## Module 1.3 Assessing and analyzing drivers of deforestation and forest degradation

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After the course the participants should be able to:

- Explain the need for monitoring direct and indirect drivers of deforestation and forest degradation within the UNFCCC REDD+ context
- Summarize different approaches to monitor drivers of deforestation and forest degradation
- Assess likely direct drivers of deforestation and degradation in a country



Photo credit: Agence France-Presse

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## **Background material**

- GOFC-GOLD. 2014. *Sourcebook*. Section 2.8.1.
- GFOI. 2014. Integrating Remote-sensing and Ground-based Observations for Estimation of Emissions and Removals of Greenhouse Gases in Forests: Methods and Guidance from the Global Forest Observation Initiative (MGD). Sections 2.2.1 (Deforestation) and 2.2.2 (Forest degradation).
- Kissinger, Herold, and De Sy. 2012. Drivers of Deforestation and Forest Degradation: A Synthesis Report for REDD+ Policymakers.
- UNFCCC. 2013. Decision 15/CP.19. Addressing the drivers of deforestation and forest degradation. <u>http://unfccc.int/resource/docs/2013/cop19/eng/10a01.pdf#page=43</u>
- UNFCCC. 2010. Decision 1/CP.16. The Cancun Agreements. <u>http://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf#page=2</u>



## **Outline of lecture**

- 1. Background and UNFCCC requirements on addressing drivers of deforestation and forest degradation
- 2. Definitions and overview of drivers
- 3. Different approaches for monitoring drivers of deforestation and forest degradation
- 4. Role of drivers in developing national forest reference (emission) levels and designing policy interventions



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UNFCCC requirements on addressing drivers of deforestation and forest degradation

(UNFCCC. 2014. 15/CP.19; UNFCCC. 2011. 1/CP.16)

- Developing country parties are requested, when developing and implementing their **national strategies or action plans** to **address the drivers** of deforestation and forest degradation.
- Drivers of deforestation and forest degradation have many causes; actions to address these drivers are a function of a countries' national circumstances, capacities, and capabilities.



UNFCCC requirements on addressing drivers of deforestation and forest degradation

Countries are encouraged to:

- Take action to reduce the drivers of deforestation and forest degradation
- Share the results on addressing drivers, including via the web platform on the UNFCCC website (http://unfccc.int/redd)
- Take note of the information from ongoing and existing work on addressing the drivers of deforestation and forest degradation by developing country parties and relevant organizations and stakeholders



## Relevance of drivers in REDD+ policy development and implementation

- Addressing all direct and indirect drivers (see next section) is essential for effectively reducing emissions from deforestation and forest degradation and enhancing forest carbon stocks in every REDD+ country.
- Understanding of drivers is essential for:
  - Designing interventions specifically to target the drivers, thereby increasing the likelihood of reducing emissions through REDD+
  - Assessing the impact of mitigation actions (track drivers locally, nationally, internationally)



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## Direct and indirect drivers of deforestation and forest degradation

- Direct drivers (or proximate drivers): human activities or immediate actions that directly impact forest cover and loss of carbon:
  - Deforestation drivers, mainly large-scale processes
  - Forest degradation drivers, mostly small-scale processes
  - For examples of direct drivers of deforestation and forest degradation, see next slides
- Indirect drivers (or underlying drivers): social, economic, political, cultural, and technological processes that give rise to the direct drivers:
  - Examples of indirect drivers: population growth, migration, market growth, agro-technical change, weak governance and enforcement, individual and household behaviour, etc.

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## Examples of direct drivers of deforestation

Category	
Commercial agriculture	<ul> <li>Forest clearing for cropland, pasture, and tree plantations         <ul> <li>For both international and domestic markets</li> <li>Usually large to medium scale</li> </ul> </li> </ul>
Subsistence agriculture	<ul> <li>Includes both permanent subsistence and shifting cultivation         <ul> <li>Usually by (local) smallholders</li> </ul> </li> </ul>
Mining	<ul> <li>All types of surface mining</li> </ul>
Infrastructure	<ul> <li>Roads, railroads, pipelines, hydroelectric dams</li> </ul>
Urban expansion	Settlement expansion

Source: Hosonuma et al. 2012.



## Examples of direct drivers of forest degradation

These activities cause degradation (as indicated by lower carbon densities) if practiced in previously undisturbed or little disturbed forest ecosystems, and can continue to cause degradation depending on the intensity of subsequent impact

Category	
Timber / logging	<ul> <li>Selective logging</li> <li>For both commercial and subsistence use</li> <li>Includes both legal and illegal logging</li> </ul>
Uncontrolled fires	<ul> <li>Includes all types of wildfire</li> </ul>
Livestock grazing in forest	On both large and small scales
Fuelwood / charcoal	<ul> <li>Fuelwood collection</li> <li>Charcoal production</li> <li>For both domestic and local markets</li> </ul>

#### Source: Hosonuma et al. 2012.



## Direct deforestation drivers: An overview

#### **Distribution of deforestation drivers**

(% of area of deforested land)



 Agriculture is the largest driver of deforestation worldwide (~ 80%)

#### Latin America: Commercial agriculture is biggest driver (2/3 of total deforested area)

#### Africa and (sub)tropical Asia: Commercial agriculture is of similar importance as subsistence agriculture (both 1/3 of total deforested area)

Adapted from Hosonuma et al. 2012.

## Direct degradation drivers: An overview

#### **Distribution forest degradation drivers**

(% of area of degraded forest)



 Latin America and (sub)tropical Asia: Commercial timber extraction and logging > 70% of total degradation

#### Africa:

Fuel wood collection, charcoal production, followed by timber logging

Adapted from Hosonuma et al. 2012.

Drivers of deforestation: Relative importance of commercial versus subsistence agriculture



#### Commercial agriculture: Large scale

Subsistence agriculture: Shifting cultivators and smallholders



## Drivers of forest degradation: Relative importance of commercial vs subsistence drivers



Commercial degradation: Timber / logging Subsistence degradation: Fuel wood collection, charcoal production and livestock grazing in forest



### Indirect drivers of deforestation

- Social processes that underpin the direct causes of deforestation
- Interplay of demographic, economic, technological, institutional, and sociocultural factors
- Main indirect drivers of tropical deforestation and degradation can include:
  - Economic growth if this increases pressure on primary forest resources through increased demand for timber, mineral resources in forest areas, and agricultural products often in the context of a globalizing economy
  - **Population growth** if this increases pressure on forest resources
  - **Insufficient regulatory arrangements**—sustainability policies may exist, but not be adequately enforced (see next slide)



## Indirect drivers of deforestation (continued)

Other indirect drivers of deforestation and forests degradation, related to enforcement of forest policies:

- Weak forest sector governance and institutions
- Conflicting policies
- Illegal activity (related to weak enforcement)
- Corruption
- Low capacity of public forestry agencies
- Land tenure uncertainties
- Inadequate natural resource planning and monitoring



#### Relationship between direct and indirect drivers of deforestation

The indirect drivers are an interplay of demographic, economic, technological, institutional, and sociocultural factors and underpin the direct drivers of deforestation.



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Module 1.3 Assessing and analyzing drivers of deforestation and forest degradation REDD+ training materials by GOFC-GOLD, Wageningen University, World Bank FCPF

Source: Geist & Lambin 2002.

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Trends in indirect drivers, expected to increase pressures on forest in the future

- Increasingly meat-based diets
- Long-term population trends
- Growth in developing country regional markets for key commodities
- Climate change adaptation factors



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## Carbon stock changes due to different deforestation and degradation processes



## Monitoring drivers of deforestation and forest degradation

- Drivers and REDD+ interventions are key to defining priorities and appropriate methods for MRV.
- Monitoring drivers important for:
  - Tracking forest change activities over time
  - Attributing emissions to specific causes
- Monitoring drivers requires resources and efforts additional to estimation and reporting of GHG emissions.
- Engagement with nonforest sectors is important in order to track drivers.



## Approaches to monitor direct drivers of deforestation

- Integrate and combine capacity-development efforts for monitoring drivers with ongoing national forest monitoring for REDD+: Link activity data monitoring with monitoring drivers.
- Remote sensing analysis:
  - Linking forest area changes to specific activities and follow-up land use (time series analysis)
  - Spatial context and location and other features (e.g., roads, settlements) can help in interpretation and can be a useful input for stratification, as set out in the GDOI MGD
- Ground observations for interpretation of land-use patterns: gather national inventories or local and regional knowledge from experts and communities.



## Approaches to monitor direct drivers of forest degradation

- Drivers of forest degradation are more difficult to detect with use of remote sensing than drivers of deforestation.
- High spatial and temporal variation in forest carbon stock change due to degradation, so frequent ground surveying is required.
- Define, identify, and measure an appropriate benchmark or reference condition in order to assess degradation.
- Assess range of natural variation of carbon stocks and other forest attributes before establishing benchmarks.

Monitoring of commercial types of degradation (see slide 14)	Through a combination of satellite data, forest concession data, forest inventories	
Monitoring of subsistence types of degradation (see slide 14)	Proxy data needed	



### Remote sensing for monitoring direct drivers

Driver	Indicator of driver	Method	Sensors
Deforestation			
Industrial agricultural clearing for cattle ranching, row crops, etc.	Large-clearings (>25 ha); post-clearing land use	Size of deforestation polygons (see section 2.1); map of land use following deforestation	MODIS, Landsat-like sensors
Small-scale agricultural clearing for pastures, shifting cultivation, smallholder farming	Small clearings (<25 ha)	Size of deforestation polygons (see section 2.1)	Landsat-like sensors
Infrastructure expansion (roads, mines etc.)	Road networks, new mines	Visual analysis or automated detection of infrastructure features	Landsat-like and high resolution sensors
Degradation			
Unsustainable logging	Logging roads	Spectral mixing (see section 2.1.3)	Landsat-like sensors
Fuel wood and NTFP collection	Footpaths, low biomass, ground data	No accepted method	High resolution
Forest grazing	Ground data	No accepted method	High resolution
Wildfire	Burn scars	Burn scar detection (see section 2.5)	Landsat-like sensors, MODIS

Source: GOFC-GOLD Sourcebook 2014, table 2.8.1.

## National capacities for analyzing drivers

 Comparing country capacities for forest area change monitoring (derived from FAO 2010; see Romijn et al. 2012) with the quality of reported data on drivers from REDD+ readiness reports of 45 countries (i.e., R-PP, CIFOR reports; and see Hosonuma et al. 2012)

Quality of reported driver data	Low	Medium	High	Total
Low (listing)	8	7	3	18
Medium (ranking)	3	10	2	15
High (quantitative)	2	4	6	12
Total	13	21	11	45

#### COUNTRY FOREST AREA CHANGE MONITORING CAPACITY

Source: Kissinger et al. 2012.

Data on GHG emissions from drivers: commonly not available on national level



## Approaches to monitor indirect drivers of deforestation and forest degradation

- Relies on socioeconomic, statistical, and modelling analyses using economic, social, and demographic data and analysis of policy and governance aspects
- Must be sure to include assessment of factors outside the forest sector which affect forests
- Assessment / prediction of indirect drivers is complicated
- Important to address indirect drivers separately and examine at various scales for specific analysis and intervention strategies



## Approaches to monitor indirect drivers of deforestation and forest degradation

- It is difficult to establish clear correlation between indirect driver assessments and remote sensing and ground-level data:
  - Both ex-poste (after) and ex-ante (before intervention) assessments are challenging and may need to be revised as new information becomes available
- Good subnational data is needed: these are often scattered among sources, sectors and ministries.



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# Role of drivers in developing national forest reference (emission) levels

- Scenarios of future deforestation and degradation are based on understanding of drivers and their future developments.
- Considering drivers is important for adjusting forest reference (emission) levels (FRL) based on historical data taking into account national circumstances.
- Availability and quality of driver data is fundamental in establishing FRLs.
- A stepwise approach may be used to improve the quality and accuracy of the FRL, with increasing capacities and improved data input.



### REDD+ strategies and interventions

- In order to be successful, REDD+ strategies and interventions need to address direct drivers and indirect drivers of deforestation and degradation simultaneously.
- Interventions are related to decoupling economic growth from deforestation.
- Engagement with nonforest sectors is important. It can help integrate information in order to:
  - Track driver activity
  - Ensure social and environmental safeguards
  - Evaluate trade-offs and livelihood implications



### Examples of interventions and strategies

### Summary of national REDD+ readiness plan interventions and strategies to address drivers of deforestation and forest degradation

INTERVENTION/STRATEGY	Percentage of countries reviewed pursuing interventions/strategy as part of REDD+		
Sustainable forest management	55%		
Fuel wood efficiency/cookstoves	55%		
Illegal logging/enforcement/institutional strengthening	45%		
Community forest management/CBFRM/ Participatory Forest Management	45%		
Agroforestry	42%		
Tenure and rights	42%		
Policy and governance reform	42%		
Zoning and land-use planning	35%		
Cross-sectoral coordination	32%		
Agricultural intensification	32%		
Reforestation	29%		
Livestock/rangeland management	29%		
Shifting expansion to/reforestation on degraded lands	26%		
Payments for ecosystem services	23%		
Protected areas strategies	23%		
Afforestation	19%		

Source: Kissinger et al. 2012.

### In summary

- Addressing drivers of deforestation and forest degradation part of national strategies or action plans to reduce emissions in the context of REDD+
- Distinction between direct drivers (proximate causes) and indirect drivers (underlying causes) of deforestation and forest degradation
- Remote sensing analysis combined with ground observations important for assessing direct drivers
- Indirect drivers analysis more complex than direct, good subnational data from different sources and sectors needed
- Drivers input essential for developing REDD+ forest reference emission levels and for developing effective REDD+ policy strategies and interventions

### Country examples and exercises

#### Country examples

- National analysis of drivers of deforestation in:
  - Democratic republic of the Congo
  - Indonesia

#### Exercises

- Assessing and analyzing drivers of deforestation in a tropical country:
  - Exercise 1 Strategy development on how to address drivers
  - Exercise 2 Qualitative assessment of drivers of deforestation

### Recommended modules as follow-up

- Module 2.1 to proceed with REDD+ measuring and monitoring and focus on monitoring activity data for forests using remote sensing
- Modules 3.1 to 3.3 to learn more about REDD+ assessment and reporting



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