



National Forest Reference Level, Nepal

REDD Implementation Centre

1. Introduction

Within the context of the United Nations Framework Convention on Climate Change (UNFCCC), the reduction of emissions from deforestation and forest degradation, and the increase in removals through the role of conservation, sustainable management of forest and enhancement of forest carbon stocks (REDD+), are measured against the Forest Reference Level (FRL). FRL includes emissions from deforestation and forest degradation and activities that support emission removal and instead enhance carbon stocks. The FRL thus sets a benchmark for assessing the performance of forest-related mitigation activities allowing countries to measure, report, and verify emission reductions resulting from their mitigation efforts.

Forest Reference levels are expressed as tonnes of CO₂ equivalent per year for a reference period against which the emissions and removals from a results period will be compared. Reference levels need to maintain consistency with the country's greenhouse gas inventory estimates.

FRL should be transparent, taking into account historic data and be flexible so as to accommodate national circumstances and capabilities, while pursuing environmental integrity and avoiding perverse incentives. Developing country Parties implementing REDD+ can use a stepwise approach to construct

reference levels, incorporating better data, improved methodologies, and, where appropriate, additional pools. They should also update their reference level periodically, taking into account new knowledge, new trends, and any modification of scope and methodologies.

Box 1: UNFCCC's four major decisions to guide on FRL

- Be expressed in tonnes of carbon dioxide equivalent per year.
- Maintain consistency with national GHG inventories.
- Be established transparently, providing information and rationale on FRL.
- Allow for a step-wise approach to improve FRLs over time by incorporating better data and improved methodologies.

2. Purpose of Forest Reference Level

As benchmarks for assessing each country's performance in implementing REDD+ activities, main purposes of developing FRL could be summarized as follows:

- To measure and access results-based payments.
- To assess progress on the outcomes of the policies and measures taken to mitigate climate change in the forestry sector for domestic reasons.
- To contribute to international mitigation through REDD+ actions under the UNFCCC.

3. Nepal's National FRL

Following the guidance and guidelines of UNFCCC, Nepal also prepared and submitted National level FRL to UNFCCC in 2017. The key objective of Nepal's national FRL process is to enable the measurement of the results-based performance of REDD-plus activities associated

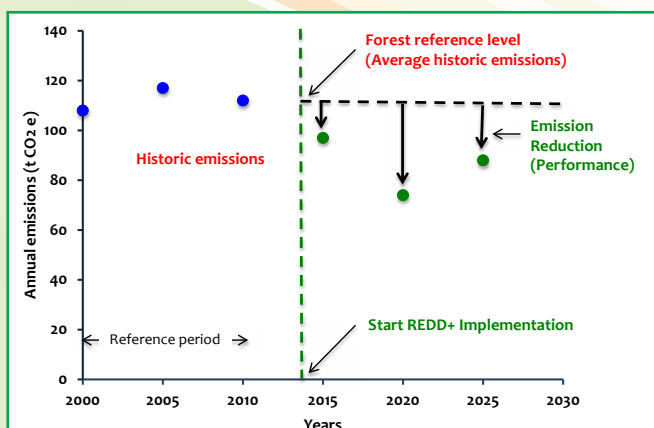


Figure 1: Graphical Illustration of FRL

with the implementation of the national REDD-plus strategy. Nepal's FRL was prepared on the basis that the FRL submission and subsequent submissions of results through a technical annex to its biennial update report are voluntary and for the purpose of obtaining and receiving payments for results-based actions, pursuant to decision 13/CP.19, paragraph 2, and decision 14/CP.19, paragraphs 7, and 8.

The national FRL with the historical reference period 2000–2010 is the annual average of the carbon dioxide (CO₂) emissions and removals associated with: (1) deforestation, defined as the long-term or permanent conversion of forest to another (non-forest) land use; (2) forest degradation, defined as the long-term or permanent reduction of biomass in forest land remaining forest land, not compensated by subsequent removals through post-harvest regrowth; and (3) afforestation and/or reforestation, defined as the long-term or permanent conversion of non-forest land-use categories to the forest. In the absence of complete and consistent time-series data, Nepal reported that only two data points, the years 2000 and 2010, were available.

Some of the basic elements and their characteristic features of Nepal's national FRL are as follows:

3.1 Scale

Nepal has developed and submitted the National level FRL to UNFCCC for technical assessment.

3.2 Forest Definition

Forest definition adopted in FRL should follow a common framework that includes threshold values for the minimum area, minimum height, and minimum level of crown cover. These thresholds of forest definition have implications for measuring and monitoring of forest conditions over time to detect changes in forest area (deforestation and afforestation) and their conditions (degradation and enhancement) using remote sensing data. Nepal follows the definition of forest stated by the FAO as the stand of trees with a minimum area of 0.5 ha with a tree canopy cover of 10 percent with growth up to five meter in maturity. However, the minimum mapping unit of 2.25 ha for forest is different from the threshold applied for the forest definition (0.5 ha). The justification behind this

difference is to achieve the highest accuracy while mapping changes in the forests using Landsat images.

3.3 Activities

FRL includes three REDD+ activities *viz.* i) Reducing emissions from deforestation; ii) Reducing emissions from forest degradation from fuelwood harvesting; and iii) Enhancement of forest carbon stocks from afforestation/reforestation. Net degradation by fuelwood collection over the regenerative capacity of forest is taken as a proxy for degradation and other factors like grazing and fire are not considered in the absence of credible data.

3.4 Carbon Pool

Out of five carbon pools listed for carbon measurement in forests *viz.* above-ground biomass (AGB), below-ground biomass (BGB), deadwood (DW), litter, and soil organic carbon (SOC); countries are allowed to choose any of the pools based on their capacities in measuring them and mapping changes over time. Nepal has considered only AGB and BGB carbon pools. It has omitted dead wood and litter and described that these pools were considered to be insignificant

3.5 Gases Considered

FRL report has considered the only CO₂ gas as the main GHG for FRL development in Nepal. Other GHGs like CH₄, NO₂, and N₂O are not considered significant from deforestation and forest degradation, and hence have not been estimated for the FRL.

Box 2: FRL in Glimpse

- **Scale** : National
- **Period** : 2000 – 2010
- **GHG** : Carbon dioxide (CO₂)
- **Pools** : Above-ground biomass, and below-ground biomass
- **Activities** : Deforestation
Forest degradation from fuelwood harvesting
Enhancement of carbon stock from afforestation and reforestation
- **Net FRL** : 1.2 M tCO₂e

3.6 Activity Data

The quantity of an activity that results in emissions/removals is referred to as activity data (AD). Nepal has selected three activities such as deforestation, degradation, and enhancement by afforestation/reforestation to be included in FRL. Land cover change assessment data, primarily between forest and non-forest, between 2000 and 2010 is used to estimate AD of the FRL.

3.7 Emission Factor

Emission factor (EF) refers to GHG emissions and/ or removals per unit area under REDD+ intervention. National forest inventory (NFI) data are the primary source of information for estimating EF of any REDD+ activities. Nepal has mostly used its NFI data for estimating EF for its first national FRL.

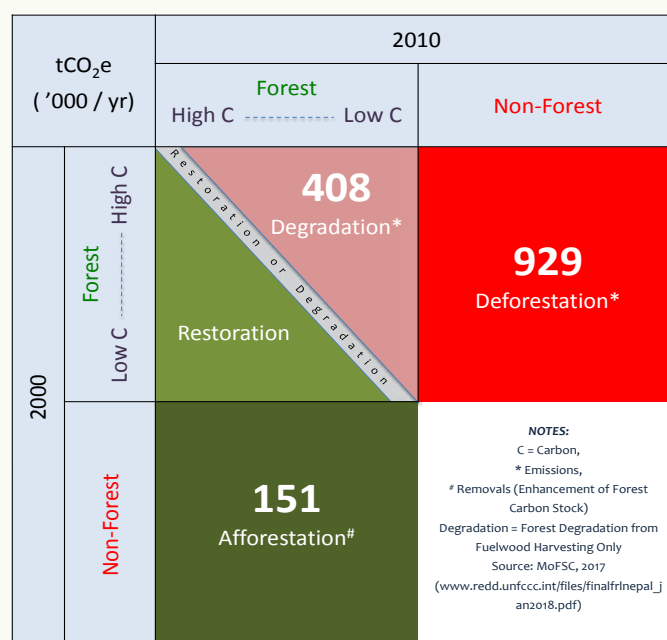


Figure 2: Nepal's National Forest Reference Level

therefore, contains emissions of 929,325 tCO₂e/year for deforestation, emissions of 408,500 t CO₂e/year for degradation, and removals of -151,077 tCO₂e/year for enhancement.

4. Methods

Remote sensing data of Landsat TM for the period 2000-2010 was used to develop activity data on deforestation and afforestation. For image classification, the object-based image analysis technique was adopted using e-cognition software. The maps were verified and updated using high resolution Google Earth Imagery and GPS tagged field information from permanent sample plots. As a result, a total of 22,314 hectare and 13,598 hectares were estimated to have undergone deforestation and afforestation respectively during 2000-2010. National Forest Inventory data of Forest Resource Assessment (2010-2014) served as a fundamental source of biomass to calculate emission factors. Similarly, degradation due to unsustainable fuelwood collection was estimated by applying the Woodfuels Integrated Supply/Demand Overview Mapping (WISDOM) methodology.

5. Estimated FRL

The annual emissions and removals due to deforestation and afforestation are estimated at 929,325 t CO₂e /year and -151,077 t CO₂e/year respectively. It is estimated that the annual degradation due to unsustainable fuelwood extraction in Forest-remaining-Forest resulted in emissions of 408,500 tCO₂/year. The FRL as per the three currently considered activities,

6. Feedback from Technical Assessment

Nepal's FRL document underwent through a rigorous assessment and the assessment team at UNFCCC has provided the following feedbacks.

- The information used in constructing FRL for the activities reducing emissions from deforestation and forest degradation and enhancement of forest carbon stocks are mostly transparent, partially complete, and overall, in accordance with the guidelines for submissions of information on FRL.
- FRL has included the most significant activities and, to the extent possible, the most significant pools in terms of emissions from forests.
- Modified submission took into consideration the technical input of the assessment, therefore; the transparency and completeness of the information was improved significantly in the modified FRL submission.
- FRL does not maintain consistency with the GHG inventory included in Nepal's second national communication, particularly in terms of the sources of activity data and emission factors. This is mainly due to the use of updated data for the period 2000–2010 in the construction of the FRL.

- The technical assessment has acknowledged and welcomed the intention expressed by Nepal to make improvements to its FRL in the following specific areas:
 - (a) To include the removals resulting from improved forest management and forest restoration under community forestry programs;
 - (b) To replace the indirect assessment of forest degradation from fuelwood extraction with cost-effective direct measurements of forest degradation from fuelwood extraction;
 - (c) To include, in a cost-efficient manner, data and information and estimates for small-scale deforestation and afforestation that are accurate to the extent possible.
- The technical assessment also identified the following additional areas for future technical improvement:
 - (a) Developing monitoring protocols and collecting direct data on forest degradation due to fuelwood collection;
 - (b) Collecting information on forest degradation due to forest fire;
 - (c) Including emissions of non-CO₂ gases;
 - (d) Using higher-resolution images and more time-series data points for deforestation, in a cost-effective manner, in order to allow for the inclusion of small-scale deforestation and afforestation with sufficient accuracy; and
 - (e) Maintaining consistency between future proposed FRL and the GHG inventory.

7. Conclusion

Nepal prepared and submitted national FRL to UNFCCC in its efforts to create a benchmark for assessing performance in implementing REDD+ activities. The FRL has already covered the activities reducing emissions from deforestation, reducing emissions from forest degradation (from fuelwood harvesting), and enhancement of forest carbon stocks (from afforestation and/or reforestation). Further, REDD implementation Centre on behalf of the Government of Nepal is working on improving the national FRL by including the additional areas, as suggested by the technical assessment of UNFCCC.



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