Working Paper

Recommendations on the preparation of the GHG inventory in the context of REDD+ in Cambodia

Training workshop on Greenhouse Gas Inventory Preparation for Forestry in Cambodia

Cambodia, 2012

REDD+
CAMBODIA

Disclaimer

This report prepared bySandroFederici, and does not necessarily represent the views of the Cambodia REDD+ Taskforce, the Forestry Administration, the General Department of Administration of Nature Conservation and Protection, the Fisheries Administration, and FCPF Project.

Recommendations on the preparation of the GHG inventory in the context of REDD+ in Cambodia

Training workshop on Greenhouse Gas Inventory Preparation for Forestry in Cambodia

Sandro Federici

November 2012

Siem Reap, Cambodia

The UN-REDD Programme, implemented by FAO, UNDP and UNEP, has two components: (i) assisting developing countries prepare and implement national REDD strategies and mechanisms; (ii) supporting the development of normative solutions and standardized approaches based on sound science for a REDD instrument linked with the UNFCCC. The programme helps empower countries to manage their REDD processes and will facilitate access to financial and technical assistance tailored to the specific needs of the countries.

The application of UNDP, UNEP and FAO rights-based and participatory approaches will also help ensure the rights of indigenous and forest-dwelling people are protected and the active involvement of local communities and relevant stakeholders and institutions in the design and implementation of REDD plans.

The programme is implemented through the UN Joint Programmes modalities, enabling rapid initiation of programme implementation and channeling of funds for REDD efforts, building on the in-country presence of UN agencies as a crucial support structure for countries. The UN-REDD Programme encourage coordinated and collaborative UN support to countries, thus maximizing efficiencies and effectiveness of the organizations' collective input, consistent with the "One UN" approach advocated by UN members.

Contacts:

Khun Vathana
National REDD+ taskforce
Cambodia
Email: vathana.khun@gmail.com

Mathieu Van Rijn
UN-REDD Programme, Cambodia
Food & Agriculture Organization of the United Nations (FAO)
Email: Mathieu.VanRijn@fao.org

Citation: Federici, S. (2012) Recommendations on the preparation of the GHG inventory in the context of REDD+ in Cambodia, Training workshop on Greenhouse Gas Inventory Preparation for Forestry in Cambodia, Siem Reap Cambodia.

Contents

1. Introduction

FAO Cambodia organized a training course on “Greenhouse Gas inventory Preparation for Forestry” held at Angkor Paradise Hotel, Siem Reap under the UNREDD programme during 5-8 November 2012 with the cooperation of the Forestry Administration of the Ministry of Agriculture, Forestry and Fisheries (MAFF) and the General Department of Administration for Nature conservation and Protection of the Ministry of EnvironmentThe training is organized for the stakeholders for capacity building for the implementation of MRV Action Plan and the REDD+ Readiness Roadmap of Bangladesh.

The objective of the workshop was (1) to support the national GHG inventory process; (2) to support the efforts in the implementation of the national REDD+ roadmap; (3) to support the preparation of the third national communication; and (4) to identify the gaps and necessary actions to support the inventory in the forestry sector.

Participants from the Ministry of Agriculture, Forestry and Fisheries (MAFF); Ministry of Environment (MoE); and Ministry of Land Management, Urban Planning and Construction (MLMUPC); the Food and Agriculture Organization of the United Nations (FAO); universities; research institutions; non-governmental organizations (NGOs); and local and international experts joined at the training.

The Conference proceedings of the workshop are presented in the document untitled: “Proceedings of the training workshop on Greenhouse Gas Inventory Preparation for Forestry in Cambodia”. The objective of this document is to provide recommendations on improving the preparation of the forest monitoring system and it associated GHG inventory for the forestry sector in Cambodia.

2. Recommendations

Cambodia is a Least Developed Country so that its reporting commitments under the UNFCCC are conformed to the maximum flexibility. Notwithstanding, the incoming deadline for the first submission of Biennial Update Report from developing countries, December 2014, is a great opportunity for those countries to start the process of setting institutional arrangements for GHG reporting and for preparing their first GHG inventory exclusively based on domestic expertise and available data.

2.1. Reporting information

To report any kind of information four steps are to be followed: (1) collecting information, (2) elaborating information, (3) evaluating the elaboration and (4) planning improvements.
For the first step the question to be answered is what kind of information is needed for fulfilling reporting requirements.
For the second step data quality should be investigated and evaluated; and the questions whether information collected is consistent (a) along timeseries, (b) among different portions and (c) with the methodology applied for the elaboration, should be answered.
For the third, having the overall objective of enhancing accuracy of elaborated information, the question to be addressed is whether, for each collected information and for each elaborated output, it is possible and it is needed to collect better information and/or to elaborate it with an improved methodology.
Finally, for the fourth step assigns priority and available resources to those detected possible

improvements with the highest proportion among achievable increase in quality of estimate and resources to be invested.

2.2. Reporting information in the context of REDD+

Within a climate change mitigation context, as REDD+, information to be collected is that related to carbon stock dynamics of forest-related land uses and to the activities/causes of such dynamic. According to COP decisions a forest monitoring system is expected to collect that information and to elaborate it in a reporting of GHG emissions and removals associated with uses of forest lands.

A monitoring system that finds equilibrium among different needs (accuracy, effectiveness, sustainability, verification):

- provides unbiased actual information to be used for preparing annual estimates of GHG emissions and removals (accuracy);
- provides information on where and when stock changes are occurring to allow, where needed, effective intervention (effectiveness);
- needs an amount of financial and human resources, including technical expertise, for which the country is capable (sustainability);
- ensures collection of, at least, a minimum amount of data needed not only for preparing annual estimates of GHG emissions and removals but also for verifying them (verification).

A forest monitoring system that is able to detect changes over time in carbon stocks over the whole national territory and is able to discriminate between causes of such changes. Noting that it is of interest the estimates of those emissions associated with human practices, whose reduction will account for achieved mitigation benefits.

Five are the main human practices that affect the GHG forest balance:

- Clearing of land to be used for other purposes (mainly agricultural: crops, livestock);
- Wood drain (by harvesting, pruning, wood gathering);
- Fire ignition and fire suppression. Fires may spread out from agricultural land or may be appositely ignited in forest land for a wide variety of reasons;
- Tree plantation and promotion of natural regeneration (both in forest and non-forest land);
- Grazing, including overgrazing.

A forest monitoring system is expected to provide timely and accurate data on all those activities where and when they occur in order to:

- Guide the implementation of REDD+ activities (for this function frequent data are needed); and;
- Quantify the impact of REDD+ activities on the GHG balance of the national land territory (for this function accuracy of data is the goal).

For instance to know when and where changes in the forest cover are actually occurring is relevant for intervening with remedial measures –as forest rangers against illegal logging or with fire brigades in case of forest fires-; at this time is not important to have an accurate figure of the carbon stocks that are going to be lost or of the burnt area. On the other hand, at a certain point on time accurate data on carbon stock changes and area affected by the disturbance/intervention are expected to be collected.

2.3. Elements of a forest monitoring system

The following elements are therefore expected to be part of a forest monitoring system:

- A system to detect land-use changes from forest to other uses:

It could consist of a ground net of “forest rangers” or “community forest people” (people that has among other duties the task to check and report either authorized or not authorized forest area clearings and harvesting). Another option is to set a control system by remote (either with optical or radar sensors). Having to detect changes on small fraction of forest area (the deforestation annual rate usually ranges between 0.1% and 0.4 % of forest area) both systems may be prone to high uncertainties, including potential biases, in land-use change area estimates. Further, considering the need to verify area estimates and technical and financial constrains a system that uses a mix of both instrument seems to be the most appropriate option.

- A system of collection of data of wood products (at harvesting point, at trading point and at consumption point):

A national forest inventory (NFI) system can provide accurate and precise estimates of stock and stock changes in forest. However, the forest inventory does not provide needed information on harvest operations, so not being a useful instrument for monitoring ongoing human activities in forest.

The best option seems to set a NFI system that every year collects information from some NFI plots and, in order to collect information on harvested volumes, visits forest concessions and areas where changes in land cover have been detected (by “forest rangers” or “community forest people” or earth observation). In addition data on HWP (including survey at trading and consumption points of HWP) is collected, so having a system that provides needed “redundancy” in data collection to be used as a verification instrument.

- A system to detect fires using remote sensing gives fundamental information for fire suppression, also fire risk evaluation by remote may give important information for displacement of fire brigades; furthermore, data collection on fire damages, assisted by remotely sensed delineation of burnt areas, allows an accurate estimate of fires emissions.

- A system to monitor forest plantations, which are easily detectable since a plantation is the consequence of administrative acts; where sites, areas, species and costs are usually described. On the other hand, natural regeneration is detected by ground survey of land uses -as forest inventories, land census, etc.- and by earth observation techniques. Anyhow, also for this land-use change (to forest) same considerations developed for forest clearing may apply, so that remotely sensed and ground data may integrate administrative data and build redundancy to be used for verification.

- A system for monitoring livestock activities. Where present, the amount of animals grazing in forest areas may be assessed by survey at villages. Also this information is part of the set of information that can be collected by “forest rangers” or “community forest people”.

3. Data Collection

- For collecting activity data on fires and for changes in the forest cover:
  i. Frequency and completeness achieved by using satellite data with high frequency (e.g. MODIS-http://modis-fire.umd.edu/Active_Fire_Products.html http://firefly.geog.umd.edu/firms/) and by information collected by local communities that daily move in the forest for livelihood;
  ii. Accuracy achieved by using medium resolution satellite data (e.g. LANDSAT) together with ground sampling of expert field-teams where changes in forest cover have been detected;
  iii. Verification ensured by the use of two concurrent datasets: satellite vs ground data.

- For collecting data on carbon stock changes:
  i. Frequency and completeness achieved by using data measured by local communities that daily move in the forests;
  ii. Accuracy achieved by using accurate ground sampling measurements taken, by expert field-teams, where changes in forest cover have been detected. In addition, data from continuous forest inventories on permanent plots could be used together with, where available, the use of remotely sensed data (including lidar and radar) at high and very high resolution;
  iii. Verification achieved by using data on gains and losses, mainly harvesting, of forest carbon stocks.

- For collecting activity data on agricultural activities (grazing and crops cultivation):
  i. Frequency and completeness achieved by using data measured by local communities that daily move in the forests;
  ii. Accuracy achieved by using accurate surveys taken, by expert field-teams;
  iii. Verification achieved by using data on survey of agricultural goods production/consumption.

4. General recommendations

1. It is recommended that in setting the MRV activities the resulting forest monitoring system will be able to:
   a. collect data on forest land cover and its dynamic and associated dynamic of carbon stocks and other emissions;
   b. distinguish between natural forests and forest plantations (according to definitions adopted preferably at regional level);
   c. be, as far as possible, the main instrument for collecting information on safeguards.

Synergies are consequently expected to be built in following elements:

- Remotely sensed data collection;
- Ground data collection;
- Definitions and consequent classification methodologies;
- Data storage and data analysis, with the aim to maximize the capability of the monitoring system to identify and track human actions, and their drivers, and disturbances affecting forest carbon stocks, at a spatial and temporal scale that allows an efficient and effective implementation of REDD+ activities.

2. The direct monitoring of harvesting activities and of fluxes of wood is a key element for guiding forest management and for preventing and halting those activities that bring to deforestation and forest degradation. Although earth observation techniques may give information on ongoing changes in forest cover and accurate estimates of land conversion to other uses they may not provide enough information for an accurate assessment of harvesting activities. The FLEGT framework of activities (http://www.fao.org/forestry/eu-flegt/en/) constitutes a relevant and useful support, where present, to the national forest monitoring system for detecting and tracking harvesting. Cambodia is already in a pre-negotiation phase and it is therefore eligible for accessing FLEGT within the period 2012-2016.

3. The direct involvement of local population in REDD+ activities, including monitoring activities, raises the largest interest of local population in the REDD+, being therefore an instrument for ensuring its success. It is therefore recommended that when the national forest monitoring systems will be made operational the involvement of local communities in collecting data will be considered to complement the use of earth observation and forest inventories data and techniques.

4. When integrating different sources of data and/or different products coming from different actors and/or activities a fundamental guiding principle has to be the consistency among different pieces of information to avoid that any detected change and any trend in changes being the result of differences in data quality and in methodologies instead of differences in drivers and activities at two point in times or along a timeseries. Although IPCC guidelines provide methods to ensure consistency when different data sources and/or methods are applied, it is recommended that consistency in definitions and geographical boundaries be achieved through harmonization of systems/methods applied for detecting/collecting information.

5. Assuming an accounting framework based on a stratification of Cambodian forests in 3 zones:

- Conservation of carbon stocks, where management activities are aimed at avoiding emissions associated with land conversion (deforestation) or anthropogenic stock losses (forest degradation). Here should be included all the forest area subject to conservation rules (i.e. exclusion of conversion and of harvesting/grazing/crops-cultivation);
- Forest restoration/reforestation, where management activities are aimed at enhancing carbon stocks (all degraded lands and those forest areas with scarce tree cover, mainly coastal areas available for mangroves plantation);
- Sustainable management, where management activities are aimed at sustainably obtaining wooden and non-wooden products from forest (all forest land that are subject to harvesting/grazing/crops-cultivation).

5. Country specific recommendations

The national forest monitoring system is expected to provide historical and actual data for setting REL/RLs and assessing the impact of implemented REDD+ P&M (i.e. to measure the deviation of actual net emissions from the REL/RL).

In particular, Cambodia will need to develop:

- A REL for accounting for reduced emissions from deforestation, being the REL the expected annual rate (%) of forest land conversion. This REL should be applied to all zones.
  When accounting, the difference (tCO2eq yr-1) between the actual rate of deforestation and the REL will be multiplied by the actual forest area (ha) and the actual average carbon stock

per hectare (tC ha^{-1}). A negative accounted value would mean a net reduction of emissions. This method avoids the need to have historical data on forest carbon stocks and excludes hot air resulting from inconsistencies among estimates of historical, projected and actual carbon stocks.

Data needed are: a) actual carbon stocks for each zone, and b) the projected rate of deforestation at regional (preferable) or national scale. To calculate the projected deforestation rate, historical data on deforestation rate and associated drivers should be collected; the projection of drivers will determine the associated rate of deforestation.

Potential drivers are:

- Positive feedbacks: the human population, the extension of roads in forest land the and per capita consumption of agricultural goods;
- Negative feedbacks: Forest ownership and livelihood, and per capita GDP.

- A REL for accounting for reduced emissions from forest degradation, being forest degradation any carbon loss due to harvesting and forest fires. This REL should be applied to zones under conservation and also to zones under sustainable forest management if a RL is not applied. The REL would be calculated as:

    a. the sum of:
        - The expected total annual amount of losses of carbon associated with harvesting ($tCO_2eq\ yr^{-1}$);
        - The expected amount of emissions ($tCO_2eq\ yr^{-1}$) associated with grazing in forest land, if any.

    b. and the sum of:
        - The expected annual rate (% yr^{-1}) of forest land subject to forest fires;
        - The expected annual rate (% yr^{-1}) of forest land cultivated for crops, if any.

    The accounted quantity ($tCO_2eq\ yr^{-1}$) of reduced emissions from forest degradation will be the sum of:

    a. the difference ($tCO_2eq\ yr^{-1}$) between the actual and expected emissions associated with harvest and grazing, if any, and
    b. the difference ($tCO_2eq\ yr^{-1}$) between the actual and expected rate of burnt area (% yr^{-1}) values multiplied by the actual forest area (ha) and the per hectare GHG emissions associated with fires (CO_2, CH_4, N_2O - $tCO_2eq\ ha^{-1}yr^{-1}$);
    c. the difference ($tCO_2eq\ yr^{-1}$) between the actual and expected rate of forest land cultivated for crops (% yr^{-1}) values multiplied by the actual forest area (ha) and the per hectare GHG emissions associated with crops cultivation (CO_2, CH_4, N_2O - $tCO_2eq\ ha^{-1}yr^{-1}$).

    To calculate the projected emissions and rates, historical data on harvesting, including illegal logging, grazing and crops cultivation in forest lands and associated drivers should be collected; the projection of drivers will determine the associated emissions and rates.

    Potential drivers are:

    - Positive feedbacks: human population, extension of roads in forest lands and per capita consumption of agricultural goods (if grazing and crops cultivation are relevant

source of emissions) and wood;
- Negative feedbacks: Forest ownership and livelihood, and per capita GDP.

A negative value would mean a net reduction of emissions. This method avoids the need to have historical data on forest carbon stocks and excludes hot air resulting from inconsistencies among estimates of historical, projected and actual carbon stocks.

- A RL for accounting for stock changes in managed forests, being the RL the expected total aggregated emissions and removals (net stock changes and other emissions - $tCO_2eq\ yr^{-1}$). This RL would be applied to zones under sustainable forest management if a REL is not applied and it should be applied to zones under restoration/reforestation. It will contain removals associated with forest growth and emissions associated with human activities (harvesting, grazing and crops cultivation) and disturbances (fires, mortality).
  The accounted quantity will be the difference between the actual and the RL value; a negative value would mean a net reduction of emissions and/or enhancement of removals.
  To calculate the projected net stock change, historical data on net stock changes (either calculated as net gains & losses or as stock-differences between two inventories) and associated drivers should be collected; the projection of drivers will determine the associated net stock changes.

Potential drivers are:

- Positive feedbacks: human population, extension of roads in forest lands and per capita consumption of agricultural goods (if grazing and crops cultivation are relevant source of emissions) and wood;
- Negative feedbacks: Forest ownership and livelihood, and per capita GDP.

6. Conclusion

Coming back to reporting, IPCC Guidelines provides guidance on:

- How to compile collected data in consistent sets of timeseries (Volume 1 of 2006 IPCC Guidelines);
- How to calculate estimated values and uncertainties of anthropogenic emissions and removals in the AFOLU sector (volume 4 of 2006 IPCC Guidelines);
- How to evaluate accuracy and completeness of estimates and plan improvements (Volume 1 and 4 of 2006 IPCC Guidelines).

The necessity to develop permanent capacities in GHG inventory reporting

Since the reporting of GHG data will be one of the main components of the BUR, which is due every two years, Cambodia needs to build permanent capacity in GHG inventory reporting. It is therefore recommended to:

- Establish (by 2013) a GHG Inventory (GHGI) unit within the Ministry of Environment, which has been and is responsible for the reporting National Communication, including the GHG Inventory. Within such unit a person should have expertise in AFOLU reporting (volume 4 of the IPCC Guidelines) and all experts should have deep knowledge of IPCC Guidelines, general part (volume 1) and sectoral part according with their expertise. It is not requested that all experts are employees of the Ministry of Environment, agreements with relevant experts in the public administration can be set to ensure needed expertise to the GHGI unit.

- Build (by 2013) memoranda of understanding between the GHGI and any relevant actor in data collection for the AFOLU sector, in particular:
    - Ministry of Agriculture, Forestry and Fisheries (MAFF), for data on forests and agriculture;
    - the Ministry of Land Management, Urban Planning and Construction (MLMUPC) for remotely sensed data (land cover and land cover changes, fires).
- Produce (by 2013) a first GHGI for the year 2000 and 2010 using data already available within the country and in international databases;
- Assess the quality and completeness of the first GHGI and plan improvements to be implementable in 2014 for the preparation of the GHGI to be reported within the first BUR.