breast height in production forests are given by species or group in **Table 3**.

Formation of working circles

The following working circles were formed:

- Production Forests Working Circle
- Planted Forests Working Circle
- Local Supply Working Circle/Community Forests Working Circle
- Watershed Forests Working Circle

Development of C&I: Toungoo Forest District

Table 2. Current forest land use in Toungoo District

Sr.	Land use type	Quantity	Area (ha.)	% of total forested area
1	Reserved Forest	37	404,720	52
2	Protected Public Forest	31	177,500	23
3	Protected Area	1	7,190	1
4	Public Forest	21	182,730	24
Total forested area		89	772,140	100

Source: Forest Management Plan (1996/1997 – 2005/2006), Toungoo District

Table 3. Growing stock in production forests

No	Species	No. of trees	Total merchantable volume (cu. ton)	Merchantable volume per acre (cu. ton)
1	Teak	346,177	247,764	0.569
2	Pyinkado	788,306	1,176,611	2.704
3	Hardwoods (Group 1) without Pyinkado	29,072	56,628	0.131
4	Other hardwoods	7,804,195	4,869,111	11.188
Total		8,967,750	6,350,144	14.592

Source: Forest Management Plan (1996/1997 – 2005/2006), Toungoo District

3.3 Forest management system

Management prescriptions

The following silvicultural operations are undertaken in Toungoo Forest District under the Myanmar Selection System (MSS):

- Teak girdling
- Green teak marking
- Hardwoods selection marking
- Plantation establishment
- Natural regeneration
- Improvement felling
- Weeding

Development of C&I: Toungoo Forest District

- Thinning
- Climber cutting & *Nyaungbat* (*Ficus* spp.) felling
- Forest road repair
- Reserved forest boundary repair
- Compartment boundary repair
- Fire management
- Forest reservation

In addition to the above-mentioned operations, a national forest inventory, the evaluation and assessment of forest cover and forest type, expansion of parks and wildlife sanctuaries, implementation of community participatory forestry, environmental restoration and greening, and protection of critical watersheds are other forest operations identified as priorities for achieving SFM.

Work performance in Toungoo District

The work performance of the fourteen 14 forest operations in Toungoo Forest District, from 1996-1997 to 2000-2001 is shown in **Table 4**.

Standards of management performance in Toungoo Forest District

A variety of instruments are applied in Toungoo Forest District, including policy, legislation, rules, regulations, departmental instructions and standing orders, records and reports, forest management plans, forest resource assessment data, regular auditing and monitoring. Girdling rules, thinning instructions (for natural and planted forests), the Forest Policy (1995) for forest management objectives, Forest Law (1992) for forest protection and reservation, and plantation management instructions help to ensure standards of forest management operations are met and maintained. Most of the standards of performance (SOP) are already in existence in Toungoo Forest District. Some may need to be developed with little effort. The SOP are considered to be the minimum requirements in assessing forests as part of the management certification process.

The following are examples of the standards of management performance for forest operations are in effect in Toungoo Forest District:

- Girdling Rules, Forest Department (1936)
- Departmental Instructions for Forest Officers in Burma (1955)
- Standing Orders for Subordinates, Forest Department 1959
- Detailed instructions issued by Divisional Forest Officers as necessary
- Working Plan Manual

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Table 4. Status of performance of 14 forest operations in Toungoo Forest District, (from 1996 - 1997 to 2000 - 2001)

No.	Type of Forest Operations	Unit	1996 to 1997	1997 to 1998	1998 to 1999	1999 to 2000	2000 to 2001
1	Teak Girdling	No. of trees	6431	4050	3925	-	-
2	Green Teak Marking	No. of trees	3000	3000	1985	2885	3361
3	Hardwoods Selection Marking	No. of trees	87551	100874	70097	113675	86414
4	Plantation Establishment	Acre	3000	3325	3900	4300	3975
5	Natural Regeneration	Acre	500	500	450	500	200
6	Improvement Felling	Acre	1592	3800	1000	1080	760
7	Weeding	Acre	16575	15400	18995	21525	22450
8	Thinning	Acre	200	11291	12010	1100	4402
9	Climber Cutting/ Nyaungbat Felling	Acre	8566	12001	5000	5166	10310
10	Forest Road Repair	Mile	115	115	80	80	70
11	Reserved Forest Boundary Repair	Sq.mile	76	77	41.5	45	52
12	Compartment Boundary Repair	Sq.mile	76.5	96	75	70	72
13	Fire Management	Acre	8135	19140	14655	18465	7510
14	Reservation	Sq.mile	-	-	244638	-	-

Note: 1 ha = 2.473 acres = 0.0038 sq. mile; 1 km² = 0.386 sq. mile

- Felling-Cum Regeneration Plan
- Forest Law (1992) and Forest Rules (1995)
- Forest Policy (1995)

The following instructions are followed in Toungoo Forest District:

Development of C&I: Toungoo Forest District

- Rules to issue bill for non-teak hardwoods.
- Procedures for personal use of forest products for local people.
- Fire management plan (for forest office and resident's buildings, nurseries, etc.)
- Action plan to control illicit cutting and trafficking, and to eliminate forest offences.
- Departmental Instructions to conduct inspections in timber extraction plots (revised on 18-5-99).
- Procedures for charcoal making and trade (dated 10-1-86).
- Establishment of Forest Development Fund (dated 15-2-96 & 2-1-97).
- Collection of rental fee for the lands encroached in the forests (dated 16-2-99).
- Permission for cultivation in degraded forest lands (dated 6-11-99).
- Departmental Instructions to inspect plantations (dated 17-10-83).
- Registration of private wood-based industries (dated 6-11-95).
- Departmental Instructions to designate the life of a bill (dated 1-3-96).
- Departmental Instructions for revision and renewal of forest operation hammers.

4. General assessment of C&I application at Toungoo FMU

A pre-assessment checklist has been prepared to enable resource managers to measure the level of forest management practices adopted in Toungoo Forest District at the FMU level. In the assessment process, standards of performance were scrutinized and checked against required activities, and potential performance evaluated. The checklist uses the criteria identified in the C&I for SFM for Forest Management Certification at the FMU level. An additional criteria - Criteria 8: Plantation - has been added to the checklist. In the checklist (Annex 3), the requirements of the Société Générale de Surveillance (SGS) are incorporated so that the Forest Stewardship Council (FSC)'s Principles and Criteria can also be satisfied. The following are the important documents used in responding to the checklist.

Criterion 1 – Enabling conditions for SFM

- (a) Myanmar Forest Policy, 1995
- (b) Forest Law, 1992
- (c) Forest Rules, 1995
- (d) Protection of Wildlife and Wild Plants, and Conservation of Natural Areas Law, 1994
- (e) Community Forestry Instructions, 1995
- (f) Departmental Instructions (DIs) and Notifications
- (g) Myanmar Selection System (MSS) and Coppice and Coppice with Standards System

- (h) Myanmar's labour laws and procedures
- (i) National Code of Practice for Forest Harvesting in Myanmar
- (j) Myanmar Agenda 21, 1998

Criterion 2. Forest resource security

- (a) 1989 Forest Cover Appraisal reports, land use and forest cover maps, and forest inventories
- (b) District Forest Management Plan
- (c) Forest resources assessment using RS/GIS/GPS
- (d) Boundary repairs and monitoring
- (e) Forest Policy, Forest Law, Forest Rules, instructions, and notifications
- (f) Maps, reports, records, and change assessment data
- (g) Law enforcement, extension services and forest offences
- (h) People's participation and establishment of community forestry
- (i) Forest Conservation Committees, local authorities, relevant sectors and local communities
- (j) Development of community forestry, agreements and certificates

Criterion 3. Forest ecosystem health and conditions

- (a) Field inspection, forest inventory, local information, maps and records
- (b) Timber harvesting plan with road system, maps and instructions
- (c) Pre-harvest and post-harvest inspection and inventory
- (d) Water quality standards and monitoring system
- (e) Impact assessment, reports and laboratory analysis
- (f) Legislation, instructions and procedures
- (g) Fire management guidelines
- (h) Level of cooperation with ASEAN member countries and National Haze Action Plan
- (i) Forest Law (1992) and prohibition of the use of harmful chemicals

Criterion 4. Flow of forest produce

- (a) Forest inventories, field procedures and instructions
- (b) Girdling and S.F. markings, reports and registers, enumeration data and stock maps
- (c) Stand and stock tables, girdling registers and S.F. marking reports
- (d) Management plan and AAC
- (e) Forest harvesting plans, extraction manuals, logging rules and departmental instructions
- (f) Records, reports and statistics of production of wood and NWFPs
- (g) Code of Practice for Forest Harvesting
- (h) Market studies and statistics on local and export sales

Development of C&I: Toungoo Forest District

- (i) FRI research programme, forest inventory, PSPs, and MSS
- (j) EIA procedures, reports and reviews

Criterion 5. Biological diversity

- (a) Forest Policy and Wildlife, Wild Plants and Natural Areas Law, 1994
- (b) List of major forest types
- (c) List of protected areas, records of sizes and reports of boundary demarcation
- (d) Buffer zone management and reports
- (e) Reports and map of habitat ranges
- (f) Conservation strategies and related laws
- (g) List of endangered, rare and threatened species
- (h) Flora and fauna surveys, guidelines, instructions, RS/GIS/GPS
- (i) Research activities, reports and results, and dissemination

Criterion 6. Soil and water

- (a) Environmental guidelines, instructions and reports
- (b) EIA report, EIA guidelines and procedures and Myanmar Agenda 21
- (c) Maps of buffer strips, location of water bodies, signboards and reports
- (d) Boundary repairs and monitoring
- (e) National Code of Practice for Forest Harvesting
- (f) Maps, reports, and forest management plans
- (g) Maps of critical catchment areas and reports
- (h) People's participation and practice of community forestry and agroforestry
- (i) Land use, soil type, slope class and climatic factors, and Departmental Instructions and procedures
- (j) Harvesting plans, road construction plans, forest maps and demarcated boundaries

Criterion 7. Economic, social and cultural aspects

- (a) Stumpage value, royalty rates, total earning from forestry sector and percentage contribution to the country's total earnings
- (b) Existing royalty rates and prevailing market prices, and amended royalty rates
- (c) Quarterly revenue statements, government budget allocated and approved, and reports
- (d) Reports on total domestic production of logs and processing capacity of sawmills
- (e) Government policy, procedures and market-oriented reforms
- (f) Survey reports, types and quantity of wood and NWFPs for subsistence use
- (g) Forest Policy, Forest Law, Forest Rules, instructions, and notifications
- (h) No of people dependent on forest for subsistence use and livelihood
- (i) No. of community forests established, instructions, reports and maps

- (j) Forest management plans and establishment of community forests
- (k) Maps of eco-tourism sites, pamphlets, extension services and regulations
- (l) Formation of forest user groups, open dialogues and reports

Criterion 8. Plantations

- (a) Plantation records
- (b) Monitoring and evaluation of performance
- (c) Plantation silviculture
- (d) Estimation of intermediate and final yields from plantations and plantation operations
- (e) Measures taken to control soil and water quality
- (f) Law enforcement, extension services and forest offences
- (g) Measures to prevent pest and disease outbreaks
- (h) Fire management strategies
- (i) Environmental Impact Assessment

5. Status of C&I assessment at Toungoo Forest District FMU

Upon review, standards of management performance regarding policy, law and institutional framework are considered to be adequate. Departmental Instructions, procedures and reporting system for forest operations are in place. A Forest Management Plan for Toungoo District for the period 1996/97 – 2005/2006, has been formulated and its implementation started.

A National Code of Forest Harvesting Practices in Myanmar was formulated based on the guidelines of the FAO. Weaknesses have been identified in some areas. Management standards for soil and water conservation, social aspects and forest workers need to be further strengthened. Although the Community Forestry Instructions (CFIs) issued in 1995, allow local communities to participate in forest management, the local people in Toungoo District show little or no interest in the CFI process. This may be due to the abundant forest resources available in the District.

Both the Forest Department and Myanma Timber Enterprise (MTE), two forestry-related institutions under the Ministry of Forestry, have fulfilled the social needs of forest workers in accordance with Myanmar's social and cultural systems but these have not been well documented. In terms of environmental conservation, existing working plans and newly formulated forest management plans contain adequate provisions and prescriptions for forest management, conservation and operations.

In general, Toungoo Forest District FMU has been managed and operated with a large number of instructions, procedures and guidelines, and it is believed that forest operations undertaken follow these instructions. The major issue facing Toungoo FMU

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is how to tighten law enforcement to minimize and eventually eliminate timber theft.

6. Opportunities and constraints

The following opportunities and constraints have a direct impact on the application of C&I in the progress towards SFM in Toungoo Forest District in particular and in the country in general.

6.1 Opportunities

- Forest policy, forest law, forest rules and other administrative requirements are in place.
- Existence of long-term forest management systems and practices.
- About 50% of the total land area is still covered with forests, of which closed forest constitutes about 43%.
- Reports, records, maps, registers and forest resource data.
- Competent human resources and favourable environment.
- Decentralization and devolution of authority and responsibility.
- Active people's participation in forestry-related programmes and activities.

6.2 Constraints

- Inadequate documents and information.
- Adhocism in land use and low productivity.
- Shifting cultivation.
- Inappropriate pricing policy and policy conflicts.
- Inefficient wood processing and utilization of forest resources.
- Inadequate budgetary resources.
- Inadequate institutional framework.

7. Development of field/MFs level C&I for SFM

7.1 Present scenario

Paukkaung Township has a total area of 190,840 ha. The MF Project covers the whole township. There are two active dams - North Nawin and South Nawin dams - within the Project area and MF activities are being concentrated in the upland catchment areas. The total watershed area of the two dams is about 129,960 ha (59,370 ha of North Nawin dam and 70,590 ha of South Nawin dam). Upstream dwellers of within the catchments of the two two dams impact on and influence the socio-economic situation of downstream users and areas.

Development of C&I: Toungoo Forest District

Agriculture is the dominant sector within the township's economy. With more than 85% of its total population of 117,830 in 2000 being rural, the township has traditionally been dependent on forest resources for daily requirements and business purposes as well. The total area of reserved forests and other forests constitutes 44% of the total township area. Some reserved forests contain a diversity of flora and fauna are still active in timber production. About two-thirds of the total area is hilly. Due to a scarcity of plains, only 15,040 ha or about 8% can be used for rice cultivation.

The climate of Paukkaung township is characterized by fairly high temperatures, and average annual rainfall rarely exceeds 1,270 mm. Different ethnic groups are live in the hilly parts of the township, with Barma constituting the largest group, at 91% of the population. Various forest operations, including establishment of forest plantations, are carried out in the forests. The Chin and Kayin are the two major ethnic groups engaged in forest activities.

Development of field/MF level C&I for SFM in Paukkaung MF should cover the following:

- adequacy of policy, legal and institutional framework and enhancement of capacity to implement SFM;
- maintenance and enhancement of the production functions of forests;
- maintenance and conservation of biodiversity in forest ecosystems;
- maintenance of forest ecosystem health, vitality and integrity;
- optimization of forest resource utilization;
- conservation and maintenance of soil and water resources; and
- maintenance and enhancement of socio-economic benefits.

The development of field/MF level C&I should be based on the subset of C&I for SFM for Natural Tropical Forests at the FMU Level in Myanmar.

8. Discussions and conclusions

Myanmar, a tropical country in Asia, is a producer member of the ITTO and consequently ITTO's C&I is deemed the most appropriate for Myanmar. Myanmar's C&I have 270 activities at the national level and 227 activities at the FMU level. Although the activities formulated are based on Myanmar's forest management practices, extensive review of the formulated activities in terms of usefulness, practicability, affordability and effectiveness should be carried out as circumstances permit. It is noted that too many activities may present problems in implementation, but too few activities may be inadequate in fulfilling the indicators. The minimum requirements of an indicator must be met. Therefore, the FD and MTE will need to assess forest management performances by measuring C&I. The relevancy and applicability of

Development of C&I: Toungoo Forest District

the C&I should be evaluated and the current C&I should not remain static.


Forest resources in the Toungoo District have been scientifically and systematically managed for many years - almost a century and a half. Therefore, the District has a deep-rooted and well-established forest management background. In addition, there are adequate management specifications in place to guide forest operations undertaken in the District. These rules, Departmental Instructions, Standing Orders, Detailed Instructions issued by Divisional Forest Officers, manuals and laws are to be strictly followed and implemented. Adherence to forest management plans, implementation of the National Code of Forest Harvesting Practices, formulation of new management specifications as required and strengthening of law enforcement measures are seen as urgent necessities to enhance C&I application. The FD, MTE, individuals or groups related to the timber trade and more importantly, local people, should take part in all activities concerning the conservation of forest resources. With such cooperative and integrated approaches and actions, Toungoo Forest District FMU level will achieve substantial progress towards SFM.

Development of C&I: the Philippines experience

**Development of criteria and indicators
for sustainable forest management: the Philippines experience**

by

Adriano Nava Jr. and Isabelita Austria
DENR, Philippines

<p>1</p>  <p>DEVELOPMENT AND APPLICATION OF CRITERIA AND INDICATORS FOR SUSTAINABLE FOREST MANAGEMENT Philippines Experience</p>	<p>2</p> <p><i>Sustainable forest management:</i></p> <p><i>A system of managing forest lands and resources to enable the present generation to meet its needs without impairing the ability of future generations to meet theirs</i></p>																		
<p>3</p> <p>1. Development of national level C&I</p> <p>1.1 What framework is in use?</p> <p>The C&I developed by the International Tropical Timber Organization (ITTO)</p>	<p>4</p> <p>1.1.1 How has the ITTO framework been adopted?</p> <p><i>There are similarities between the criteria for SFM developed by ITTO and the proposed criteria for SFM in the Philippines</i></p>																		
<p>5</p> <p>Comparison between the ITTO and Philippine criteria for SFM</p> <table border="0"> <thead> <tr> <th>ITTO</th> <th>PHILIPPINES</th> </tr> </thead> <tbody> <tr> <td>1. Enabling conditions for SFM</td> <td>1. Legal, policy and institutional framework</td> </tr> <tr> <td>2. Forest resources security</td> <td>2. Forest resources base</td> </tr> <tr> <td>3. Forest ecosystem health and condition</td> <td>3. Forest ecosystem health and vitality</td> </tr> </tbody> </table>	ITTO	PHILIPPINES	1. Enabling conditions for SFM	1. Legal, policy and institutional framework	2. Forest resources security	2. Forest resources base	3. Forest ecosystem health and condition	3. Forest ecosystem health and vitality	<p>6</p> <p>Comparison between the ITTO and Philippine criteria for SFM (cont.)</p> <table border="0"> <thead> <tr> <th>ITTO</th> <th>PHILIPPINES</th> </tr> </thead> <tbody> <tr> <td>4. Flow of forest produce</td> <td>4. Forest resources</td> </tr> <tr> <td>5. Biological diversity</td> <td>5. Conservation of genetic resources and biological diversity</td> </tr> <tr> <td>6. Conservation of soil and water resources</td> <td>6. Acceptable level of environmental impact</td> </tr> <tr> <td>7. Economic, social and cultural aspects</td> <td>7. Social and economic effects</td> </tr> </tbody> </table>	ITTO	PHILIPPINES	4. Flow of forest produce	4. Forest resources	5. Biological diversity	5. Conservation of genetic resources and biological diversity	6. Conservation of soil and water resources	6. Acceptable level of environmental impact	7. Economic, social and cultural aspects	7. Social and economic effects
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<p>9</p> <p>1.2.1 How have they been involved?</p> <p><i>The SFM Task Force drafted the proposed national C&I for sustainable forest management</i></p>	<p>10</p> <p>1.2.2 What challenges were encountered and how were they being addressed?</p> <table border="0"> <thead> <tr> <th style="text-align: left;">Challenge</th> <th style="text-align: left;">Actions taken</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> • Will the draft national C&I be acceptable to other stakeholders of forestlands resources other than the organization represented by the task force members? </td> <td> <ul style="list-style-type: none"> • Comments on the draft national C&I solicited • The task force on SFM will be strengthened • Other stakeholders will be involved in the C&I development process </td> </tr> </tbody> </table>	Challenge	Actions taken	<ul style="list-style-type: none"> • Will the draft national C&I be acceptable to other stakeholders of forestlands resources other than the organization represented by the task force members? 	<ul style="list-style-type: none"> • Comments on the draft national C&I solicited • The task force on SFM will be strengthened • Other stakeholders will be involved in the C&I development process
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<p>11</p> <p>1.3 What progress has been made in monitoring and reporting on national indicators?</p> <p><i>The proposed C&I have not been widely discussed, finalized and officially acknowledged as the national guidelines</i></p>	<p>12</p> <p>1.3.1 What challenges are faced and how are they overcome?</p> <table border="0"> <thead> <tr> <th style="text-align: left;">Challenge</th> <th style="text-align: left;">Action</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> • How can the proposed national C&I be improved to make it more appropriate, acceptable and acknowledged as the official measures of SFM in the Philippines? </td> <td> <ul style="list-style-type: none"> • Get lessons and experiences from other cases • Get inputs from various stakeholders • Solicit technical and financial support for the activity </td> </tr> </tbody> </table>	Challenge	Action	<ul style="list-style-type: none"> • How can the proposed national C&I be improved to make it more appropriate, acceptable and acknowledged as the official measures of SFM in the Philippines? 	<ul style="list-style-type: none"> • Get lessons and experiences from other cases • Get inputs from various stakeholders • Solicit technical and financial support for the activity
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<p>13</p> <p>1.4 What are the efforts being made at the national level to ensure that the national C&I activities are relevant at the local level?</p> <ul style="list-style-type: none"> • <i>In the development of the local-level C&I for SFM in the Philippines, the proposed national C&I was used as one of the inputs</i> • <i>National and local forestland resources management activities in the Philippines are supportive of Sustainable Forest Management</i> 	<p>14</p> <p style="text-align: center;">National-level criteria and indicators for SFM</p>
<p>15</p> <p>Criterion 1. Legal, policy and institutional framework</p> <p>Indicators</p> <p>1.1 National Land Use Plan with provisions for the establishment of Permanent Forest Zone (PFZ)</p> <p>1.2 National Forest Policy and a National Forest Action Plan</p>	<p>16</p> <p>Criterion 1. Legal, policy and institutional framework</p> <p>Indicators (cont.)</p> <p>1.2.1 Provides for periodic forest-related planning, assessment and policy review that recognizes the range of forest values, including coordination with relevant sectors</p> <p>1.2.2 Provides opportunities for public participation in planning and policy decision-making</p>
<p>17</p> <p>Criterion 1. Legal, policy and institutional framework</p> <p>Indicators (cont.)</p> <p>1.3 Competent professionals and dedicated forest service</p> <p>1.4 Effective coordination/linkage with other government agencies and local government units</p>	<p>18</p> <p>Criterion 1. Legal, policy and institutional framework</p> <p>Indicators (cont.)</p> <p>1.5 Effective information, education and communication (IEC) campaign</p> <p>1.6 Creation of Multi-Sectoral Forest Protection Committees (MFPC)</p>

<p>19</p> <p>Criterion 1. Legal, policy and institutional framework</p> <p>Indicators (cont.)</p> <ul style="list-style-type: none"> 1.7 Forest protection and law enforcement initiatives 1.8 Administrative procedure for forest management 1.9 Information and training on forest management standards 	<p>20</p> <p>Criterion 2. Forest resource base</p> <p>Indicators</p> <ul style="list-style-type: none"> 2.1 Establishment of Permanent Forest Zone (PFZ) <ul style="list-style-type: none"> 2.1.1 Areas for Production and Protection Forests 2.1.2 Areas of forest cover within the production and protection forests
<p>21</p> <p>Criterion 2. Forest resource base</p> <p>Indicators (cont.)</p> <ul style="list-style-type: none"> 2.1.3 Areas of natural and plantation forests within the production and protection forests 2.1.4 Areas covered by tenurial instruments within the production and protection forests 	<p>22</p> <p>Criterion 2. Forest resource base</p> <p>Indicators (cont.)</p> <ul style="list-style-type: none"> 2.2 Volume per hectare of timber and non-timber products within production and protection forests 2.3 Area and percent of forest land with significant soil erosion
<p>23</p> <p>Criterion 3. Sustained productivity of forest resources</p> <p>Indicators</p> <ul style="list-style-type: none"> 3.1 Volume of supply and demand of forest products 3.2 Documentation of logging operations over time 3.3 Appropriate cutting cycles by forest types 	<p>24</p> <p>Criterion 3. Sustained productivity of forest resources</p> <p>Indicators (cont.)</p> <ul style="list-style-type: none"> 3.4 Regulated allowable cut in relation to increment data and operable area 3.5 Appropriate regulations in the utilization of forest resources

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<p>25</p> <p>Criterion 3. Sustained productivity of forest resources</p> <p>Indicators (cont.)</p> <p>3.6 Continuing forest inventory</p> <p>3.7 Reliable volume equations and tables, and growth increment data</p> <p>3.8 Changes in forest cover</p> <p>3.9 Availability of silvicultural prescriptions for the major forest types</p>	<p>26</p> <p>Criterion 4. Social and economic effects</p> <p>Indicators</p> <p>4.1 Rate of increase in income and employment of recipient individuals and communities</p> <p>4.2 Number of upland population and rural poor benefited from forestry programs</p>
<p>27</p> <p>Criterion 4. Social and economic effects</p> <p>Indicators (cont.)</p> <p>4.3 Number of upland population and rural poor with access to forest resources use and benefits</p> <p>4.4 Rate of participation of the upland population and the rural poor in policy-making and implementation</p>	<p>28</p> <p>Criterion 4. Social and economic effects</p> <p>Indicators (cont.)</p> <p>4.5 Capacitation of recipient individuals and communities</p> <p>4.6 Gross Value Added (GVA) in forestry as a share in the GNP</p> <p>4.7 Volume and value of imports of wood-based products</p>
<p>29</p> <p>Criterion 4. Social and economic effects</p> <p>Indicators (cont.)</p> <p>4.8 Volume and value of exports of processed forest products</p> <p>4.9 Volume and value of imports of non-timber forest products</p>	<p>30</p> <p>Criterion 5. Conservation of genetic resources and biological diversity</p> <p>Indicators</p> <p>5.1 Appropriate protected areas management system</p> <p>5.2 Documentation of the impact of human activities on the forest ecosystem</p> <p>5.3 Extent of area by forest type relative to total forest area</p>

<p>31</p> <p>Criterion 5. Conservation of genetic resources and biological diversity</p> <p>Indicators (cont.)</p> <p>5.4 Extent of area by forest type in protected areas categorized as defined by IUCN or other classification systems</p> <p>5.5 Number and status of forest dependent-species at risk of not maintaining viable breeding populations, as determined by legislation or scientific assessment</p>	<p>32</p> <p>Criterion 6. Acceptable level of environmental impacts</p> <p>Indicators</p> <p>6.1 Determination of impacts (qualitative and quantitative) of the stress/es brought about by forest activity/ies</p> <p>6.2 Management prescriptions for other non-production components of the forest</p>
<p>33</p> <p>Criterion 6. Acceptable level of environmental impacts</p> <p>Indicators (cont.)</p> <p>6.3 Degree of participation of stakeholders</p> <p>6.4 Soil and water quality as key indicators for environmental impacts</p>	<p>34</p> <p>Criterion 7. Forest ecosystem health and viability</p> <p>Indicators</p> <p>7.1 Impact of harvesting and gathering operations</p> <p>7.2 Administrative and financial plans for preserving the health and vitality of the forest ecosystem</p> <p>7.3 Damage caused by biotic or abiotic agents.</p>
<p>35</p> <p>Development of local-level criteria & indicators for sustainable forest management</p>	<p>36</p> <pre> graph TD TS[TECHNICAL SUPPORT] --> Box1 LS[LOGISTICS SUPPORT] --> Box1 subgraph Box1 [] PO[Peoples Organization] NG[National Government] LGU[Local Government Units] NGO[Non-Government Organizations] end Box1 --> CB[CONSULTATION AND PARTICIPATORY BUILDING] CB --> C[CRITERIA & INDICATORS for SFM] C --> I[Identification of Core and Proxy Indicators] I --> EMS[ENVIRONMENTAL PERFORMANCE MONITORING SYSTEM] </pre> <p>2. DEVELOPMENT OF LOCAL-LEVEL CRITERIA & INDICATORS FOR SUSTAINABLE FOREST MANAGEMENT</p>

<p>37</p> <p>2.1 Partners involved</p> <ul style="list-style-type: none"> • Peoples' Organization (POs) • Department of Environment and Natural Resources (DENR) • Local Government Units (LGU) • Non-Government Organizations (NGO) 	<p>38</p> <p>2.1 Partners involved (cont.)</p> <ul style="list-style-type: none"> • United State Agency for International Development (USAID) • Development Alternatives, Inc. (DAI) • Orient Integrated Development Consultants, Inc. (OIDCI) 				
<p>39</p> <p>2.1.1 How have they been involved?</p> <ul style="list-style-type: none"> • <i>formulation of C&I for SFM</i> • <i>provision of financial support</i> • <i>provision of technical assistance</i> 	<p>40</p> <p>2.1.2 What challenges were encountered and were these addressed?</p> <table border="0"> <thead> <tr> <th>Challenge</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>• <i>How to sustain partners' participation even after external financial assistance ceases?</i></td> <td>• <i>Include them in environmental programs' monitoring activities</i></td> </tr> </tbody> </table>	Challenge	Action	• <i>How to sustain partners' participation even after external financial assistance ceases?</i>	• <i>Include them in environmental programs' monitoring activities</i>
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<p>41</p> <p>2.2 What progress has been made in selecting relevant local-level indicators?</p>	<p>42</p> <p style="text-align: center;">MILESTONES</p> <pre> graph TD A[December 1997 to February 1998] --> B[Broad Consultations] C[May 1998] --> D[Case Study Workshops] E[June 1998] --> F[National Synthesis Workshop] G[January 1998 to January 1999] --> H[Review of revised set of indicators] I[February 1999] --> J[Final Workshop] K[June 1999] --> L[Publication of the field manual] M[August 2000 up to the present] --> N[Field-testing] </pre>				

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<p>45</p> <p>2.3 How are indicators being field-tested?</p> <p><i>Preliminary Activities:</i> <i>Formation of EPM Team</i></p> <ul style="list-style-type: none"> • Orientation on the EPM Process <ul style="list-style-type: none"> ⇨ Importance of EPM ⇨ Core Indicators and Process Indicators ⇨ Monitoring Process ⇨ Practicum <p><i>Actual Field-Testing of EPM:</i> <i>Monitoring of Ecosystem Health</i></p> <ul style="list-style-type: none"> • Monitoring of PO capability for SFM 	<p>46</p> <p>2.3.1 What plans or programs are in place to monitor the indicators?</p> <p>Field-testing of the EPM is on-going in Regions 5, 10, 11 and 13</p>										
<p>47</p> <p>2.4 What are the short and long-term goals?</p> <p><i>Short-term goals:</i></p> <ul style="list-style-type: none"> • organize EPM teams • gather baseline data • determine periodically if the community's environmental objectives are being achieved 	<p>48</p> <p>2.4 What are the short and long-term goals? (cont.)</p> <p><i>Long-term goals:</i></p> <ul style="list-style-type: none"> • To assess effectiveness of forest management practices and initiate appropriate measures towards sustainability • To strengthen POs capability in SFM • To develop forest community ownership of EPM 										

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<p>49</p> <p>2.4.1 What specific outputs have been completed?</p> <ul style="list-style-type: none"> • <i>Environmental Performance Monitoring Guidebook</i> • <i>EPM Manual</i> • <i>Initial EPM reports from field sites</i> 	<p>50</p> <p>2.4.1 What specific outputs have been completed? (continuation)</p> <p><i>Follow-up activities:</i> <i>Consolidate comments and recommendations based on EPM field reports</i></p> <ul style="list-style-type: none"> • <i>Use the above as inputs for improving the EPM tool</i> • <i>Extend use of the EPM process to other forest management units</i>
<p>51</p> <p>2.4.2 What are the desired outcomes, benefits and impacts of working with local level indicators?</p> <ul style="list-style-type: none"> • <i>Development of field-level capabilities that lead to healthy forest ecosystem</i> • <i>Eventual development of provincial, regional and even national C&I from local experiences and lessons learnt</i> 	<p>52</p> <p>2.4.2 What are the desired outcomes, benefits and impacts of working with local level indicators? (cont.)</p> <ul style="list-style-type: none"> • <i>Enable forest communities to realize the importance and their ownership of the C&I processes in Environmental Performance Monitoring</i>
<p>53</p> <p>2.5 What assistance do you require to enable you to develop, test and regularly monitor C&I for your MF Project area?</p> <ul style="list-style-type: none"> • <i>Technical assistance</i> • <i>Financial assistance to cover costs for:</i> <ul style="list-style-type: none"> ⇨ <i>Consultation meetings</i> ⇨ <i>Training on EPM and formation of monitoring team</i> ⇨ <i>Materials to set up the system</i> ⇨ <i>Travel/subsistence</i> ⇨ <i>Monitoring and evaluation</i> 	<p>54</p> <p>Forest cover - Increased?</p> <p>Forest destruction - Decreased?</p> <p>Water supply - Reliable & stable?</p> <p>Water quality - Good?</p> <p>Soil erosion - Minimized?</p> <p>Wildlife - Increased?</p> <p>Questions asked by POs and other stakeholders</p> 

Thailand's experiences in the development of criteria and indicators for sustainable forest management

by

Jira Jintanugool and Thannarin Na Nakorn
Royal Forest Department, Thailand

1. Introduction

Since the 1992 Earth Summit in Rio de Janeiro, Brazil, international attention has been focused on the issue of sustainable development. In the forestry sector, the concept of SFM was developed through the *Forest Principles* and Chapter 11 of *Agenda 21*. It was agreed that forest resources and forestland should be sustainably managed to meet the social, economical, cultural and spiritual needs of present and future generations. There have also been calls for the formulation of scientifically sound criteria and guidelines for the management, conservation and sustainable development of all types of forests across the world.

This has resulted in a number of national, regional and international initiatives. C&I for SFM have been identified and developed by different countries and international organizations to monitor and evaluate the status and progress of SFM as well as global environment quality.

2. Development of C&I for SFM in Thailand

Thailand recognizes the importance of sustainable forest practices and has continued to participate in activities concerning the conservation and sustainable management of forests. The following provides a brief overview of some of the activities undertaken to develop and implement C&I for SFM in the kingdom.

A study on the development of C&I was conducted by Jintanugool in 1997, which examined C&I as a tool for monitoring and evaluating progress towards SFM in Thailand. As a result, a set of national-level C&I for SFM was proposed, consisting of 6 criteria and 54 indicators:

- Forest resource base (7 indicators);
- Conservation of biological diversity (10 indicators);
- Maintenance of the forest ecosystem and environment (9 indicators);
- Social and economic contribution of forest (12 indicators);
- Involvement of stakeholders in forest management (7 indicators); and
- Legal, policy and institutional frameworks for forest management (9 indicators).

Developing and using local level indicators of sustainable forest management: experiences from the Canadian Model Forest Network

by

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1. Introduction

MFs were established in Canada in 1992 with the intent of functioning as ‘living laboratories’, where people with a direct interest in the forest, supported by up-to-date science and technology, could participate in decisions about how the forest could be sustainably managed. After reviewing over fifty proposals, a network of ten MFs was established, later expanded to twelve sites. Perhaps the most distinctive common feature of MFs is their reliance on diverse partnerships both for exploring new approaches to shared decision-making as well as for actual leadership on individual projects.

In 1997 all MFs in Canada, as part of their commitments towards Phase II of the Model Forest Program, developed their own work programs to identify, measure and report on local level indicators of SFM. Since that time a great deal of progress has been made, by individual MFs as well as by the Canadian Model Forest Network (MFN) as a whole.

This paper summarizes the work done to date by MFs across Canada, drawing out some of the commonalities as well as differences among MFs. It does not provide detailed information about any individual MF; however, that information has been compiled in a report prepared for the Canadian MFN,¹ which served as the source for much of the information presented in this more general overview.

2. MFs and local level indicators

Much of the initial interest in criteria and indicators of SFM arose out of a need for credible, transparent and consistent reporting at the national and international levels. It is clear, however, that the ability to demonstrate national advancement towards SFM rests largely with actions that are carried out at the local level. If these local actions are to be assessed it will require indicators that are particularly well suited to local needs. In other words, any effective fulfillment of the expectations set forth in criteria and indicators initiatives requires not so much “topdown” completion of a particular framework, but rather “bottom-up” reporting of progress made at the

1 von Mirbach, M. A Users' Guide to Local Level indicators of Sustainable Forest Management: Experiences from the Canadian Model Forest Network, Version 1.0, June 2000

local level. This has meant that the interest at the forest management unit level has gradually shifted from grappling with the more abstract concept of criteria towards a more practical challenge of identifying and using effective local level indicators.

There is a number of reasons why the MF program is a particularly well-suited vehicle for showing leadership in the development and application of local level indicators. MFs were established in order to explore and implement innovative practises at an operational scale. They range in size from about 100,000 ha to over 2 million ha, a size range that covers the typical scales at which district-level forest management decisions are made. They are represented in each of the major forest types in Canada, and include the full range of ownership patterns to be found in Canada, including large-scale private freehold or leased land, public lands, private forest smallholdings and forests within an Aboriginal treaty area. As well, five MFs include national parks within their boundaries, which have particular relevance in the context of local level indicators since they allow for comparisons between lands managed for timber production and lands managed primarily for heritage and conservation values.

3. Initiating a work program on local level indicators (LLI)

One of the characteristics common to all MFs and their approach to LLI is their reliance on partnerships of diverse interests to guide and/or lead the process. The important feature here is that these diverse interests are involved at the front end of the planning process, rather than simply being brought in at a later stage to comment on a draft plan. MFs are founded upon the principle of shared decision-making, and this principle is applied to most major initiatives, including work on local level indicators.

There are four general reasons why participatory approaches can be an appropriate way to address resource management issues, briefly discussed below along with the particular relevance to work on LLI:

- a) *Affected interests have a right to be meaningfully involved.* Since the vast majority of forested land in Canada is publicly owned, there is an understanding that the public has a right to be meaningfully involved in decisions that affect the use of that land, and a growing recognition that this involvement should properly take place before commitments have been made. Since selecting appropriate indicators is a vitally important early step in the planning process, it makes sense to include public and stakeholder involvement at this stage.
- b) *People have valuable information and perspectives to contribute.* The information that diverse interests bring to any discussion of LLI is likely to reflect their varied backgrounds and perspectives. They will consider things from an angle not necessarily anticipated by the resource managers themselves, and thereby contribute a spirit of open-mindedness, creativity and innovation to

the process. When it comes to LLI, many participants (both non-governmental as well as from governmental agencies involved in areas such as wildlife management, tourism, recreation and community development) will have valuable suggestions for how to make effective use of existing information. A participatory process, in other words, can result in a *better* plan.

- c) *Up-front involvement improves the credibility of the overall plan.* To the extent that LLI are embedded in a forest management planning process, involvement in the LLI process will improve the overall acceptability of the plan when it is time to seek final political approval, and result in a plan that is more likely to be implemented.
- d) *Having diverse participation can help to generate interest in, awareness of and commitment to SFM.* Sooner or later it will be necessary to communicate the results of any work being done on local level indicators. By having diverse interests involved from the very beginning, this communications function is built right into the LLI development process, rather than as an add-on at the end. Communications and outreach to the various constituencies is best done by people who are part of those constituencies and accountable to them.

Of course, for any participatory process to be effective there must be adequate attention paid to some of the basic requirements of effective participatory processes. Many participants will be unfamiliar with some of the jargon used by forest managers, and care must be taken to bring these people up to speed and to keep them at the table.

It is also important to recognize and acknowledge that the interests of various participants may not be the same as the interests of forest managers. For instance, forest managers are likely to want to use LLI to demonstrate progress towards SFM and/or to meet forest certification requirements. These concerns are not widely shared by the diverse participants that might be invited to join the process, who are more likely to want to see LLI used to monitor forestry activities, especially where trust has been lacking in the past, or to obtain recognition or respect for certain key non-timber values. There is no fundamental inconsistency between these differing expectations, however, and a good set of LLI can contribute towards all of these goals, as well as the shared goals of obtaining better information and understanding about SFM with the ultimate aim of improving forestry practises overall.

4. Selecting and refining indicators

A key task in any process to develop LLI is to adopt an initial set of indicators and then to whittle that set down to something that is manageable. MFs across Canada have used a variety of approaches towards adopting an initial set. Some simply started with the set of national-level indicators adopted by the Canadian Council of Forest

Experiences from the CMFN

Ministers in 1995. Some MFs used this set but added to it other indicators from assorted sources. One MF started with an entirely different set, oriented towards monitoring the implementation of a specific Aboriginal treaty. A few MFs started from a “blank slate,” encouraging a committee of diverse interests to define appropriate indicators to address a common set of shared values and goals. There is probably no single preferred approach to this task.

Each MF has used its own methods to reduce the initial set of indicators to a more manageable set, although there was general consistency in the approaches used.

The following is a compilation of the various screening criteria that were used, in three general categories:

- a) **Criteria of credibility**
 - Is the indicator *relevant*, and does it tell us something meaningful about SFM?
 - Is it *reliable*, and relatively free of extraneous influences (“noise”)?
 - Is it *responsive* to management actions?
 - Is it *sensitive* to change, and will it show trends over time?
 - Can future indicator levels be *predicted* with reasonable accuracy?
- b) **Criteria of practicality**
 - Is data for this indicator currently *available*?
 - Is data *affordable*, and can it be collected and compiled at a reasonable cost?
- c) **Criteria of overall acceptability**
 - Is the indicator *measurable* at an appropriate scale and time frame?
 - Is the indicator and its relevance readily *understandable*?
 - Is the indicator *cost-effective*, and is the cost of supporting it justified by the value of the information it provides?
 - Is there the necessary *commitment* to measure, report on and use this indicator?

Although each MF has come up with an initial refined set of indicators, no single set can ever be considered final. Because of the considerable effort required to collect, compile, assess and report on data, there is continual pressure to reduce and simplify the indicators in current use. At the same time, there is a strong interest in expanding the scope and coverage of the indicators, thereby adding to the complexity of the initial set. And added to both of these competing factors is the simple fact that as greater experience is gained in using indicators there are always opportunities to modify and refine the indicators in use, or to reject them as unworkable. In other

words, there are dynamic tensions ensuring that no set of indicators remains static and fixed as a 'final' set.

5. Gathering information

Supplying data for the selected indicators requires a combination of accessing existing data (e.g., timber inventories, permanent sample plots, provincial government records, Statistics Canada data) and generating new data (e.g., on-site monitoring, remote sensing, public surveys). While gathering new data usually involves greater additional cost, it also takes considerable time and attention to detail to obtain existing data in a useable form. It is at this stage that a partnership-based approach to LLI can be especially useful, since it allows for the possibility that some of the tasks can be shared among the partners. However, dividing up work responsibilities in this way cannot be done effectively without adequate leadership, commitment and support, and without a shared understanding of the desired outcomes of the process.

All MFs are currently in the process of gathering data on their core, or initial indicators. Some have already collected and compiled information on an initial set of indicators, while others are at different stages in the process. Some of the many common challenges being faced and overcome by MFs are briefly described below.

- a) **Technical challenges.** Some of the technical challenges include difficulties in obtaining data at the most relevant scale, or in merging different data sets. This latter problem has proven to be especially prevalent when attempting to obtain consistent data covering both national parks as well as industrial timber lands.
- b) **Practical challenges.** The most common practical difficulty is the sheer difficulty of juggling data collection requirements for so many different indicators, resulting in the inevitable pressure to limit the number of indicators being monitored in the initial stages. As MFs gained more experience in data gathering more ideas were generated about how to make better use of existing data sets. In some cases it became evident that direct measurement across an entire forest management unit was not feasible, but that case studies could be used to get at least a general picture of a particular indicator. Partnership-based approaches have proven to be particularly effective in helping to share the burden of gathering data on a broad set of diverse indicators.
- c) **Human (or institutional) challenges.** In some cases it became evident that there was a reluctance to release information, either because of the proprietary nature of the information or because of a general reluctance to release information voluntarily. In such cases it can be helpful to ensure that there is adequate buy-in from the beginning, involving representatives with sufficient authority to help in overcoming these potential barriers.

6. Using and applying LLI

One of the biggest mistakes that people can make when working with LLI is to assume that LLI everywhere are being developed for the same purpose. Nothing could be further from the truth, and the experience of the Canadian MF Network displays this very clearly. Despite starting from a common set of guidelines, MFs across Canada have adapted LLI to their own particular situations, with widely differing results. In general, the various applications of LLI can be grouped in three broad categories, listed below with a few examples of specific applications, as well as reference to MFs that have shown particular leadership in that regard. Please note that these MFs are named solely as examples, and this summary is not a comprehensive list of all MFs engaged in each particular activity.

6.1 Using LLI to improve knowledge of and understanding about SFM

- **Addressing gaps in LLI frameworks.** One particularly useful feature of developing indicators to address a broad framework of criteria is that it quickly becomes apparent where knowledge is lacking. This helps to generate interest and commitment to addressing those gaps. Some of these gaps (and the MFs that are devoting special attention to filling them) are in the areas of socioeconomic indicators (being studied by Foothills MF and others), the identification of appropriate indicators of traditional knowledge (Waswanipi Cree, Long Beach, Prince Albert and McGregor MFs), and indicators of public participation (Waswanipi Cree and Prince Albert MFs).
- **Establishing a comprehensive monitoring regime.** Long Beach MF is taking particular leadership here, in helping to facilitate, guide and coordinate the activities of various agencies with a mandate to monitor and report on many aspects of forest management and forestry impacts.

6.2 Using LLI in forest management

- **Incorporating LLI in management plans.** Most MFs across Canada have been working to some extent at encouraging and helping their partners to build an enhanced awareness of LLI into their management plans. The Bas-Saint-Laurent MF has gone so far as to actually coordinate the planning process on behalf of its many diverse small-scale landowners and forest tenant farms.
- **Scenario planning.** Both Fundy and McGregor MFs have used indicators to project values forward in time, and to assess the predicted impact of different management activities on those actions. This can be a powerful tool to frame discussions and decisions based on the “desired” or “preferred” future forest state.
- **Best Management Practises.** A number of MFs - most notably Fundy and

Manitoba - have used their indicator frameworks in order to set targets, thresholds or specific objectives for particular indicators, reflecting a level of performance believed to constitute Best Management Practises.

- **Forest certification.** Despite their significant differences, every certification system includes an environmental management system within its standard, and every environmental management system identifies a need to monitor and evaluate actual performance against stated objectives. Local level indicators are an essential part of every certification system, therefore, whether or not they are explicitly referred to. Many MFs are assisting their partners to meet various certification requirements related to LLI. The Eastern Ontario MF is playing a particularly active role in helping to assist in the certification-related efforts of many private woodlot owners.

6.3 Using LLI in communications, outreach and knowledge transfer

- **State of the Forest Reporting.** Several MFs are in the midst of compiling a “State of the Forest Report” for their MF, intended to communicate information about what can be learned on the basis of information compiled from various diverse indicators. Lake Abitibi MF has compiled a wealth of relevant information, and the Eastern Ontario MF has published its first report, and is undertaking a series of outreach presentations to communicate the results.
- **Broader application and knowledge transfer.** A number of MFs have taken steps to ensure that their work in local LLI is applied outside the actual boundaries of the MF. McGregor MF, for instance, conducted a series of workshops on its approach to scenario planning, and has followed up with detailed work in a number of districts in the interior of British Columbia. Western Newfoundland MF developed a manual on how to involve the public and diverse interest groups in developing LLI; the guide has been distributed widely and is one of the tools used by district forest planners throughout the province. Foothills MF is currently in the process of transferring its experiences with LLI to a multi-departmental integrated land use planning exercise being led by the province of Alberta.

7. The role of the MF Network

In 1997 the Model Forest Network established a number of strategic initiatives, including the one devoted to LLI. The purpose of this initiative is to help MFs make progress more quickly, to promote knowledge transfer between MFs, to facilitate the implementation of joint or collaborative initiatives and to promote outreach beyond the MF Network. A number of workshops have been held in order to share perspectives and information among MFs. In the past year the attention has turned towards effective outreach, resulting in a number of initiatives or products designed to be used

by any agency involved in implementing LLI. The initiatives listed below are a few highlights:

- **A Users' Guide to LLI of SFM.** This is a comprehensive reference tool, currently in an advanced draft stage. It compiles information about how each MF has gone about identifying, measuring and using LLI, along with specific details about how data is being collected. Combined with this thorough database is a section that synthesizes the information, outlining commonalities and differences in the approaches used by MFs.
- **Development and identification of common local level social and economic indicators across the MF Network.** This project developed methodologies to use Statistics Canada data to report on social economic indicators of sustainability that are common across the MF Network. The user-friendly tool allows for the creation of socio-demographic profiles of communities, parishes, villages and Aboriginal reserves, with a graphical interface to allow the information to be visually displayed.
- **LLI workshops.** The MF Network, in conjunction with host MFs, is organizing a series of workshops across Canada intended to highlight the most practical aspects of the work done to date by MFs across Canada. The workshops are designed to meet the needs of resource managers and stakeholders, giving them specific tools to address particular challenges they are facing.

8. Conclusion: why use LLI?

It can be seen from the above that MFs have found a wide range of practical applications for LLI. There are many commonalities in terms of the methods used, but also significant differences, arising from differing regional circumstances. What all MF approaches have in common is that they enable and require the forest manager to exercise due diligence across the full range of timber and non-timber values implicit in the concept of SFM, create a common and deeper understanding of SFM, foster transparency and openness in forest management planning and establish a consistent and credible platform from which to evaluate forest operations. Moreover, they do this in an open and transparent manner, involving the full range of interests that ultimately have a stake in SFM. Although it has required considerable commitment and patience in order to get so many diverse interests working together, the results would suggest that broad participation can be a valid and effective method for developing, measuring, using and reporting on LLI of SFM.

Experiences in developing C&I: Thailand

In 1998, the Royal Forest Department (RFD) set up a committee to be responsible for the formulation, development and implementation of C&I for SFM in Thailand. At the same time, the ASEAN countries had occasional meetings and discussions about SFM in the region. C&I for SFM were among the main issues discussed at the meetings. By 1999, the ASEAN countries agreed to use the new ITTO Criteria and Indicators for Sustainable Management of Natural Tropical Forests (ITTO, 1998) as a main frame for the ASEAN region.

3. C&I for SFM at the national level

Apart from the ITTO (1998) and ASEAN (1999) guidelines and Jintanugool's proposal (1997), some C&I proposals from other regions have been studied and discussed by the RFD committee. To get broader views and aspects, some committee members participated at other meetings related to the development and implementation of C&I for SFM. Those meetings included:

- *Workshop on National Level Criteria and Indicators for the Sustainable Management of Dry Forests in Asia* (India, 1999), and
- *Workshop to Train Trainees on the Use of the Manual for the Application of ITTO Criteria and Indicators for the Sustainable Management of the Natural Tropical Forests* (Malaysia, 2000).

C&I for SFM was quite a new issue for Thailand in 1998. Some committee members were not familiar with the concepts and roles of C&I. It was a time-consuming effort for the committee to move forward at the beginning.

Another challenge was that the ITTO guidelines, which were adapted by the ASEAN countries, were more suitable for a tropical timber *producer* country. Although Thailand is classified within the producer category, the kingdom has banned all logging in terrestrial forests since 1989 and has depended on imported timber since then. Thailand may have some weaknesses in ITTO's *Criterion 4: Flow of Forest Produce*, but can show strengths in the other criteria, especially conservation aspects.

To speed up the task, two working groups were set up by the C&I committee in 1999. The first working group was responsible for the technical framework. The second working group was responsible for the administrative framework. Both working groups reported to the committee. By this method, the committee was able to prepare a draft C&I for SFM at the national level in 2000.

A seminar on SFM was held at the RFD in August 2000 to discuss SFM and C&I approaches. About 200 people from the RFD, universities, other relevant

government agencies, non-government agencies and the media participated in the seminar. The draft C&I were presented and discussed. Observations and comments from the participants were taken for consideration by the committee. Finally, the committee adopted the Criteria and Indicators for Sustainable Forest Management in Thailand at the national level in December 2000. The RFD endorsed the national level C&I in February 2001. The Thai version has been distributed to relevant agencies for further action.

The approved national level C&I for SFM in Thailand consists of 7 criteria and 67 indicators as follows:

- Criterion 1: Enabling Conditions for Sustainable Forest Management (9 indicators)
- Criterion 2: Forest Resource Security (7 indicators)
- Criterion 3: Forest Ecosystem Health and Condition (9 indicators)
- Criterion 4: Flow of Forest Produce (8 indicators)
- Criterion 5: Biodiversity (9 indicators)
- Criterion 6: Soil and Water (6 indicators)
- Criterion 7: Economic, Social and Cultural Aspects (19 indicators)

Details of these C&I appear in **Annex 1**.

4. C&I for SFM at the local level

Very little work has been done in Thailand on the development and implementation of C&I for SFM at the local level. A workshop on *Criteria and Indicators for Improving Recognition of Local Forest Management Systems*, organized by RECOFTC in 1999 marked the first initiative at this level. A pilot study conducted by the Danish Forest and Landscape Research Institute and Chiangmai University later in 1999 produced very useful outputs.

The objective of this pilot study was to apply the CIFOR toolbox in two test areas in Northern Thailand. The two selected case-study areas were Doi Inthanon National Park in Chiangmai Province and Mae Moh Teak Plantation in Lampang Province. The team also wanted to assess whether the C&I concept could be implemented at the FMU level where management objectives could differ strongly, according to the relative emphasis placed on the various ecological, political, economic, social or cultural functions of the concerned forest areas.

The results of the study were published in 2000 under the title *For Whom and for What? Principles, Criteria, and Indicators for Sustainable Forest Resources Man-*

agement in Thailand. The conclusion of the report showed that C&I could be a useful tool in the development of a more coherent forest policy in Thailand. It was also evident the C&I could provide the framework for the establishment of generally accepted regulations for protected areas and timber production plantations at the FMU-level. The paper presented example sets of C&I at the local level, based on the Doi Inthanon National Park (protected area) and Mae Moh Teak Plantation. It suggested the continuation of the work on C&I at FMU-level by running a trial workshop with interested people and government institutions.

5. Discussion

Thailand has developed a set of C&I for SFM at the national level. It can be used as a framework for further research and development as well as implementation. At present, there is no framework of C&I at the FMU-level. A study has been made to apply the CIFOR approach at two selected areas in northern Thailand. The results of the study are two sets of C&I at FMU-level as examples and a number of recommendations for the planning and accomplishment of a process to develop C&I as a common platform for discussion and negotiation at the local level. One strong recommendation was the active involvement of stakeholders in the process. The important role and skills of facilitators is another concern.

Ngao MF is seen a good site for the field tests in the development of C&I at FMU-level. The MF area covers some protected areas, plantations, national reserved forests and local communities. Some basic data and information have been collected as part of the ITTO pre-project *Development of a Model Forest for Sustainable Forest Management in Thailand*. An on-going ITTO project *Preparatory Studies to Install a Continuous Monitoring System for the Sustainable Management of Thailand's Forest Resources* can provide some scientific information to be applied to the development of C&I at Ngao Model Forest as well.

But, much remains to be done. The C&I concept and application are not familiar to the relevant people. There are not many people, including RFD staff, who have a good understanding of this subject. Providing training and improving the learning processes are very important. Outside assistance will be needed to provide experienced facilitators and other support. We are looking forward to learning at this workshop how we can best proceed to develop appropriate C&I for the Ngao MF.

Annex 1
Criteria and indicators for sustainable forest management in Thailand
(national level)

Criterion 1: Enabling condition for sustainable forest management

This criterion covers the general institutional requirements for sustainable forest management to succeed. It addresses policy, legislation, economic conditions, institutional and administration frameworks.

Policy and legal framework

- 1.1 Existence of a framework of Laws, Policies and Regulations to govern
 - (1) national forest policy including production, conservation, and protection
 - (2) establishment of the permanent forest estate
 - (3) land tenure and property rights relating to forests
 - (4) conservation of forest resources
 - (5) forest harvesting and operation
 - (6) control of non-wood forest product harvesting
 - (7) encroachment control activities
 - (8) participation of local communities
 - (9) incentives to encourage sustainable forest management
 - (10) health and safety of forest workers.

Economic framework

- 1.2 Amount of investment and reinvestment in forest management
 - (1) national (governmental)
 - (2) sub-national
 - (3) private sector
 - (4) domestic organization
 - (5) international organization

Institutional and administration framework

- 1.3 Number and adequacy of institutions to support sustainable forest management.
- 1.4 Number and adequacy of trained professional and technical personal at all levels to perform and support SFM
- 1.5 Existence and application of appropriate technology to practice sustainable forest management
- 1.6 Capacity and mechanisms for planning and periodic monitoring and evaluation
- 1.7 Mechanisms for active public participation in forest management

Experiences in developing C&I: Thailand

- 1.8 Adequacy and timeliness of information, public relations and forest information exchange
- 1.9 Collaboration in research and development activities

Criterion 2: Forest resource security

This criterion relates to the basic foundation for sustainable forest practices to which the kingdom's forest estate, which include the biodiversity, production, protection, conservation and other social, economic and environmental needs of present and future generations.

Description of forest resource base

- 2.1 Extent and percentage of total forest land area under :
 - (1) natural forest
 - (2) plantation forest
 - (3) forests according to various objectives
- 2.2 Extent and percentage of total land area under each forest type
- 2.3 Length and percentage for external boundaries of the designed forest demarcated or clearly defined

Protection procedures

- 2.4 Existence of procedures to control encroachment by:
 - (1) forest protection stations
 - (2) forest guard units
- 2.5 Existence of procedures to control wild fire
- 2.6 Existence of procedures to control pests and diseases
- 2.7 Existence of collaboration for forest protection

Criterion 3: Forest ecosystem health and condition

This criterion relates to the condition of a country's forest and the healthy biological functioning of forest ecosystems. Forest condition and health can be effected by a variety of human actions and natural occurrences, protection and control procedures and reforestation.

Area and degree of forest damaged by human actions

- 3.1 The extent and nature of direct damage, caused by:
 - (1) encroachment and shifting cultivation
 - (2) illegal logging
 - (3) dams
 - (4) forest burning
 - (5) mining
 - (6) legal harvesting and operations

- (7) roads
- (8) physical infrastructure
- 3.2 The extent and nature of indirect damage, caused by:
 - (1) animal raising
 - (2) resettlement
 - (3) development activities

Area and degree of forest damage by natural causes

- 3.3 The extent and nature of natural damage, caused by:
 - (1) storm
 - (2) flood
 - (3) drought
 - (4) wild fire
 - (5) pest and disease
 - (6) soil erosion
 - (7) other natural causes

Protection and control procedures

- 3.4 Pest and Diseases
 - (1) existence and implementation of quarantine control
 - (2) procedure available to prevent pest and disease
- 3.5 Exotic plant and animal species
 - (1) existence and implementation of quarantine stations
 - (2) procedure available to prevent potentially harmful exotic plant and animal species
- 3.6 Toxic substances
 - (1) existence and implementation of operational units
 - (2) existence of regulations

Extent and percentage of reforestation

- 3.7 Natural forest rehabilitation
- 3.8 Enrichment planting
- 3.9 Re-afforestation

Criterion 4: Flow of forest produce

This criterion is concerned with forest management for the production of wood and non-wood forest products. Such production can only be sustained in the long-term if it is economically and financially viable, environmentally sound and socially acceptable.

Experiences in developing C&I: Thailand

Forest area and products

- 4.1 Extent and percentage of total forest area under each forest type, which inventory have been used to define
 - (1) the quality and quantity of the main wood forest products
 - (2) the quality and quantity of the non-wood forest products
- 4.2 Extent and percentage of total growing stock and yield under each forest type, which inventory have been used to define
 - (1) the quality and quantity of the main wood forest products
 - (2) the quality and quantity of the non-wood forest products

Planning procedures and management guidelines

- 4.3 Existence and implementation of planning procedures and management guidelines.
 - (1) forest management plans
 - (2) forest logging operation and non-wood forest products harvesting (utilization)
- 4.4 Existence of long-term projection, strategies and plans
- 4.5 Availability and implementation of guidelines for managing forest produce
- 4.6 Availability and implementation of guidelines for reduced/low impact logging to minimize damage to residual stand

Monitoring and evaluation

- 4.7 Procedures for periodic monitoring of management practices
- 4.8 Procedures for periodic evaluation of management practices

Criterion 5: Biodiversity

This criterion relates to the conservation and maintenance of biological diversity, including ecosystem, species and genetic diversity.

Maintenance of ecosystem diversity

- 5.1 Extent and percentage of area of protected areas
- 5.2 Extent and percentage of protected areas connected by biological corridors
- 5.3 Percentage of each forest type in protected areas

Maintenance of species diversity

- 5.4 Existence and implementation of procedures to identify status for conservation
- 5.5 Number of threatened species of forest flora and fauna
- 5.6 Threatened species habitats

Maintenance of genetic diversity

- 5.7 Availability of effective strategy to implement in-situ/ex-situ genetic conserva-

tion of threatened species of forest flora and fauna.

Management prescription

5.8 Existence and implementation of management guidelines within production forest to:

- (1) keep undisturbed part of each production forest
- (2) protect threatened species of forest flora and fauna
- (3) protect species of biological interest

Monitoring and evaluation

5.9 Existence and implementation of procedures for assessing changes of biological diversity within:

- (1) protected areas
- (2) production forest

Criterion 6: Soil and water

This criterion indicates roles of forest management to conserve soils and water for the benefit of the society.

Extent of forest area managed primarily for the conservation and protection of soil and water

- 6.1 Availability and implementation of procedures for watershed classification
- 6.2 Existence and number of total watershed area class-1 within National Park and Wildlife Sanctuaries

Soil and water conservation and protection procedures

- 6.3 Availability and implementation of procedures for each watershed category
- 6.4 Watershed management scheme
- 6.5 Important activities:
 - (1) rehabilitation of watershed ecosystem
 - (2) dams for storing soil moisture

Monitoring and evaluation

6.6 Existence and implementation of procedures for assessing change in quality of the soil and water

Criterion 7: Economic, social and cultural aspects

This criterion indicates potentials of forest resources that make important contribution to sustainable development of the kingdom in economic, social and cultural aspects.

Experiences in developing C&I: Thailand

Socio-economic aspects

- 7.1 Value and percentage contribution of the forestry sector to the Gross National Product /Gross Domestic Product
- 7.2 Quantity and value of wood and non-wood forest products in the domestic/international market
- 7.3 Quantity and value of wood and non-wood forest products for subsistence use.
- 7.4 Economic value of forests for recreation
- 7.5 Extent and ratio of domestic log production to the processing capacity of wood-based industries
- 7.6 Employment in the forestry sector
- 7.7 Extent of forest area upon which people are dependent for subsistence uses and traditional and customary lifestyles
- 7.8 Number of people dependent on the forest for subsistence uses and tradition and customary lifestyles
- 7.9 Forest area available for recreational purposes
- 7.10 Number of visitors to recreation sites
- 7.11 Forest area available for research purposes
- 7.12 Forest area available for educational purposes
- 7.13 Forest area available for direct use and benefit of local communities

Cultural aspects

- 7.14 Number of important archaeological and cultural sites
- 7.15 Extent of local wisdom in forestry

Community participation

- 7.16 Extent to which tenure and user rights over the forest are documented and recognized
 - 7.17 Procedures and actions for the promotion of community participation
 - 7.18 Levels of community participation
 - 7.19 Procedures and activities for the development of community forests
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Developing and using local level indicators of sustainable forest management: experiences from the Canadian Model Forest Network

by

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1. Introduction

MFs were established in Canada in 1992 with the intent of functioning as ‘living laboratories’, where people with a direct interest in the forest, supported by up-to-date science and technology, could participate in decisions about how the forest could be sustainably managed. After reviewing over fifty proposals, a network of ten MFs was established, later expanded to twelve sites. Perhaps the most distinctive common feature of MFs is their reliance on diverse partnerships both for exploring new approaches to shared decision-making as well as for actual leadership on individual projects.

In 1997 all MFs in Canada, as part of their commitments towards Phase II of the Model Forest Program, developed their own work programs to identify, measure and report on local level indicators of SFM. Since that time a great deal of progress has been made, by individual MFs as well as by the Canadian Model Forest Network (MFN) as a whole.

This paper summarizes the work done to date by MFs across Canada, drawing out some of the commonalities as well as differences among MFs. It does not provide detailed information about any individual MF; however, that information has been compiled in a report prepared for the Canadian MFN,¹ which served as the source for much of the information presented in this more general overview.

2. MFs and local level indicators

Much of the initial interest in criteria and indicators of SFM arose out of a need for credible, transparent and consistent reporting at the national and international levels. It is clear, however, that the ability to demonstrate national advancement towards SFM rests largely with actions that are carried out at the local level. If these local actions are to be assessed it will require indicators that are particularly well suited to local needs. In other words, any effective fulfillment of the expectations set forth in criteria and indicators initiatives requires not so much “topdown” completion of a particular framework, but rather “bottom-up” reporting of progress made at the

1 von Mirbach, M. A Users' Guide to Local Level indicators of Sustainable Forest Management: Experiences from the Canadian Model Forest Network, Version 1.0, June 2000

local level. This has meant that the interest at the forest management unit level has gradually shifted from grappling with the more abstract concept of criteria towards a more practical challenge of identifying and using effective local level indicators.

There is a number of reasons why the MF program is a particularly well-suited vehicle for showing leadership in the development and application of local level indicators. MFs were established in order to explore and implement innovative practises at an operational scale. They range in size from about 100,000 ha to over 2 million ha, a size range that covers the typical scales at which district-level forest management decisions are made. They are represented in each of the major forest types in Canada, and include the full range of ownership patterns to be found in Canada, including large-scale private freehold or leased land, public lands, private forest smallholdings and forests within an Aboriginal treaty area. As well, five MFs include national parks within their boundaries, which have particular relevance in the context of local level indicators since they allow for comparisons between lands managed for timber production and lands managed primarily for heritage and conservation values.

3. Initiating a work program on local level indicators (LLI)

One of the characteristics common to all MFs and their approach to LLI is their reliance on partnerships of diverse interests to guide and/or lead the process. The important feature here is that these diverse interests are involved at the front end of the planning process, rather than simply being brought in at a later stage to comment on a draft plan. MFs are founded upon the principle of shared decision-making, and this principle is applied to most major initiatives, including work on local level indicators.

There are four general reasons why participatory approaches can be an appropriate way to address resource management issues, briefly discussed below along with the particular relevance to work on LLI:

- a) *Affected interests have a right to be meaningfully involved.* Since the vast majority of forested land in Canada is publicly owned, there is an understanding that the public has a right to be meaningfully involved in decisions that affect the use of that land, and a growing recognition that this involvement should properly take place before commitments have been made. Since selecting appropriate indicators is a vitally important early step in the planning process, it makes sense to include public and stakeholder involvement at this stage.
- b) *People have valuable information and perspectives to contribute.* The information that diverse interests bring to any discussion of LLI is likely to reflect their varied backgrounds and perspectives. They will consider things from an angle not necessarily anticipated by the resource managers themselves, and thereby contribute a spirit of open-mindedness, creativity and innovation to

the process. When it comes to LLI, many participants (both non-governmental as well as from governmental agencies involved in areas such as wildlife management, tourism, recreation and community development) will have valuable suggestions for how to make effective use of existing information. A participatory process, in other words, can result in a *better* plan.

- c) *Up-front involvement improves the credibility of the overall plan.* To the extent that LLI are embedded in a forest management planning process, involvement in the LLI process will improve the overall acceptability of the plan when it is time to seek final political approval, and result in a plan that is more likely to be implemented.
- d) *Having diverse participation can help to generate interest in, awareness of and commitment to SFM.* Sooner or later it will be necessary to communicate the results of any work being done on local level indicators. By having diverse interests involved from the very beginning, this communications function is built right into the LLI development process, rather than as an add-on at the end. Communications and outreach to the various constituencies is best done by people who are part of those constituencies and accountable to them.

Of course, for any participatory process to be effective there must be adequate attention paid to some of the basic requirements of effective participatory processes. Many participants will be unfamiliar with some of the jargon used by forest managers, and care must be taken to bring these people up to speed and to keep them at the table.

It is also important to recognize and acknowledge that the interests of various participants may not be the same as the interests of forest managers. For instance, forest managers are likely to want to use LLI to demonstrate progress towards SFM and/or to meet forest certification requirements. These concerns are not widely shared by the diverse participants that might be invited to join the process, who are more likely to want to see LLI used to monitor forestry activities, especially where trust has been lacking in the past, or to obtain recognition or respect for certain key non-timber values. There is no fundamental inconsistency between these differing expectations, however, and a good set of LLI can contribute towards all of these goals, as well as the shared goals of obtaining better information and understanding about SFM with the ultimate aim of improving forestry practises overall.

4. Selecting and refining indicators

A key task in any process to develop LLI is to adopt an initial set of indicators and then to whittle that set down to something that is manageable. MFs across Canada have used a variety of approaches towards adopting an initial set. Some simply started with the set of national-level indicators adopted by the Canadian Council of Forest

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Ministers in 1995. Some MFs used this set but added to it other indicators from assorted sources. One MF started with an entirely different set, oriented towards monitoring the implementation of a specific Aboriginal treaty. A few MFs started from a “blank slate,” encouraging a committee of diverse interests to define appropriate indicators to address a common set of shared values and goals. There is probably no single preferred approach to this task.

Each MF has used its own methods to reduce the initial set of indicators to a more manageable set, although there was general consistency in the approaches used.

The following is a compilation of the various screening criteria that were used, in three general categories:

- a) **Criteria of credibility**
 - Is the indicator *relevant*, and does it tell us something meaningful about SFM?
 - Is it *reliable*, and relatively free of extraneous influences (“noise”)?
 - Is it *responsive* to management actions?
 - Is it *sensitive* to change, and will it show trends over time?
 - Can future indicator levels be *predicted* with reasonable accuracy?
- b) **Criteria of practicality**
 - Is data for this indicator currently *available*?
 - Is data *affordable*, and can it be collected and compiled at a reasonable cost?
- c) **Criteria of overall acceptability**
 - Is the indicator *measurable* at an appropriate scale and time frame?
 - Is the indicator and its relevance readily *understandable*?
 - Is the indicator *cost-effective*, and is the cost of supporting it justified by the value of the information it provides?
 - Is there the necessary *commitment* to measure, report on and use this indicator?

Although each MF has come up with an initial refined set of indicators, no single set can ever be considered final. Because of the considerable effort required to collect, compile, assess and report on data, there is continual pressure to reduce and simplify the indicators in current use. At the same time, there is a strong interest in expanding the scope and coverage of the indicators, thereby adding to the complexity of the initial set. And added to both of these competing factors is the simple fact that as greater experience is gained in using indicators there are always opportunities to modify and refine the indicators in use, or to reject them as unworkable. In other

words, there are dynamic tensions ensuring that no set of indicators remains static and fixed as a 'final' set.

5. Gathering information

Supplying data for the selected indicators requires a combination of accessing existing data (e.g., timber inventories, permanent sample plots, provincial government records, Statistics Canada data) and generating new data (e.g., on-site monitoring, remote sensing, public surveys). While gathering new data usually involves greater additional cost, it also takes considerable time and attention to detail to obtain existing data in a useable form. It is at this stage that a partnership-based approach to LLI can be especially useful, since it allows for the possibility that some of the tasks can be shared among the partners. However, dividing up work responsibilities in this way cannot be done effectively without adequate leadership, commitment and support, and without a shared understanding of the desired outcomes of the process.

All MFs are currently in the process of gathering data on their core, or initial indicators. Some have already collected and compiled information on an initial set of indicators, while others are at different stages in the process. Some of the many common challenges being faced and overcome by MFs are briefly described below.

- a) **Technical challenges.** Some of the technical challenges include difficulties in obtaining data at the most relevant scale, or in merging different data sets. This latter problem has proven to be especially prevalent when attempting to obtain consistent data covering both national parks as well as industrial timber lands.
- b) **Practical challenges.** The most common practical difficulty is the sheer difficulty of juggling data collection requirements for so many different indicators, resulting in the inevitable pressure to limit the number of indicators being monitored in the initial stages. As MFs gained more experience in data gathering more ideas were generated about how to make better use of existing data sets. In some cases it became evident that direct measurement across an entire forest management unit was not feasible, but that case studies could be used to get at least a general picture of a particular indicator. Partnership-based approaches have proven to be particularly effective in helping to share the burden of gathering data on a broad set of diverse indicators.
- c) **Human (or institutional) challenges.** In some cases it became evident that there was a reluctance to release information, either because of the proprietary nature of the information or because of a general reluctance to release information voluntarily. In such cases it can be helpful to ensure that there is adequate buy-in from the beginning, involving representatives with sufficient authority to help in overcoming these potential barriers.

6. Using and applying LLI

One of the biggest mistakes that people can make when working with LLI is to assume that LLI everywhere are being developed for the same purpose. Nothing could be further from the truth, and the experience of the Canadian MF Network displays this very clearly. Despite starting from a common set of guidelines, MFs across Canada have adapted LLI to their own particular situations, with widely differing results. In general, the various applications of LLI can be grouped in three broad categories, listed below with a few examples of specific applications, as well as reference to MFs that have shown particular leadership in that regard. Please note that these MFs are named solely as examples, and this summary is not a comprehensive list of all MFs engaged in each particular activity.

6.1 Using LLI to improve knowledge of and understanding about SFM

- **Addressing gaps in LLI frameworks.** One particularly useful feature of developing indicators to address a broad framework of criteria is that it quickly becomes apparent where knowledge is lacking. This helps to generate interest and commitment to addressing those gaps. Some of these gaps (and the MFs that are devoting special attention to filling them) are in the areas of socioeconomic indicators (being studied by Foothills MF and others), the identification of appropriate indicators of traditional knowledge (Waswanipi Cree, Long Beach, Prince Albert and McGregor MFs), and indicators of public participation (Waswanipi Cree and Prince Albert MFs).
- **Establishing a comprehensive monitoring regime.** Long Beach MF is taking particular leadership here, in helping to facilitate, guide and coordinate the activities of various agencies with a mandate to monitor and report on many aspects of forest management and forestry impacts.

6.2 Using LLI in forest management

- **Incorporating LLI in management plans.** Most MFs across Canada have been working to some extent at encouraging and helping their partners to build an enhanced awareness of LLI into their management plans. The Bas-Saint-Laurent MF has gone so far as to actually coordinate the planning process on behalf of its many diverse small-scale landowners and forest tenant farms.
- **Scenario planning.** Both Fundy and McGregor MFs have used indicators to project values forward in time, and to assess the predicted impact of different management activities on those actions. This can be a powerful tool to frame discussions and decisions based on the “desired” or “preferred” future forest state.
- **Best Management Practises.** A number of MFs - most notably Fundy and

Manitoba - have used their indicator frameworks in order to set targets, thresholds or specific objectives for particular indicators, reflecting a level of performance believed to constitute Best Management Practises.

- **Forest certification.** Despite their significant differences, every certification system includes an environmental management system within its standard, and every environmental management system identifies a need to monitor and evaluate actual performance against stated objectives. Local level indicators are an essential part of every certification system, therefore, whether or not they are explicitly referred to. Many MFs are assisting their partners to meet various certification requirements related to LLI. The Eastern Ontario MF is playing a particularly active role in helping to assist in the certification-related efforts of many private woodlot owners.

6.3 Using LLI in communications, outreach and knowledge transfer

- **State of the Forest Reporting.** Several MFs are in the midst of compiling a “State of the Forest Report” for their MF, intended to communicate information about what can be learned on the basis of information compiled from various diverse indicators. Lake Abitibi MF has compiled a wealth of relevant information, and the Eastern Ontario MF has published its first report, and is undertaking a series of outreach presentations to communicate the results.
- **Broader application and knowledge transfer.** A number of MFs have taken steps to ensure that their work in local LLI is applied outside the actual boundaries of the MF. McGregor MF, for instance, conducted a series of workshops on its approach to scenario planning, and has followed up with detailed work in a number of districts in the interior of British Columbia. Western Newfoundland MF developed a manual on how to involve the public and diverse interest groups in developing LLI; the guide has been distributed widely and is one of the tools used by district forest planners throughout the province. Foothills MF is currently in the process of transferring its experiences with LLI to a multi-departmental integrated land use planning exercise being led by the province of Alberta.

7. The role of the MF Network

In 1997 the Model Forest Network established a number of strategic initiatives, including the one devoted to LLI. The purpose of this initiative is to help MFs make progress more quickly, to promote knowledge transfer between MFs, to facilitate the implementation of joint or collaborative initiatives and to promote outreach beyond the MF Network. A number of workshops have been held in order to share perspectives and information among MFs. In the past year the attention has turned towards effective outreach, resulting in a number of initiatives or products designed to be used

by any agency involved in implementing LLI. The initiatives listed below are a few highlights:

- **A Users' Guide to LLI of SFM.** This is a comprehensive reference tool, currently in an advanced draft stage. It compiles information about how each MF has gone about identifying, measuring and using LLI, along with specific details about how data is being collected. Combined with this thorough database is a section that synthesizes the information, outlining commonalities and differences in the approaches used by MFs.
- **Development and identification of common local level social and economic indicators across the MF Network.** This project developed methodologies to use Statistics Canada data to report on social economic indicators of sustainability that are common across the MF Network. The user-friendly tool allows for the creation of socio-demographic profiles of communities, parishes, villages and Aboriginal reserves, with a graphical interface to allow the information to be visually displayed.
- **LLI workshops.** The MF Network, in conjunction with host MFs, is organizing a series of workshops across Canada intended to highlight the most practical aspects of the work done to date by MFs across Canada. The workshops are designed to meet the needs of resource managers and stakeholders, giving them specific tools to address particular challenges they are facing.

8. Conclusion: why use LLI?

It can be seen from the above that MFs have found a wide range of practical applications for LLI. There are many commonalities in terms of the methods used, but also significant differences, arising from differing regional circumstances. What all MF approaches have in common is that they enable and require the forest manager to exercise due diligence across the full range of timber and non-timber values implicit in the concept of SFM, create a common and deeper understanding of SFM, foster transparency and openness in forest management planning and establish a consistent and credible platform from which to evaluate forest operations. Moreover, they do this in an open and transparent manner, involving the full range of interests that ultimately have a stake in SFM. Although it has required considerable commitment and patience in order to get so many diverse interests working together, the results would suggest that broad participation can be a valid and effective method for developing, measuring, using and reporting on LLI of SFM.

Developing local unit criteria and indicators: learning from failure, defining success

by

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with support from Pam Wright, et al

1. Size and scope of the United States forests and national C&I update

The uncontrolled harvesting of America's forests during the first 150 years of our history was viewed as a failure by some and a necessary part of building a nation by others. Though we have lost 27% of the original forest, American forests have great resiliency. Knowing and understanding this resiliency in the face of many human needs is what assessing sustainability is all about. The forested landscape of the U.S. is vast and complex making the development of C&I complicated. U.S. forests comprise 302.4 million hectares (747 million acres) amounting to about 7% of the total world forestland area and representing 12% of the total area of temperate and boreal forests. Forests comprise approximately 1/3 of the total U.S. land area, and this figure has been relatively stable since 1920.

In the east, where the Ottawa National Forest (ONF) is located, most of the forested landscape had been removed via early logging. Now there has been an increase in the forest types representative of late successional stages. Concern over threatened and endangered species continues, and the highest concentrations are in hot spots across the U.S. located along the coastlines, the arid southwest and the Southern Appalachians. Mammals represent the greatest proportion of species with reduced ranges, thus they have the highest percentage of listings.¹

Some issues facing our forested landscape are increased fragmentation and parcelization of forests through private ownership. Of the 1/3 of the U.S. acreage that is forested, almost 2/3 is privately owned, with 10% of this owned by industry and the rest owned by non-industrial, private landowners. The USDA Forest Service is the largest public-forest land management agency, and is responsible for close to 46% of the total forested area in the public ownership. The National Park Service, Department of Defense, Department of Energy and other agencies manage other federal ownership. Other owners include the States, the Bureau of Land Management, counties and municipalities.

As the largest producer and consumer of sawn wood, wood base panels, wood

1. 2000 RPA Assessment of Forest and Range Lands. Report FS-687, February 2001. Washington, DC: U.S. Department of Agriculture, Forest Service. (p. 78)

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pulp for paper and paper board² in the world, it is critical that the U.S. develop and understand the appropriate role for the public and forested land base as well as support and understand private owners' desires for management of their lands. The U.S. per capita consumption of 62.5 cubic feet of wood (338 board feet) per year represents about six times the world average wood consumption. On private lands only about 25% of the privately owned forest land is managed with timber production as the primary reason for ownership³. Most individuals who own forest land in the U.S. hold it as a form of investment and for recreational opportunities with hunting, fishing and camping being the most popular activities pursued. Nowhere in the U.S. is the debate over how to use wood more focused and intensified than on the largest forested management units - the public land base within the National Forest Management System.

Since its creation in 1905, the USDA Forest Service has had a role in assessing and inventorying the Nation's forests. The 1974 Forest and Rangeland Renewable Resources Planning Act strengthened this role. In 1997, the first approximation using the Montreal C&I framework was focused on assessing the Nation's capability to quantify the C&I. This report is available on-line at www.fs.fed.us/global/aboutus/policy/reports/welcome.htm. The second approximation report is scheduled for completion in the summer of 2003. It will use available databases to address the C&I and discuss the data shortcomings and results of the current monitoring that is fragmented and varies by scale and data source.

To help implement the use of C&I for these vast U.S. forestlands with numerous landowners and expectations, the Forest Service employs multiple approaches. The Northeastern Area (NA) of the USDA Forest Service's State and Private Forestry Branch is carrying one regional effort forward. NA, in cooperation with the Northeastern Area Association of State Foresters (NAASF) will soon release a sustainability assessment for the twenty-state area based on the full suite of Montreal Process indicators, and covering state and private land as well as public land. The NA serves as a clearinghouse for information on sustainable forestry and implementation of the Montreal Process indicators at the state and regional scale. They have developed a website (www.na.fs.fed.us/sustainability) devoted to forest sustainability that outlines federal and state roles in SFM, hosts a database of sustainability indicator projects, and contains links to a variety of regional and state planning and assessment activities and tools. In order to facilitate the use of indicators of sustainability, NA has conducted a comparative analysis of on-going indicator projects and is compiling the results of this analysis into a guidebook for use by state and

2. *Ibid.*

3. *Ibid.*

private partners. The Northeast Forest Resource Planners Association is working with NA on means to incorporate more detailed state held information into future sustainability assessments.

As is typical in the U.S., grass roots efforts in sustainability are springing up across the country. At the same time the Forest Service at the federal level was considering the development of C&I, local units of government were also concerned with economic development and their ability to create sustainable strategic plans and goals for their community. In 1999, Gogebic County, which has the largest county forest in the State of Michigan, and its Forestry Commission worked with the local public to develop a list of data sets that they felt would measure forest sustainability from a county perspective. Their initial set consists of 56 C&I. These C&I were subsequently approved by the next two levels of government (township and city levels) as well as by the native Ojibwe Tribe.

At this point in time they are working to populate their datasets and begin sustainability assessment as it relates to local economic development. The strength of their methodology attracted the attention of the National Sustainable Development Program Manager for the USDA Forest Service. As a result, Gogebic County is part of a new pilot project that will assess the development of C&I in rural communities across the U.S. The intent is to develop both the methods of engaging the public and the processes for C&I development in this sector of forest ownership. At this time, three to four counties in western northern Michigan will be participating in this process. The Ottawa National Forest (ONF) will tie the C&I into the revision of the Ottawa Forest Management Plan. This concludes a brief overview of C&I work in progress in the USDA Forest Service except for the North American Test and Local Unit C&I Development (LUCID) projects that will be discussed later. The challenge will be how to pull together all the C&I from different methodology, recognizing scope and scale differences as a result of different public expectations of their C&I process.

2. Local unit C&I development

2.1 Why get involved?

In 1998, the U.S. Forest Service research and international programs cooperated with the Centre for International Forestry Research (CIFOR) located in Bogor, Indonesia for a North American test on the Boise National Forest in Idaho with the intent to develop C&I at a forest management scale. Representatives from government, industry, and non-governmental organizations from Canada, Mexico and the U.S. participated. The most important outcome of the Boise test was recognition of the value of local scale C&I. However, the Boise test was complex, reviewing over

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400 indicators and testing 207. Of the 207, 71 were accepted. As part of the Boise test, the team reviewed a number of sets of C&I developed for the forest management scale and it also reviewed the national level Canadian Council of Forest Ministries C&I whose development had preceded the Montreal Process C&I. In addition to the wealth of technical analysis, the Boise report included this practical comment: 'At their heart, C&I are practical applications of knowledge. We must remember to focus on their practicality. Otherwise, we will ignore many pressing and real problems while we get the science right.'⁴

The Boise test was expanded when the Forest Service approved the LUCID test. The LUCID objective was to create a science-based evaluation process to develop and apply local criteria to assess sustainability, and to identify the linkages between forest scale sustainability monitoring and national scale sustainability monitoring (Montreal Process C&I). The Forest Service wanted to use the strength of the Boise test that combined researchers, university staff and Forest Service managers to develop the test objectives and a system that would be effective and complete at the forest level.

In March 1999, Forest Service Chief Dombeck asked Regional Foresters to nominate six national forests for the pilot project. Each forest had to meet ten selection factors supplemented by 100% support from their managers, the Forest Supervisor and Regional Foresters. The ONF wanted to be involved for several reasons:

- 1) it was one of the forests to help develop the ecological classification and inventory system that is currently used nationwide in the Forest Service (this system helped examine past and current vegetation and will be used to project future vegetation);
- 2) it had a strong and data-rich Forest Plan monitoring program;
- 3) 50 years of water quality data were in an easily accessible computer database,
- 4) the forest wanted to assess sustainability under the Forest Plan; and
- 5) there was an ongoing need to create more cost-effective monitoring of change on the forest. The other pilot forests had similar reasons. A full report is available at the LUCID web site at <http://www.fs.fed.us/institute/lucid>.

The six pilot forests are the ONF in the Upper Peninsula of Michigan, the Mt. Hood in northwest Oregon, the Allegheny National Forest in Northeastern Pennsylvania, the Tongass National Forest in southeast Alaska, the Modoc National Forest in California and the Blue Mountain Province, consisting of the Wallowa-Whitman, Umatilla and Malheur National Forests in eastern Oregon and adjacent WA.

4. *North America Test of Criteria and indicators of Sustainability Forestry. Inventory and Monitoring Institute Report No. 3, March 1999, U.S.Dept. of Agriculture, Forest Service. (p. 13)*

Collectively, these forests represent much of the diversity of forests across the country. They vary in how intensively they have been managed and what condition they were in when the Forest Service first acquired the land. The Tongass was relatively unaltered when it became a National Forest in 1907. In contrast, the Ottawa had been dramatically altered by the turn of the century through logging.

All national forests produce a wide range of benefits from recreation and wildlife to timber. The value of last years timber sales of the six pilot forests range from a low of \$8,137,815 to a high of \$11,927,000 on the Allegheny NF. In fiscal year 2000, National Forests produced a total of 323,000 cubic feet (1,744,502 board feet) of timber. These values have to be kept in balance with the multiple objectives of the forest for wildlife and recreation. On a national level, a total of \$134 billion is contributed to the GNP through recreation activities. In the U.S. a contribution of 25% of the receipts of any income generated on the national forest system public land base is returned to the local counties via their respective states.

2.2 The Ottawa National Forest

For brevity, this paper will primarily explore the LUCID project in terms of the ONF. The final report, expected to be published in the fall of 2001, will summarize additional insights to the LUCID project and will be posted on the web site. It will identify the common measurements for C&I developed during the study.

The ONF, like many eastern forests, was initiated in the early 1930s. It was a land that came into federal ownership through purchase or after it had reverted to public ownership from tax default. Much of the land had been cut or burned over – the original white and red pinery was almost eliminated in the late 1800s, and hardwood logging in the early 1900's removed most of the remaining forest cover. At the time the forest came into public ownership it was seriously deforested, and the previous log drives had highly altered the river systems. Currently, over 186 kilometers (300 miles) of rivers are part of the National Wild and Scenic River Program, and in addition, a hydroelectric project in 1937 put a significant water diversion system in place in order to produce electricity for the Midwest. The ONF has 20 762 ha (51 282 ac) of lakes and 1 295 km (2 086 mi) of rivers and streams. Recreationists spend over 2 266 400 visitor days on the forest.

For the first 50 years, Ottawa managers managed the forest for multiple use objectives guided by early management reports and multiple use plans. They enjoyed a close working relationship with the research branch of the Forest Service, and conducted numerous studies and adaptive management practices on the forest. In 1986, the ONF completed an integrated resource plan as mandated by the National Forest Management Act (NFMA) of 1976. It began a new era of plan implementation

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and monitoring to meet public expectations.

Part of the mandate of the NFMA was to make sure every forest annually monitored the forest plan outputs for sustainability and effectiveness in meeting the Forest Plan goals. The ONF has a set of Forest Plan monitoring criteria that includes everything from population censuses of animals to field reviews of timber sale compliance with environmental planning documents and prescriptions for change. It includes constant assessments of the growth, mortality and removals of timber on the forest. Ottawa objectives for monitoring is to measure the success of our forest plan efficiently and help in determining and expanding our knowledge of the linkages across the complex ecological, social and economic fabric of the forest. The LUCID project provided an opportunity to improve our monitoring.

2.3 The LUCID process

The objectives of the pilot forests were to:

1. create efficiencies in monitoring and to create linkages between local unit work and the national scale;
2. lay the ground work for local support of criteria and to develop a better understanding of tradeoffs of public land outputs as a result of the discussions; and
3. keep track of the broader scale C&I and verifier development to create links between private data and public data in the future.

The formal processes of the researchers include the following 16 steps:

1. PCIV framework
2. Systems approach
3. Systems elements
4. Systems interactions and linkages
5. Identify review criteria
6. Examine indicator definition/meaning
7. Make initial accept/reject decision (independent of methods)
8. Complete indicator evaluations
9. Examine possible verifiers
10. Identify and model indicator interactions (*NETWEAVER*)
11. Review existing monitoring programs for overlap
12. Field test
13. Examine analysis implications
14. Construct threshold / benchmark
15. Conduct sustainability analysis
16. Evaluate utility of LUCID approach

The core research team's roles and responsibility were coordination and communication between the forests and Washington DC; to serve as a resource

center; to develop the software to support managers; to define a general template of C&I to be used across all national forests and to do the cross-forest evaluation of the work.

The forest team's role is to define the study area and be responsible for communicating with the public, provide expertise in the critical areas and to adapt C&I to be effective for the local conditions. There were a lot of partners involved with this, including university researchers, other government agencies, and other sections of the Forest Service, such as Northeast Area State and Private Forestry and Regional Office Specialists.

In the beginning, we added public outreach to the process. Since the Ottawa is just a small island of green public ownership in a sea of private ownership, managers felt it was critical to engage our local public, let them know about the project and solicit feedback. Our outreach included local government representatives from our county planning boards and forestry departments. The outreach also included department of natural resource specialists from three states, universities, and institutes. The forest team solicited their input including data recommendations. Much of the discussion focused on how the concerns of people who were part of the community of place might vary from the community of interest that includes the greater U.S. Tribal members were concerned about ensuring consideration of the unique tribal perspectives in regards to wild rice, sugar bush, aspen, paper birch, deer and cedar management. Most of the counties were very interested in the trends and where the forest was headed in production of the various components such as timber and tourism, outlined in the Forest Plan. Prior to taking on the LUCID project, both the Ottawa and one of the local counties had been involved in separate sociological research studies to determine how people perceive the forest in general as well as their expectations for the future.

For the forest, the process to develop C&I was relatively simple in concept but complex in accomplishment. The steps were:

1. review the previous work;
2. discuss the project with the National Team, Ottawa Managers, and selected public;
3. refine national level C&I for local use
4. develop verifiers and benchmarks;
5. evaluate modeling software (*NETWEAVER*) and its spatial link software developed for the project (*GEONETWEAVER*);
6. review PCIVD set with ONF, staff, subject experts, national team;
7. develop and populate databases;
8. test model; and
9. produce two reports.

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Report one evaluated the pilot test methods, discussed the use of system frameworks, discussed C&I, verifiers, standards, benchmarks and reference conditions that were selected and developed, discussed conceptual and analytical modeling as well as described public involvement. The second report is a summary of the results of the testing of the C&I that were developed to determine how well they seem to tell the story of sustainability on the forest. The final report summarizes the lessons learned from the volume two process.

The LUCID researchers reviewed six different methods to organize the development of forest unit C&I. Though LUCID primarily used the systems framework, other countries may benefit from reviewing and using one of the other approaches. The systems approach operates on the premise that sustainability variables are inter-related, interacting and interdependent constituent parts of a complex economic, social and ecological whole. A systems based framework uses the structures and functions of the systems as organizing tools, but tends toward reductionism. Important elements may be missed and interactions are difficult to represent.

Because the PCIVD framework was individualized for each forest, the researchers have a complex analysis ahead of them to identify commonalities. During the analytical stage, some pilot forests tested an issues-based analysis approach. Consequently, indicators were developed under different frameworks, and for different purposes, and will require considerable effort to translate and collate as they also vary by scale. Issue 5 of the April 2001 LUCID Update provides the discussion of the development of the framework as well as the principles of using a systems approach. Sustainability assessment at the forest management unit level involves understanding of the forest in the context of the ecological, social and economic systems that help define boundaries that measure the critical factors of these systems.

One of the critical points in the LUCID process is understanding the significance of scale. The C&I developed on one forest may not be able to be added to the C&I developed on another forest and then combined in an additive manner to reflect the nation as a whole. Each pilot forest was free to develop their part of the picture of the puzzle. For example, the six study areas ranged in size from 202 429 ha to 6.9 million ha (500 000 ac to 17 million ac). Each forest has a legally defined boundary, and the forest team had the opportunity to define the area of interest for the pilot in slightly different ways. The Allegheny National Forest, for example, described the boundaries of interest to include the ecological extent of the Allegheny unglaciated plateau. The Ottawa used two primary boundaries: the actual proclamation boundaries of the forest and a 12 county area in the states of Wisconsin and Michigan. Although the social and economic systems are influenced by, and interact with, the

ecological resource, they are bounded in other ways.

What is apparent from the issue of scale is that the sustainability of an individual forest has to be placed within the context of its eco-region, and then the national scale for it all to add up. Although there may be some common C&I, the verifiers, benchmarks and data will vary depending on the scale. Each of the pilot forests was allowed to apply local adaptation of LUCID core indicators. The core set of indicators was provided by the researchers, and for each indicator the team could:

1. accept it as is;
2. accept it, but modify it within the system;
3. reject it;
4. propose new indicators; or
5. reorganize new indicators within the system.

Another critical step in this process was to determine how well the C&I covered changes on the forest or if there was a significant gap in C&I that needed to be filled. One area identified as a gap was air quality. Although air pollution is not significant in our remote area except for mercury deposition, there is a need for baseline data, thus a criterion was added in.

The following summarizes some of the issues that arose in the process.

Not all datasets were able to be populated, which limits the ability to fully assess forest sustainability. For the social framework, the social indicators were refined because the original set was too limiting, and did not seem to reflect the complexities of the attribute and relationship to forest values and institutional dimensions. In real terms that means it was important to measure not just the forest attribute or use or the access to the forest itself, but how people relate to or qualify this issue. For example, one verifier may measure the change in number of campsites on the Forest whilst another may look at site variety, quality and location.

For the ecological principle, over time, we were able to populate about 67% of our verifiers and data elements. A gap in this area is data that would provide insight into selecting representative species to monitor structural and functional changes at the genetic level. Although we do conduct genetic improvement in regards to our superior tree program, it is a small part of the overall forest program. Genetics, in general, is more the province of the Forest Service research branch than the National Forests. Additionally, appropriate verifiers monitoring change at the landscape scale in the development of C&I were more difficult to develop than evaluating at a population level for the different species on the forest. This is partly due to the types of specialists available on the forests in the U.S. and partly due to where monitoring efforts have traditionally been focused.

3. How to measure C&I

3.1 Development of verifiers

Once indicators were in place, the team moved on to the development of verifiers, i.e. data to measure these criteria. Usually there was more than one option to develop verifiers and more than one was needed for each indicator. They ranged in accuracy and precision, ease of measurement, and of data and standards availability. Though the research team did not provide actual verifiers, the forest worked interactively and cooperatively with other pilots to exchange verifiers found to be applicable across more than one forest as appropriate. In the end, for the Ottawa, 490 verifiers and data elements were created and 372 of these were populated with data (see **Table 1**).

Table 1. Ottawa PCIVD statistics: summary of available verifiers/data

Principle	Number of criteria	Number of indicators	Number of verifiers/data elements	Number of v/d with data
Social	7	18	83	73 (88%)
Ecological	8	21	310*	208 (67%)
Economic	4	11	97	91 (94%)

* Many of these evaluate data by management area, super-landtype association (slta), or hydrologic unit, so that there are actually many more data pieces than 310

Verifier development consumed the most time in the process. Often more than one verifier was associated with a given indicator. When multiple verifier methods were considered, the team placed those that were most desirable ahead of alternate methods in the model. Because establishing a verifier often included a complex analysis, we added another layer called data element. The data elements were the pieces of data that needed to be compiled in order to arrive at the verifier. Most forests are concerned about developing the ecological verifiers for disturbance processes. **Table 2** summarizes our ability to capture data for the indicators.

Table 2. Ottawa PCIVD statistics: status of different data for indicators

	Total Data Elements/ Verifiers (D/V)*	D/V with data available and examined, value placed in model	D/V with data available but no time to examine, no data placed in model	D/V not available /needs to be collected	D/V with high priority data collection needs (subset of previous column)
Social	83	73 (88%)	1 (1%)	9 (11%)	8 (10%)
Ecological	310	208 (67%)	19 (6%)	76 (25%)	19 (6%)
Economic	97	91 (94%)	0	6 (6%)	6 (6%)

Doing the review itself was a continual learning opportunity. We reviewed examples of existing data relative to severe weather and management effects, chronic or systemic disturbance from elements such as deer herbivory, predator density, and harvest disturbances. Towards the end of the project, it was suggested to take the perspective of historical natural disturbance processes and use data elements for fire and gap phase dynamics, past and present, using the vegetative notes from the government land office survey in the late 1800s. As the forest further refines this process, these elements will be incorporated into the Ottawa C&I structure. For instance, the forest has good records of age class data that could serve as proxy for the structural class related to landscape structure even though it was a simplistic model. If the forest team knew there was no available data for a verifier that they felt would be important to measure, they inserted a placeholder verifier hoping that in the future we might be able to find data or initiate the collection of data that would fulfill that gap.

Currently, the data that we collect to assess Forest Plan monitoring is organized in a very functional manner, and the complexity of the results of Forest Plan implementation is reflected through expert analysis. *NETWEAVER*, software developed to model the PCIVD, had many application issues, but using it provided insights into the need to redo the structure for data acquisition on the forest in order for it to be more statistically representative of the different systems, and to better feed the C&I system. For example, the forest does a good job of monitoring the current situation of native species, but the invasive non-native taxa are little assessed. Identifying specific data points that would allow us to assess these data gap areas were critical for areas with little or no data, such as the genetic level. The forest developed use of specific amphibians and small ferns as the “canary” species for the forest, but a system for data collection has to be developed.

Determining which species to include as verifiers for C&I was always a critical debate. Current species monitored through the Forest Plan are based on the need to assess specific management actions. To pick species to assess change using the systems approach to C&I development means 1) pinpointing the species that might best illustrate change, 2) having a means to measure that change, and 3) being able to quantify it meaningfully in a verifier. This meant some verifiers might be a species on the top of the food chain or on the bottom. For example pesticide contamination in eagles may show up too late to be a useful verifier, however, measuring pesticide contamination in frogs may show population impacts early.

Another indicator is in the area of non-native or modified taxa. Introduction of species such as brown trout (European) began in the 1930s within this forest. Brook trout were also heavily stocked, so there is a good chance that there has been some

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genetic alteration of native brook trout strains. Such alterations have been a result of deliberate management decisions to provide a social good. Undoing these actions may not be possible. The validity and utility of continuing this type of action should receive significant social debate.

Under the area of social and economic verifiers, the efforts were made to develop a set of verifiers for each indicator that would allow the team to draw the following three types of conclusions:

- 1) short-term maintenance of components versus long-term resiliency of the attributes through time,
- 2) the spatial distribution of effects over the entire impact area versus more localized effects, and
- 3) individual versus societal effects. The latter might be thought of in general effects or contributions to the diversity of opportunities in the impact area. For the most part, verifiers were developed based on expert opinion.

3.2 Tools for analysis

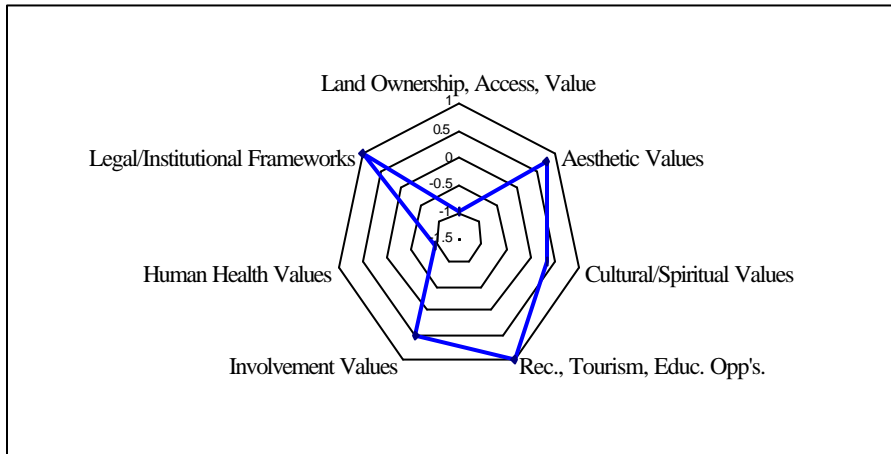
Researchers focused on developing an analytical model. At this stage of the *NETWEAVER* model development, the current model can be used as a warning flag of items of concern as opposed to an actual pass/fail type of assessment. The model currently does not have the capacity to show complexities, such as if a benchmark is a pass in one context but failure in another benchmark. Future models should focus on evaluating trade offs since a forest might choose to relax one standard while staying within known limits in order to avoid negative impacts in another area. Researchers are currently working with this model to enhance its ability for analysis beyond data storage and as an early warning system of issues.

Other presentation methods that were explored included the amoeba and radar diagram. The amoeba diagram shows which elements fully meet, at the criteria level, a passing mark. The O line represents actually neither failing to meet nor fully meeting benchmarks; below O represents criteria that do not meet the benchmark, the less spikes on the amoeba the more the benchmarks are met. **Figure 1** shows which social criteria are more problematic for meeting benchmarks.

An interesting observation in the amoeba diagram is it is more accurate at the lower data levels. For example, take a similar amoeba and add the points relevant to the indicator level under the social principle and criteria, and it illustrates that more and more of the critical elements are met under the indicators (**Figure 2**).

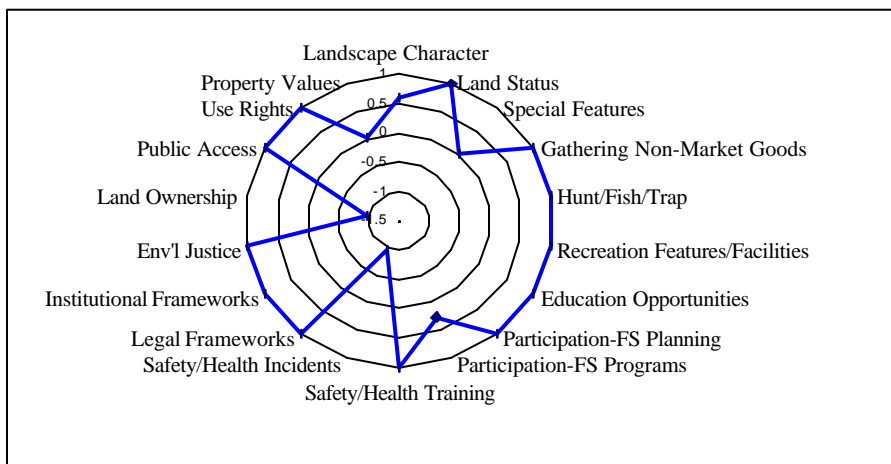
Only land ownership and safety and health accidents are not meeting the bench-

Figure 1. Amoeba diagram for social criteria



marks developed. Both of those issues are out of the control of the local unit forest manager. Managers need to be careful how they compile these complex analyses. Examining ‘failures and warning flags’ will help managers define success for the future.

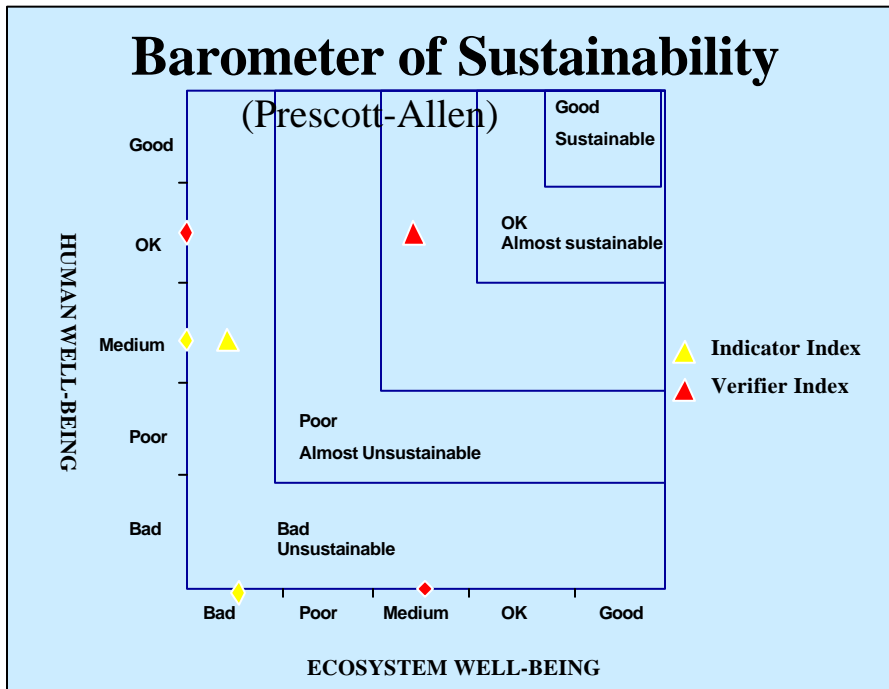
Figure 2. Amoeba diagram for social indicators



Another descriptive tool is the barometer of sustainability (see **Figure 3**), from the *Well Being of Nations* by Robert Prescott Allen; it combines both the indicators and interactions between human well being (social and economic principles), and the ecosystems well being. The point of intersection summarizes the achieved level.

For this research evaluation, the pilot forests used the tools for analysis that were provided, however, there are other analysis that may be useful in further developing analysis. These ideas should be subjected to some scientific rigor but are presented here for critique and review. The first is vital sign analysis. Patterned after a medical exam, a vital sign analysis would measure and assess a number of key system indicators against the standard. If the standard is exceeded, it would trigger a testing of the subsequent series of indicators at a broader or more in-depth degree. If narrowed down, the number of indicators could be using a variety of criteria that could either be important to management or the public, they could be linked to other ecosystem attributes, they could signal a long term risk to adaptability of the ecosystem or they could signal short term changes to the economy.

Figure 3. Prescott-Allen, Barometer of sustainability



A second method would be a threat set analysis and basically, it would assess the indicators or verifiers not needing benchmarks or ones that are most likely in the future to cause failure in meeting standards. You might be able to apply weights to the different indicators in order to represent a level of danger to the system that would occur if an individual verifier was not met. Weighting can provide a critical way to sort through indicators and do a better job of evaluating a relative risk.

A wellness-based analysis would take a look at how to stay healthy. Under this approach, success would be measured by achieving the standards of a goal and determining where the important conditions, states or (flows) could be further strengthened. This is most important for indicators that have a large number of links to other indicators within, as well as across, criteria principles.

Fourth analysis would be a trade off analysis. By adjusting to minimally or maximally satisfy some standards, the effect on other standards could be analyzed. It would focus more on the inter-relationships between indicators and the attributes they represent in the ecological, economic or social systems in the ONF region.

The sensitivity of sustainability conclusions to under or over achievements of standards could also be investigated. The forest plan baseline analysis would key into the current NFMA by using the forest plan monitoring to annually measure forest accomplishments against the plan goals. The monitoring typically has assessed:

- a) the units' accomplishments in terms of activities and outputs; and
- b) if those accomplishments are combining to create forecasted conditions and addressing resource issues as estimated and desired. The current C&I overlap somewhat with current monitoring protocols, however, many do not. Any forest with current monitoring protocols can use them as a test of the C&I and verifiers' effectiveness relative to sustainability.

A very complex type of examination of interactions and trade offs amongst ecological, economic and social factors would examine the system status versus the fundamental system. Two reference points would exist: the existing systems, condition or status and the short term effect of those, and a prediction of the long term or overall effects to the system resiliency. This reference point would examine if the indicator suggested an improvement or a decline in the fundamental ability of the systems to be resilient. The other logical extension of this type of analysis would include a scale or spatial dimension, i.e. a set of regional, in the case of the ONF, the Great Lakes indicators defined appropriately for that scale could be developed and linked to many of the forest unit indicators.

As the analysis process is defined, it is important to screen and weight the veri-

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fiers. Verifiers can be grouped into categories such as those that are predictive, and those that are enabling conditions or those related to a forest plan. The categories themselves may aid users in examining different attributes of the model as well as defining a custom set of verifiers. This analysis should reveal the verifiers that are more meaningful to multiple, critical resource issues or that define where further work is needed related to the verifiers. Over the next year, the ONF personnel hope to work with the researchers to develop the most promising analyses from the above discussion.

4. Issues raised during the process

4.1 Assessing whether to use a verifier

Some of the issues discussed in the area of social and economic effects were the result of fragmentation and ownership changes on the landscape. There is no doubt that this has a tremendous effect on forests, however, it is beyond the ability of the public forest managers to deal with. As such, should it really be a verifier? In the context of the U.S. where private property rights are a dominant and significant part of the culture, how would you account for the effects of zoning regulation? Would such forested landowners be “zoned” to retain 90% of the forest intact? Many of these debates have come and gone, and have typically ended on the side of private property rights in the U.S. Changes on private land may mean public land managers need to review the effects on reserves. It is important to monitor these changes; they provide context for forest management.

Let’s explore the question whether to include an indicator or verifier as part of the ability to assess things even though they are not under the manager’s control. Currently, the ONF has no ability to directly reduce the number of deer. Game is managed by the State of Michigan as part of the separation of state and federal powers in the U.S. Vegetation management has limited effects on population. Hunting and weather will keep this species under control. The measurement of deer density contributes to a number of verifiers. For example, it reflects in the social criteria as a cultural and economic desire for high deer numbers for hunting. There are also negative social effects in terms of car-deer accident frequency, which is on the rise.

For the ecological verifiers, high deer numbers are negative for the retention of native plant species due to over browsing, yet positive by providing prey for recovering wolf populations. In other words, high deer numbers are good for some things and very bad for others. Identifying how many is too many is complex in terms of social, economic and ecological impacts.

Another example is that the mercury abundance benchmark is exceeded in fish

species in the lakes on the forest due to off-site release and travel in air currents. Because of the hierarchical/aggregating model, failing to meet the acceptable range in this one data element that is used in three places could mean the forest would not meet the benchmark for the water quality indicator, the landscape structure criteria and the ecological principle. Mercury contamination is a human health problem and has some environmental effects such as impacting loon reproductive capability. However, failing to meet this benchmark may not necessarily mean that the forest is actually failing the ecological sustainability principle in the areas where a forest manager can make a difference.

Our conclusion is that the significant effects on the forest have to be captured so they can be addressed at an appropriate scale. One advantage to keeping indicators that relate to structure or function that are not within the control of the manager is that they raise warning flags. A manager may then choose to make a response to the situation even though the creation of the condition is not something he/she can directly address. However, this type of verifier illustrates whether management actions on the individual forests are sustainable needs to be reconciled.

Temporal questions are also critical and need to be addressed. As data elements are developed, the question of frequency of acquisition of data was critical on some but not on others. For example, for one verifier, one point in time may be an adequate data set yet for another indicator you may need to have more than one point in time in order to have a meaningful verifier. If frequency of data collection was critical, that was specified in the metadata for the PCIV list.

4.2 Benchmarks

Eventually, as C&I are implemented, most data points will be compared through time. If C&I and verifiers are elements that determine what is good relative to sustainability, it is also critical to determine the level where things are bad, i.e. at the threshold level. This was one of the more difficult tasks to accomplish during the LUCID pilot test. If the indicator or verifier was based on management direction from the Forest Plan, the standard came from the Forest Plan. If it was based on research results, it was noted as such and benchmarks may have been available in that research. In some cases, the benchmark reflected the protocol for data collection and in other cases benchmarks were implied by legal regulations or imposed by regulatory agencies. If verifiers were constructed in a binary fashion, then the benchmark became either a yes or a no.

In the construction of benchmarks where the data were incomplete or the relationships within the verifier were complex, the team found the use of fuzzy logic was a positive means to deal with the uncertainties. Since ecological as well as social

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and economic conditions change across the Great Lakes, the sub-regions and definitely across the country, the Ottawa team was concerned with using common benchmarks amongst the forests. Common benchmarks may be able to be identified throughout the system, but due to variation, the verifier may be different. Our team projects that only a limited quantity will overlap at this level. They may, however, become more common as you move through the indicator level or summarize at a national scale. For example, verifiers may have a similar conceptual basis, i.e. the range of natural variability. However, the measurements for that condition would vary across ecosystems and a benchmark would have to be expressed as a standard deviation from a mean value in order to try and have comparability across the different eco-regions.

There is also the need to make sure these benchmarks cover short term conditions as well as long term. The social and economic benchmarks need involvement from the public before they are finalized. They are inherently value laden and these values may change greatly across a country the size of the U.S. Some benchmarks developed were risk-oriented, based on uncertainty and on the desire not to drop below a certain value as opposed to knowing an actual threshold value - following the concept that the 'first rule of intelligent tinkering is to keep all the pieces' (Aldo Leopold).

We are still in the process of learning about C&I and the development of forest management unit verifiers. During the LUCID study, the team only looked at what the forest was supplying, and did not look at demands or assess future demands, expectations or trade offs that need to be part of the national system.

Another lesson learned during LUCID is to simplify where you can. The beginning of this paper notes that Boise had 71 indicators (verifiers were not developed). Please note that at the end of the initial round of LUCID, the ONF ended up with a reduction in indicators (50) and 490 verifiers. Table 1 illustrated our ability to populate the measurements for indicators. As the work of the ONF is combined with the C&I lists from the other pilot forests, the overall number of indicators is relatively stable, however, the number of critical verifiers has been narrowed down substantially to approximately $\frac{1}{4}$ the starting size.

Whatever approach is used to develop C&I, it is critical to involve researchers, the public and hands-on managers in developing the C&I and verifiers because their different perspectives should represent the three critical principles. The ONF team encourages C&I developers to play with a variety of ideas and not lock onto one tool for analysis when a variety can provide perhaps a more complete picture. Complex analytical tools are probably not needed in the first round though, if the research

community develops them over the long term, they should have significant benefit.

Some of the next steps that need to be explored are the predictive capacity of the verifiers and indicators relative to the criteria, and to develop a point in time picture, if possible, of where we have been in terms of the forest and its evolution. For the ONF, the desired future conditions of its Forest Plan need to be quantified in order to demonstrate the target that we are shooting at. Then the C&I can measure the continuum of change towards these goals. This would enhance course corrections in regard to sustainability of the current Forest Plan.

Though the whole exercise of C&I development is not done in terms of a decision making document, it does allow the presentation of critical information that can help managers determine future analysis of what the forest is going to provide. Questions for the future include how to measure where the forest has been, sustainable conditions or services it will provide in the future, and will this landscape be based on the remnant of century-old landscapes or on a new mix of forest types based on the natural range of variability within the context of the dependent human need.

In closing, it's important that each manager reflects on how to define success in forest management. To a six year old in the ONF, it's pretty simple – it's just having clean water to swim in or drink, it's also taking care of the animals and having the forest look pretty. However, if you were to ask the parents, they would probably tell you success is being able to feed and clothe their families and protect those childhood dreams for their children and their grandchildren.

Each forest has to be looked at from the eyes of the local users as C&I are developed. As our vision of what these forests contribute is better defined, we will be able to look at their contributions across the landscape and the world. The MF concept will allow managers of, and the people who use the forests, to find common ground.

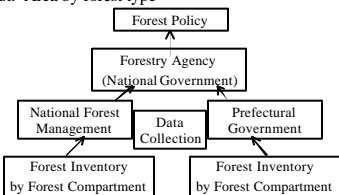
Application of criteria and indicators in Japan

by

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C&I application in Japan

<p>1</p> <p style="text-align: center;">C&I application in Japan</p> <p style="text-align: center;">Workshop on Field/Model Forest Level Criteria and Indicators for Sustainable Forest Management</p> <p style="text-align: center;">June 10-15 2001 Lin'an, China</p> <p style="text-align: center;">Makiko Uemoto</p> <p style="text-align: center;">International Forestry Cooperation Office Forestry Agency of Japan</p>	<p>2</p> <p style="text-align: center;">C&I application in Japan</p> <ol style="list-style-type: none"> 1. Montreal Process C&I 2. Maximize existing scheme 3. Current development 4. Other important issues 5. Recommendations
<p>3</p> <p>1. Montreal Process C&I Japan's view</p> <ul style="list-style-type: none"> ● Joined MP Working Group ● At 1st MP Working Group Meeting, submitted draft "Japan's View on the Technical Criteria of SFM" deliberated by Internal SFM WG <div style="border: 1px solid black; padding: 2px; margin-left: 40px;"> <p style="text-align: center;">"Japan's View"</p> </div> <div style="border: 1px solid black; padding: 2px; margin-left: 40px;"> <ul style="list-style-type: none"> ● Criteria for forest functions ● Criteria for social infrastructure </div>	<p>4</p> <p>1. Montreal Process C&I Establishment of Task Force (ITF)</p> <ul style="list-style-type: none"> ● Established Task Force (TF) to further deliberate C&I <p><u>TF Members:</u> Policy makers, Researchers, Private sector, Academics, NGOs</p> <p><u>TF Consultation Meetings</u></p> <ul style="list-style-type: none"> ➢ Reviewed Japan's forest policies ➢ Reviewed other processes (ITTO, Pan-European Process) ➢ Recommended further steps
<p>5</p> <p>1. Montreal Process C&I Adoption of Montreal Process C&I</p> <ul style="list-style-type: none"> ● Adopted MP C&I — 7 Criteria & 67 Indicators <p>Criterion 1: Conservation of biological diversity</p> <p>Criterion 2: Maintenance of productive capacity of forest ecosystems</p> <p>Criterion 3: Maintenance of forest ecosystem health and vitality</p> <p>Criterion 4: Conservation and maintenance of soil and water resources</p>	<p>6</p> <p>1. Montreal Process C&I Adoption of Montreal Process C&I</p> <ul style="list-style-type: none"> ● Adopted MP C&I — 7 Criteria & 67 Indicators (cont.) <p>Criterion 5: Maintenance of forest contribution to global carbon cycles</p> <p>Criterion 6: Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies</p> <p>Criterion 7: Legal, institutional and economic framework for forest conservation and sustainable management</p>

<p>7</p> <p>1. Montreal Process C&I Lessons learnt</p> <p><u>Challenge:</u></p> <ul style="list-style-type: none"> Introducing and accepting new concept <p><u>Solution:</u></p> <ul style="list-style-type: none"> Stakeholders' participation and consultation to reflect diverse views 	<p>8</p> <p>2. Maximize existing scheme Forest Management Structure</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th style="width: 50%;">National Forest (7.8 M ha @31%)</th> <th style="width: 50%;">Private Forest (17.3 M ha @69%)</th> </tr> </thead> <tbody> <tr> <td>National Forest Management</td> <td>National Gov. (Forestry Agency)</td> </tr> <tr> <td>Forestry Agency</td> <td></td> </tr> <tr> <td>Regional Forest Offices</td> <td>Prefectural Gov.</td> </tr> <tr> <td>District Forest Offices</td> <td>Municipal Gov.</td> </tr> <tr> <td>Forest Ranger Stations</td> <td>Forest Owners</td> </tr> </tbody> </table>	National Forest (7.8 M ha @31%)	Private Forest (17.3 M ha @69%)	National Forest Management	National Gov. (Forestry Agency)	Forestry Agency		Regional Forest Offices	Prefectural Gov.	District Forest Offices	Municipal Gov.	Forest Ranger Stations	Forest Owners
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<p>9</p> <p>2. Maximize existing scheme for C& I application MP Criterion 1: Conservation of biological diversity</p> <p>Ex. Area by forest type</p>  <pre> graph TD FP[Forest Policy] --> FA[Forestry Agency (National Government)] FA --> NFM[National Forest Management] FA --> PG[Prefectural Government] DC[Data Collection] --> NFM DC --> PG FIC[Forest Inventory by Forest Compartment] --> NFM FIC --> PG </pre>	<p>10</p> <p>2. Maximize existing scheme MP Criterion 2: Productive capacity of forest ecosystem</p> <p>Ex. Comparison b/w sustainable harvest level and actual harvest level</p> <p><u>Sustainable harvest level</u></p> <p><i>Nationwide Forest Plan</i> designates allowable cut for 15 years by 44 watersheds</p> <p><u>Actual harvest level</u></p> <p>Field offices report to National Gov. through existing channels</p>												
<p>11</p> <p>2. Maximize existing scheme MP Criterion 3: Maintenance of forest ecosystem health and vitality</p> <p>Ex. Damages by diseases, pests etc.</p> <p><u>Administrative Order</u></p> <p>Director-General of Forestry Agency ordered Prefectural Governors to periodically report on damages caused by pine bark beetles three times per year</p>	<p>12</p> <p>2. Maximize existing scheme MP Criterion 4: Conservation and maintenance of soil and water resources</p> <p>Ex. Regulation to maintain public functions of forests</p> <p><u>Protection Forest System</u></p> <p><i>Forest Law</i> designates Protection Forests, where forestry activities are regulated, for water resource conservation and prevention of soil erosion etc.</p>												

<p>13</p> <p>2. Maximize existing scheme MP Criterion 5: Forest contribution to global carbon cycles</p> <p>Ex. Role of forests as carbon sink <u>Study on carbon storage in forests</u> Forestry and Forest Products Research Institute is testing to develop scientific methods to measure carbon storage in forests</p>	<p>14</p> <p>2. Maximize existing scheme MP Criterion 6: Multiple socio-economic benefits to meet the societies' needs</p> <p>Ex. Education, recreation, employment etc. <u>World Census of Agriculture and Forestry</u></p> <ul style="list-style-type: none"> ● National Gov. conducts every 10 years ● Survey of forest holdings and forestry service enterprises ● Survey items include recreation facilities and number of forestry employees
<p>15</p> <p>2. Maximize existing scheme MP Criterion 7: Legal, institutional and economic framework</p> <p>Ex. Laws and regulations for sustainable forest management <u>Existing various legal framework</u> <i>Forest Law</i> stipulates basic provisions for Forest Planning System, which designates periodic monitoring of the state of forests</p>	<p>16</p> <p>2. Maximize existing scheme Lessons learnt</p> <p><u>Challenge:</u></p> <ul style="list-style-type: none"> ● Existing scheme does not cover all indicators <p><u>Solution:</u></p> <ul style="list-style-type: none"> ● Prioritize and determine most appropriate indicators for assessing progress towards SFM ● Introduce new methods when resources are available (→ 3. Current Development)
<p>17</p> <p>3. Current development ① Nationwide Forest Resource Monitoring</p> <p><u>Objective:</u> To monitor state of forests w/ nationally uniform method to improve forest management plans</p> <p><u>Methods & survey items:</u> 4 km x 4 km; Survey plot = 0.1ha (3,000 plots x 5 yrs = 15,000 plots); number, diameter, height of trees; weeds; soil erosion; diseases and pests etc.</p> <p><u>Implementing body:</u> Pref. Gov. & National Forest Management</p>	<p>18</p> <p>3. Current development ① Lessons learnt</p> <p><u>Challenge:</u></p> <ul style="list-style-type: none"> ● Resources and time required for a large-scale survey ● Special technical skill required for monitoring some items <p><u>Solution:</u></p> <ul style="list-style-type: none"> ● Developed a technical manual ● Capacity building

<p>19</p> <p>3. Current development ② Kasama survey area <u>Objective:</u> To develop monitoring methods at field level for indicators that existing scheme cannot monitor <u>Method & survey items:</u> Survey Area (134,000 ha), 15 municipalities ex. (C4) water flow, change in water quality (C6) distribution of recreational facilities <u>Implementing body:</u> Forestry and Forest Products Research Institute</p>	<p>20</p> <p>3. Current development ② Lessons learnt <u>Challenge:</u> <ul style="list-style-type: none"> ● Too scientific to apply nationwide <u>Solution:</u> <ul style="list-style-type: none"> ● Develop a user-friendly technical guideline for its nationwide application </p>
<p>21</p> <p>3. Current development ③ Development of “YR 2003 Report”</p> <ul style="list-style-type: none"> ● MP Working Group agreed to submit national reports in 2003 on monitored data along with C&I (1st Montreal Process Forest Reports = “YR 2003 Report”) <p><u>Approach</u> Maximize existing scheme</p>	<p>22</p> <p>3. Current development ③ Lessons learnt <u>Challenge:</u> <ul style="list-style-type: none"> ● Many FAJ divisions involved ● Interpretation of indicators ● Necessary data collected by other authorities <u>Solution:</u> <ul style="list-style-type: none"> ● Established Internal Working Group involving all related FAJ divisions and researchers ● Exchange of views among MP member countries and other processes ● Consult with related ministries/agencies </p>
<p>23</p> <p>4. Other important issues ①</p> <p><u>Challenge:</u></p> <ul style="list-style-type: none"> ● Data only on forest resources insufficient to monitor multiple functions of forests <p><u>Solution:</u></p> <ul style="list-style-type: none"> ● Collect in sufficient data and further improving forest resource assessment 	<p>24</p> <p>4. Other important issues ②</p> <p><u>Challenge:</u></p> <ul style="list-style-type: none"> ● Forests take time to grow → require long-term data collection <p><u>Solution:</u></p> <ul style="list-style-type: none"> ● Develop monitoring methods acceptable and practiced for a long time

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4. Other important issues ③

Challenge:

- Sustainability not measured or discussed by individual indicator

Solution:

- Involve all stakeholders to measure and discuss sustainability in a comprehensive manner

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5. Recommendations in applying C&I at each MF site

- Determine 1-2 key indicator(s) for a criteria
- Maximize existing data instead of creating a new data collection system
- Involve as many stakeholders as possible in applying C&I and collecting data
- Adopt cost-effective methods for long-term monitoring

Development and application of criteria and indicators for sustainable forest management in Malaysia

by

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1. Introduction

Malaysia is a tropical country located north of the equator within latitudes 1° to 7° north and longitudes 100° to 119° east. Its total land area is approximately 32.83 million ha with 13.16 million ha in Peninsular Malaysia, which comprises eleven states and the Federal Territory of Kuala Lumpur, 7.37 million ha in Sabah and the Federal Territory of Labuan, and 12.30 million ha in Sarawak.

The climate of Malaysia is typically humid tropical or wet equatorial. The mean temperature during the day is 32°C while the night temperature can fall to 22° C. The average annual rainfall is about 2,540 mm while humidity ranges from 70% to 98%.

The forestry sector has contributed significantly toward the socio-economic development of Malaysia. This can be highlighted as follows:

- In 1999, forestry and logging activities contributed US\$1.9 billion or 3% of the country's total GDP.
- The total export of timber and timber products in 1999 was valued at US\$3.0 billion or 3.5% of the country's total export earnings at f.o.b \$US 84.5 billion.
- In 1999, the forestry sector provided direct employment for 264,935 people or about 2.0% of the country's labour force of 9.2 million.

2. Constitutional provisions

Under Article 74 (2) of the Malaysian Constitution, forestry comes under the jurisdiction of the respective State Governments. As such, each state is empowered to enact laws on forestry and to formulate forestry policies independently. The executive authority of the Federal Government only extends to the provision of advice and technical assistance, training, undertaking of research and the maintenance of experimental and demonstration stations.

In order to facilitate the adoption of a coordinated and common approach to forestry, the National Forestry Council (NFC), comprising the Chief Ministers of the thirteen Malaysian states and chaired by the Deputy Prime Minister, was established on 20 December 1971 by the National Land Council (NLC). The NLC is empowered

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under the Malaysian Constitution to formulate a national policy for the promotion and control of utilization of land for mining, agriculture and forestry. The NFC serves as a forum for the Federal and State governments to discuss and resolve common problems and issues related to forest policy, administration and management. All the decisions of the NFC have to be endorsed by the NLC. The responsibility for implementing the decisions of the NFC lies with the State Governments unless it is within the authority of the Federal Government.

The National Forestry Policy of 1978 was formulated and approved by the NFC, endorsed by the NLC, and revised in 1992.

3. Forest resources

In 1999, the total forest area of Malaysia was estimated at 20.28 million ha or 61.7% of the total land area: 22% of the forests were in Sabah; 48.8% in Sarawak; and 29.2% in Peninsular Malaysia.

Recognizing that the role of forests is confined to timber production, but more importantly in the conservation of soil, water and wildlife, as well as environmental protection generally, Malaysia has 14.32 million ha of forested land designated as Permanent Forest Estate (PFE) which is under sustainable management. Approximately 10.83 million ha of the PFE is in production forest with the remaining 3.49 million ha designated as protection forest.

Since the 1930s, Malaysia has established a network of protected areas - for example, national parks, wildlife and bird sanctuaries - for the conservation of biological diversity. Presently, the country has 2.12 million ha of conservation areas protected by legislation. Of these, 1.80 million ha are found outside the PFE, while the remaining 0.32 million ha are located within the PFE.

Hence, with the protection forests of the PFE amounting to 3.49 million ha, the total protected area designated for the conservation of biological diversity in Malaysia is now estimated at 5.29 million ha or 27.8% of Malaysia's total forested land.

4. Forest management

In Peninsular Malaysia, the dipterocarp forest of the production forest of the PFE is managed under two management systems, namely the Modified Malayan Uniform System (MMUS, 55-year cutting cycle) and the Selective Management System (SMS, 30-year cutting cycle). The MMUS consists of removing the mature crop in a single felling of all trees down to 45 cm diameter at breast height (dbh) for all species, while the SMS involves the selection of optimum management (felling) regimes based on pre-felling forest inventory data.

Under the SMS, the cutting limit prescribed for the group of dipterocarp species would not be less than 50 cm dbh, with the exception of *Neobalanocarpus heimii* (*Chengal*) where the cutting limit would be above 60 cm dbh. The cutting limit prescribed for the group of non-dipterocarp species would not be less than 45 cm dbh. The difference in the cutting limits prescribed between the dipterocarp and the non-dipterocarp species would be at least 5 cm in order to conserve a higher percentage of dipterocarp species for the next cut.

Forest harvesting in the state of Sabah is undertaken in accordance with the prescribed silvicultural practice of promoting natural regeneration. In this context, the dipterocarp forest is selectively harvested based on a 50-year cutting cycle, and only trees having a size of 60 cm dbh and above are removed.

In the state of Sarawak, the cutting cycle adopted for the dipterocarp forest is 25 years, with the prescribed cutting limits for the dipterocarp and non-dipterocarp species being 60 cm dbh and 45 cm dbh and above respectively.

Currently, the peat swamp forest in Peninsular Malaysia is managed under the 'modified' SMS where higher cutting limits are prescribed due to a lower stocking of natural regeneration. Research and development is currently being undertaken to formulate a more effective management system for this forest type. In this regard, the cutting cycle adopted for the peat swamp forest in the state of Sarawak is 45 years, with the prescribed cutting limits for *Gonystylus bancanus* (*Ramin*) and that of the other species being 40 cm dbh and 45 cm dbh and above respectively.

In general, the mangrove forest is managed under cutting cycles varying between 20 and 50 years. Currently there is no commercial harvesting of mangrove forests in the states of Sabah and Sarawak. However, in Peninsular Malaysia mature trees are clear-felled with retention of seven mother trees per ha and a three-meter wide riverbank and coastal strip to ensure adequate natural regeneration and protection of the environment.

The practice of selective harvesting of inland forests in Malaysia would ensure that the remaining larger trees would reach maturity in 25 to 50 years, allowing for a second round of harvesting, and continuation of the cycle. This in itself is a form of silvicultural treatment because natural regeneration is increased by the gaps created during forest harvesting. Several studies have also indicated that regeneration of desirable species occurs naturally in and around the gaps left by logging, and only when necessary are the logged-over forests silviculturally treated to aid in their rehabilitation.

5. Forest harvesting

Forest harvesting in the inland forest in Malaysia is generally carried out by a combination of crawler tractor and winch lorry. Under this harvesting system, the crawler tractor skids the logs from the felling sites to the skid trails where the winch lorry will transport the logs to the roadside landings. In Malaysia, the skidder generally does not pick up its load from the felling site because of adverse soil and terrain conditions. Currently, reduced impact logging (ground skidding) is also being carried out in a few forest areas in Peninsular Malaysia and in the state of Sabah, while low impact logging (helicopter logging) is being carried out in the state of Sarawak.

To further mitigate the adverse effects of forest harvesting, the Forest Departments (FD) have adopted *Standard Road Specifications* and *Forest Harvesting Guidelines*, which must be strictly adhered to by all logging contractors, both at the planning and implementation levels, particularly in Peninsular Malaysia. All harvesting operations have to be carried out in accordance with these specifications and guidelines, particularly those pertaining to road construction, alignment, gradient, drainage, tree marking, direction of felling and the setting up of log-yards. The FD's role is to supervise closely the implementation of the environmental conservation measures such as choice of machinery, construction of water bars and the control of pollution of rivers and waterbodies as a result of logging. The forest engineers within the FDs play an active role in providing technical advice and services on all matters pertaining to infrastructural development of the logging sector, such as the design and construction of forest roads, so as to enhance environmental stability and quality.

6. Development of C&I

As a producing member country of the ITTO, Malaysia is fully committed to achieving SFM within the overall context of sustainable development. In 1994, Malaysia took steps to operationalise the ITTO's *Guidelines for the Sustainable Management of Natural Tropical Forests* and *Criteria for the Measurement of Sustainable Tropical Forest Management* in managing its natural forests, and to ensure that its natural forests are managed sustainably. In this respect, it is committed to acceptance of the ITTO's definition of SFM, as *a process of managing permanent forest land to achieve one or more clearly specified objectives of management with regard to the production of a continuous flow of desired forest products and services without undue reduction of its inherent values and future productivity, and without undue undesirable effects on the physical and social environment.*

In February 1994, a National Committee on Sustainable Forest Management (the 'Committee') was established to ensure that the elaborated ITTO's *Criteria for the Measurement of Sustainable Tropical Forest Management* in the Malaysian context was fully implemented. The Committee comprised representatives from the Min-

istry of Primary Industries; Forestry Departments of Peninsular Malaysia, Sabah and Sarawak; Forest Research Institute of Malaysia; Malaysian Timber Council; Malaysian Timber Industry Board and the Faculty of Forestry, University Putra Malaysia. At the same time, to further support the Committee's work, the ten State Forestry Departments (SFDs) in Peninsular Malaysia formed a Working Group on Sustainable Natural Forest Management based at Forestry Department Headquarters, Peninsular Malaysia.

After a series of meetings, the Committee developed a total of 92 activities to operationalise the ITTO 5 criteria and 27 indicators on SFM at the national level. The activities covered the forest resource base, continuity of flow, level of environmental control, socio-economic effects and institutional frameworks, as well as the management specifications for each activity so as to ensure its effective monitoring and evaluation in the field. A summary of the number of criteria, indicators, activities and management specifications developed at the national level is provided in **Annex 1**.

During the process, the Committee omitted two of the proposed ITTO indicators and included two additional indicators. The reason for omitting the indicator on *Availability of Environmental Assessment Procedures* under the criterion *Socio-Economic Effects* was that this indicator was also included under the criterion on the *Level of Environmental Control* which the Committee deemed to be more appropriate. The omission of the indicator on the *Relationship of National Policy to ITTO Guidelines* under the criterion on *Institutional Frameworks* was that the National Forestry Policy of Malaysia had adequately met the objectives of the ITTO's guidelines in terms of SFM. The two additional indicators were the indicator on *Plantation Establishment of Non-wood Forest Produce and Annual Planting Targets* under the criterion *Forest Resource Base* and the indicator on *Expenditure Budgets for Forest Administration* under the ITTO criterion on *Socio-Economic Effects*.

At the FMU level, the Committee identified a total of 84 activities to be implemented under 6 criteria and 23 indicators of the ITTO, covering resource security, continuity of timber production, conservation of flora and fauna and other forest resources, an acceptable level of environmental impact, socio-economic benefits, and planning and adjustment to experience.

Currently, a state in Peninsular Malaysia is defined as a FMU. Through its deliberations, the Committee added 7 additional indicators from those identified at the national level, to the FMU level. The indicators are:

- length of cutting cycle;
- areas of protection forests and production forests within the PFE;

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- establishment of forest plantations for wood production;
- establishment of forest plantations for non-wood production;
- availability of environmental assessment procedures;
- expenditure budgets for forest management; and
- expenditure budgets for forest administration.

Of the 84 activities identified for implementation on a state basis, a total of 70 activities or 83% are identical to those identified at the national level. In addition, for Peninsular Malaysia, against each of the activities identified at the national and FMU level, the respective SFDs have also formulated management specifications (benchmarks) for effective monitoring and evaluation. A total of 206 management specifications at the national level, and 191 at the FMU level have been formulated. Of the 191 management specifications formulated at the FMU level, a total of 161 or 78% are identical to those formulated at the national level. A summary of the number of criteria, indicators, activities and management specifications developed at the forest management unit level is provided in **Annex 2**. In addition, a sub-set at the FMU level was used to undertake forest management certification in Peninsular Malaysia. The sub-set encompasses 6 criteria, 28 indicators, 71 activities and 164 management specifications (see **Annex 3**).

However, in 1999, with the adoption of the new ITTO documents on *Criteria and Indicators for Sustainable Management of Natural Tropical Forests* and *Manual for the Application of Criteria and Indicators for Sustainable Management of Natural Tropical Forests (Part A – National Indicators and Part B – Forest Management Unit Indicators)* at the 24th Session of the International Tropical Timber Council (ITTC) held in May, 1998 at Libreville, Gabon and the 26th Session held in June, 1999 at Chiang Mai, Thailand, Malaysia had undertaken to revise its C&I which were developed based on the earlier guidelines.

In July 1999, a revision of the C&I was conducted, coordinated by the National Timber Certification Council (NTCC) through a preliminary meeting among the FDs of Peninsular Malaysia, Sabah and Sarawak. The purpose of the meeting was to agree on common C&I at the national and FMU levels for SFM for the whole country based on the ITTO's *Criteria and Indicators for Sustainable Management of Natural Tropical Forests*, as well as the activities required to operationalise these C&I which were based on 'Action to be taken' as contained in the ITTO's *Manual for the Application of Criteria and Indicators for Sustainable Management of Natural Tropical Forests (Part A – National Indicators and Part B – Forest Management Unit Indicators)*.

This meeting was followed by regional consultations with interested parties to

identify appropriate SOP for each of the Activities. The FDs of Peninsular Malaysia, Sabah and Sarawak conducted the consultations in August 1999, within their respective regions. In the case of Peninsular Malaysia, the process involved the refinement and/or addition to the Management Specifications of the C&I developed earlier in 1994. These regional SOP were then integrated into the draft C&I for the whole country through a meeting held between the three FDs of Peninsular Malaysia, Sabah and Sarawak, which was again coordinated by the NTCC in September 1999.

The draft C&I were then tabled at a national-level consultation, held in October 1999, where a total of 85 organizations and companies, representing interested parties such as the timber industry, social and environmental NGOs, trade unions, women's organizations, academic/research institutions and government agencies, were invited to attend. A total of 111 participants representing 58 organizations, including two representatives from the Forest Stewardship Council, participated. Through this open and transparent process, Malaysia has adopted a set of Malaysian C&I (MC&I) for forest management certification that will be used to assess forest management practices in all FMUs for the purpose of certification.

Under the 7 ITTO criteria, a total of 64 indicators, 200 activities and 170 standards of performance were developed at the national level while 7 criteria, 56 indicators, 171 activities and 150 SOP were developed for assessing SFM at the FMU level. A sub-set of those developed at the FMU level was taken for forest management certification purposes, comprising 7 criteria, 53 indicators, 162 activities and 142 SOP (see Annexes 4, 5 and 6).

7. Revisions made to the MC&I

In the process of revising the MC&I in 1999, Malaysia made the following changes:

7.1 National and FMU levels and for forest management certification

Omitted two of the ITTO indicators from the MC&I:

- i) ITTO Indicator 7.3 – Quantity (volume) and value of wood and non-wood forest products for subsistence use, including fuel wood, as the use of wood and non wood forest products for subsistence use is insignificant in Malaysia and has a very negligible impact on its overall economy.
- ii) ITTO Indicator 7.18 – Number of agreements involving local communities in co-management responsibilities, as co-management agreements are not currently used in Malaysia, especially in forest harvesting.

7.2 National and FMU levels

Added three items to the ITTO indicators:

- i) An element on **rights of forest workers** to ITTO Indicator 1.1 – Existence of a framework of laws, policies and regulations under Criterion 1 – Enabling Conditions for Sustainable Forest Management.
- ii) An item on **mortality rate** to ITTO Indicator 7.8 – Employment in the forestry sector under Criterion 7 – Economic, Social and Cultural Aspects.
- iii) The words '**and competency**' to ITTO Indicator 1.5 – Number and adequacy of trained professional and technical personnel at all levels to perform and support management, implementation, research and extension, also under Criterion 1, which now reads as Number, and adequacy and competency of trained professional and technical personnel at all levels to perform and support management, implementation, research and extension.

Addressed the gender issue in ITTO Indicators 1.5 and 7.8.

For Indicator 1.5, information on Research and Extension will be recorded separately instead of as one category as suggested by the ITTO.

7.3 FMU level and forest management certification

Included 7 additional indicators/items from those proposed by ITTO to be used at the national level to this level:

- i) ITTO Indicator 1.1 – Existence of a framework of laws, policies and regulations.
- ii) The item on the Bali Partnership Fund in ITTO Indicator 1.2 – Amount of investment and reinvestment in forest management, administration, research and human resource development.
- iii) ITTO Indicator 5.1 – Statistics of protected areas in each forest type.
- iv) ITTO Indicator 5.2 – Percentage of total number of protected areas connected by biological corridors or 'stepping stones' between them.
- v) ITTO Indicator 7.4 – Ratio of domestic log production to the processing capacity of wood-based industries.
- vi) The items on percentage of total work force and average wage rate in ITTO's Indicator 7.8 – Employment in the forestry sector.
- vii) The items on research and education in ITTO Indicator 7.9 – Number and extent of forest sites available.

Omitted four indicators/items although they have been proposed by the ITTO:

- i) ITTO Indicator 5.5 – Percentage of original range occupied by selected endangered, rare and threatened species, as this indicator is best reflected at the national level as the protection of selected endangered, rare and threatened spe-

- cies is a national responsibility.
- ii) The item on *ex situ* conservation in ITTO Indicator 5.6 – Existence and implementation of a strategy for *in situ* and/or *ex situ* conservation of the genetic variation within commercial, endangered, rare and threatened species of forest flora and fauna, as this is deemed to be best covered and implemented at the national level.
 - iii) ITTO Indicator 7.2 – Quantity (volume) and value of wood and non-wood forest products traded in the domestic and international markets, as all relevant data on trade of wood and non-wood forest products is collected at the national level.
 - iv) ITTO Indicator 7.5 – Efficiency of utilization in terms of the percentage of felled volume processed, as all relevant data is collected at the national level.

7.4 Forest management certification

Omitted three indicators found at the FMU level. They will be taken on board once new knowledge is gained in their application through more field testing.

- i) ITTO Indicator 6.2 – Extent and percentage of area to be harvested for which off-site catchment values have been defined, documented and protected before harvesting.
- ii) ITTO Indicator 6.4 – Extent and percentage of area to be harvested for which drainage systems have been demarcated or clearly defined and protected before harvesting.
- iii) ITTO Indicator 6.9 – Existence and implementation of procedures for assessing changes in the water quality of streams emerging from production forests as compared with streams emerging from the same forest type kept free from human intervention.

8. Application of C&I

The criteria, indicators, activities and standards of performance at the national level would be used for reporting Malaysia's progress towards achieving SFM. Those formulated at the FMU level would be used by the FDs to monitor and assess progress in SFM at the state level, and for undertaking forest management certification by independent third party assessors in the overall context of timber products certification.

The main purpose of indicators is to indicate change, both in the forest itself (outcome indicators) and in the environmental and forest management systems used (process indicators). If the values of any indicator are placed in a time sequence, they provide information on the direction of change, either towards or away from SFM. It should be noted that no single criterion or indicator alone constitutes a measure of sustainability. Rather the C&I should be considered as integral to assessment of SFM.

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It is also important to note that C&I by themselves cannot establish whether management is or is not sustainable. To do this, they must be supplemented by standards of performance and management prescriptions, which must be determined by the countries themselves and may often, within countries, be specific to particular forest types. The standards of performance act as benchmarks to measure the attainment of a particular indicator.

The information generated through the use of C&I in assessing the state of the forest will help policy and decision-makers to communicate the status of SFM more effectively to the public. It will also assist in developing policies and strategies for SFM; in focusing research efforts where knowledge is still lacking and deficient; and in identifying those areas that are in special need of international assistance and cooperation.

In addition, if indicators are operationalized and if prescriptions and standards are set, a sound basis would have been created for assessing SFM at the operational level.

As stated earlier, in Peninsular Malaysia, an FMU is defined as the state. Since the establishment of the Forestry Department in 1901, forests in Malaysia have been systematically managed. Over the years, ecologically and environmentally-sound forest conservation and management practices have been developed to ensure that forest resources in Malaysia are managed for the sustainable production of timber and non-timber products; to enhance climatic stability and ecological balance; to safeguard water supplies and environmental quality; and to conserve biological diversity. In this scenario, the SFDs only have to ensure that forestry activities are further improved to meet the benchmarks set in the standards of performance listed in the MC&I.

Manuals and guidelines on forest management, silviculture, forest road construction as well as circulars issued by the Director General of Forestry govern the work of the SFDs. In order to effect improvements in the field, training was conducted to familiarize FD staff working at the state and district level with the MC&I, and, more importantly, the standards of performance. For instance, in Indicator 5.6a of the MC&I, the standard of performance states that *buffer strips of permanent watercourses in Dry Inland Forest and Peat Swamp Forest of at least 5m wide on either side of the watercourse* are required, and these need to be marked on the ground. Furthermore, no felling of trees is allowed within the buffer strips. On the standard requiring at least four seed trees per hectare of 30 cm dbh and above in the Production Forest of the PFE to be marked and protected, this is implemented during the pre-felling phase whereby seed trees are marked, recorded and located on a map. In addition, trees to be felled are also marked and the felling direction determined.

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In another standard for feeder roads and skid trail densities, it is a requirement that the density of feeder roads and skid trails be less than or equal to 40 m/ha and 300 m/ha respectively. To ensure that this is complied with, the location of feeder roads is pre-determined and mapped and later verified and marked on the ground. All changes to the alignment of feeder roads are recorded. Skid trails are also pre-determined, marked on the ground and mapped.

In applying the MC&I at the state level, the FDs have encountered problems such as unmarked buffer strips or damage to mother trees after felling, but through training and detailed monthly reports, there have been improvements in the field procedures to meet the standards set. However, this is an on-going exercise and the cooperation of staff in the field is most important to ensure standards are met.

In 1996, Malaysia and the Netherlands, through the Keurhout Foundation, implemented a pilot study on forest management certification which involved the development of an operating system for product certification to track the source of timber products in a chain-of-custody study, including the costs involved. It was to be a phased approach using a sub-set of the MC&I developed for forest management certification at the FMU level. In this study, involving SGS (Societe Generale de Surveillance) Malaysia Sdn. Bhd., a sub-set containing 6 criteria, 29 indicators, 87 activities and 48 standards of performance was used for certifying three FMUs in Peninsular Malaysia, namely the states of Selangor, Pahang and Terengganu.

It was noted in an assessment report, conducted in 2000, that there were improvements in forest management, mainly with regard to mapping, documentation, marking and monitoring of growth plots, development of Virgin Jungle Reserves in each forest district, implementation of enrichment planting in disturbed areas, and clear marking of buffer strips for permanent rivers and streams. However, improvements in field operations such as road construction and maintenance, reduced impact logging, environmental monitoring of water quality, endangered species and forest biological diversity, and procedures to identify endangered, rare and threatened species of fauna and flora have not been fully addressed. It also noted that continuous improvements to achieve full compliance with the requirements of the MC&I should be pursued.

In Sabah, a forest certification exercise was also undertaken where the forest management model area in the Deramakot Forest Reserve was certified as being a 'well-managed forest'. The management concept and practices in Deramakot are in full compliance with the MC&I, and hence the ITTO C&I for SFM.

9. Monitoring and evaluation

To ensure that the agreed activities are implemented in the field by the respective SFDs in Malaysia, a task force comprising representatives from the Ministry of Primary Industries, Malaysia; the FDs of Peninsular Malaysia, Sabah and Sarawak; Forest Research Institute, Malaysia; Malaysian Timber Council; the Malaysian Timber Industry Board; and the Faculty of Forestry, Universiti Putra, Malaysia was established in May 1995. To complement this effort, Peninsular Malaysia has also formed a technical monitoring committee at Forestry Department Headquarters, Peninsular Malaysia, in October 1995 to monitor the implementation of all activities undertaken by the respective SFDs in Peninsular Malaysia.

The task force has since developed effective mechanisms and procedures for the periodic monitoring of the implementation of all activities, and produces reports on their progress to relevant authorities for their information and action.

10. Conclusion

C&I at the national level would provide a common framework for monitoring and evaluating progress towards sustainability. However, they do not specify requirements for SFM practices in the field. C&I at the FMU level will directly assess the sustainability of forest resource management, conservation and development in practice. No single criterion or indicator is alone an indication of sustainability. The set of C&I should be considered together with the standards of performance as an integral system to assess the practice of SFM.

While there is no denying there are still weaknesses in the implementation of the MC&I in the field, improvements in the field will continue to be pursued and the current MC&I will also be reviewed and refined over time. In the final analysis, forest resources in Malaysia will continue to be managed in accordance with national objectives and priorities so the country can continue to enjoy the benefits generated from the forest and forest industries.

Annex 1
Criteria, indicators, activities and management specifications for sustainable forest management at the national level

Criteria	Indicators	Activities	Management specifications
1. Forest resource base	6	21	64
2. Continuity of flow	8	33	89
3. Level of environmental control	3	10	20
4. Socio-economic effects	4	12	12
5. Institutional frameworks	6	16	21
Total:	5	27	206

Annex 2
Criteria, indicators, activities and management specifications for sustainable forest management at the FMU level

Criteria	Indicators	Activities	Management specifications
1. Resource security	8	23	53
2. Continuity of timber production	9	24	59
3. Conservation of flora and fauna and other forest resources	2	8	27
4. An acceptable level of environmental impact	5	12	27
5. Socio-economic benefits	4	14	21
6. Planning and adjustment to experience	2	3	4
Total:	6	30	191

Annex 3
Criteria, indicators, activities and management specifications for forest management certification at the FMU level

Criteria	Indicators	Activities	Management specifications
1. Resource security	6	18	42
2. Continuity of timber production	9	17	44
3. Conservation of flora and fauna and other forest resources	2	8	27
4. Acceptable level of environmental impact	5	12	27
5. Socio-economic benefits	4	13	20
6. Planning and adjustment to experience	2	3	4
Total:	6	71	164

Annex 4
Criteria, indicators, activities and standards of performance for sustainable forest management at the national level in the revised MC&I

Criteria	Indicators	Activities	Standards of performance
1. Enabling conditions for sustainable forest management	9	31	20
2. Forest resource security	5	22	17
3. Forest ecosystem health and condition	5	20	13
4. Flow of forest produce	12	37	31
5. Biological diversity	8	25	22
6. Soil and water	9	26	29
7. Economic, social and cultural aspects	16	39	38
Total:	7	200	170

Annex 5

Criteria, indicators, activities and standards of performance for sustainable forest management at the FMU level in the revised MC&I

Criteria	Indicators	Activities	Standards of performance
1. Enabling conditions for sustainable forest management	8	26	17
2. Forest resource security	5	22	17
3. Forest ecosystem health and condition	3	12	9
4. Flow of forest produce	12	37	31
5. Biological diversity	7	21	18
6. Soil and water	9	26	29
7. Economic, social and cultural aspects	12	27	29
Total:	7	171	150

Annex 6

Criteria, indicators, activities and standards of performance for forest management certification at the FMU level in the revised MC&I

Criteria	Indicators	Activities	Standards of performance
1. Enabling conditions for sustainable forest management	8	26	17
2. Forest resource security	5	22	17
3. Forest ecosystem health and condition	3	12	9
4. Flow of forest produce	12	37	31
5. Biological diversity	7	21	18
6. Soil and water	6	17	21
7. Economic, social and cultural aspects	12	27	29
Total:	7	162	142

Developing village-level C&I, Yunnan, China

**Developing and filtering village level criteria and indicators in
Yunnan, southwest China**

by

Karen Edwards
RECOFTC

Developing village-level C&I, Yunnan, China

<p>1</p> <p>Case study: Developing and filtering village level C&I in Yunnan, SW China</p> <p>Presentation based on collaborative work of Yunnan Forest Department, Centre for Development Studies (CDS) and RECOFTC with communities in Yunnan</p> <p>April 2001</p>	<p>2</p> <p>Overview</p> <ul style="list-style-type: none"> ● Why are RECOFTC and partners interested in P, C&I? ● Background to case study ● Process of developing and filtering field C&I ● Some examples of C&I and changes from field filtering ● Issues arising ● Summary
<p>3</p> <p>Why are RECOFTC and partners interested in P, C&I</p> <ul style="list-style-type: none"> ● Forests as contested domain in the region ● Reality of multi-stakeholder processes and current power structures ● Lessons learned about effective units of management; administrative levels versus 'real users' 	<p>4</p> <p>Background to case study</p> <ul style="list-style-type: none"> ● RECOFTC and partners looking for tools which could facilitate..... ➢ Involvement of communities as 'users' or 'managers' of the forest in stakeholder dialogue
<p>5</p> <p>Background to case study (cont.)</p> <ul style="list-style-type: none"> ➢ Illustrate different perceptions but help to reach mutual understanding on 'sustainable' (negotiation tool to agree standards of management) ➢ Discussion of management issues at levels at which communities are organized 	<p>6</p> <p>Process of C&I development</p> <ul style="list-style-type: none"> ● integrating different resources and perspectives ● making sure field reality is reflected in C&I; ground truthing ● balance between process and outcome

<p>7</p> <p>Issues and questions</p> <ul style="list-style-type: none"> ● Are we developing C&I for the forest resource or forest management? ● What is most appropriate level to develop C&I and for what? ● What are the local power structures? ● Using principles in negotiation process and ‘debate’ on sustainable management 	<p>8</p> <p>Summarising and suggesting...</p> <ul style="list-style-type: none"> ● Options to develop field level C&I; start with a base set, or set of standards, or visions of stakeholders of forest ● Tools and ideas to ensure that C&I are shared and agreed; who will apply the C&I? ● Ensuring that watershed level’ not missing real’ management issues
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Annex 1

Revised version of P,C & I after field work

Principle 1. Forest health is maintained

Criteria	Indicators	Verifiers
1.1 Forest structure and regeneration is maintained	1.1.1 Diversity in age of growing stock evident and managed 1.1.2 Regeneration ¹ occurs and is managed/assured for the future	
1.2 Biodiversity is maintained	1.2.1 No of species in forest increasing/decreasing	
1.3 Ecosystem functions (earth, water and fire are managed)	1.3.1 Communities can explain how they managed fire in the recent past 1.3.2 No of fires unsuccessfully controlled 1.3.3 Community manage vegetation for reduction of fire hazards and control 1.3.4. Removal of soil and litter from the forest is controlled 1.3.5 Communities can explain how to avoid an increase in bare areas of soil 1.3.6 Communities can explain how they manage the forest for water regulation	Verification of water regulation?
1.4 Local Land use systems reflect diversity of local needs and capacity of landscape	1.4.1 Communities can explain why certain land uses are allowed in certain places 1.4.2 Communities can explain what happens when land uses occur which are not allowed 1.4.2 Communities can explain how future land uses will be related to rationale of landuse planning explained	

¹ Natural regeneration is emphasized as focus is on management of existing forest resources. Tree plantation will only be added for consideration as indicator where natural regeneration is not possible

Developing village-level C&I, Yunnan, China

1.5 Villagers can explain how their productive interventions effect the forest	1.5.1 Villagers can explain how they control extraction of NTFPs 1.5.2 No of species of NTFP disappearing in the last 10 years 1.5.3. rules and regulations for sustainable harvesting of timber in place 1.5.4 Villagers can explain how hunting is regulated 1.5.5 Villagers can explain how expansion of agricultural land will not adversely effect the forest area.	
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Principle 2. Human well-being is assured

2.1 Forest contributes significantly to local village economy (not admin village)	2.1.1 Considerable part of sustainable needs met from forest 2.1.2 Forest contributes critically to agricultural activities 2.1.3 Sale from forest products contributes to household income	
2.2 Different forest users and interest groups of forest products coexist harmoniously	2.2.1 Interests do not adversely compete 2.2.2 Benefits supplement diverse sectors; balance between benefit contribution to local household income and community development	
2.3 Benefits of productive activities serve as an incentive to conserve the forest	2.3.1 Villagers can explain a wider range and the importance of benefits from productive activities 2.3.2 Villagers can explain how they ensure they continue getting benefits from the forest	
2.4. Local knowledge demonstrates ethics of sustainable land use	2.4.1 link with 1.4.1, 1.4.2 & 2.4.1 Local customs do not damage the forest	
2.5 Access to and use of forest secured for all community members	2.5.1 No complaints about inequitable access to the forest link with indicators from criteria 3	

Principle 3. Community well-being is assured

3.1 Local Organizations exist for the diverse interests of different interest groups at natural village level	3.1.1 Villagers can explain how their interest in the forest is represented in important decisions on the forest 3.1.2 Villagers can explain the roles and responsibilities within existing local organizations 3.1.3 Women and minority views are represented in local organizations	
3.2 Rules² to ensure sustainable land use exist	3.2.1 link with 1.4.1 and 1.4.2 3.2.2 Rules refer to relationship between management responsibilities and benefits	

² Rules refer to both formal and informal in some situations evidence of both may exist. Rules which are practiced and understood by community members should be used as the indicator here. This may mean they are not formalized in writing

Developing village-level C&I, Yunnan, China

3.3 Local organizations have the capacity to monitor and enforce rules	3.3.1 Villagers can explain forest use rules and how they are enforced 3.3.2 No of times rules were broken and effective action taken in last two years 3.3.3 No interference from higher administrative levels on rule making and enforcement (support versus interference) 3.3.4. Villagers can explain arrangements for <u>monitoring forest management and use</u>	
3.4 Effective mechanisms for conflict management exist	3.4.1 Villagers can explain how conflicts in the community are managed 3.4.2 No of conflicts managed effectively in the last two years	
3.5 Access and rights to forest clearly defined and respected	3.5.1 Villagers can explain their rights and the rights of other villages and administrative units 3.5.2 Other villages and administrative units can explain the rights of the community clearly 3.5.3 Villagers can explain how the younger generation are kept informed of their forest rights and how to ensure them 3.5.4 Boundaries ³ are clearly defined and respected	

Principle 4. Supportive and enabling environment exists for community management

4.1 Community management is compatible with priority goals of forest management and developed (Policy Support)	4.1.1 Flexibility of local policy to incorporate aspirations of local community on forest management and development	
4.2 Government plans consider local tenure and land use (policy support)	4.2.1 Local tenure and land uses are part of development programs 4.2.2 Agricultural development programs do <u>not have adverse effect on the forest</u>	
4.3 Markets for forest products exist	4.3.1 Evidence of knowledge of markets for forest products 4.3.2 Existence of community mechanisms for <u>commercialization of forest products</u>	
4.4 Community has access to outside technical support	4.4.1 Community has access to important outsiders information ⁴ about their own resources 4.4.2 Relevant technical support is available for sustainable forest management ⁵	

³ Boundaries refer to between lineages and production group

⁴ Revelant data from forestry bureau and other departments or projects available to the community

⁵ Revelant possible needs emerging in field testing included support for facilitating strong local management organizations and technical support in forest management and silviculture as revelant to community needs and forest condition

Criteria and indicators based sustainable forest management: field experience from Nepal

by

Mani Ram Banjade
Adaptive Co-Management Team
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1. Background

C&I are used to assess SFM, and therefore lead to enhanced human well-being and improved health of the overall forest ecosystem. Moreover, it considers the ecological as well as socio-economic perspectives while assessing the sustainability of a forest. In Nepal, the Adaptive Co-management (ACM) Project of CIFOR is conducting a combination of traditional and Participatory Action Research (PAR) in four research sites of two hill districts - Sankhuwasabha District in the east and Kaski District in the west.

2. ACM Project

CIFOR, an institute of the Consultative Group on International Agricultural Research (CGIAR), has been inquiring into the appropriate tools, techniques, methods and strategies for SFM with increased human well-being through its ACM Project. It is assumed that the shared learning and adjustment reflected in the forest management may lead to joint/collaborative actions which will ensure greater human well-being and forest sustainability. In other words, it is research on learning and adaptive processes in community forestry, the role of collaboration, and the implications for the well-being and sustainability of forest resources. The assumption is that the research process incites an evolution of a conscious and co-learning system in the local situation.

Vision

The well-being of diverse people involved in the management of forest resources and the sustainability of the forest resources.

Goal

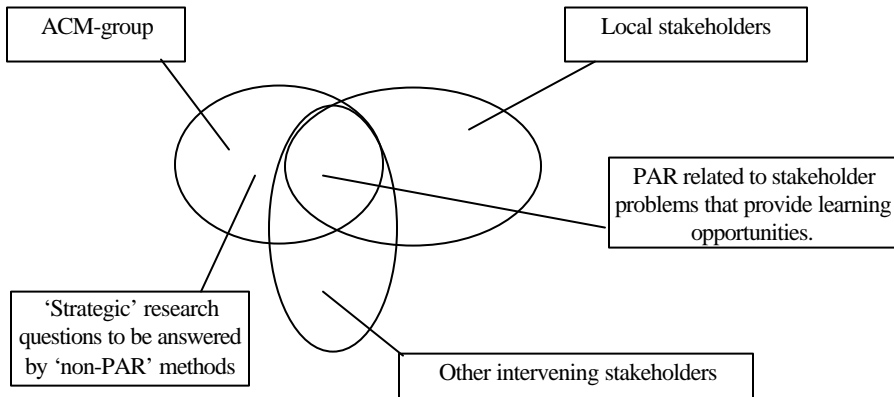
Increased effectiveness, efficiency and equity of stakeholder relations and management practices through enhanced and shared institutional learning and adjustment of management (i.e., 'collaboration' and 'adaptation') in order to promote SFM and human well-being.

General objective

To identify, enhance, and/or develop a set of approaches/strategies, institutional arrangements, and tools, and their enabling conditions, that allow local communities

to achieve more sustainable and equitable forest management and greater human well-being in a multi-stakeholder environment.

Space for collaboration



Strategic research questions

The ACM Project is trying to answer three strategic questions with its partners and stakeholders at various levels. The umbrella of research questions, based on which ten country specific research themes were prepared, is shown in **Box 1**.

Box 1: Questions informing the ACM research project

<p>1. Conditions for ACM What are the necessary conditions (e.g., policy, institutional arrangements, capacities, resources, functioning, attitudes) among relevant stakeholders and their environments for initiating and maintaining collaborative and adaptive forest management, with the aim of enhancing human well-being and maintaining sustainable forest cover and diversity?</p>	<p>2. Approaches, strategies and tools for ACM What approaches, strategies and tools can be used by various stakeholders, under different conditions, to initiate and sustain collaboration, centered on social learning, adaptation, and collaborative action, in forest management by a diversity of stakeholders?</p>	<p>3. Impacts of ACM In what ways do the processes and outcomes of collaborative and adaptive management impact on social, economic, political and ecological conditions and functioning?</p>
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3. National level workshop on C&I

The ACM Nepal research team initially developed the C&I framework for Nepal to assess the biophysical and socio-economic conditions in four research sites at a CIFOR-organized workshop held with our local and national level partners in Nepal¹, from 20-22 September, 2000. In line with the principle, and in many cases criteria, indicators and verifiers, stated in the *Criteria & Indicators Toolbox Series-5*², criteria, indicators and verifiers for the sustainable management of community forests³ of Nepal were developed and subsequently adapted in mini-workshops of the ACM Team. The C&I framework is presented in **Annex 1**.

C&I developed in the workshop reflect on the local level community forestry (CF) context and, with slight adaptation, can be used to assess and direct CF across Nepal. However, the project is using the criteria, indicators and verifiers to assess the existing socioeconomic, policy and biophysical situation of the research sites before conducting the PAR. The same process of assessment will be used at the final stage to assess the effects/impacts of the research interventions.

3.1 Process

At the national level workshop, the facilitator explained the objectives of the workshop and conceptual background, followed by group work presentations and plenary discussion. Participants found it easy to recognise the importance of integrating all parts to make a meaningful whole, with in the context of CF, when the facilitator used an example using the body parts of an elephant. The facilitator's sense was that just as we would mis-interpret the overall structure of the elephant by seeing or examining only the head, tail, legs, or body, we also cannot interpret the sustainability of a forest with information from only one area. Reflecting the essential elements of CF as a whole for the research sites, four broad areas of SFM were identified, i.e., policy, ecology, social and production of goods and services. One group worked each of the four areas.

¹ Stakeholders that participated in the national level workshop were: Nepal Australia Community Resource Management Project (NACRMP), Asia Network for Small Scale Bio-resources (ANSAB), District Development Committee Chairperson of Sankhuwasabha District, District Forest Officers of Kaski and Sankhuwasabha Districts, Central representative and District Chairpersons of Federation of Community Forestry User Groups Nepal (FECOFUN) of Kaski and Sankhuwasabha Districts, five representatives from four forest users' groups - research sites (at least one from each site) and members of the ACM Team.

² C. Colfer et al. 1999. 'The BAG' Basic Assessment Guide for Human Well-Being. Tool #5, The Criteria and Indicators Toolbox Series. CIFOR, Bogor, Indonesia.

³ Community forests are forests handed over, for management responsibilities to forest users by government authorities (by Act it is District Forest Officer) to protect, utilize and develop the forest resources.

All the stakeholders actively participated in the workshop and an attempt was made to avoid any one stakeholder dominating the discussion. Participants contributed tremendous time and effort to develop the C&I framework. Because of the involvement of diverse stakeholders from central to local/site level in the workshop including some technical experts, many of the compatible interests are reflected in the C&I framework.

3.2 Results

A C&I framework (**Annex 1**) was developed that encompasses 6 principles, 24 criteria, 84 indicators and 96 verifiers. The background studies of policy, socio-economic condition and bio-physical situation have been conducted in all the four sites using the C&I framework developed in the workshop. The workshop not only produced a C&I framework, but helped to build trust and initiate partnership development amongst a large number of stakeholders.

4. Local level indicators as bases for self monitoring and sustainability of community forest

4.1 Groundwork

Groundwork was undertaken with the objective of determining local issues and research questions, leading to the identification and reflection of local CF issues by the stakeholders themselves. The work highlighted the necessity to plan and act together with different stakeholders, acting directly and/or indirectly within the broad scope of CF (i.e., forest resources and people dependent on these), to decide what, who, how, when and where to launch CF activities. The groundwork encompassed group discussions amongst different caste/ethnic, gender and occupational groups with each group urged to engage in a joint discussion with all relevant stakeholders, and which led to the self-monitoring workshop⁴.

4.2. Self-monitoring and action plan workshop

Research site

Hansapur site is the name given to the Forest User Group (FUG) that enjoys three community forests, namely Baghedanda, Deurali and Hansapur Pahiropokhari Plantation. It is situated in the western hills some 35 km from the Pokhara valley. These forests were legally handed over to the community, which is heterogeneous and comprises Brahmin, Gurung, Magar and Bishwokarma castes/ethnic groups. The forest is sub-tropical, rich in biodiversity and encompasses more than 300 plant

⁴ *Self-monitoring workshops were organized in all the research sites (two in Sankhuwasabha and two in Kaski districts) from 17th February to 9th March 2001. However, this discussion is mainly focussed on the workshop of Hansapur conducted from 1-4 March 2001.*

C&I: field experience from Nepal

species within a total area of 181 ha. Indigenous management of the forests started in the 1970s by the local people, and they believe forest cover has significantly increased over that time.

Participants

Participants in the workshop represented each of the local level stakeholders⁵ of the site. A total of 37 users participated in the workshop, of which 19 were women. Representatives from NARMSAP regional office, DFO, and the Institute of Forestry, Pokhara Campus also participated from the district level, and in many areas facilitated the group work. Likewise, one outsider and four members of the ACM team also facilitated the workshop.

Process

A self-monitoring workshop was conducted which included a lecture, plenary discussion, group work and presentations, supplemented by various games related to visioning, networking, collaborating, adaptiveness and self reflection/monitoring with debriefing. The workshop started with the introduction of all participants followed by their expectations for the workshop. Group work then commenced, with an analysis of the present situation regarding forest condition, forest use trends, management activities, FUG functionaries, institutional development, users' awareness levels and relationship with other stakeholders. This was followed by presentations from the four groups.

Visioning of ten years for the forest and livelihood of users was made in the form of pictures, where participants could derive their vision of a sustainable future. During the presentation of each group, facilitators extracted the issues/indicators indicated by the pictures and expressed in the presentation. ACM team members and FUG leaders, together with the representatives of district stakeholders categorized and constructed the vision statements from the identified issues in the four major headings, namely:

1. Institutional development including relationship with other stakeholders;
2. Participatory decision making process;
3. Forest management; and
4. Fund mobilization, income generating activities, community development and benefit sharing mechanism. These categorized indicators are shown in **Annex 2**.

Participants were then divided into four groups to assess the present condition

⁵ *Local level stakeholders comprised different caste/ethnic groups, gender groups, FUGs, local level GOs, NGOs and occupational groups.*

of every indicator. This was done in the museum; as such every group had the opportunity to assess the indicators of other groups. To visualize the assessment for illiterate users, five phases of the moon (black moon, 3rd phase, 7th phase, 10th phase and full moon) were used, to show the present situation. A black moon indicated no work had been done at all, with a full moon indicating no further effort was required for the indicator(s). Users should focus on reaching the full moon for every indicator. The seventh phase is the mid-point; indicators below this are considered weak areas where efforts should be focused. The assessment form of one heading is given in **Annex 3**.

The assessment of all groups was presented in the plenary for discussion, and strong and weak areas identified. The prioritization of weak areas that were most urgent was done. Three groups prioritized two indicators each and discussed these in the plenary. Some amendments were made. In the final stage of the workshop, six groups were formed to work on the detailed planning of action for the prioritized six issues and presented by each group.

5. Indicators of self-monitoring: field experience

Indicators for self-monitoring were identified as the issue to be addressed in order to attain the vision. However, some effort and support from outsiders is beneficial to explore the strengths, weaknesses and interests of local stakeholders. Self-monitoring is the continuous process of reflection of present and past situation and/or activities, planning the activities as per the available resources and implementing of the activities. The cycle is iterative and new areas and potentialities will strengthen the system.

5.1 Strengths

The process we applied to identify the indicators for SFM at the local level created a feeling of ownership for local forest users. Local stakeholders are reservoirs of information as they evolve with a long history of experiences on the socio-cultural norms and values, and bio-physical changes within an area. Moreover, it incorporates the local issues and priorities, and reflects local scenarios. As stated earlier, it is an iterative process and leaves space for positive adaptation of the indicators (new priorities, new ways of planning and effective and efficient implementation of the planned activities) and a self-monitoring process.

Local users considered the self-monitoring as a 'mirror' for themselves, and resolved to undertake it annually. This process will help to evaluate the performance of the FUC (and therefore FUGs), reflecting strengths, weaknesses, opportunities and limitations, and support further planning and implementation processes.

5.2 Weaknesses

Local people may have limited technical expertise. In many decision making forums, there is the possibility of misinterpreting the interests of other stakeholders, and the risk of domination and overruling by some elite individuals and/or groups. Local people might concentrate on short-term, burning issues and interests and potentially overlook long-term implications.

6. Conclusion

Self-monitoring through the locally developed indicators is perceived by the participants of the self-monitoring workshop as a very powerful tool for reflecting on, and planning, for CF management activities. This will eventually help in the effective and efficient implementation of management plans. In a single sentence, our experience is that *'involving local stakeholders in the initiatives of forest resource management is much better than avoiding them.'*

Annex 1

C&I based biophysical and socioeconomic background study

C&I framework for Nepal

Policy

P1 Policy, planning and institutional framework are conducive to sustainable community forest management

C1.1 Policy formulation is carried out in a participatory way.

I1.1.1 Mechanisms for enhancing participation in policy formulation exist.

VI.1.1.1 There is a multi-sectoral forum at various levels (national, district and local).

VI.1.1.2. Various stakeholders (FUG, FECOFUN, DDC, VDC, NGOs, etc) are invited and represented in the forum.

VI.1.1.3 Meetings, discussions and other interaction fora are held regularly.

VI.1.1.4 Decisions are made based on the consultation with these various stakeholders.

- C1.2 Existence of non-contradictory forestry rules and regulations.**
- I1.2.1 The forestry acts and regulations pertain to the national forestry policy guidelines (Master Plan For the Forestry Sector).
 - I1.2.2 Government directories do not conflict with the provisions of forest acts.
- C1.3 Non-forestry policies do not distort community forestry management.**
- I1.3.1 Absence of multiple ownerships in community forestry (eg. Land Reform Act 2021 (1964) and Land Measurement Act (1962)).
 - I1.3.2 Absence of distorting policies that affect the community's user rights over forest products (eg. Local Self Governance Act).
- C1.4 Legal framework protects FUGs rights over community forests and forest resources.**
- I1.4.1 Community forests are legally handed over to FUGs.
 - VI.4.1.1 Agreement between FUGs and DFO exists, and is formally registered.*
 - I1.4.2 FUG have the right to use and market forestry products, such as timber and NTFPs.
 - I1.4.3 Land use policy supports community forestry.
 - I1.4.4 Indigenous practices that support SFM are recognised.
- C1.5 Effective structures and coordination within the institutions responsible for community forest management, at different levels, exist.**
- I1.5.1. Effective central and local level institutions responsible for community forest management.
 - VI.5.1.1 Effective communication and decision making mechanisms exist between district and central level institutions.*
 - VI.5.1.2 Services and support provided to FUGs are adequate and timely.*
 - I1.5.2 Existence of effective coordination and supportive mechanism within local institutions.
 - VI.5.2.1 Absence of overlapping responsibilities between different institutions.*
 - VI.5.2.2 Low level of conflict between different institutions.*
 - I1.5.3 Existence of effective inter-sectoral coordination between institutions responsible for community forest management.

C&I: field experience from Nepal

C1.6 Boundaries of community forests are known, clear and respected.

I1.6.1 All users and other local stakeholders recognise and respect the boundaries.

I1.6.2 Absence or low level of conflicts on the boundaries.

I1.6.3 Forest management shows demonstrated attempts to protect boundaries.

Ecology

P2 Maintenance of ecosystem integrity

C2.1. The processes that maintain biodiversity in Community Forests are conserved.

I2.1.1 Landscape pattern is maintained.

V2.1.1.1 Information on areal extent of vegetation type is maintained.

V2.1.1.2 Information on number of edges.

I2.1.2 Diversity of habitat is maintained.

V2.1.2.1 Vertical structure of the forest (number of storeys).

V2.1.2.2 Size class distribution of tree species.

I2.1.3. Species richness/diversity of selected groups (trees, herbs, birds, mammals) is maintained.

V2.1.3.1 Species richness of vegetation.

V2.1.3.2 Species list of birds and mammals.

V2.1.3.3 Number of tree species removed from the forest.

V2.1.3.4 Identification of rare and endangered species.

I2.1.4. Population size and structures of selected plant species do not show significant change.

V2.1.4.1 Population density of selected plant species is estimated.

C2.2. Ecosystem function is maintained.

I2.2.1. Ecologically sensitive areas (buffer zone along water courses) and other ecologically important areas are protected.

V2.2.1.1 Identification of ecologically and important areas within the community forests.

V2.2.1.2 Measures applied to protect those areas.

I2.2.2. Erosion and landslides are minimized.

- V2.2.2.1 Identification of erosion or landslide areas.*
- V2.2.2.2 Magnitude of erosion and landslides.*
- V2.2.2.3 Measures applied to protect these areas.*

Social

P3. Community forest management increases benefits through better forest management.

C3.1 Local management is effective in maintenance of, and access to, the forest resources.

- I3.1.1 Ownership and use rights to resources are clear and respected.
- I3.1.2 Rules and norms of resources use are successfully enforced and monitored.
 - V3.1.2.1 There are rules and norms that regulate access to resources.*
 - V3.1.2.2 Patrolling takes place regularly.*
 - V3.1.2.3 Occurrence of violations eg. illegal extraction of forest products, illegal timber cutting, illegal poaching, etc.*
 - V3.1.2.4 Number of violations that receive sanctions or punishments.*
- I3.1.3 Effective and accepted conflict management mechanisms exist.
 - V3.1.3.1 Number of cases resolved within the community compared to those resolved by other stakeholders.*
- I3.1.4 Access to forest resources is perceived locally to be fair.
 - V3.1.4.1 Deprived and poor users within the community get fair concession.*
 - V3.1.4.2 Access of non-timber users to NTFPs.*
 - V3.1.4.3 Meetings and assemblies discussing access to resources are attended by different gender, class, caste and ethnicity.*
- I3.1.5 Local people feel secure about access to forest resources.

C3.2 Stakeholders get equitable share from forestry resources.

- I3.2.1 Mechanisms for equitable benefit sharing are developed and implemented.
 - V3.2.1.1 Local people, in particular lower class, caste, and groups, express satisfaction with the benefits received.*
- I3.2.2 Employment opportunities exist for poor and deprived users.
 - V3.2.2.1 Number of such users involved in livestock raising, carpentry,*

coal making, and other income-generating activities.

C3.3 Community forests are used as a means of livelihood by poor and deprived groups of people, including ethnicity, individuals and women.

I3.3.1 The above people invest a significant amount of their time and efforts in community forestry activities.

V3.3.1.1 The time and efforts spent in community forestry activities increase over time.

I3.3.2 Destruction of natural resources by the local people is rare.

I3.3.3 Maximum utilization of private and/or community forests by community members.

V3.3.3.1 No barren and fallow land observed.

P4. Concerned stakeholders have acknowledged rights and means to manage forests cooperatively and equitably.

C4.1 Community FUGs are institutionally developed.

I4.1.1 Users and committee members are fully aware of their rights and responsibilities and perform accordingly.

V4.1.1.1 Users and committee can describe their rights and responsibilities according to constitutions.

V4.1.1.2 Users and committee perform the duties assigned at the assembly.

V4.1.1.3 Members participate actively in decision-making and community-forestry management activities.

V4.1.1.4 Users and committee members are aware of gender issues.

I4.1.2 Effective leadership is developed within the community.

V4.1.2.1 Mechanisms to transfer leadership exist.

I4.1.3 Documentation system is well maintained.

I4.1.4 Funds are managed in a transparent way and are properly utilized.

V4.1.4.1 Financial records are kept and maintained.

V4.1.4.2 Financial records are accessible to all members.

V4.1.4.3 Existence of separate account for community forestry-related funds.

V4.1.4.4 Funds are spent in community development as planned and on a priority basis.

V4.1.4.5 No misuse of funds.

I4.1.5 Information flow to members is maintained.

V4.1.5.1 Evidence of formal and informal information exchange amongst FUG members and FUC.

V4.1.5.2 FUG members are aware of the decisions made by the FUC.

V4.1.5.3 Evidence of formal and informal information exchange between members.

I4.1.6 Mechanisms for shared learning exist.

V4.1.6.1 Evidence that experiences and lessons learnt (from training, workshops, etc.) are shared with other community members.

V4.1.6.2 Evidence that community members successfully implementing lessons learnt from training etc.

V4.1.6.3 Evidence of locally-led learning processes (eg. farmer to farmer exchanges, farmer field trials).

C4.2 Effective two-way communication related to forest management exists among stakeholders.

I4.2.1 Local stakeholders meet and interact with satisfactory frequency, representation of local diversity and quality of interaction.

V4.2.1.1 Meetings and assemblies are held on a regular basis.

V4.2.1.2 Different class, castes, gender and ethnicity are present in meetings.

V4.2.1.3 Discussions are monopolized by certain individuals and groups.

I4.2.2 Stakeholders' contributions are respected and valued.

C4.3 Local stakeholders have detailed, reciprocal knowledge pertaining to forest resources use as well as forest management plans prior to implementation.

I4.3.1 Plans/maps showing integration of uses by different stakeholders exist.

I4.3.2 Updated plans, baseline information on socio-economic conditions of the people, forest conditions and maps are widely available to stakeholders.

I4.3.3 FUC recognizes the legitimate interests and rights of other stakeholders.

I4.3.4. Management of NTFPs reflects the interests and rights of local stakeholders.

I4.3.5 Stakeholders are aware of related community forestry acts, regulations, and guidelines.

C4.4 Agreement exists on rights and responsibilities of relevant stakeholders.

I4.4.1 FUGs make agreements with relevant stakeholders in forests and forest resources related activities.

I4.4.2 Level of conflict is acceptable to stakeholders

P5. The relationship between forest management, environment and local culture is acknowledged by all related stakeholders.

C5.1 There is a balance between human activities and environmental conditions.

I5.1.1 Environmental conditions affected by human activities are stable or improving.

I5.1.2 There is a balance between forest resources and population growth/migration.

C5.2 The relationship between human culture and forest management is recognized.

I5.2.1 Local stakeholders can describe the relationship between human culture and forest management.

I5.2.2 Operational plan reflects local human culture.

I5.2.3 Absence of activities that disintegrate human culture.

C5.3 People and their children received formal and informal education on forest resource management.

I5.3.1 Increased awareness of forests and forest resource management.

I5.3.2 There are mechanisms to enhance people and children's knowledge and awareness of forest resource management.

V5.3.2.1 School curriculum includes forest resource management.

V5.3.2.2 Education and communication materials on forest resource management are produced and distributed.

Production of goods and services

- P6 Yield and quality of forest goods and services are sustainable.**
- C6.1 Forest management unit is implemented on the basis of legal title on the land and recognized customary rights.**
- I6.1.1 Forest management takes place based on written agreements between the government and FUGs.
- I6.1.2 Information on the identity, location and population of all indigenous and traditional people living in the vicinity of the community forests and their customary rights exist.
- V6.1.2.1 FUGs and other concerned institutions have evidence and maps of the indigenous and traditional people, their territories and rights.*
- C6.2 Management plans are detailed and clearly documented.**
- I6.2.1 Management objectives are clearly stated in terms of the major functions of the forests.
- V6.2.1.1 The long term and short term objectives based on users need in relation to forest condition are clearly stated in operational plan.*
- I6.2.2 Operational Plan is comprehensive.
- V6.2.2.1 Clear boundary maps and resource maps exist.*
- V6.2.2.2 Inventories of forest resources are available.*
- V6.2.2.3 Forest protection, management and utilization plans are clearly stated.*
- I6.2.3 Management takes place with appropriate involvement of the stakeholders, and takes into account all the components and functions of the forest, such as timber production, NTFPs, etc.
- V6.2.3.1 There is evidence of involvement of all concerned stakeholders in the preparation of the Operational Plan.*
- I6.2.4 Yield regulation by area and/or volume is prescribed in the Operational Plan.
- V6.2.4.1 Allowable annual cuts, minimum exploitable diameter, and number of trees harvested per year are specified.*
- V6.2.4.2 Allowable annual harvesting amount of other forest products eg. fodder, fuelwood and other NTFPs are specified.*

C&I: field experience from Nepal

- I6.2.5 Silvicultural systems are prescribed and are appropriate to forest types and produce growth.
 - V6.2.5.1 Emphasis is given to local forest management practices.*
 - V6.2.5.2 Interventions are highly specific to species level.*
 - V6.2.5.3 Tree growth is not declining.*
 - V6.2.5.4 Enrichment planting should be based on indigenous locally adapted species.*
 - V6.2.5.5 Plantation of exotic species, if carried out, should be suitable to the local conditions.*
 - V6.2.5.6 Nurseries of fast growing species and non-timber forest products are established.*

- I6.2.6 Harvesting systems and equipment are prescribed to match forest conditions in order to reduce impact.
 - V6.2.6.1 Harvesting standards are explicit and cover key issues.*
 - V6.2.6.2 Guidelines for rational harvesting of NTFPs are clearly defined in the Operational Plan.*
 - V6.2.6.3 Appropriate tools and equipment that minimize impacts are used.*

- I6.2.7 Operational Plan is periodically revised and approved by appropriate authority.
 - V6.2.7.1 Operational Plan is revised regularly as necessary and approved by the DFO.*
 - V6.2.7.2 Discussions to revise the Operational Plan take place with active participation from other FUG members.*

- I6.2.8 Programs and estimated costs of forest management activities are included in the Operational Plan on a priority basis.

- I6.2.9 Programs and estimated costs of community development are included in the Operational Plan on a priority basis.

- C6.3 Implementation of the Operational Plan is effective.**
- I6.3.1 The forest unit is zoned into areas to be managed for different objectives.

- I6.3.2 Activities are carried out as described in the Operational Plan.

- I6.3.3 FUGs have sufficient skills and knowledge to implement the Operational Plan.
 - V6.3.3.1 Training and other forms of education held for FUGs to improve their capability to implement the Operational Plan.*

C&I: field experience from Nepal

I6.4.6 Results derived from monitoring and research as well as any additional scientific and technical information, are incorporated into the Operational Plan.

C6.5 Costs and benefits from forests are equitably shared and distributed.

I6.5.1 Mechanisms for equitable distribution of forest products to all the members of FUGs are clearly described in the Operational Plan.

I6.5.2 Benefits from community forestry management is invested for community development.

V6.5.2.1 Portion of income generated from community forest management allocated for community development.

I6.5.3 Benefits from community forestry management is reinvested for forest management purposes.

V6.5.3.1 Portion of income generated from community forest management allocated for forest management.

I6.5.4 There is provision of an emergency fund for natural disaster.

V6.5.4.1 The fund is being kept separately or in coordination by various stakeholders such as FECOFUN, DFO, FUG, etc.

C6.6 Development of alternative energy.

I6.6.1 Community members establish bio-gas plants.

I6.6.2 Hydro-electricity is used for energy.

Annex 2

Issues/indicators derived from the pictorial visioning

Indicators phrased from the pictorial vision followed by the explanation at the plenary are categorized in four broad areas of intervention. However, some policing and condensing is done while categorizing of the indicators. They are listed as follows.

A) Institutional development:

1. All users are well informed about the concepts, policies and legal frame-

work of CF.

2. Members of the FUG and FUC are aware of their roles and responsibilities.
3. Men and women equally have sufficient knowledge of community forestry.
4. Users have increased leadership skills.
5. Proper member(s) received training, and use the knowledge and skills obtained from this training.
6. FUG has functional relationship with different institutions.
7. There is a functional relationship with neighboring and other FUGs.

B) Participation in decision-making:

1. Equal participation of male and female members is found in FUC meetings and FUG assemblies.
2. Decisions are made by consensus.
3. The voice and thoughts of women and deprived groups of people are respected during the decision-making process at meetings and assemblies.
4. All users know about the decisions made in meetings and assemblies.
5. There is equitable representation from women and all caste/ethnicity groups.

C) Forest management:

1. The plants of all age groups enrich the forest.
2. Wildlife is increased.
3. Forest is clearly demarcated.
4. Illegal extraction of forest products is totally stopped.
5. All medicinal plants are identified.
6. There are various types of plant species found in the forest.
7. Seedlings are produced and raised in the barren areas.
8. Grazing is controlled.
9. Forest fire is controlled.
10. Many users have expertise in tending of the forest.
11. Forest is regularly tended.






D) Fund mobilization, income generating activities (IGA), community development and mechanism for distribution:

1. All users know about the income and expenditure of the FUG.
2. Excess forest products are sold outside the FUG.
3. Medicinal plants are collected from the forest and sold.
4. FUG members are regularly participating in the preparation of different end products from bamboo and small stretcher bamboo (*Arundinaria* sps.).
5. FUG members raise high quality breeds of domestic animals.
6. FUG fund is used for the poor to increase their economic condition.

C&I: field experience from Nepal

7. FUG fund is also used in community development activities such as roads, water supply, schools, etc.
8. FUG fund is increased from the sale of bamboo, small stretcher bamboo and broom grass.
9. Wood carvers are receiving sufficient raw-wood from the forest.
10. FUG members are receiving sufficient forest products as per need.

Annex 3
Assessment form

SN	Indicators	Present Condition					
1	All the users are well informed about the concepts, policies and legal framework of CF.						
2	Members of the FUG and FUC are aware of their roles and responsibilities.						
3	Men and women equally have sufficient knowledge of community forestry.						
4	Users have increased leadership skills.						
5	Proper member(s) received training and used the knowledge and skills obtained from those training.						
6	FUG has functional relationship with different institutions.						
7	There is a functional relationship with neighboring and other FUGs.						

PART 3. ADDITIONAL PAPERS FOR DISTRIBUTION

Criteria and indicators for sustainable temperate forest management - 1992 to 1996

by
Christian Barthod

1. Introduction

The issue of C&I for SFM was brought into the political debate during preparations for the United Nations Conference on Environment and Development (UNCED) in 1992, when the Canadian delegation presented a proposal for guidelines on international cooperation and negotiations for development projects. The only trace left of this proposal, in the *Declaration of Forest Principles*, was a reference to 'governing principles taking account of the relevant methodologies and criteria that have been internationally agreed, when they are judicious and applicable.' This minimal agreement did, however, pave the way for some major achievements: the Helsinki, Montreal and Tarapoto Processes and the mandate of the Intergovernmental Panel on Forests, not to mention the pioneering work of the ITTO and the World Wide Fund for Nature.

2. Four major issues regarding indicators for sustainable management

The concept of C&I for sustainable management has various aspects - with consequent ambiguities - and this in part explains the amount of attention it receives. Four major issues are involved and they can be analysed separately.

1. At the national or provincial level where forestry policy is developed and actually implemented, C&I are tools for assessing the relevance and consistency of any action undertaken. No matter how sophisticated the instruments used in developing and implementing forestry projects, the contradictory results of public assessments in different countries over the past ten years have shown that an unquestioned reliance on technical expertise and a systematic chain of implementation are no guarantee against what turn out to be serious errors and glaring negative examples, nor against the unforeseen ill-effects that are part and parcel of any complex process. Most administrations now recognize that no forestry policy will automatically bear good results simply by following the procedures approved, but that constant reassessment (national, provincial or international) is needed on the basis of indicators covering a wide range of concerns.
2. Public opinion shows an increasing concern about forests, as they are seen as archetypal images of nature. Moreover, traditional approaches to policy-making and information on forests are no longer being accepted in democratic societies where participation and transparency in decision-making are considered a right

as well as a guarantee that opposing views will be heard. Forests are not protected islands totally cut off from the workings of the rest of society, and foresters on their own cannot hope to grasp and control all the factors affecting their choices and goals. C&I are first and foremost useful tools in setting up dialogue with all those who claim a voice in forestry policies and how they are implemented.

3. In countries where the state does not have direct overall charge of forests, forest owners or concession holders are subject to certain constraints, adapting the broad outlines of national forestry policy to local economic, environmental, legal and social contexts. There are two major approaches here: that of imposing the use of certain methods, instruments or procedures and that of specifying the objectives or obligations to be met. The former has traditionally been preferred, but there is growing support for the latter, based on the assumption that local managers are in the best position to choose the most affective and cheapest methods, instruments or procedures once the public authorities have clearly defined the objectives. This use of decision-making C&I of results thus requires that norms be fixed for management units - a procedure not necessarily required for the two previous approaches.
4. To sway forest management according to their own analyses and priorities, some large environmental and consumer protection associations try to exert pressure on policy-makers or local managers by encouraging buyers to prefer products that are ecocertified over those that are merely tolerated or boycotted. An ecocertification procedure focuses on the quality of forest management and thus requires a prior definition of the C&I to be used as a basis for the guarantees that buyers are expected to demand. As with the previous point, this is basically a normative approach but it also raises the question of the choice and legitimacy of the structure that dictates these norms and gives credibility to ecocertification in the eyes of buyers. Theoretically, this normative approach can be applied equally well at the national or provincial levels where forestry policy is developed as at the management unit level. It can also be developed just as well in terms of methods, instruments and procedures as in terms of results.

In the context of issues 1 and 2, attention must be paid both to the absolute values of indicators and to the changes observed between two evaluations. Although absolute values are clearly important, they are largely dictated by the biogeographical context and the historical background to forestry policy; they flow from an observed situation in which the possibility of short-term (and often medium-term) action is bound to be limited, given the length of forest cycles and social resistance to any change. By contrast, changes are extremely important since they show the actual

consequences of official goals, thus allowing a check on possible discrepancies between official pronouncements on forestry policy and its concrete outcome. Even when evaluation of a forestry policy or one of its aspects involves the examination of absolute values, this has to be done by referring to the objectives that the relevant government has freely set itself or that follow from negotiated and freely ratified international agreements. Although the importance of measuring changes is not forgotten in the framework of issues 3 and 4, the emphasis here is on absolute values, which are specified case by case and allow an evaluation of how closely a given instance of management is in line with a reference model, whether explicit or implicit.

The Helsinki and Tarapoto Processes, and to a large degree the Montreal Process, have very clearly chosen to emphasize issues 1 and 2, while the large international non-governmental organizations (NGOs) have devoted their energy to issues 3 and 4. This does not mean that various governments involved in these processes are not also very sensitive to issues 3 and 4 (even if it is only the major northern wood-exporting countries and countries where NGOs have a powerful influence), but at present there is no intergovernmental consensus to move in this direction, despite consultations and work within individual countries and the growing number of international and European Union work groups on ecocertification. Similarly, the large NGOs cannot ignore issues 1 and 2, although their strategic concerns and analyses mean that they will attack - and often very forcefully - the priority given them by various countries. Moreover, the lists of C&I developed in response to issues 1 and 2 at the national or provincial level are not necessarily relevant to issues 3 and 4.

3. Steps now under way and the limitations of the exercise

The identification of C&I is also a practical attempt to avoid the pitfalls of an overly theoretical approach that seeks to specify all the conditions for sustainable management in the abstract and to confine the provisional state of a technical-scientific and political-cultural consensus within a necessarily complex definition. The list of C&I adopted by the Helsinki and Montreal Processes reflects a compromise supported by both forest professionals and scientists. It encompasses indicators of both methods and results, since the very partial state of scientific knowledge means that we cannot yet do without the past centuries' experience with different methods. The main aim of the selection process has been to adopt scientifically relevant indicators whose measurement is technically feasible and whose cost is not prohibitive. While results are admittedly imperfect, progress in scientific knowledge and instruments and the questions raised by public opinion should allow the present list, which is already long, to be further expanded and systematized.

Although the lists adopted by the Helsinki and Montreal Processes are rooted in very different contexts (the level of human intervention in forests, the structure of

landholdings, the antiquity of forest laws and regulations, etc.), they are in fact fairly similar. They take account of:

- traditional biological parameters (area, volume, biological growth, forest type, etc.) as well as those raised by the 1980s debate on acid rain (health and vitality of stands);
- traditional forest products (volume of felling and hunting) as well as aspects that have come to the fore in recent years (minor forest products, employment creation, participation in decisions on rural development); and
- the involvement of forestry both in general interest protection missions that have long been recognized (soil and water) and in others that have developed more recently (biodiversity).

The current state of scientific knowledge and available inventories makes the concept of biodiversity a difficult one and means that indicators in this connection still require considerable refinement. Work on identifying species that indicate the healthy functioning of a given ecosystem is much more advanced for plants than animals, despite major North American reflection on the question. However, the main difference between the choices of the two processes hinges on the seventh criterion on the Montreal list - institutional aspects - which does not appear on the European list. These aspects have long been taken into account in forestry in countries adhering to the Helsinki Process, and they reflect a national and cultural balance in Europe where pragmatic considerations take precedence over the kind of theoretical consistency that countries with more recent institutional forestry traditions would perhaps tend to emphasize.

No list of C&I can be used to evaluate and conduct a forestry policy without a reliable and consistent mechanism to measure and evaluate the indicators adopted. A permanent or periodic forest inventory is indispensable, but there is also the question of indicators that fall outside the usual scope of traditional inventories. In some cases, forest inventories must be developed in order to take these into account in terms of measurement in the field, how statistics are treated during data processing and the use of new instruments such as geographical information systems. In other cases, however, it would be too expensive and inefficient to provide forestry services with sophisticated new measurement instruments, especially if there are highly qualified specialist services, which is often the case for monitoring water quality or animal biodiversity. This should encourage foresters to expand cooperation with services with which they have had very little contact in the past and, furthermore, it will develop a new awareness of the impact of other policies on forests. Such a choice develops new working methods, requires an understanding of possible lines of cooperation and means that this new situation will be taken into account in the

relevant international processes, especially within the regional offices of the FAO. It enabled France to publish a list of national indicators for sustainable management as early as April 1955.

Old forestry countries have sets of statistics going back a long way which provide a valuable record of methods and definitions. As always when new international concerns appear, there is much discussion focusing on the attempt to standardize definitions and inventory methods, despite the failure of numerous previous attempts. In the present context, it is essential that the publication of indicators should always give the source of figures and the methods of calculation used in the case of indirect estimates in order to provide a public guarantee of the reliability of the figures and sometimes to specify limitations to their interpretation. Standardization is in fact vital in only two specific cases: for those advocating a supranational forestry policy (for example in a union framework for member countries of the European Union); and for those seeking to establish a consistent international mechanism for eco-certification supervised by a central authority. In the first case, the solution would have to entail payment for a supranational inventory parallel to national inventories and allowing a sufficient period for the old set of data to be replaced. In the second case, a normative approach based on absolute values and with no standardization of definitions or inventory methods can very soon create difficult issues concerning equity between the countries involved (basically the wood-exporting countries) not to mention equity between exporting countries subject to examination and importing countries.

Defining C&I for sustainable management at the level of management units is particularly problematic when these units cover too small an area. Units in Canada are set at a lower limit of 500 ha, which would rule out three-quarters of the wooded area of France. Furthermore, in the interest of financial viability and efficiency, it is vital to fix the lowest possible number of indicators for managers to incorporate into their reasoning and decisions. Biological complexities and the 'holistic' character expected of sustainable management make such a selection process particularly difficult. If a series of small, independent forest properties were grouped together and treated as a single management unit, this would clearly mean that owners' rights would be subjected to the authority of biology experts, and most societies would be unwilling to accept this. It would also be unrealistic and politically foolish to consider insisting that certain goals must be met by hundreds of thousands (indeed millions, in France) of private owners of small forest plots whose main profession is in another activity. The only solution that would take this aspect into account entails a return to the obligation of using methods specified and monitored by the public authorities and the appraisal of quantitative results for the larger area covered by such a forestry policy. The sometimes very fragmented structure of forest landholdings is

the reason why some European countries, including France, are extremely unwilling to address issues 3 and 4 in the absence of specific solutions to their problems.

4. Cultural aspects and the international dimension

In democratic countries where public opinion exerts a strong influence on political decision-makers, experience during negotiations over these lists has shown the importance of the cultural elements involved in the wish to take both issues 1 and 2 into account. Forestry is both a science and an art, and these two aspects cannot be separated; expertise and knowledge based on sometimes centuries of experience play an important role in the approach adopted by each country and each forestry tradition, although it is not always clear how much comes from practical experience and how much is a result of cultural values and judgement systems. The way that public opinion and NGOs see forests is also influenced by a given society's cultural values, concern over the future and relations with nature (albeit an imaginary rather than a real nature), and political decision-makers have to take this into account. It is thus inevitable that any articulated reflection or negotiations on C&I for sustainable management will be governed both by biological reality and by the way a given society views it under the imperfect control of available scientific information and economic constraints.

It would therefore seem pointless to hope that C&I for sustainable forest management could be anything other than the fleeting consensus of an international technocracy if such lists are jointly negotiated by countries that do not feel they have a common future, let alone a common cultural outlook, even if care has been taken to check that they have similar environmental, economic and social conditions as concerns the forestry sector. However desirable it may be, it is unrealistic to hope to negotiate a single worldwide list of indicators for SFM. On the other hand, it would be productive to encourage similar countries to join forces in order to draw up and implement such lists in the framework of open processes that allow each person or group (forest professionals, scientists and NGOs), whatever their country, to share its experiences and give public warnings against choices that do not pay adequate attention to available scientific knowledge and the common interest in assuming joint responsibility for the biosphere. Respect for the guidelines that would result from this would already represent considerable progress. Mutual recognition of these lists would in itself show the political intention of every country to move in the direction indicated in the Declaration of Forest Principles.

Unless this takes place, progress on criteria for sustainable management may indeed be made after long drawn-out technical and political negotiations, but such an agreement is not likely to go beyond a very limited group of traditional forestry indicators, unless the consequences of contemporary reflection on sustainable

management are taken seriously. Another possibility would be to let scientists draw up such lists on their own, but this ignores the shortcomings of scientific knowledge in the forestry sector, the slow speed at which scientific consensus tends to be reached, the very uneven distribution of researchers in different parts of the world and the fact that scientists are not culturally neutral when asked to transform knowledge into expertise. The last possibility would be to leave economic forces free licence concerning ecocertification, letting buyers and sellers fight it out and letting donors impose their own C&I when negotiating the terms for development aid. In the case of many such solutions, it is clear that any instrument that might have helped the practical pursuit of progress in sustainable management would be robbed of its attraction for those concerned.

5. Conclusion

An approach in terms of C&I for SFM offers such a good response to a whole series of negative developments in modern-day societies, including a wide variety of requirements, that it cannot be seen as a passing fashion in international forestry. Over the past four years, some exceptionally rich and stimulating work has produced solid gains, but has also raised many thorny questions that technical and political exponents are not yet in a position to solve. However, the development of forestry policies in many countries where forests play a major economic, environmental or social role will depend to a considerable extent on these answers.

Application of criteria and indicators for sustainable forest management in Pahang: a case study¹

by

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1. Introduction

The State of Pahang is the largest of the eleven states in Peninsular Malaysia, with a total area of 3,596,585 ha, and a population of 1.1 million.

Pahang has a total forested area of 1,958,095 ha, which represents 54.4% of the state's total surface area. Out of this forested area, 1,393,935 ha has been gazetted as PFE and the remaining 564,160 million ha as Wildlife Reserve, Nature Reserve, National Park, State Park or Stateland forests.

Ecologically, the forests of Pahang are similar to those of the rest of Peninsular Malaysia and can be classified into ten major forest types:

- i) Lowland Dipterocarp Forests
- ii) Hill Dipterocarp Forests
- iii) Upper Dipterocarp Forests
- iv) Lower Montane Forests
- v) Upper Montane Forests
- vi) Heath Forests
- vii) Freshwater Alluvial Swamp Forests
- viii) Peat Swamp Forests
- ix) Riparian Forests
- x) Mangrove Forests

2. Administrative and legal frameworks

Under the Malaysian Constitution, land is defined as a state matter. As such, each state is empowered to enact laws on forestry and to formulate forest policy independently. The executive authority of the Federal Government only extends to the provision of advice and technical assistance to the states, training and in the conduct of research and maintenance of experimental and demonstration stations.

In order to facilitate the adoption of a co-ordinated and common approach to forestry, the National Forestry Council (NFC) was established on 20 December, 1971. The

¹ *A summary of the paper presented at the International Workshop on Model Forests for Field Level Application of Sustainable Forest Management, Mie, Japan, 23-27 March, 1999.*

NFC serves as a forum for the Federal and the State Governments to discuss and resolve common problems and issues related to forestry policy, administration and management.

The State Forestry Department of Pahang was established in 1900. It is responsible for the administration and regulation of forest exploitation, forest revenue collection, the management and development of the state forest resource and the planning and coordination of wood-based industries. In addition to the above functions, it coordinates with other government agencies to ensure the sustainable development of land in the state.

The current National Forestry Act was enacted in October, 1984 and amended in 1993. The National Forestry Policy was formulated in 1978 and revised in 1992.

3. Forest management practices

In Pahang, the inland production forest of the PFE is managed under two management systems, based either on a 30-year (Selective Management System (SMS)) or a 55-year (Modified Malayan Uniform System (MMUS)) cutting cycle. In brief, the MMUS consists of removing the mature crop in one single felling of all trees down to 45 cm dbh for all species, while the SMS involves the selection of optimum management (felling) regimes based on pre-determined residual stocking, net economic cut and residual species composition criteria. Under both systems, a pre-felling forest inventory is conducted to determine the stocking and size-class distribution of the forest prior to harvest.

4. Forest conservation practices

Over the years, Pahang has been establishing a network of protected areas for the conservation of biological diversity. Currently, the total area designated for the conservation of biological diversity is estimated to be 727,672 ha or 37.2% of the total forested land of Pahang. Of this, 375,654 ha is located in the PFE.

5. Forest harvesting

Forest harvesting in the inland forest in Pahang is generally carried out by a combination of crawler tractor and winch lorry. To mitigate the adverse impacts of forest harvesting, the State Forestry Department of Pahang has adopted *Standard Road Specifications* and *Forest Harvesting Guidelines* for strict adherence by all logging contractors both at the planning and implementation levels.

6. Community consultation and participation

In the State of Pahang, there are a total of eleven administrative districts. Each administrative district, which is headed by a District Officer, is sub-divided into

Application of C&I for SFM in Pahang

several sub-districts ('mukim'). Each sub-district is headed by a Sub-district Officer ('Pengkulu'). Each sub-district consists of several villages, each of which is headed by a Village Head Man ('Ketua Kampong'). There are several committees which deal with land use and forestry matters ranging from the village level right up to the State Executive Council (EXCO) level. These committees meet regularly and proposals and decisions made at a lower level committee is submitted to the next higher level committee and finally to the EXCO meeting for a final decision and endorsement. The committees referred to are as follows:

- Village Security and Development Committee
- Sub-district Planning and Development Committee
- District Development Committee
- State Development Technical Committee
- State Development Council
- State Land Development and Forestry Committee
- State Executive Council (EXCO)

Informal consultations with local communities on forestry matters are carried out by District Forest Officers, field staff of the forestry department and logging contractors, whenever the need arises.

Local communities often participate as contractors or contract workers in forest development projects and as tree fellers and general workers in logging operations.

7. Development of C&I

Malaysia is fully committed to achieve SFM in the overall context of sustainable development, as well as in meeting the ITTO Year 2000 Objective.

A National Committee on Sustainable Forest Management in Malaysia (the National Committee) was established in February 1994 at the Ministry level to ensure that the elaborated ITTO's *Criteria for the Measurement of Sustainable Tropical Forest Management* in the Malaysian context are fully implemented. To support the National Committee's work, the ten State Forestry Departments in Peninsular Malaysia had formed a *Working Party on Sustainable Natural Forest Management, Peninsular Malaysia* at the Forestry Department Headquarters, Peninsular Malaysia in February, 1994.

The National Committee has formulated a total of 92 activities to operationalize the ITTO's 5 criteria and 27 indicators on sustainable forest management at the national level.

Each individual state in Peninsular Malaysia is defined as the forest management unit. The *National Committee* had identified a total of 84 activities to be implemented at the FMU level under the 6 criteria and 23 indicators. In its development, the Committee added 7 additional indicators from those identified at the national level.

In Pahang, against each of the activities identified at the forest management unit level, the State Forestry Department has also formulated management specifications (benchmarks) for effective monitoring and evaluation. Currently, a total of 191 management specifications have been formulated.

8. Implementation of C&I

For the purposes of forest certification, a sub-set of the activities and management specifications formulated for SFM at the FMU level was taken. It encompasses 71 activities under a total of 6 criteria and 28 indicators.

An assessment of the implementation of C&I in Pahang was undertaken by a third party, Societe Generale de Surveillance (SGS) in September, 1996 to evaluate current practices of forest management and determine the actions needed to fully comply with the Malaysian Criteria and Indicators (MC&I) for Sustainable Forest Management under the Malaysian-Netherlands initiative through the Keurhout Foundation of the Netherlands. A re-assessment by SGS was also conducted in June, 1998.

In order to ensure that the agreed activities are implemented in the field by the respective State Forestry Departments, a Task Force was established at the Ministerial level in May, 1995. To complement this effort, a Technical Monitoring Committee was formed at the Forestry Department Headquarters in October, 1995 to monitor the implementation of all the activities undertaken by the respective State Forestry Departments in Peninsular Malaysia.

In the course of implementation, a number of issues/constraints were encountered, which require further attention. These issues are:

- i) the demarcation and maintenance of external boundaries of the Permanent Forest Estate, national/state parks, wildlife sanctuaries etc, because of their extent and the rapid growth of tropical forest vegetation;
- ii) the identification of areas suitable for non-wood forest produce and the techniques required for their establishment;
- iii) the formulation and implementation of management prescriptions for the non-production components of the Permanent Forest Estate.
- iv) the implementation and monitoring of engineering, watershed protection and

Application of C&I for SFM in Pahang

- other environmental management prescriptions especially road specifications, for the production forests of the Permanent Forest Estate;
- v) the assessment of long-term soil productivity;
 - vi) the parameters for assessing the extent of vegetation disturbance after logging; and
 - vii) the procedure for assessing the extent and severity of soil erosion in the field.

Besides the above, there is also a need to mobilize additional financial resources, both domestically and externally, to train additional scientific, technological and professional personnel, and to strengthen the capacity of existing institutions in the forestry sector.

9. Future actions

- Appropriate forest road specifications will be developed and strictly enforced.
- Training programs on effective implementation of the MC&I will be intensified.
- More funds will be allocated to enhance the implementation of all the activities of the MC&I.
- The C&I developed will be reviewed and refined periodically to reflect new concepts of SFM.
- New specifications, if required, for each of the activities identified to be implemented at the forest management unit level will be developed through further research.
- An internal assessment procedure and a computerised monitoring system for SFM based on the Malaysian Criteria, Indicators, Activities and Management Specifications will be developed.
- Action will be taken to revise the MC&I in the light of the recently adopted the *ITTO's Criteria and Indicators for Sustainable Management of Natural Tropical Forests* at its 24th Session of the International Tropical Timber Council in May, 1998, Libreville, Gabon.

10. Conclusions

The future patterns of forest resources management and use in Malaysia, and especially in Pahang, would have to be restructured in order to ensure that maximum economic and social benefits are derived from managing these resources. This restructuring should be done by adopting strategies of sustainable management which are innovative and imaginative, and which treat the environment as an integral part of management and by implementing such strategies through enhanced human resources development.

Pahang will continue to manage its forest resources in accordance with national

Application of C&I for SFM in Pahang

objectives and priorities so that the state and country will continue to enjoy the benefits generated from the forest and forest industries.

The long-term strategy for the sound and sustainable development, management and conservation of the forest resources in Pahang will be one that balances the needs of the economy with the social, environmental and ecological values and functions of the forests.

Criteria and indicators for sustainable forest management

by
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C&I are tools used to define, assess and monitor progress towards SFM. The term *criteria* designates the essential elements or principles against which sustainability is judged, with due consideration paid to the productive, protective and social roles of forests and forest ecosystems. Each criterion is defined by quantitative or qualitative indicators, which are measured and monitored regularly to determine the effects of forest management interventions, or non-intervention. C&I at the national level may be used to guide countrywide policies, regulations and legislation. The ultimate aim is to promote improved forest management practices over time, and to further the development of a healthier and more productive forest estate, taking into consideration the social, economic, environmental, cultural and spiritual needs of the full range of stakeholder groups in the countries concerned.

Over the past years, C&I processes have helped promote a better understanding of the concept of SFM. The FAO's Forestry Department has collaborated with and supported a number of international initiatives on C&I, including those summarized below:

- The Pan-European C&I for SFM, developed within the framework of the Pan-European Forest Process, cover boreal, temperate and Mediterranean forests in 37 European countries. The process is overseen by Ministerial Conferences on the Protection of Forests in Europe. At the Third Ministerial Conference (1998), the six national-level criteria identified within this process were officially adopted and the corresponding 27 indicators were endorsed. Ministers also endorsed the Pan-European Operational Level Guidelines for Sustainable Forest Management for further development and for use on a voluntary basis.
- The Montreal Process on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests covers temperate and boreal forests outside Europe. The 12 participating countries have agreed on a set of seven non-legally binding national-level criteria and 67 indicators (Santiago Declaration, 1995). Participating countries recently agreed to review and consider possible elements for C&I at the forest unit level; these are currently under discussion and development.
- The eight signatory countries of the Amazon Cooperation Treaty have identified

seven national-level criteria and 47 indicators within the Tarapoto Proposal for Criteria and Indicators for Sustainability of the Amazon Forest, launched in 1995. Four criteria and 22 indicators were also identified for the forest management unit (FMU) level and one criterion and seven indicators for the global level. National Consultations for Validation were conducted in each of the participating countries between December 1996 and July 2000 to evaluate the relevance and applicability of these C&I in light of national conditions and needs.

- The 28 countries participating in the Dry-Zone Africa Process, which originated in a United Nations Environment Programme (UNEP)/FAO Expert Meeting on Criteria and Indicators for Sustainable Forest Management in 1995, have identified seven national-level criteria and 47 indicators. The African Forestry and Wildlife Commission and the secretariats of three subregional groupings – the Permanent Interstate Committee for Drought Control in the Sahel (CILSS), the Intergovernmental Authority on Development (IGAD) and the Southern African Development Community (SADC) – have endorsed the work of this process. A number of national and regional workshops and expert meetings have been held to review the applicability of the C&I in the countries concerned, to discuss the availability of information and national capacities for collection and analysis of data, and to elaborate a plan of action for implementation. Two subregional follow-up meetings of national coordinators have also been held, covering countries in SADC and CILSS countries. Following recommendations of the former, *Practical guidelines for the assessment and measurement of criteria and indicators for sustainable forest management in dry-zone Africa* has been published (FAO, 2000).
- The Near East Process originated in an FAO/UNEP Expert Meeting on Criteria and Indicators for Sustainable Forest Management in 1996. The 30 participating countries have identified seven national-level criteria and 65 indicators, focusing mainly on the management of dry-zone forests and woodlands in the region. The Near East Forestry Commission has endorsed and is closely following the work. A number of regional workshops and expert meetings have been held to review the applicability of the C&I in the countries concerned and to discuss the availability of information and national capacities for collection and analysis of data. Guidelines for assessment and measurement are currently under development (2000).
- The Lepaterique Process of Central America was initiated following the recommendations of an Expert Meeting on Criteria and Indicators for Sustainable Forest Management organized in 1997 by the Council for Forests

C&I for SFM

and Protected Areas (CCAB-AP) in collaboration with the FAO. Experts from the seven participating countries identified eight national-level criteria and 53 indicators, as well as four criteria and 40 indicators at the regional level. The expert meeting was followed by two subregional training workshops and seven national seminars, which reviewed applicability and availability of data and made recommendations on future implementation. Countries concerned are at present carrying out National Validation Exercises to review the C&I identified.

- The Dry Zone Asia Initiative originated in a workshop on National-Level Criteria and Indicators for the Sustainable Management of Dry Forests in Asia/South Asia, held in December 1999 and supported by the FAO, UNEP and the International Tropical Timber Organization (ITTO). The nine participating countries identified eight national-level criteria and 49 indicators for the sustainable management of dry forests in the region. Participating countries also elaborated a two-year plan of action and undertook to seek political and technical support from national forestry authorities for its implementation.
- The ITTO recently revised its criteria for SFM. The ITTO document *Criteria and indicators for the measurement of sustainable management of natural tropical forests*, endorsed in 1999, identifies seven criteria and 66 indicators applicable at both the national and forest unit levels.
- The 13 member countries of the African Timber Organization (ATO), in a meeting held in 1993, identified five principles, 20 criteria and 60 indicators for SFM, for application at the regional, national and FMU levels.
- Focusing largely on research at the FMU level, the Center for International Forestry Research (CIFOR) has assisted a number of countries in field-testing of C&I for SFM. In support of this work, CIFOR published the *Criteria and indicators tools series* in 1999.

Many of the ongoing processes have established technical and scientific committees to ensure soundness of approach. At the international level, the FAO has collaborated with the International Union of Forestry Research (IUFRO) in the organization of three international conferences on indicators for SFM (Australia, 1998; Costa Rica, 1999; France, 2000).

First MCPFE workshop on the improvement of pan-European indicators for sustainable forest management

26 – 27 March 2001, Triesenberg/Liechtenstein

1. Background document on the evaluation of pan-European indicators

The Ministerial Conference on the Protection of Forests in Europe (MCPFE) has developed the Pan-European C&I as a common policy instrument for evaluating and reporting progress towards SFM.

In Resolution L2, signed at the 3rd Ministerial Conference in Lisbon in 1998, the ministers responsible for forests in Europe formally adopted the six criteria for SFM and endorsed the associated indicators. They also committed themselves to 'proceed to implement, continuously review and further improve the associated indicators.' In order to put this ministerial commitment into action, the participants of the MCPFE decided to invite an Advisory Group to develop proposals for improvement of the pan-European indicators for SFM. It was also decided to involve a wider group of experts in order to make best use of the expertise existing in Europe.

The objective of the meeting in Triesenberg/Liechtenstein will be to share perspectives on the improvement of the indicators and to assist in the work of the MCPFE on the improvement of pan-European indicators. In preparation of the meeting the Advisory Group on Criteria and Indicators set up a list of concrete tasks in order to achieve the goal of improvement:

1. Background document on data sources, and other relevant C&I initiatives.
2. Evaluation of indicators.
3. Improvement of aspects of existing indicators and/or suggestion of new indicators, proposals for structures and aggregation of indicators.
4. Consequences on measurement systems (costs, ...).
5. Recommendations on grouping according to the importance of individual indicators, practicality.

The Triesenberg Workshop should focus on tasks 1-3. At the subsequent two workshops participants will be invited to work on tasks 4-6. The second workshop will focus on MCPFE Criteria 2 (health and vitality), 4 (biodiversity), and 5 (protective functions). The third workshop will cover MCPFE Criteria 1 (forest resources), 3 (productive functions) and 6 (other socio-economic functions and conditions, and rural development). The fourth and final workshop will focus on a synopsis of the work.

To facilitate the progress on the evaluation of criteria and indicators the work-

shop participants are invited to evaluate each indicator in work groups. The evaluation process will be guided by a set of evaluation criteria that were elaborated by the advisory group.

The following criteria have been identified for the evaluation process:

- reliability
- feasibility
- cost-effectiveness
- data availability
- political relevance for MCPFE and other initiatives
- visible significance

In order to operationalize the evaluation a short description of the evaluation criteria will be given.

2. Reliability

From a statistical point of view the term reliability refers to the ability to interfere from a set of samples on the true population values. Information obtained from resource assessments is subject to a number of errors, such as sampling errors, measurement errors, prediction errors and other non-statistical errors. The amount of the overall error is decisive for the extent to which information obtained from samples reflects the true situation.

Combining information assessed from different data sources and by different national programs has to face some specific problems. The systems of nomenclature used at the national levels might show distinct differences, which result in information that is not harmonised at the multi-national level. Differences between countries could be artefacts due to different measurement rules and definitions. A study on the European Forest Information and Communication System (EFICS), carried out by the European Forest Institute, showed for example that the total standing volume reported by the Finnish National Forest Inventory would be shrunk by 13 percent if the nomenclature for standing volume used by the Swiss National Forest Inventory would be applied

Evaluating the reliability of criteria should therefore focus on the:

- degree of harmonisation in nomenclature (i.e. measurement rules and definitions used for individual attributes) used at the national levels;
- reliability of measurements (i.e. sampling errors, periodicity of assessments, directly assessed or derived information, prediction errors of models applied);

and

- the sensitivity of assessment systems to detect changes.

3. Feasibility

The definition of criteria and indicators implies that they can be assessed in an operational way. Attributes assessed in surveys might not be appropriate to fulfil the information requirements embedded in criteria and indicators. On the other hand methods and approaches developed for data collection in the scope of research projects might fail when they are implemented in extensive resource assessments.

Aspects to evaluate the feasibility of indicators are:

- Cost; are the assessment costs within the frame of available budgets? Monitoring criteria is a long term obligation that requires substantial funding over long periods.
- Time; assessments of natural resources are often limited by vegetation periods. Is the time interval between assessments on successive occasions adequate to detect changes in time and to establish time series?
- Does the indicator meet the information needs?
- Is there a sound scientific background for the indicator?

4. Cost-effectiveness

Forest resource assessment can utilize several inventory concepts to provide the information required. The inventory concept do not share the same cost-efficiency, i.e. for a given budget the concepts provide information with different magnitudes of errors and reliability.

Information needs can often be satisfied by different sets of indicators. Some indicators may be assessable by lower cost than others. It is therefore essential to select the set of indicators that provides the required information at lowest cost with an appropriate reliability.

- Does the sampling design/ assessment concept guarantee to provide the required information with lowest cost at a acceptable level or reliability?
- Are administrative resources available for assessing the indicators or is capacity building needed?
- Are the possibilities offered by survey statistics and combination of available data sources utilized to a maximum extend.

5. Data availability

Availability of data can be limited due to legal restrictions, cost of data sources

or technical shortcomings such as to poor data quality, insufficient assessment periods or to low spatial and/ or thematic resolution. The evaluation of the availability of data should take into consideration the following aspects:

- Are there any legal restrictions associated with the access to data sources?
- Is there cost free access to the required data sources? If not, are the costs for purchasing data and any associated cost (e.g. data processing) within the frame of the available budgets?
- Are the data sources adequate for the specified purposes in terms of data quality?
- If remote sensing is utilised as data source: are images available for the required points in time? Is the spatial, spectral and thematic resolution sufficient? Is pre- or post-processing needed?
- Will raw data or pre-processed data be delivered?
- Do data formats need harmonisation? Can data formats of different data sources be easily converted to match the requirements of software interfaces?

6. Political relevance for MCPFE and other initiatives

The indicators selected should facilitate the criteria specified by the MCPFE.

They should:

- meet the criteria;
- form a base for objective decisions about political measures; and
- be of use and directly applicable in other processes and initiatives.

7. Visible significance

Scientific concepts are often difficult to be transferred into generally understandable information. Indicators form the base for a wide scope of users and decision makers with different professional background. Thus not only persons holding a PhD in statistics or environmental sciences should be able to work with indicators. The indicators have to be:

- intuitively clear;
- transparent regarding the underlying estimation procedures and models;
- simple to be understood; and
- transfer the scientific background into understandable and operational information.

Criteria and indicators for sustainable forest management¹

by

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1. Introduction

This presentation gives a brief, summarized review of the issue of C&I for SFM. Additional information, especially as it relates to the various on-going C&I processes, can be found in the FAO Forestry Department Information Note, which has been made available to the meeting.²

2. The concept of SFM

The concept of SFM, as presently widely agreed, includes economic, environmental, social and cultural dimensions. Action over the past decade has stimulated changes in forest policy and legislation in many countries.

In essence, the implementation of SFM means that there is, at all levels, from the policy and decision making level to actual managers and users of the forests, full acknowledgement of the range of values that forests provide - that is, recognition of their economic, environmental, social and cultural/spiritual dimensions. Put in another way, sustainability means that people at all levels, and in all stakeholder groups, care; that they are heard; that they are aware of these various dimensions; and that they respect each others values and viewpoints.

Neglecting any one of the dimensions of sustainability will lead to friction among interest groups and stakeholders. If practices are continued, such neglect will have a negative influence on all forest values, which are inter-linked; and, ultimately, it will lead to the degradation or outright destruction of the resource.

Although it is difficult to assess the area of forest under SFM, the information available seems to indicate a decisive global commitment to working toward SFM. On the ground, changes are occurring in management objectives and practices, and in the involvement of partners in forest planning and management.

¹ Document prepared for the 42nd Session of the FAO Advisory Committee on Paper and Wood Products. Rome, Italy 27 April 2001.

² Forestry Department Information Note on Criteria and Indicators for Sustainable Forest Management, available from FAO, Rome; and on-line at:
<http://www.fao.org/forestry/FODA/Infonote/en/t-crit-e.stm>
See also Information Note on Sustainable Management of Natural Forests and Woodlands:
<http://www.fao.org/forestry/FODA/Infonote/en/t-smnf-e.stm>

The findings of the Global Forest Resources Assessment 2000 indicated that 89% of forests in developed countries were being managed according to a formal or informal management plan. National statistics on forest management were not available from many or most developing countries. Preliminary results, however, indicated that about 6% of forests in developing countries were covered by a formal, nationally approved forest management plan, spanning a period of at least five years.

Additional information is available in the *State of the World's Forests 2000*, in Annex 3 of the Data Tables contained in the Supplement to SOFO³. These tables provide available information, by country, on *i.a.* Area under Forest Management Plans, and on Forest Area Certified. The tables also make reference to the coverage, by country, of C&I processes for SFM.

In regard to the above it must be emphasized that the total area reported to be subject to a formal or informal forest management plan, be it in developed or developing countries, is not necessarily equivalent to the total area of forest under SFM. Some areas covered by management plans may not actually be sustainably managed. Conversely, areas may be under SFM without the existence of a formal management plan.

Direct comparison between present-day and earlier estimates of the forest management status in both tropical and temperate/boreal regions is not possible due to differences in definitions used. It can however be said with some confidence that the areas under forest management have increased over the past decades in developing countries, while remaining fairly stable in industrialized countries.

Maybe the biggest victory today is that we are discussing how to manage forests everywhere in the world, not whether or not to do it, or whether or not it is possible.

We have a big challenge in front of us!

3. C&I for SFM

3.1 The concept

C&I are tools which can be used to review status and to monitor trends towards SFM at national and forest unit levels, with a view to gradual improvement of prevailing practices.

³ *SOFO 2000 will be available from FAO, Forestry Department, Rome (Italy) in mid 2001. See also the Global Forest Resources Assessment 2000 Web Page, at:*
<http://www.fao.org/forestry/fo/fra/index.jsp>

Criteria define the concept of SFM and related values. *Indicators* are used to measure and monitor status and trends in quantitative and qualitative attributes of each criterion.

Changes in indicators over time will help determine if a country is moving towards increased sustainability in forest management, as defined by the established criteria. It should be stressed that C&I refer to a time-series; by definition, related values or results cannot, as such, be compared among countries. On the other hand, forest certification - which is the subject of another presentation today - refers explicitly to agreed-upon minimum performance standards, which allow for comparisons between countries.

Monitoring changes over time using C&I will help make policy decisions and to take corresponding action to improve the situation in regard to those indicators which point to an unsatisfactory situation or to undesirable or negative trends. The aim is to gradually improve forest management practices over time: looking to the future, based on evaluation of the present and drawing lessons from past experiences.

3.2 The FAO's role

The FAO in its capacity as the lead UN agency in issues related to forests and forestry, offers the following support and services to member countries in relation to SFM⁴:

- provides a forum for discussion at policy and technical levels;
- collates, analyses and disseminates information;
- helps streamline concepts and terminology and, thus, comparability and compatibility of information and data among countries; and
- provides institutional support and technical assistance, at request.

In relation to C&I for SFM and in its role as 'focal point' for the issue in the post-UNCED international dialogue, the FAO, more specifically:

- supports on-going C&I processes;
- catalyzes action in countries and regions not presently involved;
- promotes comparability among processes (concepts, terms, field level assessment, analysis, documentation);
- ensures information flow, dialogue, exchange of experiences and know-how

⁴ For a more accurate and complete description of FAO's role and key activities in forestry, see: *FAO Strategic Plan for Forestry*, available from FAO, Rome and, on-line, at: <http://www.fao.org/forestry/fo/strategy/vision-e.stm> and the *FAO Strategic Framework*, adopted by the FAO Council in November 1999- see: <http://www.fao.org/strategicframework/>

among processes;

- supports countries in implementation, at request, including the development of assessment methodologies and the analysis of information; and
- helps raise awareness at decision-making, policy and technical levels.

The FAO's major collaborators in this field include national governments and, among international partners, notably: UNEP, ITTO, ATO, IUFRO and CIFOR. In addition, FAO has also collaborated with a range of other governmental and non-governmental agencies, including industry, academia and international environmental groups.

3.3 The inter-governmental C&I processes

National action over the past ten years has been developed mainly within the framework of nine major inter-Governmental processes: the ITTO, Pan-European, Montreal, Tarapoto/Amazon, Dry Zone Africa, Near East, Lepaterique/Central America, Dry Forest Asia, African Timber Organization initiatives⁵. Action underpinning research and promoting scientific soundness of approaches have been supported by IUFRO and CIFOR, and some other regional institutions (e.g. CATIE, Costa Rica).

Presently, some 150 countries formally adhere to one, or at times several, of these major C&I processes. However, the degree and advancement and implementation varies greatly among countries, both at the policy and field level.

In general it can be said that the criteria are largely similar, or identical between the processes. Their number varies from 6 to 8. In regard to the indicators, while all processes have developed a number of identical or similar indicators, the original number of indicators at the national level varies from 27 to 67.

Within the framework of many of the processes, countries are in the process of verifying the relevance of the indicators developed within regions or ecological regions, to national institutional, ecological and socio-economic conditions and needs. In this process, and in further field testing, the number of indicators which countries are able and willing to assess, measure and monitor, on a regular basis, is likely to decrease substantially.

⁵ More information on these processes can be found in the *Forestry Department Information Note on Criteria and Indicators for Sustainable Forest Management*, available from FAO, Rome; and on-line at: <http://www.fao.org/forestry/FODA/Infonote/en/t-crit-e.stm>

3.4 November 2000 expert consultation and proposed follow-up

An FAO/ITTO/UNEP/CIFOR/IUFRO Expert Consultation on Criteria and Indicators for Sustainable Forest Management was held in Rome in November last year, just over five years after the first such meeting⁶, in which experts knowledgeable of the various processes and other related issues had a chance to get together, take stock of the situation, and discuss the way ahead.

The Expert Consultation:

- stressed the need to improve field level forest management practices, world-wide;
- noted the similarity of the identified criteria and a number of the indicators developed in the various international processes; and
- noted the need to further clarify the relationship between C&I, performance standards and certification.

Based on the above, the Expert Consultation requested that the FAO continue to strengthen support to international coordination, development and implementation of C&I.

The Expert Consultation recommended that an international conference on C&I for SFM be organized with broad stakeholder involvement. The need to adequately involve forest related industry, private forest owners and other stakeholder groups, was highlighted.

It was suggested that such a consultation discuss and help progress in:

- streamlining concepts and terms, and reporting;
- the sharing of know-how between countries which have advanced considerably and those which are still in the early stages of implementation; and
- reviewing ways to improve compatibility and comparability between the major forestry C&I processes, and between these and similar programmes in other but related sectors, such as biological diversity, desertification control and climate.

4. Final observations

Plans for an international conference on C&I for SFM, on the lines mentioned above, are presently being developed.

⁶ *FAO/ITTO Expert Consultation on the Harmonization of Criteria and Indicators for Sustainable Forest Management. Rome, Italy 13-16 February 1995.*

C&I for SFM, FAO Rome, Italy

The conference is tentatively planned to be organized in the first quarter of 2002. A number of national and international partners, notably ITTO, have already expressed willingness to collaborate to make such a meeting a success.

The conference will help raise awareness at all levels about the importance and the need to sustainably manage available forest resources. These resources are, by definition, renewable and, if correctly managed, will provide a range of goods and services in perpetuity.

The conference will facilitate and promote dialogue and understanding among different stakeholder groups and will, ultimately, lead to increased commitment and enthusiasm to further the implementation of SFM.

We would appreciate comments and possible expressions of support from colleagues present, regarding the event.

Sources:

FAO, 2001. *Criteria and indicators of sustainable forest management of all types of forests and implications for certification and trade*. Secretariat Note COFO-2001/3. Fifteenth Session of the Committee on Forestry. Rome, Italy, 12-16 March 2001, FAO, Rome.

FAO, 2000. *Criteria and indicators for sustainable forest management and implications for certification and trade in Africa*. Secretariat Note FO: AFWC/2000/5. Twelfth Session, African Forestry and Wildlife Commission. Lusaka, Zambia, 27-30 March 2000, FAO, Rome.

National-level **criteria** define the range of forest values to be addressed and the essential elements or principles of forest management against which the sustainability of forests may be assessed. Each criterion relates to a key element of sustainability, and may be described by one or more indicators. **Indicators** measure specific quantitative and qualitative attributes (and reflect forest values as seen by the interest group defining each criterion) and help monitor trends in the sustainability of forest management over time. Changes in the indicators between periods indicate whether a country is moving towards, or away from, sustainability. Viewed this way criteria and indicators are similar, for example, to economic indicators such as interest rates and inflation rates that governments use to assess the health of an economy. If these indicators suggest that an economy is moving away from the desired direction, the government is able to adjust its management policies to achieve the preferred outcome. Change in the indicators of SFM provides similar information to policy makers and practising foresters to allow them to intervene appropriately to correct any undesirable trends (FAO 2000).

National level indicators will contribute towards the development and regular updating of policy instruments (laws, policies, regulations), while trends in the indicators at the **forest management unit level** will help adjust forest management prescriptions over time to meet established national goals. The overall aim of the development of both national and forest management unit level criteria and indicators is to achieve better forest management over time. While criteria and indicators developed at these two levels differ in concept and substance, forest management unit level criteria and indicators should be linked to the national level, and the two levels must be mutually compatible (FAO 2001).

Criteria and indicators, at both national and forest management unit level, are neutral assessment tools for monitoring trends, they cannot be used as substitutes for minimum agreed-upon forest management standards which underpin certification.

On the other hand, forest management unit level criteria and indicators can be used to guide the development of minimum standards of performance at the management unit level, thus indirectly linking criteria and indicators at this level with forest products certification (FAO 2001).

Certification is one of a number of market-based instruments that may contribute to improved management of forests and improved forestry sector development. The goal is to link trade in forest products to the sustainable management of the forest resource, by providing buyers with information on the management standards of the forests from which the timber came. While assessment results from criteria and indicators work cannot be compared between countries, the specified performance standards used for certification purposes can, by definition, be compared (FAO 2001).

Certification processes need to be closely linked to national and forest management unit level criteria and indicators because a number of macro-level criteria for certification, such as the legal and policy frameworks, should be based on the national level data provided within national criteria and indicators processes. A similar dependence of national level criteria and indicators on certification, however, need not exist. In other words, certification, though helpful, is not a necessary condition for achieving sustainable forest management (FAO 2001).



**List of documents on
C&I for SFM according to process by, or
in collaboration with, the FAO**

Near East process

1. FAO/UNEP, 2000. *Practical Guidelines for the Assessment and Measuring of Criteria and Indicators for Sustainable Forest Management in the Near East Region*. FAO Regional Office for the Near East Cairo, Egypt, 2000 (E, A).
2. FAO/UNEP, 1998. *Report of the National Coordinators' Meeting on Criteria and Indicators for Sustainable Forest Management for Near East Countries*. Damascus, Syria, 02 - 04 December 1998 (E, A).
3. FAO, 1997. *Report of the Workshop on Criteria and Indicators for Sustainable Forest Management in Near East Process*. Cairo, Egypt, 30 June - 03 July 1997 (E, A).
4. FAO/UNEP, 1996. *Report of the Expert Meeting on Criteria and Indicators for Sustainable Forest Management in the Near East*. Cairo, Egypt, 15-17 October 1996 (E, A).

Dry-zone Africa process

5. UNEP/FAO, 2000. *Practical Guidelines for the Assessment and Measurement of Criteria and Indicators for Sustainable Forest Management in Dry-Zone African Countries*. Rome, Italy, 2000 (E, F).
6. FAO/UNEP, 1999. *Report of the FAO/UNEP Workshop of National Coordinators for Criteria and Indicators for Sustainable Forest Management in CILSS Member Countries, Dry-Zone Africa Process*. Dakar, Senegal, 14 – 17, December 1999 (E, F).
7. UNEP/FAO, 1998. *National Coordinator's meeting on Criteria and Indicators for Sustainable Forest Management for SADC Member Countries; Dry-Zone Africa Process*. Lilongwe, Malawi, 15 - 18 December 1998 (E).
8. UNEP/FAO, 1997. *Report of the UNEP/FAO Workshop on Criteria and Indicators for Sustainable Forest Management in Dry-Zone Africa*. Nairobi, Kenya, 24-27 November 1997 (E, F).
9. UNEP/FAO, 1995. *Report of UNEP/FAO Expert Meeting on Criteria and Indicators for Sustainable Forest Management in Dry-Zone Africa*. Nairobi, Kenya, 21-24 November 1995 (E, F).

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