Module 2.4 Incorporating community-based monitoring (CBM) in national (or subnational/ jurisdictional)* REDD+ monitoring

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After the course, participants should be able to:

- Present arguments for the benefits of CBM as an element within national REDD+ monitoring
- Explain the steps needed to set up CBM as an element within national REDD+ monitoring

* *Advice presented here applies equally to the cases of national and subnational/jurisdictional REDD+ monitoring.*

V1, May 2015

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GOFC-GOLD Global Observation of Forest and Land Cover Dynamics

FOREST CARBON PARTNERSHIP FACILITY

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Background material

- GOFC-GOLD. 2014. *Sourcebook*. Section 3.4.
- IPCC (International Panel on Climate Change). 2003. *Good Practice Guidance for Land Use, Land-Use Change and Forestry.*
- Skutsch, M. 2011. *Community Forest Monitoring for the Carbon Market: Opportunities under REDD+.*
- Danielsen et al. 2013. "Community Monitoring for REDD+: International Promises and Field Realities*. Ecology and Society*.
- FCPF (Forest Carbon Partnership Facility). 2011. "Linking Community Monitoring to National Measurement, Reporting, and Verification for REDD+." Report on an FCPF workshop.

Background material

- Danielsen et al. 2011. "At the Heart of REDD+: A Role for Local People in Monitoring Forests?" *Conservation Letters*.
- McDicken, K. 1997. *A Guide to Monitoring Carbon Storage in Forestry and Agroforestry Projects*.
- UNFCCC COP (United Nations Framework Convention on Climate Change Conference of the Parties). 2010. *Report of the Conference of Parties on Its 15th Session, Held in Copenhagen from 7–19 December 2009*.

Outline of the lecture

1. Why CBM should be part of national monitoring for REDD+
2. How CBM can relate to the national forest monitoring system (NFMS) and national monitoring
3. Setting up protocols for CBM
4. Monitoring other (noncarbon) variables
5. How to feed local data into a national database
6. Other issues: Verification and the basis of benefit sharing
7. How much does CBM cost?
8. Planning a national CBM monitoring exercise

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Role of communities in national monitoring for REDD+ (1/2)

- Monitoring systems for REDD+ include many activities related to design, planning, data gathering, processing, report, and verification of the information.
- *Community-based monitoring* (CBM) refers to those monitoring systems where **communities** play an active role in one or more of these activities depending on the design or the scheme, local skills, resources, and capabilities.
- Usually communities play a more active role in **data gathering at local level.**

Role of communities in national monitoring for REDD+ (2/2)

- Countries have been requested to create **national forest monitoring systems.**
- Data requirements include levels and changes of forested area and carbon stocks (geographical/activity data and carbon stock change factors).
- Data is required for construction of the national forest reference emission levels (FRELs) and forest reference levels (FRLs).
- A **phased approach** starting with relatively low accuracy data (Tier 1) migration toward advanced levels (Tier 3) **could be greatly increased by CBM.**

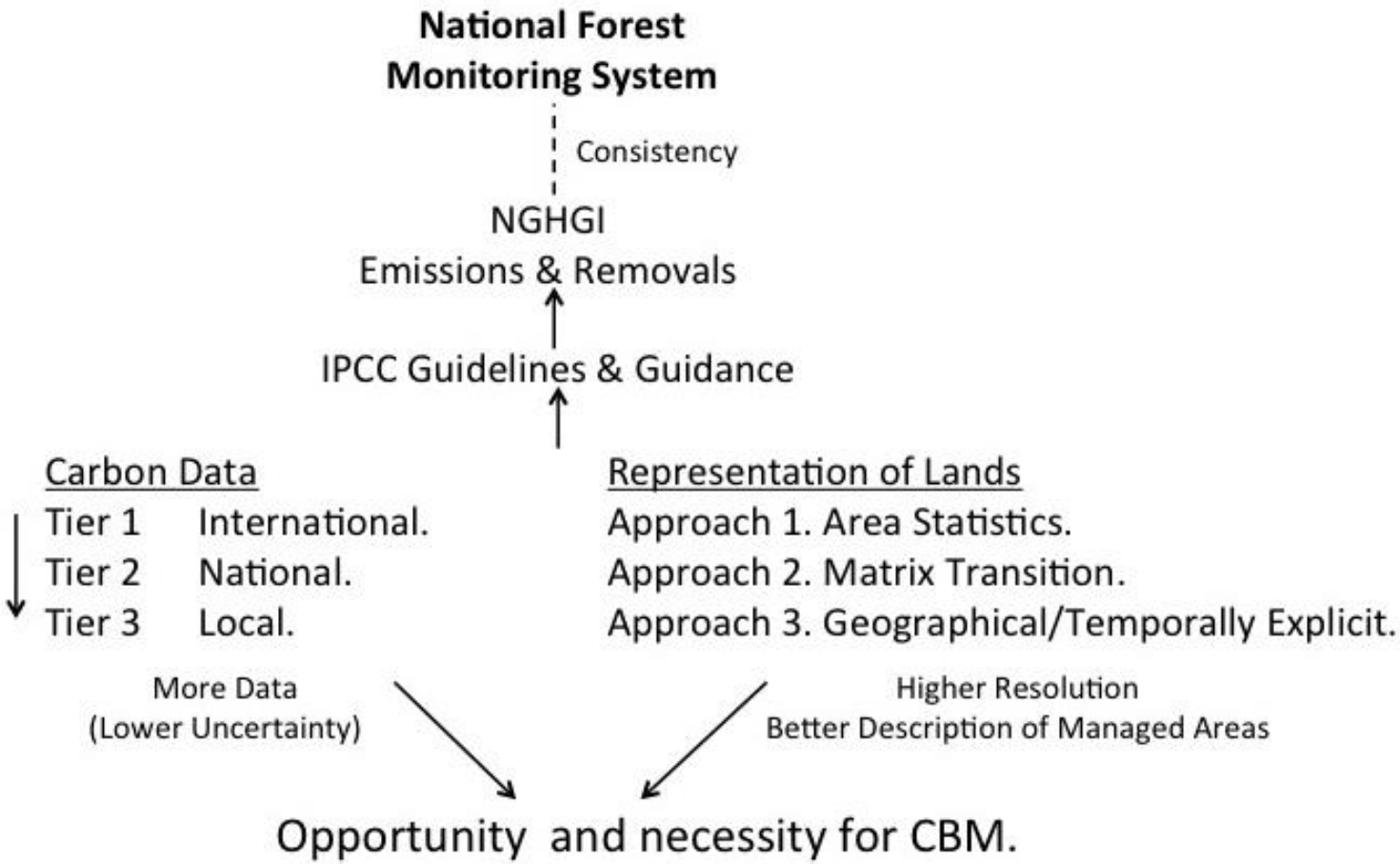
Community engagement in REDD+ monitoring (1/2)

- The UNFCCC COP recognized that implementation of REDD+ requires full engagement of indigenous groups and local communities, and monitoring could be a good way to promote participation (UNFCCC COP 2010).
- Countries have different starting points in terms of data availability.
- Where communities are engaged in managing forests, such data could be gathered more easily.

Community engagement in REDD+ monitoring (2/2)

- Phased approach to monitoring for REDD+ (see Module 1.1):
  - Emissions Factors: Tier 1 → Tier 2 → Tier 3 (local data, carbon content/dynamics) (see Module 2.3)
  - Activity/Geographical Data: Approach 1 → 2 → 3 (frequent, descriptive information of land uses and land-use changes, with high resolution) (see Module 2.1)
- CBM offers the opportunity to provide Tier 3, Approach 3 data, although only in the areas where communities are actively engaged in forest management and/or REDD+ activities.
- Identification of managed areas as new stratum, to help explain the variability of carbon stocks and changes and to reduce uncertainties in estimates

Opportunity for CBM within phased approach for building NFMSs



Advantages of CBM

- Accurate measurements
- Enables frequent update of data
- Low-cost data gathering
- Access to remote areas
- Multifunctional
- Transparent
- Improves decision making

Initial challenges for including CBM into national monitoring systems for REDD+

- Consistency of methods with IPCC guidelines, National Greenhouse Gas Inventory (NGHGI) and the FREL/FRL submitted to UNFCCC for REDD+.
- Consistent use of definitions of forest.
- Data should be consistent across communities producing data through CBM (variables, methods, and formats).
- Standardized protocols are required.

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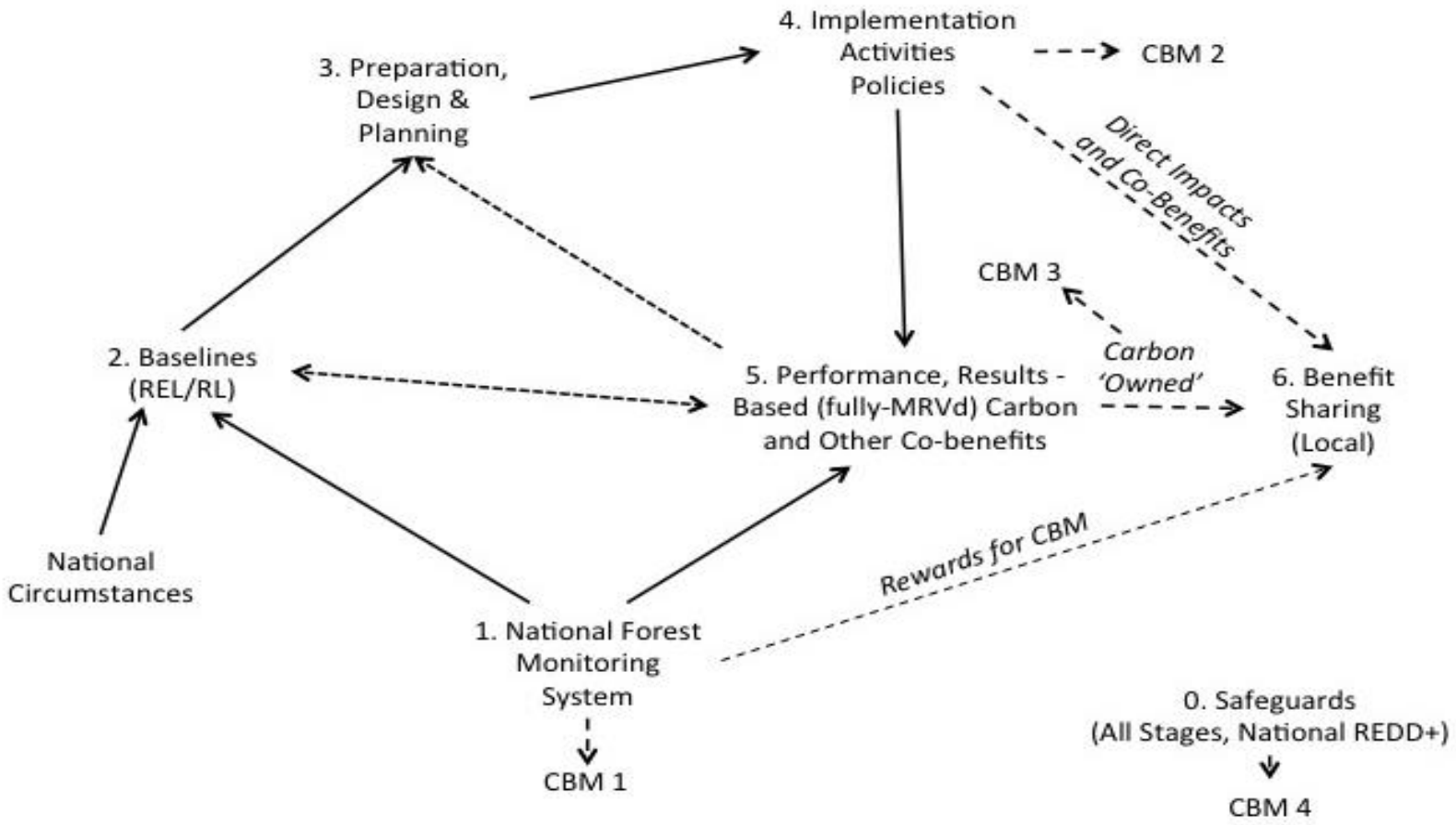
Integrating CBM into national measuring, reporting, and verification (MRV) and NFMS

Assumption:

National REDD+ program is implementing a top-down approach based on interpretation of satellite imagery and Tier 1 and possible Tier 2 carbon data (national forest inventories).

Main opportunities for integrating CBM into national MRV and NFMS



Opportunity 1. Data gathering in public programs

- Activities developed to increase sample size of forest inventories:
  - Community brigades
  - As part of existing programs (PES, conservation, CFM, etc.)
- Main benefit: wages for brigades, access to public programs.
- Easier to align protocols to national systems.

Opportunity 2. Activities driven by local access to benefits and co-benefits

- Access to local, direct benefits motivates CBM (e.g., water supply, timber, and nontimber forest products).
- There is a need to align protocols to national systems.
- Agreements over data ownership are needed.
- It is necessary to ensure management practices have positive impacts on carbon.

Opportunity 3. Information from projects in carbon markets and certification schemes

- Projects participating in carbon markets or schemes such as Fair Trade, Organic, and FSC can provide data for MRV systems.
- There can be benefits for local people from carbon credits and premiums for certified products.

Opportunity 4. Implementation of safeguards

- There is a need to document implementation of safeguards.
- These activities may not be linked to forest inventories, but documentation can provide geographical data of regions participating actively in REDD+.

Discussion 1

- *Which of the four opportunities for CBM that have been identified do you think would be most useful in the case of your own country? Consider the following*:
  - Are there public schemes targeting community forest management/conservation practices?
  - Are there CFM practices in which implementation is driven by communities? Are communities interested in the local provision of specific environmental services?
  - Are communities participating in carbon markets or other certification schemes?
  - Are communities actively participating in REDD+ implementation? How can participation be documented?

Discussion 2

CBM can be carried out only in areas where communities are actively engaged in community forest management and/or REDD+ activities:

- How much of the country could be monitored in this way? Would the data be useful if it is patchy?
- Could and should CBM be made compulsory, as a condition for participating in REDD+?
- Should people be paid to do it (separately from any funds disbursed for forest management itself or for carbon performance)?

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Standardized protocols for CBM

- Data should be compatible with NFMS.
- It is necessary that data facilitate comparisons and evaluation among different REDD+ interventions.
- Standardized protocols (i.e., variables and methods) are needed.
- Methods needed for stock and stock-changes in permanent plots (stock-difference method).
- Statistics of management practices can also provide information to assess emissions and removals (gain-and-loss method).
- Methods can be selected ad hoc according to local context.
- This data can add to that of national inventories to increase sample size.

Functions of CBM in national monitoring

- Forest area and area changes (monitoring of deforestation) are difficult for CBM to monitor → most likely through remote sensing.
- Primary aim of a CBM survey is to measure carbon stocks and changes in carbon stock in community forests.
- CBM can also provide geographical information of forest areas under management (i.e., participatory mapping),
- New areas of afforestation may also be included.
- CBM allows accurate identification of forest trajectories and supports the analysis of drivers of emissions.

General approaches to set up protocols (1)

Methods to estimate carbon stocks:

- Set up a forest inventory and collect data of individual trees via DBH (caliper/tape) and height (clinometer) and later use of allometric equations to estimate biomass See manual provided for this course, or any of those listed following:
- Wood Hole Research Institute: http://www.whrc.org/resources/fieldguides/carbon/pdf/chapter6.pdf.
- The KTGAL project: http://www.communitycarbonforestry.org/. The link is under Resources, Community Monitoring.
- The Nepal-based network ANSAB: http://www.ansab.org/wp-content/uploads/2010/08/Carbon-Measurement-Guideline-REDD-final.pdf.
- UN REDD Vietnam: http://www.un.org.vn/en/component/docman/cat_view/130-un-viet-nam-joint-publications/209-climate-change-joint-un-publications.html?orderby=dmdate_published.
- Winrock International: http://202.99.63.183/tanhui/thjl/Winrock%20International%20%E7%A2%B3%E7%9B%91%E6%B5%8B%E6%8C%87%E5%8D%97.pdf.

General approaches to set up protocols (2)

- Set up measurement plots to determine basal area visually (relascope) and apply modified allometric equations to estimate biomass
- Obtain figures of volume of timber and apply biomass expansion factors (visually or remotely, i.e., drones and/or LiDAR)

Methods to estimate changes in carbon stocks:

- Take repetitive measurements of stocks in plots
- Quantify reductions and increments of biomass and carbon in forests in a given period (gain-loss method); understand management practices and dynamics of carbon in the forest; have access to associated statistics and censuses

Processes Leading to losses/reductions and gains/increments in the different carbon pools

Reservoir	Losses/Reductions	Gains/Increments
Trees	Timber Harvesting, Illegal Logging, Fuel-wood Collection, Grazing, Mortality and Disturbances (Pests, Fires, Meteorological).	Growth in standing trees, Natural recruitment of trees, Tree Planting, Forest Management Practices (Growth after Thinning, Cattle Exclusion, Fertilization/Watering); *Stock in Durable Wood Products.
Shrubs	Harvests and Fuel-wood Collection, Grazing, Mortality, Disturbances, Harvest	Cattle Exclusion, Planting, Natural Growth, Natural Recruitment
Herbs	Grazing, Harvest (e.g. Fodder), Disturbances, Mortality, Erosion.	Cattle Exclusion, Soil Conservation, Planting, Natural Growth, Recruitment
Soil	Erosion, Soil Extraction, Fire, Cattle.	Soil Conservation (Barriers-Thinning-Disturbances, Terraces, Dams), Assimilation (from deadwood, litter)
Deadwood	Fuel-wood Collection, Fire, Assimilation Rate (into soil), Erosion	Disturbances, Thinning, Mortality, Deposition Rate. Reduced Extraction (below mortality/ deposition rates).
Litter	Erosion, Fire, Assimilation Rate (into soil)	Disturbances, Thinning, deposition rate.
Fire Occurrence	Factors that Increase Occurrence: Deadwood, dry herbs/shrubs; drought, wind, human presence, agricultural practices, roads, rubbish, limited access.	Factors that Reduce Occurrence/ Severity: Brigade and vigilance, firebreaks, black lines, prescribed fires, improved access, fast access for brigades.

Discussion 3

- Under what circumstances would you recommend using the gain-loss method instead of stock change estimation, and why?
- Relascopes are generally used in the timber industry and often in plantation forests where the variation between sizes of trees is relatively small:
  - Do any of the participants have experience in their use?
  - Would the relascope pick up differences in woody biomass if used, say, in annual surveys of savanna forests (*miombo*, *selva baja*, *cerrado*, etc.)?

Advantages and disadvantages of different approaches

Stock-difference, gain-loss, visual methods, LiDAR:

- Variables to measure
- Cost of equipment
- Capacities and technical skills required
- Maintenance and calibration
- Steps required for data analysis

Acceptable error level

- Need to select the level of error that is acceptable in estimating the mean carbon stock.
- Acceptable level of error is usually 10% or 5%.
- The value selected will affect the number of sampling plots that are required.

Advantages and disadvantages of different confidence levels

- A lower level of error means that the mean value of the estimate of carbon is more likely to be correct.
- However, this requires many more sampling plots.
- Hence there is a trade-off in terms of the need for accurate data and the costs involved in achieving it.
- The levels of error to be used may be set by companies or organizations buying carbon credits or financing REDD+ activities.

Sampling

- The size and shape (circular or rectangular) of sampling plots needs to be selected:
  - Circular plots are easier for communities to lay out
- In open forests where the number of tree stems per hectare is low, larger sampling plots will be needed than in dense forests.
- It is common practice to use nested plots in which a small plot is defined within the larger one:
  - In this case, all trees above a given diameter at breast height (e.g., DBH >10cm) are measured in the large plot, but smaller trees (say, 2.5–10 cm diameter) are measured only in the smaller, inner plot

Typical plot sizes for forest inventories

Vegetation characteristics	Plot radius (m)	Plot size (m^2)
Very dense vegetation, stands with large numbers of small stems, or highly uniform distribution of larger stems (e.g., even aged plantations)	5.64	100.0
Moderately dense woody vegetation	8.92	250.0
Moderately sparse woody vegetation	12.62	500.0
Sparse woody vegetation	14.56	666.6
Very sparse woody vegetation	17.84	1000.0

Source: MacDicken 1997.

Scope: Carbon pools

- Possible pools to be measured:
  - Aboveground tree biomass
  - Belowground tree biomass (roots)
  - Soil carbon
  - Shrub layer (bushes, etc.)
  - Litter layer (leaves)
  - Deadwood (fallen branches, etc.)

- When should a pool be included?
  - If it is expected to change (increase) due to the REDD+ management practices introduced
  - Or alternatively if it is likely to be negatively affected

Equipment and technology

The data recording technology to be used:

- Paper based data collection or electronic?
  - Tailor made apps for smartphones or tablets for CBC (mostly freeware)
- If electronic, which of the different systems available would be most suitable?

Skills required for different technologies as part of CBM (Larrazabal and McCall, forthcoming)

Level of skill required to use the option: *High* *Medium* *Low*.		***Options***					
	Skills	***Paper + GPS***	***Registering data with handheld***	***Use of handhelds plus downloading the data***	***Previous plus processing the information***	***Previous plus reporting***	***Previous plus designing a digital form***
	Programming knowledge						
	Basic software use knowledge						
	Computing knowledge						
	Knowledge on how to turn on and off a handheld device						
	Knowledge about the territory and its resources						
	Measuring method skills.						
	Knowledge on GPS use						
	Literate						

Advantages of electronic recording of data

- User-friendly interfaces on smartphones and tablets make entry of data quick and easy.
- Less risk of errors in transmission if the data is entered into the database at the time of measurement.
- Less time spent on coding and analyzing data after the fieldwork is finished.
- The GPS coordinates of the plot can be automatically registered and associated with the data.
- Photographs can be taken using the same equipment and directly associated with the biomass data in the database.

Disadvantages of electronic recording of data

- Equipment (smartphones, tablets) may not be available.
- Battery life can be a problem:
  - Back up batteries or solar chargers can be a solution
- In some conditions (dense forest, deep valleys) GPS signals may not be easy to obtain.
- Training is obviously necessary, but can be easily done for a selected software system

Discussion 4

- What is the availability of smartphones in rural communities in your country?

- The alternative is for the community to use paper recording formats: the supervising organization/NGO transcribes the data into the database on a PC or laptop.

  Which system do you consider to be more reliable?

Frequency of measurements

- Monitoring takes time and is costly to the community.
- Frequency should be established depending on changes in management practices and expected growth rates (detectable changes).
- However, the more frequent the measurements, the greater the reliability of the data; trends can be more easily seen and errors caught and corrected.
- Consider the need for retraining for infrequent measurements.

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Monitoring other (noncarbon) variables

- REDD+ projects can deliver benefits additional to emissions reductions:
  - Biodiversity conservation, enhanced forest governance, water services, etc.
- There is a possibility of using electronic system to record data relating to safeguards.
- A need exists to establish a protocol and appropriate methodologies for monitoring specific noncarbon benefits.

Discussion:

- *Do you think that standard protocols are possible for safeguards, or are they too different in different areas to allow this? What elements should be included?*

Monitoring drivers of deforestation and forest degradation

- Monitoring changes in drivers could help to anticipate changes in emissions and removals.
- Changes are related to management practices inside and outside forests (e.g., silvicultural activities, protective activities, changes in agricultural practices, efficient stoves, etc.).
- Communities could identify drivers and document key indicators.
- Understanding the impact of changes in drivers is very important for evaluating approaches to dealing with deforestation and degradation.

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Integrating local data into a national database

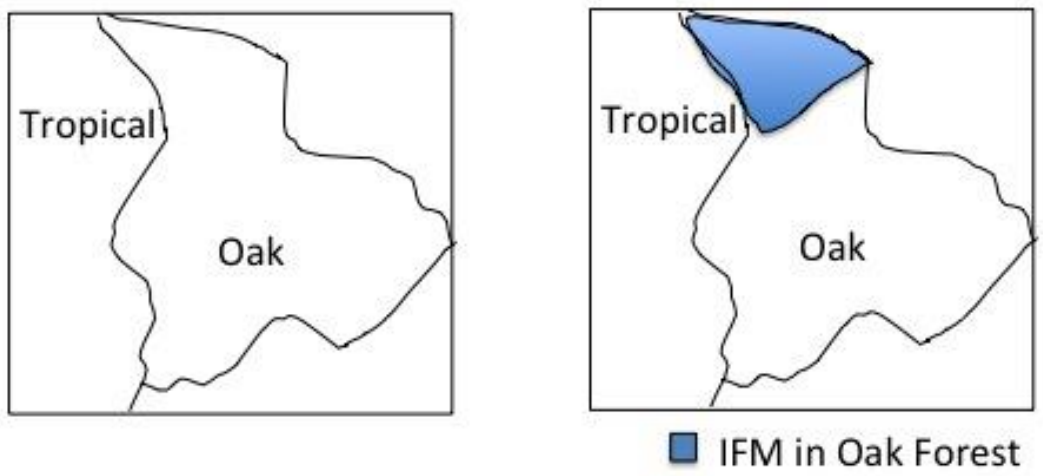
- Protocols will have to ensure CBM data is compatible with NFMS.
- CBM can densify existing inventories.
- CBM can add a new layer to estimate carbon stocks and changes in managed areas:
    - It has the potential to evaluate the impact of different management practices
- It is possible to design participatory systems (direct upload of data by communities).
- Data ownership and protection need to be considered.

Example of integration of local data (1)

- National systems can become participatory to allow the integration of local geographical and carbon data.

Example: In a national system a region is classified as Tropical and Oak Forest

- But one subarea could be under improved forest management by a community, (blue)
- A community can provide local data on the managed area



Based in Balderas Torres (2013)

Example of integration of local data (2)

Table 1. The information in a national system (Tier 1)

Stratum	Area (ha) and U%	Carbon Stock Change Factor (CSCF) (Mean, $tCO_2e/ha\text{-}yr$)			Uncertainties CSCF (%U)			Carbon Change in stratum (tCO_2e/yr)	%U (Stratum)
		BIOM.	SOIL	**FACTOR**	BIOM.	SOIL.	**U**		
Tropical	5,000 (5%)	3.0	-	3.0	NA	-	NA	15,000	NA
Oak	12,500 (5%)	-3.5	-	-3.5	NA	-	-	-43,750	NA

Table 2. Local information of the blue polygon can be integrated as a new stratum and polygon… up-date area, carbon and uncertainties (Tier 1 to Tier 3)

Stratum	Area (ha) and U%	CSCF (Mean, $tCO_2e/ha\text{-}yr$)			Uncertainties CSCF (%U)			Carbon Change (tCO_2e/yr)	%U (Stratum)
		BIOM.	SOIL	**FACTOR**	BIOM.	SOIL.	**U**		
Tropical	5,000 (5%)	3.0	-	3.0	NA	-	NA	15,000	NA
Oak	*9,500 (5%)*	*-3.5*	-	*-3.5*	*NA*	-	-	*-33,250*	*NA*
Oak (IFM)	*3,000 (3%)*	*5.4*	*0.5*	*5.9*	*5%*	*8%*	*4.3%*	*17,700*	*4.6%*

Based on Balderas Torres (2013)

The inventory can be recalculated including local information

Technical difficulties in feeding CBM data into a national data base

For maps, uncertainty can be estimated depending on scale and size of forest polygons.

Table. Uncertainty of polygons of different size at different map scales (in ha)

Map Scale	Percentage Uncertainty (%)						
	190%	100%	20%	10%	5.0%	2.0%	1.0%
1:3,000 (CBM)	0.004	0.01	0.3	1.3	5.2	**32.5**	130
1:5,000 (CBM)	0.01	0.04	0.9	3.6	14.4	90	361
1:10,000 (CBM)	0.13	0.45	11.3	45.1	58	1,128	4,513
1:20,000	0.16	0.58	14.4	57.8	231	1,444	5,776
1:50,000	1.0	3.6	90.3	361	1,444	9,025	36,100
1:100,000	4.0	**14.4**	361	1,444	**5,776**	**36,100**	144,400
1:250,000	25.0	90.3	2,256	9,025	36,100	225,625	902,500

Communities can produce accurate data for small managed areas, but if national MRV systems do not increase the scale, uncertainty will not decrease, unless large areas under management are consolidated.

Based on Balderas Torres (2013)

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Verification and the basis for benefit sharing

- Verification is important as part of CBM:
  - Without verification, communities may report, for example, only positive results, and they may be tempted to exaggerate the results
- Third party verification (V in MRV) is always required and could be carried out on a sampling basis.
- Different methods can be used at different stages:
  - For example: Stock-difference method when the project begins, gain-loss method for follow-up, and stock-difference methods for (sampled) verification

CBM and benefit sharing (1/2)

- Transparent and traceable flow of information can contribute to design of acceptable benefit-sharing schemes.
- With CBM it is easier to trace information and link performance to incentives in carbon markets, certification, and carbon removals/enhancements than for reduced deforestation and degradation.
- Benefits can include payment for monitoring (wages), independent of carbon performance.
- Performance payments at the community level can also be based on proxies for improved management.
- It is important to identify motivations for CBM in the long term.

CBM and benefit sharing (2/2)

- Elements to include in benefit sharing schemes:
  - Performance vs. input vs. opportunity cost; ex-post vs. ex-ante payments; payment vehicle; pricing; eligibility; suitable proxies, etc.
- Carbon monitoring can be used as a basis for performance based benefits, in cases where it has been decided that this is appropriate
- However some countries are using alternative bases for benefit distribution, for example by payment for input/effort
- In some countries such as Nepal and Vietnam weighted indices are used to take into account social conditions

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Costs of CBM (1/2)

- No references exists for the costs of including CBM in national systems.
- In comparison with professional brigades, CBM has higher investment costs, but lower operative costs.

Table. Monitoring costs of CBM and professional brigades (in $US)

	Training	Travel and Accommodation	Per diem and food	Equipment	Salary and Administration	Total Cost	Total cost per ha-yr
CBM	700 (97)	629 (227)	769 (108)	282 (59)	1344 (333)	3724 (651)	1.06 (0.33)
Professional	66 (14)	4355 (1133)	2992 (972)	61 (13)	6507 (1033)	13982 (2713)	3.33 (0.96)
CBM/Prof.	10.6	0.1	0.3	4.6	0.2	0.3	0.3

*Data from case studies in India, Tanzania, and Madagascar.
Source: modified Danielsen et al 2022.

Costs of CBM (2/2)

- Approximate price of equipment for CBM is available online (e.g., http://www.forestry-suppliers.com/index1.asp).
- Costs are provided as unitary prices; brigades may need more than one unit of some equipment.
- Capacities and resources needed vary depending on project area, local capacities, and need for external services.

Type	Equipment	$USD*
PGIS	Computer	>$200
	GIS Software (iCMTGIS)	>$100
	GPS/Smartphone	$100
	Printer	$200
	Plotter	$1300
Forest Inv.	Graduated Ropes	$30
	Clinometer	$150
	Compass	$20
	Digital Camera	$100
	Drone	$300
	Portable LiDAR	$26000
	Diametric Tape	$45
	Caliper	>$30
	Relascope	$10
	Cajanus Tube	$100
	Densiometer	$150
	Collection of soil (probe)	$50
	Cylinder for bulk density	$10
	Increment Borer (Pressler)	$150
Water	Infiltrometer	$300
	Water Quality Kit	$600
	Pluviometers	$300
Biodiversity	Camera traps	$250
	Throw Nets	$100
	Mist nets (birds)	$100
	Aquatic nets	$50

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Planning a national CBM exercise

- Requirements:
  - To define responsibilities for relevant actors
  - Training and equipping brigades
  - Data gathering
  - Data storage and communication
  - Data analysis and interpretation
  - Reporting
  - Verification

Summary of steps to set up CBM schemes (1/4)

Planning and training

- Identify activities to be implemented:
  - How can implementation and results be documented?
- Create a GIS and participatory GIS scheme with skills, infrastructure, and resources needed for analysis: satellite images, software, local data on soil, climatology, administrative limits, ownership, vegetation types, etc.
- Create forest stratification: by vegetation types and management practices:
  - Need to perform historical analysis? Need to do drivers assessment?
- Local land-use plans: Analyze scenarios, including carbon accounting (baseline).

Summary of steps to set up CBM schemes (2/4)

Planning and training (cont.)

- Describe activities and practices to be implemented (and their impact on carbon). Define reservoirs and GHG to be monitored.
- Identify indicators/variables to be monitored at local and regional levels as part of implementation.
- Define methods for carbon accounting and protocols for data gathering. Define frequency for gathering and reporting.
- Assess needs and capacities required. Conduct training and capacity building.

Summary of steps to set up CBM schemes (3/4)

Implementation (data gathering and registering)

- Collect geographical and carbon data.
- Measure the variables, validate field data, determine uploading and conservation (20 or 30 years).
- Create information management system to maintain updated and approved protocols.
- Update electronic data (files and software).
- Calibrate field equipment.

Summary of steps to set up CBM schemes (4/4)

Data processing and validation

- Store data electronically and in hard copy.
- Prepare electronic toolkits or spreadsheets to make the necessary analysis (semi-automated processes).
- Facilitate interpretation and validation of results (processed information).

Reporting, communication, and verification

- Create protocols for:
  - Integration of national report
  - Communication at national and international levels
  - International verification

Challenges of integration of CBM in NFMS

- Capacities and initial infrastructure depending on scope of scheme (i.e. electricity, Internet, hardware, software, skills).
- Social capital to organize brigades, analyze information, present results.
- Inflexible centralized systems, not allowing participatory approaches; land stratification that does not include local management description.
- Small scale of national systems for geographical data.
- Lack of permanent incentives (external or internal) to maintain monitoring practices.
- Compatibility of information with NFMS.
- Harmonizing local baselines if many projects are started.

In Summary

- With *Community-based monitoring* (CBM) communities play an active role in one or more monitoring activities depending on the design or the scheme, local skills, resources, and capabilities.
- CBM offers the opportunity to provide Tier 3, Approach 3 data.
- There are many advantages of incorporating CBM into national forest monitoring systems (NFMS).
- Challenges / points of consideration are related to integration of data into NFMS, consistency of data, ownership and protection of data; data verification and benefit sharing.
- Use of standard protocols for taking measurements is important.

Country examples and exercises

Country examples

- Community/local expert forest monitoring in:
  - Guyana (Norad funded pilot project)
  - Nepal (Norad funded pilot project)
  - Vietnam (projects by Sumernet, Wageningen University, SNV)

Exercise

- Recording data using cybertracker

Recommended modules as follow-up

- Module 2.5 to estimate carbon emissions from deforestation and forest degradation.

- Modules 3.1 to 3.3 to proceed with REDD+ assessment and reporting.

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