A global challenge needing local response

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A common approach to defining and measuring forest degradation can lead to unique solutions for addressing it.

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Forest degradation involves a change process that negatively affects the characteristics of a forest

Forest degradation is a serious environmental, social and economic problem, particularly in developing countries. Yet it is difficult to define and assess. Degradation is viewed and perceived differently by various stakeholders who have different objectives. It is technically and scientifically difficult to define, and its definition can have policy implications, which further complicates reaching consensus and developing common approaches applicable at both international and country levels.

Quantifying the scale of forest degradation is difficult because it has many causes, and occurs in different forms and with varying intensity. Ten years ago, the International Tropical Timber Organization (ITTO, 2002) estimated that up to 850 million hectares (ha) of tropical forest and forest lands could be degraded. This figure is larger than that of the existing area of non-degraded tropical forests.

However, more recently, the Global Partnership on Forest Landscape Restoration (Laestadius *et al*., 2011) suggested that more than two billion ha worldwide of forest land that has either been completely cleared over the

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centuries or has been degraded offers opportunities for restoration (see Mapping opportunities for forest landscape restoration, in this issue).

In practice, *local* response should be the main focus in addressing forest degradation as a global challenge.

WHY DOES FOREST DEGRADATION MATTER?

Forests provide a wide range of ecosystem services such as protecting soil from erosion, regulation of the water regime and provision of freshwater, capturing and storing carbon, producing oxygen and maintaining habitats for biodiversity. In addition, production of wood-based products, fibre and various non-wood products is critical for satisfying the needs for shelter, communication, packaging, food and many other uses of the global population.

There are about 300 million people in the tropics, consisting of indigenous peoples, local communities, settlers and smallholders, who depend on degraded forests and forest lands for their livelihoods, and they are often suffering from extreme poverty (ITTO, 2002). Bringing degraded areas under sustainable management would not only help in mitigation of and adaptation to climate change, but would also create employment and income for millions of people.

Forest degradation is one of the major sources of greenhouse gas (GHG) emissions, as shown by some regional and country studies, but its significance has not been quantified on a global scale.

WHAT IS FOREST DEGRADATION?

Perceptions of forest degradation are many and varied, and so are its drivers. Therefore, it is difficult to find a common approach for defining forest degradation: one person's degraded forest is another person's livelihood. For example, for a conservationist, any change in natural forest induced by human action can represent "degradation". A sustainably managed planted forest may be regarded as "degraded" if consideration is based only on the criterion of biodiversity. Degradation is, therefore, a relative concept that has to be linked with the forest's management objectives.

An Expert Meeting (FAO, 2002) developed a common definition of forest degradation: *The reduction of the capacity of a forest to provide goods and services*.

However, the definition, being generic, has proved to be difficult to operationalize. In practice, the focus has been given to productivity, biomass or biodiversity. Definitions that refer to multiple forest benefits may treat forest values in a comprehensive manner, but are more difficult to use beyond national purposes, for international purposes, in a consistent, transparent manner. A particular issue is definition of suitable thresholds for degraded and non-degraded forests, especially with regard to the international negotiations on climate change.

From the perspective of reporting on forests at an international level, a coherent, comparable and harmonized definition of forest degradation is desirable. However, national circumstances have implications for how internationally agreed definitions can be applied. Nevertheless, the general definition of forest degradation given above is compatible with an ecosystem services approach; as such, it provides an adequate umbrella at the international level and a common framework for developing more-specific interpretations for particular purposes.

WHY SHOULD FOREST DEGRADATION BE ASSESSED?

Forest degradation involves a change process that negatively affects the characteristics of a forest, reducing the value and production of its goods and services. This process is caused by disturbance (although not all disturbance causes degradation), which varies in origin, extent, severity, quality and frequency. Disturbance may be natural (e.g. fire, storm or drought), human-induced (e.g. harvesting, road construction, shifting cultivation, hunting or grazing) or a combination of the two. Human-induced disturbance may be intentional (direct), such as that caused by logging or grazing, or it may be unintentional (indirect), such as that caused by the spread of an invasive alien species (FAO, 2009). We need to know if forests are being degraded and, if so, what the causes are and to what extent

the ecosystem has been impacted, so that measures can be taken to arrest and reverse the process. Information on the degradation process is also necessary to adjust national policies that may directly or indirectly lead to it.

Countries are required to report on the state of their forests, including their efforts to tackle forest degradation, at the international level, to various fora. The tenth Conference of the Parties to the Convention on Biological Diversity, for example, adopted the Strategic Plan for Biodiversity 2011–2020 with the Aichi Biodiversity Targets, including reduction of forest degradation. To determine if the targets are reached, an effective process for monitoring and reporting on forest degradation is required.

The agreement to establish a mechanism under the United Nations Framework Convention on Climate Change (UNFCCC) aimed at Reducing [GHG] Emissions from Deforestation and Forest Degradation (REDD+) provides another reason to measure forest degradation. The REDD+ mechanism has the potential to generate substantial funds for developing countries for reducing forest degradation and restoring, or otherwise improving, the management of forests (thereby increasing forest-based carbon sequestration). How degradation is defined will have significant implications for the financing volume and respective benefit-sharing among stakeholders.

HOW CAN FOREST DEGRADATION BE ASSESSED?

The articles in this issue of *Unasylva* provide in-depth information on assessing forest degradation from different perspectives (productivity, biodiversity, soil and others). Some considerations in assessing degradation relate to spatial and temporal scales and thresholds.

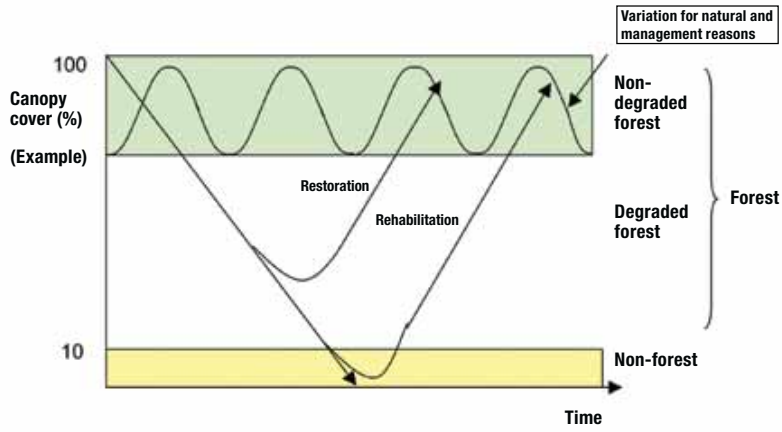
Forest degradation needs to be assessed at different spatial scales for different purposes. Assessment at the scale of a stand or site is needed for taking effective corrective action at the local level; many indicators of a forest's capacity to supply goods and services vary over time within a stand, without implying forest degradation. Degradation is also to be assessed and monitored over an entire forest management unit, and over a landscape (see Global forest alteration, from space, in this issue). Assessment over higher scales is necessary for national and international reporting and other purposes.

Temporal scale is another important aspect in assessment of degradation (see NDVI as indicator of forest degradation, in this issue). Short-term fluctuations in the capacity of a forest to produce certain goods and services are often part of a natural cycle or the result of planned human interventions (e.g. silvicultural treatment) (Figure). In forest management, the objectives are always set in the long term, which also holds true for the maintenance and enhancement of carbon reservoirs. For example, we should avoid a situation in which, although a forest is under sustainable management, short-term fluctuations in the growing stock resulting from harvesting in some stands are counted as emissions. Including such data would make sustainability an unattainable goal, and thereby lead to significant losses of other benefits. What matters is that the carbon pools be maintained and enhanced in the long run in the entire management unit or forest landscape.

A forest that is considered degraded has passed a threshold, i.e. the value set for an indicator of measurement. As forest types and biophysical situations vary extensively, it will not be possible to establish common thresholds. Similar to the concept of a threshold is that of a tipping point – the point at which a process of degradation becomes irreversible. Avoiding irreversible change – tipping points – may be one of the most important measures towards sustainability (see Biodiversity, ecosystem thresholds, resilience and forest degradation, in this issue).

WITH WHAT CAN DATA BE COMPARED?

The assessment of degradation requires the establishment of a reference state – a baseline or "ideal state" – against which the changed situation can be assessed. In practice, establishing a reference state is not an easy task. Primary forest could theoretically serve as a baseline, but this approach is sometimes problematic



Source: FAO, 2011.
Note: Canopy cover is used here as an example of an indicator of degradation. Restored or rehabilitated forest may not be similar to the original one.

Degradation process and thresholds

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Human-induced disturbance may be intentional (direct) or unintentional (indirect)

because of past changes in the ecosystem. Sustainably managed forests for production could also serve as a reference state, even though they may lack some species, processes, functions or structures found in a primary forest. In addition, all forest ecosystems are characterized by inherent change and natural variation. Degradation occurs when the production of an identified good or service is consistently below an expected value and is outside the range of variation that would be expected on the site under the selected management regime. Therefore, assessment often tends to be based on judgement, because the range of natural variation can only be known through long-term research or monitoring, and data available for a given time are usually deficient. (See A review of methods to measure and monitor historical carbon emissions from forest degradation, in this issue.)

Natural and human-induced degradation are often interdependent. Human actions can affect the vulnerability of a forest to be degraded from natural causes, while natural damages can lead to increased human-induced disturbance. Distinguishing between natural and human-induced causes may be difficult when abiotic and biotic factors are triggered by changes in weather patterns that lead to a greater frequency, scale and impact of forest degradation.

Degradation can be, but is not necessarily, a precursor to deforestation. Forests may remain degraded for a long time but never become completely deforested; change can also be abrupt, such as when an intact forest is converted to another land use. At any stage on the continuum depicted in the Figure, forest degradation can be halted or reversed by forest improvement or other management interventions, including restoration through silvicultural measures and the rehabilitation of degraded non-forest land through reforestation.

HOW CAN THE GLOBAL CHALLENGE BE ADDRESSED?

The more than two billion ha of degraded forest land – a global combined area greater than that of China – offers huge opportunities for restoration and rehabilitation. Degraded areas are not usually subject to intensive land use, even in areas that may be densely populated. Sometimes, reversing degradation may require significant investments. However, more often it can be achieved through low-intensity interventions, such as extension of fallow periods and setting aside for natural regeneration.

Rural populations living in or near degraded forests can take remedial action when awareness is raised and economic incentives are made available. The successful restoration of the Loess Plateau in China is one such example. Restoration could provide many co-benefits, such as reduced erosion, reduced risk of flooding, improved agricultural productivity, and production of fuelwood, timber and other forest products. Useful guidelines for remedial action exist on both an international level – e.g. ITTO (2002) – and a national one – e.g. CONAFOR (2007). The Global Partnership on Forest Landscape Restoration (2011) provides a platform for information and exchange of experiences.

The REDD+ mechanism under the UNFCCC negotiations has raised great expectations for financing of restoration, rehabilitation and sustainable forest management. There is, however, a risk that the rural poor may not be able to benefit from REDD+ and that their forest tenure and use rights might be

Degraded forest land offers tremendous opportunities for reforestation

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Solutions to degradation have to be adaptable and flexible over time to meet the needs of different forest stakeholders

negatively affected when maintenance and enhancement of the forest carbon pools become a binding objective by REDD+ financing. Without establishing clear and secure land tenure, building capacity, providing financial support and taking due consideration of the values and needs of local people, it is unrealistic to assume that these people will really benefit from REDD+. Another issue is that, in many countries, lands that have been transferred to community ownership have often been degraded and require significant investment through restoration.

REDD+ payments should be sufficient and differentiated to address variation in local conditions. By the same token, if forest owners, communities and dwellers are paid for "doing nothing", the system is not likely to work. Many payment schemes for forest environmental services have suffered from becoming simple subsidy schemes in which the link between the payment and the obligation for corrective action by the owner has remained unclear. Mitigation of climate change requires quick results, and restoration of degraded forests can absorb more carbon dioxide fast. As such, it represents an excellent bridging strategy. At the same time, resilience can be improved, and the recovery capacity of vulnerable biodiversity can be enhanced. The opportunity costs are low, and the results have important co-benefits. Time will be needed for capacity-building, tenure reforms and strengthening of governance, but action cannot be delayed.

There is no one size that fits all; solutions for degradation are always unique to their setting. They have to be adaptable and flexible over time, because they seek to channel the needs of many different forest stakeholders towards sustainable practices that create change. ◆

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