Building a Forest Conservation Corp:
A New Model for Forest Carbon Monitoring in Indonesia

A thesis

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Abstract

This thesis evaluates the viability of creating a national service corps in Indonesia, called a Forest Conservation Corps (FCC), to carry out the monitoring that will be necessary to fulfill the requirements of Reduced Emissions from Deforestation and Forest Degradation (REDD+), a proposed global forest carbon emissions reduction strategy. The FCC is modeled after the Civilian Conservation Corps (CCC), a national work-relief program in the United States that lasted from 1933-42. A qualitative analysis examined the activities of four REDD+ pilot initiatives: the UN-REDD Programme, the Forest Carbon Partnership Facility, the Indonesia-Australia Forest Carbon Partnership, and the Norway-Indonesia REDD Partnership. The results of the analysis together with the evaluation of the CCC form the basis of the FCC model, which was designed to achieve two main goals: (1) build measurement, reporting, and verification (MRV) capacity within Indonesia and (2) carry out MRV that complies with global carbon emissions reduction treaties.

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Abbreviations and Acronyms

CCC	Civilian Conservation Corps
FAO	Food and Agriculture Organization of the United Nations
FCPF	Forest Carbon Partnership Facility
FCC	Forest Conservation Corps
FRIS	Forest Resource Inventory System
GOFC-GOLD	Global Observation for Forest and Land Cover Dynamics
GPG	Good Practice Guidance
GPS	Global Positioning System
PolInSAR	Polarized Interferometric Synthetic Aperture Radar
INCAS	Indonesian National Carbon Accounting System
IPCC	Intergovernmental Panel on Climate Change
LiDAR	Light Detection and Ranging
MRV	Measurement, Reporting, and Verification
NFI	National Forest Inventory
NPS	National Park Service
REDD+	Reduced Emissions from Deforestation and Forest Degradation (plus conservation of forest carbon stocks, sustainable management of forests, and enhancement of forest carbon stocks)
RL	Reference Level
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UN-REDD	United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries
USFS	United States Forest Service
SCS	Soil Conservation Service
SES	Soil Erosion Service

Chapter 1: Introduction

Overview

This thesis evaluates the viability of creating a national service corps in Indonesia, called a Forest Conservation Corps (FCC), to build capacity for the monitoring that will be necessary to fulfill the requirements of Reduced Emissions from Deforestation and Forest Degradation (REDD+), a global forest carbon emissions reduction strategy. REDD+ is a concept that centers on performance-based financial incentives in which developed countries pay developing countries to preserve their forests as a way to reduce global greenhouse gas emissions. The original policy has evolved and expanded since it was first placed on the international negotiating agenda in 2005. It began as Reduced Emissions from Deforestation (RED). A second 'D,' which stands for 'forest degradation,' was added two years later. Today REDD+, the policy currently being negotiated, also includes reforestation and sustainable forestry activities.[1] REDD++, which is not on the current negotiating agenda but has been proposed for future consideration, encompasses all land uses, including agriculture and peatland development. REDD+ has received considerable support in the international community, was a core element in the Copenhagen Accord,[2]

[1] REDD+ stands for: Reduced emissions from deforestation and forest degradation plus conservation of forest carbon stocks, sustainable management of forests, and enhancement of forest carbon stocks (Meridian Institute, 2011, p. 4)

[2] The Copenhagen Accord is a non-binding agreement that was produced during the international climate negotiations in Copenhagen in December 2009. It includes a collective commitment of $30 billion from developed countries to fund REDD+, adaptation, technology development and

and is currently being negotiated for inclusion in the international climate policy that is intended to replace the Kyoto Protocol in 2012. Monitoring systems that ensure credible measurement, reporting, and verification (MRV) [3] of REDD+ activities have been identified as a crucial element for the successful implementation of any REDD+ mechanism (UN-REDD, 2010b).

Indonesia has one of the highest rates of deforestation among tropical forest countries, yet it has limited capacity for conducting MRV. There is a need for solutions that address both problems, which is why I chose it for the focus of my thesis. In formulating a topic, I began to consider the key advantages of developing an MRV program that was modeled after the Civilian Conservation Corps (CCC), a national service program in the United States that lasted from 1933-1942 (Salmond, 1967). Drawing from a wide range of current and historical literature, data, and reports, this thesis answers the question: would a national service program similar to the CCC be an effective model for building and executing an MRV program in Indonesia?

The components of the CCC that make it a good model for an MRV program include its scale, structure, and flexibility. The CCC was a government program created by President Franklin Delano Roosevelt as part of the New Deal

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transfer, and capacity building in developing countries for the period 2010-2012, with a goal of giving $100 billion a year by 2020 (UNFCCC, 2009a, p. 3).

[3] Measurement, reporting, and verification (MRV), is a term that refers to a monitoring system that records and evaluates the amount of carbon stored in forests that would otherwise be released into the atmosphere. It involves collecting a combination of remote sensing and ground-based data which are used to establish reference levels (RLs) and monitor forest inventories. In this paper, the term 'Forest Carbon Monitoring' is used interchangeably with MRV and means the same thing.

to enhance the value of natural resources, offer jobs to the unemployed, and provide education and training.[4] Conserving and expanding the country's forest resources was central to the formation of the program. The work, which focused primarily on reforestation, road construction, and soil conservation, took place in local communities, was carried out on a national scale, and was supported by existing government programs and infrastructure (Bennett, 2004). If the CCC model is updated and adapted to fit within Indonesia's governance structure, it offers a compelling example of an effective and efficient capacity building program that would serve as the foundation for a permanent forest carbon monitoring program in Indonesia.

Given the likelihood that REDD+ will be included in the next climate treaty, pilot programs (also called 'demonstration projects') are currently underway in multiple counties, including Indonesia. These programs were launched voluntarily with funding and support from select governments to lay the groundwork for REDD+ implementation at the national level in developing countries. They offer a way for governments and institutions to test out many of the program ideas and theories that have been put forth over the past few years. They also enable countries to begin tackling MRV, which has been shown to be one of the most challenging aspects of implementing REDD+. These programs are experimenting with a variety of different approaches to MRV. The results and

[4] The New Deal was a series of government relief, recovery, and reform programs that President Franklin Delano Roosevelt initiated between 1933 and 1938. A majority of the programs provided jobs and financial relief to the unemployed to help them recover from economic losses caused by the Great Depression. The CCC was one of the first programs to be created and is widely regarded as the most successful (Bennet, 2004; Maher, 2008; Salmond, 1967).

outcomes of these different approaches, when examined alongside the research on the CCC and the larger body of literature on REDD+, enabled me to explore the following questions that support the main thesis:

1. What are the primary challenges to be overcome for MRV in Indonesia?
2. What are the main advantages of a top-down versus a bottom-up model?
3. How would participation in the FCC be encouraged?
4. Who will provide MRV training to FCC participants?
5. Is the number of jobs expected to grow, remain constant, or diminish over time?
6. Will the program produce measurable benefits? If so, what kind and on what scale?
7. Will the incentives and benefits offered by the FCC be enticing enough to outweigh the advantages of participating in activities that cause deforestation?

The information I found through my research provides answers to these questions and supports the FCC model. For example, question three raises the issue of recruitment. The proposed FCC model draws on a variety of program elements of contemporary national service programs, in addition to the CCC. In chapter six I describe incentives that would encourage participation in the FCC. One such incentive is an educational benefit in exchange for a term of service. Because FCC salaries are unlikely to rival or exceed those of jobs in the private sector (oil palm industry) or illegal markets (logging), an educational benefit in the form of tuition remission would help boost enrollment. This incentive would offer citizens the opportunity to enhance their long-term economic circumstances while providing the added advantage of helping to advance Indonesia's goal of becoming a developed economy with an educated populace. Likewise, the thesis explains the precedent for and advantages of other recommendations within the

FCC model, including describing how the program components address issues such as corruption, equity, revenue sharing, and community involvement.

Citizen participation is a primary advantage of the FCC. Studies have shown that involving local and indigenous people in forest monitoring can provide accurate, cost-effective, and locally-anchored information (World Bank, 2010, p. 129). In the proposed model, people would be recruited to work in or near their local communities. The salary and incentives available through the program would provide a form of compensation to individuals who are most impacted by the financial losses associated with keeping forests intact. This addresses, in part, the concern expressed by many Indonesians that they will be left out of REDD+ fund distribution schemes by corrupt government officials.

I also explain the main reasons for selecting a top-down model and theorize why I think it would work best within Indonesia's current political, economic, and social systems. I also explain why a centralized system is the most effective and efficient solution. It has been demonstrated that credible, ecologically sound, and consistent MRV data is essential in order to participate in the proposed global REDD+ regime and the FCC would meet that need.

Relevance

According to the Intergovernmental Panel on Climate Change (IPCC) (2007, p. 36), deforestation accounts for an estimated 17% of global greenhouse gas emissions. Indonesia contributes the largest share of those emissions (PEACE, 2007, p. 2) and is currently on a development trajectory that will result in continued forest loss. For example, the palm oil sector is one of the most

profitable and fastest growing industries in Indonesia, with palm oil plantations accounting for the majority of deforestation in recent years. In 2009, 47% of the world's palm oil was produced in Indonesia, and the country plans to double its palm oil fruit production from the current 80 million tons to 160 million tons over the next 10 years (Koh & Ghazoul, 2010, p. 11140). Indonesia has exceptionally high levels of biodiversity and species endemism, which means that additional deforestation will increase the number of rare and endangered plants and animals that go extinct. Furthermore, as an island nation, Indonesia is increasingly vulnerable to the effects of climate change, which provides an even greater impetus for action on REDD+. The dual threats to the global climate and biodiversity demonstrate the urgent need for Indonesia to take action on REDD+.

In October 2009, Indonesian President Susilo Bambang Yudhoyono committed to reducing Indonesia's carbon emissions by 26% by 2020, which is the largest absolute reduction commitment made by any developing country. Less than a year later, in May 2010, Norway agreed to contribute up to $1 billion toward REDD+ and loss of peatland in Indonesia (Norway, 2010a & 2010b). The country is also engaged in REDD+ pilot activities launched by the United Nations REDD Programme (UN-REDD) and the Forest Carbon Partnership Facility (FCPF), and has passed the world's first laws related to REDD+, which create a framework for allocating carbon rights (FAO, 2011, p. 71). These actions indicate elevated levels of commitment to REDD+ by both Indonesia and developed countries. It seems likely that, in the near future, Indonesia will need a national MRV program that can be rolled out quickly and achieve maximum effectiveness

at a minimal cost. Yet MRV capacity in Indonesia remains weak. For example, Indonesia's 2009 Readiness Preparation Proposal (R-PP)[5] recognizes that enforcement of regulations relating to MRV systems have been weak, but it doesn't outline any concrete actions or plans for improvement (Davis et al., 2009, p.14).

There is currently significant concern among individual citizens and indigenous groups that revenue sharing at the sub-national level will be inequitable. They have expressed an eagerness for policy provisions and systems that would circumvent corruption and ensure REDD+ funds are distributed fairly and equitably. Given these concerns, there is a need for REDD+ solutions that address corruption and equity issues. A key advantage of the FCC program is that it channels a certain amount of REDD+ revenues directly to individuals, many of whom are likely to be members of indigenous groups or dependent on forests for their livelihoods.

Finally, the United Nations General Assembly has designated 2011 the 'International Year of the Forests' which coincides with a heightened level of attention given to REDD+ (FAO, 2011). International negotiators, world leaders, government representatives, researchers, program administrators, academic scholars, and others involved with REDD+ activities are actively seeking solutions that address the issues that are raised with this thesis, especially MRV and how it can eventually be linked to larger global greenhouse gas emissions

[5] A Readiness Preparation Proposal (R-PP) is a document that outlines the steps a country needs to take in preparation for undertaking REDD+ activities, also known as 'REDD+ Readiness'. It includes a framework for establishing a budget and schedule, as well as information about capacity building needs and quality of data.

trading markets. Therefore, this topic is timely and relevant to the current global forest policy discussion.

Research Methodology

A qualitative analysis of current measurement, reporting, and verification (MRV) plans and practices in Indonesia was conducted to answer the central research question. The analysis draws primarily on reports produced by: (1) the UN-REDD Programme, which funded and launched Indonesia's first official REDD+ pilot program; (2) the Forest Carbon Partnership Facility, which offers countries financing and guidance for developing systems and policies in preparation for REDD+; (3) the Indonesia-Australia Forest Carbon Partnership; and (4) the Norway-Indonesia REDD Partnership. The pilot programs and readiness initiatives are still in the early stages, which means data collection is not yet complete and preliminary results are limited. As a way to narrow the information gap, I examined supplemental reports, scientific assessments, theoretical literature, and supporting data from other relevant sources. Through that process, I was able to identify elements and variables that are considered essential for an effective REDD+ MRV program. I studied the Civilian Conservation Corps (CCC) to determine whether its administrative framework would meet the goals and purpose of REDD+ MRV and be compatible with Indonesia's current political regime. The results of the analysis together with the evaluation of the CCC form the basis of the Forest Conservation Corp (FCC) model, which was designed to achieve two main goals: (1) build MRV capacity

within Indonesia and (2) carry out MRV that complies with international carbon emissions reduction treaties.

Goals

Tropical rainforest conservation has been an interest and passion of mine for more than ten years. In graduate school I have focused on learning more about REDD+ and other policy solutions that would enable emerging economies to simultaneously preserve natural resources and maintain their economic growth trajectories. In selecting my thesis topic, I wanted to explore a solution that could be readily implemented and one that I had not seen addressed in the body of literature on REDD+ and MRV. I also saw this project as a way to gain a nuanced understanding of the many facets of REDD+, from reconciling local, national, and global forest governance issues to deciphering the technical and logistical challenges of implementing a national MRV program. Finally, this project offered me the opportunity to undertake a substantive, in-depth analysis of an issue that is currently at the forefront of global environmental policy discussions. I plan to pursue a career in international environmental policy when I graduate and having strong interdisciplinary knowledge in this area is likely to be an asset in the job market.

Chapter 2: Deforestation and Forest Degradation

Introduction

Indonesia, the world's largest archipelago, is made up of more than 17,000 islands spread across more than 1.8 million square kilometers in the Pacific Ocean. Its tropical rainforests are known for having extraordinarily high levels of biodiversity. Thousands of endemic animals and plants inhabit the forests, including an estimated 3,305 species of amphibians, birds, mammals, and reptiles, and at least 29,375 vascular plants (World Bank, 2011). Forests are also a vital part of the economy and culture of the country, supporting the livelihoods of thousands of people living in indigenous communities and rural areas who depend on the forests for building materials, medicine, incomes, and food (Shepard, 2004). Forests also provide valuable ecosystem services, both locally (watershed protection) and globally (carbon sequestration). For example, from 1990 to 2007 tropical forests captured an estimated 1.2 billion tons of carbon dioxide a year, which represents 55% of the global forest carbon sink (Pan et al., 2011, p. 1). Given that Indonesia has the third largest area of rainforests in the world (World Bank Group, 2009, p. 12), it represents a large share of that sink.

Continuous deforestation and forest degradation over the last twenty years has led to the loss of massive areas of rainforest in Indonesia. The loss of old growth forests, called primary rainforests, is of particular concern, since they support the most biologically diverse ecosystems and have been shown to release the largest amount of carbon emissions when cleared. Heightened global

awareness of the ecological value of rainforests combined with growing knowledge of the role of rainforests in the global climate and carbon cycles has elevated REDD+ in international environmental negotiations in recent years.

Background

The IPCC defines deforestation as "the direct human-induced conversion of forested land to non-forested land" (UNFCCC, 2006a, p. 5). More commonly, it is referred to as the cutting, clearing, reduction, or removal of a forest. Forest degradation refers to structural or functional changes to a forest that decrease the quality of a component of the ecosystem – such as soil, vegetation, tree density, or species composition – and limit its capacity to provide goods and services. Unlike deforestation, the size of the forest area is not reduced. The IPCC (2003, p. 16) defines forest degradation as the "direct human induced long-term loss (persisting for *X* years or more) of at least *Y* % of forest carbon stocks (and forest values) since time (*T*) and not qualifying as deforestation." However, there is no authoritative, universal, operational definition for either term. There are dozens of variations on the definitions owing to the differing forest management goals and strategic interests of different nations, regulatory bodies, agencies, institutions, businesses, and organizations. In practice there is a great deal of uncertainty and ambiguity regarding what constitutes 'deforestation' and 'forest degradation'. I included the IPCC's definitions because any future REDD+ mechanism will

likely need to conform to IPCC and UNFCCC reporting principles, guidelines, and methodologies.[6]

The exact extent of deforestation in Indonesia is currently unknown. Forest loss estimates vary widely depending on the data source, methodology, and reporting period (Grainger, 2008). However, research suggests that deforestation rates have dropped in the past decade compared to the exceptionally high forest loss that took place during the 1990s. For example, the FAO (2010, p. 230) estimated that the deforestation rate was 1.75% from 1990 to 2000 and 0.31% from 2000-2005. Hansen et al. (2009, p. 7) show higher rates of 1.78% and 0.71%, respectively, with deforestation concentrated in the lowlands of Sumatra and Kalimantan. By contrast, Miettinen et al. (2011) found an overall annual deforestation rate of 1.0% from 2000 to 2010, but that figure represents all of Southeast Asia, not just Indonesia. However, the same study found that deforestation rates soared to over 5.0% in the eastern lowlands of Sumatra, supporting the findings of Broich et al. (2011, p. 7), who discovered "high spatial and temporal variation" in forest loss trends in sub-regions of Indonesia, including Sumatra and Kalimantan. A mapping project by Hammer et al. (2010) shows similar trends, with significant variations in annual forest clearance rates from 2005 to 2010 and distinctive clusters of rapid forest loss in Sumatra, Kalimantan, Sulawesi, Maluku, and Irian Jaya. Even with the decline, the scale and pace of

[6] Indonesia ratified the United Nations Framework Convention on Climate Change (UNFCCC) in August 1994 and is now included as a Party to the Conference, which binds it to the rights and obligations put forth by the UNFCCC (UNFCCC, 2011; Ministry of Environment of the Republic of Indonesia, 1999).

rainforest destruction has made Indonesia the world's third largest emitter of greenhouse gases, behind China and the United States.

Gauging forest degradation rates is even more difficult, as demonstrated by the lack of current statistics or quantitative data showing Indonesia's levels of forest degradation (UN-REDD, 2010a). However, a 2006 study by Marklund and Schoene (as cited in Tavani et al., 2009) indicated that Indonesia's forest stock is diminishing by an estimated 6% a year, with forest degradation accounting for two thirds of that figure and deforestation accounted for the remaining third. This suggests a need for a more detailed assessment that correlates different types of forest loss with distinct causal activities.

Causes

Today a leading cause of rainforest loss in Indonesia is land clearing for commercial palm oil development. Palm oil comes from the fruit of the palm oil tree, an agricultural monocrop that thrives in tropical environments, particularly Southeast Asia, which has extended periods of light, evenly distributed rainfall, and year-round temperatures that are favorable to tree growth. The oil is extracted from two parts of the fruit – the flesh and the kernel – and each fruit yields approximately 82% crude palm oil, 10% palm kernel meal, and 8% palm kernel oil (Brown & Jacobson, 2005, p. 6; Santosa, 2008, p. 457; Basiron, 2007, pp. 289-290). The fruit grows in compact bunches, with 1,000 to 3,000 fruits per bunch and multiple bunches per tree (MPOC, 2011). To ensure optimal fruit yields, trees are planted approximately 30 feet apart in a triangular pattern, which means that industrial-scale cultivation requires vast areas of contiguous land (Better Crops

International, 1999). To achieve economies of scale and process the fruit quickly,[7] trees are grown on plantation 'estates' by business conglomerates that build and operate palm oil mills and refineries nearby (Basiron, 2007, p. 291). Once seedlings are planted it takes approximately three years for trees to mature and produce fruit. After that, the trees produce fruit multiple times throughout the year for as long as 25-30 years, at which time they are removed and the land is re-planted with new trees (FAO, 2001, p. 12).

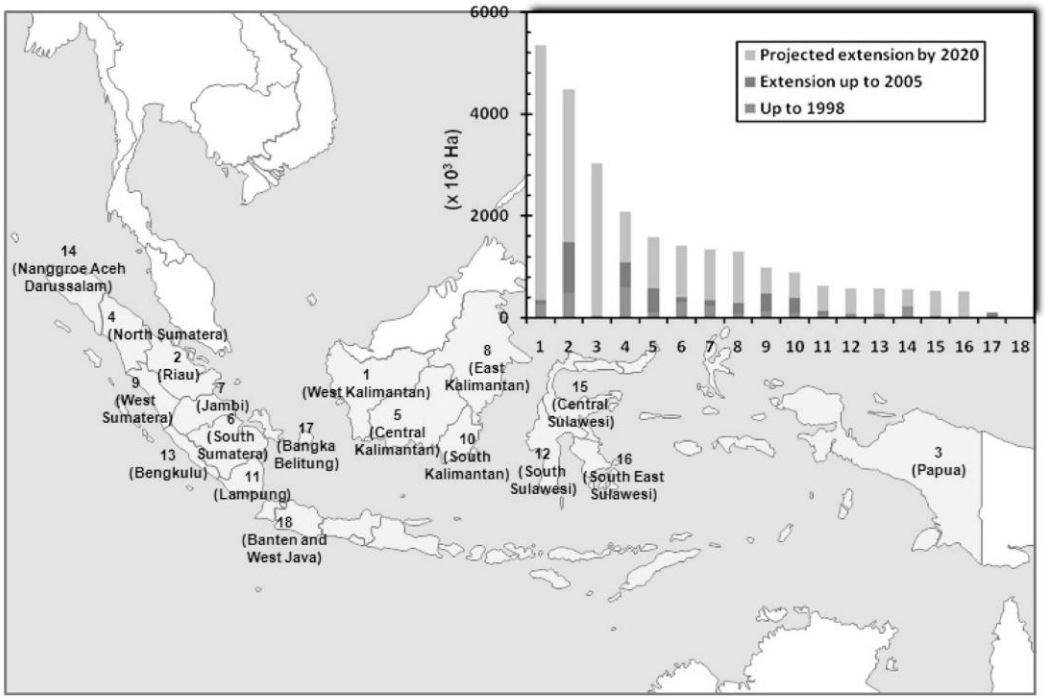
Palm oil recently surpassed soybean oil as the world's leading vegetable oil, mainly because it costs less to produce and is priced lower than alternatives.[8] Developing countries are the leading consumers, with India, China, Pakistan, and Bangladesh importing 35% of the global supply and Indonesia, Malaysia, Nigeria, and Thailand consuming 24%; by contrast, the United States imports 2% of the global supply (Boucher et al., 2011, p. 52). Palm oil is used primarily as cooking oil and in commercially processed foods such as chocolate, baked goods, ice cream, margarine, shortening, peanut butter, canned goods, and microwave meals. It is also used by the cosmetics industry (in lipstick, lotions, soaps, and creams) and chemical companies (as a lubricant and raw material), and it is a main ingredient in biofuels (Brown & Jacobson, 2005). Palm kernel meal, which is a by-product of the extraction process, is used as a supplement in animal feed (Basiron, 2007).

[7] Freshly harvested palm oil fruit must be processed within 24 hours to prevent spoilage (Boucher et al., 2011, p. 53; Santosa, 2008, p. 457).

[8] Oil palm is a high-yield crop that requires just 0.26 hectares of land to produce one ton of oil whereas soybean, sunflower, and rapeseed need 2.22, 2.00, and 1.52 hectares, respectively (MPOC, 2011).

Indonesia and Malaysia together produce 85% of the global supply of palm oil (Carter et al., 2007, p. 307) and Indonesia has been the world's leading producer since 2005 (Santosa, 2008, p. 455). Supply forecasts and growth trends indicate that the amount of land covered by palm oil plantations in Indonesia will continue to expand, especially in the Kalimantan province on Borneo (Carter et al., 2007, p. 312), driven in large part by Indonesia's growing biofuel industry. The total area of expansion is expected to be 8.90 million hectares in 2012 and reach 26.07 million hectares by 2020 (Santosa, 2008, p. 455) (see Figure 1). Palm oil expansion into peat swamp forests is compounding the damage, since clearing the land typically involves draining and burning the peatland, which increases carbon emissions exponentially (Boucher et al., 2011). Thirty five years ago an estimated 20 million hectares of peat swamp forests covered Indonesia. Between 1987 and 2000, approximately 3 million hectares were destroyed and an additional 1.04 million hectares were cleared between 2000 and 2005, mostly due to palm oil expansion (Ministry of Forestry of the Government of Indonesia, 2008, p. 47). Expansion of smallholder palm oil development also poses a threat to forests. For example, smallholders are responsible for one third of the area being cultivated for palm oil and that is expected to continue (Rist et al., 2010).

Figure 1: Extension of Oil Palm Plantation Area by Province in Indonesia



Note: Reprinted from Santosa, S. J. (2008). Palm oil boom in Indonesia: From plantation to downstream products and biodiesel. *Clean-Soil Air Water, 36*(5-6), p. 456.

Proponents of REDD+ point out that it is one of the least expensive abatement options available for reducing greenhouse gas emissions, making it an ideal solution for curbing deforestation, forest degradation, and other unsustainable land use practices (Stern, 2006, p. 217). However, some researchers suggest that the financial gains derived from unsustainable land uses may undercut REDD+ incentives. Most profitable land uses involve cutting down or degrading the quality of rainforests. For the reasons outlined above, palm oil development is anticipated to remain an ongoing threat to rainforest conservation.

Recent studies suggest that profits under REDD+ won't exceed the profitability of palm oil development. Persson and Azar (2010) predict that carbon pricing schemes will drive up the price of fossil fuels, which will end up boosting demand for lower-priced biofuels and biofuels' main ingredient: palm oil. Similarly, Butler et al. (2009) conducted a study that indicated incentives for escalated palm oil development will substantially outweigh the value of keeping forests intact. While the findings suggest that a carbon credit trading scheme would potentially mitigate the effect, they also suggest that market demand for palm oil – as well as other profitable land uses that lead to forest loss – present a potential obstacle to the implementation of REDD+. Studies such as these highlight the level of uncertainty that exists about the potential impact of commodities on carbon markets. If it turns out that REDD+ revenues don't counterbalance the economic incentives of continuing to clear forests, it could threaten to cripple or collapse REDD+ systems. This is of special concern to Indonesia, which generates a considerable portion of its revenues from the palm oil sector. For this reason, some researchers say that REDD+ systems need to take into account global trade flows and market trends. Other profitable land uses present the same dilemma. Logging, mining, and agriculture generate substantial revenue for businesses and individuals, and many are concerned that profits in those industries will exceed REDD+ revenues.

Palm oil development has also been prioritized in decisions made by the Indonesian government, which began accepting money from World Bank funding agencies for plantation development starting in 1988 and continuing through 2002

(Compliance Advisor Ombudsman, 2009, p. 15). More recently, Indonesia set the goal of becoming the world's largest supplier of palm oil for the biofuels industry. This set the stage for further expansion. On May 20, 2011, Indonesia's President, Susilo Bambang Yudhoyono, signed a two-year moratorium on new forest concessions, however, the decree excluded existing and "pre-approved" concessions, extensions of existing concessions, and national development projects, which many contend was a deliberate attempt to pave the way for continued palm oil development (Belford, 2011).[9]

The oil palm sector is also intertwined with the pulp and paper industry, which is a second major source of forest loss. Logging, timber production, and oil palm development are often concentrated within a few industrial conglomerates that are involved in all three activities (Resosudarmo, 2005). These companies have developed business practices that maximize profit, yet also maximize forest loss. It takes palm oil trees three years after being planted to produce fruit. To fill this revenue gap, producers routinely opt to clear a forested area, sell the wood, and then plant palm oil plantations on the cleared land. The money from selling the wood subsidizes plantation development in the interim period before the first palm oil harvest (Brown & Jacobson, 2005; Butler et al., 2009). Exacerbating the

[9] Forest concessions are the principle form of land tenure in Indonesia. A forest concession (also called a timber concession) is a contract, license, or permit that gives a company or an individual the right to extract trees from a defined area of forest within a given time period; it often specifies the number, type, and size of trees that may be harvested. Typically, a fee is levied by the government in exchange for awarding a concession. However, in Indonesia fees are often set far below the market price of timber or avoided entirely. In addition, monitoring and enforcement of concession restrictions are often weak or non-existent. These factors have led to overexpansion and unsustainable logging practices (Gray, 2002, pp. 4 & 8-10; Society of American Foresters, 2008). Concessions are also granted for mining and other land uses.

ecological damage, producers often clear areas of primary rainforest for plantations, since old-growth forests contain older, more valuable trees.

Intensive logging to supply demand from the pulp and paper industry is also a key contributor to deforestation and forest degradation. Some of the logging is sanctioned by the government through forest concessions; however selective logging is a common practice that involves harvesting mature, old growth trees, which leaves behind tree felling gaps, logging roads, and log decks, all of which degrade forests (Ministry of Forestry of the Republic of Indonesia, 2008). While timber smugglers account for a certain amount of illegal logging, the majority of illegal clearing is carried out by forest concessionaries and plantation developers, who engage in massive logging operations outside of their permit areas (Boucher et al., 2011; Obidzinski et al., 2007).

Most fires in tropical forests are deliberately set as a way to clear land quickly and inexpensively (Miettinen et al., 2011; Secretariat of the Convention on Biological Diversity, 2001). Forest fires have resulted in the loss of large areas of rainforest and significant emissions during years when they were numerous and severe, such as in the 1997 when they accounted for an estimated 10% of global fossil fuel emissions (Page et al., 2002). Other contributors include locally-gathered fuel wood and overgrazing by livestock. Agriculture from smallerholder development is another growing source of forest clearance, although to a lesser extent in Indonesia than in other tropical rainforest countries, such as Brazil, where agriculture is a main driver of forest loss. In addition to the loss of trees and vegetation, when forests are converted to cropland as much as 30-40% of the

top 30 centimeters of organic soil can be lost in the first five years (GOFC-GOLD, 2009, p. 55). Urbanization and rural population declines have also contributed to deforestation, largely due to the effects of increasing the distance between where food is produced and where it is consumed (Boucher et al., 2011, p. 12). Finally, natural disturbances such as tropical storms, flooding, droughts, and attacks by pests and insects exacerbate human-caused forest loss and degradation.

Quantifying the extent to which any single activity is responsible for deforestation and forest degradation is difficult due to a lack of comprehensive data, but cumulatively these activities have a wide range of social, economic, and environmental implications. There are clear links between forest loss and the extinction of species. Advances in science and medicine are often dependent on the discovery of new plants and animals that are found only in tropical rainforests. Fewer forests also erode the opportunity for indigenous groups to practice cultural and spiritual traditions, which leads to the loss of traditional knowledge. On a global scale, rainforests play a crucial role in the climate and carbon cycles; ongoing deforestation and forest degradation threatens to disrupt those ecological processes. Understanding the causes and consequences of forest loss is a useful backdrop for the complexities and challenges of REDD+ that are discussed in subsequent chapters. It also offers insight into the factors that are likely to influence decision making in a future REDD+ regime.

Chapter 3: Literature Review

While there is significant global support for a REDD+ mechanism, there is also considerable debate about the best way to develop and execute REDD+ within individual countries, which is partly why governments have not yet reached consensus on an international climate change treaty. The literature review focuses on the challenges that have been identified for implementing REDD+ in Indonesia. It includes a thorough examination of relevant books and academic journals, along with a review of reports, papers, and articles produced by scholars, scientists, governments, intergovernmental organizations, and non-governmental organizations. The challenges represent a constellation of complex, inter-related issues that have received considerable attention in the international community, as well as within Indonesia.

Indonesia is divided into 26 provinces, 341 districts, 4,044 sub-districts, and 69,065 villages, and has more than 300 ethnic groups (Suryahadi & Sumarto, 2010, p. 46). With a total population of approximately 235 million (Population Reference Bureau, 2011), there are significant socio-economic variations across regions and demographic groups. The country has a tumultuous history due to decades of authoritarian rule that led to social inequality, corruption at all levels of government, economic instability, poverty, military clashes, and political unrest. These challenges were compounded by the Asian economic crisis, which created widespread unemployment and triggered a series of political reforms that began with the fall of the Suharto regime in 1998. A massive reform effort was

launched in 1999 that aimed to shift the power of the central government to provinces, districts, and sub-districts. The process was referred to as *reformasi* and resulted in series of decentralization laws meant to empower local citizens (Resosudarmo, 2005).

The history of decentralization – which reflects a triumph against the concentration of power among elite politicians and corrupt power brokers – offers a useful context for understanding why local and indigenous groups may be reticent about a centralized forest carbon monitoring program. The growing demand for equitable distribution of forest benefits was a key aspect of *reformasi* (Resosudarmo, 2005). While laws were passed during *reformasi* that gave local and indigenous communities greater access to forest resources, the forestry sector remained under the domain of the state. In addition, unclear, complicated, and overlapping regulations have led to ambiguities regarding forest governance (Barr et al., 2006; Caldecott et al., 2011; World Bank Group, 2009). For example, the Ministries of Forestry, Agriculture, Defense, and Public Works, and the National Land Agency all have separate planning procedures for forest areas. Meanwhile, parks are managed by provincial and local authorities. This has led to a wide array of different land use practices, confusion about jurisdictions, and conflicting views on forest administration. For example, Henley (2008) claims that illicit deforestation within protected forests is an on-going problem, giving the example of an area in Central Sulawesi in 1999 in which local villagers living on the borders of a park were given permission to plant traditional, sustainable crops; instead they planted cocoa, a lucrative export crop. This is just one type of

example critics point to when highlighting the negative effects of decentralization and the unintended consequences of abandoning a centralized legal and institutional framework for forest management.

The ambiguities associated with forest administration extend to land ownership and property rights (also known as land tenure). Indonesia doesn't have a strong tradition of private land ownership; securing legal property rights is a complicated process that typically involves expensive bribes to government officials. Instead, land (including forests) has traditionally been managed according to customary law (*adat*) in which usage rights are granted to individuals (for farming and land cultivation) or the community; land is not typically bought, sold, or titled. Although *adat* usage rights are recognized by Indonesia's 1967 forestry law, the central government legally owns the forests and can grant usage rights to other entities, including corporations (Collins, 2007).[10] The decentralization laws placed more power over forests at the sub-national level, but a distinction was not made between rights and ownership. A system in which rights and ownership are not clearly defined presents a significant barrier to compensation schemes that form the basis of REDD+, which is designed to pay land owners to preserve forests (Koh & Ghazoul, 2010). In the absence of land tenure reforms, some worry that the government will fail to distribute REDD+ revenues equitably (Lawlor et al., 2010). Others have expressed concern that

[10] Prior to 1967, most of Indonesia's forests were controlled and managed by forest dwellers. The 1967 Basic Forestry Law placed all forests under the authority of the central government. Local governments gained greater management responsibilities under a new forestry law created under *reformasi* in 1999 (and revised in 2004), but the central government still owns the forests and manages all conservation (Resosudarmo, 2005).

concessionaires and industry will be the primary beneficiaries or that government officials will be bribed to overlook regulatory violations (Steni, 2010, p. 10). In 2010 Indonesia began the process of developing a national regulatory framework that would "clarify the roles of land owners, investors, and local and national government bodies" when it comes to carbon rights and land tenure, but most recommend against putting REDD+ on hold until land ownership issues are clarified (FCPF, 2010b, pp. 20-21).

Fears of corruption compound concerns about ambiguous property rights and weak governance. Corruption at all levels of government has been identified as a barrier to REDD+ and a limiting factor in its implementation. Indonesia has a long history of rampant bureaucratic corruption that began during the Dutch colonial period, extended through the Suharto regime, and continues to this day. A prime example is the Reforestation Fund, which was established in 1989. Financed with timber concession taxes, the fund generated more than US $5.8 billion over the past twenty years that was intended to be used exclusively for reforestation activities and rehabilitation of degraded land (Barr et al., 2010, pp. 19 & 22). However, the government routinely dispersed money to projects unrelated to forestry, gave grants and loans to commercial plantation enterprises, misappropriated funds, and engaged in a series of accounting inconsistencies. This fueled skepticism of large government-run forest programs and reinforced concerns that REDD+ will repeat this pattern of corruption.

While past anti-corruption measures have proven to be relatively ineffective, there is evidence that an agency created in 2003 (called the

Corruption Eradication Commission) is helping to scale back corruption (Barr et al., 2010; Bolongaita, 2010). To date the Commission has won all the cases it has prosecuted, resulting in the convictions of more than 100 high-level officials in all branches and sectors of government, including "members of parliament, heads and senior officials of key agencies (i.e., [sic] the Central Bank, the Election Commission, the Competition Commission, etc.), governors and mayors, officials from the National Police (including a former Chief of Police), the Attorney-General's office, ambassadors and top officials of ministries (including one Minister), and, most notably, the father-in-law of the President's son, a former Deputy Governor of the Central Bank" (Bolongaita, 2010, p. 10). The Commission's successes have been attributed to the agency's unprecedented investigative and prosecutorial powers, including the ability to conduct wiretaps, examine bank accounts and tax records, freeze assets, issue hold orders, and arrest suspects (Barr et al., 2010; Bolongaita, 2010). The success of this commission suggests that steady progress is being made in the effort to eliminate government corruption.

In November 2010, a major report was released that identified corruption risks that would be present during REDD+. The report outlined a series of recommendations to address the problems, including establishing multi-stakeholder decision making and monitoring mechanisms; conducting participatory corruption risk assessments; and strengthening reporting mechanisms (Thorpe & Ogle, 2010). Recent multi-stakeholder anti-corruption workshops and a series of newly released anti-corruption studies have also

reinforced the importance of building anti-corruption mechanisms into the REDD+ framework (UN-REDD, 2011, p. 7). It seems that collectively these initiatives have increased public confidence in anti-corruption measures and helped shift the prevailing assumption that anti-corruption efforts are weak and ineffective.

Fear of the combined effects of corruption, tenuous governance, and land tenure issues has fueled concerns by local citizens that they will be excluded from REDD+ funding schemes. In theory, the government would implement a mechanism for ensuring money was channeled to citizens – such as cash payments to households – but without a concrete plan there is uncertainty about how citizens will benefit from REDD+. In a recent interview, Frances Seymour, the Director General of the Center for International Forestry Research, confirmed that this is a valid concern. "Concession models and investment in community infrastructure such as clinics and schools are being planned, rather than cash payments," she said. "As far as I know, none of the REDD projects in Indonesia have got to the stage of transferring funds to the local level" (Askham, 2011, p. 21). Convincing rural and indigenous communities that they will benefit financially from REDD+ is crucial to community engagement, which was identified as a high priority for REDD+.

Most developing countries lack the technical and administrative capacity to carry out REDD+. One of the biggest challenges is building stakeholder capacity quickly and effectively. There is disagreement about the best way to engage local communities and indigenous groups. Phelps et al. (2010) argue that

REDD+ will re-centralize forest governance and shut locals out of the process. They advocate giving local communities full autonomy and decision making authority, including the ability to negotiate revenue sharing and opt out of participation in REDD+ programs if they wish. Thompson et al. (2011) acknowledge the challenges of involving indigenous groups in the planning process and suggest implementing a more robust consultative process for aligning the interests of all stakeholders. Others take the position that effective national forest carbon monitoring requires centralized coordination and management, particularly for the MRV process, and that it is the only feasible way to achieve the economies of scale, coordination, and standardization that are necessary to participate in a global REDD+ scheme.

In two studies, a case is made for examining best practices and lessons from past projects to determine the best approach for ensuring that REDD+ is implemented effectively, efficiently, and equitably (Blom et al., 2010; Kanowski et al., 2011). In contrast, Capelow et al. (2010) cautioned against drawing lessons from pre-REDD+ projects because the projects frequently lacked consistency and scientific rigor. Another researcher came to the same conclusion, claiming that past sub-national REDD+ projects utilized inadequate sampling techniques and inconsistent methods of data collection, which produced results that were too fragmented and inconsistent to extrapolate reliable conclusions (GOFC-GOLD, 2009, p. 21).

Some caution that the newly gained power that came with decentralization threatens to undermine support for REDD+ at the local level and foresee ongoing

institutional weaknesses and policy gaps. Achieving the transparency that is necessary for REDD+ has been highlighted as another major obstacle to its speedy implementation and suggests that further political and administrative reforms may need to take place in advance of rolling out a full-fledged MRV program. Lawlor et al. (2010) cite the need for secure land tenure, economic incentives for conservation at the local level, and opportunities for rural and indigenous groups to participate in REDD+ program design and implementation.

Another potential challenge is the costs associated with institutional and capacity-building activities that fall outside of REDD+ compensation schemes. For example, the expenses associated with the political, legal, legislative, and regulatory processes that are needed in order to implement REDD+ are often incurred by the recipient country. Other expenses that often aren't included in REDD+ payments are: guards to prevent illegal logging; relocating activities away from forests (i.e. roads, timber harvesting, hydroelectric projects, agriculture, and ranching); and carbon accounting specialists (i.e. third-party verifiers, certifiers, and lawyers) (Pagiola & Bosquet, 2009, p. 4). For countries like Indonesia, these added costs may end up being prohibitively high.

Chapter 4: Forest Carbon Monitoring

Introduction

Measurement, reporting, and verification (MRV) – commonly referred to as forest carbon monitoring – is a system of recording and evaluating the amount of carbon in forests that would otherwise be released into the atmosphere. This chapter provides a summary of the process of measuring forest carbon within the context of REDD+. It describes the key methods and techniques being used in the current REDD+ pilot programs. It also illuminates some of the potential challenges that have been highlighted by researchers, scientists, and practitioners who have worked on or been involved with REDD+ projects and policy discussions. Each of these elements offers a necessary context for the proposed FCC model, which is introduced in chapter six. The discussion starts with a brief summary of the terms, definitions, and concepts that are fundamental to understanding how MRV systems function, and concludes by highlighting the main challenges of designing and carrying out MRV.

Background

Defining what constitutes a forest is a useful starting point for describing the MRV process because it underscores the uncertainty and complexity of forest carbon accounting. Similar to deforestation and forest degradation, there is currently no clear, consistent definition of 'forest' that meets the needs and preferences of all stakeholders and nations. Under the Kyoto Protocol, the UNFCCC (2006a, p.5) currently defines a forest as:

> "...a minimum area of land of 0.05–1.0 hectare with tree crown cover (or equivalent stocking level) of more than 10–30 per cent with trees with the potential to reach a minimum height of 2–5 metres at maturity *in situ*."

This definition has provoked a great deal of debate in the context of REDD+. Critics point out that under REDD+ oil palm and timber plantations would qualify as 'forests,' potentially misrepresenting the amount of forested land and failing to slow carbon emissions (Moses, 2010; Phillips, 2010).[11] The UNFCCC currently permits flexibility with the term, allowing each country to decide on its own definition, but most agree that there will need to be more clarity in order to create a consistent REDD+ monitoring methodology (Boyle et al., 2011; Ministry of Forestry of the Republic of Indonesia, 2008). One suggestion is to develop an alternative process by which there are multiple definitions that are flexible enough meet the unique conditions of a given country, but similar enough that measurement and reporting methodologies are comparable. Experts agree that it makes sense to reconcile these issues in advance of launching REDD+.

MRV is a sequential process that is designed to record the amount of carbon in forests. The UN-REDD Programme (2009, p. 3) uses the following definitions of MRV:

> Measurement: "The process of data collection over time, providing basic datasets, including associated accuracy and precision, for the range of relevant variables. Possible data sources are field measurements, field observations, detection through remote sensing and interviews."
>
> Reporting: "The process of formal reporting of assessment results to the UNFCCC, according to predetermined formats and according to

[11] Trees in palm oil plantations reach an average height of 12-15 meters (FAO, 2001, p. 12) and provide at least 10% canopy cover, so technically they meet the UNFCCC's definition of forest.

> established standards, especially the Intergovernmental Panel on Climate Change (IPCC) Guidelines and GPG [Good Practice Guidance]."
>
> Verification: "The process of formal verification of reports, for example, the established approach to verify national communications and national inventory reports to the UNFCCC."

The model proposed in this paper is designed to carry out the measurement and reporting only. Verification is conducted by an independent entity.

Currently, the Intergovernmental Panel on Climate Change's (IPCC) Good Practice Guidelines (GPG) are expected to be used as the basis for MRV national reporting standards and methodologies (UN-REDD, 2008, p. 2). Those guidelines represent five data reporting principles: transparency, consistency, comparability, completeness, and accuracy (UNFCCC, 2006b, pp. 4-5). The GPG also contains three reporting tiers that correspond to different levels of monitoring. Tier 1 is the broadest category, drawing from default data such as estimated national or global deforestation rates and land cover maps derived from remote sensing. Tier 2 data relies on forest inventories and field data from sample plots, as well as high resolution geospatial data. It includes a much higher level of detail than Tier 1 and is the minimum standard countries are expected meet for REDD+ compliance. Tier 3 achieves the greatest level of precision by including repeated measurements of highly disaggregated carbon pools, assessments of carbon stock change, and dynamic modeling. Moving from Tier 1 to Tier 3 substantially increases the cost and complexity of monitoring, and also requires greater technical and institutional capacity (GOFC-GOLD, 2010; IPCC, 2003). The FCC model proposed in this thesis is designed to meet the requirements of both Tier 2 and Tier 3 reporting schemes.

Methods

The first step in establishing an MRV system is to develop a national forest inventory. A forest inventory is the measurement and analysis of the abundance, distribution, state, change, and trend of forest resources; data is typically gathered through systematic field sampling (Tavani et al., 2009). Developing a full inventory is an essential first step toward setting a reference level (RL), also called a reference scenario or a business-as-usual baseline, which refers to the projected amount of forest carbon emissions if there were no REDD+ interventions. A RL is calculated based on historical emission rates from deforestation and forest degradation along with the amount of carbon removals from sustainable forest management and enhancement of forest carbon stocks. To calculate emissions reductions, actual emissions are subtracted from the RL (Meridian Institute, 2011, p. 2). Once a full forest inventory has been completed, it is periodically updated (typically every 5 to 10 years) to capture incremental changes in carbon stock and inform models that predict baseline and actual scenarios (Andersson et al., 2009, p. 75; Diaz & Delaney, 2011, p. 1). An inventory is usually conducted when a REDD+ program is initiated.

In many developing countries, including Indonesia, forest inventories exist but have sizeable data gaps due to a lack of capacity and technical resources. Starting in 1989 Indonesia began developing a partial inventory, called the National Forest Inventory (NFI), which comprised ground-based data drawn from 2,725 sample plots. In 1997, the NFI began using remote sensing data (Landsat)

and conducted assessments every three years after that (in 2000, 2003, and 2006), (Scheyvens, 2010, p. 42; UN-REDD, 2009, p. 26). The NFI was recently re-named the Forest Resources Inventory System (FRIS) and integrated with the Indonesian National Carbon Accounting System (INCAS), which tracks all greenhouse gas emissions and terrestrial carbon. The integrated system is designed to improve forest monitoring, data and information management, communication and information flow, technical capacity, and the application of information into decision making. The FRIS also tracks forest productivity, yield and growth, harvesting rates, age class, species, and forest area, as well as information on deforestation, land use, and land use change. The FRIS will be used as the basis for measurement, reporting, and verification of REDD+ (Ministry of Environment of the Republic of Indonesia, 2010, chapt. 6, p. 6; UN-REDD, 2009, pp. 9-10).

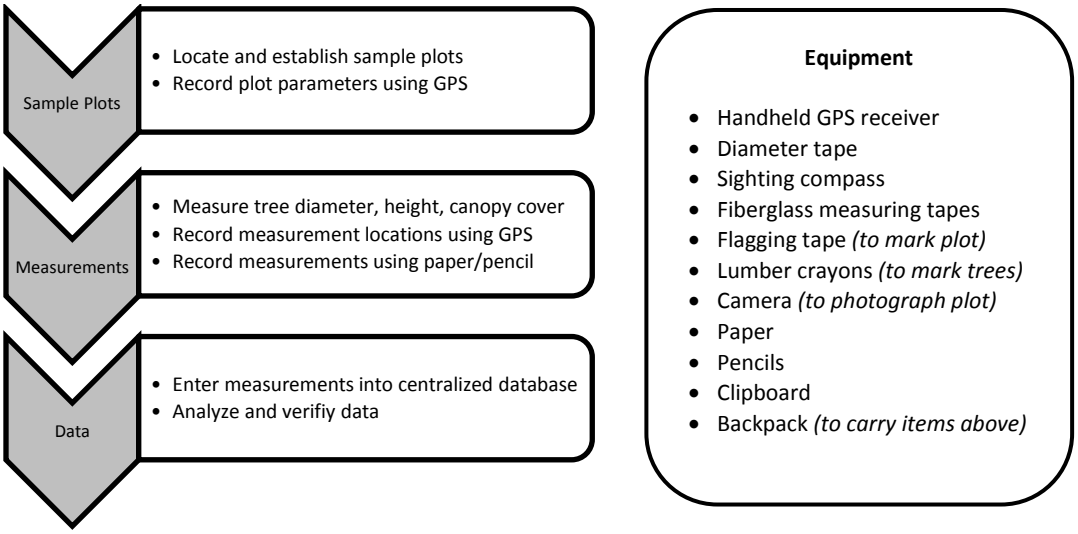
Gathering ground-based forest carbon data is a relatively simple task, although labor intensive. Accurate field measurements can be obtained with minimal training, skills, and tools. Field teams trek into the forest, establish a specified number of sample plots (delineated areas of forest), and then take a series of measurements within these plots (see Figure 3). These measurements include the diameter of individual trees, tree height, and canopy cover.[12] Often shrubs, dead wood, and litter are also counted.[13] Together these measurements

[12] Worldwide, tree diameter is one of the most commonly used measurements for estimating forest carbon (Walker et al., 2011; IPCC, 2003).

[13] Dead wood and litter refer to downed trees, standing dead trees, stumps, broken branches, and leaves (Gibbs et al., 2007, p. 2).

constitute what is known as aboveground biomass. The plot coordinates and the location of each individual measurement are recorded with a hand-held Global Positioning System (GPS) receiver[14]; the actual measurements are recorded with a pencil and paper. Similar tools and techniques are used to measure belowground biomass, which includes roots, soil, and peat (IPCC, 2003; Walker et al., 2011).[15] After the field measurements have been collected and entered into a database, mathematical conversion equations are then used to calculate the carbon content (Diaz & Delaney, 2011; Gibbs et al., 2007; Walker et al., 2011).

Figure 2: Process for Obtaining Field Measurements of Forest Carbon Stocks



Note: Figure created by thesis author based on information from Walker et al., 2011

[14] GPS is a worldwide navigation and positioning system that consists of 24 satellites orbiting the earth that work together to precisely identify a specific location (called a waypoint) using a set of coordinates (Walker et al., 2011, p. 7).

[15] Peat-swamp forests represent more than 50% of Indonesia's belowground biomass and are a major source of carbon emissions (GOFC-GOLD, 2009, p. 54). This is a main driver behind the push to adopt REDD++.

Remote sensing is the other method used to estimate forest carbon. Its main advantages are that it is a fast and efficient way to gather comprehensive data using globally consistent methodologies. The primary drawbacks are the high cost of the technologies and the technical expertise required to use the tools, which is often lacking in countries like Indonesia. In addition, forest type, density, and age cannot be captured with a degree of accuracy that is comparable to ground-based field measurements. For example, selective logging can significantly degrade the quality of an old growth forest, but if the canopy cover isn't appreciably diminished, the remote sensing is unable to pick up small differences in canopy cover or tree density. And because tree size and height is difficult to measure using standard remote sensing instruments (i.e. Landsat, MODIS, and AVHRR), young forests and old-growth forests are often indistinguishable. An added problem for Indonesia is that it is covered with clouds a major portion of the year. Remote sensing tools rely on optical data (visible and infrared light) and cloud cover prevents accurate, comprehensive readings. The resulting data gaps have led many experts to conclude that current forest cover estimates for countries like Indonesia are inaccurate and unreliable (Gibbs et al., 2007, p. 8).

Despite the difficulties estimating forest biomass using remote sensing tools, satellite and geospatial mapping technologies are rapidly advancing. Researchers are beginning to develop more sophisticated analytical techniques and capture higher resolution images. For example, to get around the problem of persistent cloud cover, researchers have begun to overlay imagery and remote

sensing data across multiple time periods, which has enabled them to develop more precise estimates of forest cover in individual countries, as well as globally (Broich et al., 2011; Saatchi et al., 2011). Given that differentiating forest type is a key factor in measuring carbon emissions, researchers have begun experimenting with newer remote sensing tools such as light detection and ranging (LiDAR) and polarized interferometric synthetic aperture radar (PolInSAR), which are able to detect differences in tree height and other variations in aboveground biomass (Goetz & Dubayah, 2011).

Even with more advanced tools, it is important to note that remote sensing by itself produces an incomplete picture of forest cover. The most powerful, accurate, and reliable remote sensing analyses integrate ground-based data, which is why forest inventories and field measurements are so important and will be needed for the foreseeable future (Broich et al., 2011; Gibbs et al., 2007). In describing the process, Goetz & Dubayah (2011) explain that ground-based data is used for both calibrating and validating spatial estimates of forest stocks derived from remote sensing readings.

Chapter 5: Civilian Conservation Corps

Introduction

The Civilian Conservation Corp (CCC) was a national service program in the United States that was developed as part of the New Deal, a series of government relief programs developed by President Franklin Delano Roosevelt between 1932 and 1945 to relieve the economic hardship caused by the Great Depression. With unemployment soaring to 13 million – which meant that a quarter of working-age adults didn't have a job – there was an urgent need for financial relief (Maher, 2005, p. 52).

By the 1930s, deforestation was also major concern in the United States. Eight hundred million acres of virgin forests once covered the continental United States, but by 1932 massive logging operations had winnowed that down to 100 million acres (Salmond, 1967, p. 4). Widespread soil erosion due to the loss of trees caused increasing land degradation, fires, droughts, and flooding, which had a detrimental impact on farm productivity, aquatic ecosystems, grassland habitats, and other natural resources. This resulted in financial losses to farmers and land holders, and rising public health costs. Roosevelt devised a solution to address both crises: provide the unemployed with jobs that conserve natural resources. His message to Congress on March 21, 1933 succinctly captured his intent: "I propose to create a civilian conservation corps to be used in simple work, not interfering with normal employment and confining itself to forestry, the prevention of soil erosion, flood control and similar projects" (Maher, 2005, p. 52). This chapter

provides a brief history of the evolution of the CCC, outlines its administrative structure, and describes aspects of the program that are relevant to the FCC model.

Background

Roosevelt never explicitly stated the origins of the ideas behind the CCC, but he alluded to three factors that gave him the idea to combine conservation and public service. First, his experiences planting trees on his family's 1,200 acre estate in Hyde Park, New York convinced him that reforestation was the key to revitalizing land (Maher, 2005, p. 53). A second influence was his involvement with the Boy Scouts. This began in 1921 and culminated in the establishment of the "Franklin D. Roosevelt Conservation Camps," in which unemployed scouts aged 15 or older worked on tree planting projects, cut fire breaks, and battled forest fires (Maher, 2005, pp. 68-69). Finally, in 1932, while governor of New York State, he developed a work relief program in which 25,000 unemployed men worked on reforestation projects and related activities in state parks and forests (Maher, 2005, pp. 51 & 70).

Scholars and commentators of the time have theorized that the original idea traces further back, to an 1906 essay written by Harvard philosopher William James titled "The Moral Equivalent of War" in which he advocated "a conscription of the whole youthful population to form for a certain number of years a part of an army enlisted against nature" as an alternative to military conscription (Maher, 2008, p. 18). Others have discerned similarities between the CCC and work relief programs in other countries. For example, by 1932

conservation camps for the unemployed had been established in Bulgaria, the Netherlands, Norway, Sweden, Denmark, Austria, and Germany. The German Labor Service's 1931 program was notably similar in form and function to the CCC: enrollment was on a voluntary basis and it provided a modest wage to young men in return for six months of service performing conservation work from a network of camps (Salmond, 1967, pp. 5-6). Although Roosevelt denied that any overseas programs influenced the evolution of the CCC and claimed not to have read James's essay, it seems plausible that those precedents influenced his thinking and perhaps offered a frame of reference for formulating the program. Though perhaps not a wholly original idea, the CCC was the first program of its kind in the United States. Roosevelt was the first to synthesize the idea of employment and conservation at a national level and it remains an enduring example of a successful large-scale government work relief program.

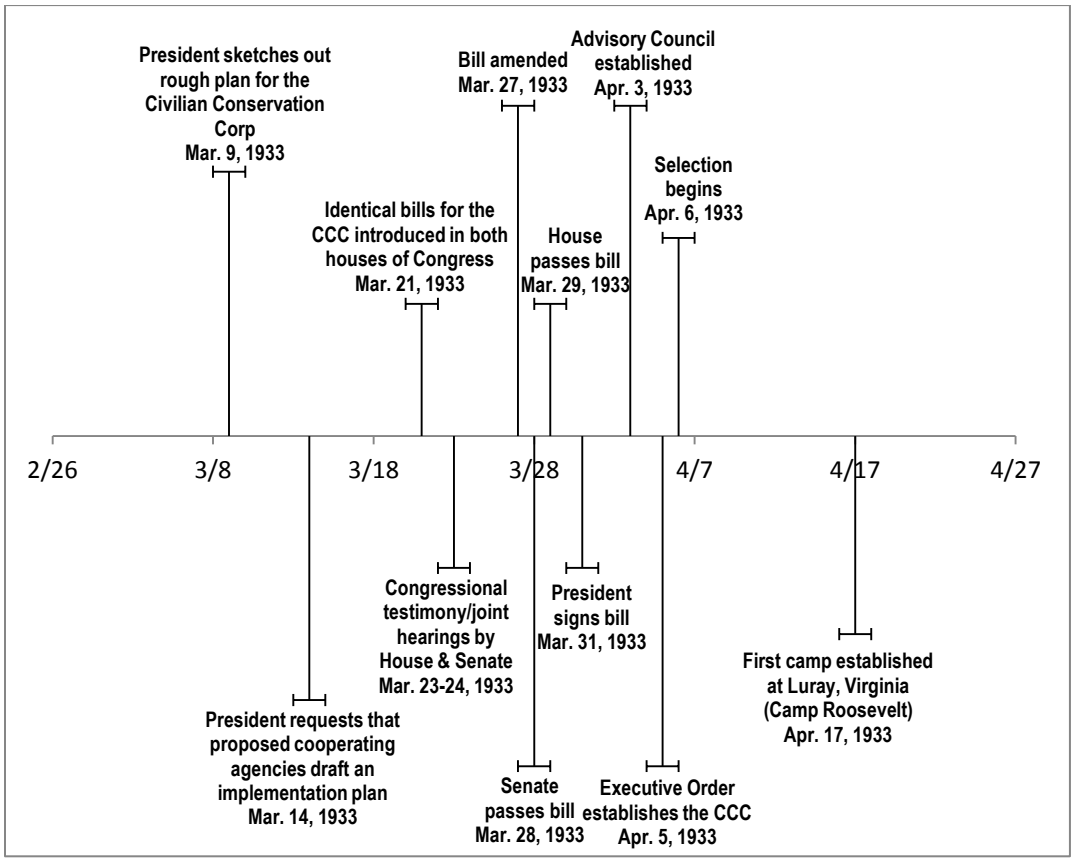
Implementation

Roosevelt sketched out a plan for the CCC on March 9, 1933 and twelve days later identical bills were introduced into Congress, which was followed by two days of testimony and debate. Less than a week later the bill passed the House and Senate and on March 29, 1933 the bill was signed by President Roosevelt. Eight days after that selection began and by April 17, 1933 the first camp – aptly named Camp Roosevelt – was established in George Washington National Forest in Luray, Virginia (Maher, 2008; Salmond, 1967) (see Figure 3).

Roosevelt's original plan was to have 250,000 enrollees plus 24,375 "local experienced men"[16] at work in the forests by early summer. Selection was complete by June 7, 1933 and by July 1, 1933 the full contingent of 274,375 men was enrolled and in camp (Salmond, 1967, pp. 40 & 45). Such rapid mobilization was made possible by swift legislative action and concerted planning among government agencies. In fact, Roosevelt was so confident his proposal would be accepted that prior to Congress's passage of the bill, he selected the agencies that would be administering the CCC and directed them to develop a preliminary implementation plan for the CCC. From conception to launch, the CCC took less than six weeks (see Figure 3). Its accelerated rollout was unprecedented and it was regarded as the "largest peacetime government labor force the United States had ever known" (Salmond, 1967, p. 45).

[16] In addition to the regular enrollees, two special groups were invited into the fold: unemployed local forestry experts (who were hired as technical assistants at Civil Service pay rates and referred to as "local experienced men") and veterans (who lived in separate camps and were given tasks suitable to their age and skill level) (Salmond, 1967, pp. 34-36).

Figure 3: Chronology of the CCC from Concept to Launch



Note: Figure created by thesis author using dates and information from Salmond, J. A. (1967). *The Civilian Conservation Corps, 1933-1942: A New Deal case study.* Durham, NC: Duke University Press.

The CCC was run cooperatively by four federal agencies: the Department of Labor, the Department of Agriculture, Department of the Interior, and the Department of War. The organizational structure and discrete administrative responsibilities of the agencies were key to its effectiveness: the Department of Labor was responsible for enrollee selection and recruitment; the Department of War enrolled the men, transported them to the camps, provided them with food, clothing, and housing, and managed the daily functioning of the camps; the Department of Agriculture selected and supervised work projects in national

forests; and the Department of the Interior selected and supervised work projects in the national and state parks. In addition, a representative from each agency served on an Advisory Council that provided guidance to the CCC director, who reported directly to Roosevelt and, together with an assistant director, oversaw overall operations for the CCC.

There were a total of nineteen six-month enrollment periods, with the first period running from April 1, 1933 to September 30, 1933 and the second from October 1, 1933 to March 31, 1934; that temporal pattern continued through the final period: April 1, 1942 to September 30, 1942 (Maher, 2008, p. 49). The distribution of camps and projects varied over the course of the CCC's nine year history, but overall 50% were under the purview of United States Forest Service (USFS) and just over 20% were supervised by the National Park Service (NPS). The remainder fell under the auspices of the Soil Conservation Service (SCS), the Soil Erosion Service (SES), the Department of War, and an assortment of government offices and bureaus (see Table 1) (Maher, 2008, p. 80). By the time the CCC ended in 1942, the program was credited with "planting more than 2 billion trees, slowing soil erosion on 40 million acres of farmland, and developing 800 new state parks" as well as "constructing more than 10,000 small reservoirs, 46,000 vehicular bridges, 13,000 miles of hiking trails, and nearly 1 million miles of fence, while simultaneously stocking America's rivers with 1 million fish and eradicating almost 400,000 predatory animals from the nation's forests, farmlands, and prairies" (Maher, 2008, pp. 43-44). The while the CCC's work

initially focused primarily on forestry, soil erosion, and flood control projects, in later years it expanded to infrastructure and recreational projects.

Table 1: CCC by Supervising Agency and Six-Month Enrollment Period

	Department of Agriculture			*Department of the Interior*				*Total*
*Enrollment Period^^*	*USFS*	*SCS*	*Other**	*NPS*	*SES*	*Other***	*War Dept.****	*Number of Camps*
1	1255	---	9	172	---	1	31	1468
2	1097	---	31	300	---	5	35	1468
3	1104	---	31	423	34	14	34	1640^
4	1095	---	29	421	51	19	25	1640
5	1434	544	127	590	---	109	108	2912
6	1157	398	95	489	---	82	101	2322
7	976	454	100	424	---	79	76	2109
8	964	456	91	422	---	79	78	2090
9	853	432	102	408	---	80	51	1926
10	639	364	83	291	---	81	41	1499
11	624	349	80	289	---	71	22	1435
12	630	355	76	306	---	132	0	1499
13	624	365	76	311	---	138	0	1514
14	614	393	7	308	---	176	0	1498
15	606	391	15	308	---	175	2	1497
16	682	318	7	308	---	174	11	1500
17	396	306	9	242	---	146	28	1127
18	183	190	7	118	---	87	41	626
19	108	112	4	89	---	37	49	399
Average % of camps	50%	18%	3%	20.5%	0%	6%	2.5%	100%

* Includes camps supervised by the Bureau of Biological Survey, Bureau of Animal Industry, Bureau of Plant Industry, and Bureau of Agricultural Engineering.
** Includes camps supervised by the Bureau of Reclamation, Fish and Wildlife Service, Grazing Service, and General Land Office, but excludes non-standard camps under the jurisdiction of the Bureau of Indian Affairs.
*** Includes camps supervised by the U.S. Army, U.S. Navy, and U.S. Corps of Engineers.
^ Expansion of camps in response to the Dust Bowl drought of the summer of 1934. Because the SCS did not exist at the time, these camps were placed under the jurisdiction of the USFS and NPS.
^^ Enrollment periods: (1) Apr 1, 1933-Sep 30, 1933 (2) Oct 1, 1933-Mar 31, 1934 (3) Apr 1, 1934-Sep 30, 1934 (4) Oct 1, 1934-Mar 31, 1935 (5) Apr 1, 1935-Sep 30, 1935 (6) Oct 1, 1935-Mar 31, 1936 (7) Apr 1, 1936-Sep 30, 1936 (8) Oct 1, 1936-Mar 31, 1937 (9) Apr 1, 1937-Sep 30, 1937 (10) Oct 1, 1937-Mar 31, 1938 (11) Apr 1, 1938-Sep 30, 1938 (12) Oct 1, 1938-Mar 31, 1939 (13) Apr 1, 1939-Sep 30, 1939 (14) Oct 1, 1939-Mar 31, 1940 (15) Apr 1, 1940-Sep 30, 1940 (16) Oct 1, 1940-Mar 31, 1941 (17) Apr 1, 1941-Sep 30, 1941 (18) Oct 1, 1941-Mar 31, 1942 (19) Apr 1, 1942-Sep 30, 1942

Note: Reprinted from Maher, Neil M. 2008. *Nature's New Deal: The Civilian Conservation Corp and the Roots of the American Environmental Movement*. New York: Oxford University Press, p. 80.

The CCC's enrollment limitations and restrictions were designed to achieve the program's main goal: providing work relief to unemployed young men. Enrollment was limited to unemployed single men between the ages of 18 and 25 who were willing to send $22-25 of their $30 monthly pay to their families, who had to be on the public relief rolls (Salmond, 1967, p. 30). It turned out that a relatively narrow segment of the unemployed population qualified to serve, which was Roosevelt's intent, since CCC was just one among a series of New Deal work relief programs. In total, the CCC employed more than 3 million men (Maher, 2008, p. 80).

A distinguishing feature of the CCC was the education program, which the president approved on November 22, 1933. Like the CCC's other program components, it was a nationwide, centrally-administered service (Salmond, 1967, p. 47). Attendance was voluntary and classes were held in the evening. Due to the wide variety of skills, backgrounds, and educational levels of enrollees, the scope of instruction varied, spanning a wide variety of academic and vocational disciplines. In the first year, just 35% of enrollees participated in classes, but two years later that figure rose to 87% and by the end of the 1930s nearly 92% of enrollees took advantage of the educational offerings (Maher, 2008, p. 90). The most popular classes focused on forestry, landscaping, and nature, which complemented the instruction they received on the job. Maher (2008, p. 91) claimed that the joint learning process fostered a new conservation ethic among enrollees, providing them with a base of knowledge about conserving timber, soil, and water resources that they would bring back to their communities.

Relevance

The CCC holds a distinguished place in American history. Nearly 80 years after its inception it is still lauded by many for its contribution to the revitalization of the country and its enduring legacy as a strong, effective national service program. One of its greatest strengths was its administrative structure, which provided the capacity for an accelerated roll-out of a highly organized workforce, making it a strong and compelling model to draw on for a forest carbon monitoring program in Indonesia. Furthermore, it is a model that features a top-down administrative structure, but a decentralized operating network that offers the potential to accommodate a work strategy that integrates stakeholders and communities. It is an ideal hybrid solution that could streamline and standardize the MRV data gathering process, along with providing education, skills, and jobs to citizens whose livelihoods will be most impacted by REDD+.

No special training or skills were required for enrollment in the CCC. Projects were designed for non-specialized workers and required minimal training. The level of skill and physical fitness required for taking plot sample measurements is in line with the projects undertaken by the CCC. As described in chapter four, the skills required to carry out ground-based forest carbon field monitoring can be provided through specialized, short-term training. While the planning and design of the overall MRV system requires the expertise of skilled professionals with advanced knowledge of MRV systems, the on-the-ground collection of field data can be done by almost anyone. Multiple studies show that local community members without former scientific training can collect accurate

data with just a few days of introductory training on methods and data gathering techniques (Danielsen et al., 2011; Fry, 2011; Holck, 2008). These same studies show that when unskilled workers take measurements the data quality is comparable to that of professionals, yet far less expensive since professionals command much higher rates of pay.

The urgent financial needs of American citizens led to the rapid formation of CCC. The urgent need to dramatically reduce deforestation and forest degradation in Indonesia calls for a similar response. Although the CCC's administrative structure will need to be adapted to meet the needs of Indonesia's current political regime and to fit within the proposed REDD+ architecture, the basic model and fundamental concept of the Corps is as viable today as it was back then. Finally, a forest carbon monitoring program that is designed like the CCC offers the potential to expand the environmental movement in Indonesia, fostering a conservation ethic among citizens that translates into sustainable development and greater national unity. The analysis in the next chapter shows how the core strengths of the CCC model would form the basis for a strong, effective, and credible forest carbon monitoring program.

Chapter 6: Qualitative Analysis and Model

Introduction

This chapter introduces the Forest Conservation Corps (FCC) model which was developed based on the results of a qualitative analysis that examined the Civilian Conservation Corp (CCC) in tandem with proposed REDD+ forest carbon monitoring systems. The FCC is an idea that was developed by me, the thesis author, as a way to solve the problem of insufficient measurement, reporting, and verification (MRV) capacity in Indonesia. To my knowledge – based on a thorough review of available sources – no one has proposed or studied the viability of a national service corps modeled after the CCC as a way to carry out forest carbon monitoring. However, others have proposed contemporary versions of Roosevelt's New Deal work relief programs. Kampelman (2005) revived the idea of a Civilian Conservation Corp, suggesting that the United States create a national, voluntary, civilian public service corps that focused on prevalent societal needs, such as public health and the environment. He suggested that participants receive a pay rate comparable to the military and benefits similar to those granted by G.I. Bill of Rights, such as two years of tuition-free higher education in exchange for two years of service or four years of education in exchange for four years of service (Kampelman, 2005, p. 1680). More recently, Barbier (2010) introduced a plan for a "Global Green New Deal" in which he proposed that nations create jobs that address global challenges such as climate change, carbon dependency, ecosystem degradation, and poverty as a way to

stimulate a global economic recovery. The FCC is a similar concept, but targeted exclusively to forest carbon monitoring and thus narrower in purpose than the proposals put forth by Kampelman and Barbier. I did, however, borrow and build on the idea of offering educational benefits as incentives, using the AmeriCorps as a primary example. The following section describes the qualitative analysis. Drawing on the results of the analysis, the CCC was used as a guiding framework to inform the development of the proposed FCC model.

Qualitative Analysis

A qualitative analysis was conducted to identify current capacity gaps in policies, systems, and resources that are needed to carry out forest carbon monitoring in Indonesia. 'Capacity' and 'capacity building' are broad terms that refer to the array of activities that are needed to provide people with the guidance, knowledge, skills, and abilities to carry out REDD+. These activities include training in remote sensing, carbon emissions monitoring, carbon stock estimation, spatial planning, and modeling (UNFCCC, 2009b). The process also includes a variety of community outreach activities to engage indigenous communities, raise awareness of REDD+, and encourage citizens to participate in monitoring initiatives. The idea is that eventually enough people will be sufficiently trained to complete all MRV activities without drawing on the resources and expertise of other countries.

For the analysis, I examined project documents that were produced for Indonesia's REDD+ pilot activities by the UN-REDD Programme (UN-REDD),

the Forest Carbon Partnership Facility (FCPF), the Indonesia-Australia Forest Carbon Partnership, and the Norway-Indonesia REDD Partnership. UN-REDD is is a collaborative initiative that was launched in 2008 to support nationally-led REDD+ processes; it builds on the convening role and technical expertise of the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP). The FCPF, a global partnership that is part of the World Bank's Carbon Finance Unit, also was launched in 2008. It provides technical assistance and funding to support national strategies and systems for REDD+ in developing countries. The Indonesia-Australia Forest Carbon Partnership was formalized in 2008 and focuses primarily on implementing three incentive-based REDD+ demonstration activities: the $30 million Kalimantan Forests and Climate Partnership, the $30 million Sumatra Forest Carbon Partnership, and a $10 million bilateral package of support for forests and climate. The Norway-Indonesia REDD Partnership, announced in 2010, plans to give $1 billion to Indonesia over the next seven years to support REDD+ initiatives (Caldecott et al., 2011). These organizations and partnerships frequently work together on REDD+ planning, preparation, and outreach activities.

As of July 2011, the exact details and parameters of REDD+ had not been established for two reasons: (1) language has been drafted in official negotiating texts that suggests REDD+ will be included in the post-Kyoto climate treaty, but the treaty has not yet been adopted, and (2) REDD+ is a new mechanism, so there is no precedent for the actions, costs, and resources that will be needed for

successful implementation. In the absence of an official REDD+ policy, the analysis focused on the actions and activities that have been prioritized and undertaken by Indonesia in support of a future national REDD+ framework.

The project documents I reviewed for the analysis included progress reports, meeting notes, workshop reports, data sheets, assessments, analyses, and official government communications (see Appendix). None of the pilot projects has a fully-implemented MRV program, so the results and outcomes thus far are very limited. Therefore, supplemental reports, academic studies, and theoretical literature were consulted as complementary resources. The goal of the analysis was to identify the current capacity gaps in Indonesia and determine the resources needed to carry out MRV. Forest carbon monitoring was mentioned in all of the documents I reviewed and capacity was determined to be lacking at both institutional and community levels. Because the projects are in the early stages, I was not able to discern the exact number of jobs, people, and materials it would take to build an MRV program. The results of the analysis suggest that additional studies and assessments need to be done to quantify the resources, funding, and personnel needed to carry out MRV. A technical paper produced by the UNFCCC (2009b) provides a detailed estimate of the costs and resources needed to establish a forest carbon monitoring program and would be a useful starting point.

A 2009 study that examined forest monitoring capacity in tropical countries found that Indonesia's weak institutional framework resulted in a "lack of technical capacity throughout the forestry sector." Researchers determined that hardware, software, and technical resources were readily accessible in Indonesia,

but coordination and integration between central institutions and local governments was missing, leaving a capacity gap that handicapped decision making. The report suggests that Indonesia strengthen its capacity "in collaboration with NGOs" and recommends increasing staffing levels, building technical skills, and re-organizing institutions. The report also points out that "up to date forest inventory data does not exist in Indonesia" and suggests that capacity be built "upon the existing network of permanent sample plots and make use of existing experiences from the project-level, where proven methodology can be transferred and used for scaling up to national level" (GOFC-GOLD, 2009, p. 45).

That same year, Indonesia and Australia submitted a joint report to the UNFCCC that outlined their progress on implementing REDD+ MRV as part of the Indonesia-Australia Forest Carbon Partnership. Similar to the GOFC-GOLD study, the team found capacities in some areas and deficits in others, stating that "Indonesia already has considerable technical expertise in establishing forest inventories, geographic information systems and remote sensing" (Indonesia & Australia, 2009, p. 3). However, they emphasize the need for Indonesia to continue building capacity at the national level to avoid "duplication of existing skills and expertise" (Indonesia & Australia, 2009, p. 3). The report describes the progress Indonesia has made toward establishing an institutional framework to "enhance coordination across government" at the national and sub-national levels, citing the creation of the National Council on Climate Change, which is underpinned by working groups in key ministries and supported by new national

REDD regulations plus a series of climate change policies and measures (Indonesia & Australia, 2009, p. 3). This again suggests that synchronization across different agencies and levels of government is needed to support REDD+ MRV.

As described in chapter four, a robust forest inventory is necessary in order to establish a reference level (RL), which is an essential pre-requisite of REDD+. A primary goal of the UN-REDD pilot program, as described in the National Programme Document (2009, p. 19), is to "improve the capacity and methodology design for a forest carbon inventory within an MRV system" that would include "improved protocols for carbon measurements at the field level" (UN-REDD, 2009, p.19). In addition, a recent safeguards assessment by the Forest Carbon Partnership Facility stated that "field-based data and sub-national readiness will be a critical component of national readiness" and emphasized the importance of conducting a time-series study of the effect of land use change on carbon stocks at the ground level (FCPF, 2011d, p. 3). A June 2011 progress report from the FCPC notes that while initial work on the development of a reference level has been completed, "no comprehensive approach is published as of yet on the REL/RL system for the national and sub-national approach" (FCPF, 2011a, p. 2). Likewise, the national independent MRV agency that is to be set up under the auspices of the Norway-Indonesia REDD+ Partnership agreement is not complete; the report states that "it is not certain how and when this will be established" (FCPF, 2011a, p.2). These reports show that ground-based field monitoring has been prioritized in REDD+ design and planning, but the most

recent progress report suggests a need for greater institutional capacity for developing MRV resources.

According to Indonesia's Second National Communication under the UNFCCC (Ministry of Environment of the Republic of Indonesia, 2010, chapt. 6, pp. 6-7), ninety-one training, public awareness and capacity building activities related to climate change were conducted in Indonesia between 2000 and 2008. The report claims that figure is most likely lower than the number of actual events, since many were not recorded by agencies and there is no system in place to record or monitor the activity outcomes. Even if the actual number were higher, the fact that Indonesia doesn't have a system in place to track these activities is another indicator that Indonesia lacks the institutional capacity and resources to facilitate inter-agency communication.

A 2010 case study of REDD+ in Indonesia highlighted the importance of transferring expertise and skills from international experts to Indonesians, and implored the government to "ensure that capacity building of Indonesian nationals is set as one objective [in demonstration projects], and that it is reflected in the timelines and activities of the projects." The report also suggests that "inclusive, transparent processes that build a sense of ownership and commitment to REDD-plus among various stakeholders are critical" (Scheyvens, 2010, pp. 2 & 48). As a model that is built around teaching workers new skills and fostering civic involvement, FCC model incorporates these principles.

Workshops at the national and sub-national levels have been used as a common capacity building tool in REDD+ initiatives. In 2010, the Forest Carbon

Partnership Facility financed a communications and outreach program for Indonesia and part of the plan included a series of MRV workshops. Leading government agencies – including the National Development Planning Agency (Bappenas), the Ministry of Forestry, and the National Council on Climate Change (DNPI) – arranged consultative workshops with other national agencies, local provincial governments, private companies, civil society groups, local communities, universities, and research institutions (FCPF, 2010a). The same strategy is planned for the strategic environmental and social assessment, which is scheduled to begin in September 2011. The workshops will take the form of consultative meetings that cover a wide range of issues, including MRV. Leaders will present preliminary findings to stakeholders to stimulate discussion, after which comments will be recorded and incorporated into a draft report (FCPF, 2011b). This form of transparent, participatory engagement has been consistently identified as a key component of capacity building.

Indonesia's Readiness Preparation Proposal (R-PP) (FCPF, 2011c, pp. 11, 17 & 79-81) shows that substantial funds have been dedicated to MRV activities and capacity building initiatives. For example, an estimated $18 million was allocated for capacity building, including $264,500 for training of trainers on carbon accounting and monitoring (ground and spatial data analysis) at the national and sub-national levels in East Kalimantan, South Kalimantan, Maluku, Nanggroe Aceh Darussalam, West Papua, East Java, and South Sumatra. The proposal also lists a long schedule of workshops, public consultations, focus group meetings, policy dialogues, consultations, stakeholder analyses, and peer

reviews that are intended to engage indigenous communities, *adat* communities, private companies, local governments, and other stakeholders.

Capacity building for MRV was a key element in each pilot project. A thorough review of FCPC and UN-REDD Programme project documents shows that Indonesia has not reached the stage where it has determined the exact resources that will be needed to carry out a national MRV program. While the project development strategies were evident, there were very few specific outcomes noted. Words and phrases were often repeated across documents, but the language centered on design and planning, rather than results. It was also difficult to quantify the resources needed to carry out the different project components. The missing pieces were most likely due to the fact that the programs are still in the planning and implementation phases. Rigorous project evaluations and outcome assessments take time to complete. Also, while a number of smaller REDD pilot projects that have been undertaken in the past few years by NGOs and private companies at the sub-national level, REDD+ at the national level is still a new and untested model. However, this made it challenging to identify project constraints or determine what constitutes "best practice" in the current paradigm. The lack of specificity suggests a high level of uncertainty with national MRV planning, which indicates this might be the ideal time to put forth a new model.

The document review also suggests that more alliances and partnerships between the government and local communities, and across government agencies, would help build capacity for REDD+. The MRV project needs that were listed

indicate that a concerted effort is required in order to deliver results on the scale and scope required for REDD+ compliance. This calls for a model that is structured enough to support a large-scale MRV program, but flexible enough to engage different stakeholders and communities.

There are three key ways that the FCC model will achieve the dual goal of building capacity for MRV and carrying out MRV: (1) it is designed to be implemented on a national scale (2) it will offer training, education incentives, and jobs to low-income rural residents and indigenous communities, which will facilitate community engagement and channel money to those most impacted by REDD+ (3) it will be efficient and cost-effective, while complying with international reporting requirements.

Model

Currently, the government of Indonesia owns approximately 91% of the forests in Indonesia and the Ministry of Forestry is responsible for managing nearly all the country's 134 million hectares of forested land, which cover 74% of its land surface (World Bank, 2011, p. 20). It seems improbable that the land tenure and governance issues described in the literature review will be resolved prior to the adoption and implementation of a national REDD+ scheme. But, within the current land tenure regime, a government program modeled after the CCC would be an effective way to carry out forest carbon monitoring.

Selecting a data collection strategy is a useful first step toward developing an MRV model. Danielsen et al. (2008 & 2010) developed a typology that categorized monitoring protocols based on the level of involvement of local

stakeholder and professional researchers (see Table 2). The results of the qualitative analysis suggest that category 2 offers a number of advantages over data collection approaches that are primarily or exclusively bottom-up strategies. First, a category 2 design would support a streamlined process which ensures that measurement and monitoring is carried out uniformly and consistently. Thousands of data collectors would be supported by a professional staff that operates within a highly organized administrative structure, leading to greater efficiency. Second, a system based on category 2 is likely to produce results that most closely match the REDD+ MRV reporting requirements. Like the IPCC reporting tiers, the accuracy and precision of data collection varies among categories. A system that requires a high level of professional involvement would arguably produce data that is more accurate, consistent, and reliable than a bottom-up, community-based system. Third, a category 2 approach would help to build capacity for ongoing monitoring and conservation initiatives. For example, Danielsen et al. (2008 & 2010) note that category 2 schemes are the most likely to improve the capacity of participants, help change attitudes of local community members, and facilitate collaboration between the national government and local communities.

Table 2: Types of Monitoring Approaches

Category	Main Characteristics
1. Externally driven professional-researcher executed monitoring	All stages of design, data collection, date analysis (off-site), and decision making undertaken by professional researchers. High degree of accuracy and precision; no local involvement. *Examples: forest inventory plots; remote sensing of forest cover; water-quality monitoring; water-flow assessments*
2. Externally driven monitoring executed with local paid employees	Design, data analysis (off-site), and decision making undertaken by professional researchers; data collection carried out by professional researchers and local paid employees (hundreds or thousands). *Examples: monitoring of air/water-quality, vegetation, weather, bird populations, invasive species, commercially exploited wildlife*
3. Collaborative monitoring with external data interpretation	Design, data analysis (off-site), and decision making undertaken by professional researchers; data collection carried out locally with professional advice/training. *Examples: wetlands monitoring; bird counts; bicycle transects of large mammals; species monitoring by hunters*
4. Collaborative monitoring with local data interpretation	Design undertaken by professional researchers; data collection, data analysis (on-site), and decision making carried out locally with professional advice/training. *Examples: nature reserve and wildlife monitoring by rangers, amateur naturalists, and volunteer wardens*
5. Autonomous local monitoring	All stages of design, data collection, data analysis, and decision making undertaken locally. *Examples: species monitoring by fishing and hunting clubs; natural resource monitoring by indigenous groups*

*Note:*Adapted from Danielsen et al., 2008 & 2010.

There are approximately 32 million people living below the poverty line in Indonesia (Kimura, 2011, p. 192). While overall national economic growth is strong and incomes are gradually rising, the country has prioritized reducing unemployment and underemployment (Ministry of Environment, Republic of Indonesia, 2010; Republic of Indonesia & United Nations, 2010). As of 2010, the unemployment rate was 7.41% and the country is aiming to bring the rate down to 5-6% by 2014 to meet the United Nations Millennium Development Goals (Ministry of National Development Planning & National Development Planning Agency (Bappenas), 2010, p. 23). An MRV program that centers on providing jobs to rural residents and indigenous groups would offer significant

socioeconomic benefits, including helping to raise their standard of living. In the FCC model, enrollment would be limited to unemployed citizens living in rural areas, either in or near forests, and below the poverty income level, or they would be a member of an indigenous group. In this way, a portion of REDD+ revenues (in the form of jobs) would be given to that segment of society most impacted by the financial losses associated with not engaging in profitable activities that destroy forests. Unlike the CCC, which kept wages at a minimal level so as not to compete with the private sector, the FCC would set wages high enough to incentivize participation and draw people away from sectors that clear forested land.

Work relief programs are not a new concept in Indonesia. A small-scale employment creation program, called the *padat karya* (labor intensive), was created to assist the workers who were laid-off from their jobs following the 1998/99 economic crisis. It was a set of sixteen different programs that channeled funds to ongoing investment and infrastructure projects, block grants to support public works projects in local communities, special work projects undertaken by sectoral ministries (such as forestry), and "food for work" activities (Sumarto et al., 2010, p. 115). One major weakness was that the programs were not well coordinated, but the biggest complaint was that these programs didn't help the poor. Sumarto et al. (2010, p. 128) attribute this to the lack of enrollment restrictions combined with the relatively high compensation received by participants (the daily wage was Rp 6,073, which was comparable to the Rp 6,350 daily wage for a worker in the food crop sector). More recently, Indonesia

committed to design and implement a broader program, called the National Employment Guarantee Program (NEGP), which aims to provide jobs to the poor in rural areas for three months a year. The central government would provide the majority of the financing and program delivery would take place at the district level under the guidance of a national council (Islam & Chowdhury 2010, p. 161; National Planning Agency & ILO, 2005). With the right combination of incentives and qualifying restrictions, the FCC would be a valuable addition to Indonesia's suite of social safety net programs.

According to Islam and Chowdhury (2010, p. 162), available evidence suggests that 87% of Indonesia's poor have primary education or less. It has been shown that higher levels of education correlate with higher wages, higher labor productivity, and lower rates of poverty. For these reasons, an educational benefit would be offered in exchange for serving in the FCC. Similar to the AmeriCorps – a national service program in the United States that provides educational benefits in exchange for a year of service – the benefit could take the form of tuition remission for either vocational or academic classes, or be used to pay down an educational loan. Alternatively, enrollees unwilling or unable to use the educational benefit could receive an equivalent cash payment. The income and educational opportunities provided by the FCC would support Indonesia's larger goal of creating an educated, adaptable, and skilled workforce.

The administrative structure of the FCC would resemble the CCC, with key government agencies taking on administrative roles in the MRV process. The FCC would be overseen by the director who would report to the head of the

independent MRV agency. A representative from each of the agencies would serve on an advisory council that guides the decisions of the director. The Ministry of Forestry and the National Council on Climate Change would jointly coordinate the MRV process, with the Ministry of Forestry overseeing all field operations and the National Council on Climate Change taking the lead on implementation planning in consultation with the REDD Council.[17,18] The Department of Labor would manage and execute all selection and recruitment activities (see Figure 4). Participants would be recruited from areas closest to the sampling sites and would live at the camps while enrolled in the program, which would be cost-effective and logistically efficient. While the military operated the CCC camps, research suggests that this part of the model may not work well for Indonesia. Political instability and an extended history of clashes between citizens and the armed forces mean that a military presence may be perceived as suspicious or threatening. Instead, the Ministry of Home Affairs could establish and operate the camps, drawing on a network of local non-profits and businesses to deliver the services needed to run the camps on a daily basis. The first step would be to develop a database of willing participants. A government representative would partner with local non-governmental organizations and

[17] The National Council on Climate Change was established in 2008 to advise and oversee the implementation of climate change mitigation and adaptation policies. It comprises six working groups to address issues of adaptation, mitigation, technology transfer, finance, forestry, and post-Kyoto mechanisms (UN-REDD, 2009, p. 10)

[18] The REDD Council was established in accordance with the Norway-Indonesia REDD Partnership, which stipulated the creation of a special agency dedicated to coordinating REDD+ implementation; the same agreement requires that Indonesia establish an independent MRV body that reports directly to Indonesia's President (Simamora, 2010)

businesses to provide a particular service. There are multiple advantages to be gained from this approach, including supporting local enterprises; involving as many local stakeholders as possible in the REDD+ process; providing professional and personal networking opportunities for local residents; and building nationwide capacity for MRV.

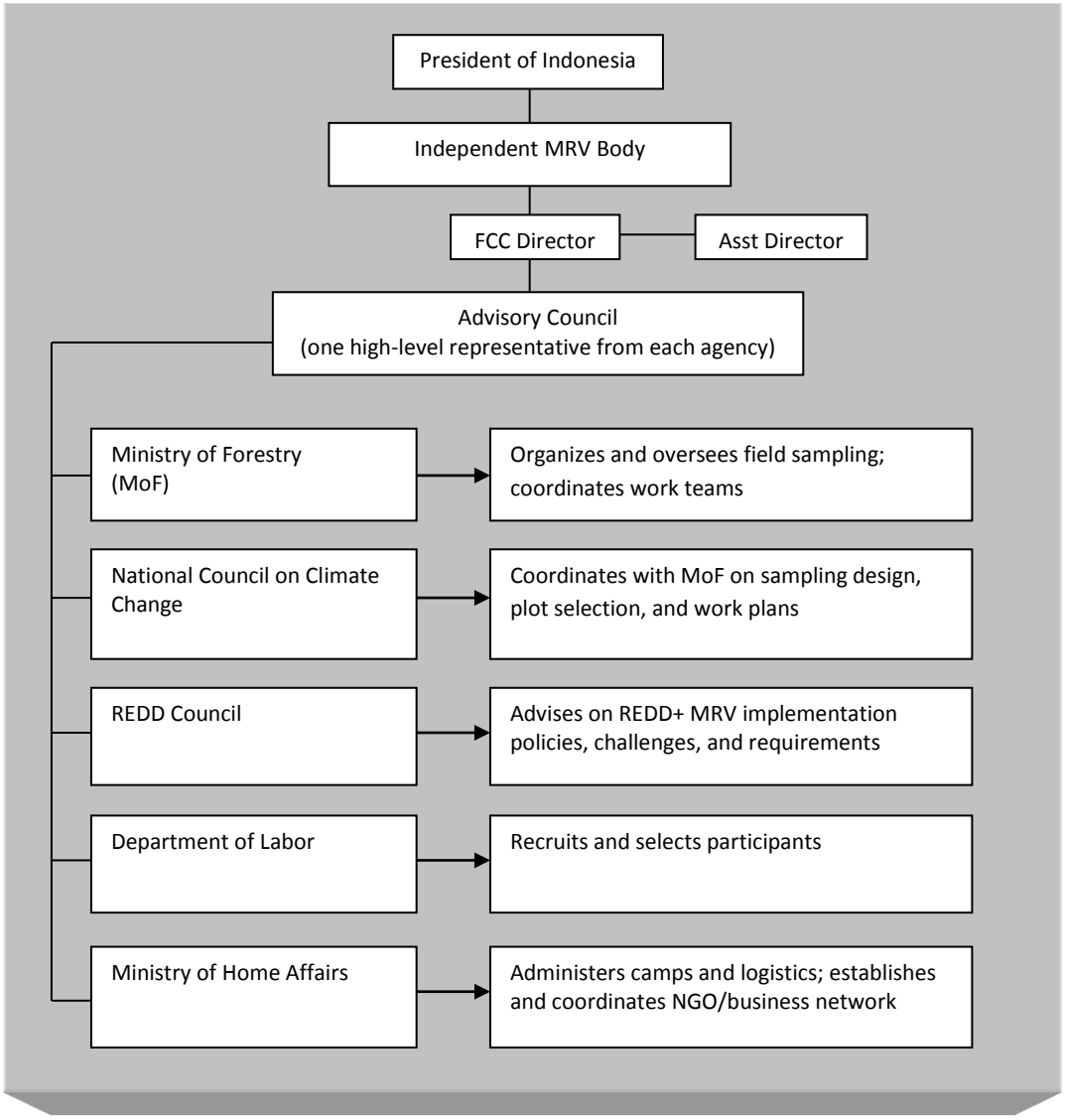
The project documents that were reviewed as part of the qualitative analysis did not identify the staff or agencies that would deliver MRV technical and field training. In the FCC model, the trainers would be drawn from a network of international experts and as many local experts from within Indonesia as possible, including staff from universities. Similar to the NGO/business network, a database of MRV experts could be created and they would work on a contract basis.

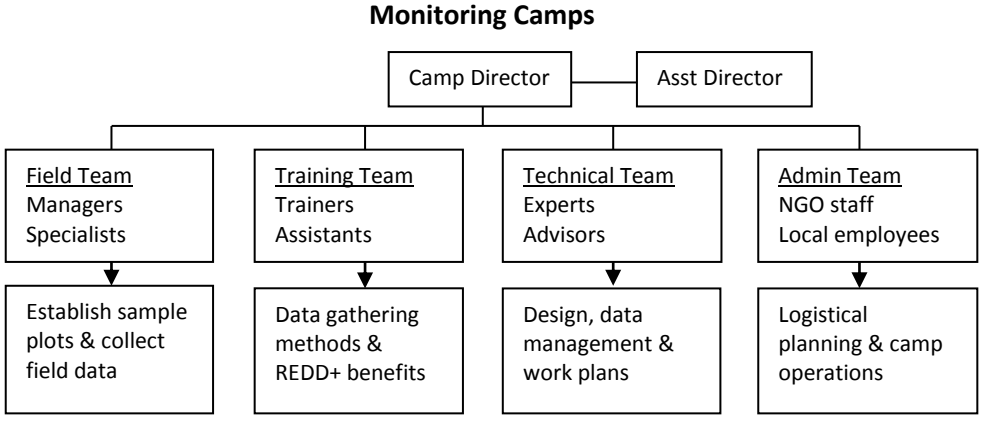
Given the ongoing reporting needs of REDD+, including periodic updates to the national forest inventory and monitoring of specific projects, the plan would be for the FCC to be established as a permanent government agency. The CCC was a temporary agency and during its nine-year history the distribution of projects and number of enrollees fluctuated widely. The growth and longevity of the FCC would be dependent on future monitoring needs. The FCC could be scaled up or down based on the reporting needs at any given time, with the activity level based on MRV reporting cycles. Initially there would be a need for a substantial number of jobs, which would diminish once baselines are established, capacity grows, systems become more efficient, and technological advances lessen the need for intensive field monitoring. However, as noted in chapter four,

there will most likely always be a certain amount of field sampling that will be needed in order to determine whether REDD+ interventions are working as planned and actually reducing carbon emissions.

While the FCC alone is unlikely to offer sufficient incentives to outweigh the financial advantages of participating in activities that cause deforestation, in combination with other REDD+ program components, regulatory reforms, and economic incentives, it offers the potential to be a highly effective conservation initiative. Furthermore, citizen participation in the measurement and monitoring processes has been shown to raise awareness of the importance of conservation and foster greater commitment by local communities to protect natural resources (Holck, 2008).

Figure 4: Administrative Structure of the Forest Conservation Corps





Chapter 7: Recommendations

The results of this study indicate that additional research is needed to determine the resources that would be required to develop and deploy an FCC. For example, in the absence of results of the REDD+ pilot programs, it is difficult to quantify the exact number of field staff and administrative personnel that would be needed to carry out MRV. There are also unanswered questions regarding the extent of Indonesia's technical and administrative capacity. The first step toward gauging the feasibility of the model would be to seek feedback from government representatives and stakeholders in the REDD+ planning process in Indonesia. I recommend developing a survey or conducting a series of interviews that are designed to identify the actual and perceived advantages and disadvantages of an FCC. If the results suggested that there would be no major impediments, I would suggest convening a high-level exploratory committee to examine the model and make recommendations about the best way to integrate it into current REDD+ design and planning discussions. Following that, I would recommend commissioning a formal feasibility study.

A number of interim steps could be taken that could inform the results of the survey, interviews, exploratory committee, and feasibility study. A team of researchers and practitioners could begin to map out the cost, resource, personnel, and logistical requirements of an FCC. They could start by identifying existing research stations, ranger camps, and other pre-existing structures that could be used as monitoring sites. They could then calculate the number of sample plots

(both temporary and permanent) that would be needed to develop a comprehensive and accurate assessment of forest inventory and create a map of potential locations, which could then be overlaid onto the map of pre-existing monitoring sites. From this, the team could start to evaluate the number of new sites that would need to be created, and begin to assess the cost and feasibility of creating a network of monitoring camps.

It would also be necessary to examine the administrative and logistical requirements of a full-service camp network. This would potentially involve determining the number of vehicles that would be required for transport, as well as calculating the material costs of constructing, supplying, and staffing the camps. This would include looking at the most sustainable options available, such as purchasing from local businesses and 'green' suppliers. Speed, efficiency, and cost are key considerations, so performing cost-benefit analyses would be an important part of the assessment. That would include estimating the cost per enrollee as well as the short-term and long-term program costs.

In order to ensure that the program draws enrollees from the preferred demographic group, I recommend performing an analysis that shows the areas where unemployment is concentrated and then examining the results of the analysis against the monitoring site overlay maps. An accompanying economic analysis could determine how high the pay rate would have to be to recruit participants. It would also be important to estimate the length of time and number of personnel it would take to measure a sample plot. For example, for a plot that is 'X' size, would it take three days with five people, or ten days with two people?

This process could be conducted with varying iterations and combinations of staffing levels and plot sizes until there are several scenarios that can be used as the basis for designing an implementation plan. A similar exercise could be conducted to determine the administrative staffing levels of the camps. Workers would be recruited from towns, villages, and communities closest to the sampling sites, so it may be useful to examine demographic data to see whether population concentrations match the anticipated employment needs. Finally, I suggest consulting with the Indonesia's labor department about potential synergies with current work relief programs, such as the National Employment Guarantee Program. It would also be worthwhile to examine potential roles for local forest managers and other conservation professionals.

As described in chapter six, the FCC model is not designed to involve local citizens or program enrollees in data analysis or decision making. This could alienate some communities or stakeholders who want a greater role in MRV or who fear government corruption. To mitigate this effect, I recommend consulting local stakeholders during the MRV design phase, which will be one of the most challenging aspects of the project and will need to be completed prior to the roll-out of the FCC camps. During the design phase, it might be worthwhile to examine whether there are monitoring needs outside the context of REDD+ that could be performed in tandem with forest carbon monitoring. For example, water testing, plant surveys, species monitoring, or other natural resource data collection.

Chapter 8: Conclusion

Preventing tropical deforestation is a monumental endeavor that requires a multi-faceted and concerted approach by all nations. As evidenced by the high priority that REDD+ has received in climate treaty negotiations, it appears likely that it will become part of the successor to the Kyoto Protocol. Forest carbon monitoring is regarded as one of the most challenging aspects of REDD+ due to the limited technical, administrative, and financial capacity of most developing countries. Creating national REDD+ MRV systems that are fully compliant with international reporting standards will require unprecedented levels of cooperation, both between nations and at the sub-national level within individual countries.

As a country experiencing high rates of deforestation and forest degradation, Indonesia has taken a leading role in global REDD+ initiatives. It hosts more than 30 different REDD+ pilot projects, ranging from small demonstration projects sponsored by private companies and non-profit organizations to multi-million dollar partnerships with other nations. These initiatives have spawned numerous scientific studies, theoretical assessments, policy reports, and field experiments that have helped lay the groundwork for a successful launch of REDD+. They have also provided insight into the challenges and obstacles of developing and implementing a national REDD+ MRV system.

From the adopting the world's first laws related to REDD+ to enacting a two-year ban on new forest concessions, the Indonesian government has shown that it is willing and able to take unprecedented actions to conserve its rainforests.

This willingness to chart new territory suggests that now is an ideal time to consider a new approach to forest carbon monitoring. The Forest Conservation Corps (FCC) model offers a potent way to carry out MRV in Indonesia. If implemented as proposed, it will fulfill the projected REDD+ MRV reporting requirements, plus provide substantial socioeconomic benefits to poor and indigenous groups in rural areas. Although I expect the model would need to be further refined and adapted to fit Indonesia's political regime as well as any logistical constraints that exist at the time of implementation, the results of the qualitative analysis suggest that it offers a solid framework for an effective MRV program.

The FCC model proposed in this thesis – which is based on the Civilian Conservation Corp, a national work relief program in the United States that lasted from 1933-42 and focused on natural resource conservation – is designed to optimize the involvement of local communities and indigenous groups in forest carbon monitoring, helping to close the capacity gap identified in the qualitative analysis of REDD+ project documents. The main advantage of this model over other models is that it will maximize efficiency and minimize costs, enabling timely, accurate, consistent, and reliable forest carbon monitoring. Although the FCC was developed specifically for Indonesia, it offers potential ideas and solutions for other countries looking for innovative ways to build effective and efficient MRV systems. My hope is that the FCC concept will generate further research into the topic and stimulate stakeholder discussions that explore ways for carrying the idea forward.

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Appendix: List of Reports

List of Reports Used for Qualitative Analysis

Forest Carbon Partnership Facility	
Country Progress Sheet	Jun 2011
Terms of Reference: Strategic Environmental and Social Assessment	May 2011
Integrated Safeguards Data Sheet	Feb 2011
Readiness Preparation Proposal Assessment Note	Feb 2011
Draft Communication Outreach Program for Readiness Activities	Jun 2010
Readiness Preparation Proposal (R-PP)	May 2009

UN-REDD Programme	
Signed National Programme Document	Dec 2010

Indonesia-Australia Forest Carbon Partnership	
Joint submission to UNFCCC on MRV for REDD+	Aug 2009

Norway-Indonesia REDD Partnership	
First Evaluation of Deliverables	May 2011

Other	
Indonesia Second National Communication under the United Nations Framework Convention on Climate Change	Nov 2010
Developing National REDD-plus Systems: Progress, Challenges, and Ways Forward: Indonesia and Vietnam Country Studies.	Sep 2010