

Banko Janakari

A Journal of Forestry Information for Nepal

Monitoring, reporting & verification of carbon emission and its trading

Carbon trading or carbon emissions trading is the use of a marketplace to buy and sell permits that allow companies or other parties to emit a certain amount of carbon dioxide (CO₂). It allows individuals and companies to offset their emissions by purchasing carbon credits from entities that actively reduce or eliminate greenhouse gas emissions. Since the Kyoto Protocol in 1997, global adoption of Clean Development Mechanism (CDM) and emissions buying and selling structures has increased.

Nepal, as a signatory to the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, and the Paris Agreement, takes part in Reducing Emission from Deforestation and Forest Degradation (REDD) initiative to assign economic cost to wooded area carbon storage. Nepal's REDD initiatives provide environmental, economic, and social benefits through clean energy adoption deforestation reduction, and improved land use and forest management. After COP13 held in 2007, Nepal started REDD readiness efforts, filing a REDD Readiness Plan Idea Note (R-PIN) to the World Bank's Forest Carbon Partnership Facility (FCPF) in March, 2008. This led to the establishment of Nepal's National REDD Implementation Centre directly under the Ministry of Forests and Soil Conservation then submitted a Readiness Preparation Proposal (R-PP) to the FCPF in April 2010 and formation of the FCPF Participants Committee in June 2010. The R-PP involved extensive studies on key areas, such as strategic environmental and social assessment (SESA), an environmental and social management framework (ESMF), deforestation, carbon possession, land use, and forest value. These studies had certainly inspired the development of a national REDD strategy for a developing country like Nepal, for which the nation has already developed nationally development contributions (NDCs- 1& 2) for its further improvement. Additionally, studies on monitoring, reporting, & verification (MRV) and reference level/reference emission level (RL/REL) had already been accomplished. In 2013, Nepal submitted a mid-term report to the FCPF detailing progress in its R-PP, highlighting areas like land use, governance, and monitoring structures. Several donors, mainly the FCPF under the World Bank, the UN-REDD Program, and development partners like USAID, SDC, DFID, NORAD, and GIZ, have supported in course of the preparation of Nepal's R-PP. Nepal submitted its national Forest Reference Level (FRL) to the UNFCCC in 2017 for Overview multi-stakeholder self-evaluation process was recommended in 2016. Since June 2018, Nepal has been implementing the 'People and Forests: a sustainable forest management-based emission reduction program' inside the Terai Arc Landscape (TAL), which became admitted to the Carbon Fund Portfolio during the Paris Assembly. Criticism towards REDD for prioritizing carbon over biodiversity has faded in current years. International organizations like UNFCCC, UN-REDD and the World Bank have evolved hints to make certain REDD tasks integrate those safeguards, emphasizing the conservation of forests and biodiversity. CoP16 in Cancun (2010) and CoP19 in Warsaw (2013) installed shield concepts, including the requirement for REDD nations to establish Safeguard Information Systems.

The Emissions Reduction Purchase Agreement (ERPA) is committed to switch 9,000,000 emission reduction (ER) unit devices through FCPF over an area of four million hectares within Nepal's TAL, covering 15% of the country's total area and hosting 25% of its population. The program aims to mitigate deforestation and

degradation while supporting livelihoods and normal forest management practices. The Ministry of Forests and Environment (MoFE) plays various key roles in REDD implementation, which involves federal, provincial, and local governments, with institutional mechanisms developed since the initiation of the REDD readiness segment in 2009. The National REDD Implementation Center (NRC) is the primary operational body for the overall implementation of REDD initiative as per the National REDD Strategy. It follows fiduciary standards, generates budget independently, and accesses global REDD-related budgets. The National REDD Steering Committee and the National REDD Coordination Committee together with the representatives from federal ministries, local governments, and provincial government supervise decision-making and technical matters. The structure ensures inclusive participation and gender balance in course of the implementation of REDD initiative throughout the nation. The shape additionally consists of the joint secretaries and director generals of the departments under the MoFE, and up to nine representatives from different organizations concerned; the head of the NRC serves as its member secretary.

Forest Resource Assessment (FRA) or National Forest Inventory (NFI) of Nepal is a periodic process that produces estimates on emission factors and information on biomass and carbon stored per hectare of forest. So far, Nepal has conducted three national-level forest inventories: i) NFI in the early 1960s, ii) NFI during 1987–1998, and iii) FRA during 2010–2014. The FRA (2010–2014) produced emission factors used for the Forest Reference Emission Level (FREL) submitted to the UNFCCC in 2017. During the latest national-level forest inventory (2010–2014), a multi-source forest resource inventory was adopted using high-resolution satellite imageries and digital elevation models along with the national topographic maps. Recently, Nepal has implemented a systematic forest monitoring system known as the 'National Land Cover Monitoring System' (NLCMS, 2022) through the Forest Research and Training Center (FRTC) to conduct annual monitoring and mapping of forest cover using satellite images. NLCMS serves as one of the input variables for generating the activity data which are prepared using ensemble methods, which include four algorithms: CODED (Continuous Degradation Detection), CCDC-SMA (Continuous Change Detection and Classification- Spectral Mixture Analysis), Land Trendr, and MTDD (Multivariate Time-series Disturbance Detection). These methods are detailed in the Nepal Forest Change Area Estimation Tool. The establishment of the Reference Level and the estimation of Emissions and Emissions Reductions during the Monitoring and Reporting Period involve using these activity data for estimating emissions and removals from the sources/sinks, carbon pools, and greenhouse gases selected in the ER-PD.

The Forest Survey and Carbon Monitoring Division of the FRTC is responsible for the task of MRV of carbon emission from the forested areas of the nation. In addition to this, the FRTC has initiated to develop the allometric equations for 16 major tree species for precise estimation of their volume and biomass through outsourcing in 2022; however, FRTC has now conducted wood sample collection from different parts of the nation to develop allometric equations for seven out of the 16 major tree species.

In 2021, Nepal signed an agreement with the FCPF to reduce deforestation and forest degradation. With 45.31% of its land covered by forests, Nepal has potential for carbon financing. The Emission Reductions Payment Agreement aims to reduce carbon dioxide emissions by 9 million tons, with USD 5 for every ton of emission successfully mitigated. Now it is final stage that the third party has recently audited carbon accounting methodology for Nepal's payments in TAL area through World Bank.

Carbon trading from the forest resources including Soil Organic Carbon (SOC), below ground biomass, herb and shrub with robust inventory design from TAL area, LEAF Coalition (Lowering Emissions by Accelerating Forest finance) of Bagmati, Lumbini, and Gandaki regions as well as from other parts of the nation is absolutely necessary for additional economic returns keeping environment balance with zero emission, as far as possible, through sustainable forest management adopting Carbon Trade and REDD+ mechanism.

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