Reducing Forest Degradation

Basic knowledge

Reducing forest degradation contributes to SDGs:

This module is intended for forest and land managers, as well as for stakeholders in all sectors involved in joint efforts to reduce forest degradation. It provides guidance on how to slow, halt and reverse forest degradation within a manager's sphere of control and influence. Readers may find it helpful to read this module in conjunction with the Reducing Deforestation module.

What is forest degradation?

Forest degradation is the reduction of the capacity of a forest to provide goods and socio-cultural and environmental services. It involves a change process that negatively affects the characteristics of a forest (e.g. growing stock and biomass, carbon stock, biodiversity, soils, and aesthetic values), resulting in a decline in the provision of goods and services. This change process is caused by disturbances (although not all disturbances cause degradation), which can vary in extent, severity, quality, origin and frequency. Disturbances may be natural (e.g. fire, storms, drought, pests and diseases), or human-induced (e.g. unsustainable logging, invasive non-native – "alien" – species, road construction, mining, shifting cultivation, hunting and grazing), or a combination of both natural and human-induced. Human-induced disturbance may be intentional, such as that caused by logging or grazing, or it may be unintentional, such as that caused by the spread of an invasive alien species. There are also indirect or underlying reasons for forest degradation, such as poverty, inappropriate policies, and unclear tenure rights.

Forest systems always have an inherent range of natural variation and succession stages, and natural or human-induced disturbances do not necessarily lead to degradation. Degradation occurs when the production of an identified forest good or service is consistently below an expected value and is outside the range of variation that would be expected naturally.

Although it is complex to define and measure, forest degradation is a serious problem. It has adverse impacts on forest ecosystems and the goods and services that forests provide; for example, it is considered a significant source of land-related greenhouse gas (GHG) emissions. It is estimated that, in 2010, 27 percent of forest landscapes worldwide (about 1.5 billion hectares) were degraded.

There is often confusion between the concepts of deforestation and forest degradation. **Deforestation** is the long-term loss of forest, with no guarantee that the forest will re-establish through natural regeneration or silvicultural measures; it results in a decrease in forest area. **Forest degradation** does not involve a reduction in forest area but, rather, a qualitative decrease in forest condition. Forest degradation often leads to full-scale deforestation, however, because degraded forests are more easily converted to agricultural lands. Figure 1 depicts the forest degradation continuum, and deforestation.

Why must forest degradation be addressed?

Forests provide a wide range of services. For example, they protect soils from erosion, regulate the water regime, capture and store carbon, produce oxygen, provide freshwater and habitat, help reduce fire risk (in the tropics), and produce wood and non-wood forest products. Forest degradation, therefore, adversely affects millions of people who depend, wholly or in part, on forest goods and services at a local scale, and billions of people who benefit from forest services at a regional or global scale. Specifically, for forest owners and managers, forest degradation is a direct threat to their livelihoods as it reduces a forest's productivity and profitability, and it is a clear indication of unsustainable practices in the forests under their supervision.

It has been estimated that more than 2 billion hectares of deforested and degraded forest land worldwide is potentially suitable and available for restoration. Bringing degraded areas under sustainable management would reverse the trend of degradation, help forest landscapes to recover, and restore the associated forest goods and services. This would not only replenish the productive capacity and diversity of forest and land resources, it would yield economic, social and environmental benefits, including the mitigation of, and adaptation to, climate change.

Degradation is mentioned explicitly in Goal 15 of the Sustainable Development Goals to be achieved by 2020, in the Global Objectives on Forests of the United Nations Forest Instrument, and in the Aichi Biodiversity Targets of the Convention on Biological Diversity.

The agreement under the United Nations Framework Convention on Climate Change (UNFCCC) to reduce GHG emissions from deforestation and forest degradation (known as REDD+) is a potential source of incentives for developing countries that could be used to reduce forest degradation (and related GHG emissions) and to restore or otherwise improve the management of forests (thereby increasing forest-based carbon sequestration).

What is the role of forest managers?

Forest degradation is a global challenge, and it should be addressed at all levels (local, subnational, national and international). It is often the consequence of unsustainable forest management, the excessive exploitation of forest resources, and factors outside the specific forest area being managed. Forest degradation may be considered as a signal to alert us that sustainable forest management (SFM) is not being achieved.

It is difficult to implement SFM when the enabling conditions for SFM – that is, conducive policies, governance regimes, institutions, incentives, regulations, tenure, rights, transparency and stakeholder engagement – are absent. Forest and land managers can advocate for an enabling environment for SFM, and they can be key actors in halting and reversing forest degradation through their local-level actions.

The most important thing that forest managers can do is to adhere to the principles of SFM in their management approach, with the aim of ensuring that today's uses and practices maintain and enhance the economic, social and environmental values of forests in perpetuity while also providing appropriate livelihoods. More specifically, forest managers should define and apply sound management plans, define and respect harvesting limits, monitor and detect signs of forest degradation and environmental impacts, and take appropriate and timely measures to halt or reverse degradation – including by requesting assistance and technical support when needed.

In forests under SFM, forest managers should regularly monitor the effects of management practices and assess whether they are causing degradation (see the Forest Management Monitoring module). SFM is a dynamic process, and forest management plans and practices should be adapted over time in light of monitoring and assessment and evolving economic, social and environmental conditions (see the Climate Change Adaptation and Mitigation module).

Forest degradation is best addressed by a comprehensive approach aimed at its direct and underlying drivers. The table provides examples of technical actions that can help prevent or halt forest degradation.

Examples of undesirable effects leading to forest degradation	**Examples of actions to arrest forest degradation**
Reduction in site productivity	- Modify sustainable annual harvest
Limited regeneration after logging	- Put in place practices to help forests recover after harvesting (e.g. assisted natural regeneration, enrichment planting) - Avoid reducing the population of any tree species to the extent that self-replacement is not possible (e.g. maintain a sufficient number of seed trees) - Modify logging practices to avoid future degradation
Soil erosion	- Reduced impact logging - Mulching to improve soil conditions - Measures to maintain and improve the growth of groundcover vegetation
Impact on wildlife populations	- Measures to reduce the impact of logging activities on local fauna (e.g. respecting reproductive periods) - Maintenance of connectivity across forest landscapes - Appropriate land-use planning
Presence of pests	- Ensure that good practices are applied correctly (e.g. control entry pathways – see the Forest Pests module)
Forest encroachment for agriculture/livestock	The following actions may be beyond the scope of forest managers and require the involvement of other land managers and actors: - Land-use planning - Promotion of sustainable practices - Promotion of alternative livelihoods - Law enforcement, awareness-raising and capacity building

The Silviculture in Natural Forests module provides additional information.

When forest degradation is the result of natural causes such as storms, droughts, pests or wildfires, forest managers should aim to strengthen forest resilience so that stands are better prepared for future events. This can be done, for example, by maintaining biodiversity at varying forest scales (e.g. stand, landscape and region); applying integrated fire management (mainly risk reduction and recovery); applying integrated pest management; and (in planted forests) selecting tree species and varieties likely to be resilient in the face of expected future conditions (see also the Forestry Responses to Natural and Human-conflict Disasters module).

Forest and land managers can reverse degradation by restoring and rehabilitating forest landscapes (see Forest Restoration and Rehabilitation module) and through appropriate land-use planning.

In order to do so in a way that is efficient for the community and the environment, both men and women forest managers must take gender considerations into account. Overall, the degradation of forests affects men and women differently. In rural areas, a woman's life is fundamentally dependent on nature, since she has to maintain her family by managing and using natural resources (e.g. women are primary providers of household food, fuel and water for cooking, heating, drinking and washing). Climate and biodiversity alterations caused by forest degradation largely hinder women's livelihoods.

When assessing forest conditions and planning a reverse degradation project, forest managers must consider women's needs, as well as the role they play as mitigating agents. If trained and empowered, women can lead the fight against degradation. They have a very close relationship with forests and trees and can recognize the undesirable effects of forest degradation such as soil depletion, reduced productivity and regeneration, and the presence of pests. This knowledge can be applied to adopt mitigation measures. For instance,

composting kitchen waste may provide soil-enriching fertilizer. Since women know the life cycles of the trees and plants, they are inestimable resources for land use planning, especially when it comes to sustainable harvests, seed conservation and maintenance.

Related modules

- Climate change adaptation and mitigation
- Forest and landscape restoration
- Forest management planning
- Forest pests
- Forest restoration
- Forestry responses to conflict & disasters
- Participatory approaches and tools for SFM
- REDD+
- Silviculture in natural forests
- Vegetation fire management
- Wood harvesting

In more depth

Drivers of forest degradation

Globally, the most important activities that cause forest disturbances and – in the longer term – forest degradation include:

- unsustainable logging and timber extraction;
- unsustainable fuelwood collection;
- unsustainable charcoal production;
- overgrazing in forests;
- uncontrolled fires; and
- defaunation (i.e. the loss or reduction of wildlife, which may have major ecological consequences, for example in terms of tree pollination, seed dispersal and pest control).

Underlying drivers are the complex interactions of social, economic, political, technological and cultural factors that affect direct drivers. They include unsound policies; weak governance and a lack of law enforcement; landlessness and the unclear allocation of rights; rural poverty; a lack of investment and financial resources; population growth and migration; and civil conflict.

The distinction between direct and underlying causes, and between human-induced and natural changes, is often not as clear as might first appear. Human and natural causes of degradation are often interdependent, and degradation is the end result of long, complex chains of causation.

Table 2. Main drivers of forest degradation

	Human-induced	Natural
DIRECT DRIVERS	*INTENTIONAL* • Unsustainable logging and timber extraction • Unsustainable fuelwood collection • Unsustainable charcoal production • Overgrazing in forests • Hunting and defaunation • Uncontrolled fires • Invasive pest species • Shifting cultivation • Road construction *UNINTENTIONAL* • Spread of invasive species	• Wildfires • Storms • Drought • Forest pests and diseases
UNDERLYING DRIVERS	• International (e.g. markets forces, commodity prices) • National (e.g. population growth, domestic markets, unsound policies, conflicting cross-sectoral policies, weak governance, lack of law enforcement, illegal activities, civil conflict) • Local (e.g. poverty, changes in household behaviour, landlessness and unclear allocation of rights, lack of investment and financial resources)	

How to address forest degradation

Assessing forest degradation

It is important to know whether forests are being degraded and, if so, what the causes are, so that steps can be taken to arrest and reverse the process.

Collecting and analysing information on forest condition and the extent of forest degradation will help in prioritizing resources and measures to prevent further degradation, address the root causes, and restore and rehabilitate degraded forest landscapes. It will also allow countries to fulfil their commitments on international reporting.

Quantifying the scale of the problem is difficult, however. Different stakeholders perceive forest degradation differently – one person's degraded forest may be another's livelihood – and it can be difficult to find a common approach to defining it. Various criteria may be applied, such as health and vitality, species diversity, production capacity, protection capacity and aesthetic value, but the weighting given to such criteria will influence the perception of degradation. For example, a planted forest may be regarded as "degraded" if consideration is based only on the criterion of biodiversity.

The definition of degradation should be linked to the objectives of forest management and ultimately to society's goals – "degradation" is thus defined by the capacity of a forest to produce the products and services wanted by stakeholders.

Another issue in monitoring degradation is the potential difficulty in differentiating between natural variations and degradation. A reference state is required for comparing changes in a forest at a given temporal scale.

The SFM thematic elements enumerated in the UN Forest Instrument (and listed in the table) may provide a suitable framework for choosing indicators of forest degradation.

SFM thematic elements	**Example of indicators of forest degradation**
1. Extent of forest resources	• Decrease in canopy-cover percentage
2. Forest biological diversity	• Amount of fragmentation and road density • Species composition and changes in composition (for an ecosystem type) • Existence of or changes in key species (e.g. threatened, old-growth, hunted) • Existence or changes and degree of occurrence of invasive species • Existence or changes and degree of occurrence of pollinator bees
3. Forest health and vitality	• Area affected by pests and diseases • Area affected by fire
4. Productive functions of forest resources	• Number of commercial timber tree species • Number of mature trees • Diminished reproductive capacity of commercial species (e.g. number of exhausted coppices) • Average distance travelled to collect fuelwood or non-wood forest products • Number of game animals
5. Protective functions of forest resources	• Soil erosion (e.g. presence of rills, gullies and ravines, and plant root exposure) • Water quality and quantity

The assessment of forest degradation implies the selection of a spatial scale (e.g. global, national, subnational, landscape/watershed, forest management unit –FMU, or stand/site), and an assessment methodology. These are discussed further below.

Forest management unit or site level

Assessing forest degradation at each site or FMU enables forest owners and managers to decide on corrective actions at the local scale.

Forest managers should decide on the degradation indicators to be measured in their regular forest monitoring (see Forest Management Monitoring module). The early identification of local problems can guide the revision of forest management plans so as to prevent further degradation, address the root causes of degradation, take action to restore the damage already done, and invest in rehabilitation.

Forest managers should bear in mind that many indicators of a forest's capacity to provide goods and services vary over time within a stand without implying forest degradation. Short-term fluctuations may be part of natural cycles or the result of planned human interventions (see Figure 1 in "basic knowledge").

Subnational, national or global level

Forest degradation is normally estimated at larger scales to assist in policy and programme design and implementation, including payment mechanisms or other incentive schemes aimed at preventing degradation (e.g. payments for environmental services). Such larger-scale

monitoring is also need for national reporting to international processes, such as those related to GHG emissions and biodiversity.

Measuring and monitoring forest degradation at the subnational or national scale is a challenge, and it can be more time-consuming and costly than assessing deforestation. A combination of on-the-ground forest inventories and remotely sensed data will provide the most reliable estimates. Remote sensing can be used as a cost-efficient option for assessing degradation through proxies – such as canopy-cover percentage (with a decreasing trend implying degradation). Focused field surveys (e.g. biometric field observations, biodiversity assessments and rapid rural assessments) can be undertaken in areas where remote sensing has detected degradation to obtain a more nuanced understanding of degradation trends and their causes and possible solutions.

The most suitable monitoring approach should be determined depending on parameters such as vegetation type, climate and degradation dynamic (e.g. is degradation occurring at a small or large scale? Is it concentrated or diffuse?). Sometimes, degradation may be the direct result of management, and differences in forest condition may be observable on different sides of management boundaries. In other cases, time-series observations may be required to detect change.

In some countries, existing national forest monitoring systems may be suitable – if adapted and expanded – for monitoring forest degradation.

Monitoring forest degradation with a high level of certainty is time-consuming and costly; it should only be considered in the context of REDD+ if forest degradation is likely to be a major contributor to GHG emissions. If such monitoring is considered necessary, it should focus on those areas most likely to be subject to degradation.

Estimates of degradation are likely to be imprecise (i.e. with wide confidence intervals) because of the large number of variables and the difficulty in measuring many of these. Even with the best measurement and monitoring systems, it may be difficult to estimate degradation rates from year to year, so a long-term approach is required.

Sources of remotely sensed data that can be used in monitoring forest degradation include high-spatial-resolution optical methods (e.g. RapidEye) and active sensors such as radar and lidar.

Identification and analysis of forest degradation drivers

Forest degradation is a complex, highly location-specific phenomenon, and understanding it requires the analysis of both direct and indirect causes. When the scale and areas of forest degradation have been identified, a comprehensive assessment of the drivers of degradation should be undertaken in each area. It is desirable that the key stakeholders associated with degradation drivers participate in such assessments and assist in analysing data to understand the dynamics of change.

Actions and strategies to address forest degradation drivers

Degradation can be – but is not necessarily – a precursor to deforestation. Forests may remain degraded for a long time but never become completely deforested. Moreover, forest degradation can be halted or reversed at many points on the degradation pathway (see Figure 1 in “basic knowledge”) by forest management interventions. In many other cases, however, forest degradation is a precursor to deforestation: for example, selectively logged areas may become deforested within a few years of logging in the absence of SFM and the presence of deforestation pressures.

Actions and strategies to address forest degradation drivers should take into account the potential impacts on food security, local livelihoods, and climate-change mitigation and adaptation. Priority should be given to improving governance; increasing transparency, capacity and law enforcement; providing secure, equitable tenure; and combating illegal activities.

Interventions should consider both direct and underlying drivers and scale (e.g. local, national or global) and include a mix of measures. Forest managers are mainly responsible for actions at the local level, but viewing forest degradation in the context of larger scales may be beneficial. The time needed to design programmes to address drivers and reconcile the interests of multiple stakeholders should not be underestimated.

Example of strategies and actions to prevent and halt forest degradation

Forest degradation drivers	Actions	Sector

Unsustainable wood and non-wood forest product extraction and logging	Promote sustainable management practices in production forests, including: *At local/forest management unit level* - Elaborate or review SFM plans and implementation, including sustainable yields - Reduced impact logging - Certification *At subnational/national level* - Review concessions policies, management plans and harvesting practices - Conduct research, build capacity and pilot experiences - Review forestry laws - Enter into dialogue and make mutually accountable arrangements with local stakeholders on access to, the use of, and sharing the benefits of, forest resources	
	Strengthen forest governance and law enforcement (against illegal logging and the illegal harvesting of non-wood forest products; to ensure respect for established quotas; and to guarantee the legality of imports and exports)	
	Reinforce and expand forest protected areas, considering joint forest management approaches	
	Encourage agroforestry, afforestation and reforestation to address demand for construction materials	
	Strengthen forest tenure and rights	
Unsustainable fuelwood collection and charcoal production	Promote sustainable levels of fuelwood collection (e.g. through awareness-raising, local regulations and law enforcement), and fuelwood efficiency (e.g. efficient stoves and heaters)	
	Promote sustainable and efficient charcoal production	
	Promote agroforestry, afforestation and reforestation as strategies for addressing demand for fuelwood and charcoal	
	Assess and promote alternative fuels (e.g. organic briquettes) and alternative energy sources (e.g. solar, biogas)	 
	Provide local communities with incentives and support as they transition to alternative sources of energy	
Livestock grazing and overgrazing	Promote sustainable grazing Promote sustainable silvo-pastoral systems	 
Wildfires	Promote integrated fire management	 
Forest pests and diseases	Promote integrated pest management	

Natural disasters	Promote forestry responses to disasters (e.g. to mitigate impacts, prevent future disasters and strengthen resilience)	

Prioritization and implementation

Actions should be selected and ranked according to agreed criteria (e.g. objectives, estimated costs and potential for funding, and existing implementation capacities) through consultation with local stakeholders. The consultation process can be used to determine which drivers should be addressed first, the most suitable actions for addressing them, and the rationale for the choices.

E-learning

Forests and transparency under the Paris Agreement

The objective of this course is to learn about the Enhanced Transparency Framework (EFT) under the Paris Agreement. It will be useful to those wishing to understand the importance of forest-related data collection, analysis and dissemination in meeting the Enhanced Transparency Framework...

Sharing the experience on “Forest and land monitoring for climate action – SEPAL” facilitated course

The overall objective of this course is to support knowledge and skills development to operationally apply high-resolution satellite imagery to critical forest and land monitoring in tropical forest countries. More specifically, the course focuses on how the System for Earth Observation Data Access...

Sharing the "Forests and Transparency under the Paris Agreement" MOOC multilingual experience

This Massive Open Online Course (MOOC) was based on the FAO e-learning course “Forests and transparency under the Paris Agreement” available on the FAO e-learning Academy. In this course participants learnt about the importance of forest-related data collection, analysis...

Further learning

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FAO. 2013. *FRA 2015 Terms and definitions.* Forest Resources Assessment Working Paper 180

Grau, H. R., & Aide, M. 2008. Globalization and land-use transitions in Latin America. *Ecology and Society* 13(2): 16.

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Prince's Charities' International Sustainability Unit. 2015. *Tropical Forests. A review*.

Simula, M. 2009. *Towards defining forest degradation: comparative analysis of existing definitions*. Forest Resources Assessment Working Paper 154.

Credits

This module was developed with the kind collaboration of the following people and/or institutions:

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This module was revised in 2018 to strengthen gender considerations.

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