Summary of Small Group Discussions

Patricia Manley[1]

Workshop participants were asked to address sets of questions in small group discussions, which were subsequently brought to the entire group for discussion. The first set of questions was directed at identifying a set of degradation activities that could be a primary focus for developing or refining methods and techniques for monitoring:

- What drivers and degradation sources can be detected?
- What methods are most effective at detection?
- What are the challenges and opportunities in detecting degradation?

<u>Drivers</u>

The definition and classification of drivers and degradation activities continues to present challenges. Currently there are no international agreements through IPCC or the UNFCCC on how to classify forest degradation drivers. However, relevant to a REDD+ mechanism, there are several ways to classify the activities that contribute to degradation of forests. Workshop participants differed in their opinions as to whether drivers were the correct focus, or whether the focus should simply be on human extraction of forest products that reduces forest carbon stocks. Despite these differences, all agreed that activities needed to be identified for monitoring degradation.

Traditional forest monitoring methods (remote sensing, ground-based field measurements) are most often used to assess changes in forest structure and quality. Understanding which direct drivers are present is the most important first step towards identifying possible monitoring methods. Participants of the workshop identified four primary and four secondary categories of drivers that are prevalent and substantial contributors to carbon loss in the forests of Southeast Asia:

- Primary
    - Selective logging: commercial planned, commercial unplanned, and domestic (customary)
    - Fuelwood gathering: commercial and domestic (customary)
    - Shifting cultivation
    - Conversion to plantations (if using a definition of forest where plantation is not considered forest)
- Secondary
    - Human induced forest fire
    - Non-timber forest products (e.g., yellow vine)
    - Access
    - Grazing

[1]US Forest Service, Pacific Southwest Research Station, 2480 Carson Road, Placerville, CA 95667
Corresponding author: pmanley@fs.fed.us

There were a few differences in how the groups defined selective logging, with some separating single tree removal from multiple tree harvest, but generally single tree removal was synonymous with domestic or customary use. Individual trees are removed for a variety of applications, including personal use as housing material and for sale. The activities considered secondary were primarily a function of their prevalence, as opposed to the impact of individual occurrence on carbon. In landscapes in which these activities are prevalent, they could be considered primary.

Field Methods

The participants identified the primary field-based data sources that could detect and describe the primary degradation activities as the following:

- Forest management unit inventories
- Permanent sampling plots
- Change detection inventory
- Interviews/secondary data
- Participatory monitoring
- Temporary sampling plots

Although a diversity of opinions were expressed, the two groups that addressed field methods agreed that permanent plots and temporary plots both had important contributions to meeting monitoring information needs. Permanent plots provided measures of growth and accurate change detection for vigor, disease, and harvest. Cost was identified as the primary limiting factor for permanent plots – both the cost to install and the cost to relocate and remeasure in a precise manner. Temporary sampling plots have strengths and limitations that are complementary to permanent plots – faster to install for a given budget, additional plots can be measured, but they lack data on growth and have additional sources of error in estimates of change. Participatory monitoring was considered by most, but not all participants as a secondary source of data as opposed to a primary given the uncertainty associated with how to maintain and validate data quality.

Remote-Sensing Methods

Group participants identified a wide range of applications for remote sensing data in meeting forest carbon monitoring needs, with the primary focus being on selective logging. One of the contributions remote sensing can make to monitoring of selective logging was indirectly, through the detection of roads, skid trails, and landing areas. Degradation risk and predicted intensity of selective logging in association with these readily detected features is a unique contribution that remote sensing can make. Direct detections of selective logging, including individual tree removal, are more challenging, but can be estimated based on detected changes in canopy cover using combinations of high and moderate resolution imagery. At least one of the groups felt that remote sensing could offer reliable change detection, early warning information on shifts in use, detailed information on threatened areas, and frequent repeatability in areas that warranted it for whatever reason. Direct detections for plantations are accomplishable with low resolution imagery, and are possible with more advanced methodology for shifting cultivation and fire, but discussions were primarily limited to selective logging.

Ideally, remote sensing would be the primary source, if not a sole source, of data for monitoring forest degradation. It is objective, spatially consistent and comprehensive, repeatable with minimal error, and does not require capacity building across as large a population of technicians as is needed for ground based monitoring. In general terms, remote sensing faces many challenges in detecting degradation, including clouds, topography, access, cost, and capacity. Opportunities for overcoming these challenges lie in technological advances that offer higher resolution imagery at reduced costs to users and overall more accessible technology – a process that takes place over an uncertain time scale and over which most practitioners do not have control. In the meantime, practical challenges posed by existing technology need to be addressed.

Technical challenges associated with detecting selective logging fell into three categories: 1) visual interpretation; 2) object-based image classification; and 3) spectral un-mixing. Visual interpretation challenges included short-duration of detectability of canopy gaps in many cases, ability to obtain sufficient cloud-free images over a short period of time, steep topography, consistency among observers over time, voluminous data associated with higher resolution imagery, and scaling up. Object-based image classification can also be challenging, namely effectively setting up routines for segmentation. Spectral un-mixing challenges included obtaining ancillary data to correctly classify local land cover classes, consistency in technology and interpretation, and consistently interpreting conditions in steep terrain (i.e., topographic illumination allometry).

Finally, feasibility challenges were identified, primarily in association with high resolution imagery. They included availability, access (for LiDAR), frequency needed to detect ephemeral canopy gaps, narrow window of time for data collection in deciduous forests, cost to obtain imagery, cost to process imagery, local capacity to process and interpret data (people, knowledge and hardware), ability to scale data to provide useful interpretations at multiple scales (e.g., “scaling-up”), and the difficulty in linking observed changes to specific drivers.

Conclusions

Challenges in detecting degradation with remote-sensing were numerous, and generally indicated that remotes sensing plays a central role in detecting and monitoring primary sources of degradation; however it must be used in conjunction with field-based data sources, statistical modeling, and decision support tools in order to achieve an adequate level of detectability and a reliable characterization of forest carbon to address emissions. Similarly, field-based sampling, although technically simple, is labor and time intensive, making it inefficient as a singular approach to monitoring degradation.

Challenges in designing and implementing field sampling for monitoring carbon paralleled the strengths and weaknesses of the methods – the intersection of time, cost, and the data yielded and its value. The lack of a clear singular best approach seems to indicate that a multi-pronged approach will be most effective, one that is tailored to meet the needs of a given landscape, and one that can be adapted over time to be more efficient and effective as opportunities arise. The overarching challenge then becomes to determine at what spatial scales monitoring approaches need to be similar, and in what ways do they need to be consistent over time. For example, an optimal monitoring approach for a district in one part of a country may look very different than an optimal monitoring approach for a district in another part of the country as a function of capacity, terrain, land use, etc. However, in order to maximize the utility of the monitoring data to address a range of questions about forest conditions, biodiversity, ecosystem services, and drivers (i.e., to maximize co-benefits), as much consistency as possible is desirable at province, multi-province, ecoregional and national scales. Finding a balance in these objectives will be enhanced by a few key demonstration projects that highlight how to assess and select optimal monitoring designs. A two-pronged, phased approach to implementation (design, capacity building, data acquisition, and analysis/interpretation) that simultaneously targets the development of efficient and effective monitoring at local scales (e.g., districts or provinces) and the development of an effective national inventory will enhance the probability that solid, forward progress is made toward meeting the information needs of REDD+ and realizing multiple co-benefits.