Mitigating Climate Change through Tropical Forests:

An Analysis of U.S. Bilateral REDD+ Finance

A 2013 Group Project

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The Group Project is required of all students in the Master's of Environmental Science and Management (MESM) Program. It is a three-quarter activity in which small groups of students conduct focused, interdisciplinary research on the scientific, management, and policy dimensions of a specific environmental issue. This Final Group Project Report is authored by MESM students and has been reviewed and approved by:

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Abstract

Land clearing for agriculture and forestry is a significant global source of greenhouse gas emissions. We evaluate the United States' contribution to REDD+ (reducing emissions from deforestation and forest degradation), an international strategy for reducing such emissions. We examined bilateral investments made by the U.S. to 36 tropical countries from 2008 to 2011 for conservation, reforestation, afforestation, and sustainable management projects and their resulting impacts. Indonesia, Peru, and Brazil received the most bilateral finance, accounting for 37% of all investments. Countries with greater technical capacity to measure forest carbon fluxes, higher per capita gross domestic product, and larger forested area, were statistically correlated with receiving more REDD+ finance. The majority of impacts (57%) are focused on "Readiness," which builds capacity for national REDD+ programs, rather than the "Demonstration" of emissions reductions, suggesting that REDD+ is in an early stage. The U.S. can ensure the viability of its investments and the overall REDD+ mechanism by also supporting efforts that address the drivers of deforestation: demand from commodity markets for food, fuel, and timber. This could decrease emissions from land clearing, reduce leakage, and ensure permanence of emissions reductions. The U.S. should integrate REDD+ and food security aid, encourage yield efficiency and agroforestry, increase financing for countries with low carbon monitoring capacities for REDD+, and consider deforestation rate and biodiversity loss in investment decisions. To better track U.S. investments, reporting agencies should clearly and concisely link finance and associated impact.

Executive Summary

In 2007, the 194 countries participating in the United Nations Framework Convention on Climate Change agreed that increasing forest cover and combatting deforestation is essential to effectively mitigate climate change. In response developed nations, including the United States, have collectively provided billions of dollars in aid to developing countries for REDD+, reducing emissions from deforestation and forest degradation. REDD+ allows tropical countries to be financially compensated for measured and verified reductions in carbon emissions and increases in forest cover that result from conservation, afforestation, reforestation, and sustainable management of forest carbon stocks.

As the U.S. and other countries increasingly allocate money to REDD+, examinations of early initiatives are essential in ensuring that the mechanism is on track to accomplish its goals of sequestering carbon and decreasing deforestation. An analysis of United States bilateral REDD+ investments between fiscal years 2008 and 2011 to 36 tropical countries revealed that approximately 37% was given to three countries: Indonesia, Peru, and Brazil. We performed linear regressions to determine if certain factors were statistically associated with investment decisions. Results suggest that countries with higher gross domestic product per capita, larger forested area, and/or greater technical capacity to monitor and map carbon fluxes often received more finance. This strategy implies that the U.S. is investing to optimize a return on investment and minimize risk. However, these investment priorities may hinder the development of a strong global REDD+ framework and may not appropriately fund countries that experience high rates of deforestation and biodiversity loss.

After examining impacts resulting from finance dispersed during these years, we determined that the majority of reported impacts (57%) can be categorized as “Readiness” for REDD+. Readiness activities build capacity for a performance-based system ideally supported by carbon markets and would require that countries demonstrate emissions reductions before receiving payment. Some countries possess greater capacities to execute REDD+ projects and receive finance for “Demonstration” activities (40% of reported impacts), which unlike Readiness activities produce quantifiable impacts. While Demonstration will ultimately be measured in terms of carbon sequestered, the U.S. has been using metrics such as hectares protected, reforested, or improved.

To complement these investments and ensure the mechanism’s long-term viability, the U.S. should address the biggest drivers of deforestation, demand for agriculture and timber products. Increased demand for these products from population growth will result in forest conversion to agricultural land for food, fuel, timber, and other forest products. If demand for these products is not addressed, emissions from these industries will dwarf reductions achieved through REDD+. Projects could be threatened by leakage, the displacement of emissions to other areas, and permanence.

To address commodity drivers, we recommend that the U.S. integrate REDD+ investments with food security aid in tropical countries and support agricultural yield efficiency and agroforestry. To support the formation of a global framework for REDD+, the U.S. should support countries with lower technical capacities by providing technologies for carbon mapping and monitoring. Finally, increasing reporting transparency will allow U.S. REDD+ efforts to be better assessed as the mechanism progresses.

Background

U.S. Forestry Finance History

Under the Obama Administration, United States funding for international forestry and forest management initiatives has increased significantly. Bilateral funding for forestry abroad began in 1939 under the U.S. Department of Agriculture (USDA) and Forest Service (USFS), increasing steadily through the USFS until the 1990s (Wolosin, 2012). The 1986 enactment of Section 118 of the Foreign Assistance Act, which recognizes the destruction caused by deforestation, propelled the start of finance for international forestry through the U.S. Agency for International Development (USAID). While bilateral funding for forests has ballooned under USAID, finance through USFS has greatly decreased as it has assumed more of a technical, advisory role. In 1998, the Department of the Treasury became another funding entity with the signing of the Tropical Forest Conservation Act (TFCA), which operates through debt-for-nature swaps. Currently, USAID, the Department of the Treasury, and the Department of State, through its oversight of USAID's budget, are the main government entities involved in bilateral forestry finance.

Since USAID became a main financier, the goals of international forestry funding have followed a few trends. While the early years of USAID forest finance were geared towards economic development in tropical countries, sustainable management and production and biodiversity conservation have emerged in the past decade as main goals (Wolosin, 2012). The majority of USAID forestry finance qualifies as Development Assistance while some is labeled by the agency as Economic Support Funds. Forest conservation is also a major goal for the Department of the Treasury, whose debt-for-nature swaps under the Tropical Forest Conservation Act involve the U.S. government restructuring, reducing, or buying a portion of a developing country's debt. Funds generated from these transactions are used to support conservation projects in developing countries (Sheikh, 2006). Under the Obama Administration, in reflectance of international priorities, emphasis has been placed on forestry finance meeting climate change objectives, such as mitigation through increased carbon sequestration.

International Forestry Finance and REDD+

In 1992 at the Earth Summit in Rio de Janiero, 50 countries signed the United Nations Framework Convention on Climate Change (UNFCCC), an international agreement and framework for intergovernmental efforts to address climate change. Since up to 17 percent of greenhouse gas emissions annually are attributed to deforestation and land use change, parties to the UNFCCC have acknowledged the importance in addressing deforestation to adequately mitigate climate change (USAID, Dec. 2010). When forests are burned or cleared, carbon from both the aboveground biomass and soil is released to the atmosphere (Van der Werf, 2009). Therefore, averting deforestation not only reduces carbon emissions, but when coupled with reforestation and afforestation, a forest's potential to act as a carbon sink is expanded.

At COP13 in Bali, parties for the first time made general commitments to protect and conserve forest cover. Two years later during COP15 in Copenhagen, parties identified REDD+, reducing emissions from deforestation and forest degradation, as the proper mechanism to meet this end. The scope of mitigation actions under REDD+ includes forest conservation, sustainable management, afforestation, reforestation, and overall enhancement of forest carbon stocks. REDD+ also has the potential bolster security for indigenous communities that depend on forest resources and provide environmental co-benefits such as biodiversity and ecosystem services (Brown et al., 2011).

Although parties to the UNFCCC have not yet been able to achieve a post-Kyoto deal involving binding emissions reductions, many see progress through developed nation pledges to fund finance transfer mechanisms, including REDD+. These involve payments to developing countries to mitigate climate change while contributing to economic development. REDD+ ultimately aims to transition to a performance-based system where financial compensation is only given after demonstration of measured and verified decreases in carbon emissions or increases in forest cover. Ideally, linking REDD+ with markets by allocating carbon credits to tons of sequestered carbon has the potential to leverage the scale of funds needed for large-scale carbon sequestration projects. These carbon credits could be traded on the world market between national governments and private companies that wish to offset their own emissions (Parker et al., 2009). However, as long as parties fail to produce a post-Kyoto deal, global demand for carbon credits will likely not surface, and REDD+ will be relegated to smaller scale carbon markets.

U.S. Fast Start Finance

Another significant achievement at COP15 was developed countries' commitments to provide Fast Start Finance over the next three years to jumpstart climate change mitigation and adaptation projects in developing countries. As part of the $30 billion Fast Start Finance commitment by donors, the United States pledged $1 billion in finance for REDD+ initiatives from fiscal years 2010 to 2012. U.S. Fast Start Finance evolved in 2010 as part of the Obama Administration's Global Climate Change Initiative (GCCI), which aims to incorporate climate change considerations into bilateral and multilateral foreign aid (Lattanzio, 2012). The GCCI splits its climate finance into three "pillars:" Adaptation, Clean Energy, and Sustainable Landscapes. Finance for REDD+ falls under the Sustainable Landscapes pillar, which focuses on increasing carbon storage and sequestration by vegetation (U.S. Department of State, 2010).

In November 2012, the U.S. Department of State totaled its REDD+ expenditures and determined that the government spent $887 million on REDD+ during the "fast start" period, falling just short of its $1 billion target (Table 1) (U.S. Department of State, 2012). A comparative literature review of analysis on global "fast start" pledges by the World Resources Institute and Michael Wolosin of Climate Advisers corroborates this total and registers the United States as $113.26 million short of its pledge [(Polycarp, 2012) & (Wolosin, 2012)]. However, our communications with State Department officials revealed confidence that the $887 million figure will be revised upward in the near future (Verdieck, "Private Conversation"). The State Department expects the $1 billion target to be met as U.S. missions in tropical countries report discretionary funds used for REDD+ that have initially not been counted, essentially fulfilling their pledge.

Table 1: All funding from the U.S. government for REDD+ activities from 2010-2012 as part of its Fast Start Finance pledge according to the U.S. Department of State (U.S. Department of State, 2012)

U.S. "Fast Start" Category	**FY 2010**	**FY 2011**	**FY 2012**	**Total**
Sustainable Landscapes	$249.0 million	$361.5 million	$276.2 million	$886.74 million

Most of this aid was given to tropical countries as grants through bilateral or multilateral channels to fulfill various capacity needs. Loans, equity, loan forgiveness, insurance, and private investments make up other forms of REDD+ finance. Overall, "fast start" investments for REDD+ are meant to help provide the basic infrastructure for the mechanism by helping countries put forward "ambitious REDD+ plans" for national orchestration (USAID, Oct. 28, 2010). At this point, countries have varying abilities to

effectively execute projects; each may lack the necessary level of governance, established land tenure rights, satellite data for monitoring and establishing baselines for forest carbon stocks, legal institutions (particularly for proper zoning), or support of indigenous or other local people. All of these activities make up the first phase of the REDD+ framework, "Readiness." Readiness prepares tropical countries for an eventual results-based phase where funding for the framework and individual projects comes not only from donor governments but from linkages with either carbon markets (should a global carbon cap and trade program come into force) or a global agreement. In this global agreement, donors would commit to their own domestic actions as well as support developing nations in their nationally appropriate mitigation actions (NAMAs) agreed to under the UNFCCC.

Essentially, Readiness activities build capacity for pay-for-performance "Demonstration" activities, where national or subnational projects receive payment after an increase in forest cover and decrease in emissions has been demonstrated with satellite data. Demonstration investments will test programs built using readiness funds and will produce lessons that will feed back into the readiness phase, making policies more effective (USAID, Oct. 28, 2010). All actions that conserve, sustainably manage, enhance, reforest, or afforest tropical forests constitute Demonstration.

Finally, "Architecture" is the third target area for U.S. government REDD+ aid and for global REDD+ aid overall. Architecture is geared towards creating and supporting a global framework to integrate national REDD+ programs (USAID, Oct. 28, 2010). This is expected to occur under the UNFCCC should a global agreement on REDD+ arise in the coming years.

Objectives

During these initial phases of REDD+, finance provided by the U.S. and other donor countries will be instrumental to build capacity for a self-sustaining, performance-based system. The U.S. government has provided bilateral finance for REDD+ projects since fiscal year 2008, most of which was allocated during the "fast start" period from fiscal years 2010 to 2012. We examined this finance and its intended impacts, as well as the overall status of the global REDD+ framework to answer the following questions:

1. What does the U.S. portfolio of REDD+ investments look like, and what factors have been associated with these investment decisions?

2. What other approaches are needed to complement the U.S.' REDD+ investments and ensure the mechanism's long-term viability?

As the U.S. and other countries increasingly allocate money to develop the REDD+ framework, examinations of early initiatives will be key to ensure that it is on track to accomplish its intended goals of enhancing carbon stocks and slowing deforestation.

OBJECTIVE 1: What does the U.S. portfolio of REDD+ investments look like, and what factors have been associated with these investment decisions?

The U.S. is a major player in the worldwide REDD+ mechanism and exerts a considerable amount of influence through its international aid. We sought to illustrate a picture of the United States' portfolio on REDD+ investment in order to elucidate any funding patterns. By examining the patterns and trends in its financing decisions, we may be able to determine whether its money can be used more effectively.

Methods

We focused on the bilateral portion of the United States' REDD+ portfolio, utilizing public data contained within the non-governmental organization Tropical Forest Group's U.S. REDD+ Finance Database. To determine financing trends via statistical analysis, we collected data from various other sources.

Tropical Forest Group Database

Our primary source of data was a database created by the Tropical Forest Group[1] that aims to capture every instance in which the U.S. government has relayed information to the public about its bilateral[2] expenditures for REDD+ and other sustainable tropical forestry projects. It contains information surrounding REDD+ forestry finance as made public by the three main U.S. government reporting agencies from fiscal years (FY) 2008 to 2011. While these entities represent the vast majority of U.S. financial investments in bilateral REDD+ activities (henceforth "finance"), additional data was collected from the Voluntary REDD+ Partnership Database (RPD). The table below illustrates exactly what data is in the dataset and where it was obtained.

Table 2: Scope of Tropical Forest Group's U.S. REDD Finance Database

Reporting Entity	Financing entities it reports on	Type of report	Fiscal years represented in dataset
Department of State	USAID	Fast Start Finance annual reports	FY 2010, FY 2011
Department of Treasury	Department of Treasury	Tropical Forest Conservation Act (TFCA) annual reports	FY 2009, FY 2010
USAID	USAID	Biodiversity Conservation and Forestry Funding Annual Reports	FY 2008, FY 2009
Voluntary REDD+ Partnership Database	USAID, Department of Treasury	Fast Start Finance annual reports, Tropical Forest Conservation Act (TFCA) annual reports	FY 2010

The above reporting entities have captured bilateral finance flows for REDD+ projects from the U.S. to 36 tropical countries (Appendix 1). In actuality, bilateral flows for 40 countries are contained in the database, but four countries did not possess enough data to be analyzed in this project. While Tropical Forest Group's Database may not capture every single dollar spent in bilateral forestry aid, it depicts what the U.S. government tells the American public and the world about its expenditures. Most missing

[1] Available publicly online at <www.usreddfinance.org>.

[2] Tropical Forest Group Database focuses solely on bilateral expenditures, excluding regional and multilateral investments due to the lack of detail in reports.

data can be attributed to incomplete or unclear government agency reporting or lack of publically available data.

It is important to note that the dataset is a work in progress; not every fiscal year from each financing source is represented. When the database was constructed, its architects were not able to locate reports on TFCA expenditures during FY 2008 and FY 2011. Additionally, while it may appear at first glance that the database is missing USAID annual reports from FY 2010 and FY 2011, we believe that in FY 2010 the responsibilities of reporting on USAID forestry expenditures were transferred from USAID to the Department of State. This most likely reflects a shift in priorities after the Obama Administration's promise at COP15 to provide forestry aid to meet climate goals, rather than to facilitate biodiversity conservation.

World Bank Governance Indicators

Another source of data we used in our analysis was the 2011 World Bank Worldwide Governance Indicators. The Worldwide Governance Indicators are composed of six aggregate indicators, which attempt to provide a metric to compare governance for countries around the world. These indicators are representative of several concepts aggregated by the World Bank. For instance, the government effectiveness indicator includes concepts such as quality of primary education, satisfaction of public transportation, and trust in government. In our study, we used these indicators to run regressions against the amount of financing for each country in order to determine if there were any correlations.

Capacity Gap

In order to determine the technical ability of a country to conduct REDD+ monitoring, we used a metric created by Romijn et al. (2012) called the capacity gap. The capacity gap is the difference between what is required for REDD+ carbon flux monitoring and the current monitoring capacity of a country. It measures the ability of national monitoring capacities in REDD+ countries by attributing a numeric value to four main categories:

1. National engagement of a country in the UNFCCC processes
2. Existing monitoring capacities for monitoring forest cover and carbon stocks
3. Challenges that countries face in the REDD+ process
4. Remote sensing technical challenges.

The technical capacity gap was calculated by summing these different performance indicators (Romjin et al., 2012). Each category was grouped into different assessment types, representing the current capacities of a country, and conversely the challenges a country faced. The capacity gap was determined by adding up the values of assessment categories one and two, then subtracting the indicator values of assessment categories three and four (Romjin et al., 2012).

$$\textbf{Capacity gap} = (\Sigma(\text{category 1}) + \Sigma(\text{category 2})) - (\Sigma(\text{category 3}) + \Sigma(\text{category 4}))$$

An array of data sources were referenced by Romijn et al. (2012) and used to assess national monitoring capacities. The 2006 FAO Forest Resources assessment provides information on countries forest resources, such as measurements and estimations of forest area, biomass and carbon stocks. The National Communications to UNFCCC is a national inventory of anthropogenic greenhouse gas emissions (UNFCCC, 2008). The ''Readiness Project Idea Notes'' explains national REDD+ strategy, the status of monitoring systems and greenhouse gas emission estimation, and challenges and the constraints in each country (Forest Carbon Partnership Facility, 2010).

Table 3: The technical capacity gap for tropical countries in implementing a national forest monitoring system for integration into an international REDD+ framework (taken from Romijn et al., 2012). Associated Values are used in statistical analyses.

Technical Capacity Gap (for implementing a national forest monitoring system, Romijn et al., 2012)				
Very large Value=5	**Large Value=4**	**Medium Value=3**	**Small Value=2**	**Very small Value=1**
Belize	Bangladesh	Indonesia	Bolivia	India
Ecuador	Cambodia	Madagascar	Brazil	Mexico
El Salvador	Colombia	Panama	Peru	
Ethiopia	Democratic Republic of Congo	Uganda	Philippines	
Guatemala				
Guinea				
Guyana	Liberia			
Haiti	Mozambique			
Honduras	Nepal			
Jamaica	Nicaragua			
Kenya	Rwanda			
Malawi	Senegal			
Mali	Tanzania			
Paraguay				
Zambia				

Level of Engagement

In order to gauge the level of involvement of each country in REDD+ efforts, we developed a metric, called "Engagement in multilateral REDD+ institutions." We assumed that as a country's involvement in the number of REDD+ programs and institutions increases, their knowledge and national articulation of REDD+ also increases. Besides being funded bilaterally by governments, tropical countries engaging in REDD+ can be involved in communications with the UNFCCC, can develop a national program or share best practices through UN-REDD, and can receive project funding through the World Bank's Forest Carbon Partnership Facility.

The "Engagement" metric incorporates a country's involvement in these three entities and categorizes overall engagement as high, medium, or low. We utilized Romijn et al.'s (2012) evaluation of tropical countries' involvement (high, medium, or low) in the UNFCCC REDD+ negotiations through national communications UNFCCC Country Submissions for REDD and National Communications. We also found out whether these countries are involved in UN-REDD, which is captured in two tiers: as receiving support to develop a national program or as a "partner" that shares best practices for REDD+. Since developing a national program through UN-REDD requires far greater participation than being a partner, we weighted this more heavily. Countries that were highly involved in UNFCCC and participated in UN-REDD and the Forest Carbon Partnership Facility were categorized as highly engaged (Table 4). Countries that are involved with UNFCCC on a medium level and are either partners with UN-REDD or the Forest Carbon Partnership Facility received a medium ranking. Countries highly involved with the UNFCCC but that do not participate in other institutions were also ranked as medium engagement. Finally, countries with low participation in UNFCCC and no involvement in other organizations received a low engagement score.

Table 4: Our rankings for the "Engagement" metric

Engagement in Multilateral REDD+ Institutions		
High (1)	**Medium (2)**	**Low (3)**
Bolivia	Ecuador	Bangladesh
Cambodia	El Salvador	Belize
Colombia	Liberia	Brazil
Dem. Republic of Congo	Madagascar	Guinea
Ethiopia	Mozambique	Haiti
Guatemala	Nicaragua	India
Guyana	Philippines	Jamaica
Honduras	Zambia	Malawi
Indonesia		Mali
Kenya		Rwanda
Mexico		Senegal
Nepal		
Panama		
Paraguay		
Peru		
Tanzania		
Uganda		

Finance analysis

To analyze U.S. bilateral funding, we summed the total amount of funding given by the two financing agencies to each of the 36 tropical countries from fiscal years 2008 to 2011. However, as data from the four reporting sources have the possibility of overlapping, there is a chance of some double counting in these finance numbers. As a result, the amount of financing for each country may be higher than the actual number.

While it would be ideal to link a particular grant with its resulting or intended impacts, the level of detail provided in the U.S.' REDD+ reporting prevents this. If the U.S. clearly reported the cost of each project impact, we would be able to evaluate impacts in terms of dollars, such as dollar per hectare. Instead, this paper views finance for REDD+ and its resulting or intended impacts using two different metrics: finance in terms of dollars and impacts in terms of the prevalence of the language used to describe them. The impact metric, although not ideal, is a reflection of how grants are funded and reported. Vague and subjective descriptions, differing by reporting entity, are employed to report project activities. One concise metric cannot be utilized to describe every impact because of the variety of impact activities conducted and the undisclosed specific dollar amount associated with each impact.

Regression analysis

To determine whether various variables were statistically associated with the level of U.S. financing for each country, we ran single linear and multivariable regressions plotting the amount of finance in each country against:

> Total forested land, per capita gross domestic product (GDP), deforestation rate, technical capacity gap, level of engagement in REDD+ institutions, political stability, government effectiveness, and control of corruption.

Ultimately, we report only on the results of the single linear regressions, which is a conservative method to detect underlying relationships. Since the dataset is limited to just 36 countries (data points), there was insufficient power to detect the effects of more than two variables in multivariable regressions. To determine whether finance and trends were associated with likely strategic considerations, additional data was collected from the CIA's World Factbook 2011 on total forested area, per capita GDP, and deforestation rate. To calculate total forested area, we multiplied each country's total land area by its percent forest cover, using information also obtained from the CIA's World Factbook 2011. Deforestation rates were obtained from the United Nations Food and Agriculture Organization's 2005 Global Forest Resources Assessment.

Impact Analysis

To evaluate the activities encompassed in REDD+ projects, we tagged the 453 impacts reported from FY 2008 to FY 2011 for each receiving country according to three categories: Architecture, Readiness, and Demonstration, which are the three overarching objectives of U.S. REDD+ finance investments that USAID describes in its 2010 "REDD+ Strategy" report. To do this, we compared language used in each impact description contained in the database with language in the strategy report.

However, when tagging project impacts, we used a more liberal definition of Demonstration, interpreting it to include any project reporting a quantifiable impact, including hectares designated protected, hectares improved, hectares purchased, hectares reforested, trees planted, and hectares enforced, among others. While Demonstration projects will ultimately use 'tons of carbon' or 'tons of carbon sequestered' as the main metrics to describe its activities, we believe that because REDD+ is in a primordial state, other impact metrics should be accepted as Demonstration at this point.

Readiness Impact Analysis

To gain further insight about the usage of Readiness funds since FY 2008, we examined each of the 260 impacts from FY 2008 to FY 2011 in the database associated with Readiness. We then broke down the funding into seven different categories based on the range of impact descriptions (Table 5):

1. Strengthen partnerships and participation (between local government, forest communities, national government, and/or private sector)
2. Strengthen forest governance
3. Improve forest management
4. Strengthen environmental regulation compliance or prosecution
5. Technologies for forest carbon monitoring and mapping
6. General capacity building
7. Agroforestry

By evaluating the number of times an intended or realized impact fell into each category, we were better able to identify trends and make inferences about the status of REDD+-related activities.

Table 5: Examples of intended impacts that fall within each of the seven categories

READINESS CATEGORY	PROJECT EXAMPLES		
Strengthen partnerships and participation between local and forest governments	Establishing a public-private partnership for low emissions development	Partner with Walmart Family Foundation to fund a Sustainable Landscapes Partnership in two districts	Strengthen partnerships between private sector, government, and communities, focusing on sustainable forest use
Strengthen forest governance	Strengthen judicial ability to prosecute forest related crimes	USAID will help strengthen forest resource governance	Expanded patrolling activities now cover 70%
Improve forest management	Forests slated for conversion to plantations instead managed sustainably, protecting 10,000 Bornean and Sumatran orangutans	Improves forest management and combats illegal logging	Improve forest management and preserve carbon sinks with indigenous peoples and local governments
Technologies for forest carbon monitoring and mapping	USFS training and technical cooperation with government agencies to design and implement a national forest carbon inventory	Forest inventory development that will include tracking systems to monitor carbon fluxes in support of Peruvian forests	Forest mapping using LIDAR technologies
Strengthen environmental regulation compliance and prosecution	Strengthen judicial ability to prosecute forest related crimes such as deforestation	Form regulations and zoning to reduce deforestation generated by cattle raising	Build government capacity to implement policies and laws
General capacity building	Sustained management of the main natural resources used by indigenous peoples within the National Reserve	Establishing climate change center in Indonesia which links science to policy on strategic climate change priorities	Strengthening Native Communities capacity to implement Payments for Environmental Services
Agroforestry	Establishing an Agroforestry Model with Native Forest Species	Reduce deforestation through agroforestry and palm management	Used carob and sapote trees, Mahogany (1748), citrus (278), and coffee (4000)

Results & Discussion

Distribution of Finance

An examination of the United States' investment portfolio for REDD+ revealed that roughly 37 percent of bilateral finance from fiscal years 2008 to 2011 was given to three countries: Indonesia (17 percent of total finance), Peru (11 percent), and Brazil (nine percent) (Figure 1). Aggregating finance by geographical region shows that countries in Latin America and the Caribbean (LAC) received 46 percent of bilateral REDD+ finance, while Asian countries were given 35 percent. African countries received only 19 percent of finance (Figure 2).

Figure 1: Bilateral REDD+ finance from FY 2008 to 2011 by country

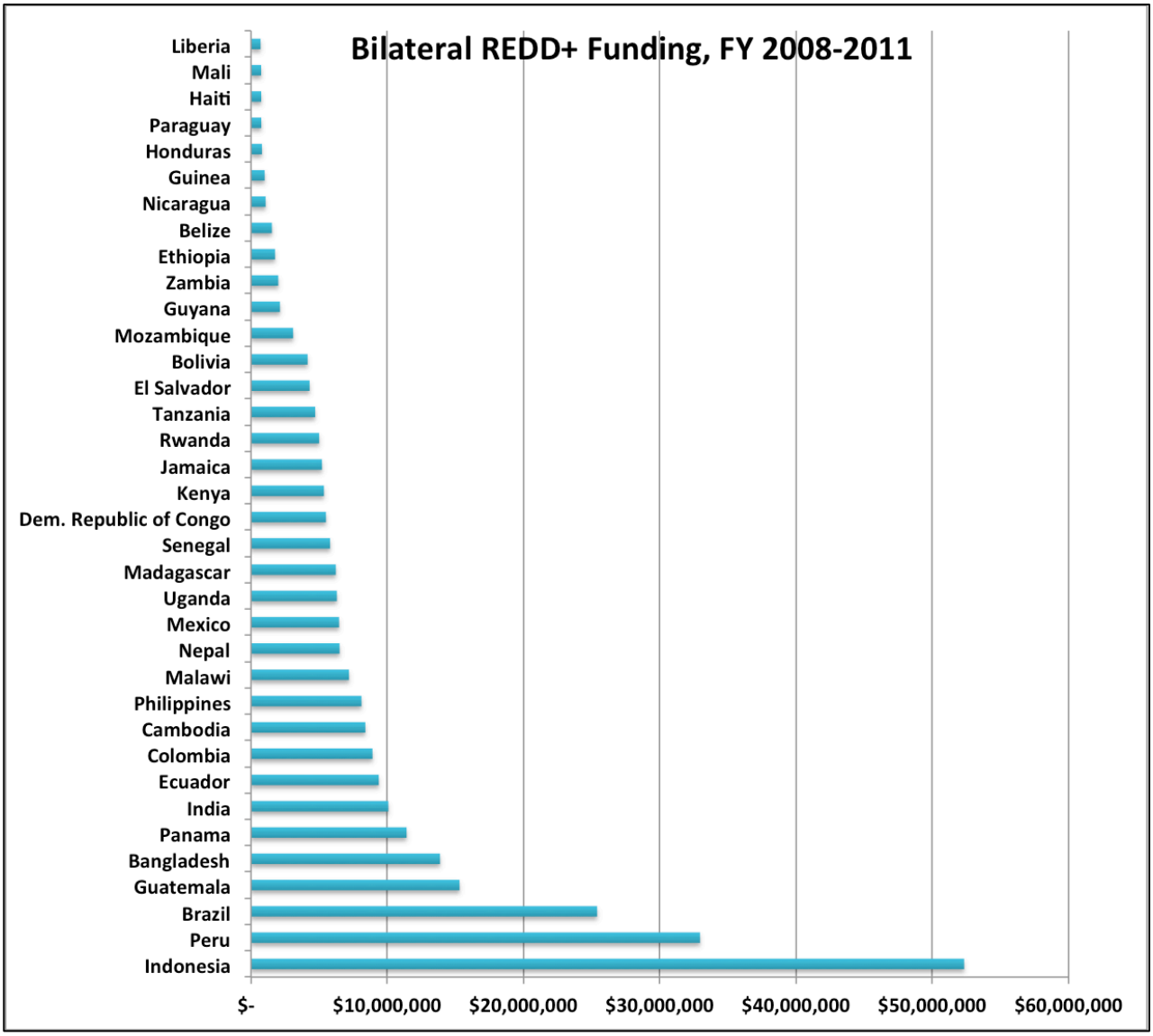
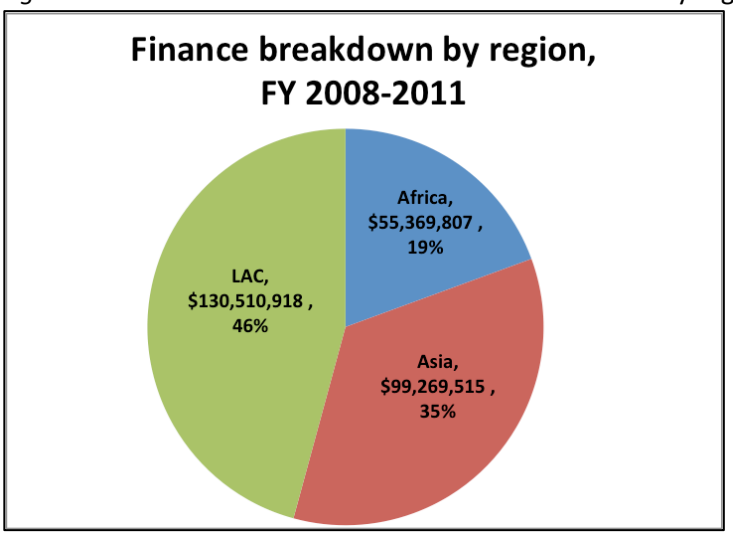


Figure 2: Bilateral REDD+ finance from FY 2008 to 2011 by region



While Brazil receives a significant portion of bilateral REDD+ finance from the U.S. relative to other countries, it receives less overall foreign aid from other countries. U.S. finance to Brazil has declined over the years, from $25.1 million in FY 2010 to $6.1 million pledged for FY 2013. One reason for this relatively low contribution can be traced to the fast development of Brazil's economy, making it a middle income country (Meyer, 2012). Despite declines in overall foreign aid, the majority of the aid Brazil receives concerns environmental issues, such as its deforestation rate. Environmental aid from the U.S. was $14 million in FY 2010, which is more than half of its total aid. One potential reason may be due to the large area of forested land in Brazil (478 million hectares in 2005), a significant portion of which is the Amazon rainforest (FAO, 2006). Roughly 60% of this rainforest lies within Brazil's borders (Meyer, 2012). Between 2000 and 2005, Brazil had the largest net loss of forest area, losing 3.1 million hectares annually, however since 2008 Brazil has drastically reduced its deforestation rate (FAO, 2006).

This deforestation began mostly in the late 1960s, which is largely attributed to the clearing of forests for the development of transportation infrastructure and cattle ranching (Kirby et al., 2006). These projects were undertaken in order to encourage colonization of the region and incentivize economic development. Cattle ranching, for instance, was heavily incentivized by the government between 1965 and 1985. Additionally, soy farming has greatly increased in recent years (Kirby et al., 2006). These factors have led to the country's past high deforestation rates. Both the prominence of the Amazon rainforest and its prior high deforestation rate may be one factor in Brazil receiving such a significant portion of REDD+ finance from the U.S. The country saw a 27% decrease in deforestation from August 2011 to July 2012, observing the lowest deforestation rate ever recorded in Brazil, and achieved 76.27% of its 80% voluntary deforestation reductions (by 2020) (Portal Brasil, 2012).

Similarly, Peru has the second highest amount of the Amazon rainforest within its borders. It has 64 million hectares of forest, which is approximately half of its total land area. However, Peru has experienced a much lower rate of deforestation compared with countries like Brazil and Indonesia. Over the last decade, Peru had a 0.22% rate of deforestation, a number that has been steadily increasing (FAO 2010). The differences between Peru and neighboring Brazil are mostly the result of the lack of road access to forested areas in Peru, whereas in Brazil, there is much greater access (Imbernon, 1999). The primary drivers of deforestation in Peru are largely attributed to conversion by subsistence agriculture with a significant amount linked to illegal logging (Knight et al., 2012).

Peru's forests also possess a very high level of biodiversity, increasing the incentive for further conservation of its forests. The amount of protected area in Peru is one of the largest under the United States' Tropical Forest Conservation Act debt-for-nature swap program. Due to its existing institutions and frameworks, Peru has been viewed by some as an ideal country to implement REDD+ initiatives (Gutman and Patterson, 2010). This may provide a foundation for the large amount of finance that it receives relative to other countries.

Located in Southeast Asia, Indonesia is home to the third largest rainforest area in the world (with over 88 million hectares of forest) and has undergone one of the highest rates of deforestation in the world (FAO, 2006; Arunarwati et al., 2012). It began in the 1970s as a result of new land-settlement schemes until recent times when palm oil production and logging became the dominant drivers. Other causes have been attributed to an aggressive expansion of the country's pulp and paper industries, creating an unsustainable level of demand (FWI/GFW, 2002). It lost roughly 1.8 million hectares of forest annually between 2000 and 2005 (Knight et al., 2012). By taking steps to avoid deforestation and degradation, it is estimated that Indonesia can reduce its emissions by 14 percent. As a result, Indonesia has taken the initiative on developing REDD+ policy and building capacity. It was a key proponent of REDD+ as the Chair of the Bali Climate Change Conference in 2007 (Knight et al., 2012). These efforts may have improved Indonesia's standing in the eyes of the United States, potentially affecting its financing decision.

Additionally, much like Peru, Indonesia has a very high level of biodiversity. However, its lowland tropical forests, which are the richest areas in terms of biodiversity, have been cleared entirely in some areas and predicted to disappear completely in others by 2010 (FWI/GFW, 2002). Prior to the influx of REDD+ finance into Indonesia, USAID had contributed a significant amount of financing towards conserving the country's biodiversity, particularly targeting endangered species such as the orangutan. As a result, there is a possibility that some USAID financing was simply relabeled as Fast Start Finance. This may also explain the large amount of financing that Indonesia receives.

To further assess the distribution of finance and potential motivations from general foreign aid on REDD+ financing, we compared the United States foreign aid portfolio to U.S. REDD+ funding being received by a country. The foreign aid portfolio includes contributions to Peace and Security, Health, Economic, Development, and other general philanthropic assistances. Data from 2008 to 2011 for the countries in our analysis showed that the funding distributions do not correlate. Although Indonesia receives the highest percentage of REDD+ finance, the country only receives 3.06% of U.S. foreign aid. Similarly, Peru and Brazil receive the second and third highest REDD+ funding, but only receive 1.51% and 0.30% of foreign aid respectively. The countries receiving the highest foreign aid assistance from the years 2008-1011 are Ethiopia, Kenya, and Haiti, which are some of the lowest funded REDD+ countries. This illuminates that REDD+ financing is motivated by different factors than those considered by overall foreign aid.

Regression Analysis

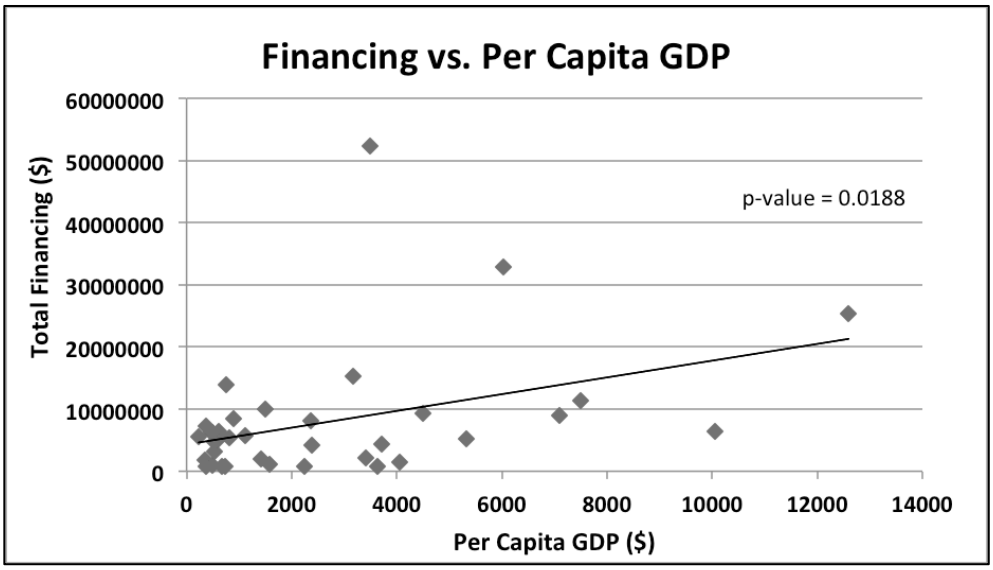
The results of our regressions are shown in Table 6. The regressions revealed that the U.S. gives more bilateral REDD+ finance to countries that have a higher per GDP (Graph 1), larger total land area (Graph 2), and greater technical capacity to monitor carbon fluxes (Graph 3). These correlations indicate that the U.S. could be attempting to minimize risk and achieve cost effectiveness in its REDD+ finance portfolio.

Percent forested area, deforestation rate, engagement in international REDD+ institutions, political stability, government effectiveness, and control of corruption were found to not correlate significantly to financing decisions.

Table 6: P-values for linear regressions

Dependent variables	Independent variables							
	Total forested area	Per capita GDP	Deforestation rate	Technical capacity gap	Engagement in REDD+ institutions	Political stability	Government effectiveness	Control of corruption
Finance	0.005	0.019	0.965	0.011	0.197	0.738	0.142	0.298

Graph 1: Linear regression between finance and per capita GDP



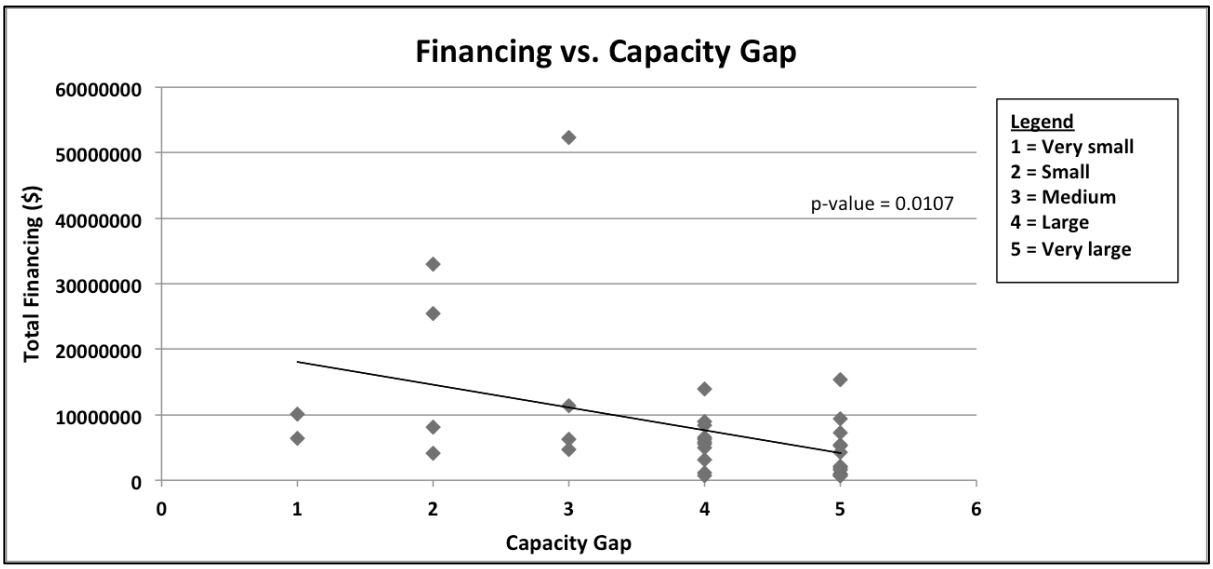
Per Capita GDP

The positive relationship between finance and per capita GDP indicates that the U.S. is more likely to invest in countries with higher levels of economic productivity than others in the dataset. Although there are countries that have a relatively low per capita GDP within our dataset, they tend to receive less financing than countries with higher per capita GDPs. The per capita GDP of a country may be inversely proportional to its capacity to implement REDD+ initiatives (Angelsen, 2008). Richer countries arguably possess greater potential to leverage co-finance from national, regional, or local governments, increasing a given project's potential for success. This contrasts with the riskier prospect of investing in poorer countries that may lack government resources to support projects. We believe that this relationship has a major influence in how REDD+ funds are distributed by the U.S.

However, this perspective may be flawed because countries with lower per capita GDPs generally require more external assistance to build their capacity for implementing REDD+ projects. Poorer countries often lack the institutions and foundations that are present in other countries, which may increase the likelihood of success of a project. GDP per capita may also be linked to the baseline determination of deforestation for each country. The Coalition of Rainforest Nations, among other organizations, has suggested that poorer nations should have a more generous baseline in order to provide a better incentive to conserve their forests (Angelsen, 2008). If this happens, it would provide

low GDP per capita countries with a better capacity to implement projects and should increase the incentive for further financing from the U.S.

Graph 2: Linear regression between finance and technical capacity gap

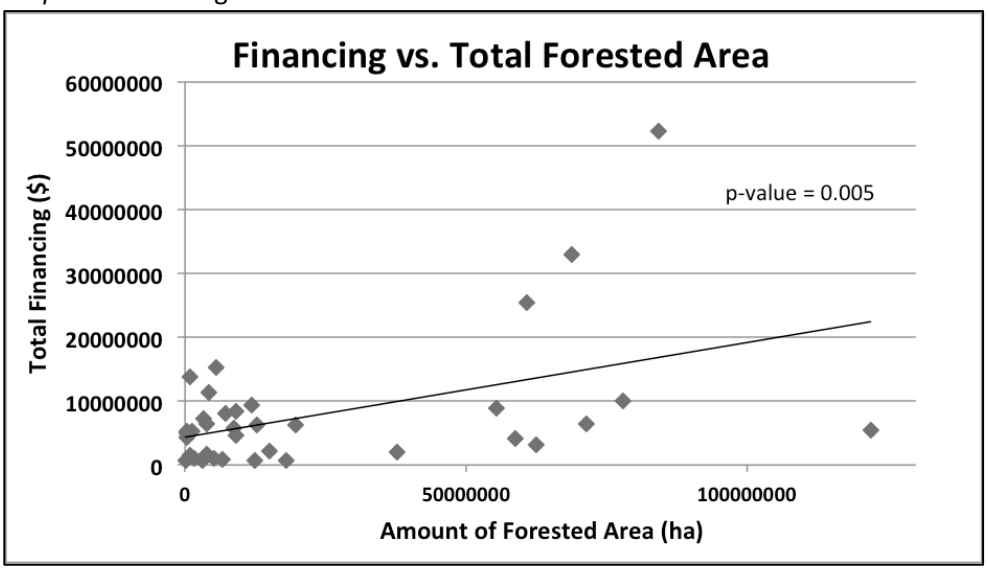


Technical Capacity Gap

With regard to the technical capacity gap for each country, we found that as capacity gap increases, the amount of financing received by each country from the U.S. decreases. This essentially indicates that the U.S. is more interested in funding countries with larger technical capabilities to execute carbon mapping and monitoring. Those countries with abilities to monitor the carbon stored in their forests on a national scale are potentially better investments as satellite monitoring can prove in real time whether the finance is actually affecting change.

The consequences of the U.S.' stance is strikingly similar to its stance towards countries with low GDP per capita. Through this perspective, countries that require aid to decrease their technical capacity gaps may be prioritized less by the U.S. For instance, nearly eighty percent of the African countries in the database were evaluated to have a large or very large technical capacity gap, yet these countries receive the lowest finance for REDD+ by region (Figure 2). Additionally, these countries lack technologies in carbon mapping and monitoring. If African countries' technical capacity gaps are to be closed, finance will need to increase in order to improve their access to these technologies. Closing technical capacity gaps will be essential for REDD+ to evolve into a performance-based system, which deliver payment only after increased carbon sequestration is demonstrated with satellite imagery and other carbon monitoring technology. Existing projects and literature imply that REDD+ projects will be most cost-effective when based on performance (Bond, 2009).

Graph 3: Linear regression between finance and total forested area



Total Forested Area

Our analysis revealed that as the amount of forested area a country possesses increases, so does the amount of finance it receives. This indicates that the U.S. is more interested in financing countries that have a larger area of concern. Additionally, the U.S. may be attracted to countries with greater total forested area because they may offer the potential for larger scale projects that target bigger tracts of forests. Bigger tracts of forests constitute much larger carbon stocks.

Sensitivity analysis

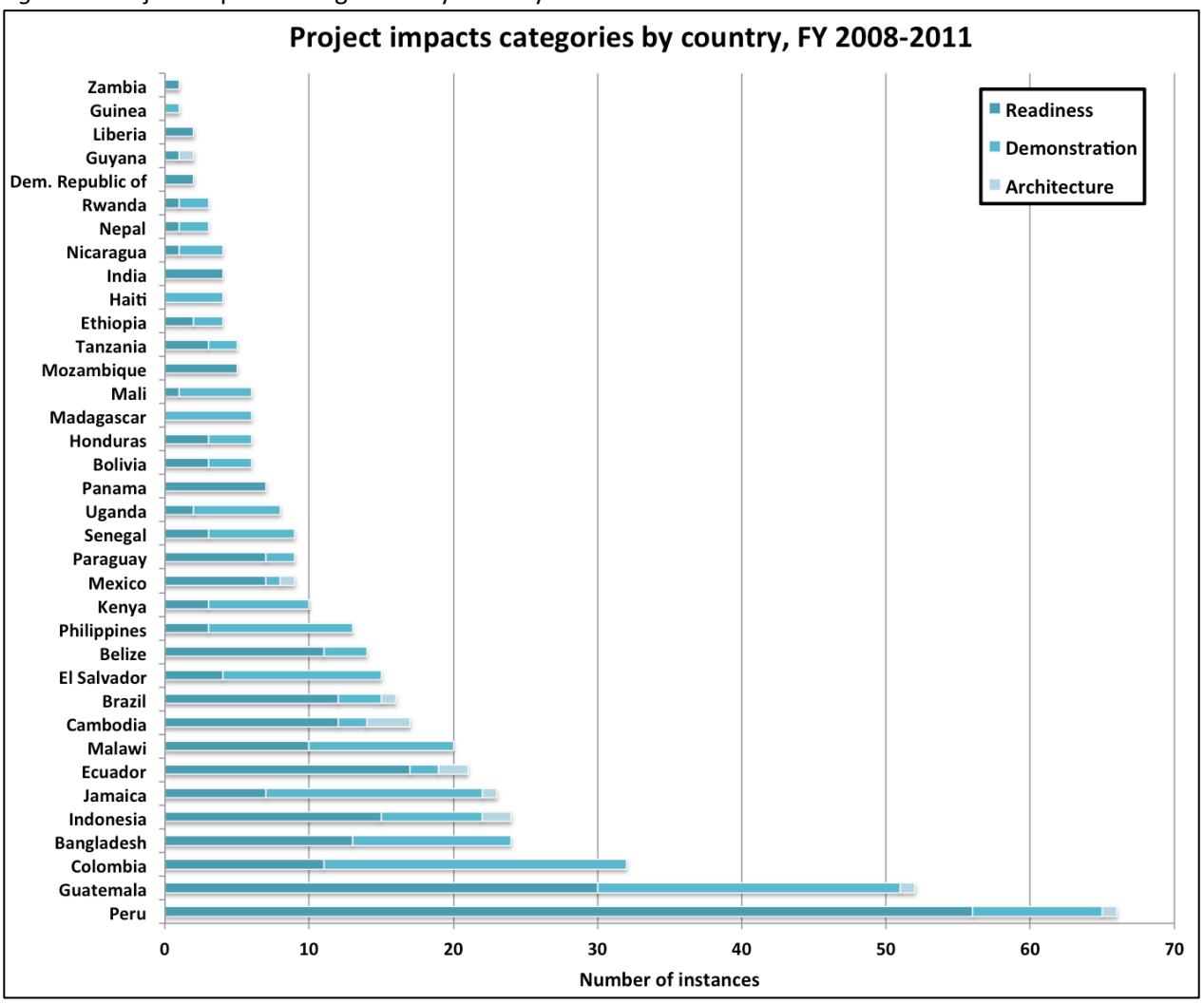
To assess the accuracy of our regression analysis, we conducted sensitivity analysis. This analysis removed one, two, or three of the top three countries receiving bilateral REDD+ finance (Indonesia, Peru, and Brazil) and revealed that finance trends are largely influenced by these countries. Once these countries are removed, regressions showed countries receiving lower amounts of funding largely scattered. Capacity gap was the only variable significantly tied to finance after these countries were removed from the dataset. However, we decided to include these countries in our dataset rather than remove them as outliers because their of importance in the U.S. portfolio.

Impacts Distribution

Categorizing reported impacts by country revealed that the majority of impacts are reported by Peru and Guatemala (Figure 3). Overall, roughly 63 percent of project impacts occurred in Latin America, while 19 and 18 percent occurred in Asia and Africa, respectively. Countries with the lowest number of reported impacts include Zambia, Guinea, and Liberia.

For the projects captured in the database, the majority of reported impacts (57 percent) can be categorized as meeting the Readiness objectives outlined in the U.S.' REDD+ Strategy (Figure 4). This is consistent with current literature on REDD+ that generally characterizes most initiatives around the globe as in an initial Readiness phase that builds capacity for a performance-based REDD+ system. Figure 4 also reveals very few impacts were focused on Architecture. This is to be expected, as multilateral rather than bilateral funding seems to be more appropriate for contributions to international framework-building efforts.

Figure 3: Project impacts categorized by country



Evaluation of the frequency of certain Readiness impact language reveals that the majority of impacts are focused on what we interpret to be the most basic of Readiness activities (Figures 4 and 5). Before the more technical and applied aspects of Readiness are carried out, such as developing and utilizing carbon mapping tools and agroforestry, forested areas need to be secured and managed. The focus of Readiness activities on improving forest management, general capacity building, and strengthening environmental regulation compliance and prosecution satisfy these goals. Illegal logging, a major cause of deforestation in Latin America and the Caribbean and Asia, is more common where land tenure rights are ambiguous (FAO, 2012). Governance of forests, whether by local, regional, or national governments, indigenous peoples, or whomever holds property rights, is a large target of Readiness efforts, indicating that in many cases property rights may not be clearly established.

Focus on agroforestry projects shows an emphasis on sustainable business and addressing commodity market drivers of deforestation. While deforestation rates in countries like Peru are currently low, pressures from expanding commodity markets and illegal logging are predicted to increase in the near future. Therefore, current efforts to expand agroforestry and increase protection, enforcement, and monitoring (part of strengthening governance and improving management) against illegal logging are

the right prescription.

Figure 4: Project impacts categorized for all countries; Readiness broken down into 7 categories

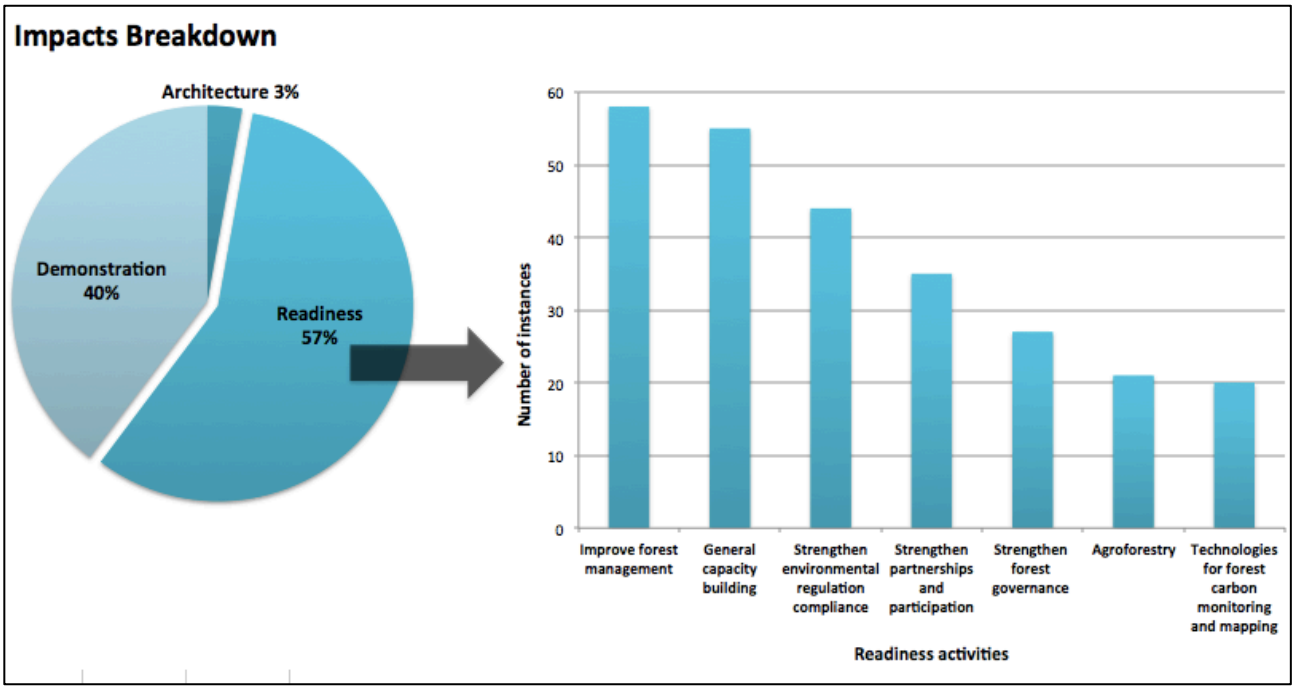
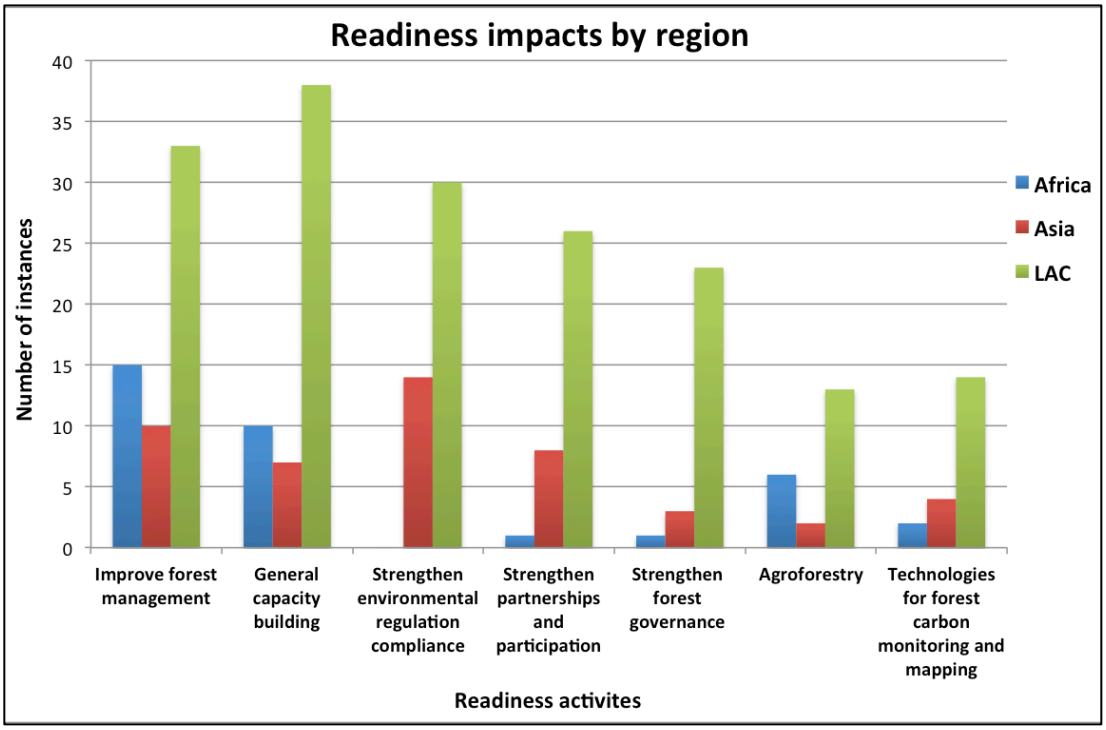


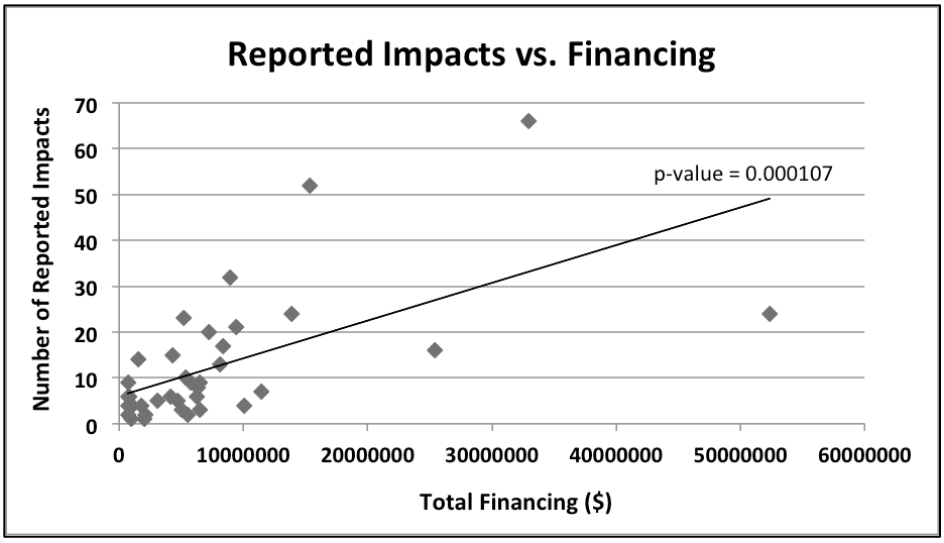
Figure 5: Readiness impacts categorized and broken down by region



Finally, running a linear regression plotting finance against number of impacts reported for each country revealed a very strong correlation (p-value of 0.000107) (Graph 4). This could indicate that countries

receiving more funding through either larger or more frequent grants are more likely to produce more project impacts. However, these impacts may also be determined by the source of the data, as different reporting entities tend to have varying levels of detail for the reported impacts of the financing. For instance, USAID reports tend to have an equal amount of space dedicated to listing the impacts of all their funding for each project. This results in every country receiving a similar number of reported impacts despite the amount of money received. On the other hand, TFCA reports are generally more detailed. Countries that receive more funding tend to report more impacts as they have a higher number of projects, though not necessarily so.

Graph 4: Linear regression plotting total number of impacts reported versus finance for each country



Overall, our analysis shows that U.S. investments have been reported to produce a significant number of impacts. This relationship could indicate that there is a connection between the money that the U.S. provides and REDD+ projects on the ground. By providing more funding to countries like Peru, we can slowly see its capacity begin to increase through the variety of projects that are reported. This is encouraging as it demonstrates that U.S. REDD+ financing is ultimately having an impact on tropical forests around the world.

Uncertainty

We have identified two areas of uncertainty in our analysis. First, there is a concern over possible over-reporting associated with the multiple sources of data within the Tropical Forest Group's database. More specifically, there may be overlap between the amounts of financing reported in the USAID reports and reporting by the State Department through its Fast Start Financing as well as through the RPD. Both Fast Start Financing and RPD may also be redundant with reporting by the Treasury Department through its TFCA reports.

Second, there is a lack of complete information associated with the United States' REDD+ financing. While the Tropical Forest Group's database is unparalleled in the amount of data it provides to the public, it still lacks information regarding U.S. multilateral and regional funding for REDD+. At the moment, the database only includes information for bilateral funding. However, since the majority of the funding the U.S. gives out consists of bilateral funding, we are still confident in our conclusions and recommendations.

OBJECTIVE 2: What other approaches are needed to complement the U.S.' REDD+ investments and ensure the mechanism's long-term viability?

Constructing and analyzing the United States' REDD+ portfolio has suggested that certain criteria influence the U.S.' bilateral investment strategies, most likely to optimize return on investment. These initial investments supporting readiness activities from the U.S. and other donor countries are essential for the progression of the REDD+ mechanism to a performance-based system that would in theory be self-supporting. According to the World Bank (2010), roughly $140-175 billion dollars a year for the next 20 years would be required in order to account for the costs of mitigating climate change for developing countries. The U.S. and other donor countries will be more apt to escalate investments if issues that threaten the long-term success of REDD+ are addressed.

Commodity markets are arguably the biggest driver of global deforestation in Latin America and South East Asia, and the economic incentives currently provided by REDD+ may not be enough to combat demand for food, fuel, timber, and other forest products. In the future, it is essential that REDD+ activities occur alongside efforts that address land use, land use change, and forestry (LULUCF). Increasing pressure on commodity markets from growing populations results in land conversion from forests to agricultural land for food and fuel and expanded legal and illegal logging for timber and other forest products (FAO, 2006a). Thus far land use, land use change, and forestry have not been adequately integrated into emissions reductions schemes such as the Kyoto Protocol, and therefore their inclusion in the REDD+ discussion under the UNFCCC could increase the mechanism's efficacy and viability (Ellison et al., 2012). Emissions from LULUCF, leakage, and permanence should be discussed as the REDD+ mechanism progresses.

Emissions

Agriculture Industry

Human population growth has resulted in an increase in demand for food and thus production. In order to meet the increasing food demand of local populations, there has been a corresponding increase in the clearing and conversion of forested land to meet agricultural uses, mostly in developing nations (Naburs et al., 2007). This has resulted in tension between forest conservation and agricultural production. Between 1961 and 2005, an average of approximately six million hectares of forestland were converted for agricultural use each year, and an additional one billion hectares from natural ecosystems are projected to be converted through 2050 (Naburs et al., 2007; Tilman et al., 2001). As these two factors are highly intertwined with each other, they must be taken into account synergistically to avoid both food shortage issues and deforestation.

Land use conversion and agricultural practices transform forests from net sinks of carbon dioxide to sources of significant amounts of greenhouse gases. These activities accounted for roughly 29 percent of total emissions as of 2012, primarily producing carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) (Vermulen et al., 2012; Naburs et al., 2007). CO_2 is released when land is cleared through the removal of aboveground biomass and exposure of underground soil carbon. Also lost is the forest's potential for future carbon sequestration. Land clearing for agriculture is predicted to release 3 million Gt CO_2-C equivalent by 2050 (Tilman et al., 2011). Additionally, agricultural practices, such as fertilizer application and livestock production, accounted for 47% and 58% of CH_4 and N_2O, respectively, in 2005 (IPCC, 2007). CH_4 and N_2O, projected to increase along the same emissions trajectory as CO_2, are troublesome because their global warming potentials of 72 and 289, respectively, over 20 years make them very potent greenhouse gases (Naburs et al., 2007). As populations and food demand continuously

increase, greenhouse gas emissions from agriculture will dwarf any sequestration from REDD+ initiatives if land use change is not considered alongside the mechanism.

Biofuel Industry

Likewise, biofuels derived from food crops such as corn, soybeans, sugarcane, and palms also put pressure on forests by driving land conversion to cropland (Fargione et al., 2008). Interest and production of biofuels has increased substantially within the last decade as they are often incorrectly viewed as a low carbon emission fuel source (Fargione et al., 2008; Searchinger et al., 2008). While biofuel production and combustion releases fewer greenhouse gases than that of fossil fuels, the emissions from land clearing of rainforests, savannas, grasslands, and peatlands in Brazil, United States, and Southeast Asia to produce these crops are often not counted in emissions calculations of biofuels (Fargione et al., 2008; Seachinger et al., 2008). Increased production of biofuels will not only lead to increased land use change and biodiversity loss from deforestation but will also increase prices of important subsistence crops, threatening food security. U.S. subsidies of corn cause an increase in demand and a decrease in domestic supplies in countries such as Guatemala, which are within the U.S. REDD+ investment portfolio. It also resulted in crop yields that were typically designated for subsistence being diverted to meet international biofuel demand (Rosenthal, 2013).

Timber Industry

Similar trends can be observed in the timber industry, which must utilize global forest stocks to meet increasing demand for wood, fiber, and related products. The global wood harvest in 2011 was approximately 3.5 billion cubic meters, which followed a similar trend during the past two decades (FAOSTAT, 2011; IPCC, 2007). Due to illegal logging, this number might be significantly higher. The uncertainty surrounding the extent of illegal logging in developing countries impacts the ability to accurately assess fluctuations in the global net terrestrial carbon sink (Cox et al., 2004).

Leakage & Permanence

Leakage and permanence pose hurdles to the success of REDD+ by potentially illegitimating its activities. Leakage occurs when unanticipated greenhouse gas emissions are displaced to an area outside of the REDD+ initiative's boundary as a result of the project's activities (Henders, 2012). Although REDD+ may result in the aversion of deforestation in a specific area, it may contribute to increased deforestation elsewhere as the drivers of deforestation (demand for agricultural, fuel, and timber products) have not been sufficiently addressed in the project policies. In this way, leakage dilutes the emissions reductions resulting from a REDD+ initiative. The main cause of leakage, demand in commodity markets, can be addressed by tying investments in crop and timber yields, for example, with REDD+ finance (Estrada, 2011). Leakage can be identified by a complete global monitoring system and inventory of carbon stocks, pending the development of necessary political will and technical coordination.

Similarly, systems monitoring carbon fluxes will be key in identifying areas where permanence is an issue. Permanence addresses the importance of longevity and stability of projects and carbon stocks (Veronesi et al., 2012). Ideally, the protection or other benefits resulting from REDD+ finance in a particular area would remain for perpetuity. In order for carbon credits generated under a performance-based system to be legitimate and hold their value, they must stand the test of time; forestland preserved by REDD+ cannot be later lost to logging or land clearing for food or fuel. It must be noted, however, that natural risks such as fire, pests, and hurricanes, can also thwart the permanence of carbon stocks (Niles and Olander, 2009).

The exact effect of REDD+ initiatives on global carbon levels is currently unknown, mainly because the mechanism is at such an early stage, but also partially due to issues like leakage and permanence. Nonetheless, it is expected that a transition to a performance-based system will facilitate more accurate measurement of carbon fluxes, facilitating the identification of leakage and impermanence. Performance based funding will heavily rely on the implementation of MRV—measurement, reporting, and verification, followed by monitoring—which will provide data on carbon stocks and emissions levels. It will also monitor country governance and the ancillary benefits of REDD+, such as biodiversity (UN-REDD, n.d.). Metrics such as deforestation rate and technical capacity gap being incorporated into funding motivations by countries such as the United States may allow receiving countries to see more benefits from REDD+, therefore allowing the mechanism to progress. Progression to a performance-based system supported by a carbon trading system would lead to private sector engagement (Moss and Kovacevic, 2012).

Policy Suggestions

In order to ensure that the REDD+ mechanism is a successful and viable long-term strategy, it is imperative that emissions drivers are addressed either within the mechanism or in policies or programs alongside it.

Though agriculture has become more efficient over time through yield increasing technologies, many lands used for agriculture and timber production, typically in poorer countries, do not utilize the full capacity of potential output (Tilman et al., 2011). Without interference, land use will be intensified to meet expected global food and timber demand through 2050. Following current rates of land use, the result will be increased deforestation and reduced potential for carbon sequestration. One solution is to meet expected global food and timber demand by moderately intensifying agricultural land use improving land utilization (Tilman et al., 2011). Therefore, limiting the clearing of additional lands by improving agricultural practices will result in higher crop yields per hectare and more efficient agriculture and timber production. “While non-CO2 GHGs can increase under intensive production, this rarely exceeds the carbon emissions from clearing land,” leading to fewer greenhouse emissions overall (Myers Madiera et al., 2009).

To facilitate this, REDD+ donor countries are increasing aid for sustainable agriculture. The United States could expand its investments in agroforestry in some countries, which utilizes various practices and technologies to improve sustainable land use. Particularly, it can focus agroforestry finance in countries with low crop yields to increase efficiency. Agricultural productivity could be considered a metric of REDD+ financing. This may also be achieved by combining REDD+ financing with food security aid in low-yield agricultural countries. USAID provides aid on behalf of the United States for various agricultural initiatives, which include food security, land management, and science and technology (USAID 2010). However, it may be the case that these increased funds for sustainable agriculture are diverted from funds used for measured emissions reductions. This could be a problem as both issues are critical for the success of REDD+.

Engagement of the private sector will be an important part of the progression of REDD+. The private sector should be exposed to viable solutions to unsustainable practices such as low-carbon investments and carbon trading in regulated markets (Moss and Kovacevic, 2012). The private sector can also provide climate finance that can help further REDD+ projects (Kahurani, 2012). Organizations such as the Consumer Goods Forum, a partnership of companies that use agriculture and timber outputs, have identified the importance of reducing deforestation and are working to increase sustainability of their

operations and supply chains through various climate change initiatives (CGF, 2012).

In order for these recommendations to be accounted for, the United States should consider increasing its reporting transparency and also take necessary actions to progress the adoption of MRV standards in the REDD+ mechanism. In addition to increasing the overall credibility of REDD+, it will allow the United States and other donor countries to assess improvements in crop yields and the maintenance of forest cover. MRV instruments will provide quantitative measures to see if the U.S. investments are being allocated wisely and meeting their objectives. Whether or not these measures will stop deforestation and reduce greenhouse gas emissions is unknown, however they can increase the likelihood of a high return on investment for the United States, while strengthening the REDD+ mechanism as an effective climate change mitigation policy.

Conclusions & Recommendations

1. *REDD+ can address the drivers of deforestation by integration of finance with food security aid and supporting yield efficiency and agroforestry.*

Ultimately, reducing land clearing will result in carbon storage and sequestration benefits and regional biodiversity conservation. To achieve reduced land clearing, the underlying societal drivers of increasing demand for agriculture and timber products must be addressed. REDD+ finance should be integrated with food security aid in tropical countries to ensure that REDD+ is not displacing farmland. Food security aid and REDD+ financing can be focused towards technologies that increase agricultural crop yields and overall efficiency. Similarly, agroforestry management improvements can provide higher yields of timber and other forest products from existing forestry lands or from recently cleared forests. Illegal logging and increased timber demands can be addressed by increasing sustainable forest management, thus lessening land clearing. These changes will also significantly decrease the impacts of biofuel production on deforestation, land use change, and biodiversity. However, to address the root of biofuel caused land use changes, the United States should consider restructuring its biofuels policy to account for emissions from land use change and the unintended impacts on food security in developing nations.

Generally, increasing REDD+ finance will increase the mechanisms beneficial impacts, therefore encouraging investments from the private sector to supplement public funds will be important. Relevant private sector entities can also assist in decreasing deforestation by encouraging the use of sustainable forest products in their supply chains.

2. *U.S. REDD+ bilateral funding should consider additional criteria.*

Based on the results of our study, we would recommend that the U.S follow a different method for distributing finance. Currently, it appears as if the U.S. is investing in countries that have the capacity to complete and maintain REDD+ projects through metrics such as per capita GDP and capacity gap. Although the U.S. will receive the highest number of reported impacts for its given finance with this portfolio strategy, it could be detrimental for the progress of REDD+ overall. Countries that need financing for its REDD+ projects the most are generally the countries that are not being targeted by the U.S. at the moment, such as countries with a large capacity gap and a low GDP.

As such, the U.S. should fund countries that need to narrow their capacity gap. Despite the possible lack of tangible results through Demonstration projects, it would increase the overall capacity of countries to implement REDD+ initiatives. Similarly, poorer nations would benefit more greatly than richer countries from REDD+ financing, as they would have a much greater utility per dollar invested. At the moment, these countries are currently being neglected in terms of how much financing they are receiving from the U.S.

Similarly, we would recommend that the U.S. increase financing towards projects that demonstrate carbon monitoring and mapping technologies. This would allow countries to be better integrated into future REDD+ frameworks that require measurement, reporting, verification, and monitoring. At the moment, there is only a limited amount of financing going towards this area, as most impacts are categorized into improving forest management and governance.

3. *Reporting should be more transparent by linking finance specifically with its associated impacts and using clear and concise language.*

Finally, U.S. government agencies reporting on REDD+ expenditures should increase transparency by reporting about finance and impacts more clearly and in greater detail. This would allow organizations like Tropical Forest Group to better analyze REDD+ finance and impacts and provide recommendations during these crucial early stages. U.S. government agencies reporting on REDD+ finance do not provide a line-item list linking a specific amount of finance with its intended impact. Instead, the agency will assign a sum of money to a project that achieves a number of individual impacts falling within a number of categories, including Architecture, Readiness, or Demonstration. Therefore, it is impossible to seriously evaluate whether a specific amount of finance is being used effectively. Keeping a line item budget will accurately reflect which impacts are being given the most monetary support and will increase the transparency of financial flows, known impacts, and will hypothetically allow agencies to verify the permanence of these impacts and reduce the opportunity for corruption. In order to facilitate verification in the future, reporting agencies must employ clearer language when describing project impacts or develop common metrics to describe impacts. Using vague language for intended impacts sets low standards for project outcomes, possibly resulting in inefficient use of government money.

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Appendices

Appendix 1: Countries represented in the Tropical Forest Group database

Geographical Region	Africa	Asia	Latin America & Caribbean (LAC)
Countries	Democratic Republic of Congo Ethiopia Guinea Kenya Liberia Madagascar Malawi Mali Mozambique Rwanda Senegal Tanzania Uganda Zambia	Bangladesh Cambodia India Indonesia Nepal Philippines	Belize Bolivia Brazil Colombia Ecuador El Salvador Guatemala Guyana Haiti Honduras Jamaica Mexico Nicaragua Panama Paraguay Peru