

Module 1.1 UNFCCC context and requirements and introduction to IPCC guidelines

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After the course the participants should be able to:

- Understand the UNFCCC context and requirements for monitoring and reporting of REDD+ activities
- Explain fundamental concepts of the IPCC guidelines for national greenhouse gas (GHG) inventories and for reporting on forest-related activities



V2, December 2016

Background material

- GOFC-GOLD. 2014. *Sourcebook*. Section 1.
- IPCC good practice guidelines and guidance (various).
<http://www.ipcc-nggip.iges.or.jp/public/index.html>
- 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).
- Hewson, Steining, and Pesmajoglou, eds. 2013. REDD+ Measurement, Reporting and Verification (MRV) Manual. USAID-supported Forest Carbon, Markets and Communities Program.



Background material

- UNFCCC, 2016. Decision 1. Adoption of the Paris Agreement. Report of the Conference of the Parties on its twenty-first session, held in Paris from 30 November to 13 December 2015. FCCC/CP/2015/10/Add.1.
http://unfccc.int/meetings/paris_nov_2015/session/9057/php/view/decisions.php#c
- UNFCCC. 2013. CP.19 Decisions:
 - Decision 11. Modalities for national forest-monitoring systems.
<http://unfccc.int/resource/docs/2013/cop19/eng/10a01.pdf#page=31>
 - Decision 12. The timing and the frequency of presentations of the summary of information on how all the safeguards referred to in decision 1/CP.16, appendix I, are being addressed and respected.
<http://unfccc.int/resource/docs/2013/cop19/eng/10a01.pdf#page=33>
 - Decision 13. Guidelines and procedures for the technical assessment of submissions from Parties on proposed forest reference emission levels and/or forest reference levels.
<http://unfccc.int/resource/docs/2013/cop19/eng/10a01.pdf#page=34>
 - Decision 14. Modalities for measuring, reporting and verifying.
<http://unfccc.int/resource/docs/2013/cop19/eng/10a01.pdf#page=39>
 - Decision 15. Addressing the drivers of deforestation and forest degradation.
<http://unfccc.int/resource/docs/2013/cop19/eng/10a01.pdf#page=43>



Background material

- UNFCCC. 2011. Decision 12/CP.17. Guidance on systems for providing information on how safeguards are addressed and respected and modalities relating to forest reference emission levels and forest reference levels as referred to in decision 1/CP.16
<http://unfccc.int/resource/docs/2011/cop17/eng/09a02.pdf#page=16>
- UNFCCC. 2011. Decision 2/CP.17. Outcome of the work of the ad hoc working group on long-term cooperative action under the convention.
<http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf#page=4>
- UNFCCC. 2010. Decision 1/CP.16. The Cancun Agreements
<http://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf#page=2>
- UNFCCC. 2009. Decision 4/CP.15. Methodological guidance for activities relating to reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries.
<http://unfccc.int/resource/docs/2009/cop15/eng/11a01.pdf#page=11>
- UNFCCC. 2007. Decision 2/CP.13. Reducing emissions from deforestation in developing countries: approaches to stimulate action.
<http://unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf#page=8>



Outline of lecture

1. Introduction to UNFCCC REDD+ process
2. UNFCCC context and requirements for measurement and reporting of REDD+ activities
3. IPCC guidelines for national GHG inventories and reporting for forest land
 - a. Reporting principles
 - b. Estimation of carbon emissions



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Tropical forests and climate change

- Tropical forests store significant amounts of carbon in above- and belowground biomass, dead wood, litter, and soil.
- Deforestation impacts global GHG emissions by releasing carbon dioxide (CO₂) to the atmosphere.
- A significant amount of emissions is from deforestation: see next slide.



Greenhouse gas emissions by economic sectors in 2010

Electricity and Heat Production 25%

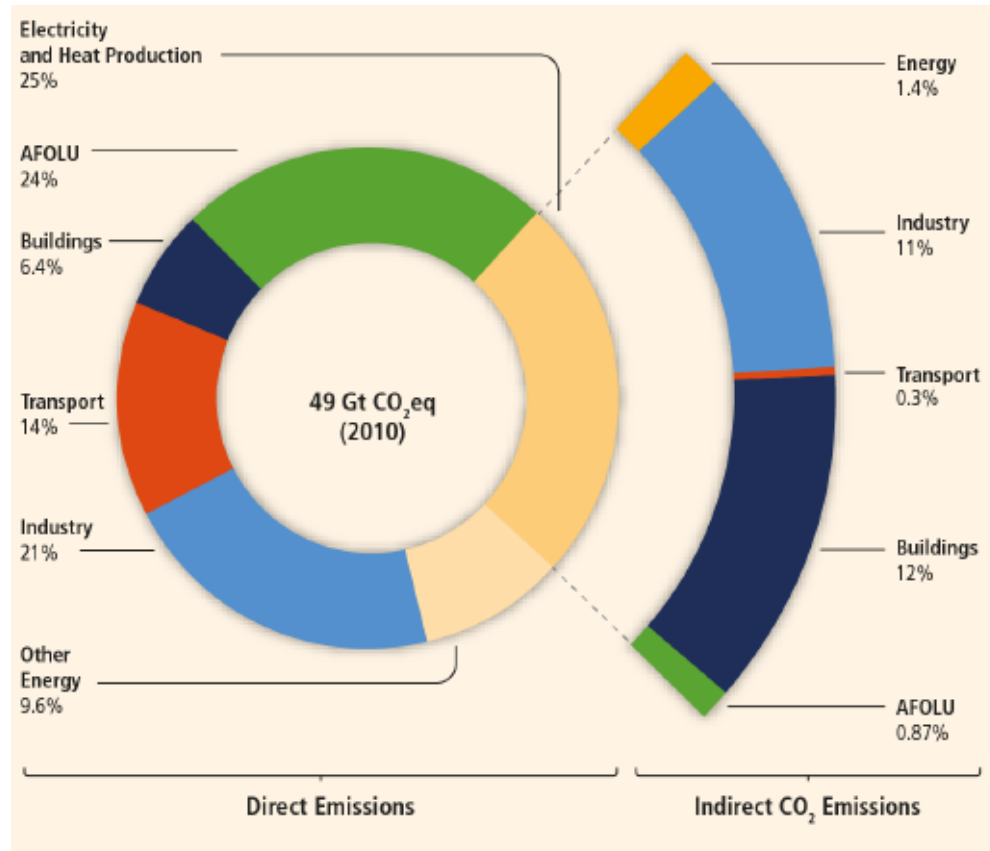
AFOLU 24%

Buildings 6.4%

Transport 14%

Industry 21%

Other energy 9.6%



Energy 1.4%

Industry 11%

Transport 0.3%

Buildings 12%

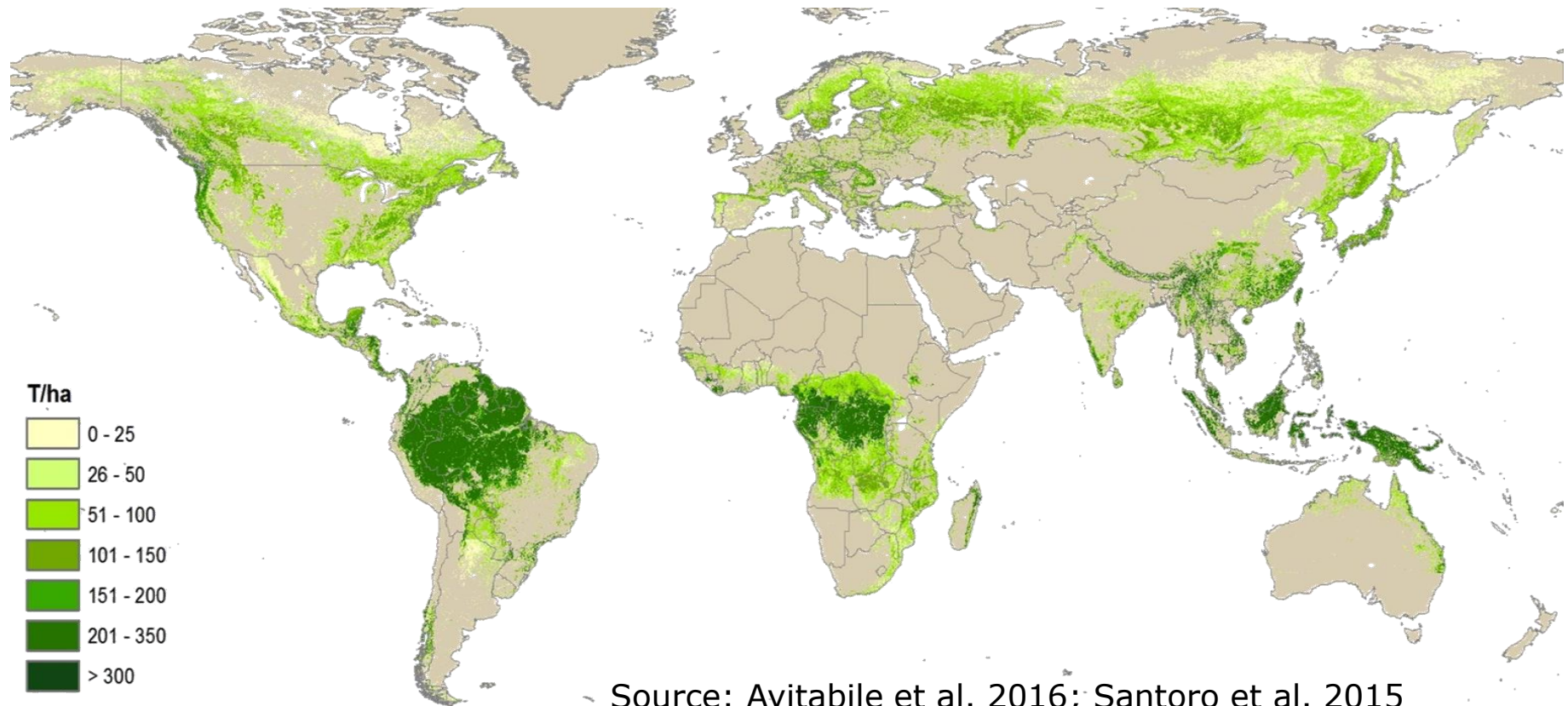
AFOLU 0.87%

Source: IPCC, 2014

➤ AFOLU: agriculture, forestry and other land use



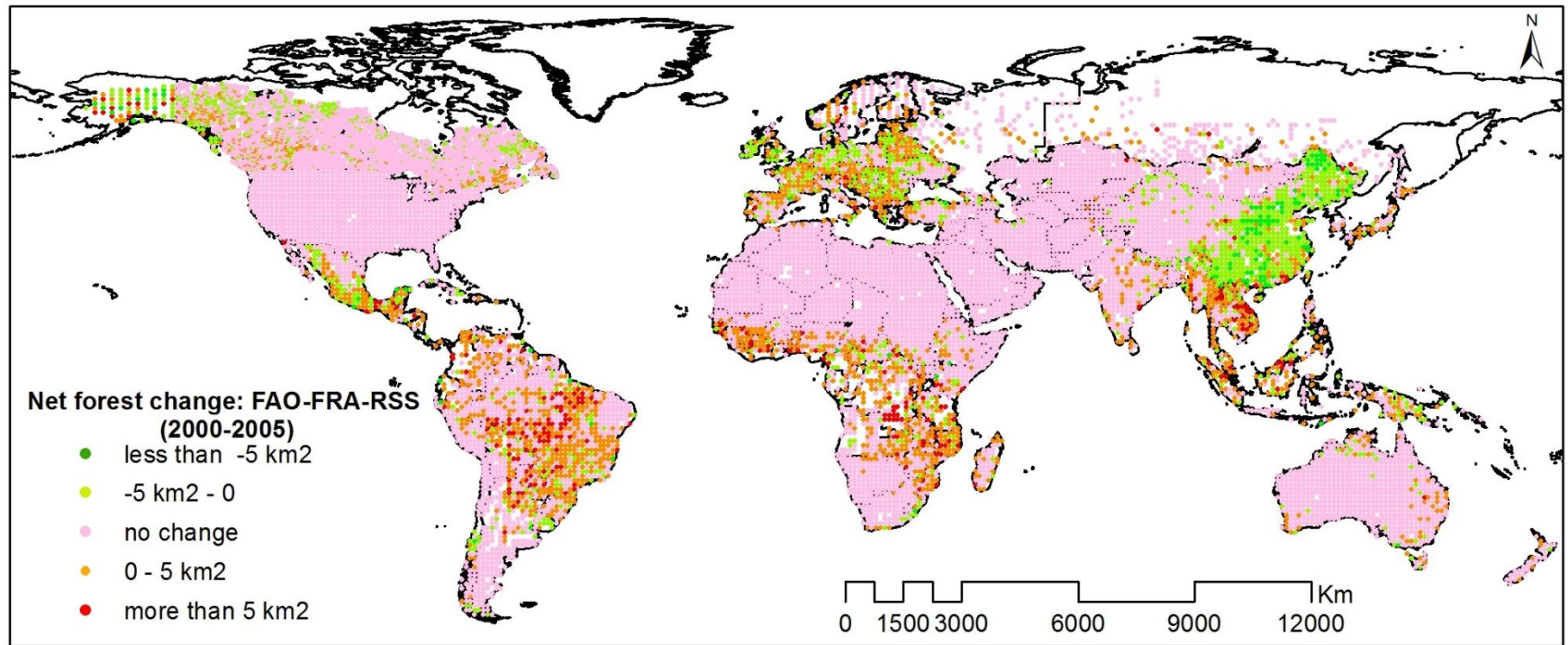
Distribution of aboveground forest biomass



Source: Avitabile et al. 2016; Santoro et al. 2015
<http://lucid.wur.nl/>



Forest change patterns, 2000–2005



Source: FAO & JRC 2012



Climate mitigation framework REDD+

- United Nations Framework Convention on Climate Change, Cancun Agreements on REDD+ (UNFCCC, 2011. Dec.1/CP16)
"Policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries"
- Following activities are included:
 - Reducing emissions from **deforestation**
 - Reducing emissions from **forest degradation**
 - **Conservation** of forest carbon stocks
 - **Sustainable management** of forest
 - **Enhancement** of forest carbon stocks

} **REDD**
} **+**



Development of REDD+ policy

Conferences of the Parties (COPs)

2005

COP11 Montreal RED discussions started. Papua New Guinea and Costa Rica asked for new agenda item: "Reducing emissions from deforestation in developing countries: Approaches to stimulate action."

2007

COP13 Bali Bali Action Plan was provided, in which the RED concept was broadened to REDD+.

2009

COP15 Copenhagen Methodological guidance for REDD+ activities was developed.

2010

COP16 Cancun Cancun Agreements were established, including policy approaches and positive incentives on issues relating to REDD+.

2013

COP19 Warsaw REDD+ package was developed, including modalities and guidance for establishing national forest-monitoring systems; measuring, reporting, and verification (MRV); and forest reference (emission) levels and addressing safeguards and drivers.



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UNFCCC COP 21: Paris Agreement (1/CP.21)

(1/3)

- The Paris Agreement is a new legally-binding framework for an **internationally coordinated effort to tackle climate change** and replaces the Kyoto Protocol.
- The overall goal of the Paris Agreement is to hold increase in global average temperature **well below 2 degrees** on pre-industrial levels and to reach global peaking as soon as possible.
- The Paris Agreement encourages Parties to support existing frameworks for REDD+ and **includes references to previous COP decisions on REDD+.**



UNFCCC COP 21: Paris Agreement (2/3)

- Individual countries have to formulate their mitigation measures in **nationally determined contributions** (NDCs) which should be communicated and updated every five years.
- **REDD+ action and support** needs to be included in the NDCs.
- **Global Stocktaking** takes place every five years with the goal to assess whether collective mitigation action as expressed in NDCs is consistent with meeting the global temperature goals of the Paris Agreement.



UNFCCC COP 21: Paris Agreement (3/3)

Transparency Framework

- Parties are required to **account for their NDCs** in a way that ensures environmental integrity.
- Parties have to **provide information** necessary to track progress made in implementing and achieving its NDCs and keep track of their emissions in **national inventory reports**. For more info see Module 3.3
- Information submitted will undergo a **technical expert review**.



UNFCCC REDD+ mechanism

- Parties should collectively aim to **slow, halt, and reverse forest cover and carbon loss**, thereby addressing the five REDD+ activities.
- Participation is voluntary and in accordance with respective **capacities and national circumstances**.
- **Performance-based payments** are based on the difference between actual forest emissions and a reference level, which requires:
 - Methodologies to estimate actual emissions and removals
 - Establishment of a reference level with the same coverage of emissions and removals
- REDD+ results-based actions should be **measured, reported, and verified (MRV)**; full implementation requires national monitoring systems.



Guidance from UN climate negotiations on MRV of REDD+ activities

Developing country parties are requested to develop the following elements:

- A national strategy or action plan
 - Including ways to address drivers of deforestation and forest degradation (See Module 1.3) and ensuring safeguards
- A robust and transparent national forest-monitoring system including, if appropriate, subnational systems (See Module 1.2)
- A national forest reference (emission) level (See Module 3.2)
- A system for providing information on the safeguards (respecting the role of local people and ecosystems)



REDD+ phased approach

Countries may follow a phased approach for implementing REDD+ in steps, which allows them to gradually build capacities and acquire data

Implementation phase		Characteristics	MRV activities
Phase 1	Readiness	National strategy or action plan formulation, development of policies and measures and capacity building	Capacity-development needs; roadmap development
Phase 2	Transition, implementation, and capacity building	Implementation of national policies and measures and national strategies or action plans (further capacity building); technology development and transfer and results-based demonstration activities	Demonstration activities; monitoring system development
Phase 3	Full implementation	Implementation of national policies and measures on the whole national territory; results-based actions that should be fully measured, reported, and verified	national performance monitoring system; fully operational MRV system to report REDD+ mitigation performance in CO ₂ e

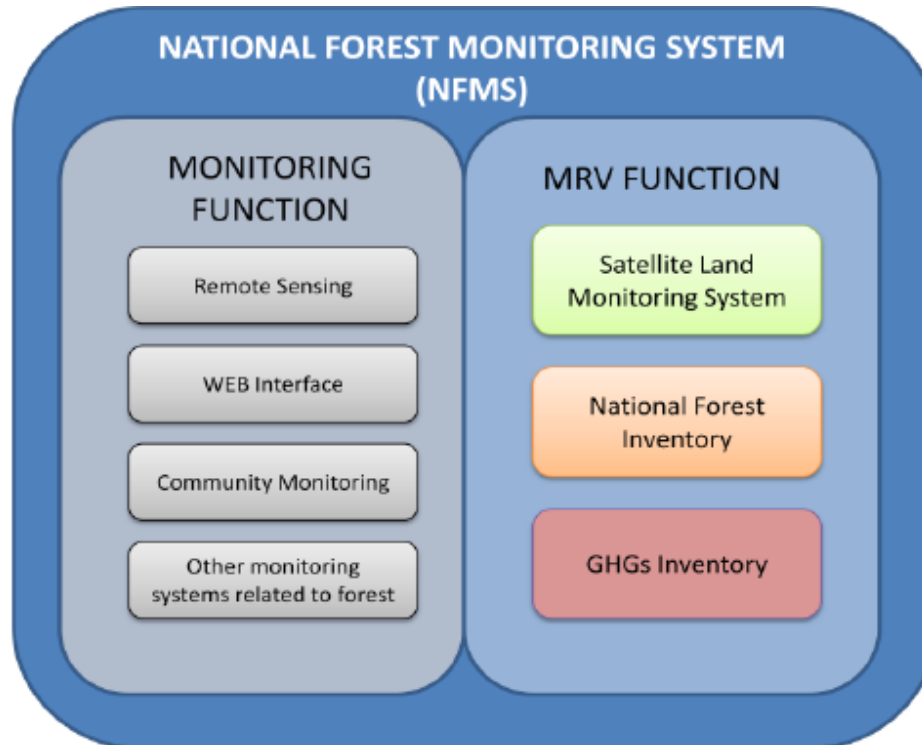


Modalities for developing national forest-monitoring systems (11/CP.19)

- Countries should establish national forest-monitoring systems (NFMS), with, if appropriate, subnational monitoring and reporting as an interim measure.
- National forest-monitoring systems should:
 - Build on existing systems, as appropriate
 - Enable the assessment of different types of forest in the country, including natural forest
 - Be flexible and allow for improvement
 - Reflect, as appropriate, the phased approach
- For more info on NFMS, [see Module 1.2](#)



Concepts of REDD+ MRV and national forest-monitoring systems



Two simultaneous NFMS functions:

- **Monitoring function**
 - More than assessment of only carbon
 - Harmonization of existing and new forest-monitoring tools important
 - Should be well harmonized with development of MRV capacities
- **MRV function**

Source: UN-REDD 2013



Modalities for addressing drivers (15/CP.19) & safeguards (12/CP.19)

- Drivers of deforestation and forest degradation (See Module 1.3):
 - It is important to address drivers of deforestation and forest degradation in the context of the development and implementation of national strategies and action plans by developing country parties.
 - Drivers have many causes, and actions to address these drivers are unique to countries' national circumstances, capabilities. and capacities.
- Safeguards:
 - Developing country parties should provide a summary of information on how all of the safeguards referred to in decision 1/CP.16, appendix I, are being addressed and respected throughout the implementation of the activities.

All parties are encouraged to share the summary on safeguards and drivers, including via the web platform on the UNFCCC website.



Modalities for forest reference emission levels (FREL) and forest reference levels (FRL)

(12/II CP.17 and Annex)

- FRLs/FRELs are benchmarks for assessing each country's performance in implementing REDD+ activities. They are:
 - Expressed in t CO₂eq per year
 - Consistent with anthropogenic forest-related GHG emissions and removals from the GHG inventories
- FR(E)Ls should be transparent, taking into account historical data and adjusting for national circumstances.
- FR(E)Ls may be improved over time, incorporating better data, improved methodologies, and / or additional carbon pools.
- Submission of a FR(E)L shall be subject to a technical assessment.
- For more info on FR(E)L development, [see Module 3.2](#).



Modalities for measuring, reporting, and verifying (14/CP.19)

- Results (emissions/reductions) are made in t CO₂ per year, consistent with the assessed reference levels.
- Data and methodologies may be improved over time, while maintaining consistency with FR(E)L.
- Data and information should be provided through biennial update reports by parties that include, in addition to a technical annex:
 - Summary information on assessed FR(E)Ls
 - Results in CO₂eq per year consistent with FR(E)L
 - Methods used for establishing FR(E)Ls and results that are consistent
- A team of Land Use, Land-Use Change, and Forestry (LULUCF) experts will perform a technical analysis of the submitted results.
- For more info on reporting REDD+ performance, [see Module 3.3](#).



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Reporting of GHG emissions / reductions

- Within UNFCCC REDD+ context, developing countries should:
 - Identify land use, land-use change, and forestry activities and related drivers of deforestation / forest degradation
 - Use a combination of remote sensing and ground-based forest carbon inventory approaches for estimating anthropogenic forest-related GHG emissions and removals, forest carbon stocks, and forest area changes
- Estimating emissions / removals should be done using the IPCC 2003 good practice guidance and guidelines (see next slide)



IPCC Good Practice Guidance and Guidelines

- IPCC guidance and guidelines comes in many different volumes
- Most relevant for REDD+ is 2003 Good Practice Guidance for Land Use, Land-Use Change and Forestry (GPG-LULUCF), which refers to 1996 Guidelines.
- Countries may wish to refer to the updates in the 2006 Guidelines (AFOLU).
- The GFOI Methods and Guidance Document (MGD) provides systematic linkage between IPCC guidance and each of the REDD+ activities, showing in each case how the IPCC methods can be used to estimate the REDD+ activity and countries may also wish to refer to this.



IPCC good practice principles

Countries should report estimates that are consistent with the five IPCC reporting principles:

- *Consistency* – Same definitions and methodologies used over time
- *Comparability* – Standard methodologies and formats, provided by IPCC and agreed within UNFCCC
- *Transparency* – Assumptions and methodologies clearly explained and appropriately documented
- *Accuracy* – Estimates neither over- nor underestimated, uncertainties reduced as far as is practical
- *Completeness* – Estimates include all agreed categories, gases, and pools for all relevant geographical areas



Forest definitions

- A forest definition is needed to estimate deforestation and other changes.
- Countries may use their own definitions and should use them consistently. UNFCCC asks for an explanation if countries use a different forest definition for REDD+ than the one used for other international reporting.
- FAO forest definition:
 - Minimum forest area: 0.5 ha
 - Trees potential to reach a minimum height of 5 meters
 - Minimum tree crown cover: 10%
 - Forest use should be the predominant land use in the area
- Considerations for establishing forest definition:
 - Thresholds of minimum forest area / crown cover / tree height
 - Including / excluding plantation forests
 - Separate natural forest class



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Estimation of carbon emissions

Carbon emissions

Deforestation

$$C_{gr_em} = \left(\sum_{i=1}^m A_{loss(i)} \cdot C_{loss(i)} \right)$$

for forest types $i \dots m$

C_{gr_em} = Gross carbon emissions

A_{loss} = Area of deforestation (ha), also called *activity data*

C_{loss} = Change in carbon stock per unit area (t/ha), also called *emission factor*



Estimation of carbon emissions

Carbon emissions

Deforestation

$$C_{gr_em} = \left(\sum_{i=1}^m A_{loss(i)} \cdot C_{loss(i)} \right)$$

■ Data needs:

- Forest area change (activity data) (See Modules 2.1 and 2.2)
 - Associated carbon stocks changes (emission factors) – See M. 2.3
 - Forests need to be stratified by forest type, e.g., primary forest, modified natural forest, and planted forest (or some other stratification according to national circumstances) (See GFOI MGD for more advice)
- More information on the application of IPCC methods to REDD+ activities and stratification of forests is provided in the GFOI MGD, which describes how to estimate not only deforestation, but degradation and all the other REDD+ activities.



IPCC guidance on assessing activity data

Three approaches for assessing forest area changes, with increasing accuracy and precision

Approach 1	Approach 2	Approach 3
Total area for each land use category, but no information on conversions	Tracking of conversions between land-use categories, on nonspatially explicit basis	Tracking of land-use conversion on a spatially explicit basis
Only net changes between categories	Changes between categories	Changes between categories and within categories

➤ Assessment of remote sensing data (satellite images) for Approach 3



Defining and measuring vegetation biomass



Biomass is defined as mass per unit area of above- or belowground live plant material (in g/m² or multiples)

About half of the biomass is carbon (average forest carbon fraction is 0.47)

There are four main ways to estimate biomass:

1. *In situ* destructive direct biomass measurement
2. *In situ* nondestructive biomass estimations (using allometric equations or conversion factors) appropriate to the ecosystem under consideration
3. Inference from remote sensing (can be problems with saturation)
4. Models calibrated to the ecosystem under consideration

See Module 2.3 for more.



IPCC guidance on assessing emission factors

- Emission factor = change in C stock per unit area
- Stratification of carbon stocks into forest types with different C densities
- Assessment of 5 carbon pools per strata:
 - **Aboveground biomass** – trees and shrubs
 - **Belowground biomass** – root biomass
 - **Dead wood** – logs and fallen branches
 - **Litter** – fine woody debris, dead leaves and humus
 - **Soil organic matter** – carbon that has been incorporated into the mineral soil



IPCC guidance on assessing emission factors

Three tiers for estimating emission factors, with increasing accuracy and precision

Tier 1	Tier 2	Tier 3
IPCC default factors (i.e., biomass in different forest biomes, carbon fraction, etc.)	Country-specific data for key factors (e.g., from field inventories, permanent plots)	Detailed national inventory of key C stocks, repeated measurements of key stocks through time and modeling



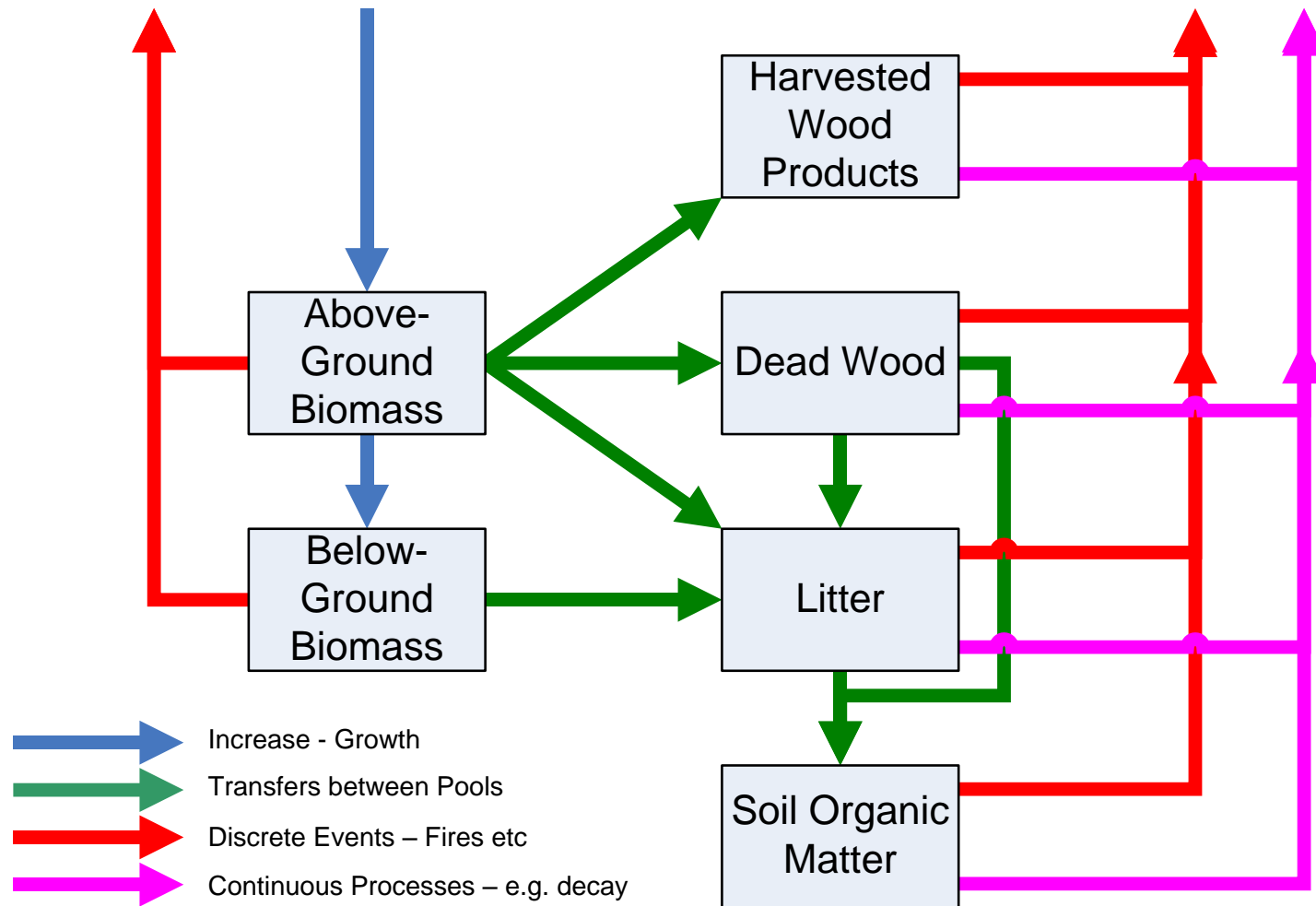
Approaches to estimate C emissions

- IPCC describes two methods: gain-loss and stock change.
- Gain-loss is more generally applicable.
- The GFOI MGD describes how to use IPCC guidance to estimate emissions and removals from the five REDD+ activities.
- **See Module 2.5** on estimation of carbon emissions from deforestation and forest degradation.



C Pools and fluxes in forests

(Source: IPCC 2003, GPG)



Estimating C emissions from deforestation and forest degradation with use of disturbance matrix

- Retention, transfers, and releases of carbon can be tracked
- Impossible transfers are blacked out

<div> <div>To</div> <div>From</div> </div>	Above-ground biomass	Below-ground biomass	Dead wood	Litter	Soil organic matter	Harvested wood products	Atmo-sphere	Sum of row (must equal 1)
Aboveground biomass								
Belowground biomass								
Dead wood								
Litter								
Soil organic matter								

Source: IPCC 2006, AFOLU Guidelines



In summary

1. REDD+ is a UNFCCC process following COP decisions.
2. Countries measure and report on the five REDD+ activities and carbon pools defined by IPCC; significant pools and activities should not be omitted.
3. COP decisions require use of IPCC guidance and guidelines.
4. National forest-monitoring systems are needed for measurement, reporting, and verification of REDD+ activities.
5. The GFOI MGD has described how to use IPCC guidance and guidelines to do this.



Country examples and exercises

Country examples

- Review of FCPF country REDD+ readiness preparation proposals
- Phased approach to improving greenhouse gas inventories in Mexico
- Experiences from annex I countries using tier 3 models for carbon accounting

Exercises

- Exercises will start in **Module 1.2.**



Recommended modules as follow-up

- **Module 1.2** as a continuation of the UNFCCC context within a country and to learn more about building a national forest-monitoring system for REDD+
- **Modules 2.1 to 2.8** to continue with REDD+ measuring and monitoring
- **Modules 3.1 to 3.3** to learn more about REDD+ assessment and reporting



References

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<http://www.climatefocus.com/sites/default/files/20151228%20COP%2021%20briefing%20FIN.pdf>
- UNFCCC COP (United Nations Framework Convention on Climate Change Conference of the Parties) Decisions. This module refers to and draws from various UNFCCC COP decisions. Specific decisions for this module are listed in the “Background Material” slides. All COP decisions can be found from the UNFCCC webpage “Search Decisions of the COP and CMP.”
<http://unfccc.int/documentation/decisions/items/3597.php#beg>.
- UN-REDD, 2013. National Forest Monitoring Systems: Measurement, Reporting and Verification (M & MRV) in the context of REDD+ Activities.
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