MINUTES AND ACTIONS v1.1

COLOMBIA SILVACARBON WORKSHOP

17th-19th September 2014
Armenia, Colombia

Workshop Objectives

- Exchange of MRV development experiences between the GFOI countries, with a focus on the necessary technical skills they have developed. The countries will also present their capacity building priorities and needs for the near future.
- The participant countries will have the opportunity to provide a critical analysis of the different methodologies they have adopted and gained through different capacity building programs. The outcomes are expected to highlight the advantages and disadvantages of different methodologies, and facilitate the evaluation of the practicality of the methods for their MRV systems.
- Colombia will highlight the GFOI assistance that has been critical for building their monitoring system.
- Coordination with donors on the implementation of the work plan and vision of the GFOI Capacity Building component in order to avoid duplication of efforts and increase their impact.
- Discussion around and adoption of a capacity building work plan for every region, which involves the participation of the 'major players' of international cooperation.
- Adoption of a coordinated capacity building plan between Colombia, Ecuador, Peru, and Mexico.

Wednesday 17th September

Objectives:

Share experiences gained throughout the development of the countries MRV systems with the GFOI members, in terms of the technical competence and the presentation of their capacity building priorities for the future.

1 Introductions

IDEAM, CRQ

- Edersson Cabrera (IDEAM), Maria Teresa Martinez (IDEAM), and John James Fernandez Lopez (CRQ) welcomed all of the participants to the meeting, Colombia, and Quindio.
- Maria spoke about the importance of environmental preservation in reducing the impact of climate change, adding that forests are just one key component that can reduce the effects of extreme weather phenomena.
- Maria noted that Colombia achieved a significant MRV milestone in 2013 – the production of their first annual national figures for forest cover and deforested area. This information will allow the country to take on and follow up actions and to identify priority forestry actions. Colombian deforestation over the last 23 years can now be compared, and the results demonstrate that 6 million hectares of forest have been lost.
- John spoke about the Quindio region, noting that it is the center of the coffee growing region in Colombia, and has substantial forest and semi-natural areas that have been declared UNESCO World Heritage Areas. He added that this GFOI Workshop is one of the most significant events held in the department.
- John also mentioned a number of Quindio forestry initiatives, in particular an aerial image land cover survey that was undertaken and published in a collaboration between the local governments, coffee growers, and power companies. He added that Quindio still needs to refine their specific protection policies.

USAID

- Evan Notman (USAID) welcomed everyone to the meeting and thanked the department of Quindio and IDEAM for their hosting efforts.
- Evan noted that he is looking forward to understanding the capacity building requirements of the invited countries. He said that SilvaCarbon has a strong collaboration with Colombia, and it is good to see countries such as Ecuador and Peru working together to share information and determine key capacity building needs.
- Evan emphasised the importance of identifying how we can work together more effectively to address all of the requirements and follow up the work already done.

2 Overview of GFOI and its Five Components

Global Forest Observations Initiative

- Simon Eggleston introduced the GFOI, noting that it was established to address deforestation and degradation on a global scale, which is now possible due to advances in satellite observations which make global observations cost effective and timely.
- GFOI responds to the needs of countries that wish to report under REDD+ and supports countries national efforts to implement National Forest Monitoring Systems (NFMS). GFOI provides a platform for coordinating observations and providing assistance and guidance.
- The GFOI is working with the Committee on Earth Observation Satellites (CEOS) to ensure systematic worldwide Earth observations for GFOI users, with 13 space agencies engaged to date. In-country activities are coordinated with the FAO and World Bank. GFOI is developing capacity building through both SilvaCarbon and R&D.
- The GFOI uniquely links space agencies, experts in EO, organisations involved in REDD+, and developing countries.
- Simon spoke about each of the five components of GFOI: Methods & Guidance Documentation, Coordination of Satellite Data Supply, Research and Development Plan, Administration & Coordination, and Capacity Building.

Questions

- In response to a question, Simon noted that the R&D program is focused primarily on topics that are needed for improved NFMS and reporting in the near-term.
- Jean Parcher (USDOI) asked what data sources other than Landsat and the Sentinels are being pursued by the Space Data Component, and she asked whether any advances have been made with CNES, DLR, or JAXA, among others. Matthew Steventon noted that some special core data sets are available for SPOT/CNES and ALOS/JAXA. Matt added that SPOT archive data older than five years old will be available through the SPOT World Heritage Program, along with data over the Congo Basin for 2008 – 2015. JAXA have announced plans to release annual ALOS-2 25m global mosaics from 2014.

Research and Development

- Simon noted that the R&D component aims to address the gaps in current methodologies (identified as R&D topics in the Methods and Guidance Documentation (MGD)) that will facilitate countries operational NFMS and MRV activities. The review of priority R&D topics is available on the website at www.gfoi.org
- The R&D Strategy for GFOI is currently being developed and will have a focus on direct biomass estimation, forest degradation, early warning systems, estimating activity data and sensor interoperability and complementarity, however the funding for R&D is uncertain at the moment.
- Stakeholders are being engaged through a series of R&D Expert Workshops (detailed below), and their feedback is being input to the R&D strategy.

Table 1 - R&D Expert Workshops

Date	Location	Topic
June 10 – 11, 2014	Woods Hole Research Center, MA, USA	Sensor interoperability and complementarity
October 1 – 3, 2014	Wageningen, Holland	Measurement of forest degradation
February 2015	Brisbane, Australia	Above-ground biomass

Methods & Guidance

- Simon spoke about the GFOI Methods and Guidance Documentation.
- COP-19 in Warsaw, Poland, saw the establishment of rules for monitoring under REDD+
- GFOI has produced the MGD, which provides countries and organisations advice on the use of EO information for NFMS and MRV systems, consistent with UNFCCC decisions/IPCC guidelines.
- The audience for the document ranges from space agencies, senior technical implementers, national negotiators and international organisations.
- The MGD is currently being translated and should be available in Spanish soon, along with web-based support tools.
- The MGD is fundamental to all GFOI activities and provides the Space Data Component with the minimum data requirements for mapping needs.

Space Data Coordination Group

- Matthew Steventon (SDCG) reviewed the work of the Committee on Earth Observation Satellites Space Data Coordination Group for GFOI (CEOS SDCG).
- The SDCG is tasked with implementing the CEOS Space Data Strategy for GFOI, which aims to ensure the availability of regular and systematic observations for effective reporting, and a continuity of data supply for the maintenance of consistent time series.
- The SDCG has devised a three-part strategy for GFOI consisting of The Baseline Global Data Acquisition Strategy, The Space Data Services, and data supply in support of GFOI R&D activities.
- The Global Baseline Data Acquisition Strategy aims to coordinate the acquisitions of CEOS agencies to ensure that at least annual, national, cloud-free, optical coverage is available for each GFOI country. The Strategy focuses on publicly open “core” satellite datasets, and the coverage is being implemented in phases, with an initial focus on tropical forest countries developing MRV systems for REDD+, with the aim of full global coverage by 2016.
- The objective is to ensure the availability of temporally and spatially consistent time-series of optical and Synthetic Aperture Radar (SAR) satellite data over global forest cover.

- Matt reviewed some of the core and contributing satellite data sources, highlighting Landsat-7/-8, Sentinel-1/-2, CBERS-4, and the special core data sets of ALOS (25m global mosaics) and SPOT (SPOT World Heritage archive data and Congo Basin initiative).
- Matt noted that Landsat-7/-8 are currently the only core data missions in operation, however their coverage is sufficient to meet the minimum requirements for all but the most cloud affected areas, and he added that next year's launch of Sentinel-2A will further increase the likelihood of optical coverage for these troublesome areas. In areas with persistent cloud coverage, integration of Sentinel-1A and ALOS-2 SAR data can overcome the limitations of optical data.
- Matt then introduced the Space Data Services, noting that the SDCG recognizes that some countries will need customised support that takes into account their specific technical requirements, heritage, or experience with a particular EO data source or type (including commercial). The following six components comprise the CEOS Space Data Services for GFOI:
    1. Regional GFOI Space Data Workshops
    2. Impartial National Space Data Needs Assessments
    3. National Historical Coverage Reports
    4. Ensured On-going Coverage
    5. Satellite Data Discovery, Assembly & Delivery
    6. Cloud Storage, Processing, and Analysis of Satellite Data (Space Data Management System, SDMS)
- The third and final component of the CEOS Space Data Strategy for GFOI is Data Supply in Support of GFOI R&D Activities, including topics such as satellite sensor interoperability, time series consistency, forest degradation, validation activities, and measurements of above ground biomass. The CEOS strategy for R&D is being developed in consultation with stakeholders at a series of R&D expert workshops.
- Matt noted that the SDCG is continuing to coordinate with agencies on core data streams, as well as working to develop the data services and tools and the CEOS strategy for GFOI R&D. Priority countries are being engaged though pilot Space Data Services projects such as the SDMS cloud computing platform.
- Matt concluded by saying that the SDCG is ready to support countries REDD+ MRV ambitions, and they are seeking feedback from countries on their space data needs and MRV status.

Discussion

- Matt was asked whether the SDCG has identified any LIDAR missions as core or contributing data sources, and he noted that the recently announced GEDI-on-ISS Lidar mission might be a candidate. Brian Zutta (MINAM) noted that ICESat-II would be a useful mission in the future.
- Sarah Marlay (USFS) asked how a country could request a national space data needs assessment and national historical coverage report. Sylvia noted that these assessments have been completed for countries that have attended SDCG country day meetings, and that she has been responsible for arranging country participation in those meetings.

Capacity Building

- Evan Notman presented on GFOI capacity building, which is lead by SilvaCarbon and aims to improve country capacity for forest management, strengthen the forestry community, and enhance the capacity of countries to initiate forest and terrestrial carbon assessment monitoring.
- The capacity building approach of GFOI is focused on addressing the needs of countries in a flexible, consistent framework and on improving coordination and collaboration between countries.
- Some key achievements to date have been:
    - Improving and delivering good practice guides, manuals, training, and tools;
    - The facilitation of learning exchanges, regional forums, and networks to enhance sharing among countries;
    - Provision of technical advice and assistance to governments and others; and,
    - Partnering with donors and international organisation to multiply impact and reach.
- Evan noted that coordination from the US side is being improved by bringing together some of the key US agencies involved in forestry and forest carbon monitoring (e.g. USGS, USFS, EPA, NASA).
- SilvaCarbon has also been working with a range of partners including the FAO, WB, and academia to coordinate effectively on defining partner responsibilities to minimize work duplication and ensure that countries are not spending excessive time coordinating with the agencies themselves.
- This workshop will facilitate the sharing of information, experiences, and approaches, and help to identify future needs. This feedback will clarify the status of GFOI capacity building and also serve as important input to the under-development GFOI Capacity Building Strategy.

3 Colombian Forest Monitoring System Overview

- Edersson Cabrera presented an overview of the Colombian Forest Monitoring System.
- IDEAM is the public institution within the Ministry of Environment and Sustainable development and is the Colombian authority for meteorological and hydrological issues. IDEAM manages the environmental Information System of Colombia (SIAC), and is the Earth Observation Technical coordinator in the Colombian Space Commission.
- IDEAM is the official source of forestry information in Colombia and is responsible for implementing the Forest and Carbon Monitoring System for Colombia (PMSB).
- PMSB monitors forestry mobilizations and trade; stock, carbon dynamics, and GHG emissions; deforestation and degradation; and forest fires.
- Colombia adopted its first national policy for climate change in 2011, after which the national REDD+ strategy was developed and NFMS established.
- Edersson noted that MODIS and the Landsat missions are the key EO data used by Colombia.
- Forests are defined as having an area of greater than 1 hectare, a minimum tree height of 5m, a crown density of greater than 30%, and don't include commercial plantations and trees in urban parks.
- Edersson reviewed the operational design of the PMSB, noting that it will be semiannual, articulated with GHG inventories every two years, and updateable every two years.
- IDEAM are generating early warning reports (see Figure 1) and also have 23 years of forest cover change time series.
- Edersson shared some results generated from the annual national level deforestation reports with GFOI support:
    - IDEAM are processing more than 660 Landsat images (both 7 and 8)
    - In 2013 Colombia had 59.1 million hectares of natural forest, representing 51.8% of the land cover for the country.
    - More that 6 million hectares of deforestation.
    - In 2013, Colombia generated their first annual forest cover and deforestation reports.
    - 147,946 hectares were lost to deforestation over the period 2010 to 2012. This equates to an FAO deforestation rate index of -0.21%, higher than the global index of -0.14%.
    - Deforestation is most prevalent in the Amazon region. Edersson reported that we are seeing the overall deforestation rate in Colombia is decreasing; however deforestation in the Amazon region is increasing. This demonstrates that one number (national) is not sufficient to determine the deforestation characteristics.
    - Deforestation hotspots tend to be concentrated in the Northwest of the Colombian Amazon, Northern Colombia, and the border with Venezuela. Identification of deforestation hotspots is a key function of Colombia's NFMS.

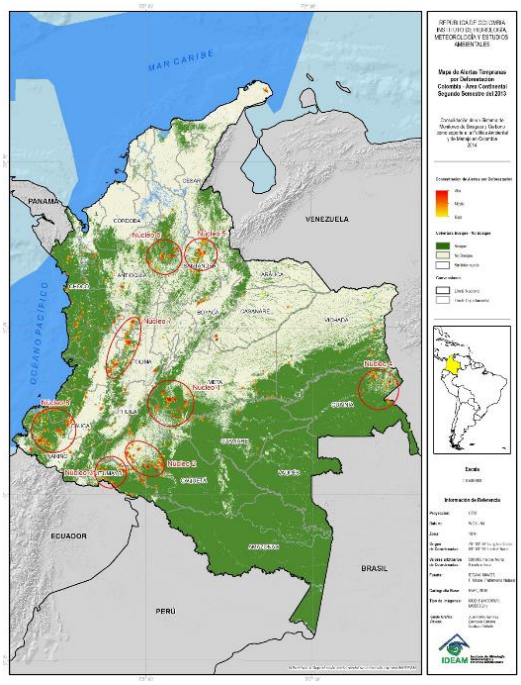

Figure 1 – Colombian Early Warning Report

- The highest emissions in Colombia are associated with cattle ranching, and expanding municipalities.
- IDEAM are advancing their identification of deforestation trends using spatial and statistical trends related to the behavior of deforestation rate. The models can identify the probability of forest change and stability.
- IDEAM has established an online platform to share MRV maps and reports: http://trianea.ideam.gov.co/MonitoreoBiomasaCarbono/pages/home.jsp.
- Results are communicated via conferences, meetings, the website, technical publications, and peer reviewed articles.
- The national department of statistics DANE certifies that the work of IDEAM is accurate and valid, and the precision level of estimation is tier 2.

Discussion

- Edersson was asked to describe Colombia's forest degradation monitoring plans. He noted that they are now testing in some regions, but there is no accepted protocol or official numbers for forest degradation. However, it is estimated that forest degradation is a large source of GHG emissions, and they are hoping to have some data for the Amazon region by next year.
- Sar Sophyra (Forestry Administration, Cambodia) asked about the application of MODIS. Edersson stated that MODIS is only used for quickly identifying important deforestation areas in Colombia, and then medium resolution (Landsat) data is used for the generation of the numbers.
- Roger Sayre (USGS) asked how many national allometric equations they're using, noting that Colombia's Carbon stock estimation covered 16 forest types. Edersson said that they don't have allometric equations for all 16 types yet, but they are working on more.

4 Country Overviews

Nepal

- Shree Krishna Gautam presented an overview of forest monitoring in Nepal. He noted that their first inventory was in 1964, and the next was in 1990 using a combination of Landsat and aerial photography. A comprehensive base map has been established for 2010 using Landsat.
- Forest change has been assessed for the year 1995 to 2010 using a combination of Lidar, Landsat, and RapidEye data. Overall they derived a 0.2% deforestation rate, but have found some interesting results in the mountainous areas, in which a +1% forestation rate was found for 1995 – 2010.
- Nepal is proposing a Landsat based continuous change detection system, however due to the national-scale reporting requirements (every two years) they haven't been able to progress the work.
- Shree reviewed some local, regional, and national scale forest cover maps, noting that major change hotspots were verified in the field.
- Shree identified that forest type mapping is still a challenge for Nepal, noting they are currently working on classification.
- Shree said that GFOI capacity building through SilvaCarbon has been very beneficial. They have also received assistance through the World Bank. The World Bank is supporting the development of a conceptual MRV framework for linking NFI and MRV at a national level, and Shree added that they are expecting to have a national level strategy this year.
- Shree reported that Nepal has completed 99% of their NFI, and noted that they're aspiring to produce annual biomass maps using this data and Landsat.

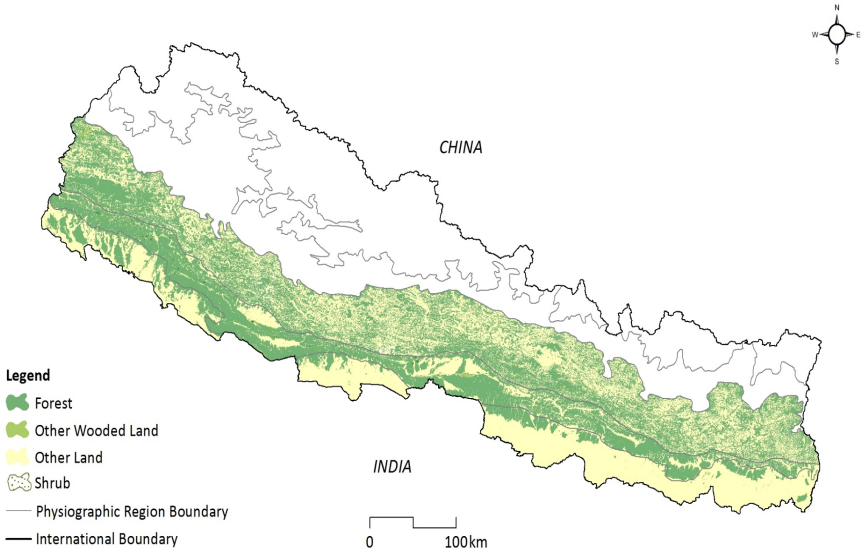

Figure 2 – Nepal Land/Forest Cover Map Overview

- Shree noted that their FAO FRA is ongoing (December 2014 goal), a REDD World Bank Study has been completed, ERPIN has been submitted, they are continuing to participate in GFOI capacity building activities, and they have organised a land cover harmonization training session.

- Nepal's most immediate needs are long-term training for specific topics such as Landsat based forest change detection; biomass mapping; the integration of remote sensing and ground data for wall-to-wall biomass estimates; cloud removal; forest degradation mapping; the application of radar and Lidar; land cover stratification; and the use of open source tools for data analysis, storage, and handling.
- Shree noted that they still need to develop their REL/MRV concept.
- Shree also identified that retaining trained staff is an issue, and identified the follow long- and short-term capacity building requirements that might be addressed by international cooperation:

Short Term (1-2 years)	Long Term (5 years)
– Regional training – Integration of ground data and remote sensing data – Sampling design/inventory design – Radar data analysis – Use of open source tools for change detection/forest cover monitoring – MRV institutionalization	– Collaborative research on biomass change/carbon modelling – Advanced study support for MSc/PhD students – GEO-FCT carbon tracking sites continuous carbon modelling – Data sharing

Discussion

- Jean Parcher (USGS) noted that Nepal wishes to use more open source tools in the future, and she asked whether he was referring to statistics or remote sensing software. Shree confirmed that they were interested in both, and that they would specifically like to identify some tools for change detection and remote sensing data handling.

Laos

- Soukanh Bounthabandid (Forest Inventory and Planning Division, Laos) presented on the MRV and capacity building status of Laos. At the national level, FIPD is working with CliPAD and PAREDD.
- Soukanh noted that his team requires training on the MRV concept (particularly with integration of REL produced at various levels), the conversion of forest type maps to carbon maps, and assistance with reducing costs associated with their forest inventory methodology. They also need more satellite imagery and assistance with methodologies to establish their REL.
- Soukanh identified that they need help to formulate an implementation approach.
- Laos has developed a 2010 forest base map, which can be seen in Figure 3.

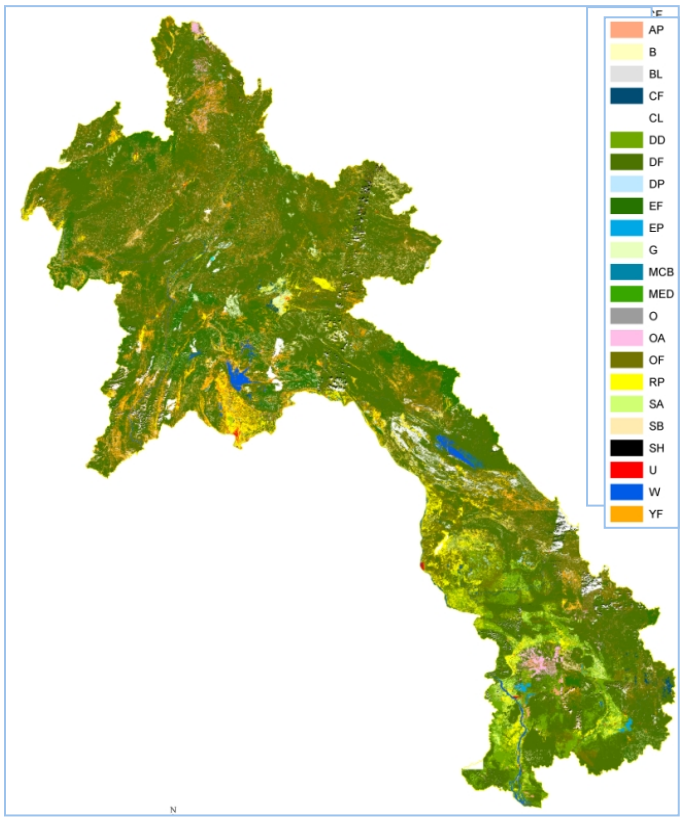

Figure 3 – Laos 2010 Forest Base Map

Discussion

- Chip Scott (USDA Forest Service) asked who helped with the inventory design. Soukanh said that it was supported by Japan.
- Craig Wayson (SilvaCarbon) asked whether Laos had access to sufficient localized allometric equations. Soukanh noted that for now they are using those developed for surrounding countries to save money and effort, however they do plan to develop their own in the future.

Cambodia

- Sar Sophyra (Forestry Administration, Cambodia) started by thanking SilvaCarbon and GFOI for inviting her to the workshop.
- Cambodia defines a forest as follows: 10% crown cover with a minimum area of 0.5 hectares and a minimum tree height of 5m.
- A forest cover map was produced for Cambodia in 2010 using Landsat TM data.
- From 1965 to 2010, the countries forest cover has dropped from 73.4% to 57.07%.
- The national REDD+ strategy is to support the management of Cambodia's forest by: using innovative financing models, improving forest law enforcement, increasing local forest protection, and placing a valuation on the forest ecosystem.

- Cambodia's MRV/REDD+ GHG emissions registry and reporting is supported by UN-REDD, CAM-REDD, FCPF, FAO TCP-NFI, The Embassy of Japan, and REDD Projects in Communities and protected forests.
- Sar noted that the key tools to be developed/used for their NFMS are: a multipurpose NFI (developing in collaboration with the FAO), a 2014 base line map (22 classes, 13 forest classes), 2005 and 2010 historical maps, and the FAO's Satellite Land Monitoring System (SLMS), and a GHG inventory.
- Cambodia's sampling strategy for the NFI is shown in Figure 4, below.

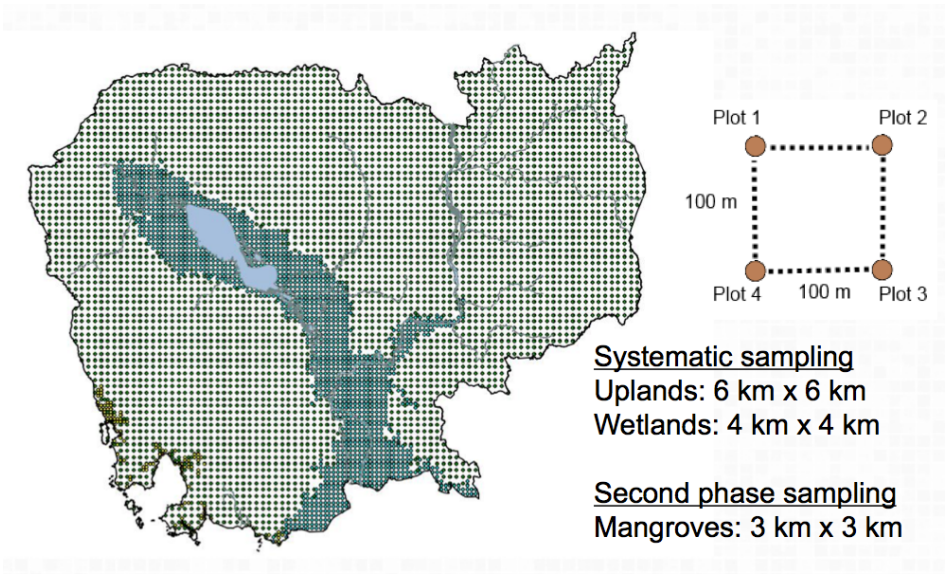

Figure 4 - Design Proposal of Cambodia's Multipurpose National Forest Inventory (NFI)

Key NFMS Challenges and CB Needs

- They need to define REL/MRV in the REDD+ context
- Two separate forest management entities need to be coordinated (FA/MAFF and GDANCP/MoE)
- Require more human resources to implement an REL/MRV work plan, and they also need to harmonize work plans between the various stakeholders (FA, GDANCP, JICA-CAMREDD, FAO-UNREDD, etc.)
- Need more trained GIS and RS image processing staff
- Need more staff for NFI field data collection
- Lack of data availability and storage facilities
- Financial support is needed
- Training on quality control, quality assurance, database

management, and GHG inventories – Integration of remote sensing data and NFI – Need to know how to identify drivers of forest degradation – Integrate existing RS data with current suitable data to establish base maps (2005, 2006, 2010, and 2014).

Discussion

- Matthew Steventon asked Sar how Cambodia receives their EO data (physically or over the internet) and he also asked whether they face any major obstacles to obtaining the data. Sar noted that they have received Landsat data via GISTDA and USGS directly in previous years, however they now download their data via the Internet and no capacity issues were raised.

Vietnam

- Manh Tuong Ho (FIPI) presented on behalf of Vietnam. Vietnam has a long history of monitoring forest change, with the responsible organisation, Forest Inventory and Planning Institute (FIPI) completing 4 cycles of NFI from 1990 – 2010 (every 5 years). FIPI also completed a number of statistical assessments in 1981-1983, 1989-1992, and 1997-1999. FIPI is now focused on improving the NFI under a Finland/FAO project, and will produce their next NFI for the 2016 – 2020 time frame using new approaches for sampling design (using k-nn to generate volume maps and simulation for optimizing sampling design).
- The new NFI is known as the National Forest Inventory, Monitoring and Assessment Programme (NFIMAP).
- The proposal for NFIMAP is under consideration by the government, and it is based on the DTIM and FRIED SilvaCarbon tools, and also the approach of the UN-REDD program.
- FIPI are now also pursuing a new endeavor: measuring and monitoring carbon stocks.
- Vietnam currently has a number of international programs active in the country: NFA, SilvaCarbon, UN-REDD Phase II, LEAF (US supported), JICA, and FORMIS. These programs either provide support to the development of NFIMAP, technical support, or the piloting of REDD+ in a number of provinces.
- Manh Tuong highlighted the following as the most immediate capacity building needs and international support for Vietnam:

Forest Monitoring Capacity Building Needs	Desired International Assistance (1 – 2 years)
– Training on forest carbon measurement and monitoring methodologies/techniques – Transfer of and training in advanced GIS techniques, and remote sensing for forest and carbon mapping. – Hardware and software for measuring	– Training, technology transfer, equipment, software, technical exchange tours – Technical support to finalize the design and implementation of NFIMAP – Capacity building to meet the requirements to operate NFIMAP to fulfill national requirements and international

and processing data – Technical exchange visits, study tours, and workshops	commitments including REDD+ – Technical support with NFMS design – Financial support for pilot activities on forest governance in Vietnam

Discussion

- Evan Notman (USAID) noted the significant ongoing support, both at national and provincial levels, and asked how much collaboration there is between these projects. Manh Tuong admitted that integration of the different programs is difficult, and that work is ongoing to integrate NFIMAP, the NFI, and the NFMS.
- Chip Scott (USDA Forest Service) said that coordination issues are present in several countries, noting that it is common for one program to complete a pilot study and not share the data with the other groups, impeding progress. Chip encouraged all of the groups to make their data more readily available to others.

Bangladesh

- Md. Abdul Latif Mia presented on behalf of Bangladesh. He began by reviewing some country statistics for Bangladesh and noted that the high population density of the country is the main driver of deforestation.
- Md. Mia reviewed the forest monitoring status of the country:
    - Previous NFI (the first being in 2005-06) have not covered some forest types due to their sampling strategies.
    - One national forest cover assessment was performed at coarse resolution, along with a number of sub-national assessments.
    - GHG inventories are usually performed by external contractors.
- Tier 3 reporting has been achieved for all types of carbon pool emission factors, but only for Sundarban forest reserve and 6 other protected areas, using mid to very-high resolution aerial and space-based (SPOT-4, IKONOS, RapidEye, Landsat, LISS-III, LISS-IV) EO data. No accuracy assessment was done for Sundarban and no such emission factors are available nationally and for other forests.

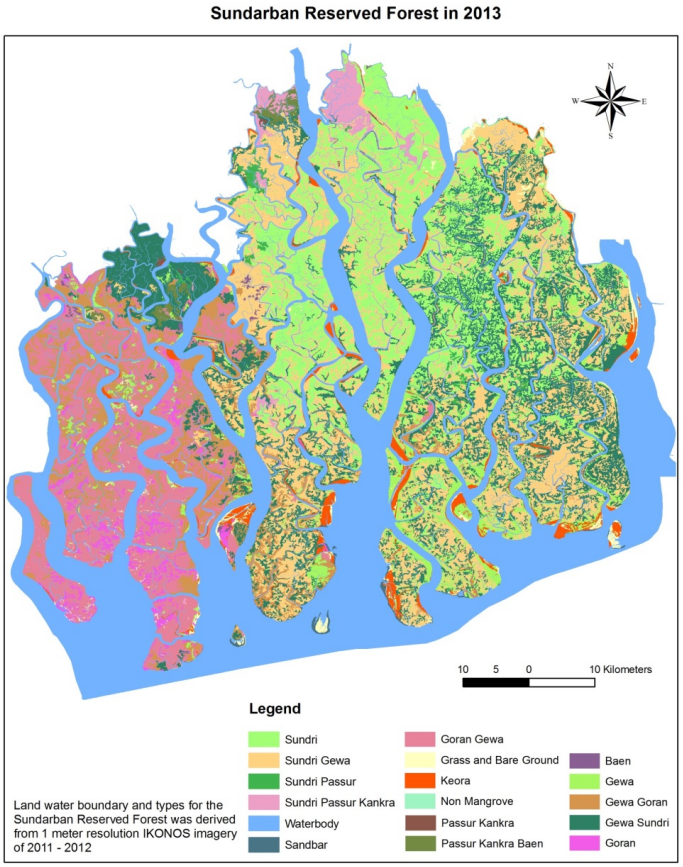

Figure 5 – Land Cover Assessment for Sundarban Reserved Forest in 2013

- Md. Mia noted that a number of detailed sub-national inventories have been conducted by a number of different projects for different forest types.
- One national forest cover assessment was performed using Landsat for 2004-05, and was used in the first and second national communication. GHG were reported by non-spatially estimating the total area of each land category.
- The Bangladesh Readiness Preparation Proposal (R-PP) was approved by the Policy Board of the UN-REDD Programme in December 2013, and it includes details of the activities related to developing the NFMS and emissions factors.
- Bangladesh, SilvaCarbon and the FAO are collaborating on a project to calculate emission factors and activity data, which is expected to start at the end of 2014. The Bangladesh national programme under UN-REDD is also expected to begin in October 2014.

Colombia

- Gustavo Galindo (IDEAM) presented an overview of the forest monitoring activities in Colombia, with a focus on capacity building, challenges, and needs.
- Gustavo reported that Colombia produces forest change maps on a regional level annually, however they do not have a national NFI, but plan to have one in the near future.

- Gustavo said that an inside-out approach is helpful, and that better results are achieved when the capacity building is based on in-country needs. Three major capacity building activities have been done over the years:
    - Training workshops
    - Joint research activities
    - Technology transfer
- Gustavo noted that sometimes difficulties arise because there are gaps between theory and practice, and that capacity building can sometimes increase the burden on the MRV system due to a lack of communication and coordination. He added that the mobility of human resources is also problematic, making it hard to plan for the long-term. Finally, there are difficulties related to donor programs being focused on relatively short-term goals, with processes typically being very "black-box".
- Colombia is working with SilvaCarbon, USAID, and the EPA to improve GHG reporting, and also with the South-South cooperation to develop land cover change maps. Gustavo added that Colombia is looking for support on community-based MRV and forest degradation.
- Gustavo listed some immediate capacity building needs, noting that Colombia needs to look at linking degradation with their NFMS, work to improve NFI design/planning (including sampling design), perform analysis of dense SAR and optical time series. develop land cover change detection methodologies, and investigate interoperability between local and national initiatives.
- In the future, Colombia wish to continue with an inside-out driven capacity building program and to improve communication and cooperation between different agencies and institutions.

Discussion

- Evan Notman (USAID) questioned Gustavo's statement about capacity building sometimes being a burden rather than beneficial, and he asked for some examples.
- Gustavo noted that administrative overhead associated with capacity building efforts could sometimes take up a lot of time and effort. Also there is sometimes a lack of coordination between the agencies involved, which can add some political stress.
- Gustavo was asked whether the capacity building outcomes are also being applied to other areas in GEO. Gustavo said that only forest change is being considered for the medium- to long-term, however he did note that coordination between the groups should be increased.

Ecuador

- Andrea Bustos (Ministerio del Ambiente, Ecuador) presented the MRV and capacity building status of Ecuador.
- The Ministry of the Environment in Ecuador has developed baseline land use/cover maps for 1990, 2000, and 2008 at IPCC levels 1 and 2.
- In 2014 they are working with the Ministry of Agriculture to develop maps at levels 2, 3, and 4.
- The deforestation rate from 1990 – 2000 was -0.65%, and in 2000-2008 was -0.58%. Andrea attributed the falling deforestation rate to mitigation initiatives, reforestation activities, and conservation efforts.
- The main (99.4%) driver of deforestation is agriculture, with forests being converted to crops such as oil palm and sugar cane.

- Ecuador's forest protection policy is called "SocioBosque", and their efforts are prioritised in areas with a high threat of deforestation, areas relevant to maintaining ecosystem services, and areas with high poverty levels.
- Ecuador's NFI has 9 stratifications and uses the FAO's sampling methodology, integrated with Landsat imagery (k-nn).
- Andrea reported that accuracy in their results has steadily increased over each inventory period, and she attributed this to the capacity building support of their international partners. They have also received assistance with validation and methodology development.
- Ecuador is working with UN-REDD, SilvaCarbon, and OTCA on measurement activities, as well as with KfW for climate change reporting.
- Andrea noted the following as the most immediate forest monitoring capacity building needs of Ecuador:

Institutional	Remote Sensing	Reference Scenario/Data
– Consolidation and institutionalisation of the monitoring unit	– Degradation methodology – Early warning system implementation – Automation of image classification for RapidEye, Landsat, MODIS – Integration of different types of remote sensing data (Lidar, radar, drone, optical)	– National inventory of GHG – Consolidation of the National System of Permanent Plots (2014)

Peru

- Brian Zutta (MINAM) presented Peru's MRV and capacity building status and began by noting that the country has 65 million hectares of forest in the Amazon, which accounts for more than 95% of the above ground biomass in the Peruvian Amazon. Approximately 1.2 million hectares of Peruvian Amazon forest was lost from 2000 to 2011.
- In regards to Peru's forest monitoring status, Brian noted that their NFI is expanding but needs further input, they need to include more ministries and government entities in the effort, and they need to begin capacity building in newer technology and tools.
- The capacity building activities that are most effective at advancing and developing their MRV are ones that encourage the exchange of experiences; focused, objective based workshops; and those that develop products in collaboration with partners.
- Peru has relationships with many international partners for the purposes of capacity development:
    - University of Maryland – Satellite based forest measurement expertise.
    - Conservation International – Workshops.
    - JAXA – Workshops and images.
    - FAO – Workshops.

- KfW – Financing.
- WWF – Regional capacity building.
- USFS – National Forest Inventory.
- Carnegie Institute of Science – Remote sensing products.
- USAID, SilvaCarbon, Boston University, OTCA

- Brian noted that the most immediate capacity building needs are in relation to forest degradation, early warning, and Lidar; as well as technical specialist recruitment/training.
- Brian identified the follow long- and short-term capacity building requirements that might be addressed by international cooperation:

Short Term (1-2 years)	Long Term (5 years)
– Further exchange of experiences. – Continued cooperation on technical issues. – Development of new approaches and methodologies.	– Training of undergraduates, graduates, and post-doctoral staff

Mexico

- Jose Maria Michel Fuentes (FAO CONAFOR) presented Mexico's MRV status.
- Mexico is utilising both Landsat and RapidEye wall-to-wall data sets for their NFMS.
- Two NFI's have been completed, one for 2004 – 2007 (1,171,506 trees) and another for 2009 – 2013 (976,738 trees), using sites that are grid separated by 5,10, or 20km. An example of the sites for the Gulf of California is shown in Figure 6. The NFI also consists of approximately 350 allometric models.

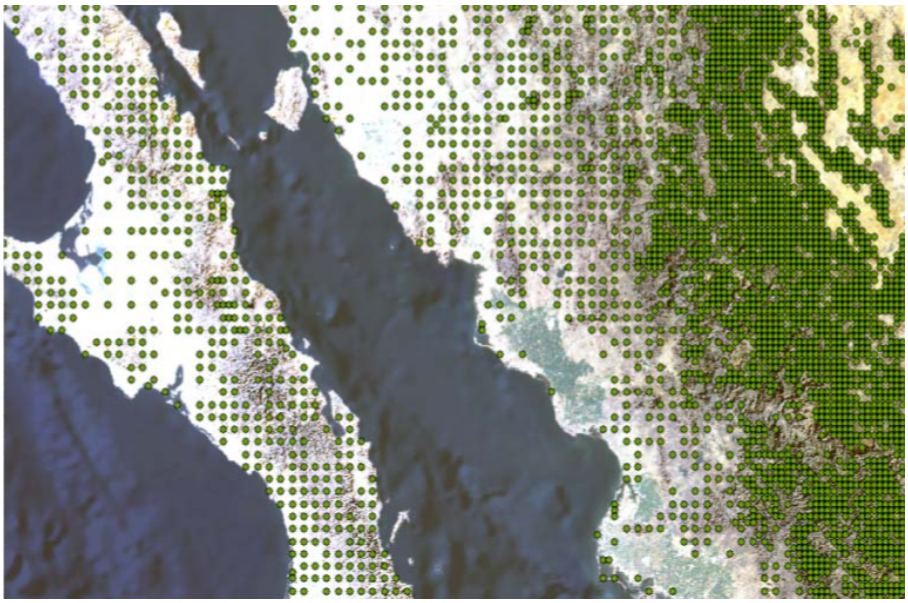

Figure 6 – Example sampling strategy for the Gulf of California

- Jose spoke about the methodologies and protocols in use (see presentation) and highlighted the following capacity building related challenges and needs:

Challenges	Needs that could be addressed by international partners	Immediate needs
– Assessing carbon from other pools (DOM, Soil, etc.) using the NFI – Integration of information related to degradation – Degradation (forest cover) – Using MAD-Mex information (including forest cover change). – Classifying change as deforestation, degradation, or phenological.	– Workshops to share progress and challenges with other countries and to identify the specific needs of each country – Technical visits by experienced individuals for the exchange of information and feedback.	– To use and spread information about the methodological framework used and to seek advice and feedback on the methodology from external reviewers. – Improve institutionalization. – Develop analytical capacities (higher priority than technical capacity at this stage). – Assistance with managing large, dynamic databases. – Developing robust tools useful for governmental institutions

Discussion

- Craig Wayson (SilvaCarbon) noted the apparently high political will around MRV in Mexico, and he asked whether it is related to REDD+ or the Mexican climate change law passed in 2012. Jose said

that it is not possible to discern the major driver, and he noted that the MRV is not only being developed for REDD+ but also has uses for university research and public services.

- Craig asked Jose to share the experience Mexico has had 'being the capacity builders' in Latin America. Jose reported that it has been a mutually beneficial process with a substantial exchange of feedback on processes and approaches. As a result of others using their tools they have received a lot of feedback and have been able to make a number of improvements.
- Evan Notman (USAID) noted that Mexico is an interesting case with their use of wall-to-wall RapidEye coverage, and he asked Jose to highlight the benefits and to describe why Mexico is going to these lengths. Jose noted that the country's half hectare forest definition played a part in their justification, as well as the number of other users of the data in the country, such as those in the field of biodiversity management who are very happy with the data they are receiving.

5 Working Meeting Discussion

– Country representatives were split into groups and asked to prepare answers to the following questions. The results were shared in a group discussion session the following morning.

1. What approaches to capacity building have been most effective in your country, and what approaches have not worked well?
2. Are there specific methodologies in your country that integrate remote sensing/field data for forest monitoring? If not, are you interested in capacity building from international partners in this area? Any suggestions?
3. What is the current status in your country for NFI, institutional arrangements, and data management.
4. What is your country's goal for NFI, institutional arrangements, and data management
5. What capacity building activities do you need to help you reach your goals in NFI, institutional arrangements, and data management.
6. When dealing with large quantities of EO data, what is the biggest obstacle to using the data? (receiving, processing, storing)
7. Can you describe your data infrastructure, and where you need increased capacity?

Thursday 18th September

Objectives:

Meet with donors to share the work plan and vision of the GFOI capacity building component. Additionally, to discuss and adopt a capacity building work plan for all countries to define their role in international collaborations.

6 Working Meeting Discussion Recap

- Representatives from each of the working meeting groups were asked to share the feedback of each country. The following tables summarise the feedback received from the countries.

Capacity Building Assessment

Country	Effective	Ineffective	RS/Field Data Integration
Bangladesh	– Long-term commitments, as they lead to consistency – Regional approaches are more effective and engage those working on the front lines – Bringing donors and countries together to best meet country-specific needs – Data sharing activities help countries learn from each other	– In general, capacity building efforts are Ineffective when donor priorities get in the way. – When donors bring their own programs/packages, as this doesn't help the country decide which program will ultimately work best or reconcile differences in approaches – Donors not working together – Regional programs that are not specific to the technical level of the country	– Received the basis for integration from SilvaCarbon, however they need support on the technical implementation – Feel that GFOI could be a good platform for integration training
Cambodia	– Long-term commitments, as they lead to consistency – Regional approaches are more effective and engage those working on the front	– In general, capacity building efforts are Ineffective when donor priorities get in the way – When donors bring their own programs/packages, as this doesn't	– Looking for capacity building support on the integration, such as through a SilvaCarbon workshop. – Cambodia often doesn't have access to raw, unprocessed data to

	lines – Bringing donors and countries together to best meet country-specific needs – Data sharing activities help countries learn from each other	help the country decide which program will ultimately work best or reconcile differences in approaches – Donors not working together – Regional programs that are not specific to the technical level of the country	analyze/integrate – Feel that GFOI could be a good platform for integration training
Colombia	– Development of close working relationships between technical and practical staff	– Capacity building activities that are not driven by country needs – When international cooperation expectations are too high – When there is a duplication of effort	– Integration methodologies are difficult and need to be improved
Ecuador	– Development of close working relationships between technical and practical staff	– Capacity building activities that are not driven by country needs – When international cooperation expectations are too high – When there is a duplication of effort	– Integration methodologies are difficult and need to be improved
Laos	– Long-term commitments, as they lead to consistency – Regional approaches are more effective and engage those working on the front lines – Bringing donors and countries together to best meet country-specific needs – Data sharing activities help countries learn from each other	– In general, capacity building efforts are Ineffective when donor priorities get in the way – When donors bring their own programs/packages, as this doesn't help the country decide which program will ultimately work best or reconcile differences in approaches – Donors not working together – Regional programs that are not specific to the technical level of the country	– Another entity collected the data and Laos doesn't currently have capacity to perform the integration – They would however like to learn the process so that they can do the integration themselves in the future – Feel that GFOI could be a good platform for integration training

Mexico	– Workshops designed to address specific needs have been very successful (e.g. workshop on map validation) – Training activities that are country driven/inside-out/identified by countries – Technical visits by experts that allow countries' technicians to ask questions about specific, relevant topics – Activities hosted by multiple partners are often more effective than those hosted by a single agency because these events demonstrate consensus among partners in methodology/approach/etc. – Follow-up with participants after an activity ends, including a meeting summary and the sharing of country/expert contact information (e.g. Skype) – Work plan development activities – One-on-one time between country technicians and international experts – In addition to technical training, there is a need for activities that bridge the gap between the technical data and the creation of forest management policies (both technical experts AND policymakers in the room, as well as basic technical training for policymakers)	– When donors do not communicate effectively – When training/workshop topics are too broad/general (e.g. workshop on general MRV) – Premature training/capacity building efforts, usually due to a donors scheduling – Inappropriately scheduled workshops; they should better take into consideration the current technical status of countries – When the wrong people/wrong profile of people attend events – Workshops that are targeted at people without the necessary technical skill – Lack of coordination between donor agencies, leading to scheduling conflicts – When feedback from past meetings is not taken into account for future meetings

Nepal			– Desire to integrate remotely sensed and field data – Need to take a multi-level institutional approach to building this capacity, and not only provide technical training to technicians but also ensure that their leadership is fully informed – They are interested in collaborating but are unable to identify any appropriate partners – Sustainable, long-term, specific training and workshops are required – Need a stepwise process for increasing data policy and political will
Peru	– Workshops designed to address specific needs have been very successful (e.g. workshop on map validation) – Training activities that are country driven/inside-out/identified by countries – Technical visits by experts that allow countries' technicians to ask questions about specific, relevant topics – Activities hosted by multiple partners are often more effective than those hosted by a single agency because these events demonstrate consensus among partners in methodology/approach/etc. – Follow-up with participants after an activity ends, including a meeting summary and the sharing of country/expert contact information (e.g.	– When donors do not communicate effectively – When training/workshop topics are too broad/general (e.g. workshop on general MRV) – Premature training/capacity building efforts, usually due to a donors scheduling – Inappropriately scheduled workshops; they should better take into consideration the current technical status of countries – When the wrong people/wrong profile of people attend events – Workshops that are targeted at people without the necessary technical skill – Lack of coordination between donor	

	Skype) – Work plan development activities – One-on-one time between country technicians and international experts – In addition to technical training, there is a need for activities that bridge the gap between the technical data and the creation of forest management policies (both technical experts AND policymakers in the room, as well as basic technical training for policymakers)	agencies, leading to scheduling conflicts – When feedback from past meetings is not taken into account for future meetings	
Vietnam			– Desire to integrate remotely sensed and field data – Need to take a multi-level institutional approach to building this capacity, and not only provide technical training to technicians but also ensure that their leadership is fully informed – They are interested in collaborating but are unable to identify any appropriate partners

National Forest Inventory

Country	Status	Goals	Capacity Building Needs
Bangladesh	– Has completed their FRA with FAO/Finland.	– They are not satisfied with the outcomes of their work with FAO/Finland and wish to improve it. – Incorporation of degradation measurement – Integrate remote sensing data with field data	– Assistance from donor agencies to improve and refine their NFI – Guidance on the technical aspects of degradation monitoring – Help on integrating remote sensing data with field data
Cambodia	– Receiving design support from the FAO	– Incorporation of degradation measurement – Integrate remote sensing data with field data	– Would like capacity building on QA/QC – Guidance on degradation monitoring – Help on integrating remote sensing data with field data
Colombia	– NFI design is in place, however they need implementation funding	– To advance the definition and assessment of forest degradation – Develop and use their own DEM	– Help on integrating remote sensing data with field data – Funding for NFI implementation – Staff training
Ecuador		– Improve management of change data to guarantee quality data	– Staff training

Laos	– Design phase with support from JICA and previously Winrock	– Incorporation of degradation measurement – Integrate remote sensing data with field data	– Would like training in Laos on general technical activities – Guidance on degradation monitoring – Help on integrating remote sensing data with field data
Mexico	– Two cycles of NFI have been completed and a third is now being undertaken	– A continuation of their strong and sustainable inventory	– Advice on how to maximize the use of the enormous amount of existing information/data. – Assistance with a gap analysis – Establishment of a step-wise approach to tool development – Help to retain trained staff – Help on methodologies for integrating remote sensing data with field data and validating the results
Nepal	– They have completed an NFI for 2010	– Monitoring changes and calculating Carbon changes	– Development of robust methods to integrate remotely sensed and field data
Peru	– One panel almost complete, but only includes the majority of the Amazon and not the other two ecoregions (Sierra and Costa)	– Expand NFI in 2015/16 to include the remaining parts of the Amazon, Sierra, and Costa. – Further develop NFI system; making sure it is well designed using the examples of others as input.	– Workshops with technical teams and policymakers to inform policy makers of the technical advancements – Over the long-term, there is a need to invest in graduate and PhD programs to help build body of experts in the agency and country – Help on methodologies for integrating remote sensing data with field data and validating the results

Vietnam	– 4 NFI completed in 5 year intervals from 1990 – 2010 – In 2011 planning for a new NFI was established with FAO/Finland. The new NFI is awaiting government approval and will cover the 2016 – 2020 period	– To implement a monitoring MRV for REDD+	– Integration of remote sensing and field data – Assistance to assess the contribution of trees that do not fall within the definition of 'forests'

Data Infrastructure/Management

Country	Status	Goals	Capacity Building Needs
Bangladesh	– Lack the basic capacity/infrastructure to receive, store, and use data		– Need support for setup/infrastructure (servers, etc.) and personnel – Help establishing data protocols
Cambodia	– Has support under UN-REDD for data management		– Needs software/hardware – Help establishing data protocols – Support with cloud removal and image processing – Better computational power to run cloud removal and image processing programs
Colombia		– Need to develop their data management and assessment protocols – Further develop open data protocols consistent with new Colombian laws – Improve interoperability of data – Make tools openly available.	– Access to more open data – Staff training
Ecuador			– Access to more open data – Software to ensure sustainable systems – Staff training

Laos	– Has remote sensing data but no management system – Issues with processing time and general capacity		– Assistance with general data management and storage – Help establishing data protocols
Mexico	– Receiving data can be difficult if clear institutional arrangements don't exist (i.e. on sharing data, transparency, etc.) – Sometimes institutional arrangements negatively impact data storage capabilities, for example one agency might not want users to share data with another agency – Data processing is the biggest obstacle in regards to the use of EO data. Distribution of data is also an issue.	– Increase institutional capacity to manage and analyze the enormous quantities of data collected – Increase storage capacity	– Assistance with a gap analysis – More capacity and resources for processing EO data – Assistance generating data/reports/etc. for distribution – Establishment of teams within government agencies consisting of a statistician, programmer, and remote sensing expert, with each role filled by a different individual
Nepal	– DOFRS manages data	– Recruitment of IT specialists to manage data – Use own ground control and DEM	– Study tours for IT staff – On-site training with agencies that handle large quantities of data (e.g. USGS) – Assistance with image processing, cloud removal, atmospheric correction, and production of mosaics – Intensive image processing training at the technical level – High-speed internet

Peru	– Receiving data can be difficult if clear institutional arrangements don't exist (i.e. on sharing data, transparency, etc.) – Sometimes institutional arrangements negatively impact data storage capabilities, for example one agency might not want users to share data with another agency – Data processing is the biggest obstacle in regards to the use of EO data. Distribution of data is also an issue	– Increase storage capacity	– Establishment of teams within government agencies consisting of a statistician, programmer, and remote sensing expert, with each role filled by a different individual – Programmers are needed, and donors might be able to assist recruitment financially – More capacity and resources for processing EO data – Assistance generating data/reports/etc. for distribution
Vietnam	– Multiple agencies are collecting data	– Consolidation of data collection into a single agency (MARD recommends FIPI) – Improve data collection hardware capacity – IT staff with long-term contracts, providing continuity	– Study tours for IT staff – On-site training with agencies that handle large quantities of data (e.g. USGS) – Assistance with image processing, cloud removal, atmospheric correction, and production of mosaics – Intensive image processing training at the technical level

Institutional Arrangements

Country	Status	Goals	Capacity Building Needs
Bangladesh	– No institutional arrangements	– Desire more institutional linkages	– Need more human resources to coordinate implementation of institutional arrangements – English language training
Cambodia	– Sending younger generations to training sessions to improve their skills		– English language training
Colombia	– Good collaboration between IDEAM and other government institutions	– Need to integrate other key stakeholders at the local level – Reduce the duplication of efforts between agencies – Improve international coordination – Make sure that decision makers receive all required information	
Ecuador	– Good institutional arrangements in place, including integration of ministers	– Need to establish institutional arrangements with other entities such as universities – Promote the use of data for decisions and coordination at the government level – Increased sharing of data and techniques between institutions	

Laos	– Working on language issues so that more people/institutions can coordinate		– English courses for stakeholders – Forestry/MRV training for Laotian-English translators so that they can attend meeting and coordinate with stakeholders
Mexico	– Three institutions have been working together, each responsible for an aspect of the MRV. (Ex: CONAFOR is responsible for reporting deforestation rates, etc.)	– Define the roles of institutions through laws, contracts, etc. – Define ways to share data between institutions (NGOs, universities, etc.) and the partner country	– Assistance with a gap analysis – Help to increase the ability of government institutions to identify what they really need from donors
Nepal	– The NFI is managed by DOFRS (one division of the Ministry of Forest and Soil Conservation)	– REDD+ responsibility falls to the Ministry of Forest and Soil Conservation	– Would like other established countries to share details of their institutional arrangements
Peru	– Few formal institutional arrangements because there is too much 'red-tape' – Very productive collaborations with researchers in institutions (like UMD) and unsuccessful partnerships with other researchers/institutions. In the unsuccessful cases, issues included: conflicts over data ownership and a lack of transparency	– More carefully assess the future steps for institutional arrangements on a case-by-case basis to avoid a bad experience	– Visits by external, technical experts can provide skills/knowledge/etc. while also acting as an impartial party that can encourage increased collaboration both within and between agencies – Over the long-term, there is a need to invest in graduate and PhD programs to help build body of experts in the agency and country
Vietnam	– FIPI (Forest Inventory and Planning Institute) and FPD (Forest Protection Department) use different, incompatible methods	– They would like unified best practices – Establishment of a coordinating agency/entity for the country	– An external reviewer to assess the methods of FIPI and FPD and to coordinate a unified approach – Would like other established countries to share details of their institutional arrangements

7 Overview of Strategic Capacity Building Plans

SilvaCarbon/USAID

- Evan Notman (USAID) gave a brief overview of some of the regional programs of USAID and other USG agencies.
- SilvaCarbon is working globally with the other components of GFOI and addressing broad capacity and technology needs. Regionally SilvaCarbon is working on training activities and also working bilaterally to develop high-level work plans.
- SilvaCarbon also focuses on collaborating with a number of other programs working with target countries, for example WRI's GFW and the USAID/NASA SERVIR Program.
- Forest Carbon, Markets, and Communities (FCMC) is another USAID project, and it has been working to link sub-national programs with national level activities. FCMC have been working on developing an MRV manual (which has some overlap with the GFOI MGD) and SilvaCarbon is working to identify how these documents, along with the GOFC-GOLD Sourcebook, can work together.
- The Governors Climate Fund helps to support REDD+ activities at a state/province level, and supports the development of MRV based on key needs. GCF is currently working with states/provinces in Brazil, Peru, Nigeria, and Colombia.
- SERVIR is a flagship initiative of USAID and NASA that has the objective of strengthening the capacity of government decision-makers and other key stakeholders by integrating Earth observation information and geospatial technologies into development decision-making.
- SERVIR turns data into decision support tools through demand-driven application development and capacity building activities.
- SilvaCarbon is working to ensure coordination with these other activities.

LC4Climate

- Jean Parcher (USDOI) spoke about the USAID funded Land Cover for Climate Programme (LC4Climate).
- LC4Climate is funded under the USAID Global Climate Change Program to build capacity for the generation of space-derived land cover data, with a focus on Africa and South East Asia.
- LC4Climate is working to provide training on interpretation and utilization of land cover data for climate change reporting requirements (GHG, REDD+, LEDS), as well as to improve global land cover databases with enhanced national and regional datasets.
- LC4Climate hosted the International Global Land Cover Workshop for Africa, and is working in coordination with the GEO Working Group on Land Cover Mapping for Africa, which is aiming to set up an inventory of land cover datasets for Africa.
- Earlier this year LC4Climate/RCMRD hosted an Eastern Africa participatory workshop to evaluate a USGS 30m Landsat-derived land cover map (8 classes) for South/East Africa (see Figure 7). A number of future events are also planned (see presentation).
- LC4Climate also funded an activity in Malawi in which two experts were sent to work with in-country REDD+ staff in different institutions and assess what datasets existed for the country and to assess any differences. They found that 4 land cover datasets existed (JICA, FAO, RCMRD, USGS) and they found that the outputs are very much influenced by the donors. This is problematic, as the land cover map might not always be appropriate for the requirements of the country.

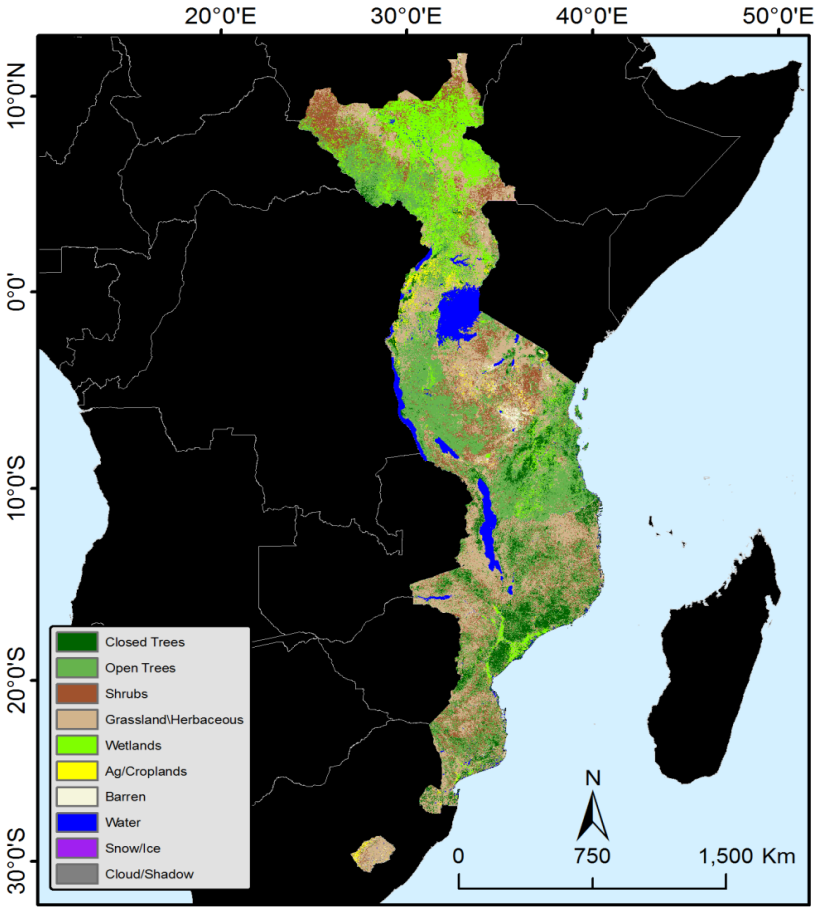

Figure 7 – Eastern and Southern 30m Landsat Land Cover Map

- LC4Climate are also working in South East Asia with the Mekong River Commission, hosting symposiums and technical training on land cover mapping.
- They are also planning to generate a South East Asia 30m land cover base map in collaboration with USGS, ADB, and MRC; co-host a remote sensing and land cover workshop with the lower Mekong SERVIR hub; and work with SilvaCarbon to address the technical capacity building needs identified at the recent Jakarta workshop.
- LC4Climate will work closely with a large number of stakeholders to coordinate on their remote sensing and land cover training needs, and also work to understand differences in how land cover classes are defined from country to global scales.
- LC4Climate will build institutional structures within regions, provide appropriate levels of sustainable capacity training, integrate 30m global land cover maps with regional and country level data, and provide the necessary satellite imagery for the generation of land cover change products (including physical delivery).

ICAA

- Adriana Suarez (USDOI) spoke about the Initiative for Conservation in the Andean Amazon (ICAA).
- ICAA is implemented by a number of consortia, which are assisted by the ICAA support unit. The International Technical Assistance Program of the United States Department of the Interior (DOI-

ITAP) operates as a Technical Support Partner and provides capacity building and technical assistance to governments.

- ICAA is currently in Phase 2, and is currently operating 9 projects in Peru (5), Colombia (2), and Ecuador (2).
- ICAA is currently working on the sustainable management of landscapes, governance, economic incentives for conservation, management for environmental problems, as well as a number of cross-cutting themes. Capacity building activities (practical workshops, virtual seminars, etc.) are integral to each of these themes.
- Adriana noted that the most important capacity building components are increasing collaboration as well as institutional strengthening.
- Adriana spoke about a capacity building program that is currently in development – Comprehensive Training for Conservation and Sustainable Development in the Colombian Amazon – that includes participants from academia, government, NGO's, and international organisations (providing technical assistance). The program has been developed with a focus on illegal activities that affect the environment, and it is directed toward technical government workers at local, national, and regional levels.
- A certification program guarantees the assistance of government workers through scholarships, however Adriana noted that it is still difficult to find government workers that are willing to contribute to the program given the necessary time and travel commitments.

USAID Colombia

- Evan Notman (USAID) discussed the USAID capacity building activities within the climate change portfolio in Colombia. USAID works with the government of Colombia to define their five-year cooperative focus.
- Evan reviewed the three Strategic Objectives (SO) of the USAID program in Colombia:
    - **SO1: Environmental resiliency: LEDS, Clean Energy, CC Mitigation**
        - Support the Government of Colombia in the process of devising Low Emission Development Strategies (LEDS), energy efficiency, and sustainable land use. USAID support to the Colombian LEDS process included the initial design of their MRV.
        - One activity under SO1 has been the development of a BIOREDD+ project which combines Radar (SAR) and Lidar data together to produce estimates of carbon stocks associated with degraded forests – a first among REDD+ projects. The work was carried out with Colombian universities and NASA/JPL, and the data is now being passed to IDEAM to potentially be used for national level assessments.
        - Biodiversity related capacity building strategies for the Amazon are being developed through ICAA/Caqueta at two different and complementary scales: regional (institutions) and local (communities).
    - **SO2: Increase Resilience (Adaptation)**
        - The goal is to build resilience and decrease vulnerability to the effects of climate change.
        - The USAID FCMC pilot Huila 2050 is a component of SO2 and aims to address climate change adaptation at a department/state level.
    - **SO3: Integrating Climate Change in Agency Programming, Learning, Policy Dialogues, and Operations**

- Monitoring and evaluation activities are a fundamental task, and include field visits, follow up with partners and impact evaluations. Capacity building is multi-level, demand driven, and long-term (phased).
- Evan concluded by summarising the challenges and opportunities associated with USAID activities in Colombia:

Challenges	Opportunities
– Bridging global climate change and Colombian climate change action plans – Budget levels – Coordination between USG/GOC – Delivering concrete results to communities – Dynamic political environment – Alignment with GOC time frames	– Peace process – New internal planning cycle – Amazonas 2020? – Build on previous experience = Focus – Local expertise – USAID well positioned with GOC and other stakeholders

FAO UN-REDD

- Erik Lindquist (FAO) reviewed the capacity building efforts of the FAO for MRV.
- The goal of the FAO's MRV efforts is to create systems that are capable of producing national level estimates of land cover/land use change at a suitable time interval to contribute to the calculation of GHG emissions/removals, and to support performance based payments for REDD+.
- Erik said that capacity building for MRV should facilitate contributions to REDD+ reporting; be supported by scalable, useful tools; build trust in the methodology; and facilitate communication.
- The FAO aims to enable sustained, autonomous national-level reporting on activity data for MRV for REDD+; establish credible reference emission levels; promote the inclusion of accuracy assessments in reports; catalogue and enable access to allometric equations; and create/maintain geographic web-based data portals.

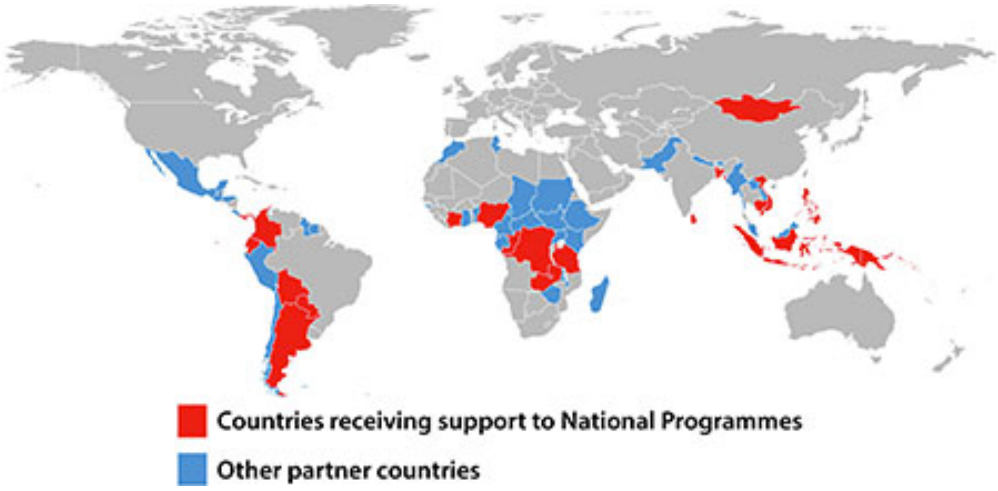

Figure 8 – UN-REDD Countries

- The efforts of UN-REDD are directed at national ministries that are responsible for reporting to the UNFCCC. UN-REDD activities have a strong sense of follow up and are focussed on harmonizing national-level statistics and reports, and on intensive, hands-on workshops, as specific problems are much easier to address.
- Erik gave an overview of some of the key activities of UN-REDD:
    - Sample-based and wall-to-wall assessments of activity data
    - Multi-source, field-based inventories
    - Integrating field based observations with remotely sensed data
    - Assessments of historic maps for the purposes of reference level derivation
    - Integration of region-specific allometric equations
    - Results and analysis dissemination via geographic web portals
    - Open source software and tools
- Erik went into more detail on some of the tools that are being used by UN-REDD, including OpenForis (open source image processing software), TerraAmazon (in collaboration with INPE, basic image interpretation and storage), Google Earth Engine (mapping, scripting, image processing), GlobAllomeTree (allometric equation database), and Collect Earth (a GEE sample-based assessment tool).
- Erik noted that building on existing data and promoting transparency are two key values of UN-REDD.
- Erik reported that the FAO is working to better organise themselves, retain key staff, collaborate with other initiatives, and ensure long-term support for projects.
- Erik posed some questions to the audience, asking:
    - What combination of top-down or bottom-up approach works best?
    - What are the limiting costs (software, data, internet, people)?

South-South Cooperation Strategy

- Jose Maria Michel Fuentes (FAO CONAFOR) presented on the South-South Cooperation Strategy, which aims to build technical capacities in Mesoamerica through the collaboration of ten countries in the area.
- Two workshops were held so that countries could identify their collaboration needs and priorities related to forest monitoring and MRV.
- Feedback gathered from the sessions was used to develop the South-South Cooperation Strategy.
- A number of workshops have been held/planned on emission factor estimates, GHG inventories, REL, activity data, community based monitoring, and forest inventories.
- Jose noted that the goal is to develop a 'lessons learned' document for countries to use in the future.

GIZ Activities in Colombia

- Angelica Beltran (GIZ) spoke about the Colombian focused activities of the Deutsche Gesellschaft für Internationale Zusammenarbeit (German Society for International Cooperation).
- GIZ is assisting the Colombian Ministry of Environment in the development and implementation of their national REDD+ strategy (ENREDD+). Angelica added that GIZ are also working to ensure consistency with international processes such as FCPF, ONUREDD; supporting an inter-sectorial approach that incorporates regional structures; and ensuring that social and environmental standards are followed.
- Angelica reviewed the expected impacts of GIZ's work in Colombia:
    - The monitoring and evaluation system are established and implemented.
    - Inter-sectorial coordination mechanisms are established.
    - Regions are actively involved in the REDD+ process.
    - The social and environmental safeguard information system is developed.
    - National approach to ENREDD+ is defined based on early pilot activities.
    - The causes of Colombian deforestation dynamics are identified and analysed.
- Activities are taking place in Santander, Norte de Santander, Caqueta, and Guaviare, and their activities and progress are varied. Angelica identified some challenges facing the pilot activities, including those related to remoteness, security, and managing community expectations (the financial benefits of REDD+ are usually overstated for individuals). She added that communication and coordination among levels, sectors, and the public, as well as long-term staff were necessary to ensure that the program is a success.

The Nature Conservancy

- Graciela Peters (TNC Mexico) gave a presentation on the Mexico Reducing Emissions from Deforestation and Degradation Programme (M-REDD) initiative, along with an introduction to the e-MREDD+ system, which includes an online MRV portal and mobile data collection application. TNC is the programme leader of M-REDD.
- M-REDD aims to assist implementation of the Mexican national REDD+ strategy by strengthening the institutional and technical capacities of stakeholders, disseminating information, implementing

REDD+ pilot projects, establishing financial structures, and setting up the required MRV systems for REDD+.

- e-MREDD+ already includes a base biomass map for Mexico, which can be used as a basis for future work at regional levels.

World Wildlife Fund

- Naikoa Aguilar-Amuchastegui (WWF) introduced the World Wildlife Fund, and he noted that the WWF has a presence in over 100 countries, with their forest and climate program covering all major forested areas. He added that they are not only working on MRV systems but also policy, capacity building, and implementation.
- Naikoa reminded everyone that the purpose of data is to inform political processes, and that capacity building needs to support the needs and reporting frameworks of countries.
- The WWF is trying to build capacity by sharing MRV knowledge and experience with countries, and linking all scales, from national to regional. The WWF aims to develop long-term capacity and provide direct support to countries.
- Naikoa noted some key WWF activities, which are summarised in Figure 9.

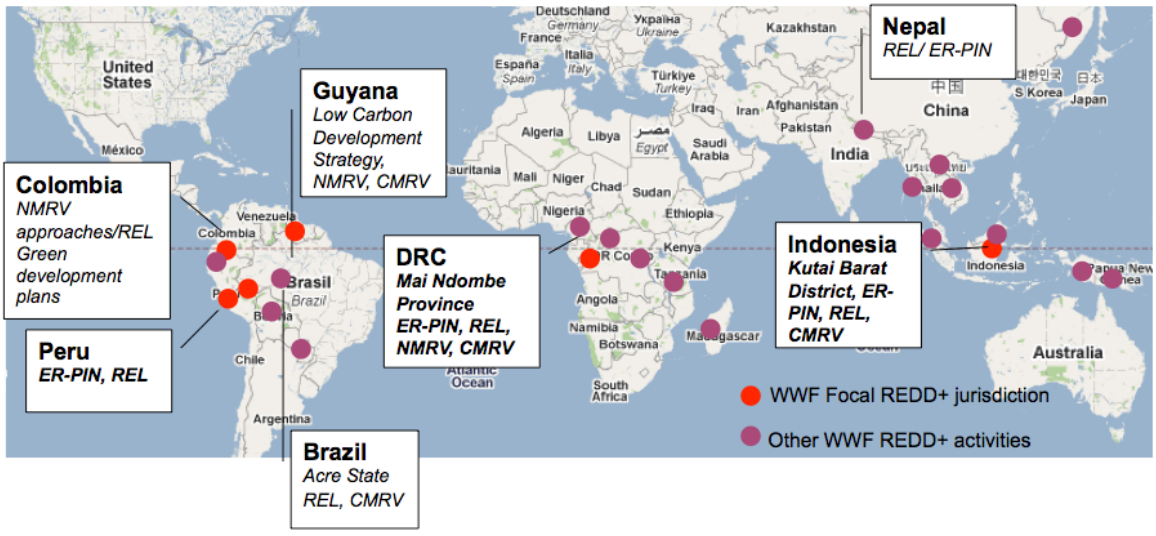

Figure 9 – Examples of WWF Forest and Climate Program Activities

- Naikoa noted some challenges that the WWF has encountered while implementing their forest and climate program:
    - There is a challenge associated with delivering long lasting capacity as opposed to products
        - A project based approach is not as effective as the institutionalization of MRV
        - The academic approach to capacity building is not suitable, as R&D does not equate to capacity building, and access to intermediate products/data is usually restricted
        - Technology packages do not fit current country needs

  - Interpretations of UNFCCC mandates vary greatly, especially around the definitions of transparency, robustness, accuracy, replicability, and verifiability. Naikoa suggested that guidance with this interpretation could be very useful.
  - There is a lack of transparency in products, and we need to be humble and acknowledge the limitations of remotely sensed data, and to also be aware of the effect of natural forest dynamics on the results.
- Naikoa also noted some needs for capacity building:
  - He feels that efforts should be process-based rather than product-based
  - Long term financing that is not project based and that is linked with institutional development is required for sustainable capacity building.
  - Governments need to develop and support their own strategies for capacity building
  - Emphasize service providers with the necessary structure and logistics for long term support
  - R&D needs to be separated from support for establishing well known alternatives
  - We need to make things simpler, not more complicated
  - Need to meet countries real needs

World Resources Institute (Global Forest Watch)

- Crystal Davis presented on the WRI's Global Forest Watch (GFW) initiative – an online forest monitoring and research system which was launched earlier this year. She noted that while it is not really a capacity building tool, GFW can be a useful data exploration tool.
- Crystal noted that static maps rapidly become obsolete, and GFW aims to overcome this by being constantly updated. She made an analogy to the business sector, for which constantly updated stock prices are readily available to the public. The goal of GFW is to provide data that is free, easy to use, timely, interactive, and actionable.
- Crystal demonstrated the GFW tool, showing off a number of different datasets for forest change assessment. She showed how the tool could generate land cover change animations and verified the changes with the associated Landsat imagery.
- Crystal noted that WRI are aiming to improve the GFW through increasing accuracy; incorporating contextual, national-level data; prioritizing R&D gaps; and increasing data sharing.
- WRI are also working on two similar applications for commodities and fires.
- Crystal said that WRI are interested in collaborating with national stakeholders, and she suggested that they could help countries with: training on GFW data, tools, and technologies; accuracy assessments of global monitoring data; integration of space-based and ground data; sharing data for use in NFMS; uploading local data for visualization on GFW.

Questions

- Evan Notman (USAID) said that it would be interesting to explore whether WRI could work with governments to assess and understand the differences between GFW and country-derived results, and to investigate how governments might use the platform to share their data. Crystal said that WRI would be very interested in having these types of discussions.

University of Maryland

- Matt Hansen (UMD) noted that UMD are applying their global-scale Landsat-based forest extent mapping experience to develop national-scale maps with interested countries. The objective of the UMD program is to create national-scale maps of forest extent and loss, which countries can then improve with additional data and also rapidly re-generate in subsequent years.
- The capacity building/training consists of lectures on pre-processing Landsat archive data, installation of workstation(s), and hands-on derivation of training data.
- UMD has delivered workstations and worked collaboratively with Democratic Republic of Congo, Republic of Congo, Indonesia, Colombia, Ecuador, and Peru.
- Matt believes that the more pre-processing can be eliminated, the better. All pre-processing is done automatically, allowing users to start generating products straight away.
- Matt demonstrated the automated generation of a cloud-free mosaic, which used 92 images that were collected over a period of 3 years.
- Matt noted that in-country partners need to be results-focused rather than process-focused for these activities to be applicable.

Woods Hole Research Center

- Josef Kellndorfer (WHRC) presented remotely on behalf of Woods Hole Research Center, and reviewed some of their key capabilities and capacity building activities.
- Josef noted that WHRC has developed many course modules with SilvaCarbon, and that they are working directly with Peru, Colombia, and Mexico.
- WHRC are also a key contributor to the GFOI MGD and GOFC-GOLD Sourcebook and they attend regular GFOI workshops.
- In regards to capacity building, in the future WHRC will engage new partners in Africa and Asia, continue intensive training in Latin America, provide training that takes the GFOI MGD into account, and foremost, build a South-South-North network to facilitate the sharing of expertise, data, and code.
- Since 2007, WHRC has undertaken large-scale projects such as biomass measurement and the integration of remotely sensed and field data.
- Josef spoke about the Woods Hole Image Processing System (WHIPS) – a UNIX based image processing and digital mosaicking tool. WHIPS allows users to specify their own DEM, resolution, map projection, optical pre-processing, and includes a number of value-added processing algorithms. Datasets are stored on a central database.
- WHIPS provides satellite image processing, storage, and delivery capacity to countries, agencies, and individuals, and includes a fully automated service to build multi-sensor/multi-temporal satellite image stacks for satellite mapping and monitoring of natural resources.
- Josef reviewed some of WHRC's key areas of expertise:
    - Biomass mapping from the integration of remotely sensed and field data.
    - Land cover mapping from optical and SAR data.
    - Integration of NFI with Lidar, Radar, and optical imagery for field to image scale up
    - Uncertainty assessments in Carbon stocks
- Josef noted that WHRC could contribute technical infrastructure such as HPC clusters, access to NASA NAS resources, and processing through WHIPS.

- Josef asked GFOI/SilvaCarbon/USAID/donors to support the establishment of the South-South-North partnership.

USGS Land Change Science Program

- Roger Sayre (USGS) presented on the USGS Land Change Science (LCS) Program, which constitutes GEOSS Task EC-01-C1: Global Ecosystem Classification and Mapping. The purpose of this task is to: "Develop a standardized, robust, and practical global ecosystem classification and map for the planet's terrestrial, freshwater, and marine ecosystems"
- USGS state that the LCS effort will: "Classify and map global ecosystems in a standardized, robust, and practical manner at scales appropriate for on-the-ground management, including conservation planning, resource management, and analyses of the economic value of ecosystems."
- Roger reported that maps of standardized terrestrial ecosystems have been produced for Africa, the United States, and South America.
- Roger noted the creation of global Ecological Land Units (ELUs), comprising 3013 classes, which will be available before the end of the year. ELUs will be relevant to GFOI as they will allow for forest classification, form the basis for regional comparisons, facilitate stratification for sampling, and promote cross GEO collaboration. Roger noted that the only downside is that the data is perhaps a bit too coarse.

Questions

- Chip Scott (USDA Forest Service) asked whether the ELU are time invariant. Roger confirmed that they are, noting that they're supposed to be invariant features.

8 Working Meeting Discussion on Future Collaboration with Partners

- The working groups were once again assembled and asked to share their ideas on the following topics:

    1. Increasing donor/country collaboration
    2. Increasing donor coordination
    3. Integrating research into capacity building
    4. Countries providing feedback on the GFOI Methods & Guidance Document based on current research or expected outcomes from current activities
    5. Connecting with regional institutions for capacity building

9 Panel Discussion

- A group discussion session was held to share the ideas generated during the preceding working meeting. The goal of this session was to gather inputs for the planned SilvaCarbon Capacity Building Strategy.

1. Increasing donor/country collaboration

- It was suggested that SilvaCarbon establish an 'MRV wedding registry', which would provide a unified summary of the capacity building desires of SilvaCarbon countries, allowing donors to review the list and follow up particular topics accordingly. A multi-institutional approach – long vs. short-term results.
- The completion of comprehensive, structured, country needs assessments were identified as critical in linking donors to the requirements. Countries also need to compile clear capacity building strategies and make their plans known to donors.

2. Increasing donor coordination

- It was suggested that both donor policies and countries needed to be flexible to increase coordination.
- Again, it was suggested that donor coordination could be increased if countries define clear capacity building strategies.
- Long-term initiatives would be most effective.
- Workshops, capacity building events, and other meeting opportunities need to be streamlined, coordinated, and announced/shared with the community/donors well ahead of time, and there needs to be a mechanism in place to support this – perhaps building upon the calendar that is on the GFOI website, with countries providing input on regional events. A one-stop place to see all of the capacity building activities.
- Countries need to inform SilvaCarbon of the efforts of donors.

3. Integrating research into capacity building

- We need to promote collaboration between organisations, universities, and government to foster the use of research, and to involve research institutions in capacity building work.
- We need to ensure that there is a clear capacity building goal related to the research.
- In the short-term, funding/scholarships could catalyze the incorporation of research into capacity building, though it was noted that many of the developing countries cannot offer funding.
- Research needs to be applied to policy – data to outcomes.
- Researchers should also be exposed to the capacity building activities to ensure that they are well aware of the practical side of the work.
- It was suggested that knowledge should be distributed widely, with a focus on providing near-term benefits. It was noted that PhD programs are great, but they are very long-term, and also have the potential for the investment to be lost due to staff turnover etc.
- An RFP approach was preferred, as it tends to foster innovation.
- SilvaCarbon needs to define a clear definition of capacity building.

4. Countries provide feedback on GFOI Methods & Guidance based on current research or expected outcomes from current activities

- A wiki version of the MGD was suggested. Such a platform would allow users to have discussions with the authors, suggest improvements, provide/receive feedback, and allow the MGD to be continuously updated and improved with new ideas and methods. It was suggested that regional community practices could also be reflected in some form. A prototype could be set up for testing and evaluation.
- Training materials based on the MGD are now being readied for release, and the FAO is developing specific MGD commands.
- GFOI is planning a revision of the MGD in early 2016. SilvaCarbon and GFOI need to coordinate on the initiation of a feedback process (both formal and informal) from countries/FAO/other organisations. GFOI needs to develop an easy mechanism for countries and partners to provide feedback.
- It was suggested that countries could select a specific section of the MGD and request a donor to work with them to build their capacity on that particular topic. The donor and country would work through the method and provide feedback to GFOI on that specific section. A feedback loop.
- Case studies could be produced to share how the MGD is being applied.

5. Connect with regional institutions for capacity building

- It was suggested that a capacity building coordinator be established within the technical teams. This person would be partially or wholly responsible for communicating with regional institutions in an organic manner.
- It was suggested that a connection could be made through the typically steady and consistent SERVIR hubs, with country input to ensure that the activities are consistent with the country needs. The hubs could coordinate the capacity building activities.

10 Closing

- On behalf of Maria Claudia Garcia (Forest Department Director of the Ministry of Environment), Edersson Cabrera (IDEAM) thanked everyone for their participation in the workshop. Edersson said that he is certain that the discussions held over the past two days have been extremely beneficial for all, and he added that he is particularly proud to have had the opportunity to share the progress of Colombia's Forests and Carbon Monitoring System. Edersson recognized the efforts of Ecuador, Peru, Mexico, Laos, Bangladesh, Nepal, Vietnam, and Cambodia, and thanked all of the donors and international partners for their support, especially SilvaCarbon.
- Simon Eggleston (GFOI) thanked everyone for contributing to the workshop, noting that lots of good discussion had taken place, and that SilvaCarbon/GFOI will review the results closely. Simon thanked IDEAM for hosting the workshop and also thanked the donor representatives and international partners for their continued support.
- Sylvia Wilson (SilvaCarbon) thanked everyone for their participation and wished everyone safe travel home.

Friday 19th September – Americas Meeting

Objectives:

Create a capacity building plan between Colombia, Ecuador, Peru, and Mexico.

11 GFOI Capacity Building Plan for the Americas

- Craig Wayson (SilvaCarbon) presented a review of SilvaCarbon activities from 2011 to present, noting that SilvaCarbon uses a bilateral, regional approach to capacity building.
    - Eleven regional workshops have been held, covering specific topics such as sensor interoperability, data processing, forest inventories, and data applications. Craig also highlighted the regional SWAMP workshops.
    - A Colombian pilot for time series system mapping methodology to map LULC classes.
    - A Boston University project on the integration of remotely sensed and forest inventory data, lead by Chip Scott in Colombia.
    - Implementation of pilot activities aiming to improve allometric equations using terrestrial and airborne Lidar.
    - Linking MRV research with local contributors to build capacity.

- Craig also reviewed some future planned activities:
    - Continued F/NF mapping activities.
    - Implementation of intensive monitoring sites incorporating tools such as eddy flux towers to measure the dynamics of carbon.
    - Continuation of GFOI regional workshops.
    - Implementation of community based monitoring pilots for MRV in three Peruvian communities.

- Each of these planned future activities then formed the focus of a working meeting discussion.
- Gustavo Galindo (IDEAM) noted that F/NF classification is critical to their short term reporting goals, and he feels that IDEAM need to change the way they are working with land cover change in the medium to long term by collaborating and coordinating more with other stakeholders.
- Evan Notman (USAID) recognized that the medium term activities of Colombia reflect that they have a system already, but that they want to improve it using some new methodologies. He suggested that IDEAM compile their desired outcomes and identify the tasks for which they would want specific SilvaCarbon support.
- Matt Hansen (UMD) stressed the need to place more emphasis on numbers, rather than maps, as these metrics are what is used for reporting.
- Erik Lindquist (FAO) noted that the FAO has a few activities going on in the region, and that they are working with countries on allometric equation development, accuracy assessments, aerial estimates, and basic capacity building in remote sensing technology. Erik said that the FAO is trying to work with countries to define forest degradation by looking at what part of degradation contributes to Carbon stock change and determining appropriate monitoring strategies. He added that they have

an upcoming workshop in Argentina on degradation. Craig noted the good collaboration and overlap between SilvaCarbon and the FAO.

- Andrea Bustos (Ministerio del Ambiente, Ecuador) shared that policy makers in Ecuador do not understand the need to produce forest-monitoring systems. Erik Lindquist (FAO) noted that in his experience, Ecuador are leaders in accuracy assessment, and he added that the FAO has helped to assess the accuracy of historic maps in Ecuador. The story of deforestation in Ecuador hadn't been critically reviewed prior to these efforts, and Erik hopes that this will prompt policy makers in Ecuador to take notice and action.
- Craig Wayson (SilvaCarbon) spoke about the intensive monitoring sites in Mexico, which incorporate eddy flux towers and Lidar measurements, among other techniques, to derive key information about CO_2, water, and energy fluxes of key areas, which can then be used to parameterize models. He added that fluxes, not just stocks, are necessary to determine how land use is changing. Craig noted that links to other international sites should be made and researchers should be encouraged to collaborate and share information.
- Craig noted the need for increased collaboration between government and academia, particularly in South America.
- Brian Zutta (MINAM) feels that the last workshop on map validation was very useful because half of the workshop was devoted to hands on training with the countries' own data. Brian added that workshops need to be scheduled and followed up to facilitate the production of applications and benefits soon after, otherwise the participants will quickly forget the lessons learned. He cited the example of a past Lidar workshop, after which none of the participants produced any benefits, and have now forgotten the methods learned. Craig reiterated that training should be continuous and followed up.
- Naikoa Aguilar-Amuchastegui (WWF) feels that the intensive monitoring sites will not be sustained in the long-term without countries taking ownership, and he added that a larger-scale regional/international strategy could prompt countries to support the activities in the long-term.
- Evan Notman (USAID) wants to ensure that there are clear applications of the sites to the MRV efforts, and that appropriate expectations are being set.
- Jose Maria Michel Fuentes (FAO CONAFOR) discussed the plans for the intensive monitoring sites over the next year, noting that measuring and validation will continue, the local level data will be compared with regional/national information, and an assessment will be carried out to determine whether the data can be applied at a national scale. He added that emissions factors would be a key output from the site work.
- The discussion then moved on to the community based monitoring pilot for MRV, and Craig Wayson (SilvaCarbon) noted that while effective, there is no clear plan for how the countries will be integrating the data at a national scale.
- Naikoa Aguilar-Amuchastegui (WWF) feels that the data will be integrated after assessment, but the frameworks need to be defined first.
- Sylvia Wilson (SilvaCarbon) said that the pilot activities have been a little uncertain, and the community requires more instruction to get started.
- Jose Maria Michel Fuentes (FAO CONAFOR) stressed that expectations need to be managed appropriately, as community based monitoring might not be effective for some countries, citing Brazil as an example.
- Gustavo Galindo (IDEAM) noted that IDEAM are working with the community, however it can be difficult to find staff that are well suited to working with the public, and he suggested that it might be necessary to have dedicated contact persons.
- Community inputs in large forested areas are invaluable to national-level datasets.

- Community input will be useful for assessing the impact of mitigation actions and understanding degradation at the local scale. These community-based efforts will not work everywhere, however to improve the chances of success strong institutional arrangements need to be established. Local communities are very much a part of REDD+ and can be a significant contributor to MRV – especially verification.

12 Discussion Panel Between Latin-American Donors and GFOI

GFOI Workshops Discussion

- Sylvia Wilson (SilvaCarbon) initiated a working meeting discussion to gather suggestions for future SilvaCarbon workshop themes from the country representatives and partners.
- It was noted that any plans should be coordinated around COP-20, and Sylvia suggested that the upcoming meeting in Brazil might be moved accordingly, and that she will coordinate with INPE.
- A workshop on SAR was suggested, however there was a feeling amongst the group that it might be premature, again citing the example that following previous workshops on radar, participants did not apply what they had been taught. Brian Zutta (MINAM) feels that a workshop on radar might be more effective if postponed to a later date.
- Andrea Bustos (Ministerio del Ambiente, Ecuador) suggested that Ecuador would benefit from guidance on publishing methodologies.
- Erik Lindquist (FAO) suggested that a hands-on workshop on combining field inventory data and remotely sensed data would be beneficial.
- Matt Hansen (UMD) feels that it would be good to determine which of stratifying and multiplying or direct biomass measurements are the most effective solution in a hands-on workshop manner.
- A hands-on workshop on Google Earth Engine and open source processing tools was suggested.
- Sarah Marlay (USFS) suggested a community-based monitoring workshop.
- During the discussion session the day before, an MRV gap analysis/needs register was proposed. It was suggested that a workshop might be organised to formulate such a registry.
- Another proposal was a workshop addressing the linkage of in-country technical communities with policy makers, looking at the application of data in a policy context and introducing policy makers to the technical aspects.
- Graciela Peters (TNC Mexico) suggested a workshop on information management, covering topics such as the integration of community level data. She added that the workshop could be used to assess whether this type of data is most applicable to verification, planning, or monitoring, and to identify where we see opportunities for using this data. Sylvia Wilson (SilvaCarbon) said that it would be a good opportunity to bring together countries and take stock of all of the information being produced at different levels and to see where it is most applicable.
- Naikoa Aguilar-Amuchastegui (WWF) feels that a workshop on interoperability analysis would be interesting and useful.
- It was agreed that a workshop on establishing reference levels and assessing their accuracy/consistency would be useful. Evan Notman (USAID) suggested that such a workshop might also cover projection/modelling for the future. Brian Zutta (MINAM) agreed, saying that he feels this would be very valuable, as policymakers will inevitably want estimated data for the future.
- The group agreed that it would be useful to have a workshop on data accuracy assessments, and understanding how this accuracy data would be used in reporting.
- Edersson Cabrera (IDEAM) would like to see a workshop on optical and radar time series interoperability. Matthew Steventon (SDCG) suggested that it might be beneficial if such a workshop were scheduled to take place after the release of the 25m ALOS-2 global mosaics, thus ensuring that radar data is available for participating countries.

Latin-American Country Goals and Needs

- The country representatives were asked to summarise their short and long term MRV/NFMS goals, and the following table compiles this feedback.
- Evan Notman (USAID) suggested the development of a tool that identifies the key MRV/NFMS components and summarises the future development requirements (based on the needs identified by countries). Such a summary would help to organise SilvaCarbon efforts and serve as a useful way to track and share country status with the community (e.g. other countries, donors, partners).

Country	Short-term Goals	Long-term Goals
Colombia	– Implement NFI – Integrate NFI and remotely sensed data, and analyse the information – Improve the interoperability of existing systems – Formulate and implement plans to prevent and control deforestation using MRV information – Strengthen institutional arrangements – Monitor and analyse the drivers of deforestation and degradation – Derive reference activity data	– Continue working on the NFI – Monitor degradation – Integrate the monitoring of deforestation and emissions – Ensure sustainability of the monitoring system – Generate national reference scenarios
Ecuador	– Improve NFI reporting – Design the next NFI measurement cycle – Speed up the analysis and classification of land cover maps – Training on GHG reporting (including software etc.)	– Strengthen the monitoring unit and keep producing data
Mexico	– Integration of the NFI with remotely sensed data – Improved governance of the monitoring system – Produce more reports (both internal and external) – Perform wall-to-wall analyses – Advance the South-South cooperation effort – Establish a platform for the dissemination of information and gathering of feedback.	– Improve the sustainability of systems – Perform impact assessments using the generated information – Increase transparency – Tier 3 reporting

Peru	– Work on institutional issues (improve clarity, legal matters, etc.) – Personnel training (both permanent employees and project based) – Improve communication at national, regional, and local levels	– Integration of remotely sensed and field data – Personnel training (both permanent employees and project based) – Improve communication at national, regional, and local levels

Action Items

No.	Action
SC-Col-1	SDCG to follow up Cambodia regarding their reported lack of data availability.
SC-Col-2	SilvaCarbon to provide guidance to countries on the interpretation of UNFCCC mandates, in particular with regards to the definitions of transparency, robustness, accuracy, replicability, and verifiability.
SC-Col-3	Countries to develop formal strategies and plans for capacity building to facilitate donor and partner contributions.
SC-Col-4	SilvaCarbon to follow up WRI regarding using GFW as a platform for data assessment and distribution by countries.
SC-Col-5	IDEAM to compile a list of desired outcomes and to identify tasks for which they want specific SilvaCarbon support to reach their goals.
SC-Col-6	Sylvia to coordinate with INPE on the upcoming meeting in Brazil to ensure that it does not conflict with COP-20.
SC-Col-7	SilvaCarbon to coordinate on establishing the MRV gap analysis/needs register, including arranging a workshop to compile inputs if necessary.
SC-Col-8	SilvaCarbon to setup a tool/table that identifies the key MRV/NFMS components and summarises the future development requirements of countries.

Attendees

Agency/Company	Name	Agency/Company	Name
CRQ	John James Fernandez Lopez	SilvaCarbon	Craig Wayson
DFRS	Shree Krishna Gautam	SilvaCarbon	Sylvia Wilson
dTS	Claudia Rossel	TNC	Graciela Peters Guarin
dTS	Laura Arntson	UMD	Matthew Hansen
FIPD	Soukanh Bounthabandid	UN-FAO	Erik Lindquist
FIPI	Manh Tuong Ho	UN-FAO-CONAFOR	Jose Maria Michel Fuentes
GFOI	Simon Eggleston	USAID	Daniel Lopez
GIZ	Angelica Beltran Guerrero	USAID	Evan Notman
GIZ REDD+	Ana Maria Pacheco Pascagaza	USAID	Katherine Faulhaber
IDEAM	Adelaida Vega	USDA	Chip Scott
IDEAM	Adriana Babosa	USDA	Linda Heath
IDEAM	Carolina Gonzalez	USDOI	Adriana Rojas Suarez
IDEAM	Edersson Cabrera Montenegro	USDOI	Alan Kroeger
IDEAM	Gustavo Galindo	USDOI	Jean Parcher
IDEAM	Maria Teresa Martinez	USFS	Dana Moore
IDEAM	Ricardo Hugo Quiroga Vanegas	USFS	Guillermo Sanchez
IUCN	Roland Ndifor	USFS	Sarah Marlay
MADS	Martin Camilo Perez Lara	USGS	Chandra Giri
MADS	Pablo Vieira Samper	USGS	Chelsea Cook
MAE	Andrea Bustos	USGS	Coral Roig-Silva
MAFF/FA	Sar Sophyra	USGS	Roger Sayre
MINAM	Brian Zutta	WHRC	Carol Franco
MoEF	Md Mia	WHRC	Josef Kellndorfer
OSFAC	Landing Mane	WRI	Crystal Davis
SDCG	Matthew Steventon	WWF	Naikoa Aguilar-Amuchastegui