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Assessment of Capacity-Building Activities for Forest Measurement, Reporting, and Verification, 2011–15



Open-File Report 2018–1031

Cover photo: Workshop participants establish an above ground biomass plot to collect height and diameter at breast height of the trees in Ba Vi National Park, Vietnam, 2016. Photograph credit: Chelsea Cook

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By Elitsa I. Peneva-Reed and J. Erika Romijn

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Contents

Acknowledgments	iii
Executive Summary	1
Introduction.....	1
Datasets.....	2
Data Summarized from the Global Forest Observation Initiative and SilvaCarbon Capacity-Building Summit, September 2014.....	3
Data Collected from the Capacity-Building Providers.....	3
Data Collected from the Recipients	4
Methods.....	4
Findings and Discussion	5
Colombia.....	5
Democratic Republic of the Congo	9
Peru.....	15
Republic of the Philippines.....	17
Conclusions and Future Actions	20
References Cited.....	22
Appendix 1.....	23

Figures

1. Total number of capacity-building activities per type per year including the three providers for the four recipient countries	3
2. Number of capacity-building activities for each indicator for the four recipient countries	9
3. Average, minimum, and maximum number of days for each of the eight capacity-building activities	10
4. Number of capacity-building activities within each indicator by year delivered by the three providers for Colombia	12
5. Number of capacity-building activities within each indicator by year delivered by the three providers for Democratic Republic of the Congo.....	12
6. Number of capacity-building activities within each indicator by year delivered by the three capacity-building providers for Peru	13
7. Number of capacity-building activities within each indicator by year delivered by the three capacity-building providers for the Republic of the Philippines	13

Tables

1. Most- and least-effective capacity-building efforts as described in the summit report	4
2. Progress status of the nine indicators for the recipient countries in 2011 and 2015	6
3. Constructive criticism and lessons learned from the summit report.....	7
4. Indicators depicting Colombia’s progress toward building measurement, reporting, and verification systems for reducing emissions from deforestation and forest degradation	8
5. Performance level of indicators in Colombia by 2015.....	11
6. Indicators depicting Democratic Republic of the Congo’s progress toward measurement, reporting, and verification systems for reducing emissions from deforestation and forest degradation	14
7. Performance level of indicators in the Democratic Republic of the Congo by 2015.....	15
8. Indicators depicting Peru’s progress toward building measurement, reporting, and verification systems for reducing emissions from deforestation and forest degradation	16
9. Performance level of indicators in Peru by 2015.....	17
10. Indicators depicting the Philippines’ progress toward measurement, reporting, and verification systems for reducing emissions from deforestation and forest degradation	18
11. Performance level of indicators in the Republic of the Philippines by 2015.....	19
12. Summary of the performance levels of the recipients using the nine indicators.....	20
13. Summary of the recipients’ performance levels using the nine indicators	21

Abbreviations

DRC	Democratic Republic of the Congo
FAO	Food and Agriculture Organization of the United Nations
GFOI	Global Forest Observation Initiative
GOFC–GOLD	Global Observation of Forest and Land Cover Dynamics
MRV	measurement, reporting, and verification
NFMS	national forest monitoring system
REDD+	reducing emissions from deforestation and forest degradation
SAR	synthetic aperture radar
UNFCCC	United Nations Framework Convention on Climate Change
WWF	World Wildlife Fund

Assessment of Capacity-Building Activities for Forest Measurement, Reporting, and Verification, 2011–15

By Elitsa I. Peneva-Reed¹ and Erika J. Romijn²

Executive Summary

This report was written as a collaborative effort between the U.S. Geological Survey, SilvaCarbon, and Wageningen University & Research with funding provided by the U.S. Agency for International Development and the European Space Agency, respectively.

The goal of this report was to assess and evaluate capacity-building activities delivered by international providers to support countries in building measurement, reporting, and verification systems for reducing emissions from deforestation and forest degradation during 2011–15 (the study period) and to determine how to coordinate future capacity-building activities among providers and recipients more effectively.

Summarizing capacity-building activities and outcomes across multiple providers was challenging. Many of the providers did not have information readily available, which precluded many of them from participating in this study despite the usefulness of their information. The information in this report suggests that systematic, annual delivery of activities leads to a plausible association with the effectiveness of the capacity-building efforts. The proposed future actions identified as a result of this study are listed below:

- *Proposed future action 1.*—Capacity-building providers could establish a central repository within the Global Forestry Observation Initiative where data from past, current, and future activities of all capacity-building providers could be stored. If the repository was designed to be iterative (for example, if it allowed for editing at regular time steps), then new lessons learned could be captured and added continually to keep the repository relevant.
- *Proposed future action 2.*—Capacity-building providers could collaboratively assist with organizing regional networking activities to enhance data and knowledge sharing among the recipients.

- *Proposed future action 3.*—Capacity-building providers could identify experts to work on a one-on-one basis with the recipients as followup activities.
- *Proposed future action 4.*—Capacity-building providers could work collaboratively with the recipients to identify needs, level of expertise, and timing for delivering targeted activities, which could be included in a 5-year work plan.
- *Proposed future action 5.*—Capacity-building providers could start a detailed study to determine what is preventing any identified lack of progress within the indicators.
- *Proposed future action 6.*—Annual capacity-building activities could be continued to achieve the set goals.

For this report, a set of capacity-building activities was analyzed to determine which activities were working well in increasing the measurement, reporting, and verification (MRV) capacity of the recipient countries and which activities were not meeting their intended goals. Data from the following datasets were used to analyze the activities:

- Data from a report on the Global Forestry Observation Initiative and SilvaCarbon Capacity-Building Summit held in Armenia, Colombia, in September 2014.
- Survey data collected from three capacity-building providers: Food and Agriculture Organization of the United Nations, SilvaCarbon, and World Wildlife Fund.
- Survey data collected from four capacity-building recipients: Colombia, Democratic Republic of the Congo, Peru, and Republic of the Philippines.

Introduction

This report was written as a collaborative effort between the U.S. Geological Survey, SilvaCarbon, and Wageningen University with funding provided by the U.S. Agency for International Development and the European Space Agency, respectively, to address a pressing need for enhanced

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2 Assessment of Capacity-Building Activities for Forest Measurement, Reporting, and Verification, 2011–15

result-based monitoring and evaluation of delivered capacity-building activities (Kusek and Rist, 2004). For this report, the capacity-building activities delivered by capacity-building providers (referred to as “providers” hereafter) during 2011–15 (the study period) to support countries in building measurement, reporting, and verification (MRV) systems for reducing emissions from deforestation and forest degradation (REDD+) were assessed and evaluated.

Summarizing capacity-building activities and outcomes across multiple providers was challenging. Many of the providers did not have information readily available, which precluded them from participating in this study despite the usefulness of their information. This issue led to a key proposed future action: Capacity-building providers could establish a central repository within the Global Forestry Observation Initiative (GFOI; <http://www.gfoi.org/>) where data from past, current, and future activities of all capacity-building providers could be stored. The repository could be maintained in a manner to continually learn from previous lessons.

Although various providers monitored and evaluated the success of their capacity-building activities, such evaluations only assessed the success of immediate outcomes and not the overarching outcomes and impacts of activities implemented by multiple providers. Good monitoring and evaluation should continuously monitor and periodically evaluate all factors affecting the outcomes of a provided capacity-building activity.

The absence of a methodology to produce quantitative evidence of a causal link between multiple capacity-building activities delivered and successful outcomes left only a plausible association (Mercado, 2012). James (2001) argued that plausible association, although not a precise measurement of cause and effect, was a realistic tool. Our review of the available literature on this subject did not find another similar assessment to assess capacity-building activities for supporting the countries in building MRV system for REDD+.

Four countries from the main forested regions of Africa, the Americas, and Asia were chosen as subjects for this report based on the length of time SilvaCarbon and other providers have provided capacity-building activities toward MRV system for REDD+: Colombia (the Americas), the Democratic Republic of the Congo (DRC; Africa), Peru (the Americas), and the Republic of the Philippines (referred to as “the Philippines” hereafter; Asia).

Several providers were contacted for information to include in this report, but, because of various constraints, only SilvaCarbon, the Food and Agriculture Organization of the United Nations (FAO), and the World Wildlife Fund (WWF) participated in this study. These three providers supported various targeted capacity-building activities throughout Africa, the Americas, and Asia, including the following: technical workshops at national and regional levels (referred to as “workshops” hereafter), hands on training, study tours, technical details by experts, technical consultation between providers and recipients, sponsorship for travel, organizing network meetings, developing sampling protocols, assessing

deforestation and degradation drivers, estimating carbon stock and flow, designing monitoring systems for multiple uses, promoting public-private partnerships to scale up investments on MRV system for REDD+, and assisting with the design of national forest monitoring systems, as illustrated in figure 1.

Their activities were planned in coordination with key partners in each country and region and with the support and assistance of other providers. Note that several other organizations and institutions assisted the providers to deliver capacity-building activities, including Boston University, Conservation International, Stanford University, University of Maryland, and Wageningen University & Research.

Datasets

The primary input data into this report came from three sources: a report from the GFOI and SilvaCarbon Capacity-Building Summit held in Armenia, Colombia, in September 2014 (referred to as the “summit report” hereafter; SilvaCarbon, 2014), survey data collected from the three participating providers, and survey data from the four capacity-building recipients (referred to as “recipients” hereafter). The surveys were used to evaluate existing capacity-building activities, to encourage more effective international cooperation, and to stimulate improvement of future training activities.

Nine indicators were used to assess the capacity-building activities delivered to the recipient countries (Colombia, DRC, Peru, and the Philippines) to develop and enhance their MRV capabilities by the three providers (SilvaCarbon, FAO, and WWF) during 2011–15 (the study period). The nine indicators were adapted from the Global Observation of Forest and Land Cover Dynamics (GOF-C-GOLD; 2016) and the three indicators used by Romijn and others (2015). Using indicators allowed us to assess whether a capacity-building activity was being implemented as planned; if it was leading to improvements; and whether it was necessary to adjust the delivered activities to achieve the set goals (U.S. Agency for International Development, 2015; Parson and others, 2013; World Health Organization, 2011). The nine indicators are as follows:

- Establish a national forest monitoring system (NFMS) driven by the United Nations Framework Convention on Climate Change (UNFCCC) guidance.
- Create a national forest inventory.
- Estimate annual forest area change.
- Assess drivers of forest area change.
- Estimate changes in carbon stock for all forest types.
- Perform accuracy assessment and validation of maps.
- Use community-based approaches for national REDD+ monitoring.

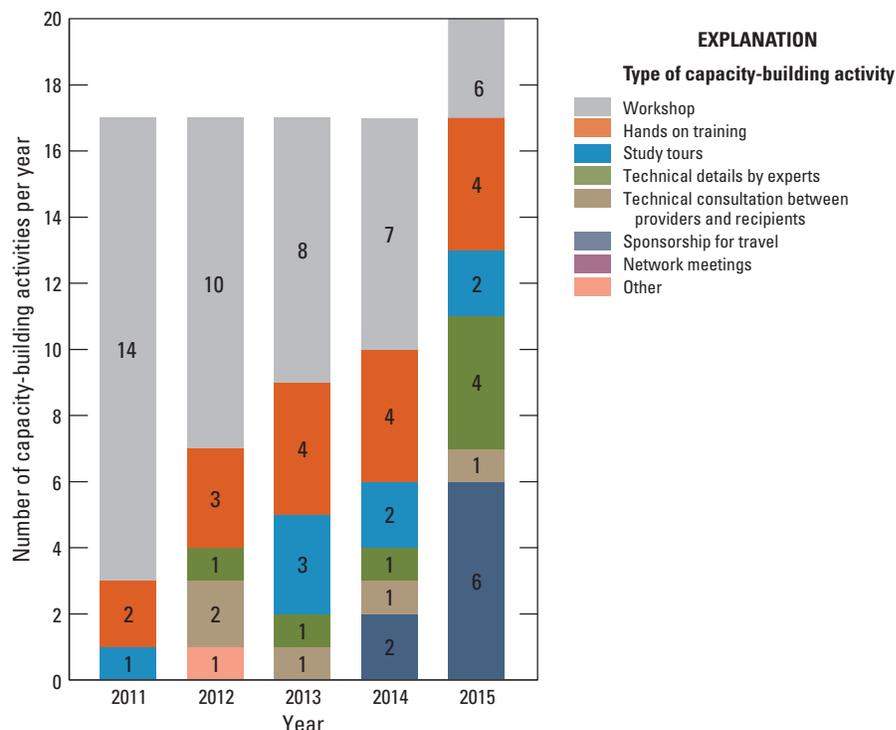


Figure 1. Total number of capacity-building activities per type per year including the three providers for the four recipient countries.

- Evolve technologies and software tools for forest mapping and monitoring.
- Report (deliver results) to stakeholders in the form of technical publications, peer-reviewed articles, and reports such as the National Communications and the Biennial Update reports submitted to the UNFCCC (referred to as “report” hereafter).

For each of the four countries, data were assembled for the nine indicators using information provided by the three providers and the four recipients. In addition, data from the summit report were used (SilvaCarbon, 2014). Learned lessons discussed in the summit report were derived from the experiences shared by the nine countries participating in the summit (Bangladesh, Cambodia, Colombia, Ecuador, Lao People’s Democratic Republic [Laos], Mexico, Nepal, Peru, and Vietnam) as recipients of capacity-building activities delivered to support their efforts in building MRV system for REDD+ during 2011–14.

Data Summarized from the Global Forest Observation Initiative and SilvaCarbon Capacity-Building Summit, September 2014

In September 2014, GFOI and SilvaCarbon organized a weeklong capacity-building workshop in Armenia, Colombia, that focused on exchanging MRV experiences among GFOI countries. The participating countries had the opportunity

to provide a critical analysis of the different methodologies they had adopted throughout the years and knowledge gained through different capacity-building programs. The outcomes highlighted the advantages and disadvantages of different methodologies, facilitating the evaluation of the practicality and effectiveness of the capacity-building activities for beginning, enhancing, and eventually establishing MRV system in each country.

The most- and least-effective capacity-building efforts identified by the participating countries were summarized and organized in a table. Lessons learned were derived from the summit report (SilvaCarbon, 2014), and the findings are summarized in table 1.

Data Collected from the Capacity-Building Providers

Nine indicators were used to assess the capacity-building activities that providers delivered to the recipients in this report. The nine indicators were adapted from the list compiled by GOFC–GOLD (2016) and supplemented with indicators that were developed and assessed by Romijn and others (2015). The resulting table of indicators was sent to the three providers who were asked to provide information about Colombia, the DRC, Peru, and the Philippines for 2011–15 (appendix table 1.1). WWF and SilvaCarbon completed the tables, and FAO provided links to online reports used by the authors to complete the survey table.

4 Assessment of Capacity-Building Activities for Forest Measurement, Reporting, and Verification, 2011–15

Table 1. Most- and least-effective capacity-building efforts as described in the summit report (SilvaCarbon, 2014)

Most-effective capacity-building efforts	Least-effective capacity-building efforts
<ul style="list-style-type: none"> • Long-term commitments of the providers to the recipient. • Regional approaches to capacity-building efforts. • Continuous involvement between the recipient and the providers to better understand the needs of the recipient. • Assisting collaboration and data sharing among recipients. • Assisting in establishing close working relationships between technical and practical staff. • Capacity-building activities organized with needs of a specific recipient in mind. • Technical visits by experts (because it allows the experts in the recipient country to ask specific, targeted questions). • Activities organized as a collaborative effort among the various providers. • Followup activities between the providers and recipients. • One-on-one time between recipient technicians and international experts. • Assistance in technical training for policymakers. 	<ul style="list-style-type: none"> • Capacity-building efforts when the priorities of the providers get in the way. • The providers do not collaborate in organizing the activities. • Providers that bring their own programs and packages without considering the specific needs of the recipient. • Activities that are not tailored to the specific technical level of the recipient. • When the international cooperation expectations are too high. • When the activities are too broad, general in nature (for example, workshop on general measurement, reporting, and verification). • Untimely or premature scheduling based on the priorities of the providers and not the needs of the recipient. • Inability of the providers to improve the chances that the “right” people are selected to attend the specific activities (for example, the need to have the necessary skills to fully benefit from the capacity-building activities). • Not incorporating feedback from past capacity-building activities into future ones.

Data Collected from the Recipients

To provide an estimate of the level of progress based on the nine indicators, survey questionnaires were sent to the recipients to complete. The data collected from each of the recipients on the status of the nine indicators are summarized in table 2.

Methods

A survey questionnaire (appendix table 1.1) was sent to the providers to document the details, outcomes, and impacts of their capacity-building activities from 2011 to 2015 (the study period). The effect of the activities was difficult to quantify directly, so results were converted into a group of nine indicators. The information presented in appendix table 1.2 serves as a structure for the report such that each indicator uses a specific approach and set of measurements (either qualitative or quantitative) to provide an evaluation of the capacity-building activities delivered to the countries.

The number and type of activities per year delivered by the providers for the four countries during the study period are provided in figure 1. Data for 2015 were based only on SilvaCarbon activities because information from the other two providers was not provided.

The total number of capacity-building activities during the study period increased, though not continuously, from a total of 17 in 2011 to 23 in 2015. The number of workshops delivered to the 4 countries during the study period decreased from 14 to 6; however, workshops were still a main type of capacity-building activity. At the same time, the number of hands on training continually increased from 2 to 4. Sponsorship for travel also increased, following a logical path of providing more specialized hands on training compared to the more general nature of the workshops needed at the beginning. The technical consultations between providers and recipients were disproportionately less than the workshops provided throughout the study period. Network meetings were not emphasized because none of the capacity-building activities delivered during the study period addressed that indicator.

The number of capacity-building activities within each year is illustrated in figure 2. Data for 2015 were based on SilvaCarbon activities only because information from the other two providers was not available at the time of data collection.

The total number of activities within each indicator per year may differ from the total number if all activities are summed for the four countries per activity. For example, in 2011, the total number of capacity-building activities was 23. Because one activity was provided to more than one country during an event, the activity was counted as one for each country that participated. Thus, in 2011, Colombia received

11 activities; the DRC received 12; Peru received 11; and the Philippines received 3, which sums up to 37 and not 23.

The average number of capacity-building activities delivered during the study period was 19.6 per year. In 2011, the most common indicator addressed was establish a NFMS driven by UNFCCC guidance with a total of 12 activities delivered to the 4 countries, progressively reducing to 2 per year in 2015 (a logical progression of the MRV process). The second most common indicator addressed was estimate annual forest area change with a total of five activities in 2011.

The two indicators: perform accuracy assessment and validation of maps and estimate changes in carbon stock for all forest types were addressed in 4 of the 5 years. During the study period, the two indicators for the use community-based approaches for national REDD+ monitoring and report were addressed in capacity-building activities but at a low emphasis, averaging 1.4 activities per year for both. During the study period, no capacity-building activities addressed the indicator related to the assess drivers of forest area change. There was more emphasis placed on the indicator for evolve technologies and software tools for forest mapping and monitoring with a total of 19 activities. This indicator was addressed throughout the study period with the greatest emphasis occurring in 2015 with seven capacity-building activities organized and delivered by SilvaCarbon. Although the pattern observed indicated a commitment of the providers to introduce the countries to various technologies and software available, the countries themselves found it overwhelming to select and implement the best technologies for their specific conditions. A specific pattern in the distribution of capacity-building activities was not observed (fig. 1), possibly because of the lack of a long-term work plan developed by the providers with input from the participating countries.

Information collected from each of the four countries is listed and the status of the nine indicators is described in appendix table 1.3. The evaluation was focused on establishing a plausible association between capacity-building activities and outcomes, and the long-term effect partially adopted from the evaluation model of Kirkpatrick (1968). Although the information gathered to evaluate the satisfaction of the recipients was not a direct measure of the extent and quality of what they learned, the information served as a background for understanding the satisfaction of the recipients. Such an evaluation provided valuable feedback about important attributes of the capacity-building activities (for example, length of the activity, use of appropriate materials [computers, fieldwork, and timing of the activity], and the priorities of the providers).

Measuring how much the recipients learned as a result of one or several related capacity-building activities required evaluating knowledge before and after the activity. This information was challenging to acquire after the fact but could have been relatively easy had it been properly planned beforehand. An approach to gather such knowledge is proposed as an action in this document. The providers could use data gathered about the specific participants in an activity and trace the participation of recipients in subsequent workshops or other

forms of activities, which would require knowledge from the previous activities. Even though it is not a direct measure, it would provide a qualitative assessment of the knowledge gained and could be used as a plausible association. A proposed future action would be for providers to set aside a modest percentage of workshop funds (about 5 percent) and use those funds to support a data collection activity and data repository for evaluation of the effectiveness of activities. The repository could be housed at GFOI.

Findings and Discussion

Based on evaluating the nine indicators for plausible associations with the effectiveness of the capacity-building efforts, major findings were linked back to the lessons learned from the summit report, and a set of lessons learned was prepared for this report. The results were summarized by range and central tendencies of responses to describe the effort put into each of the activities. For these charts, the time of an activity was divided equally if more than one activity type was provided at an event; for example, if there was a workshop and hands on training for 10 days, 5 days were assigned to the workshop and 5 days were assigned to hands on training.

The charts in figure 3 represent the average, minimum, and maximum days spent on each capacity-building activity from 2011 to 2015 (the study period). Workshops had the largest number of days allocated, followed by hands on training, whereas most of the other capacity-building activities ranged from 1 to 3 days. Sponsorship for travel fluctuated with no such activity provided between 2011 and 2013 to an average of 6 days (in 2014) and an average of 4.7 days (in 2015). Technical consultation between providers and recipients varied from 1 to 3 days.

Based on the most- and least-effective capacity-building efforts identified by the participating countries (table 1) and depicted in the capacity-building summit report (SilvaCarbon, 2014), constructive criticism was gathered and lessons learned were identified (table 3).

Colombia

The following charts and tables describe the progress toward building MRV system for REDD+ reported by Colombia. The number of capacity building activities per year with each indicator delivered to Colombia from 2011 to 2015 are summarized in figure 4.

The status and progress of the nine indicators for Colombia during the study period are summarized in tables 4 and 5. Out of the nine indicators, Colombia made progress on three indicators and achieved its goals on the rest.

Establish a NFMS driven by UNFCCC guidance.— Colombia had the institutional NFMS structure in place in 2011 and had a fully functional NFMS in 2015. The country moved beyond analyzing only deforestation and actively

Table 2. Progress status of the nine indicators for the recipient countries in 2011 and 2015.

[Data are from the recipient countries unless otherwise noted. Indicators are described in appendix table 1.3. Numbers indicate status: 0=low, 1=limited, 2=intermediate, and 3=good. NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; REDD+, reducing emissions from deforestation and forest degradation]

Country	Indicators																													
	Establish a NFMS driven by UNFCCC guidance			Create a national forest inventory			Estimate annual forest area change			Assess drivers of forest area change			Estimate changes in carbon stock for all forest types			Perform accuracy assessment and validation of maps			Use community-based approaches for national REDD+ monitoring			Evolve technologies and software tools for forest mapping and monitoring			Report					
	2011	2015	2011	2015	2011	2015	2011	2015	2011	2015	2011	2015	2011	2015	2011	2015	2011	2015	2011	2015	2011	2015	2011	2015	2011	2015	2011	2015		
Colombia	2	3	1 ^a	3 ^a	3 ^a	3 ^a	3 ^a	3 ^a	3 ^a	2	2	2	2	2	3	3	0	3	3	0	2	2	2	2	2	2	1	2	1	3
Democratic Republic of the Congo	1	2	2 ^a	2 ^a	3 ^a	3 ^a	3 ^a	3 ^a	3 ^a	2	2	2	2	2	2	2	1	2	2	1	2	2	2	2	2	2	1	2	1	1
Peru	0	1	0	2	1	2	2	0	2	2	0	2	2	0	2	2	0	2	2	0	2	2	1	2	2	1	2	0	3	
Republic of the Philippines	1	2	3 ^a	3 ^a	3 ^a	3 ^a	3 ^a	3 ^a	3 ^a	1	2	1	2	1	2	2	1	2	2	2	2	2	1	2	2	1	2	1	1	

^aData from Romijn and others (2015). Categories “good +” and “very good ++” were grouped into one category “good” for the purpose of this report

Table 3. Constructive criticism and lessons learned from the summit report (SilvaCarbon, 2014).

Constructive criticism	Lesson learned
<p>Capacity-building efforts are less effective when:</p> <ul style="list-style-type: none"> • The providers bring their own programs and packages without considering the specific needs of the recipient. • The activities are not tailored to the specific technical level of the recipient. • The international cooperation expectations are too high. 	<p>The providers could work collaboratively towards establishing long-term commitments to the recipient in the form of a medium-term work plan (for example 5 years) developed with input from the recipient and considering the goals and needs and of the recipient and their internal commitments to the process.</p>
<p>The recipients unanimously identified that regional collaboration would be a valuable asset to the process of delivering capacity-building activities.</p>	<p>The providers could collaboratively assist with organizing regional activities to enhance the data and knowledge sharing among the recipients.</p>
<p>Policy makers, though an important factor in assisting with measurement, reporting, and verification and national forest monitoring system implementation processes, are not included in the capacity-building work plans developed by the providers.</p>	<p>The providers could work collaboratively with the recipient to identify practices for delivering training to policy personnel and identifying ways of keeping them engaged in the scientific work and, thus, encouraging the needed support.</p>
<p>Followup activities between the providers and the recipients that have received training are needed.</p>	<p>The providers could identify experts to work on a one-on-one basis with the recipients as followup activities and, ideally, such an approach would be included in the medium-term (for example 5-year) work plan.</p>
<p>The lack of incorporating feedback from past capacity-building activities is reducing effectiveness and productivity.</p>	<p>The providers could gather and summarize agreed to and standardized feedback from past and current capacity-building activities and make it available through the proposed central repository within the Global Forestry Observation Initiative.</p>

researched approaches to incorporate degradation within its NFMS. This is a good example of capacity-building support achieving a fully functional monitoring system and even going beyond. In Colombia, all the capacity-building activities addressing this indicator were delivered in a timely manner with the proper emphasis on the amount of activities delivered to improve the chances of establishing a NFMS (fig. 4; table 4).

Create a national forest inventory.—Colombia had one forest inventory (external) in 2011, and had multiple inventories and produced annual forest change maps at a regional level by 2015. The three providers did not deliver capacity-building activities addressing this indicator during the study period (fig. 4); nevertheless, Colombia advanced toward and achieved establishing a national forest inventory (table 4).

Estimate annual forest area change.—Colombia made progress toward estimating annual forest area change in 2011, and achieved the goal of having maps of forest area change going back to the 1980s with figures for forest area cover and deforested areas in 2015. Colombia's success lined up with the amount of activities delivered between 2011 and 2015 as a plausible association. At least one capacity-building activity was delivered per year during the study period, which leads to a plausible association with the effectiveness of the capacity-building activities.

Assess drivers of forest area change.—By 2011, Colombia had started assessing drivers of forest area change but had not yet published maps or reports identifying the drivers

for forest area change. In 2015, drivers for some of the forest area change were evaluated, and some published information was made available. Thus, during the study period, Colombia advanced toward assessing the drivers of forest area change but did not achieve that goal by 2015 (table 4). The three providers did not deliver capacity-building activities addressing this indicator during the study period (fig. 4).

Estimate changes in carbon stock for all forest types.—Based on the data provided by Colombia and the three providers, during the study period the country produced estimates of carbon stock changes for all forest types using specific allometric equations for all forest types (table 4). Between 2011 and 2013, six capacity-building activities addressed this indicator, but none addressed it in 2014–15 (fig. 4). All the activities provided to the country were delivered in a timely manner with the proper emphasis on the amount of activities delivered to improve the chances of achieving the goal of estimating changes in carbon stock using specific allometric equations (fig. 4; table 4).

Perform accuracy assessment and validation of maps.—In 2011, Colombia did not validate or assess the accuracy of the produced maps, whereas by 2015, all forest cover and forest change maps were assessed and validated by an independent source (table 4). The providers organized and delivered five capacity-building activities through the study period from 2011 to 2015 (fig. 4). Because the country achieved its goals by 2014, no further training was needed, and no capacity-building activities were delivered after 2014; this is

Table 4. Indicators depicting Colombia's progress toward building measurement, reporting, and verification systems for reducing emissions from deforestation and forest degradation.

[Indicators are described in appendix table 1.3. Numbers indicate status: 0=low, 1=limited, 2=intermediate, and 3=good. NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; REDD+, reducing emissions from deforestation and forest degradation]

		Indicators																	
Establish a NFMS driven by UNFCCC guidance	2011	2015	Create a national forest inventory		Estimate annual forest change		Assess drivers of forest area change		Estimate changes in carbon stock for all forest types		Perform accuracy assessment and validation of maps		Use community- based approaches for national REDD+ monitoring		Evolve technologies and software tools for forest mapping and monitoring		Report		
			2011	2015	2011	2015	2011	2015	2011	2015	2011	2015	2011	2015	2011	2015	2011	2015	
	2	3	1	3	3	3	1	2	2	2	3	0	3	0	2	1	2	1	3

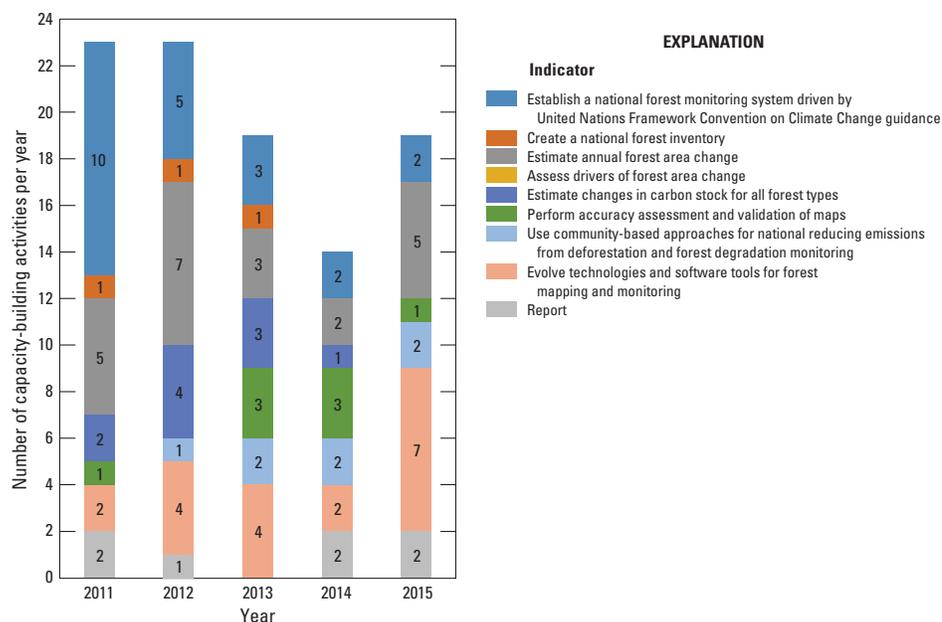


Figure 2. Number of capacity-building activities for each indicator for the four recipient countries.

an example of timely and focused delivery. Such success is evidence that the collaborative efforts between a country and its capacity-building community pays off, and the results affect the country's ability to achieve set goals and future deliverable products with high-accuracy, validated maps.

Use community-based approaches for national REDD+ monitoring.—In 2011, Colombia did not use any community-based approaches for national REDD+ monitoring (table 4). In 2015, some steps toward establishing community-based approaches for national REDD+ monitoring were started. Identification of deforestation hotspots was a key function of Colombia's NFMS. The success and effect of this indicator could be plausibly associated with the well-planned and executed capacity-building activities (fig. 4).

Evolve technologies and software tools for forest mapping and monitoring.—In 2011, Colombia was in the process of implementing some technologies and software (table 4). By 2015, various technologies and software products had been implemented; however, external funding and training were still needed. This outcome shows that progress was made with a frequent distribution of capacity-building activities delivered (fig. 4). Colombia identified that it still needed help to analyze synthetic aperture radar (SAR) and optical data time series to develop land cover change detection methodologies and to integrate remote sensing data with field data. This is a good example of how this report could be used to evaluate what has been done and to understand what is missing and how to deliver it in such a manner that the country could achieve the set goal of implementing technologies and software without requiring further external assistance.

Report.—In 2011, Colombia submitted its National Communications Report to the UNFCCC, but not their Biennial

Update Report (table 4). In 2015, both were submitted along with other reports. The country also established an online platform to share MRV maps and reports. The findings were communicated through conferences, meetings, technical publications, and peer-reviewed articles, which served as evidence that capacity-building activities were delivered and could be attributed to an accountable effect on the overall success of the process to support building MRV system for REDD+.

All indicators.—During the study period, Colombia made substantial progress toward building MRV system for REDD+ (table 5). Three of the nine indicators were evaluated as “progress” as of 2015; thus, the country still needed capacity-building assistance to achieve the set goals. Six of the nine indicators were evaluated as “goal achieved” based on systematic delivery of activities, which leads to a plausible association with their effectiveness.

Democratic Republic of the Congo

The following charts and tables describe DRC's progress toward building MRV system for REDD+. The type and number of capacity-building activities delivered to the DRC during the study period are summarized in figure 5. The status and progress of the nine indicators for the DRC during the study period are summarized in tables 6 and 7. Out of the nine indicators, the DRC made no progress for five, made substantial progress for three, and achieved its goals for one of the nine indicators, estimate annual forest area change, in 2011.

Establish a NFMS driven by UNFCCC guidance.—In 2011, the DRC started projects on a pilot basis and began expanding existing institutional structures to accommodate

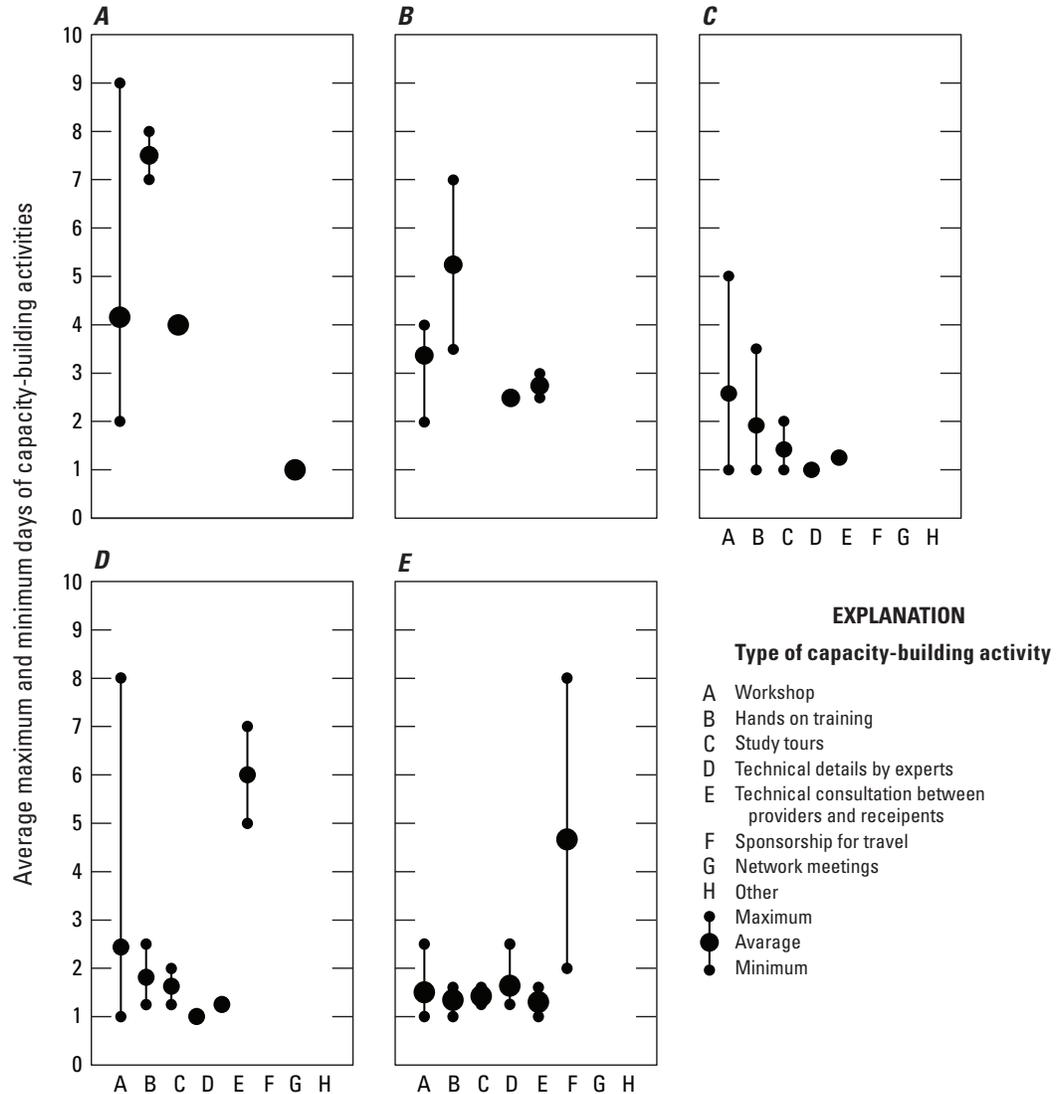


Figure 3. Average, minimum, and maximum number of days for each of the eight capacity-building activities.

MRV. By 2015, the country established a NFMS institutional structure and was in its final stages of approval (table 6). The DRC received nine capacity-building activities during the study period and was in the process of implementing its forest monitoring system while taking into account the UNFCCC guidelines. This is a good example of providing capacity-building support and securing a steady path toward a fully functional NFMS.

One possible explanation for not achieving a fully functional NFMS could be the lack of internal institutional and political will for such implementation. Policy makers, even though an important factor in assisting with MRV and NFMS implementation processes, were not included in the capacity-building work plans developed by the providers, as identified in the summit report.

Create a national forest inventory.—Based on the data sent by the DRC and the providers, the DRC had forest area change maps going back to the 1980s with figures for forest area cover and deforested areas before the study period (table 6). During the study period, the DRC did not advance toward establishing a fully functional national forest inventory beyond its level of 2011 (table 6). This lack of progress suggests that further capacity-building activities should take place to address this shortcoming. In 2015, the country had multiple subnational inventories, but it did not have a national-level national forest inventory. The DRC received only one capacity-building activity addressing this indicator during the study period in 2011. This outcome suggests that perhaps the activities focused on improving existing maps rather than developing the capacity to create forest change maps.

Table 5. Performance level of indicators in Colombia by 2015.

[Indicators are described in appendix table 1.3. NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; REDD+, reducing emissions from deforestation and forest degradation]

Indicators	Performance level
Establish a NFMS driven by UNFCCC guidance	Goal achieved.
Create a national forest inventory	Goal achieved.
Estimate annual forest area change	Goal achieved.
Assess drivers of forest area change	Progress.
Estimate changes in carbon stock for all forest types	Goal achieved.
Perform accuracy assessment and validation of maps	Goal achieved.
Use community-based approaches for national REDD+ monitoring	Progress.
Evolve technologies and software tools for forest mapping and monitoring	Progress.
Report	Goal achieved.

Estimate annual forest area change.—DRC made progress toward estimating annual forest area change in 2011, and achieved the goal of having maps of forest area change. DRC's success lined up with the amount of activities delivered between 2011 and 2015 as a plausible association. Three capacity-building activities were delivered in 2011, and one activity per year during the study period with an exception of 2013, which leads to a plausible association with the effectiveness of the capacity-building activities.

Assess drivers of forest area change.—In 2011, the DRC evaluated the drivers for some of the forest area change and published the results. The DRC did not receive any capacity-building activities addressing this indicator during the study period (fig. 5). A 5-year work plan may improve the chances of achieving this set goal.

Estimate changes in carbon stock for all forest types.—Based on data provided by the DRC and the three providers, by 2011 the DRC had produced estimates of carbon stock changes for all forest types (table 6). However, the DRC did not advance to the point of using specific allometric equations for all 16 forest types by 2015. For the study period, the DRC received one capacity-building activity in 2011 addressing this indicator but none thereafter.

Perform accuracy assessment and validation of maps.—In 2011, the DRC made progress toward assessing and validating forest cover and forest cover change maps by the institution that produced the maps, but no official results were available (table 6). In 2015, the country assessed and validated all DRC forest cover and forest cover-change maps by the institution that produced the maps, and results were made available. The providers organized and delivered two capacity-building activities addressing this indicator during the study period (fig. 5).

Use community-based approaches for national REDD+ monitoring.—In 2011, the DRC had a general understanding

that community-based approaches for national REDD+ monitoring were important (table 6). In 2015, some steps toward establishing community-based approaches for national REDD+ monitoring were started but were not yet part of the NFMS. The DRC received only one capacity-building activity addressing this indicator during the study period in 2014. Mai Ndombe Province is the area where REDD+ monitoring by the communities was advanced the greatest. The progress made could be plausibly associated with the executed capacity-building activities following the logical progression of activities identified by GOFCC–GOLD for building a NFMS.

Evolve technologies and software tools for forest mapping and monitoring.—In 2011, the DRC implemented various technologies and software products, but external assistance, both financial and through training, was still needed (table 6). The DRC received three capacity-building activities addressing this indicator during the study period (fig. 5); however, the DRC did not achieve its goal by 2015 (table 6). This is a good example of how this report could be used to evaluate what has been done and to understand what is missing and how to deliver the missing information in such a manner that the country could achieve the set goal of implementing technologies and software.

As identified in the summit report, capacity-building activities are less effective when they are not tailored to the specific technical level of the country or are too broad and general in their nature. This lesson learned could be used to help the DRC achieve its set goals. It is worth mentioning that, because of the capacity-building activities, the DRC's NFMS used open source software for forest monitoring.

Report.—During the study period, the DRC submitted its initial, second, and third National Communications Reports to the UNFCCC, but not their Biennial Update Report (table 6). The DRC received only one capacity-building activity addressing this indicator in 2015 (fig. 5), which cannot

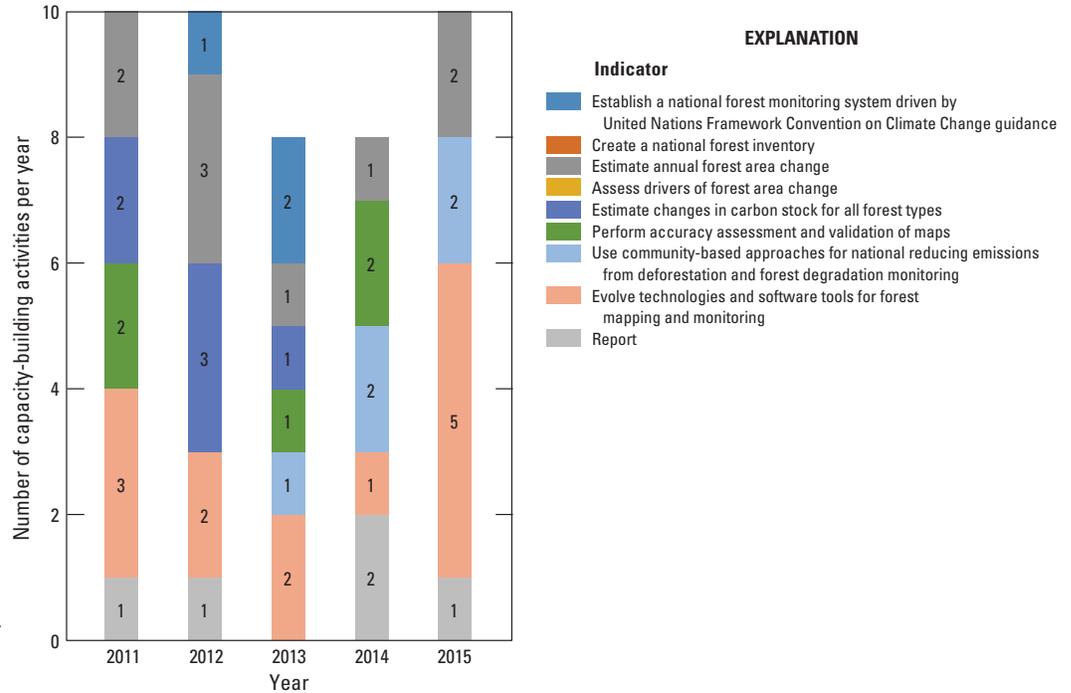


Figure 4 Number of capacity-building activities within each indicator by year delivered by the three providers for Colombia.

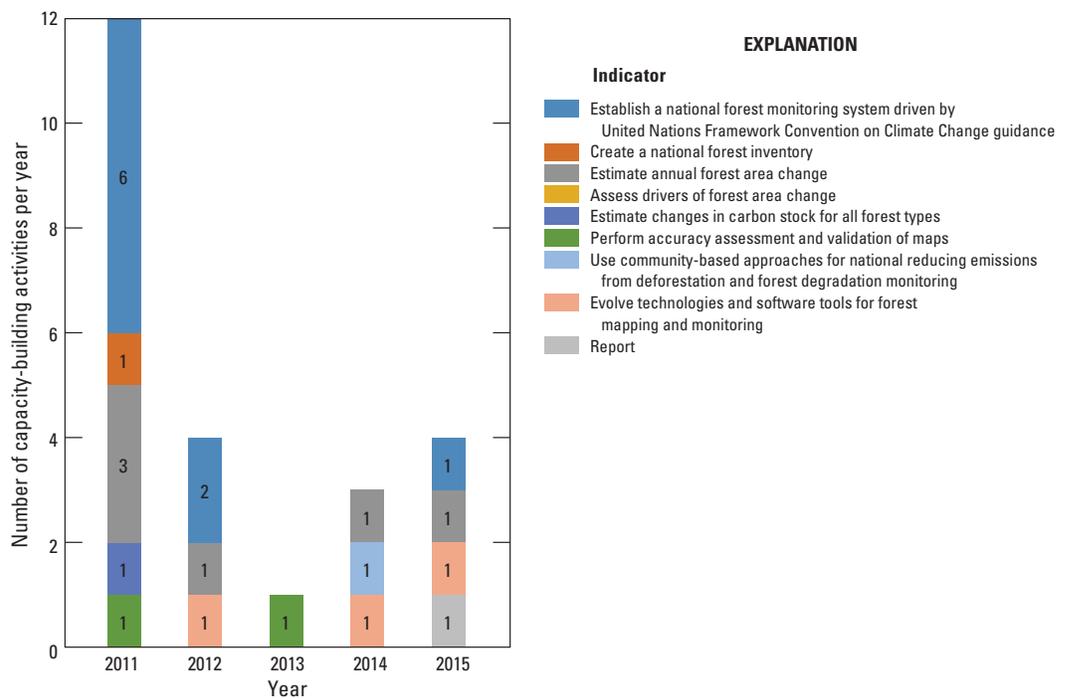


Figure 5. Number of capacity-building activities within each indicator by year delivered by the three providers for Democratic Republic of the Congo.

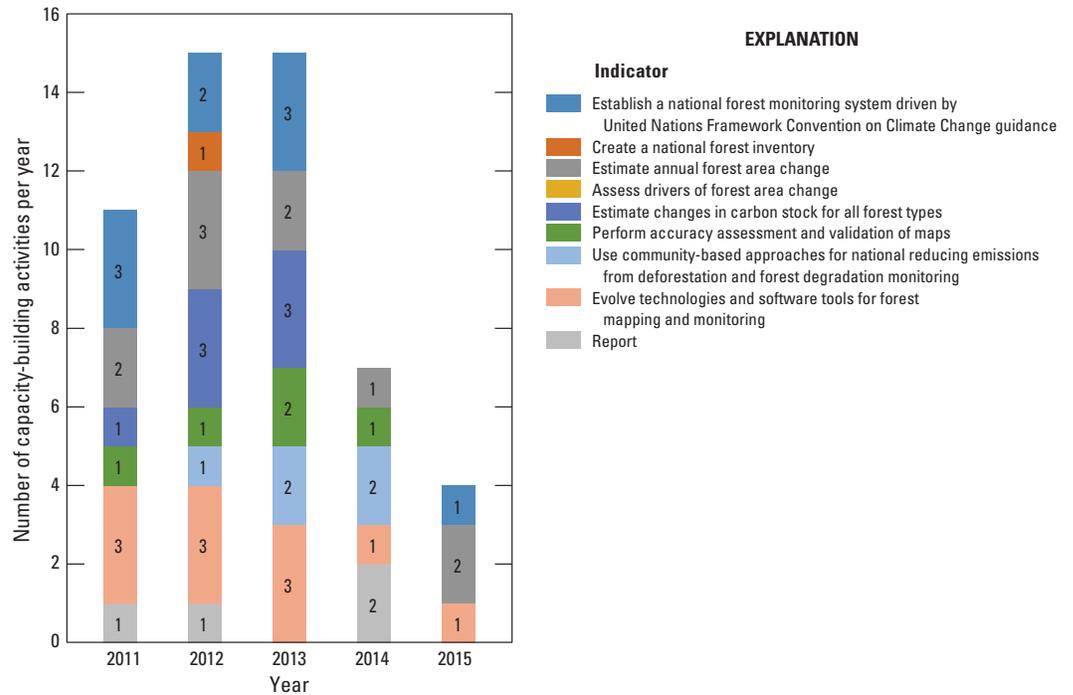


Figure 6. Number of capacity-building activities within each indicator by year delivered by the three capacity-building providers for Peru.

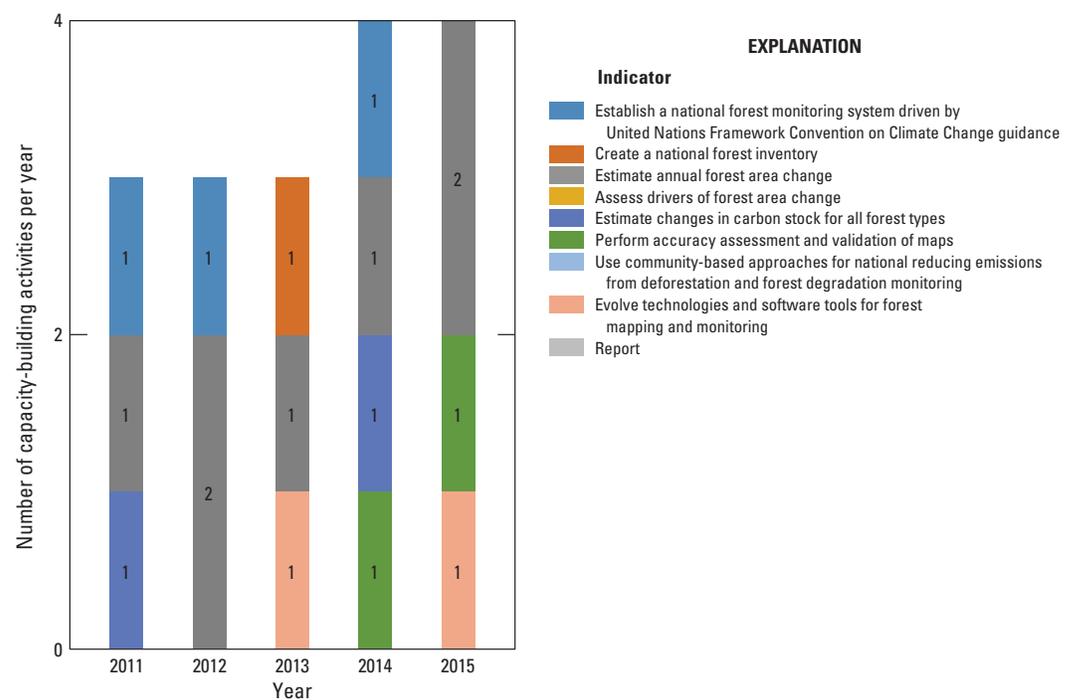


Figure 7. Number of capacity-building activities within each indicator by year delivered by the three capacity-building providers for the Republic of the Philippines.

Table 7. Performance level of indicators in the Democratic Republic of the Congo by 2015.

[Indicators are described in appendix table 1.3. NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; REDD+, reducing emissions from deforestation and forest degradation]

Indicators	Performance Level
Establish a NFMS driven by UNFCCC guidance	Progress.
Create a national forest inventory	No progress.
Estimate annual forest area change	Goal achieved.
Assess drivers of forest area change	No progress.
Estimate changes in carbon stock for all forest types	No progress.
Perform accuracy assessment and validation of maps	Progress.
Use community-based approaches for national REDD+ monitoring	Progress.
Evolve technologies and software tools for forest mapping and monitoring	No progress.
Report	No progress.

be attributed directly to the lack of collaboration. A 5-year study plan might have provided better planning and followup activities to improve the chances of achieving the set goal and understanding the needs and internal commitments of the DRC.

All indicators.—During the study period, the DRC made some progress toward building its MRV system for REDD+. Out of nine indicators used to measure its progress, five were evaluated as “no progress,” partly because the DRC had made progress before 2011 but had not achieved its set goals for some of the indicators by 2015 (table 5). Three of the nine indicators were evaluated as “progress” where the country still needed capacity-building assistance to achieve the set goals.

One of the nine indicators, estimate annual forest area change, was evaluated as “goal achieved.” Analysis of the findings revealed that providers delivered six activities during the study period even though the DRC indicated the goal was achieved, and therefore no more activities were needed in 2011. This discrepancy could be used as a starting point of a more detailed study to understand the circumstances in the DRC and the DRC’s input into the planning and delivery of the capacity-building activities.

Peru

The following charts and tables describe Peru’s progress toward building MRV system for REDD+. The type and number of capacity-building activities delivered to Peru during the study period are summarized in figure 6. The status and progress of the nine indicators for Peru during the study period are summarized in table 8, which indicates Peru made progress on eight of the indicators and achieved its goal on one of the listed indicators summarized in table 9.

Establish a NFMS driven by UNFCCC guidance.—In 2011, Peru did not have the institutional structure in place to

establish a NFMS (table 8). The country made some progress and was developing and expanding existing institutional structures to accommodate MRV by 2015. Peru received nine capacity-building activities addressing this indicator during the study period (fig. 6). The capacity-building activities provided to the country were delivered in a timely manner with a total of nine activities delivered during the study period (fig. 6; table 8); however, determining why the country did not make more substantial progress with the amount of capacity-building activities provided requires more detailed research.

Create a national forest inventory.—In 2011, Peru had no national forest inventory (table 8). By 2015, the country had multiple inventories but still did not have a national-level forest inventory, even though it produced annual forest change maps at a regional level. The three providers delivered only one capacity-building activity addressing this indicator during the study period. Peru advanced toward establishing a national forest inventory during the study period but did not achieve that goal by 2015 (fig. 6; table 8).

Estimate annual forest area change.—In 2011, Peru made progress toward estimating annual forest area change (table 8). By 2015, the country had produced annual forest area change estimates. The progress of the country lines up with the substantial number (10) of capacity-building activities delivered during the study period (fig. 6). Peru had at least one activity delivered per year during the study period, a fact that leads to a plausible association with the effectiveness of the capacity-building efforts.

Assess drivers of forest area change.—In 2011, Peru did not assess the drivers of forest area change (table 8). In 2015, Peru evaluated drivers for some of the forest area changes and made some published information available. None of the providers delivered capacity-building activities addressing this indicator during the study period (fig. 6). Peru advanced toward assessing the drivers of forest area change during the study period but did not achieved that goal by 2015 (table 8).

Table 8. Indicators depicting Peru’s progress toward building measurement, reporting, and verification systems for reducing emissions from deforestation and forest degradation.

[Indicators are described in appendix table 1.3. Numbers indicate status: 0=low, 1=limited, 2=intermediate, and 3=good. NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; REDD+, reducing emissions from deforestation and forest degradation]

Indicators																										
Establish a NFMS driven by UNFCCC guidance	2011	2015	Create a national forest inventory	2011	2015	Estimate annual forest area change	2011	2015	Assess drivers of forest area change	2011	2015	Estimate changes in carbon stock for all forest types	2011	2015	Perform accuracy assessment and validation of maps	2011	2015	Use community-based approaches for national REDD+ monitoring	2011	2015	Evolve technologies and software tools for forest mapping and monitoring	2011	2015	Report	2011	2015

Table 9. Performance level of indicators in Peru by 2015.

[Indicators are described in appendix table 1.3. NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; REDD+, reducing emissions from deforestation and forest degradation]

Indicators	Performance level
Establish a NFMS driven by UNFCCC guidance	Progress.
Create a national forest inventory	Progress.
Estimate annual forest area change	Progress.
Assess drivers of forest area change	Progress.
Estimate changes in carbon stock for all forest types	Progress.
Perform accuracy assessment and validation of maps	Progress.
Use community-based approaches for national REDD+ monitoring	Progress.
Evolve technologies and software tools for forest mapping and monitoring	Progress.
Report	Goal achieved.

One possible explanation of why no capacity-building activities were delivered during the study period could be that other providers were delivering the training; however, an answer cannot be attributed directly to the lack of collaboration.

Estimate changes in carbon stock for all forest types.—Based on the data provided by Peru and the three providers, the country produced estimates of carbon stock changes; however, Peru did not advance to using specific allometric equations for all forest types (table 8). Between 2011 and 2013, there were seven capacity-building activities focused on estimating changes in carbon stock, but none in 2014 or 2015 (fig. 6).

Perform accuracy assessment and validation of maps.—In 2011, Peru did not validate or assess the accuracy of the produced maps, whereas the institution that produced the maps assessed and validated all forest cover and forest change maps in 2015 (table 8). The providers organized and delivered five activities addressing this indicator during the study period from 2011 to 2014. The fact that the country made substantial progress is an example of timely and focused delivery only when certain assistance is needed. The collaborative efforts between Peru and the capacity-building community were determined to be successful because Peru progressed toward meeting their set goal.

Use community-based approaches for national REDD+ monitoring.—In 2011, Peru did not have any community-based approaches for national REDD+ monitoring, whereas some steps toward establishing community-based approaches for national REDD+ monitoring (such as the identification of hotspots) had been started by 2015 but were not yet part of the NFMS (table 8). Capacity-building activities addressing this indicator were delivered between 2012 and 2014: one in 2012 and two each in 2013 and 2014 (fig. 6). The progress made could be plausibly associated with the well-planned and executed activities.

Evolve technologies and software tools for forest mapping and monitoring.—In 2011, Peru was in the process of implementing some technologies and software (table 8). In 2015, various technologies and software products were implemented with external assistance, but Peru still needed funding and training. Progress was made with the numerous and frequently distributed capacity-building activities. Peru identified that it still needed assistance to run time series analysis, to develop land cover change detection methodologies, and to integrate remote sensing data with field data.

Report.—In 2011, Peru did not submit the National Communication or Biennial Update Reports to the UNFCCC, whereas both were submitted in 2015 along with other reports (table 8). Peru also established an online platform to share MRV maps and reports. Results were communicated through conferences, meetings, technical publications, and peer-reviewed articles, which served as evidence that capacity-building activities were delivered (fig. 6) and could be attributed to an accountable effect on the overall success of the process to support efforts in building MRV system for REDD+ in Peru (table 9).

All indicators.—During the study period, Peru made substantial progress toward building MRV system for REDD+ (table 9). Eight of the nine indicators were evaluated as “progress” as of 2015; thus, the country still needed capacity-building assistance to achieve the set goals. One of the nine indicators was evaluated as “goal achieved” based on systematic delivery of activities.

Republic of the Philippines

The following charts and tables describe the progress toward building MRV system for REDD+ reported by the Philippines. The type and number of capacity-building

Table 10. Indicators depicting the Philippines’ progress toward measurement, reporting, and verification systems for reducing emissions from deforestation and forest degradation.

[Indicators are described in appendix table 1.3. Numbers indicate status: 0=low, 1=limited, 2=intermediate, and 3=good. NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; REDD+, reducing emissions from deforestation and forest degradation

		Indicators																										
2011	2015	Establish a NFMS driven by UNFCCC guidance	2011	2015	Create a national forest inventory	2011	2015	Estimate annual forest area change	2011	2015	Assess drivers of forest area change	2011	2015	Estimate changes in carbon stock for all forest types	2011	2015	Perform accuracy assessment and validation of maps	2011	2015	Use community-based approaches for national REDD+ monitoring	2011	2015	Evolve technologies and software tools for forest mapping and monitoring	2011	2015	Report		
																											2011	2015
1	2		3	3		3	3		1	2		1	2		1	2		2	2		1	2		1	2		1	1

Table 11. Performance level of indicators in the Republic of the Philippines by 2015.

[Indicators are described in appendix table 1.3. NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; REDD+, reducing emissions from deforestation and forest degradation]

Indicators	Performance level
Establish a NFMS driven by UNFCCC guidance	Progress.
Create a national forest inventory	Goal achieved.
Estimate annual forest area change	Goal achieved.
Assess drivers of forest area change	Progress.
Estimate changes in carbon stock for all forest types	Progress.
Perform accuracy assessment and validation of maps	No progress.
Use community-based approaches for national REDD+ monitoring	Progress.
Evolve technologies and software tools for forest mapping and monitoring	Progress.
Report	No progress.

activities for the Philippines from 2011 to 2015 are summarized in figure 7 and tables 10 and 11.

Based on the data provided by the Philippines, no progress was made for two of the nine indicators, progress was made for five of the nine indicators, and the goal was achieved for two of the nine indicators (table 11).

Establish a NFMS driven by UNFCCC guidance.—In 2011, the Philippines started projects on a pilot basis and expanded existing institutional structures to accommodate MRV (table 10). The Philippines established an institutional structure and was in its final stages of approval in 2015. The Philippines received three capacity-building activities addressing this indicator during the study period (fig. 7). As of 2015, the Philippines was in the process of implementing a NFMS while taking into account the UNFCCC guidelines. This is a good example of providing capacity-building support and securing a steady path toward a fully functional NFMS.

Create a national forest inventory.—The Philippines had developed multiple forest inventories on a national level before the study period (table 10). Between 2011 and 2015, one capacity-building activity addressed this indicator (fig. 7). This outcome, where the country achieved its goal before 2011 and the providers delivered only one capacity-building activity during the study period, is a good example of providing timely and focused support.

Estimate annual forest area change.—Based on the data provided by the Philippines and the three providers, before the study period the Philippines produced forest area-change maps going back to the 1980s with estimates for forest area cover and deforested areas (table 10). During the study period, seven capacity-building activities addressed this indicator (fig. 7).

Assess drivers of forest area change.—In 2011, the Philippines put forth efforts but did not publish maps or reports identifying the drivers for forest area change (table 10). Drivers for some of the forest area change were evaluated, and

some published information was available by 2015. The three providers did not deliver capacity-building activities addressing this indicator during the study period (fig. 7). The Philippines advanced toward assessing the drivers of forest area change but did not achieve that goal by 2015 (table 10).

Estimate changes in carbon stock for all forest types.—Based on data provided by the Philippines and the three providers, the Philippines made progress during the study period, moving from a tier 1 approach (in 2011) where general estimates of carbon stock existed to a tier 2 approach (in 2015) where estimates of carbon stock changes existed for all types but without using specific allometric equations for each forest type (table 10). During the study period, only two capacity-building activities addressed this indicator (fig. 7).

Perform accuracy assessment and validation of maps.—In 2011, the Philippines produced and assessed forest cover and forest cover change, and the institution that produced the maps validated them (table 10). But the Philippines did not achieve their goal of having their maps validated by an external source by 2015. The providers organized and delivered two capacity-building activities addressing this indicator during the study period (fig. 7).

Use community-based approaches for national REDD+ monitoring.—In 2011, the Philippines generally understood that community-based approaches for national REDD+ monitoring were important; some steps toward establishing community-based approaches for national REDD+ monitoring were started in 2015 but were not part of the NFMS (table 10). The Philippines did not receive capacity-building activities addressing this indicator during the study period (fig. 7). The progress made could be plausibly associated with the executed activities following the GOFCC–GOLD recommendations for building a NFMS for REDD+.

Evolve technologies and software tools for forest mapping and monitoring.—In 2011, the Philippines were in the

Table 12. Summary of the performance levels of the recipients using the nine indicators.

[Indicators are described in appendix table 1.3. NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; REDD+, reducing emissions from deforestation and forest degradation]

Indicators	Number of activities per performance level		
	No progress	Progress	Goal achieved
Establish a NFMS driven by UNFCCC guidance	0	3	1
Create a national forest inventory	1	1	2
Estimate annual forest area change	NA	1	3
Assess drivers of forest area change	1	3	NA
Estimate changes in carbon stock for all forest types	1	2	1
Perform accuracy assessment and validation of maps	1	2	1
Use community-based approaches for national REDD+ monitoring	0	4	0
Evolve technologies and software tools for forest mapping and monitoring	1	3	0
Report	2	0	2
Total	7	19	10
Percentage of total possible (36)	19.4	52.7	27.7

process of implementing some technologies and software, whereas various technologies and software products were implemented by 2015 with external assistance still needed for funding and training (table 10). The Philippines identified that they still needed help to run time series analysis among other technologies.

Report.—During the study period, the Philippines submitted its initial, second and third National Communications Reports to the UNFCCC but not their Biennial Update Reports (table 10). The Philippines did not receive any capacity-building activities addressing this indicator during the study period (fig. 7).

All indicators.—During the study period, the Philippines made some progress toward building MRV system for REDD+ (table 11). Out of nine indicators used to measure its progress, two indicators (perform accuracy assessment and validation of maps and report) were evaluated as “no progress” because progress for those indicators was made before 2011; however, the Philippines did not achieve its set goals by 2015 for either of those two indicators. Five of the nine indicators were evaluated as “progress” where the country still needed capacity-building assistance to achieve the set goals. Two of the nine indicators (create a national forest inventory and estimate annual forest area change) were evaluated as “goal achieved,” even though they were achieved before 2011.

Conclusions and Future Actions

The progress of four recipient countries was evaluated using nine indicators and organized into performance levels: no progress, progress, and goal achieved. The maximum score within any category was 36, where all four recipient countries made a certain level of progress; for example, if all countries achieved their set goal for all nine indicators, then the total score would be 36 (100 percent achieved). Results for all four countries combined indicate that no progress was made 7 times (19.4 percent), progress was made 19 times (52.7 percent), and the goal was achieved 10 times (27.7 percent).

Progress was made or the goal was achieved for 29 out of the possible 36 indicators (80.5 percent) of capacity building, providing evidence that most of the capacity-building activities were effective. The progress evaluations and performance levels of the four countries for each of the nine indicators are provided in tables 12 and 13.

Successful methods included capacity-building approaches that assisted with organizing regional activities, such as regional workshops, combined with technical visits by experts to facilitate such collaborations. This approach was most effective when accompanied by followup visits by scientists to enhance data and knowledge sharing among

Table 13. Summary of the recipients' performance levels using the nine indicators.

[Indicators are described in appendix table 1.3. NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; GA, goal achieved; P, progress; NP, no progress; REDD+, reducing emissions from deforestation and forest degradation]

Indicators	Performance level of indicator			
	Colombia	Democratic Republic of the Congo	Peru	Republic of the Philippines
Establish a NFMS driven by UNFCCC guidance	GA	P	P	P
Create a national forest inventory	GA	NP	P	GA ¹
Estimate annual forest area change	GA ¹	GA ¹	P	GA ¹
Assess drivers of forest area change	P	NP	P	P
Estimate changes in carbon stock for all forest types	GA	NP	P	P
Perform accuracy assessment and validation of maps	GA	P	P	NP
Use community-based approaches for national REDD+ monitoring	P	P	P	P
Evolve technologies and software tools for forest mapping and monitoring	P	NP	P	P
Report	GA	NP	GA	NP

¹Goal reported as achieved in 2011.

the recipients. Success also was achieved when subsequent interactions between the providers and the specific people trained were organized. Capacity-building approaches where the providers brought their own programs and packages without considering the country-specific needs and where the activities were not tailored to the specific technical level of the country were less successful. Capacity-building activities that were broad and general in their nature were less effective than specific ones. To help increase the effectiveness of capacity-building activities, policy makers could be included in the capacity-building work plans developed by providers because they are an important factor in assisting with MRV and NFMS implementation processes.

An analysis of capacity-building providers and their links to lessons learned from the summit report led to the following future actions:

- Capacity-building providers could collaboratively assist with organizing regional networking activities to enhance data and knowledge sharing among the recipients.
- The providers could identify experts to work on a one-on-one basis with the recipients as followup activities.
- The providers could work collaboratively with the recipients to identify needs, level of expertise, and

timing for delivering targeted activities that could be included in a 5-year work plan.

The analysis of the data gathered from the three providers highlighted the need for continuous collaboration and further assessment and evaluation of the delivered capacity-building activities. The following main action is proposed: Capacity-building providers could establish a central repository within the GFOI where data from past, current, and planned activities of all capacity-building providers could be stored. The repository could be maintained in a manner to continually learn from previous lessons.

An analysis of the responses of the four recipient countries led to additional suggested future actions:

- Further research is needed to determine what specifically has prevented progress in some of the indicators.
- Annual capacity-building activities could be continued to achieve the set goals.

To implement the proposed future actions, a closer collaboration among the providers and improved communication with recipients will be essential. The need to facilitate such collaboration and communication became evident when, because of various constraints, only three providers participated in the study.

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Appendix 1

Table 1.1. Capacity-building activities measured using nine indicators.—Continued

[USGS, U.S. Geological Survey; USFS, U.S. Forest Service; CI, Conservation International; NA, no information available; MF, Moore Foundation; GEO-GFOI, Group on Earth Observations–Global Forest Observation Initiative; DCCEE–CSIRO, Department of Climate Change and Energy Efficiency–Commonwealth Scientific and Industrial Organization; NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; WHRC, Woods Hole Research Center; FAO, Food and Agriculture Organization of the United Nations; BU, Boston University; GIZ, German Federal Enterprise for International Cooperation; USSD, U.S. State Department; WRI, World Resources Institute; MU, Maryland University; USAID–FCMC, U.S. Agency for International Development–The Forest Carbon, Markets and Communities; EPA, U.S. Environmental Protection Agency; WWF, World Wildlife Fund; IIASA, International Institute for Applied Systems Analysis; NASA, National Aeronautics and Space Administration; EC, European Commission; NOAA, National Oceanic and Atmospheric Administration; JAXA, Japan Aerospace Exploration Agency; GCP, Global Canopy Program, UN–REDD, United Nations Collaborative Program on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries; CIFOR, Center for International Forestry Research]

Type of capacity-building activity	Capacity-building provider	Indicator addressed	Participating country	Location of capacity-building activity	Length of capacity-building activity, in days	Total participants (female/male)	Number of providers or trainers	Remote sensing/ geographic information system data provided
SilvaCarbon								
2011								
Workshop	Organizing: USGS Participating: USFS, CI	Evolve technologies and software tools for forest mapping and monitoring	Colombia Peru	Peru	5	41/51	7	NA
Workshop Study tour	Organizing: USGS	Evolve technologies and software tools for forest mapping and monitoring	Colombia Peru	United States	4	16/14	10	NA
Workshop	Organizing: MF Participating: GEO–GFOI, DCCEE–CSIRO	Establish a NFMS driven by UNFCCC guidance Evolve technologies and software tools for forest mapping and monitoring Report	Colombia Peru	Mexico	2	10/38	20*	NA
2012								
Workshop Technical details by experts	Organizing: GEO–GFOI, USGS	Estimate annual forest area change Evolve technologies and software tools for forest mapping and monitoring	Colombia Peru	Colombia	5	15/18	6	NA
Workshop	Organizing: USGS, DCCEE–CSIRO, WHRC Participating: FAO, USFS, BU, GIZ, USSD, WRI	Estimate annual forest area change Report	Colombia Peru	Ecuador	4	19/37	20*	NA
Workshop Technical consultation between providers and recipients	Organizing: GEO–GFOI, DCCEE– CSIRO, USAID–FCMC, USGS Participating: CI, USFS, BU, MU	Establish a NFMS driven by UNFCCC guidance Estimate changes in carbon stock for all forest types Evolve technologies and software tools for forest mapping and monitoring	Colombia Peru	Costa Rica	5	9/29	24*	NA
Workshop	Organizing: USGS, USAID–FCMC Participating: USFS, UNFCCC, EPA	Estimate annual forest area change Estimate changes in carbon stock for all forest types	Colombia	Colombia	4	21/19	8	NA

Table 1.1. Capacity-building activities measured using nine indicators.—Continued

[USGS, U.S. Geological Survey; USFS, U.S. Forest Service; CI, Conservation International; NA, no information available; MF, Moore Foundation; GEO-GFOI, Group on Earth Observations–Global Forest Observation Initiative; DCCEE–CSIRO, Department of Climate Change and Energy Efficiency–Commonwealth Scientific and Industrial Organization; NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; WHRC, Woods Hole Research Center; FAO, Food and Agriculture Organization of the United Nations; BU, Boston University; GIZ, German Federal Enterprise for International Cooperation; USSD, U.S. State Department; WRI, World Resources Institute; MU, Maryland University; USAID–FCMC, U.S. Agency for International Development–The Forest Carbon, Markets and Communities; EPA, U.S. Environmental Protection Agency; WWF, World Wildlife Fund; IIASA, International Institute for Applied Systems Analysis; NASA, National Aeronautics and Space Administration; EC, European Commission; NOAA, National Oceanic and Atmospheric Administration; JAXA, Japan Aerospace Exploration Agency; GCP, Global Canopy Program, UN-REDD, United Nations Collaborative Program on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries; CIFOR, Center for International Forestry Research]

Type of capacity-building activity	Capacity-building provider	Indicator addressed	Participating country	Location of capacity-building activity	Length of capacity-building activity, in days	Total participants (female/male)	Number of providers or trainers	Remote sensing/geographic information system data provided
SilviaCarbon—Continued								
2013								
Workshop	Organizing: GEO-GFOI, USAID–FCMC, USGS	Establish a NFMS driven by UNFCCC guidance	Colombia	Mexico	5	12/35	12	NA
Hands on training	Participating: FAO, USFS, Stanford University	Estimate changes in carbon stock for all forest types	Peru					
Study tours		Perform accuracy assessment and validation of maps						
Technical consultation between providers and recipients								
Workshop	Organizing: USGS, USFS, University of Michigan	Estimate changes in carbon stock for all forest types	Peru	Peru	3	10/28	12 ^a	NA
Workshop	Organizing: GEO-GFOI, USGS	Establish a NFMS driven by UNFCCC guidance	Colombia	Ecuador	4	14/20	24 ^a	NA
Hands on training	Participating: FAO, USAID–FCMC, Wageningen University, USFS, MU	Use community-based approaches for national REDD+ monitoring	Peru					
Study tours		Evolve technologies and software tools for forest mapping and monitoring						
Technical details by experts								
Workshop	Organizing: GEO-GFOI, USGS, MF	Estimate annual forest area change for all forest types	Colombia	Colombia	6	15/29	23 ^a	NA
Hands on training	Participating: WWF, IIASA, USAID–FCMC, USFS, BU, Stanford University, NASA	Evolve technologies and software tools for forest mapping and monitoring	Peru					
Study tours								
2014								
Workshop	Organizing: GEO-GFOI, USGS	Estimate annual forest area change for all forest types	Philippines	Thailand	4	24/28	28 ^a	NA
	Participating: Wageningen University, BU, NASA							

Table 1.1. Capacity-building activities measured using nine indicators.—Continued

[USGS, U.S. Geological Survey; USFS, U.S. Forest Service; CI, Conservation International; NA, no information available; MF, Moore Foundation; GEO-GFOI, Group on Earth Observations–Global Forest Observation Initiative; DCCEE–CSIRO, Department of Climate Change and Energy Efficiency–Commonwealth Scientific and Industrial Organization; NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; WHRC, Woods Hole Research Center; FAO, Food and Agriculture Organization of the United Nations; BU, Boston University; GIZ, German Federal Enterprise for International Cooperation; USSD, U.S. State Department; WRI, World Resources Institute; MU, Maryland University; USAID–FCMC, U.S. Agency for International Development–The Forest Carbon, Markets and Communities; EPA, U.S. Environmental Protection Agency; WWF, World Wildlife Fund; IIASA, International Institute for Applied Systems Analysis; NASA, National Aeronautics and Space Administration; EC, European Commission; NOAA, National Oceanic and Atmospheric Administration; JAXA, Japan Aerospace Exploration Agency; GCP, Global Canopy Program, UN-REDD, United Nations Collaborative Program on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries; CIFOR, Center for International Forestry Research]

Type of capacity-building activity	Capacity-building provider	Indicator addressed	Participating country	Location of capacity-building activity	Length of capacity-building activity, in days	Total participants (female/male)	Number of providers or trainers	Remote sensing/ geographic information system data provided
SilviaCarbon—Continued								
2014—Continued								
Workshop Hands on training Study tours Technical consultation between CBPs and recipients	Organizing: USGS Participating: IIASA, GEO-GFOI, CI, USFS, BU, EC Joint Research Center	Establish a NFMS driven by UNFCCC guidance Evolve technologies and software tools for forest mapping and monitoring	DRC	Cameroon	5	19/38	21 ^a	NA
Workshop Hands on training Study tours	Organizing: GEO-GFOI, USGS Participating: USAID–FCMC, Wageningen University, BU	Establish a NFMS driven by UNFCCC guidance Estimate changes in carbon stock for all forest types Perform accuracy assessment and validation of maps	Philippines	Nepal	6	10/37	15 ^a	NA
Workshop	Organizing: GEO-GFOI, USGS Participating: WWF, IIASA, Wageningen University	Use community-based approaches for national REDD+ monitoring Report	Colombia Peru	Guyana	8	16/17	14 ^a	NA
Workshop Hands on training	Organizing: GEO-GFOI, USGS Participating: WWF, FAO, USAID–FCMC, USFS, MU, GIZ, WRI	Report	Colombia Peru	Colombia	3	20/30	7	NA
Workshop Technical details by experts	Organizing: GEO-GFOI, USGS Participating: WWF, FAO, USFS, MU	Perform accuracy assessment and validation of maps	Colombia Peru	Colombia	2	8/16	10	NA
Sponsorship for travel	Organizing: USGS		Colombia Peru	United States	7	6	NA	NA
Sponsorship for travel	Organizing: USGS	Perform accuracy assessment and validation of maps	Colombia	Peru	5	4	NA	NA

Table 1.1. Capacity-building activities measured using nine indicators.—Continued

[USGS, U.S. Geological Survey; USFS, U.S. Forest Service; CI, Conservation International; NA, no information available; MF, Moore Foundation; GEO-GFOI, Group on Earth Observations–Global Forest Observation Initiative; DCCEE–CSIRO, Department of Climate Change and Energy Efficiency–Commonwealth Scientific and Industrial Organization; NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; WHRC, Woods Hole Research Center; FAO, Food and Agriculture Organization of the United Nations; BU, Boston University; GIZ, German Federal Enterprise for International Cooperation; USSD, U.S. State Department; WRI, World Resources Institute; MU, Maryland University; USAID–FCMC, U.S. Agency for International Development–The Forest Carbon, Markets and Communities; EPA, U.S. Environmental Protection Agency; WWF, World Wildlife Fund; IIASA, International Institute for Applied Systems Analysis; NASA, National Aeronautics and Space Administration; EC, European Commission; NOAA, National Oceanic and Atmospheric Administration; JAXA, Japan Aerospace Exploration Agency; GCP, Global Canopy Program, UN-REDD, United Nations Collaborative Program on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries; CIFOR, Center for International Forestry Research]

Type of capacity-building activity	Capacity-building provider	Indicator addressed	Participating country	Location of capacity-building activity	Length of capacity-building activity, in days	Total participants (female/male)	Number of providers or trainers	Remote sensing/ geographic information system data provided
SilviaCarbon—Continued								
2015								
Workshop Hands on training Study tours Technical details by experts	Organizing: GEO-GFOI, USGS Participating: FAO, CI, Wageningen University, USFS, NOAA	Estimate annual forest area change Evolve technologies and software tools for forest mapping and monitoring	Colombia Peru	Brazil	5	9/20	20*	NA
Workshop Hands on training Technical details by experts	Organizing: GEO-GFOI, USAID–FCMC, USGS Participating: Wageningen University, USFS	Estimate annual forest area change Evolve technologies and software tools for forest mapping and monitoring	Philippines	Cambodia	4	14/23	9	NA
Workshop Hands on training Study tours	Organizing: GEO-GFOI, USGS Participating: USFS	Estimate annual forest area change	Colombia Peru	Ecuador	5	16/20	16*	NA
Workshop Technical details by experts	Organizing: GEO-GFOI Participating: FAO, Wageningen University, USGS, USFS, BU, NASA, JAXA	Report	Colombia	Australia	5	10/41	NA	NA
Sponsorship for travel	Organizing: USGS		Colombia	Costa Rica	4	2	NA	NA
Sponsorship for travel	Organizing: USGS, USAID–FCMC	Use community-based approaches for national REDD+ monitoring Evolve technologies and software tools for forest mapping and monitoring	Colombia	Peru	8	2	NA	NA
Sponsorship for travel	Organizing: GEO-GFOI, USAID–FCMC, USGS Participating: Wageningen University, USFS, BU, WRI, EC Joint Research Center	Evolve technologies and software tools for forest mapping and monitoring	Colombia	Norway	5	1	NA	NA

Table 1.1. Capacity-building activities measured using nine indicators.—Continued

[USGS, U.S. Geological Survey; USFS, U.S. Forest Service; CI, Conservation International; NA, no information available; MF, Moore Foundation; GEO-GFOI, Group on Earth Observations–Global Forest Observation Initiative; DCCEE–CSIRO, Department of Climate Change and Energy Efficiency–Commonwealth Scientific and Industrial Organization; NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; WHRC, Woods Hole Research Center; FAO, Food and Agriculture Organization of the United Nations; BU, Boston University; GIZ, German Federal Enterprise for International Cooperation; USSD, U.S. State Department; WRI, World Resources Institute; MU, Maryland University; USAID–FCMC, U.S. Agency for International Development–The Forest Carbon, Markets and Communities; EPA, U.S. Environmental Protection Agency; WWF, World Wildlife Fund; IIASA, International Institute for Applied Systems Analysis; NASA, National Aeronautics and Space Administration; EC, European Commission; NOAA, National Oceanic and Atmospheric Administration; JAXA, Japan Aerospace Exploration Agency; GCP, Global Canopy Program, UN–REDD, United Nations Collaborative Program on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries; CIFOR, Center for International Forestry Research]

Type of capacity-building activity	Capacity-building provider	Indicator addressed	Participating country	Location of capacity-building activity	Length of capacity-building activity, in days	Total participants (female/male)	Number of providers or trainers	Remote sensing/geographic information system data provided
SilvaCarbon—Continued								
2015—Continued								
Workshop Technical details by experts	Organizing: GEO-GFOI, USAID–FCMC, USGS Participating: Wageningen University, USFS, BU, WRI, EC Joint Research Center	Establish a NFMS driven by UNFCCC guidance Estimate annual forest area change Evolve technologies and software tools for forest mapping and monitoring Reporting	DRC	ROC	3	12/16	15	NA
Sponsorship for travel	Organizing: SilvaCarbon	Establish a NFMS driven by UNFCCC guidance	Peru	Mexico	4	4	NA	NA
Sponsorship for travel	Organizing: USGS Participating: USAID–FCMC	Use community-based approaches for national REDD+ monitoring	Colombia	Colombia	5	NA	NA	NA
Sponsorship for travel	Organizing: USGS Participating: MU	Evolve technologies and software tools for forest mapping and monitoring	Colombia	Colombia	2	0/2	2	NA
Workshop Hands on training Technical consultation between providers and recipients	Organizing: GEO-GFOI, USAID–FCMC, USGS Participating: FAO, IIASA, Wageningen University, MU	Estimate annual forest area change Perform accuracy assessment and validation of maps	Philippines	Indonesia	5	22/24	16	NA

Table 1.1. Capacity-building activities measured using nine indicators.—Continued

[USGS, U.S. Geological Survey; USFS, U.S. Forest Service; CI, Conservation International; NA, no information available; MF, Moore Foundation; GEO-GFOI, Group on Earth Observations–Global Forest Observation Initiative; DCCEE–CSIRO, Department of Climate Change and Energy Efficiency–Commonwealth Scientific and Industrial Organization; NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; WHRC, Woods Hole Research Center; FAO, Food and Agriculture Organization of the United Nations; BU, Boston University; GIZ, German Federal Enterprise for International Cooperation; USSD, U.S. State Department; WRI, World Resources Institute; MU, Maryland University; USAID–FCMC, U.S. Agency for International Development–The Forest Carbon, Markets and Communities; EPA, U.S. Environmental Protection Agency; WWF, World Wildlife Fund; IIASA, International Institute for Applied Systems Analysis; NASA, National Aeronautics and Space Administration; NOAA, National Oceanic and Atmospheric Administration; JAXA, Japan Aerospace Exploration Agency; GCP, Global Canopy Program, UN-REDD, United Nations Collaborative Program on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries; CIFOR, Center for International Forestry Research]

Type of capacity-building activity	Capacity-building provider	Indicator addressed	Participating country	Location of capacity-building activity	Length of capacity-building activity, in days	Total participants (female/male)	Number of providers or trainers	Remote sensing/geographic information system data provided
WWF								
2011								
Workshop Hands on training	Organizing: WWF, FAO	Establish a NFMS driven by UNFCCC guidance Estimate annual forest area change Estimate changes in carbon stock for all forest types Perform accuracy assessment and validation of maps	Colombia DRC Peru	Peru	16	8/8	8	Y
Hands on training	Organizing: WWF	Estimate annual forest area change	Peru	Peru	7	3/5	1	Y
2012								
Hands on training	Organizing: WWF	Estimate annual forest area change	DRC	DRC	7	3/5	1	Y
Workshop Hands on training	Organizing: WWF	Establish a NFMS driven by UNFCCC guidance Estimate annual forest area change Estimate changes in carbon stock for all forest types Perform accuracy assessment and validation of maps Use community based approaches for national REDD+ monitoring Evolve technologies and software tools for forest mapping and monitoring	Peru	Peru	7	25	2	Y

Table 1.1. Capacity-building activities measured using nine indicators.—Continued

[USGS, U.S. Geological Survey; USFS, U.S. Forest Service; CI, Conservation International; NA, no information available; MF, Moore Foundation; GEO-GFOI, Group on Earth Observations–Global Forest Observation Initiative; DCCEE–CSIRO, Department of Climate Change and Energy Efficiency–Commonwealth Scientific and Industrial Organization; NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; WHRC, Woods Hole Research Center; FAO, Food and Agriculture Organization of the United Nations; BU, Boston University; GIZ, German Federal Enterprise for International Cooperation; USSD, U.S. State Department; WRI, World Resources Institute; MU, Maryland University; USAID–FCMC, U.S. Agency for International Development–The Forest Carbon, Markets and Communities; EPA, U.S. Environmental Protection Agency; WWF, World Wildlife Fund; IIASA, International Institute for Applied Systems Analysis; NASA, National Aeronautics and Space Administration; NOAA, National Oceanic and Atmospheric Administration; JAXA, Japan Aerospace Exploration Agency; GCP, Global Canopy Program, UN–REDD, United Nations Collaborative Program on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries; CIFOR, Center for International Forestry Research]

Type of capacity-building activity	Capacity-building provider	Indicator addressed	Participating country	Location of capacity-building activity	Length of capacity-building activity, in days	Total participants (female/male)	Number of providers or trainers	Remote sensing/geographic information system data provided
WWF—Continued								
2013								
Workshop Hands on training	Organizing: WWF	Establish a NFMS driven by UNFCCC guidance Estimate annual forest area change Estimate changes in carbon stock for all forest types Perform accuracy assessment and validation of maps Use community-based approaches for national REDD+ monitoring Evolve technologies and software tools for forest mapping and monitoring	Peru	Indonesia	7	25	2	Y
2014								
Workshop Hands on training	Organizing: WWF Participating: SilvaCarbon, IIASA, GCP	Estimate annual forest area change Use community-based approaches for national REDD+ monitoring Evolve technologies and software tools for forest mapping and monitoring	Colombia Peru DRC	Guyana	5	12/12	8	Y
FAO								
2011								
Workshop	Organizing: UN–REDD Participating: WWF, UN–REDD, CIFOR	Establish NFMS driven by UNFCCC requirements	DRC	Tanzania	4	22/34	NA	NA
Workshop	Organizing: UN–REDD	Estimate annual forest area change Estimate changes in carbon stock for all forest types	Colombia Philippines	Italy	4	25/55	24	NA

Table 1.1. Capacity-building activities measured using nine indicators.—Continued

[USGS, U.S. Geological Survey; USFS, U.S. Forest Service; CI, Conservation International; NA, no information available; MF, Moore Foundation; GEO-GFOI, Group on Earth Observations–Global Forest Observation Initiative; DCCCE–CSIRO, Department of Climate Change and Energy Efficiency–Commonwealth Scientific and Industrial Organization; NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; WHRC, Woods Hole Research Center; FAO, Food and Agriculture Organization of the United Nations; BU, Boston University; GIZ, German Federal Enterprise for International Cooperation; USSD, U.S. State Department; WRI, World Resources Institute; MU, Maryland University; USAID–FCMC, U.S. Agency for International Development–The Forest Carbon, Markets and Communities; EPA, U.S. Environmental Protection Agency; WWF, World Wildlife Fund; IIASA, International Institute for Applied Systems Analysis; NASA, National Aeronautics and Space Administration; NOAA, National Oceanic and Atmospheric Administration; JAXA, Japan Aerospace Exploration Agency; GCP, Global Canopy Program, UN-REDD, United Nations Collaborative Program on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries; CIFOR, Center for International Forestry Research]

Type of capacity-building activity	Capacity-building provider	Indicator addressed	Participating country	Location of capacity-building activity	Length of capacity-building activity, in days	Total participants (female/male)	Number of providers or trainers	Remote sensing/geographic information system data provided
FAO—Continued								
2011—Continued								
Workshop	Organizing: UN-REDD	Create a national forest inventory Estimate annual forest area change	DRC	DRC	2	NA	NA	NA
Workshop	Organizing: UN-REDD	Establish a NFMS driven by UNFCCC guidance Estimate annual forest area change	DRC	DRC	7	NA	NA	NA
Workshop	Organizing: UN-REDD	Establish a NFMS driven by UNFCCC guidance	DRC	DRC	4	52	9	NA
Workshop	Organizing: UN-REDD	Establish a NFMS driven by UNFCCC guidance	Peru	Peru	9	NA	NA	NA
Workshop	Organizing: UN-REDD	Establish a NFMS driven by UNFCCC guidance	DRC	DRC	7	NA	NA	NA
Workshop	Organizing: UN-REDD	Establish a NFMS driven by UNFCCC guidance	Philippines	Philippines	2	NA	NA	NA
Workshop	Organizing: UN-REDD	Establish a NFMS driven by UNFCCC guidance	DRC	DRC	2	100	NA	NA
2012								
Workshop	Organizing: FAO	Estimate annual forest area change	Philippines	Philippines	4	NA	NA	NA
Workshop	Organizing: USGS, USFS, EPA	Estimate changes in carbon stock for all forest types	Colombia Peru	Colombia	3	NA	NA	NA
Workshop	Organizing: UN-REDD, GIZ	Establish a NFMS driven by UNFCCC guidance	Philippines	Philippines	2	NA	NA	NA

Table 1.1. Capacity-building activities measured using nine indicators.—Continued

[USGS, U.S. Geological Survey; USFS, U.S. Forest Service; CI, Conservation International; NA, no information available; MF, Moore Foundation; GEO-GFOI, Group on Earth Observations–Global Forest Observation Initiative; DCCCE–CSIRO, Department of Climate Change and Energy Efficiency–Commonwealth Scientific and Industrial Organization; NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; WHRC, Woods Hole Research Center; FAO, Food and Agriculture Organization of the United Nations; BU, Boston University; GIZ, German Federal Enterprise for International Cooperation; USSD, U.S. State Department; WRI, World Resources Institute; MU, Maryland University; USAID–FCMC, U.S. Agency for International Development–The Forest Carbon, Markets and Communities; EPA, U.S. Environmental Protection Agency; WWF, World Wildlife Fund; IIASA, International Institute for Applied Systems Analysis; NASA, National Aeronautics and Space Administration; EC, European Commission; NOAA, National Oceanic and Atmospheric Administration; JAXA, Japan Aerospace Exploration Agency; GCP, Global Canopy Program, UN–REDD, United Nations Collaborative Program on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries; CIFOR, Center for International Forestry Research]

Type of capacity-building activity	Capacity-building provider	Indicator addressed	Participating country	Location of capacity-building activity	Length of capacity-building activity, in days	Total participants (female/male)	Number of providers or trainers	Remote sensing/geographic information system data provided
FAO—Continued								
2012—Continued								
Technical consultation between providers and recipients	Organizing: UN–REDD	Establish a NFMS driven by UNFCCC guidance	DRC	DRC	3	NA	NA	NA
Workshop	NA	Estimate annual forest area change	Philippines	Philippines	4	NA	NA	NA
Other	Organizing: UNFCCC	Establish a NFMS driven by UNFCCC guidance	DRC	Qatar	NA	NA	NA	NA
Hands on training	NA	Evolve technologies and software tools for forest mapping and monitoring	DRC	Brazil Italy	NA	NA	NA	NA
Workshop	NA	Create a national forest inventory	Peru	NA	NA	NA	NA	NA
2013								
Workshop	Organizing: UN–REDD	Estimate annual forest area change Evolve technologies and software tools for forest mapping and monitoring	Philippines	Philippines	3	NA	NA	NA
Workshop	Organizing: UN–REDD	Create a national forest inventory	Philippines	Philippines	NA	NA	NA	NA
Workshop	Organizing: UN–REDD	Perform accuracy assessment and validation of maps	DRC	NA	NA	NA	NA	NA

^a Includes country presentations.

Table 1.2 Results-based evaluation of activities, outcomes, and impacts of capacity-building activities delivered to the four recipient countries.

[Indicators are described in appendix table 1.3. NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; REDD+, reducing emissions from deforestation and forest degradation]

Elements of results-based evaluation	Activities	Outcomes	Impact
Definition	Activities include the set of resources such as technical expertise, data distribution, networking (collaboration among capacity-building providers and recipients), and skills provided that contribute to capacity at each level.	Outcomes are sets of products anticipated through the execution of practices, activities, or functions. Outcomes usually are described in terms of the size and scope of the services or products delivered or produced by the program, and indicate if the program was delivered to the intended audiences at the intended “dose.”	Impacts can be defined as measuring what was achieved based on the objectives set by the capacity-building provider.
Activities	Workshop Hands on training Study tours Technical details by experts Technical consultation between providers and recipients Sponsorship for travel Network meetings Other	Length of Capacity-building activity (days) Number of participants (female/male) Number of providers or trainers Remote sensing/geographic information system data provided to the five countries Number of institutions collaborating with the three providers.	Nine indicators: Establish a NFMS driven by UNFCCC guidance Create a national forest inventory Estimate annual forest area change Assess drivers of forest area change Estimate changes in carbon stock for all forest types Perform accuracy assessment and validation of maps Use community-based approaches for national REDD+ monitoring Evolve technologies and software tools for forest mapping and monitoring Report.
Data sources	Data provided by the three providers	Data provided by the three providers	SilvaCarbon (2014). Romijn and others (2015). Direct input from the countries. National Communications and Biennial Update Reports to the UNFCCC.

Table 1.3 Indicators measuring countries' progress toward building measurement, reporting, and verification system for reducing emissions from deforestation and forest degradation.—Continued

[NFMIS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; REDD+, reducing emissions from deforestation and forest degradation]

Indicator	Source	Indicator score	Value	Characteristics
Establish a NFMIS driven by UNFCCC guidance	Summit report Direct input from the countries	0	Low	No NFMIS.
		1	Limited	Currently under development (only on project/pilot site basis) and expanding existing institutional structure to accommodate measurement, reporting, and verification.
		2	Intermediate	Institutional structure is in place and in final stages of approval.
		3	Good	Fully functional NFMIS.
Create a national forest inventory	Romijn and others (2015, appendix A) Summit report	0	Low	No forest inventory.
		1	Limited	One forest inventory (external).
		2	Intermediate	Multiple forest inventories (external or in country), but not on a national level.
		3	Good	One or more (multiple) forest inventories on a national level exist (in country).
Estimate annual forest area change	Romijn and others (2015, appendix A)	0	Low	No annual forest area change estimates.
		1	Limited	Annual forest area change estimates (external source).
		2	Intermediate	Annual forest area change estimates in progress (in country).
		3	Good	Annual national forest area change going back to the 1980s or 1990s (in country).
Assess drivers of forest area change	Summit report Direct input from the countries	0	Low	No such assessment exists.
		1	Limited	Initial efforts are in place but no published maps or reports exist.
		2	Intermediate	Drivers for some of the forest area changed are evaluated and information is published/reported.
		3	Good	Full set of all drivers for all forest area changed are produced and published/reported.
Estimate changes in carbon stock for all forest types	Romijn and others (2015, appendix A)	0	Low	No estimates of the carbon stock change exist.
		1	Limited	Estimates of the carbon stock change exist [tier 1 approach].
		2	Intermediate	Estimates of carbon stock changes exist for all forest types but not using specific allometric equation for each forest type [tier 2].
		3	Good	Estimates of carbon stock changes for all forest types exist applying forest type allometric equations [tier 3].
Perform accuracy assessment and validation of maps	Summit report Direct input from the countries	0	Low	No accuracy assessment produced.
		1	Limited	Initial efforts to assess and validate forest cover and forest cover change maps by the institution that produced the maps are in progress but no official results are available.
		2	Intermediate	All forest cover and forest cover change maps are assessed and validated by the institution that produced the maps.
		3	Good	All forest cover and forest cover change maps are assessed and validated by an independent source.

Table 1.3 Indicators measuring countries' progress toward building measurement, reporting, and verification system for reducing emissions from deforestation and forest degradation.—Continued

[NFMS, national forest monitoring system; UNFCCC, United Nations Framework Convention on Climate Change; REDD+, reducing emissions from deforestation and forest degradation]

Indicator	Source	Indicator score	Value	Characteristics
Use community-based approaches for national REDD+ monitoring	Summit report Direct input from the countries	0	Low	No community-based approaches for national REDD+ monitoring exist.
		1	Limited	There is a general understanding that community-based approaches for national REDD+ monitoring are important.
		2	Intermediate	Some steps toward establishing community-based approaches for national REDD+ monitoring have been started (such as the identification of hotspots) but are not yet part of the NFMS.
		3	Good	Community-based approaches for national REDD+ monitoring have been established and are part of the NFMS.
Evolve technologies and software tools for forest mapping and monitoring	Summit report Direct input from the countries	0	Low	No such technologies and software tools are being implemented.
		1	Limited	Some technologies and software are in the process of being implemented.
		2	Intermediate	Various technologies and software products have been implemented but external assistance is still needed (financial/training).
		3	Good	Various technologies and software products have been implemented and no external assistance is needed.
Report	Summit report Direct input from the countries Reports to UNFCCC) National Communications and Biennial Update Reports)	0	Low	No National Communication and/or Biennial Update Reports submitted.
		1	Limited	National Communication Report submitted but no Biennial Update Report.
		2	Intermediate	National Communications and Biennial Update Reports submitted.
		3	Good	National Communications Report, Biennial Update Report, and other reports (such as REDD Early Movers, Emissions Reduction Program Idea Notes ER-PIN to the WB Forest Carbon Partnership Facility) submitted.

For more information:

<http://www.fao.org/forestry>

<http://www.gfoi.org/>

<http://www.gofcgold.wur.nl/>

<http://redd.unfccc.int/>

<https://egsc.usgs.gov/silvacarbon/>

<http://www.un-redd.org>

http://www.unredd.net/index.php?option=com_content&view=article&id=2088&Itemid=482

<https://www.worldwildlife.org/>

