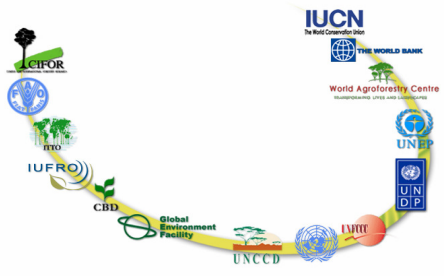

Technical Meeting on Assessment and Monitoring of Forest Degradation

FAO, Rome 8-10 September 2010

Summary Report

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Summary Report

Executive summary

The Technical Meeting on "Assessment and Monitoring of Forest Degradation" took place at FAO headquarters in Rome, Italy, from 8 to 10 September 2009.

The objectives of the meeting were to present an analysis of definitions of forest degradation, present the case studies on forest degradation, review the results and recommend actions to improve measurement, assessment and reporting on forest degradation. The meeting provided an opportunity for participants to discuss technical aspects of methodologies for assessing and monitoring forest degradation.

A total of 37 specialists from 15 countries and 12 international forest-related organisations and processes participated in the meeting.

The main conclusions were as follows:

(i) Endorsement of generic definition of 'forest degradation' as a reduction in the capacity of a forest to provide goods and services;

(ii) The many different aspects of forest degradation should be communicated better to the climate change negotiators;

(iii) Attention should be focused on harmonization of definitions and methods for monitoring five aspects of forest degradation: stocking level, biodiversity, forest health, level of use/production and forest soil

(iv) Methodologies do exist to monitor changes in carbon stocks and therefore to include forest degradation in terms of climate change into the proposed REDD mechanism.

There was a call for the development of tools and guidelines for measuring different aspects of forest degradation. The presentations made at the meeting can be found on the CPF site: http://www.fao.org/forestry/cpf/degradation/en/

Introduction

1. Background on the CPF initiative on Forest Degradation, its objectives, expected outcomes and approach.

The Challenge

Rates of deforestation and forest loss are regularly measured. Forest degradation – defined by international forest-related organizations as the reduction of the capacity of a forest to provide goods and services – is similarly important, but more difficult to measure.

Beyond this core definition, perceptions regarding forest degradation are many and varied, depending on the driver of degradation and the main point of interest (e.g., biodiversity conservation, carbon sequestration, wood production, soil conservation, recreation).

In the absence of agreed definitions and assessment methods, few countries are currently able to report on the area of degraded forests or the degree of forest degradation.

The study

Under the umbrella of the Global Forest Resources Assessment 2010 (FRA 2010), and together with members of the Collaborative Partnership on Forests (CPF) and other partners, FAO has initiated a special study to identify the elements of forest degradation and the best practices for assessing them.

The primary objective of the work is to help strengthen the capacity of countries to assess, monitor and report on forest degradation by:

- Identifying specific elements and indicators of forest degradation and degraded forest;
- Classifying elements and harmonizing definitions;
- Identifying and describing existing and promising assessment methodologies;
- Developing assessment tools and guidelines

Expected outcomes and benefits of the initiative include:

- Better understanding of the concept and components of forest degradation;
- An analysis of definitions of forest degradation and associated terms;
- Guidelines and effective, cost-efficient tools and techniques to help assess and monitor forest degradation; and
- Enhanced ability to meet current and future reporting requirements on forest degradation.

The study has so far undertaken a survey of existing country practices to see what is being measured as well as an analytical study on definitions which provides a framework for the process. A series of case studies describing proven or promising methodologies and tools for assessing different aspects of forest degradation have been undertaken. The Technical Meeting described in this report, provided a forum where the analysis of definitions and case studies on forest degradation were presented, reviewed and discussed. The meeting provided an opportunity for participants to discuss technical aspects of methodologies for assessing and monitoring forest degradation.

2. Objectives and expected outcomes of this meeting

The objectives of this meeting were to:

- Review an analytical study on definitions of forest degradation
- Review case studies on assessment methodologies for forest degradation
- Discuss possible indicators of forest degradation and how to assess these

The expected outcomes were:

- A better understanding of the concept and components of forest degradation
- A set of possible indicators and promising assessment methodologies
- Recommended actions to improve measurement, assessment and reporting on forest degradation

3. Meeting participants

A total of 37 specialists participated in the Technical Meeting representing 15 countries and the following international and regional organizations, in addition to FAO: the Convention on Biological Diversity (CBD), Center for International Forestry Research (CIFOR), the International Tropical Timber Organization (ITTO), the International Union for Conservation of Nature (IUCN), International Union of Forest Research Organizations (IUFRO), United Nations Development Programme (UNDP), United Nations Environment Programme – World Conservation Monitoring Centre (UNEP-WCMC), United Nations Forum on Forests (UNFF), United Nations Framework Convention on Climate Change (UNFCCC), World Resources Institute (WRI). The full list of participants is included in Annex 1.

4. Organization of the meeting

The Agenda of the meeting can be found in Annex 2. In the opening session, presentations were made on the background to the study and on various activities contributing to the process, the survey of existing country practices and the analytical study on definitions. This set the scene for the presentation of case studies.

Case studies describing methodologies and tools for assessing different aspects of forest degradation were presented in groups of four, relating to one of the themes of Sustainable Forest Management (SFM), followed by an opportunity for discussion. Case studies presentations can be found in Annex 3.

A half day was devoted to a working group session where 3 working groups discussed the best indicators of forest degradation in terms of the following themes:
- Forest extent, condition and health
- Reduced capacity to provide ecosystem services
- Reduced capacity to provide goods and economic services

The results from the working groups were presented on the final afternoon, and can be found in Annex 4.

In preparation for the working group sessions, participants were asked to think about forest degradation in their own country. Using separate cards they then wrote down the three variables that they would measure if they had to assess and report on forest degradation in their own country. These cards were then put up on a large "blue" wall, for all to see and consider. They were then grouped according to element of Sustainable Forest Management to

which they were most closely linked. These cards provided a starting point for the working group discussions. A list of the variables can be found in Annex 5.

Key messages and conclusions based on the discussions that had taken place following each of the sessions and the conclusions from the working group discussions were presented and discussed in the final session.

Summary of presentations and discussions by session

1. Opening session

The meeting was opened by José Antonio Prado, Director Forest Management Division, Forestry Department, FAO

Opening Remarks (Jan Heino, ADG Forestry Department, FAO)
Forest degradation is a serious problem. The total area of degraded forests and forest lands in tropical countries has been estimated to be as high as 800 million hectares, or 20 % of the global forest area. Severe forest degradation can have serious negative impacts on the livelihoods of the rural poor, on biodiversity and on soil erosion and it can contribute to climate change by reducing the ability of forests to sequester carbon.

For this reason a reduction in forest degradation forms part of the first of the four global objectives on forests as agreed by the members of the United Nations Forum on Forests; it is linked to the 2010 target on Biodiversity; and it is given prominence in the discussions on climate change mitigation and adaptation.

Estimates of the rate or level of forest degradation are few and vary widely. Only a handful of countries are able to report on the area of degraded forest or the level of forest degradation – and they use different definitions and assessment methodologies to do so. Given the severity of the problem and this lack of comparable information, the CPF initiative on Forest Degradation aims to strengthen the capacities of countries and organizations to assess, monitor and report on forest degradation. The ultimate aim is to provide better information on the scale and causes of forest degradation in order to garner support at all levels to effectively address this problem.

Background (Mette Wilkie, FAO)
Countries need to know where forest degradation is taking place, what causes it and how serious the impacts are in order to prioritize the allocation of resources to the prevention of degradation and to the restoration and rehabilitation of degraded forests. For countries to report on forest degradation and demonstrate efforts to tackle the problem and meet global objectives and targets, common definitions and agreed methodologies for the assessment and monitoring of forest degradation are needed.

The CPF initiative hopes in particular to:

- Highlight the different aspects of forest degradation
- Review assessment methodologies
- Facilitate access to new tools, especially in developing countries

With the ultimate aim of leading to action to reduce current rates of forest degradation

Process of the Study (Victoria Heymell, FAO)
This work builds on some existing processes that are already established. These include:

- Nine eco-regional processes on criteria and indicators for SFM that have been operational since 1992.
- Three past expert meetings on harmonizing forest related definitions including one in 2002 that made a recommendation for a core definition of forest degradation

- Experiences in other sectors, both within FAO and through the CPF.

The key components of the study have included:

a. Questionnaires to National Forest Correspondents and a survey of existing country practices to establish what is being measured;
b. The preparation of an annotated bibliography and an analytical study on definitions which provides a framework for the process;
c. A series of case studies describing proven or promising methodologies and tools for assessing different aspects of forest degradation.

Other activities have included:

- An ongoing in-depth review of existing and promising new methodologies and tools to generate scientifically sound estimates of historical rates of levels of forest degradation in developing countries.
- Outreach activities, including presentations at COFO in March and at UNFCCC-SBSTA in June; development of a brochure in English, French and Spanish and a webpage dedicated to forest degradation on the CPF site.

Annotated Bibliography (Evisa Abolina, Intern UNFF)

During the process of the Forest Degradation study, a long list of studies had been collected through internet searches, as well as others that were provided by Guide Lund. These were collated into an annotated bibliography. The main goals in preparing the annotated bibliography were to:

- List studies on Forest Degradation under the themes of Sustainable Forest Management;
- Indicate which forest degradation assessment methodologies and indicators were used in each study;
- Identify any definitions used in assessing forest degradation in each of the studies;
- Evaluate studies to determine the most promising ones for future work;
- Determine areas that are poorly covered with few studies.

The most poorly represented SFM elements to have been assessed were Protective and Productive functions of forests. This might be explained by the indicators used under each element and its specifics. Regarding protective functions of forests from the point of view of forest degradation, it may be that forest degradation studies rarely look at forest areas designated for protective purposes. Regarding productive functions of forests, these are seen primarily from a commercial or market perspective. It would be useful to incorporate ecosystem services here.

Many studies however, did incorporate several elements of SFM and associated indicators. Several studies suggested that remote-sensing imagery (using indicators of biomass, forest canopy cover and density and vegetation cover) supported by ground observations (including indicators such as species composition, tree height, volume, quality of timber) are the most reliable way to estimate locations and rates of deforestation and forest degradation.

2. Defining Forest Degradation

Towards Defining Forest Degradation: Comparative Analysis of Existing Definitions (Markku Simula, FAO Consultant)

The paper reviews the existing international and national definitions of forest degradation, analyses their elements and parameters and identifies their commonalities and differences. The generic definition of forest degradation (*the reduction of the capacity of a forest to provide goods and services*) provides a common framework for all the international definitions however it may be difficult to operationalise. The most comprehensive international definitions have been developed by ITTO and CBD, covering change in forest structure and dynamics, forest functions, human induced causes and a reference state.

Few countries have developed a national definition of forest degradation. Typical indicators in these definitions are stocking level, productivity, biomass density and species composition. The analysis indicates that the elements of sustainable forest management may offer a suitable framework for assessing forest degradation as well as its causes and impacts.

In general, the review of existing definitions shows that many definitions are either very general or their focus is on reduction of productivity, biomass or biodiversity. There may then be a need to combine the holistic approach and specific-purpose definitions. A particular issue is the definition of thresholds between non-degraded, degraded and non-forest. For degradation definitions the temporal scale is crucial, with the need for a long term approach, while the purpose of the definition is linked with the level of assessment.

The various international definitions currently in use, leave several issues open which need to be addressed, and any operational definitions of forest degradation for specific purposes should provide: (i) identification of forest goods and services; (ii) a spatial context of assessment; (iii) a reference point; (iv) coverage of both process and state (degradation/degraded forest); (v) relevant threshold values; (vi) specification of reasons for degradation (human induced/natural) (when required by the use of definition; (vii) an agreed set of variables; and (viii) indicators to measure the change of a forest. Additional elements could be added or singled out, depending on the particular interests related to the use of definition.

It was suggested that possible core elements could be measured by 3 proxies:
- Reduction in biomass for the growing stock or the carbon stored which can be associated with the reduction of canopy cover and or number of trees per unit area;
- Reduction in the loss of biological diversity which can be associated with the occurrence of species (dominant and non-dominant) and habitats;
- Reduction in soil as indicated by soil cover, depth and fertility.

Key points raised in the discussion included the following:

- There was overall agreement that the generic definition is broad enough.
- The time and scale may depend on the objectives of management.
- Degradation could be considered as both a state and a process
- "One person's degraded forest is another person's livelihood". [There needs to be a definition and framework that can function pragmatically to ensure that the 800 million ha of degraded forests and forest lands can be incorporated into REDD. A process is needed to measure and track degradation that meets both the aims of UNFCCC and the aims of the CBD.] Degradation cannot be measured only in terms of Carbon stocks, as proposed by UNFCCC and SBSTA, therefore a proxy is needed at global and landscape levels that can describe the decline in capacity to provide goods and services.

- Trade-offs exist in all management decisions and tools to deal with trade-offs exist (multi-purpose forestry). Levels of tolerance, safeguards and thresholds can be used when addressing trade offs.
- If forest degradation is related to the specific objective or parameter, it may be possible to say that a forest is degraded in terms of carbon, or wood species (loss of this amount). For a specific duration it can be related to how long it might take to restore it.
- Reference data could be considered as the recovery function according to the management objective that is being set.

Potential Indicators Related to Degradation by SFM Element

SFM element	Potential indicators (examples)
Extent of forest resources	Forest cover, crown cover, growing stock, stand density, degree of fragmentation, trees outside forests (TOF)
Biological diversity	Ecosystem diversity, species composition/diversity, genetic diversity, degree of fragmentation, connectivity, naturalness, crown cover, forest structure.
Forest health and vitality	Area affected by pests, diseases, fire, storm damage, area subject to air pollution damage, area with diminished biological components,
Productive functions of forest resources	Stocking level, MAI, age structure, NTFP yield, wood quality
Protective functions of forest resources	Soil erosion, water quality and runoff, managed watershed area, flood protection areas, protective plantation area
Socio-economic functions of forests	Value of forest products, recreation and tourism; cultural and community values; employment; income; area available for recreation, area available to indigenous people/social services
Contribution to the carbon cycle/climate change by forests	Carbon stock in pools (above/below ground biomass, deadwood, litter, soil), stocking density, removals, TOF

3. Extent of Forest Resources

Measuring and Monitoring Forest Degradation through National Forest Assessments (Mohamed Saket, FAO)

The presentation demonstrated how the NFMA programme addresses key criteria of forest degradation linked to the thematic elements of sustainable forest management (SFM) in its methodology. Each SFM thematic element is examined in the context of the NFMA country experience and how it has facilitated delivery of data on status and extent of forest degradation. Country-level proxies and parameters are provided for each theme in order to demonstrate how the NFMA approach can enable countries to assess and monitor degradation of forest resources. In this work, field level measurements together with remote sensing are used, as well as household interviews.

Analysis of the Normalized Differential Vegetation Index (NDVI) for the detection of Degradation of Forest Coverage in Mexico2007 – 2008 (Carmen Ourdes Meneses Tovar, Mexico)

The study described relationships between forest usage and the Normalized Differential Vegetation Index (NDVI) estimated from satellite imagery. Some of the indicators of forest usage that were related to the euclidean space of the satellite images are: type of vegetation, number of live trees, number of species, crown diameter, total height, trunk diameter, and estimates of wood volume and biomass. Other supporting variables used included precipitation, temperature, number of days of rain per year, evaporation, a digital elevation model, ecological regions of the country, as well as variables related to anthropogenic effects.

Forest Degradation in Nepal: review of data and methods (Resham Bahadur Dangi, Nepal)
In Nepal various different methods have been use to assess forest resources since the 1960s The presentation looked at the various drivers of degradation, their level of significance and the key degradation element linked to each of those drivers. Detectability of each of those key degradation elements was rated from low to high for 3 methods of detection that included field surveys, aerial photos and satellite image analysis.

An example could be fuel wood removal as a driver of degradation. The key degradation element measured is biomass and understorey. Detectability was considered as high, medium to low for each of: field surveys, aerial photos and satellite images respectively.

Overall the work concluded that the use of satellite imagery supported by ground based inventory could provide a suitable approach for assessing forest degradation as it would combine the strengths of both methods.

Extrait de l'inventaire forestier des forêts classées autour de Bamako (Nianti Ousmane Tangara, Mali)
The case study from Mali describes a dramatic degradation process as documented by forest inventories carried out 8 years apart. The gazetted forests studied exist close to Bamako where they are used for the production of wood products. The study used forest inventory is used to describe the forest structure and volume of timber. Hence changes over time and forest degradation could be quantified. The study focuses particularly on wood production and provides an example of a traditional approach at the local level.

4. Biological Diversity

Assessing forest degradation due to fragmentation – developing biodiversity-relevant measures (Val Kapos, UNEP-WCMC)
In assessing forest degradation due to fragmentation, biodiversity-relevant measures were developed. The focus is about understanding differences in composition rather than assessing species richness. Another possibility is to investigate processes and factors known to cause biodiversity to deviate from that of undisturbed forest. These include area loss, which is known to affect the abilities of some species to survive – especially animals with large home ranges and rare species (some trees) that lose options for reproduction as area declines. Changes in forest structure as discussed elsewhere here have implications not only for carbon, but also for the suitability of the forest as habitat for some species. Changes in composition can themselves lead to other changes as the occurrence of predators and the availability of food species changes. Finally, it is known from many studies that forest fragmentation has biodiversity implications that are greater than those simply relating to area loss.

Occupation des sols des forêts classes du Niger et l'analyse des dynamiques du changement (Ibro Adamou, Niger)

The case study from Niger made a comparative analysis of the situation of classified forests between 1975 and 1999. It described the forests in terms of degradation, no change or improvement. It was noted that the majority of forests were affected by advancing agricultural land use. Local communities noted changes in the structure and composition of the forests, the disappearance of some species and the general reduction in the biodiversity. It is an example of what can be done in Sahelian conditions and an example of what can be done at the national level. It looks at changes in vegetation types in a sample of 20 gazetted forests covering some 230,000 hectares spread over the country from Tillabery to Diffa. Over a period of 25 years it was noted that 22.7% was degraded, 68.5% had not changed and 8.8% had improved.

Defaunation and forest degradation: how to measure the impacts of hunting? Congo Basin (Robert Nasi, CIFOR)
The work reviewed methods used for assessing defaunation, as a forest degradation component, linked to logging and logging concession with an emphasis on mammals in the Central Africa Rainforests. A discussion on the usefulness and weaknesses of various methods was provided. Logging is recognized as having different types of impacts on wildlife that can be classified as direct (usually visible shortly after logging) and indirect (concerning the longer term). Direct can be presence of heavy machinery and logging teams, disturbance and modification of the structure and composition of the habitat. Logging also increases access to remote forests by opening roads into previously inaccessible areas. Given the limitations of the different methods discussed, a well designed survey protocol might imply the use of a combination of approaches with both measures of mammal abundance and measures of hunting and trading activities within the logging concession. Priority for the coming years should be to develop more standardized protocols that would allow comparisons among sites.

Impact of developmental projects in the humid evergreen broad-leaved forest: A case of Wasabi Pilot Project at Lamperi, Western Bhutan (Pema Wangda, Bhutan)
The case study from Bhutan describes what happened following a failed development project (pilot Wasabi plantation project) on the humid evergreen broadleaved forest. It suggests an example where following the initial removal of trees there were secondary effects of subsequent increased grazing. It appears questionable whether the forest will return to its original state, or whether the degradation has led to a permanent change in the forest composition (and structure). The measurements made were undertaken 3 years after the disturbance.

5. Productive Functions of Forests

Etude de cas sur la dégradation des forêts de la République Démocratique du Congo (Christophe Musampa, Democratic Republic of Congo presented by François Wencelius)
An example of what can be done at the national level, the case study looked at a comparison of changes in areas of land use classes, by comparing satellite imagery. The land use classes used were: primary forest, secondary forest, swamp forest, industrial agricultural plantations, agriculture/savannah mosaic, villages and water.

- The methodology (remote sensing + GIS):
  - is operational to quantify changes in land use classes
  - is appropriate for the evaluation of DRC's huge forest resources
  - makes it possible to identify the main causes of deforestation and degradation
- However, most of the elements of the methodology dates back to the 1990s

- Considerable improvements could be achieved through updated hardware and software, and further ground truthing.

An Operational Approach to Forest Degradation - Forest Stock Measurement Chile (Carlos Bahamondez, Chile)
An operational approach to Chile's forest degradation from the productive perspective is tested by using relative density (Gingrich et al 1967). The case study from Chile showed that a stocking chart provided a useful tool for helping to recognise degraded forest. As a tool used together with field observations there was improved identification of degraded forest. Data for building the stocking chart is provided by the National Forest Inventory data bases for one of the most common forest types in Chile, the Roble-Rauli-Coihue forest type *(Nothofagus oblique-Nothofagus alpine-Nothofagus dombeyii*). The resulting stocking chart constitutes a powerful tool for understanding and identifying degraded forest from the stock point of view. It also identified the needs for suitable data which must be provided under periodical bases, like large scale permanent forest inventories. The use of a stocking chart provides a feasible way to identify objectively the condition of forest degradation. It has become a potentially important tool for monitoring sustainable forest management practices or policies.

Measuring ecological impacts from logging in natural forests of the Eastern Amazônia as a tool to assess forest degradation (Marco Lentini, Brazil)Brazil
In Brazil reduced impact logging (RIL) was compared with conventional logging (CL) from an economic perspective. The work presents a simple method to assess forest degradation and ecological impacts provoked by logging. Results showed a net income from RIL 19% higher than CL. Remote sensing techniques are able to identify coarse scale problems with logging however simple field methods are also needed to evaluate quality of forest management and use of resources.

6. Contribution to the Carbon Cycle

Monitoring and Reporting Forest Degradation under UNFCCC (Danilo Mollicone, FAO)
In the interests of REDD the objective is in measuring the reduction in carbon stocks. Under UNFCCC there is no definition of forest and no definition of forest degradation, with a land based reporting approach. Carbon stock changes in the five pools, above and below ground biomass, dead wood and litter (dead organic matter), soil (mineral organic); the change in carbon being the change in carbon in any one of these pools added together. The stock difference can be the change in carbon in any one of these pools between two times.

Integrating Forest Transects and Remote Sensing data to Quantify Carbon Loss due to Forest Degradation: A case study of the Brazilian Amazon (Carlos Souza, Brazil presented by Danilo Mollicone)
Work in Brazil using remote sensing and rapid forest transect surveys showed the main sources of C emissions to be deforestation, selective logging, forest fires, forest fragmentation. Remote sensing detection of forest disturbances can range from highly detectable to almost undetectable. In this work forest degradation has been defined as a type of "land modification", which means that the original "land cover structure and composition is temporarily or permanently changed", but it is not replaced by other type of land cover type (Lambin, 1999). This work provided a brief review of how remote sensing has been used to detect and map forest degradation and how carbon stocks of degraded forests can be characterized using rapid forest transect surveys. Field data of forest carbon stocks can be

integrated with optical remotely sensed data to regionally characterize forest degradation. The challenges to integrating field-derived carbon estimates with remotely sensed data were also discussed.

Community Measurement of Carbon Stock Change for REDD (Eliakimu Zahabu, Tanzania)
The work presented on community measurement of carbon stock change for REDD, show that there is an interest and willingness from communities to participate in carbon trading; communities have the capacity to undertake forest inventory and carbon inventory; community forestry entails higher social returns that just monetary gain. One solution to forest degradation lies in sustainable forest management by local communities. While reduced degradation is to be credited and rewarded under REDD policy, it may be more important to measure and reward increases in carbon stock due to the enhanced growth, than the decreases in emissions due to reducing the degradation.

Monitoring Degradation in the scope of REDD (Thomas Baldauf, Germany)
For methodologies to observe biomass and carbon stock change in the world's forest area to be cost effective, integrated methods, utilizing terrestrial surveys and remote sensing data are widely applied. Suitable methods are available for assessing deforestation. However, for detecting degradation, which in the context of REDD applies to the partial loss of biomass, even the adaption of existing methods encounter severe constraints. The work presents a comprehensive methodology, which is intended to provide figures on both deforestation and forest degradation in the scope of REDD. As field surveys are time consuming and expensive, particularly in remote areas, they are not conducted as full tallies, but undertaken by statistical sampling approaches.

Review of work on Historical Degradation (Martin Herold, GOFC-GOLD)
Work is being undertaken to identify and promote the use of effective and cost efficient methodologies and tools to monitor forest degradation in terms of changes in forest carbon stocks and sequestration rates in "forests remaining forests" in developing countries. In this respect a group of authors are undertaking an in-depth review of existing and promising new methodologies and tools to generate scientifically sound estimates of historical rates or levels of forest degradation in developing countries. They will contribute to collating and critically reviewing case studies, articles, guidelines, manuals and other documents describing methodologies for assessing historical rates or levels of forest degradation and will compare and contrast different methodologies.

7. Socio-economic functions/ Community level assessments

Forest Resources Degradation Accounting in Mongolia (Hijaba Ykhanbai, Mongolia)
A case study from Mongolia looked at the economic accounting of Forest Degradation. The case study outlined the results of forest resources degradation accounting, covering a period of 30 years (1976 – 2006), measuring the dynamics of change of forest resources in the country. Forest Degradation accounting in that case was considered as a value of the changes of extent of forest resources and its adjustments with economic development indicators of the country. Measuring the forest as a renewable resource was dependent on annual growth and closing stock, and from stock changes due to factors of degradation.

Assessment of Forest Degradation by Local Communities – The Case Study of Ghana (Dominic Blay, Ghana)

In Ghana, the need to curb continuous degradation, led prioritisation of sites based on the level of degradation. Indicators for assessing degradation were developed in collaboration with the local communities. Work focussed on the state of flora resources (biodiversity), the state of streams and rivers (protective functions) and the state of fire and soil fertility (forest health). The approach relied on skills that are locally available and indicators that are based mainly on visual assessments. It is an approach that could easily be applied at the local level elsewhere. The approach could be improved using statistical analyses.

Local Level field assessment of land degradation (Sally Bunning, FAO)LADA- FAO
Land Degradation Assessment in Drylands (LADA look at soil properties and soil erosion, water quality and quantity, and vegetation and land use and biodiversity. They define land degradation as "The reduction in the capacity of the land to perform ecosystem functions and services that support society and development". They use a multi-scale participatory process with an integrated analysis of human and environmental indicators.

Surveillance et Suivi de la Santé des Forêts au Maroc (Taoufiq Aadel, Morocco)
The use of permanent plots to determine and follow the state of forest health was described in a case study from Morocco. A systematic network of permanent plots (8 x 8 km) was established that uses indicators that provide a simple, rapid and reliable assessment of information on forest health. The operation was conducted in collaboration with the National Forest Inventory (NFI). The permanent plots have made it possible to report on the annual state of forest health, to monitor changes over time and to anticipate any potential phytosanitary imbalance.

8. Reversing Forest Degradation

Global Mapping and Monitoring of Forest Degradation: The Intact Forest Landscapes Method (Lars Laestadius, WRI)
The IFL Method uses high spatial resolution satellite images to identify and map large un-degraded areas called Intact Forest Landscapes (IFL), defined as unbroken expanses of natural ecosystems in the zone of forest growth without signs of significant human activity and at least 50,000 hectares in size. The method produces an IFL map which shows the boundary between unaltered forest landscapes (where most components, including species and site diversity, dynamics and ecological functions remain intact) and altered or fragmented forests (where some level of timber extraction, species composition change and alteration of ecosystems dynamic has taken place).

The paper presents the results of a global assessment of forest degradation and several examples of regional-level monitoring. Forest degradation was measured at the global, biome and national levels based on the distribution and proportion of IFL areas while the detailed boundary between 'intact' and 'non intact' forest landscapes was employed as a baseline for monitoring of forest degradation. The IFL method is a rapid and cost-effective practical solution for assessing forest degradation and intactness at the global and regional scales.

The method allows users to essentially define or identify the areas that can be considered not degraded, and thus eliminate them from the rest of the forest land that would potentially be included in any degradation survey.

Addressing Forest Degradation in the Context of Joint Forest Management in Udaipur, India (Michael Kleine, IUFRO)

Many rehabilitation projects define forest degradation through an indirect three-tiered approach at the local level, which covers the socio-economic situation, the reduction in goods and services from forests and the status of forest degradation through visual field inspections. Rehabilitation targets include: Increased ground vegetation cover (improved grass production), reduced soil erosion (controlled grazing; check dams), increased tree biomass, including improved fire wood production (forest protection; planting of hedgerows)

Quantifying progress towards achieving the rehabilitation targets requires monitoring of indicators (biological, structural): data on "before and after scenarios" (on project-by project basis). Rehabilitation measures lead to higher forest biomass levels, in order to achieve improved productivity. This may or may not be in line with other goals (e.g. carbon, biodiversity).

Investments into forest rehabilitation may include field work (planting; fencing; check dam construction) and changes in the management of forests through policies and regulations, local institutions, capacities (including training of forestry staff), and employment and markets. Large portions of investments are needed to bring about a social transition to SFM. Otherwise rehabilitation results (e.g. improved production; reduced emissions) are only short-lived.

Global Partnership on Forest landscape Restoration (Stewart Maginnis, IUCN)
Forest Landscape Restoration brings people together to identify, negotiate and implement practices that restore an agreed optimal balance of the ecological, social and economic benefits of forests and trees within a broader pattern of land uses
Aims

- Support partners in effectively restoring degraded forest landscapes
- Establish and improve relationships among different interest groups involved in forest landscape restoration
- Encourage the development and use of innovative FLR approaches and methodologies

Underlying principles:

- Multi-functional:
- Situation specific:
- Participation:
- Scale:
- Adaptive Management

FLR provides a potential remedy to degradation as currently defined, and is a useful way of framing the enhancement of carbon stocks. However flexibility is required and several learning sites indicate that countries are not bound to follow the forest transition curve.

Forest Ecosystem Resistance and Resilience and Biodiversity (Ian Thompson, CBD)
Resilience is the capacity of an ecosystem to recover after disturbance. Disturbances may move the forest to a new state or age class. The stability of a forest state is a concept related to resilience. Most primary forest ecosystems are resistant and resilient to natural disturbances**.** Resilience of a forest is a function of biodiversity at many scales: genes, species, and regional diversity among ecosystems. Biological diversity also underpins the ecological goods and services from the forest. Loss of biodiversity may alter the forest resilience and will result in reduced goods and services. Loss of resilience means uncertainty about future forest condition. Most often, degraded forests are unstable because they lack diversity and functionality. Degraded forests always provide fewer ecosystem services.

Diseases and disturbances do not affect all species equally, more diversity means less loss to these factors.

Ecological principles for restoring degraded forests to improve stability and resistance:

- biologically diverse systems tend to be more productive, stable, and produce more goods and services than simple ecosystems (e.g., monotypic plantations)
- re-forest by using native species and by using natural forests as models
- maintain landscape connectivity
- manage to maintain genetic diversity (e.g., reduce selective harvest of 'best' trees) and plant several seed stocks
- protect primary forests and species at the edges of their ranges
- plan to reduce invasive species

Conclusions

- Evidence supports the concept that biodiversity confers resilience within a forest ecosystem at many scales
- Mechanisms include redundancy, resistance to disease, increased productivity, genetic capacity to adapt to change
- Loss of biodiversity can result in an ecosystem condition that is difficult to change or that provides an uncertain future condition
- Biodiversity also provides most ecosystem goods and services
- Degraded forests may be stable, although more often they are not, but they will provide reduced goods and services

Key messages/Conclusions

The generic definition of forest degradation provides an adequate umbrella for international level and a common framework to develop specific definitions for particular purposes.

The concept of degradation involves both the state of the forest and the degradation process:

- The state of degrading or degraded forest may have to be defined to differentiate it from primary and sustainably managed forest and from non-forest to ensure comprehensive coverage (that is needed e.g. for climate change mitigation and adaptation instruments). This may be determined by the management objectives.
- The degradation process reduces the delivery and distorts the balance of forest goods and services.
- Equally important is to consider improvement processes (restoration, rehabilitation and natural recovery of forests)

Degradation is related to temporal and spatial scales:

- There is need to have a long-term view in assessing reduction (or improvement) in forest goods and services so that temporary changes at stand level due to regular forest management operations (e.g., thinning, selective cutting) are not considered degradation. On the other hand, short-term changes need also be monitored as they may impact livelihoods of forest-dependent people. [A priori specification of the temporal scale in the definitions of forest degradation is not recommended].
- Degradation needs to be addressed both at stand and higher levels (forest management unit, landscape, sub-national, national, regional and global) and for various forest types for various purposes. This should be considered in stand-level focused definitions.

Trade offs exist: There are trade-offs between different forest goods and services and the balance between them is determined in management objectives. The trade-offs also need to be considered in assessing forest degradation.

Management objectives: In setting management objectives there is a general trend from wood production towards more focus on a wide range of ecosystems services of forests which has implication for assessment of forest degradation. If management (or use) objectives for a specific forest area (e.g. FMU, forest stand) are available, a more target-oriented and cost-effective assessment of forest degradation can be carried out.

Information Needs: For defining, monitoring and assessing forest degradation it is necessary to define for what purpose and on what aspects information is needed, for whom and how the information is going to be used. This links back to the objectives of management, which must be clearly established.

Separation of natural and human induced causes: Both human induced and natural causes cause forest degradation. Although their separation is often difficult due to inter-linkages, for the design of policy instruments and support programmes separation of these causes may be necessary.

Reference states, thresholds and baselines: It is particularly challenging to establish appropriate reference states, thresholds and baselines for forest degradation due to limitations

of data, different management objectives and issues of scale. Thresholds need to be identified and applied at a local level. Reference data could be considered as the recovery function according to the management objective that has been set.

Status and process: In assessing forest degradation there is a need to separate the status and the process of degradation, drivers and impacts (environmental, social and economic). The elements of Sustainable Forest Management (SFM) provide a useful comprehensive framework for identifying relevant aspects related to forest degradation.

Targets: In addressing forest degradation there is a need to establish specific targets for improvement measures and addressing the drivers of degradation in order to raise necessary resources through various mechanisms of financing. This calls for adequate information on the status and process of degradation as well as cost-benefit analyses and economic valuation of lost benefits due to forest degradation, e.g. through forest accounting combined with use valuation of environmental services.

Country and location specific character: This calls for flexibility in defining forest degradation and indicators for its assessment. It may be more important to have consistent information on changes over time within a country than fully comparable information between countries at a given point of time. However, at international level there is a need to have common definitions for selected key indicators.

Indicators and Methodologies:
Common indicators for monitoring and assessing forest degradation can developed for the following key element to be used in assessing forest degradation:

- Biomass (e.g. growing stock, forest structure)
- Biodiversity (e.g. species composition and richness, habitat fragmentation)
- Forest health (e.g. fire, pest and diseases, invasive and alien species)
- Forest goods obtained (compared against sustainably managed forests)
- Soil quality (as indicated by cover, depth and fertility)

Promising methods to monitor and assess forest degradation include:

- Combination of remote sensing, GIS and field observations
- Advanced technologies
- Community-based assessment

Involvement of local communities in assessing forest degradation can be a suitable approach for collection of field data but it needs adequate training and supervision.

There is major potential to address forest degradation by involvement of local communities but they need adequate understanding of the problem and its consequences for their livelihoods and they should have sufficient incentives to take necessary action. To achieve this they should also understand (i) forest classifications and other basic technical elements as well as (ii) compensation mechanisms to engage them fully in taking necessary improvement measures. Local communities should realize benefits, other than financial to be motivated to take action.

Monitoring of the degradation process should be systematic and continuous, involving more than two points of time.

Assessment of the status or degree of degradation can be made through comparing non-degraded and degraded forests in similar ecological and socio-economic conditions. Another approach is to use periodic data on changes in area by forest categories in two points of time.

Recommended actions

International Definitions

1. Some of the existing international definitions should be improved in terms of their clarity, consistency and compatibility including clarity about their formal status. (e.g. ITTO, CBD).

Climate change discussions

2. Improved understanding of assessment and monitoring of carbon emissions and fluxes from forest degradation need to take into account the inter-linkages between biomass, biodiversity and forest health, and forest carbon. In other words, in order to understand how or what to assess and monitor as regards forest degradation (as a state and process), it is also necessary to take into account the linkages with biodiversity, forest health, etc. It is not so much the means or methodologies per se.

3. In implementing REDD+ actions, forest carbon assessment and monitoring need to be carried out at national level to avoid leakage. A comprehensive approach (including non-degraded, degraded and non-forest) could avoid leakage between different categories.

National level information dissemination

4. The scope of national forest inventories should be expanded to include the key elements needed to assess forest degradation

5. Key common internationally applicable indicators should be identified for forest degradation to be applicable in FRA

6. Supporting data sets should be developed at national level e.g. on national Red Lists of Threatened Species

Capacity Building

7. Available methodologies and tools to address forest degradation should be further developed including guidelines for measurement and corrective action including those targeted at local communities

8. Efforts to measure and assess forest degradation should be intensified through case studies, pilot measurements and their replication, and dissemination including ensuring policy feedback

9. Support should be provided to capacity building in national forest inventories and education and training at different levels including local communities

10. Support should also be provided to countries to meet international reporting requirements on forest degradation

11. Basic research should be expanded to address forest degradation and its impacts on ecosystem services and their inter-linkages.

Annex 1.

Technical Meeting
Assessment and Monitoring of Forest Degradation
Rome, Italy, 8-10 September 2009, Mexico Room, D211

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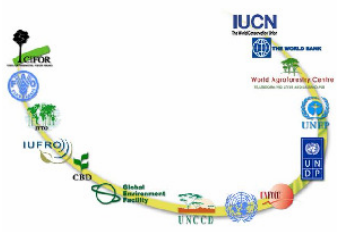
Annex 2.



Technical Meeting
Assessment and Monitoring of Forest Degradation

Rome, Italy, 8-10 September 2009, Mexico Room, D211

TIMETABLE

Day 1 – Tuesday 8 September

Morning

8:30 - 9:30	REGISTRATION
Opening Session	Chair: José Antonio Prado, Director FOMD, FAO
9:30 - 9.45	Opening Remarks (Jan Heino, ADG Forestry Department, FAO) Introduction of Participants Objectives and expected outcomes Adoption of the Agenda
9:45 – 10:00	Assessment and Monitoring Forest Degradation: Why, What and How? (Mette Wilkie, FAO)
10:00 – 10:15	Process – questionnaires, literature searches, case studies (Victoria Heymell, FAO)
10:15 – 10:30	Annotated Bibliography – analysis of material (Evisa Abolina, UNFF)
10:30 – 11:00	*Coffee break*
Technical session 1:	**Defining Forest Degradation (Chair: Mette Wilkie, FAO)**
11:00 – 11:30	Towards Defining Forest Degradation: Comparative Analysis of Existing Definitions (Markku Simula, Consultant FAO)
11:30 – 12:30	Facilitated discussion
12:30 – 14:00	*Lunch*
Afternoon	***Presentation of case studies linked to the themes of Sustainable Forest Management (SFM)***

Technical session 2:	**Extent of Forest Resources (Chair: Peter Csoka, UNFF)**
14:00 – 14:15	Measuring and Monitoring Forest Degradation through National Forest Assessments (Mohamed Saket, FAO)
14:15 – 14:30	Analysis of the Normalized Differential Vegetation Index (NDVI) for the detection of Degradation of Forest Coverage in Mexico 2007-2008 (Carmen Lourdes Meneses Tovar, Mexico)
14:30 – 14:45	Forest Degradation in Nepal: review of data and methods (Resham Bahadur Dangi, Nepal)
14:45 – 15:00	Extrait de l'inventaire forestier des forêts classées autour de Bamako (Nianti Ousmane Tangara, Mali)
15:00 – 15:15	Questions and Discussion
15:15 – 15:30	*Coffee break*
Technical session 3:	**Biological Diversity (Chair: Ian Thompson, CBD)**
15:30 – 15:45	Assessing forest degradation due to fragmentation – developing biodiversity-relevant measures (Val Kapos, UNEP-WCMC)
15:45 – 16:00	Occupation des sols des forêts classes du Niger et l'analyse des dynamiques du changement (Ibro Adamou, Niger)
16:00 – 16:15	Bush Meat (Robert Nasi, CIFOR)
16:15 – 16:30	Impact of developmental projects in the humid evergreen broad-leaved forest: A case of Wasabi Pilot Project at Lamperi, Western Bhutan (Pema Wangda, Bhutan)
16:30 – 17:00	Questions and Discussion
17:30 – 18:30	*Cocktail (Terrace, 8th floor)*

Day 2 – Wednesday 9 September

Morning

Technical session 4:	**Productive Functions of Forests (Chair: Jürgen Blaser, ITTO)**
9:30 – 9:45	Etude de cas sur la dégradation des forêts de la République Démocratique du Congo (Christophe Musampa, Democratic Republic of Congo presented by François Wencelius)
9:45 – 10:00	An Operational Approach to Forest Degradation - Forest Stock Measurement Chile (Carlos Bahamondez, Chile)
10:00 – 10:15	Measuring ecological impacts from logging in natural forests of the Eastern Amazônia as a tool to assess forest degradation (Marco Lentini, Brazil)

10:15 – 10:30	Discussion
Technical session 5: UNFCCC)	**Contribution to the Carbon Cycle (Chair: Jenny Wong,**
10:30 – 10:45	Monitoring and Reporting Forest Degradation under UNFCCC (Danilo Mollicone, FAO)
10:45 – 11:00	*Coffee break*
11:00 – 11:15	Integrating Forest Transects and Remote Sensing data to Quantify Carbon Loss due to Forest Degradation: A case study of the Brazilian Amazon (Carlos Souza, Brazil presented by Danilo Mollicone)
11:15 – 11:30	Community Measurement of Carbon Stock Change for REDD (Eliakimu Zahabu, Tanzania)
11:30 – 11:45	Monitoring Degradation in the scope of REDD (Thomas Baldauf, Germany)
11:45 – 12:00	Review of work on Historical Degradation (Martin Herold, GOFC-GOLD)
12:00 – 12:30	Questions and Discussion
12:30 – 14:00	*Lunch*

Afternoon

Technical session 6:	**Socio-economic functions/ Community level assessments (Chair: Robert Nasi, CIFOR)**
14:00 – 14:15	Forest Resources Degradation Accounting in Mongolia (Hijaba Ykhanbai, Mongolia)
14:15 – 14:30	Assessment of Forest Degradation by Local Communities – The Case Study of Ghana (Dominic Blay, Ghana)
14:30 – 14:45	Local Level field assessment of land degradation (Sally Bunning, FAO)
14:45 – 15:00	Surveillance et Suivi de la Santé des Forêts au Maroc (Taoufiq Aadel, Morocco)
15:00 – 15:15	Questions and Discussion
15:15 – 15:30	*Coffee break*
Technical session 7:	**Reversing Forest Degradation (Chair: Stewart Maginnis, IUCN)**
15:30 – 15:45	Global Mapping and Monitoring of Forest Degradation: The Intact Forest Landscapes Method (Lars Laestadius, WRI)

15:45 – 16:00	Addressing Forest Degradation in the Context of Joint Forest Management in Udaipur, India (Michael Kleine, IUFRO)
16:00 - 16:15	Global Partnership on Forest landscape Restoration (Carole Saint-Laurent, IUCN)
16:15 – 16:30	Forest Ecosystem Resistance and Resilience and Biodiversity (Ian Thompson, CBD)
16:30 – 16:45	Questions and Discussion
16:45 – 17:00	Briefing for Working Group Sessions

Day 3 – Thursday 10 September

Morning

9:00 – 12:30	Working Group Sessions Working Group 1 – Forest extent, condition and health Working Group 2 – Reduced capacity to provide ecosystem services Working Group 3 – Reduced capacity to provide goods and socio-economic services
10:30 – 10:45	*Coffee break*
12:30 – 14:00	*Lunch*
14:00 – 15:30	Chair: Mette Wilkie Presentations by working groups (20 minutes each), followed by questions and discussion
15:30 – 15:45	*Coffee break*
15:45 – 16:45	Chair: Victoria Heymell Key messages and recommended actions (Stewart Maginnis)
16:45 – 17:00	Closing Remarks

Annex 3. Presentations

Presentations will be included here. They are also available on the CPF site: http://www.fao.org/forestry/cpf/degradation/en/

Annex 4 Working Groups

Some working assumptions and general remarks were provided to the working groups:

1. The general definition of forest degradation (a reduction in the capability to provide goods and services) is broad enough – and we keep this as an overall framework definition
2. Degradation is location-specific
3. Degradation is scale dependent (spatial and temporal)
4. Degradation is both a state and a process (the opposite process is "improvement" which can happen through natural recovery, restoration or rehabilitation). Assessment of the state requires thresholds, monitoring of the process can be done focusing on trends
5. While we should allow flexibility in some interpretation of definitions (to suit local circumstances), there need to be a common definition and comparable data for some indicators of degradation (e.g. when linked to a financial mechanism)

Guidance for the working groups:

1. The questions are suggestions for how the discussion could be guided – the group is free to discard or modify these
2. As a general guide we suggest that you:
   - Do not re-invent the criteria and indicator processes and spend time coming up with a long list of potential indicators
   - Look at the ideas on the Blue Wall and those presented in the case studies. Focus on a few of those (those that can be used as proxies for more than one aspect and a few essential specific indicators)
   - Decide whether a common/global definition exists/is needed (and provide ideas if appropriate)
   - Identify suitable assessment methodologies for these
   - Identify further actions needed

Questions:

1. Building on the cards, the presentations and your own knowledge, list the most critical/best indicators of forest degradation in terms of your working group theme
2. Which of these might be used as proxy indicators for several different aspects of forest degradation?
3. Which indicators would this group recommend as key indicators for national level reporting by all countries?
4. For which of these do adequate definitions and proven assessment methodologies exist?
5. What further actions are needed to facilitate regular monitoring of these indicators? (e.g. harmonization of definitions, capacity building, R&D) By whom?

Working Group Discussions

Working Group 1: Forest Degradation in terms of forest extent, condition and health
Key words: Fragmentation, forest cover, structure, dynamics, forest health and vitality

Facilitator(s): Val Kapos, Michael Kleine
Note taker: Jean-Louis Blanchez
Members:
Taoufiq Aadel, Evisa Abolina, Resham Bahadur Dangi, Carmenza Robledo, Carmen Lourdes Meneses Tovar, Nianti Ousmane Tangara, François Wencelius

Main conclusions

- The first step is to define forest using the already agreed indicators and definitions. After, degradation and restoration potential are going to be defined as qualification of the existing forest
- Degradation is considered as a process in time
- Restoration is the vice-versa process (in time)
- Degradation and restoration are related to a specific management or use objective. The group identified the following possible management or use options:
    - Biodiversity conservation
    - Scenic beauty
    - Cultural value
    - Carbon management
    - WFP
    - NWFP
    - Water
- Therefore in determining which are the relevant indicators for measuring and assessing forest (landscape) degradation and restoration depends directly to the management or use objective
- The indicators only make sense depending of the management use options. Therefore the main recommendation for the countries is to define their management priorities even before collecting data.

Working Group 2: Forest Degradation in terms of reduced capacity to provide ecosystem services
Key words: Biodiversity conservation, Protection of soil and water, Forests and the carbon cycle

Facilitator(s): Ian Thompson, Stewart Maginnis
Note taker: Victoria Heymell
Members:
Thomas Baldauf, Sally Bunning, Martin Herold, Lars Laestadius, Pema Wangda, Jenny Wong, Eliakimu Zahabu

Key issues/conclusions:

- Degradation is location-specific
- Degradation is scale dependent (spatial and temporal)
- Degradation is both a state and a process (thresholds)

- Obvious need for flexibility but also need for some indicators that permit cross site comparability

Categories of Ecosystem Function were defined as: Carbon (biomass), Biodiversity, Food, Water and Soil. These align broadly with the Millennium Ecosystem Assessment (MA)

Possible Indicators (as identified from cards):
- Soil / water quality, Watershed quality
- Species composition, Species richness, Species presence / absence
- Stand density, Canopy cover / structure, Deadwood structure
- Comparison to «natural » reference, Biomass

Thresholds may exist and they need to be examined over time with data trends. Thresholds may be different for different indicators; they might be set for socio/political reasons. Their utility is more apparent at the local level and less apparent at higher levels.

Levels or scales for measurements defined as: global, regional, national, sub-national by forest type, local by landscape or by stand. Landscapes can be defined biophysically, functionally, or as a social or local level construct. However there needs to be some level of sub-national forest typing. The appropriate scale is relative to the goods and services being determined.

The time scale of reporting depends on what you are measuring. It is relative to the indicator or process which you are measuring.

Indicators	Scales				
	Global	Regional	National	Forest type	Local
Soil quality				X	X
Erosion rate				X	X
Water quantity		X	X	X	X
Water quality		X	X	X	X
Species composition	X	X	X	X	X
Forest stand variables (canopy stocking)				X	X
Landscape variables (land cover, fragmentation)	X	X	X	X	X
Carbon pools (5)	X	X	X	X	X

It was agreed that adequate definitions and assessment methodologies are available for all of these indicators. Lund's proposed common ground indicators (soil, biodiversity, biomass (carbon)) provide a good starting point. As a minimum to define degradation we need to measure species composition, landscape pattern, and carbon pools in some way.

Further actions are needed to facilitate regular monitoring of these indicators (e.g. harmonization of definitions, capacity building, R&D). National Forest Inventories for example are not in all countries and not standardized.
By whom? Who would undertake the further actions?

Working Group 3: Forest Degradation in terms of reduced capacity to provide goods and socio-economic services

Key words: Wood and non-wood forest products, recreation, education, protection of cultural values, livelihoods, employment

Facilitator(s): Juergen Blaser, Peter Csoka
Note taker: Rebecca Tavani
Members:
Ibro Adamou, Carlos Bahamondez, Faizul Bari, Dominic Blay, Robert Nasi, Marco Lentini Hijaba Ykhanbai

Concluding points:

1) Lots of factors that affect forest state (and degradation) (such as policy, markets, globalization, institutional setting, land tenure etc) – important for forest degradation, but out of reach in terms of measurability for these purposes
2) We can develop indicators for forest goods measurable at local level and which can be aggregated at national level (ex/ ration of sustainable production/gross)
3) Socio-economic indicators more appropriately measured at local level (need for capacity building from FAO) and more appropriately assessed locally (particularly for restorative purposes). These indicators linked to goods, but cannot be aggregated meaningfully at national level. Need to develop meaningful macroeconomic indicator at national level. Some examples of socio-economic indicators: employment, household income, population increase in forested areas, etc. (socio-economic drivers important because theory behind REDD based on clear analysis of drivers of deforestation & FD)
4) Capacity building needs – building awareness of those tools that already exist

Annex 5.

DEGRADATION MEETING
(CARDS)

Indicators: simple and cost effective – Indicateurs simples et "bon-marché"

What are the main common characteristics? Quelles sont les principales caractéristiques communes?

Degradation in relation to the objective Dégradation en relation avec les objectifs

GOODS, AND SOCIOECONOMIC - Produits et services socio-economique

Trends of goods production - tendance de production de biens (produits)

Change of the capacity in economic terms - Changement de la capacité en termes économiques

Sustainable livelihood for people who exploit forest - Bien-être durable pour les personnes qui exploite (vive de) la forêt

Human activities affecting forest/carbon - Activités humaines affectant la forêt/carbone

National level market prices and poverty - Les prix du marché aun niveau national et pauvreté

Socioeconomic services - services socio-économiques

Socioeconomic users (economic terms) - utilisateurs socio-économiques (en termes économiques)

Existing policies and plans - Politiques et plans existants

Forest provides water for hydropower generation - La forêt fournit de l'eau pour générer de l'électricité

NTFP/NWFP - PFNL – Produits forestiers non-ligneux

Medicinal plants - Plantes médicinales

SERVICES - services

How much services were affected - De combien les services ont-ils été affectés (touchés)

Ecosystem services - Services écosystémiques

Forest users goods, service - Utilisateurs de biens et de services forestiers

FRAGMENTATION AND MEASUREMENT - Fragmentation et mesures

Map alteration and fragmentation - Cartographier l'altération et la fragmentation

Map relationship actual/potential stocking - Cartographier la relation entre le stock actuel/potentiel

Map species/age class matrix - Cartographier une matrice des espèces / classes d'âge

Define rehabilitation targets - Définit les objectifs de réhabilitation

Number of dying trees - Nombre d'arbres mourants

Evidence of cuttings - Prevue évidente de coupe

Landscape level forest fragmentation - niveau de fragmentation du paysage forestier

Fragmentation - fragmentation

Percentage of area affected by intervention - pourcentage de la superficie affectée par l'intervention

Extent and severity - Étendue et sévérité

Canopy cover structure - Structure de la canopée

Stock change - Changement du stock (materiel sur pied)

Stocking level - Niveau du stock

Regeneration capacity - Capacité de regeneration

Long term impact on carbon stock - Impact à long terme sur le stockage du carbone

Percentage opening in forest canopy - Pourcentage de l'ouverture de la canopée forestière

Forest cover - Couverture forestière

Forest extent - Étendue forestière

Density growing stock, basal area stem numbers - Densité du materiel sur pied, surface terrière, nombre de tiges.

BIOLOGICAL - Biologie

Number of key species - Nombre d'espèces principales (clé)

Area affected by ... Superficie affectée par

Naturalness (respective to the sites, what is there vs. what should be) - Nature (appropriée aux sites, "ce qu'il y a" en opposition avec "ce qui devrait être")

Biodiversity changes - Changement de la biodiversité

Structure - Structure

Soil nutrients - Éléments nutritifs du sol

Loss of key structures (age/type of forest) - Perte des structures principales (âge/type de forêt)

Bird nests - nids d'oiseaux

Loss of key species (age/type of forest) - Perte des espèces principales (âge/type de forêt)

Forest cover specific to typology - Couverture forestière spécifique à la typoligie

Tee species composition - composition des espèces d'arbres

Phenology - Phénologie

Species richness - Richesse en espèces

Species composition - Composition des espèces

Biodivesity (2) - Biodiversité

Number of species - Nombre d'espèces

Loss of biodiversity - Perte de la biodiversité

Biodiversity against natural state reference - Biodiversité en opposition avec une reference de l'état naturel

Species diversity – Diversité des espèces

Three parameters - Paramètres de arbres

Health – Santé

Biomass - Biomasse

Basal area - Surface terrière

Carbon stock - Stock de carbone

Species composition - Composition des espèces

Loss of biomass by agre/tyoe - perte de la biomass par âge/type

PHYSICAL CONDITIONS - Conditions physiques

Surface - Surface

Recovering - Récupération

Species – Espèces

Timber - Grume

Watershed protection - Protection de bassin versant

Definition of functions - Définition de fonctions

Stand structure – Structure du peuplement

Forest cover - Couverture forestière

Water regulation - Régulation des eaux

Change of species and composition - Changement des espèces et composition

Soil/hidrological functions - Sol/functions hydrologiques

Soul quality - Qualité des sols

Air quality - Qualité de l'air

Soil conditions - Conditions du sol

Geological service - Service géologique

Pollinetia - Pollinisation

SERVICES - Services

Services trends + service index - tendance et index

Land use change - Changement de l'utilisation des terres

Land history - Historique des terres

Role of watershed management - Rôle de la gestion des bassins versants

Environmental productivity - Productivité environnementale

Canopy regeneration status - Statut de la regeneration de la canopée

Condition of forest: services and explotations - Conditions de la forêt: services et exploitation

How to differentiate sustained yield system/.... vs depratation - Comment différencier un système de production durable

Disturbed/undisturbed - Modifié / non modifié

Annex 6. Background Documents

Background documentation to the study including the analysis of definitions can be found on the CPF site.

"Towards Defining Forest Degradation: Comparative Analysis of Existing Definitions" Markku Simula can be found on the CPF site:
http://www.fao.org/forestry/cpf/degradation/en/

Case studies prepared during the study are to be published in a separate document.