Methodology for assessing carbon stock for REDD+ project in India

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Ministry of Environment and Forests
Government of India

The Energy and Resources Institute

www.teriin.org

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Introduction

Reducing Emissions from Deforestation and Forest Degradation (REDD) is an international initiative that was started at CoP-15 (Copenhagen) in 2009. Forests store a great deal of the world's carbon; and an estimated 12–18% of global carbon dioxide (CO_2) emissions come from land use change – mainly deforestation and forest degradations. REDD has emerged as a central strategy in efforts to reduce global greenhouse gases emissions. By creating financial incentives to reduce forest-sourced greenhouse gases, REDD projects could generate funding from developed to developing countries. This can yield significant sustainable development benefits, and may generate a new financing stream for sustainable forest management in developing countries such as India. REDD+ goes beyond deforestation and forest degradation, and includes the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks (www.un-redd.org).

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India's submissions to the United Nations Framework Convention on Climate Change (UNFCCC) have consistently reiterated its position to get recognition and encouragement for conservation, sustainable management of forests, and increase in forest cover as a potential policy approaches under REDD+. India has maintained that all countries engaged in efforts to maintain and increase forest carbon stocks in their broader national policy framework of conservation and sustainable management of forests should be rewarded. The REDD+ approach incorporates important benefits for improving livelihoods, biodiversity conservation, and food security services. Recently, India submitted the methodological guidance for a REDD+ project to the UNFCCC, where it states that stratification of forest areas, Tree-outside-Forest (ToF), crown density classes, sampling design, precision of estimates, protocols for collecting sample data, and models and equations used in computing forest carbon stocks will form an essential part of accounting the report. All equations, growth, and biomass yield models used in the computation of forest carbon stocks will be based on published records, and freely and readily accessible to all for evaluation. Developing countries will have the option to choose all or any of the pools of forest carbon stocks. Indigenous peoples, local communities, civil societies and other interested entities will be fully involved and informed about the technological, methodological, policy, and financial aspects of the Measuring, Reporting, and Verification (MRV) processes and procedures. The objective of this paper is to examine the methodological issues such as scale, baseline reference, measuring, monitoring, and verifications of the REDD+ project in context to India.

Methodological issues

Scale

Scale is one of the most critical policy issues of REDD+ project in the country since other important parameters such as base line reference level, permanence, leakages, monitoring, and investment all depends on it. While implementing the REDD+ project, a key question that arises is at what scale (level) should the project be implemented in the country? Should it be at the national level, or subnational level (project level) or mix of both (nested or hybrid approach). There are various arguments in favour and against for all these options. At the national level, favourable points are it allows broad set of policies and creates country ownership. National approach acknowledges tackling deforestation and forest degradation more, effectively which would require policy amendments in the country.

However, there are various serious constrains while implementing the REDD+ project at the national level, such as the lack of strong federal central government systems in many developing and under developed countries. Management of the project at a national level would be another constrain in larger countries such as India. It requires large number of skilled and trained forestry professionals across the nation. There would be higher transaction cost due to complex bureaucratic procedures and various complex processes at a nation-level approach.

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In case of a sub-national approach, which is more suitable for a large country like India, individuals, communities, NGOs, civil societies, private companies, and national or local governments can implement REDD+ activities in a defined geographical area or at a project scale. Smaller projects can help in building capacity at the grassroots level, and spread knowledge and awareness. Smaller projects can clearly define project stakeholders and distribute the benefits more efficiently, and there are good possibilities of attracting private investors due to simple processes and well-defined stakeholders.

There are some negative arguments that smaller projects might not fulfil the emission reduction targets at a national or global level. Sometimes, it is difficult to monitor leakages on a small scale, and the cost of monitoring would be relatively higher than a bigger project.

A hybrid, or nested, approach tries to include positives from both the above-mentioned approaches. The hybrid approach suggests implementing REDD+ policy at the project level first and then extending it at a national level. Building the capacity of various sub-national stakeholders would be helpful in implementing the policy at national level. Credits generated could be shared between the project proponent and the central authority.

There are various other options suggested by researchers from time to time. In one case, it might be possible to sub-divide one national project into a number of small projects and then implement them with the participation of local communities and private entities. However, a more feasible scale for the country would be at the subnational level, keeping in view the various positive points of the project-level approach. Initially, some projects could be started at the project level, in order to build the capacities of various stakeholders – including the Forest staff at grass root level – and then implement it at the defined geographical area. From the Indian context, village forests, community forest resources, forest areas assigned to JFM and other areas of a similar nature may be undertaken as a unit for implementing the REDD+ project. Since there is no mechanism to transfer the money generated from carbon trading to the community, it would be appropriate to have smaller project areas, so that the fund would reach the community smoothly and efficiently.

Baseline reference level

Baseline refers to the forest cover of an area at a certain period against which progress of the REDD+ project interventions can be measured. Baseline reference level is another key parameter for implementing the REDD+ project, and assessing its overall impact in terms of reduced GHGs and tradable carbon credits. There are various arguments in setting up the baseline reference level for the REDD+ project. In this case, if a baseline were established based on data from recent years only, it would discourage countries who have already made efforts for checking the deforestation rates. Such baseline will not yield any significant credits for them, hence would demotivate countries to participate in the process. India favours a baseline reference level of 1990, while countries such as Brazil and Latin America favour average of historical 10 years period. Baseline reference level should depend upon the availability of the data. India favours the 1990 baseline due to availability of GIS, RS, and Forestry data for the entire country. India has one of the most advanced forest mapping programmes in the world, the Forest Survey of India (FSI) conducts a biennial cycle of forest and tree cover assessments throughout the nation. In addition, larger activities under the gamut of Sustainable Forest Management (SFM) started during the 1990s within the country.

In India, there is an urgent need to organize capacity-building programmes of local communities and forest staff at the project level on methodologies for assessing carbon, in order to ensure minimal transaction cost for the preparation of REDD+ projects.

Monitoring

Regular monitoring of the carbon stock is very important for the REDD+ project. However, there are various issues in monitoring and verifying the REDD+ project; such as, there is no uniform defining of various terms like forests, deforestation, and degradation, across the globe. There is a lack of uniformly agreed density classification, which makes it difficult to monitor the progress and effectiveness of REDD+ projects across the nations. There is a lack of historical data, technical skills for field measurements, carbon stock calculations, and interpretation of satellite imageries in most of the world's developing and under-developed nations. Besides, monitoring and verification requires huge expense. In India, there is an urgent need to organize capacity-building programmes of local communities and forest staff at the project level on methodologies for assessing carbon, in order to ensure minimal transaction cost for the preparation of REDD+ projects.

Leakages

Leakages are defined as changes in GHG emissions outside the project boundary due to project interventions. Leakages can reduce the impact of the project significantly, hence it should be addressed properly while implementing the REDD+ project. In India, the primary sources for leakages from the forest are fuel wood, fodder, and timber extraction. Fuel wood leakages can be reduced by deploying energy-efficient mechanisms, such as renewable energy sources – especially solar energy sources – and providing alternate employment to the people who were dependant on fuel wood extraction for their livelihood. Fuel wood requirements could be tackled through the installation of improved cooking stoves, biogas plants, LPG, and various other means at the village level. Leakages in the forms of fuel wood and fodder can be managed through properly implementing the management prescriptions provided in the working plans and various other forestry documents, and cultivating nutritive grass species such as Barseem and Napier at private farms. Tree species of fodder grass such as Bhimal, Oak, Neem, and Bauhinia should be encouraged. The leakage of timber could be managed through the proper implementation of silviculture and the management techniques provided in the working plans of the respective forest divisions. In addition, conservation practices and sustainable harvesting would be encouraged.

Carbon stock assessment

India has more than 70 million hectares under forest cover and added around 3 million hectares of forest cover and ToF over the last decade. India has a good set of historical data of its forest area and thus, may propose the methodology, which is based on the Remote Sensing (RS) and Geographic Information System (GIS) followed by ground trothing. The benchmark year may be considered as 1990 or 1991 depending upon the availability of the satellite imageries and other forestry data set. Forest cover map of 1990 and 2012 (Project year) may be prepared using Landsat satellite data. The area would be divided into homogenous strata based on forest types (or species composition) and canopy density through interpretation of satellite imageries. It is proposed to classify the satellite image into three density-classes viz., "D 1" with tree canopy density between 10 to 40%, "D 2" with tree canopy density between 40 to 70%, and "D 3" with tree canopy density of more than 70%. Species composition, if not discernible from satellite data, can be determined from ground trothing. Field inventory data would be collected based on appropriate sampling design. A combination of systematic and stratified random sampling may be proposed based on methodology of the Forest Survey of India (FSI, 2011). In case of the project based approach, where average project size area is small (approximately 100 to 1000 ha), the entire project area may be divided into grids of 100m x 100m (1ha). Each grid can be assigned a unique ID and classified them according to the stratum it represents. Sampling intensity and sample plot size would be determined as per standard statistical tools. Field data such as project area, legal status of the project area, rights and concessions, topographical details, soil types and quality, site quality, status, forest types, species composition, number of stems of each species, girth, height, number of stems in each diameter class, and soil carbon data would need to be collected. Above ground carbon-stock would be calculated by taking the local volume equations prepared by FSI. (FSI, 1996). Below-ground carbon and carbon in the branches would be estimated using default values provided by IPCC Good Practices Guidelines.

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Carbon stock in each grid would be determined based on field data, and simultaneously, carbon stock per hectare would be estimated for each stratum. This would help in estimating carbon stock in the site for the benchmark year. The grids where an increase in canopy density is observed with respect to benchmark year will indicate additionality due to Sustainable Forest Management (SFM) initiatives (or other effective management practices). Similarly, a decrease in density over the years would indicate leakage of carbon from the area due to unsustainable management practices and/or anthropogenic pressures. Carbon estimation from soil, woody litter, and decompose material would be estimated based on the present data, and it can be further compared in future projects of the same area. Socio-economic data including dependency on forest produce (firewood, small timber etc.) from the adjoining villages would be collected through conducting household surveys and group discussions. Such data would help in understanding the anthropogenic demands and further improvement of management interventions for SFM.

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Remote sensing and GIS based methodology will help in estimating carbon stock of the benchmark year as well as for future temporal estimation at periodic intervals. The output generated would help in understanding the impact of on-going management practices, suggesting improved practices, and supporting decision-making processes. Annual increment data of the dominant species from the secondary sources (like Working Plan Document) can be used to refine the estimate, particularly in grids where there is no change in the density class over the past few years. Such data is needed as, while remote sensing data may not show any increase in grids where there is no change in canopy density, there would certainly be an increase in carbon stock because of annual increments in the above ground woody volume of the tree.

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