



Topic D1. Forest reference emissions level/ Forest reference level (FREL/FRL)

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Forest Reference Emissions Level/Forest Reference Level (FREL/FRL) is not only an important topic but also important step in the development of a project



Outline

- Introduction
 - Reference for mitigation
 - Definitions
- Developing FREL/FRL
- Modalities for FREL/FRL
- A stepwise approach to develop FREL/FRL
- Concluding remarks
- References

In this topic, after defining what is FREL and FRL are, we will describe three main issues related to FREL and FRL:

- Developing FREL/FRL
- Modalities for FREL/FRL
- A stepwise approach to develop FREL/FRL



Introduction: Reference for mitigation activities

- Kyoto mechanisms
 - Including Emission Trading (ET), Clean Development Mechanism (CDM), and Joint Implementation (JI)
 - The term “**baseline**” is used
- NAMA
 - Action that reduces emissions in developing countries and is prepared under the umbrella of a national governmental initiative (**Unilateral NAMA**)
 - Enabled by technology, financing, and capacity-building and are aimed at achieving a reduction in emissions relative to 'business as usual' emissions in 2020 (**Supported NAMA**)
- REDD
 - Mitigation measures through land-use sector starting from RED, REDD, and REDD+
 - Country-driven reference level (FREL/FRL) is underway

There are a number of mechanisms under the United Nations Framework Convention on Climate Change (UNFCCC) that require references, for example:

In the Kyoto mechanisms, there are emissions trading (ET), the clean development mechanism (CDM), and joint implementation (JI) (that all requires a reference called a “baseline”)

Under the Nationally Appropriate Mitigation Action (NAMA) there are actions that reduces emissions in developing countries and are prepared under the umbrella of a national governmental initiative (**unilateral NAMA**); enabled by technology, financing, and capacity-building and are aimed at achieving a reduction in emissions relative to 'business as usual' emissions in 2020 (**supported NAMA**)

Then, under REDD there are mitigation measures in the land-use sector; country-driven reference levels (FREL/FRL)



Definitions

- **Forest Reference Level (FRL)** is generally used in the context of REDD+ to estimate the amount of emission reductions from deforestation and forest degradation, as well as the amount of removals from sustainable forest management and enhancement of forest carbon stocks in a geographical area.
- **Forest Reference Emissions Level (FREL)**, in contrast, often is used to refer to the amount of emissions from deforestation and forest degradation from a geographical area (REDD).

When the REDD mechanism proposal appeared for the first time at Bali's COP13 the term "reference level" sounded very new to those who had been using the term "baseline" in mechanisms such as CDM. "Reference level" and "baseline" mean the same thing – and are used to measure how successful (or unsuccessful) a project is when project activities that are implemented to reduce emissions are compared with the business-as-usual scenario.

More recently, in the context of REDD+ we are hearing another term: "Forest Reference Level (FRL)". FRL is an estimate of the amount of emission reductions from deforestation and forest degradation, and the amount of removals from sustainable forest management and enhancement of forest carbon stocks in a geographical area.

At the same time, we repeatedly hear the term FRL/FREL to signify the choice of project context.

"Forest Reference Emissions Level (FREL)" is another term used for the amount of emissions from deforestation and forest degradation from a geographical area (REDD).

Throughout this presentation we may use FREL and FRL interchangeably, depending on the context.



Developing FREL/FRL for REDD+

- FREL/FRL can be submitted on a voluntary basis by developing country Parties
- Historical data and understanding forest change patterns and underlying causes are important
 - to take national circumstances into account,
 - to construct scenarios that deviate from historical trends
- Data type and the proximate drivers of deforestation and degradation may be identified for a step wise approach in developing FREL/FRL

There are some important issues to keep in mind when developing and using FREL/FRL for REDD+

A FREL/FRL “figure” should be provided by REDD+ countries

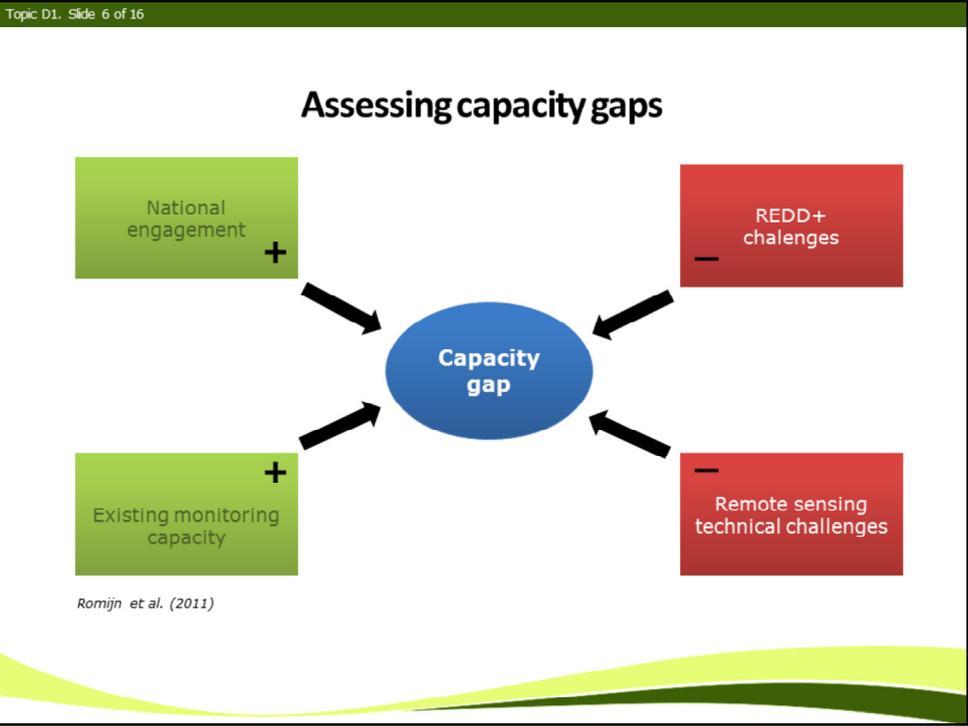
Historical data and understanding forest change patterns and their underlying causes are important

- to take national circumstances into account;

- to construct scenarios that deviate from historical trends.

The availability of data, including those of drivers, is uncertain in many REDD+ countries.

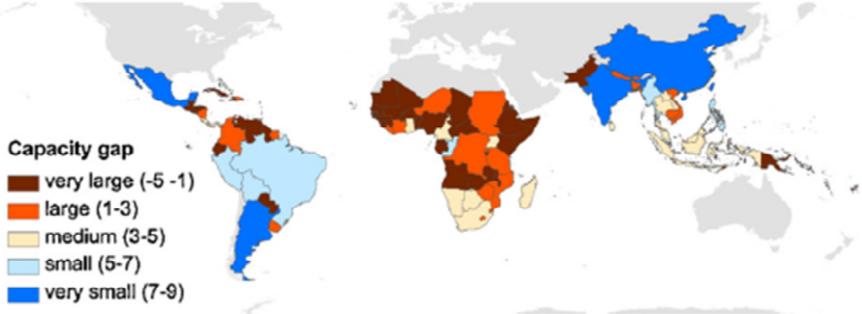
A stepwise approach should be used as a starting point to match available data and their quality with the choice of reference level methods, its uncertainties and country circumstances.



One has to realize that in many cases, developing countries experience capacity gaps at different levels.

Assessments were made based on their capacity in monitoring forest using existing inventory techniques and spatial analysis capacities.

Capacity gaps in developing countries



Romijn et al. (2011)

The gaps were derived by adding up the indicator scores for the assessment categories 1 and 2 (national engagement and existing monitoring capacities) and then subtracting the scores for the assessment categories 3 and 4 (REDD+ and remote sensing technical challenges).

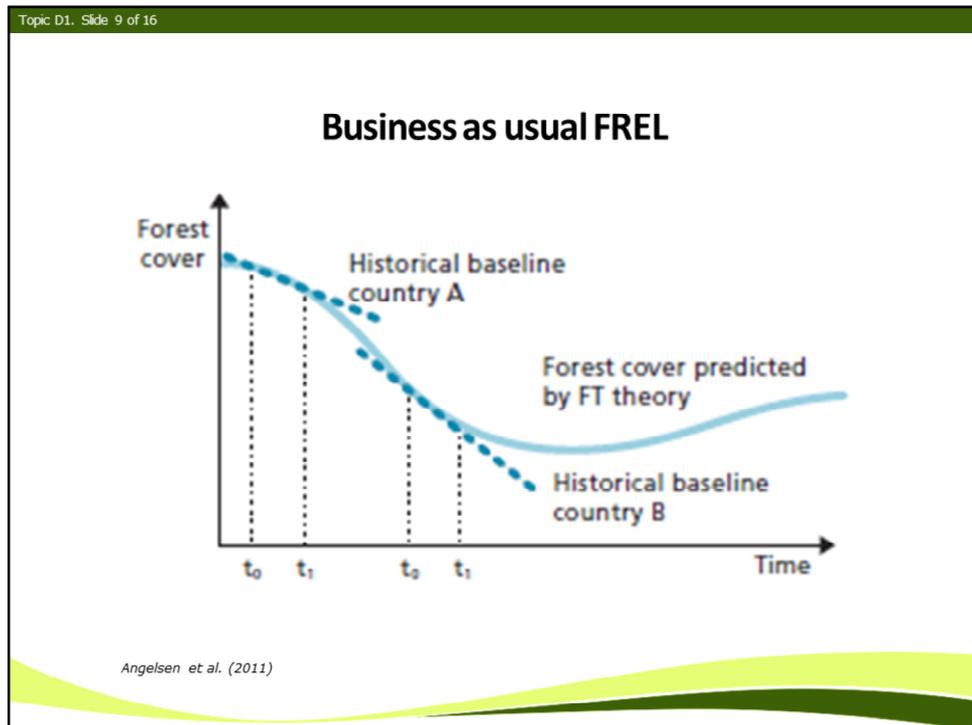
The result was classified into five categories ranging from very small to very large as shown in this map.

Modality for FREL/FRL development

Type of Data	Source of Data	Type of Data	Source of Data
Spatially explicit data for stratifying lands	Maps of biophysical factors (e.g. vegetation, elevation and slope, climate zones), disturbance history (e.g. past logging), transportation networks, population centers, forest management designations (e.g. production, protection).	Key agents or proximate drivers of deforestation and degradation¹⁹	Remote sensing imagery used for deforestation and forest degradation assessments, other map layers of transportation networks and population centers.
Spatially explicit activity data on gross deforestation and gross forestation	Time series of remote sensing products for a minimum of 3 times within at least 10 years (e.g. freely available Landsat data since 1990). ¹⁷	Analysis of key pools	Estimates of carbon (C) stocks in all nonsoil pools from existing data or newly collected data from field pilot plots. For soil pool, estimates of soil C stock to 30 cm depth in forest strata likely to be converted to agriculture, (e.g. from forest to annual crops; from soil sampling in forests typical of those deforested during historic period; and from the Harmonized World Soil Database). ²⁰
Activity data for forest degradation¹⁸ and carbon stock enhancement	Selective logging: Maps of concession areas and forest cover, and multi-year medium- to high-resolution remote sensing products and/or reliable historic records of timber extraction rates (m ³ /yr). Escaped fires: Multi-year medium to high resolution imagery of fire products coupled with optical imagery. Low-level wood extraction for fuel or local use: Very high-resolution satellite or aerial imagery. Tree planting: Area and location of each type of activity (e.g. reforestation, enrichment planting, trees outside forest) by species types and age.	Estimates of emission factors for each stratum	Appropriate allometric equations for forests. Good-quality existing data from forest inventories or other studies with good coverage for each stratum or statistically sound field data collected for all selected pools. For emission factors for degradation, use the gain-loss method based on estimates of emissions per unit of timber extracted and regrowth rates (e.g. in t C/ha/yr).

Angelsen et al. (2011)

The modality of FREL/FRL could adopt the following pathway:
 obtain and manage spatially explicit data for stratifying land;
 develop spatially explicit data on gross deforestation and gross forestation;
 assess activity data for forest degradation and carbon stock enhancement;
 identify key drivers of deforestation; and
 estimate emission factors.

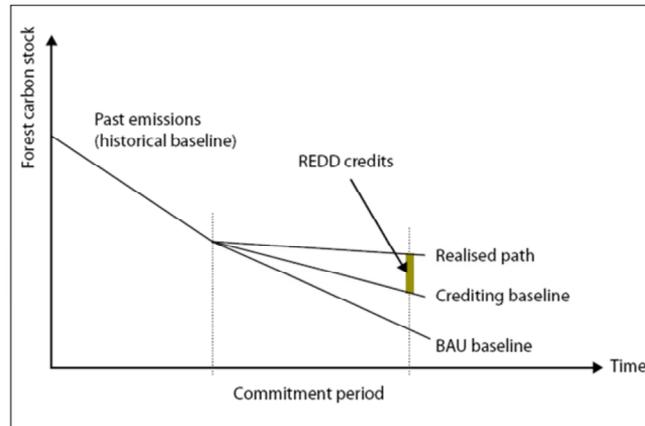


Countries could easily develop their 'business as usual' forest cover change, for example, through historical data of annual deforestation rates

This could be the first measurement for FREL/REL

Depending on a country's circumstances, the reference can be negative (with a steep or a gradual slope) or can be positive, (meaning that it gains forest cover).

FREL/FRL for crediting REDD+



Angelsen et al. (2011)

Crediting baseline is somewhat different, especially when selling countries will have to deal with buyers in regulated or more stringent markets.

It can be set slightly higher to buffer any potential risks associated with a country's circumstances.

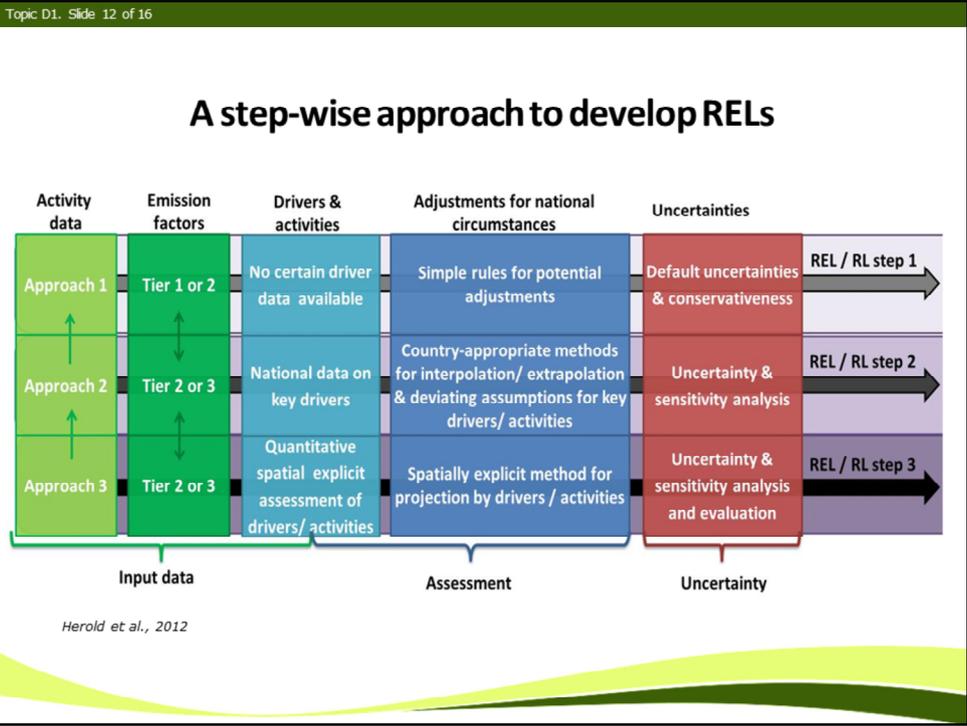
A step-wise approach to develop RELs

Step	Example	References
1. Define the pools and gases included in the RL with a justification for their inclusion	Above-ground, below-ground, and dead wood, since other pools are insignificant; includes CO ₂ only, as non-CO ₂ gases are <i>de minimus</i>	IPCC 2006 Guidelines ¹³
2. Specify the definition of forest used	All lands with tree canopy cover of 20% or more, with minimum area of 1 ha, and trees taller than 3 m	According to thresholds for defining forest in the Marrakesh Accords ¹⁴
3. Establish the historic time period within which emissions and removals will be estimated	2000 to 2010	—
4. Describe the methods used to estimate carbon stocks for the selected time period	Because no data exist in country, a plan was designed and implemented to collect data from a sufficient number of plots in the forest class where deforestation had occurred during the selected time period to achieve uncertainty around the mean of +/-15% with 95% confidence	Global Observation of Forest and Land Cover Dynamics (GOFC)-GOLD Sourcebook 2010 ¹⁵
5. Estimate the area of forest annually converted to different land uses	X million hectares cleared for small-scale grazing lands, Y million hectares for industrial-scale annual crops, and Z million for conversion to small-scale oil palm plantations	GOFC-GOLD Sourcebook 2010
6. Document past trends in forest conversion	Annual conversion of forest to nonforest land decreased/increased by XX over the past 10 years	
7. Estimate the area of forest degradation by each driver (e.g. logging, charcoal production)	Y million hectares of selective logging concessions, Z million hectares of forest subject to fuelwood/charcoal production; X thousand hectares illegally logged	GOFC-GOLD Sourcebook 2010
8. Describe the methods used to estimate emission factors for forest degradation	Because no data exist in country, a plan was designed and implemented to collect data on carbon losses from logging and fuel collection	GOFC-GOLD Sourcebook 2010

Angelsen *et al.* (2011)

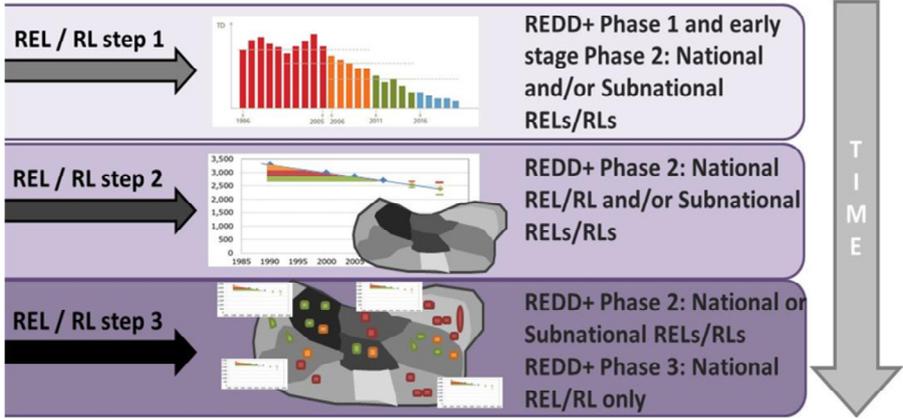
A stepwise approach to develop FREL/FRL is anticipated. In general, these may include:

- definition of pools and justification for their inclusion;
- specification of different forest uses;
- establishment of a time frame, e.g. 2000–2010 for historical baseline development;
- description of methods to estimate carbon stocks;
- estimation of forested area change due to deforestation and degradation.



A more technical stepwise approach is shown in this diagram. Emission factors and activity data are gradually developed following the development of a country's capacity to have higher tiers in both tabulated inventory data as well as spatially explicit data in terms of resolutions etc. From this diagram it is clear that uncertainties are reduced over time. Again, this depends on the capacity development.

A step-wise approach to develop RELs



Herold et al., 2012

This is a stepwise approach to develop RELs



Concluding remarks

- National forest inventory are generally available and spatial monitoring capacity are limited
- Capacity gaps are observed but may be reduced systematically
- FREL/FRL may be developed through a step-wise approach
- Improvements should be promoted to encourage broad participation
- Estimates of emissions to financial incentives and benefit sharing may be linked

In conclusion:

National forest inventories are generally available and spatial monitoring capacity are limited

Capacity gaps are observed but may be reduced by gaining international support for national and subnational processes

FREL/FRL may be developed through a stepwise approach

Improvements should be promoted to encourage broad participation

Estimates of emissions to financial incentives and benefit-sharing (e.g. financial incentive benchmarking) may be linked

References

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Thank you

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