Helsinki Summer School
Environmental Services in Forest Management
10 August 2010

Forest Degradation and Its Measurement

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Objectives of the Presentation

- Help understand different aspects of forest degradation
- Clarify related terms and concepts
- What indicators can be used in measurement

Outline of the Presentation

1. Context
2. Drivers of forest degradation and deforestation and their linkages
3. Degradation process; purpose and level of assessment
4. International definitions of forest degradation and their elements
5. National approaches to assess different aspects of forest degradation
6. Indicators for measurement
7. Debate
8. Response
9. Conclusions

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Context

- Globally, **about 1 billion ha** is reported to be degraded forests and forest lands. This represents about 25% of the world's forest area and about six percent of the total land area (Global Partnership on Forest Landscape Restoration 2010).
- About 80% of the total degraded forest area is located in the **tropics** where degradation is frequently human induced.
- Degradation also occurs in **temperate and boreal zones** where natural causes such as fire, flooding, wind, pest and diseases, alien invasive species etc. are typical reasons.
- Forest degradation is thought to result in similar **emissions** to those due to deforestation. Degradation reduces land **productivity** and all the environmental services of forests.
- **About 350 million people** including indigenous peoples, local communities and smallholders are estimated to be affected by forest degradation.

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MS1 the sheer extent of degraded forests is a huge opportunity but also an enormous challenge. Further degradation of these forest lands should be halted and they should be brought under sustainable management to enhance their carbon storage capacity and various other environmental and socio-economic benefits, including ecosystem restoration.

There are at least 300 to 350 million people consisting of indigenous peoples, local communities, settlers and smallholders who depend on the degraded forests and forest lands for their livelihoods and they are often suffering from extreme poverty. Bringing these degraded areas under sustainable management would create employment and income for these people provided that capacity can be built, financial support can provided and the values and needs of these people are considered in the safeguards of the restoration programmes such as REDD+.

Markku Simula; 21.7.2010

Drivers of forest degradation and deforestation (1/2)

Deforestation

- Agricultural expansion and other land conversion
- Infrastructure extension

Degradation

- Excessive wood harvesting for timber and fuel, creaming (high grading), illegal logging
- Shortening fallows
- Natural reasons (fire, pests and diseases, wind, flooding, snow, etc.)

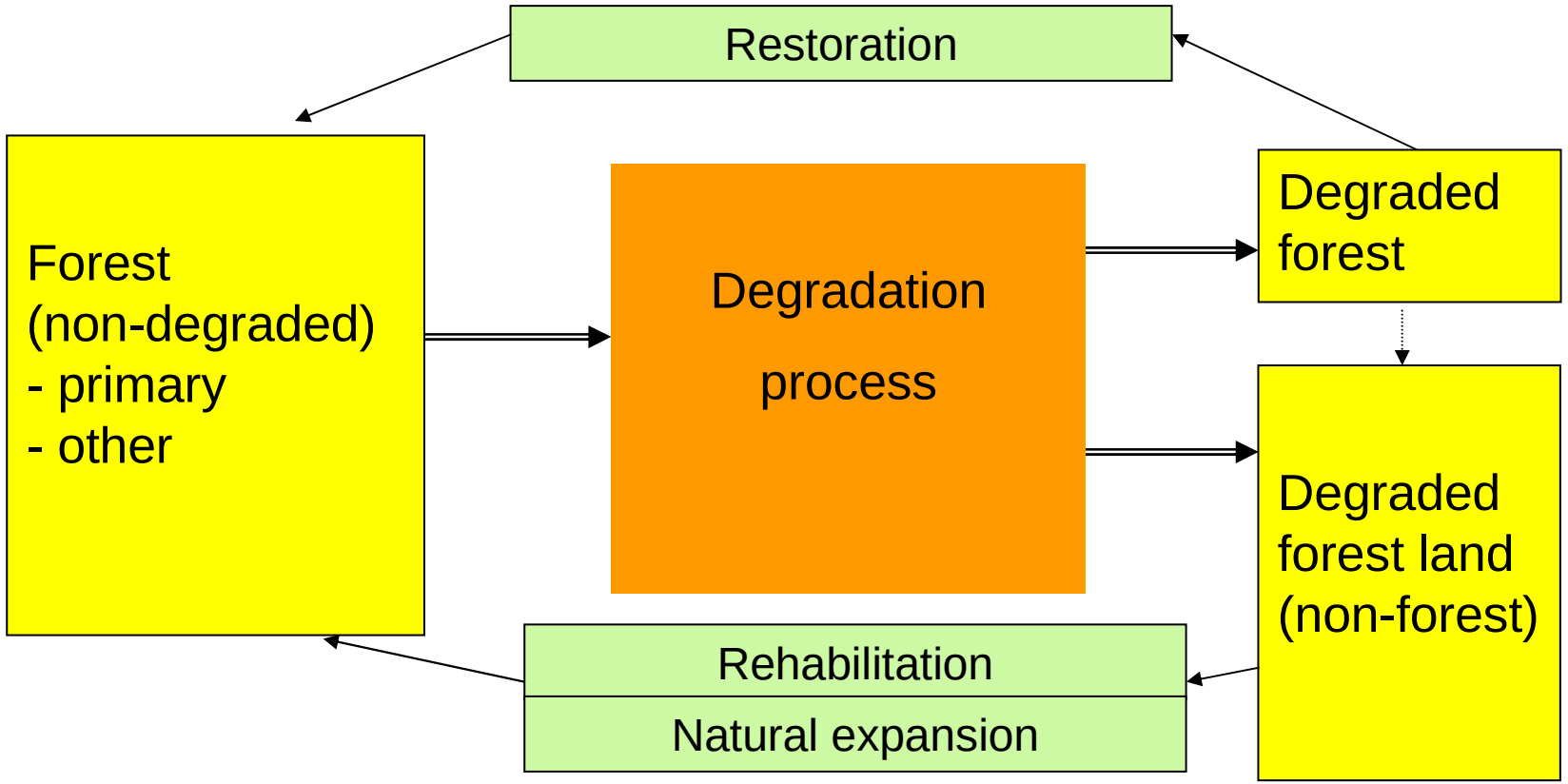
Underlying drivers

- Poverty, lack of alternative economic opportunities
- Unclear, disputed or suppressed land rights
- Weak governance, particularly corruption, lack of enforcement, transparency and accountability
- Market demand for timber and non-timber forest products
- Political and economic factors (external investors, skewed access to information, finance and government support, in appropriate tax and incentive regimes, etc.)

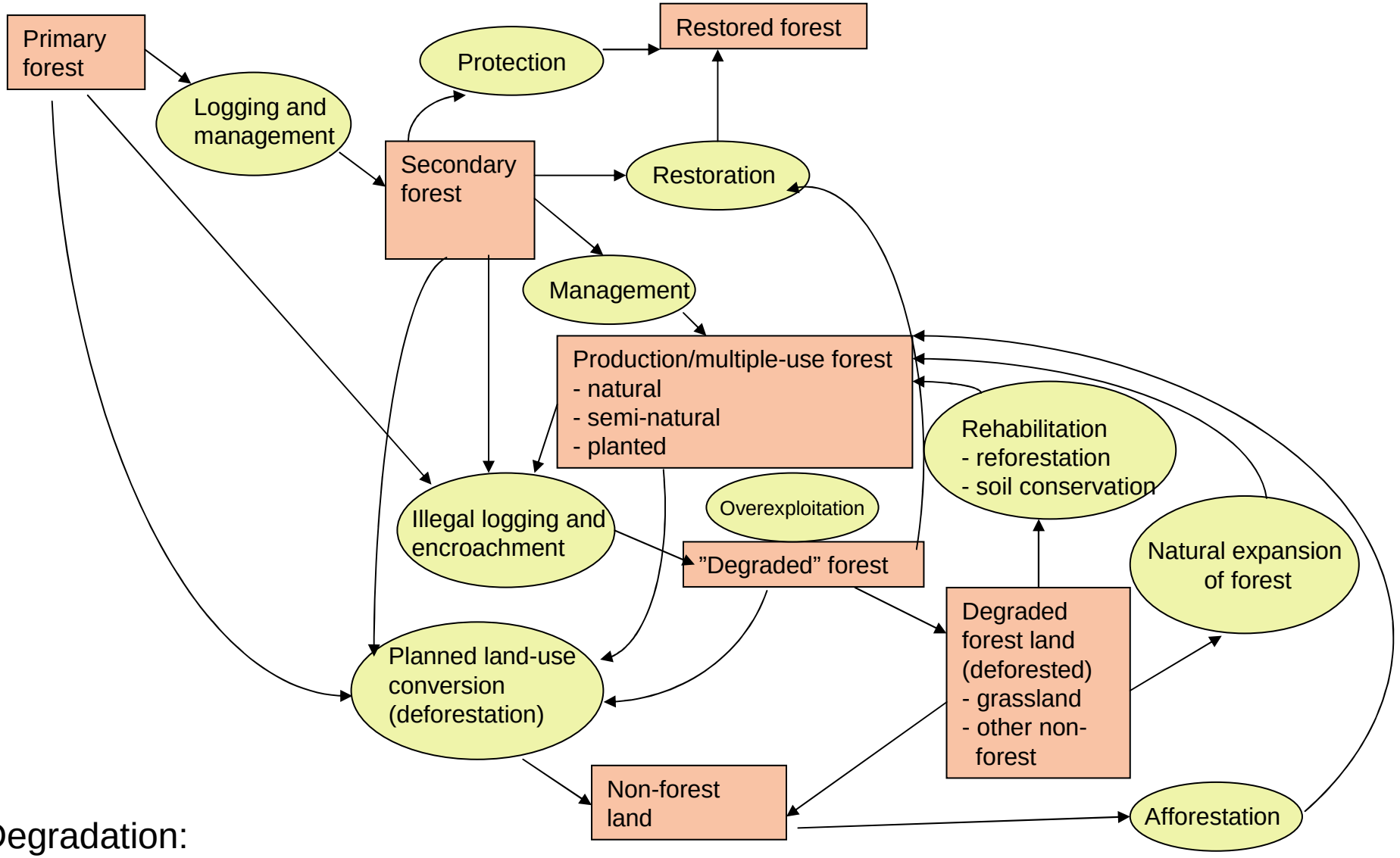
Drivers of forest degradation and deforestation (2/2)

- Human and non-anthropogenic factors are often interlinked
- Direct drivers are often interlinked (logging finances clearing, etc.)
- Degradation often leads to deforestation
- Underlying factors are largely common for deforestation and human-induced degradation
- Country and location-specific factors vary extensively and degradation processes are difficult to generalise
- Processes can be abrupt (e.g. agricultural expansion, illegal logging) or take long time periods (e.g. fuelwood collection in the Sahel)
- REDD-type performance-based payment mechanisms would require information on the links between drivers and degradation

Degradation and Related Processes



Simplified Illustration of Human-induced Forest Degradation



Degradation:

➔complex, multifaceted highly location-specific phenomenon

➔does not easily lend itself for generalizations

Generic Definition of Forest Degradation

Definition:

The reduction
of the capacity of a forest
to provide goods and services

Source: Second Expert Meeting on Harmonization of Forest-related Definitions (2002)

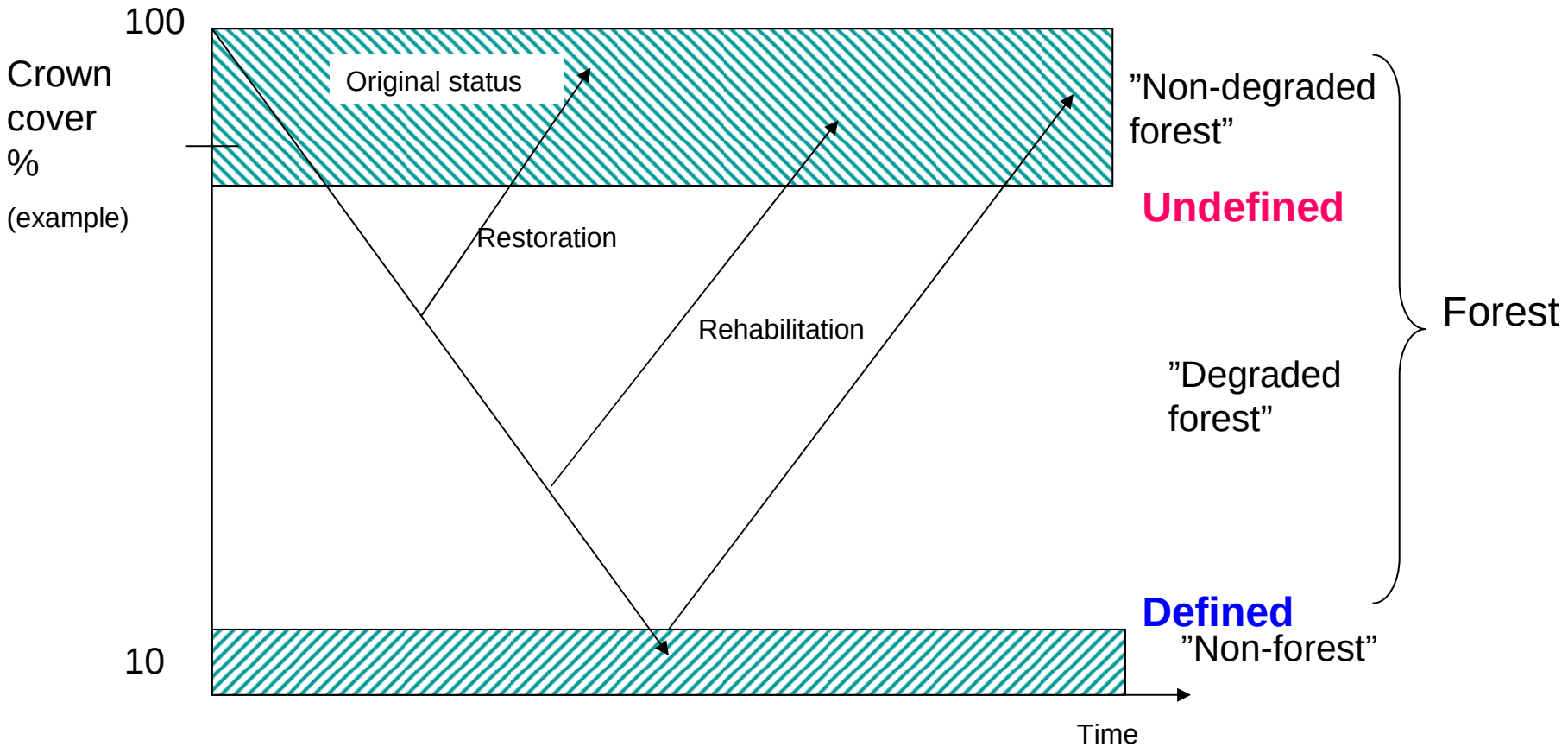
But

degradation is often difficult to detect and the forest capacity is difficult to measure.

The generic definition has proved to be hard to operationalise.

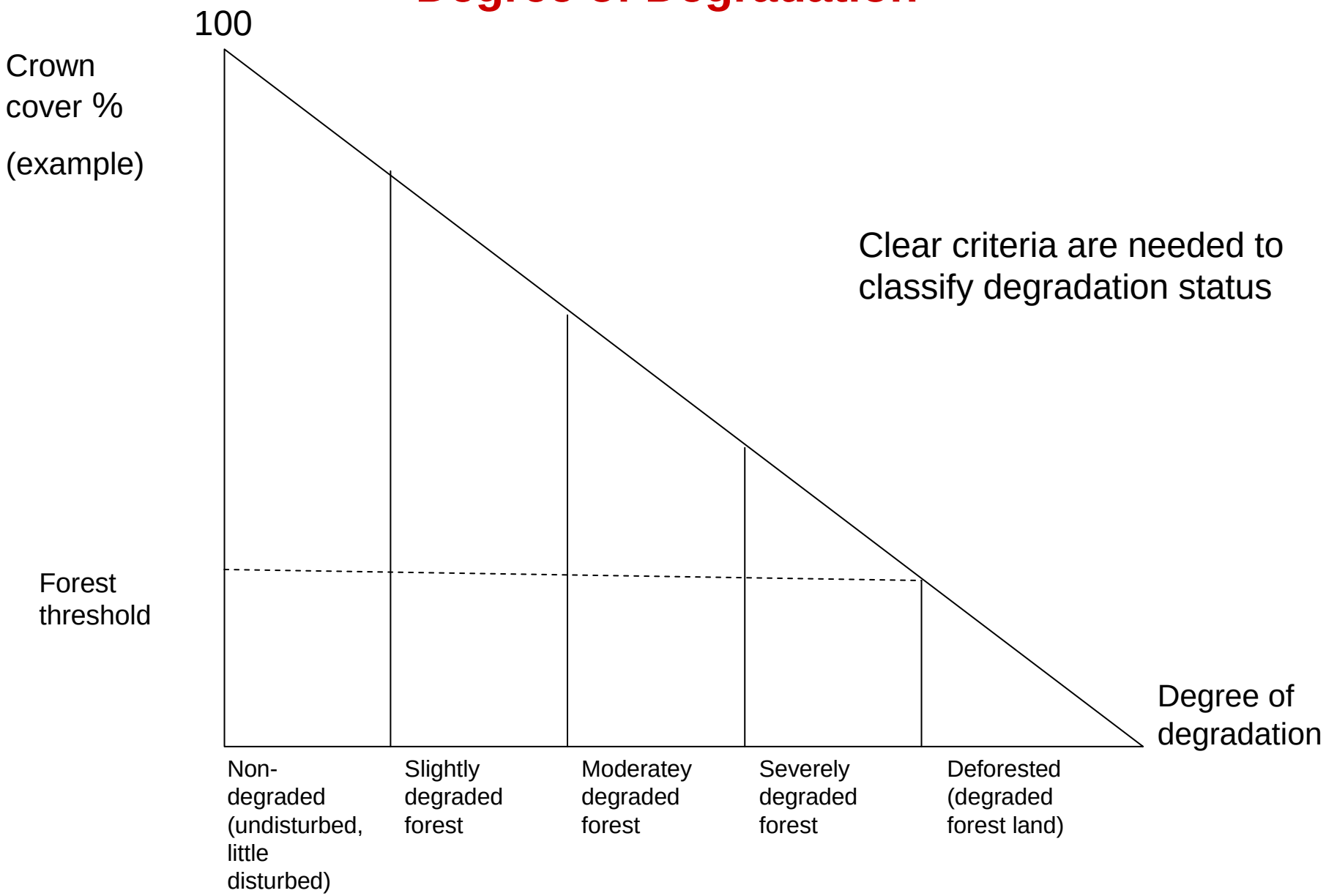
Trade-offs between forest values and management objectives can be positive or negative. One person´s sustainably manged forest is another person´s degraded forest.

Degradation Thresholds



What is original status (intact forest, primary forest, etc.)?
How to define non-degraded forest? Is such a definition needed?
Different views on the definition of ”forest” for international climate negotiations
Can sustainably managed production forest be considered non-degraded?

Degree of Degradation



Example: Northern Thailand

Creeping degradation starts in the highlands.

Severly degraded lower slopes not suitable for permanent agriculture.

Largely converted areas in the lowlands with forest mosaics and Trees Outside Forests.

Example: Impacts of Conventional (CL) and and Reduced Impact Logging (RIL) in Brazil

Reduced impact logging

Conventional logging

- Significant difference in impacts between the two methods.
- RIL can generate net income 19% higher than CL (higher productivity of harvesting, lower fixed and variable costs, less waste)
- RIL as part of SFM is a feasible strategy

Source: Holmes et al. 2002, IFT

Purposes of Degradation Assessment: for What?

- **Monitoring of the status and change** in the degree of forest degradation (provision of associated goods and services)
- **Reporting to international conventions** and processes on the status and quality of forest resources
- Design and implementation of **policies, programmes and forest management measures** to take preventive and corrective action
- Design and implementation of **payment mechanisms or other incentives schemes** for forest environmental services such as carbon offsets or conservation easements.

Levels of Assessment

1. Global/regional/sub-regional (reporting, int. policy)
2. National (national policies, programmes)
3. Sub-national (programmes, projects)
4. Landscape/watershed (projects)
5. Forest management unit (operational decisions)
6. **Stand/site** (most definitions target at this level)

➔ **Implications** for
- Choice of indicators
- Choice of assessment methodology

Comparison of Degradation Elements in International Definitions (1/3)

Parameter	FAO/FRA (2001)	ITTO (2002; 2003)	CBD (2001; 2005)	IPCC (2003a)	IUFRO	National definitions
Change within the forest						
• Canopy cover	■					■
• Stocking level						■
• Structure	■	■	■		■	■
• Age structure						■
• Species composition		■	■			■
• Biomass density						■
• Dynamics		■				
• Function			■			■
• Sanitary condition						■
Functions						
• Goods/products	■	■	■			■
• Services	■	■	■			■
• Carbon cycle				■		
• Biodiversity			■			
• Productivity		■	■		■	■
• Capacity to supply	■	■	■			■
• Ecosystem services		■				

Comparison of Degradation Elements in International Definitions (2/3)

Element	FAO/FRA (2001)	ITTO (2002; 2003)	CBD (2001; 2005)	IPCC (2003a)	IUFRO	National definitions
Ecosystem resilience						
Degree of degradation						
Causes						
• Direct						
- Human induced						
- Natural						
• Indirect						
• Indeterminate (both)						
Reference state						
• Natural forest						
• Previous						
• Other						
Spatial scale						
• Stand/site						
• FMU						
• Landscape						

Comparison of Degradation Elements in International Definitions (3/3)

Element	FAO/FRA (2001)	ITTO (2002; 2003)	CBD (2001; 2005)	IPCC (2003a)	IUFRO	National definitions
Temporal scale						
• Short term						
• Long term						
• Undefined						
• Duration years						
Exclusion						
• Deforestation (non-forest)						
• Activities under Art. 3.4 of the Kyoto Protocol						
• Planted forest						
• Degraded forest land (non-forest)						

Typical National Indicators in Measuring Degradation

- **Different strategies in monitoring**
  - direct measurement
  - measuring area changes
- **Relevance of the degradation concept**
  - many countries with ”no degraded forests”
- **Reporting**
  only one third of countries had estimates on the extent of degradation

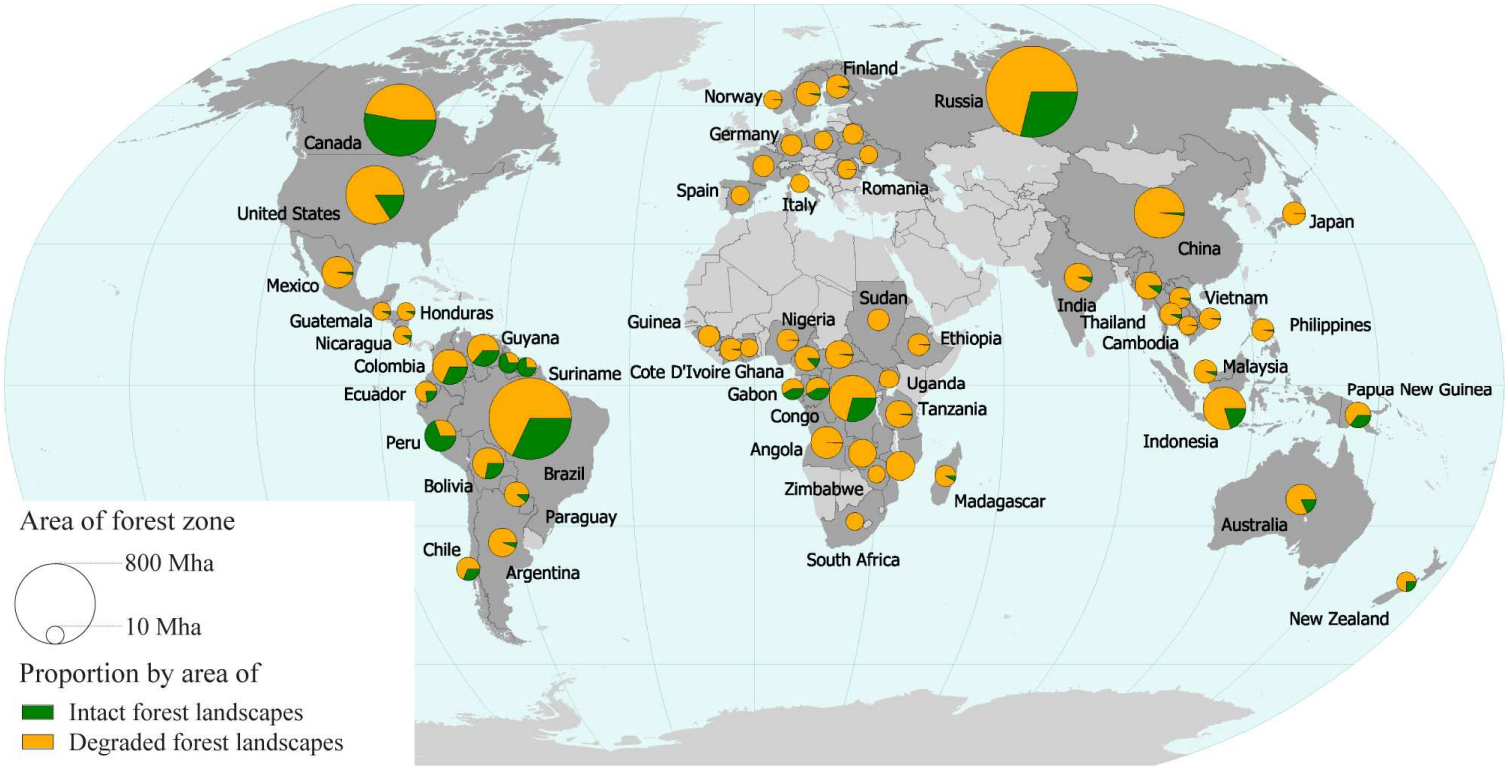
Based on a sample of 15 countries

Definitions	**Assessment**
Stocking level (6 countries)	Stock density (8)
Productivity (7)	Forest/canopy cover (6)
Biomass density (3)	Diasappearance of bd/species (6)
Canopy cover (4)	Occupancy of invasive/introduced species (3)
Species composition (2)	Erosion (3)
Structure (1)	Wildlife habitats (2)
Number of trees per ha (1)	Timber/NTFP value (2)

Potential Indicators Related to Degradation by SFM Element

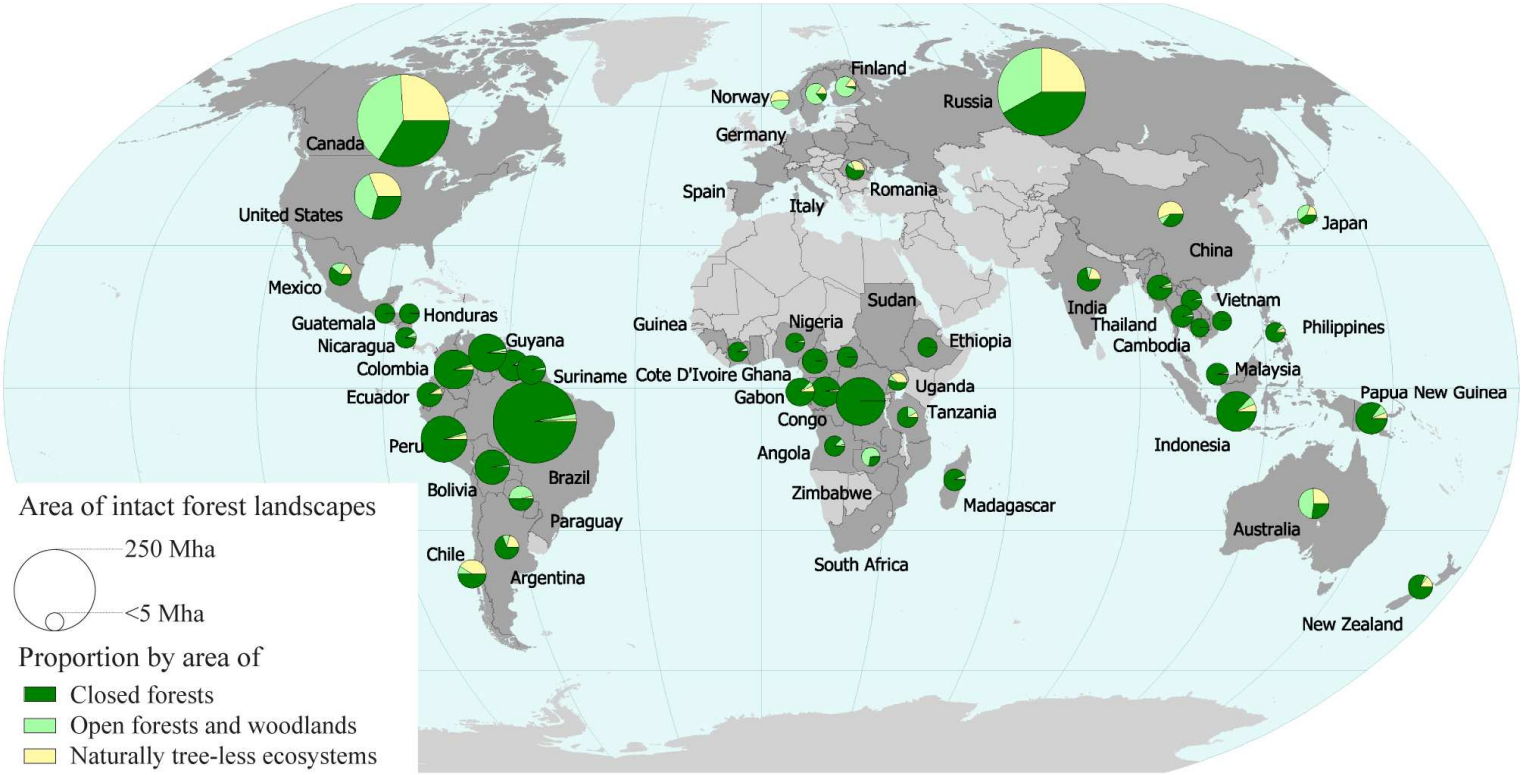
SFM element	Potential indicators (examples)
Extent of forest resources	Forest cover, crown cover, growing stock, stand density, degree of fragmentation, trees outside forests (TOF)
Biological diversity	Ecosystem diversity, species composition/diversity, genetic diversity, degree of fragmentation, connectivity, naturalness, crown cover, forest structure, habitat quality (resilience, ecological integrity, ecosystem elasticity).
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

Degraded Proportion of Forest Zone



Intact Forest Landscape Method – Baseline Results
Source: Laestadius, WRI. 2009

Forest Canopy Density in Intact Landscapes



Intact Forest Landscape Method – Baseline Results
Source: Laestadius, WRI. 2009

Debate questions

- What is non-degraded forest/reference status (primary, intact, natural, semi-natural, planted forest, etc.)?

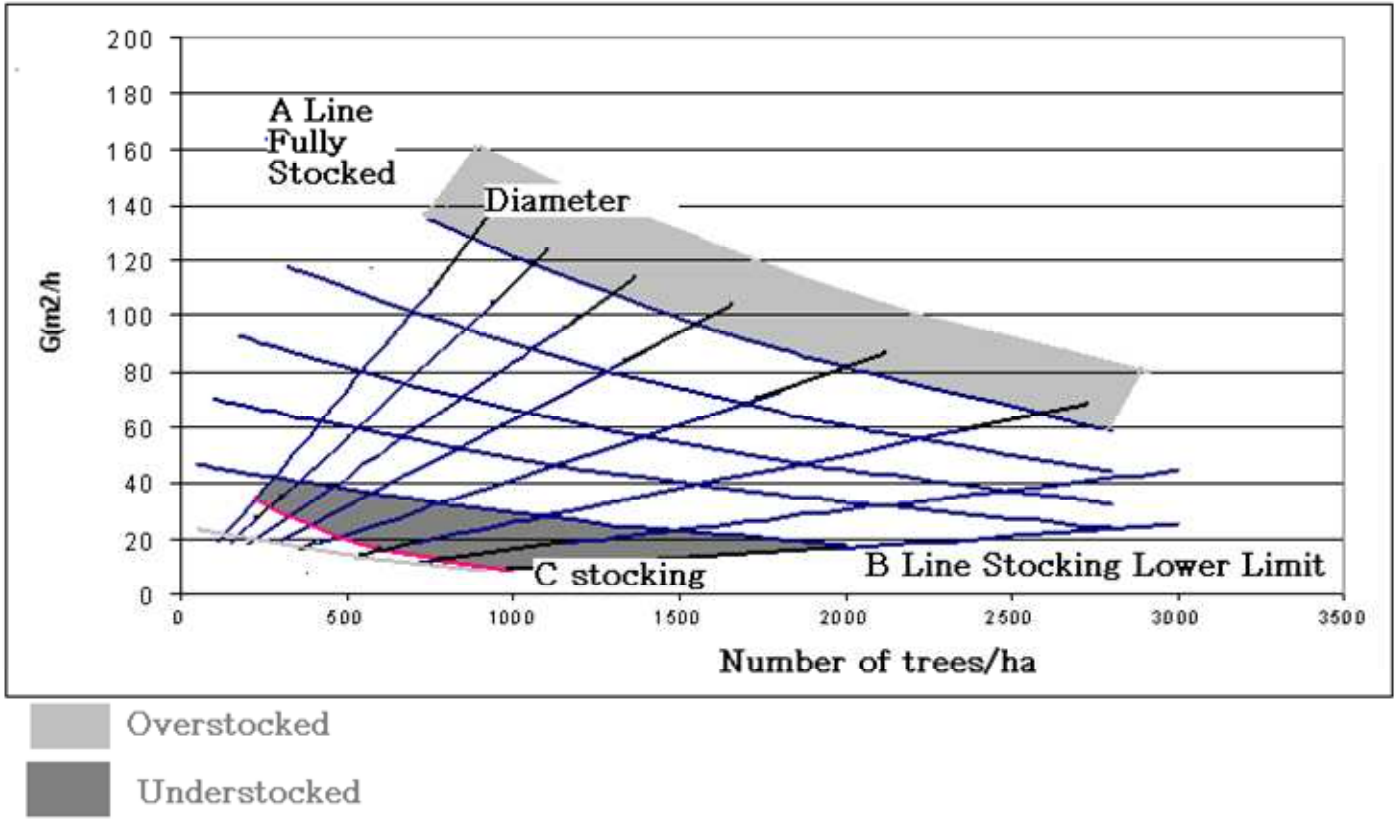
- How much ”degradation” can be ”tolerated” in SFM of production areas (stocking level, crown cover, biodiversity, etc.)

Three Possible Proxies for Measurement of Degradation

- 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[1]
- Reduction in loss of **biological diversity** which can be associated with the occurrence of species (dominant and non-dominant species composition and richness) and habitats (fragmentation)
- Reduction in **soil** as indicated by soil cover, depth and fertility

[1] Degradation does not necessarily lead to loss of biomass even if the growing stock may decrease.
Source: Lund (2009)

Stocking Level as a Measure of Degradation (Example of Chile)



Light grey area indicates overstocked forests, dark grey indicates understocked forests.

Source: Bahamondez et al. 2009

Measurement Approaches in the REDD Context

1. Remote sensing for measuring the removal of carbon stocks in selectively felled areas (applicable in large areas)

2. Direct cost-efficient monitoring of low-intensity timber harvesting, NTFP and fuelwood collection, understorey thinnings, etc. with community participation

Response: Global Partnership on Forest Landscape Restoration

GPFLR is a proactive network that unites governments, organisations, communities and individuals with a common goal.

Opportunities for restoration (1.3-1.7 billion ha excl the boreal)

1. Mosaic-type restoration in densely populated and intensively used land areas with reduced tree cover, typically in degraded woodlands
2. Broad-scale restoration in areas with low land-use pressure and potential for tree growing
3. Various kinds of other oportunities

*www.ideastransform**landscapes**.org/*

Proactive Measures

- **RIL** for mandatory practice, SFM standards
- Prevent and control **fires**
- Provide **incentives** for restoration and **disincentives** for unsustainable practices
- Establish **tenurial security** and good governance
- Enhance **market** pressure (certification)
- Performance-based **payments** for maintenance of forest cover
- **Training and rewarding** of staff and workers

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Conclusions

- **Need to combine** the holistic approach (all products and services) and specific purposes of monitoring of degradation as well as the status and processes of degradation
- Need for clarity on **reference status** (naturalness, canopy cover, etc.)
- **Thresholds between non-degraded/degraded/non-forest;** in the climate regime apply the wall-to-wall approach to avoid major leakage, justification for inclusion of degradation in REDD
- **Temporal scale** is crucial for degradation definitions and assessment: need for a long-term approach
- **Spatial scale: need to assess degradation on different levels for different purposes;** limitations of stand-level approaches for measuring carbon stock reduction, biodiversity, and soil and water resources. Recognize that for international purposes forest degradation needs to be geographically assessed at a **higher than stand or site level** over time without *a priori* specification of the temporal scale in the definition.
- **Need to link with drivers** to define remedial measures
- **Phased approach**: start measurement with available data, technology and resources

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MS2 In forest management objectives are set in the long term and this also holds true with the maintenance and enhancement of carbon reservoirs. Periodic short-term changes in the growing stock of a forest area are part of regular forest management. What matters is that the carbon pools are maintained and enhanced in the long run. We should definitely avoid a situation where harvesting under sustainable forest management becomes forbidden i.e. considered as generating emissions, as this would make sustainable forest management impossible in practice and lead to loss of other benefits.
For international purposes forest degradation needs to be geographically assessed at a higher than stand or site level while stand/site-level assessment is needed for taking local level corrective action. This approach would focus on assessment of the forest degradation (or improvement) process over time without a priori specification of the temporal scale in the definition.
An FMU or a watershed as a whole may be well managed even though there are some small areas of degraded forest. Such areas can also be valuable for some forest functions such as maintenance of specific components of biodiversity. The need for a broader scale in monitoring and verification is particularly important when carbon emissions or biodiversity are considered because carbon stocks and biodiversity should also be assessed at higher than site or stand levels.
Several ideas have been proposed for the consideration of definition and measurement of forest degradation in the climate context but no conclusion has been achieved as yet demonstrating the technical and policy complexities of the issue. The problem could be solved if we focus on the estimation of change in carbon stocks across a certain area of land. The area should be large enough to allow stand level variation due to regular management interventions as part of sustainable forest management. .
Markku Simula; 23.7.2010

Thank You

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