

The Geography of REDD+ Finance

Deforestation, Emissions, and the Targeting of Forest Conservation Finance

Michael Wolosin, Jessica Breitfeller, Brian Schaap



August 2016

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Executive Summary

The recent Paris Climate Agreement, reached at COP 21 in December 2015, marked the culmination of ten years of negotiations concerning the integration of tropical forest conservation within a global climate regime. First placed on the agenda of the UNFCCC (United Nations Framework Convention on Climate Change) in 2005, the idea that developed (Annex I) countries could compensate developing (Annex II) countries for Reducing Emissions from Deforestation and forest Degradation (REDD+) aims to recognize the crucial role that forests play in the global carbon cycle and to incentivize forest conservation as a core component of global climate change mitigation efforts. While the primary REDD+ policy architecture was decided through the Warsaw framework at COP 19 (2013), negotiators in Paris have now struck a deal that fully operationalizes REDD+ within the UNFCCC.

Since 2011, Forest Trend's REDD EXpenditures Tracking initiative (REDDX) has worked to provide greater transparency around the financial flows that have been committed for REDD+ programs. As policy progresses to implementation and the scope of REDD+ expands, mapping global investments in REDD+ is becoming ever-more critical.

The following report combines for the first time the financial data gathered by REDDX with the deforestation and emissions data of World Resources Institute's Global Forest Watch (GFW) to examine the spatial distribution of REDD+ finance and its relation to forest cover, forest loss, and emissions patterns at both the national and sub-national levels.

Working in partnership with in-country civil society organizations, REDDX tracked nearly \$6 billion¹ in total REDD+ finance commitments between 2009 and 2016, spanning ten different countries throughout Latin America, Africa, and Asia Pacific. Of this amount, **\$2.9 billion was allocated toward national-level REDD-readiness initiatives, while \$3 billion was earmarked for subnational initiatives that target specific regions or provinces in individual countries.**

When comparing this financial data with deforestation and emissions trends, the following key findings emerge:

Key Findings

- **Overall, REDD+ finance appears to be more closely related to higher deforestation than to forest cover alone, suggesting that donors may be prioritizing REDD+ finance toward areas facing acute deforestation pressures, rather than equally targeting all areas with high forest cover.**
- **REDD+ finance increases in total, but decreases per ton of emissions, as forest area, deforestation, and deforestation emissions—all associated with country size—increase.** This is largely a function of the fixed costs of REDD-readiness investments and the economy of scale that these investments achieve in larger countries with greater forest cover. Differences in capacity appear to drive deviations from this broad trend, with Mexico, Brazil, and Peru receiving more funding than predicted and Tanzania, Ethiopia, and Ghana less.
- **REDD+ finance at both the national and subnational level is strongly correlated with emissions and forest loss, although the details of that relationship differ across countries.** While not surprising, this research is the first to verify such a relationship across a broad swath of REDD+ finance.
- **Individual provinces that have displayed high levels of commitment and capacity are more often participating in jurisdictional REDD+ (J-REDD) programs,** such as the Governors' Climate and Forest Task Force (GCF), the Forest Carbon Partnership Facility (FCPF) Carbon Fund, and the BioCarbon Fund's Initiative for Sustainable Forest Landscapes (ISFL), and therefore tend to receive significantly more funding per hectare of forest cover, forest cover loss, and ton of emissions than provinces not in these J-REDD pipelines.

¹ All financial amounts are in US dollars unless otherwise noted.

- **However, provinces and regions facing civil conflict or with weak governance and political institutions, often receive comparatively less funding, even in the presence of high deforestation rates.** For example, certain regions within both Mexico and Colombia are associated with high levels of illegality and illicit drug trade which are contributing to increased levels of deforestation. In some cases, certain provinces which appear to be comparatively underfunded—based on their forest cover loss and emissions trends—are within countries that have recently received large national-level pledges, which will likely be redistributed to the subnational scale in the coming years. This suggests that donors are in many cases aware of funding discrepancies and are working to rectify them.
- **In general, REDD+ finance is being targeted to those countries and provinces demonstrating strong political commitment to tropical forest protection,** as indicated by their Intended Nationally Determined Contributions (INDCs) and other policies such as low-carbon development plans.

Policy Implications

Additional economic incentives are needed to continue REDD+ progress

In the absence of a predictable future funding source, such as an international carbon market, jurisdictional REDD+ finance should be coupled with low-carbon, landscape-level development approaches to provide additional economic incentives for forest conservation. Such an approach may ultimately create greater buy-in and the enabling conditions required to attract large-scale private sector investments and to address deforestation at scale. REDD+ finance alone will be insufficient to overcome the economic and political forces driving deforestation; broader changes are needed as well, including domestic policy incentives and reforms, and greater participation and investments by private sector actors to drive more sustainable agricultural commodity production.

More finance is needed to counter uneven distribution at the subnational level

Given the uneven distribution of REDD+ finance at the subnational level, many provinces in the future will likely require additional readiness funding. Readiness and capacity building are not only a national process, and uneven investment across jurisdictions in many countries suggests that progress from earlier to later phases of REDD+ is also likely to be uneven. In these cases, “graduation” from readiness to results-based finance will be at the subnational scale. Investment in additional geographic areas within a REDD+ country may bolster potential capacity and governance deficiencies, and create a more robust framework to support performance-based payments for quantifiable forest emissions reductions in relation to agreed-upon reference levels. As more of these provinces reach readiness benchmarks, there must also be a concerted effort to provide additional results-based finance.

There are significant fixed costs of engagement that require policy recognition and planning

While much of the variation in donor REDD+ finance at the national scale can be explained by deforestation and emissions, our models suggest that about \$32 million/year (95% Confidence Interval: \$3.6–\$61 million) is independent of such variables. This level of annual donor investment is much higher than multilateral REDD+ funding initiatives allocate for early phases of REDD+, and it may in fact be supporting a wider range of activities than just readiness and capacity building. It suggests that policy makers in both donor and forest countries may need to plan for a higher level of “baseline” REDD+ finance than previously recognized, perhaps engaging through the Green Climate Fund.

Interested jurisdictions need to get involved to receive significant finance

Although our analysis did not address the “success” of REDD+ national and jurisdictional programs—allocating and spending REDD+ money is not the same as reducing deforestation—jurisdictions that are seeking investment in low-emissions rural development should consider engaging in J-REDD pipelines, if they are not already.

Donor coordination will be important to direct public REDD+ finance where it is most needed

While Norway stands out as a dominant funder of early REDD+ efforts, additional donors may soon become more fully engaged in funding REDD+ under the framework of the Paris Agreement. Donors have inherent motivations, preferences, and biases which must be acknowledged. Various political, historical, and economic factors influence donor decision-making concerning where to direct funding, and what types of activities that funding should support.

These donor preferences must be acknowledged and used as a basis for planning and coordination in order to avoid significant funding gaps which may otherwise result. The strong relationships we find between REDD+ finance and forest loss/emissions in the 10 countries of our sample suggest that donor coordination is yielding relatively good coverage to date. Continued coordination as additional donors join the REDD+ effort will be important to maintain this rational allocation of finance to match avoided deforestation opportunity. This coordination is also important for subnational REDD+ finance. There is a greater risk of leaving large funding gaps at the subnational level as the number of REDD+ jurisdictions vastly exceeds the number of REDD+ countries; donors should work closely with forest countries to track REDD+ finance to specific geographies and to identify potential gaps.

Introduction

In recent years, the Paris Agreement and the United Nations Framework Convention on Climate Change's (UNFCCC) Warsaw Framework for REDD+, coupled with voluntary and pre-compliance REDD+ mechanisms, such as the Verified Carbon Standard's (VCS) Jurisdictional and Nested REDD+ (JNR) and the Forest Carbon Partnership Facility's (FCPF) Carbon Fund, have solidified the groundwork for the multi-scale implementation of REDD+. As policy becomes practice, dozens of national and jurisdictional REDD+ programs have begun to emerge on the ground.

As such, several studies² have attempted to analyze the effectiveness of REDD+ initiatives, evaluating the state of REDD+ finance, the evolution of jurisdictional approaches, and early lessons learned. However, few of these studies have fully considered the spatial distribution of REDD+ activities and finance, and the relation of this distribution to forest cover, deforestation, and emissions patterns. Obtaining a better understanding of the spatial targeting of REDD+ finance and the degree to which it overlaps with the particular subnational geographies facing the most acute deforestation pressures is a crucial step in evaluating whether funding is being utilized effectively and directed to those places most in need of forest conservation interventions.

Thus, the purpose of this report is to explore potential linkages and trends between the spatial targeting of donor REDD+ finance, and forest and climate data. To do so, this report—for the first time—combines financial data from Forest Trends' REDDX initiative with deforestation³ and emissions data from the World Resources Institute's Global Forest Watch (GFW) to address the following questions:

1. What are the patterns and correlations between forest data and the allocation of international donor commitments and pledges at both the national and subnational scales?
2. As the locus of REDD+ efforts begins to shift from national capacity building to subnational implementation, is international REDD+ finance following suit?
3. What factors explain the distribution of REDD+ finance at both the national and subnational scales?
4. Are there certain countries, or provinces within countries, attracting notably more or less funding than one might expect given their forest cover, rate of deforestation, and CO₂ emissions trends?
5. If so, are there underlying socio-political factors that may help explain why the distribution of REDD+ finance differs from avoided deforestation opportunity?

Section I explores the comparative distribution of REDD+ finance across ten of the thirteen REDDX⁴ countries in relation to forest cover, forest cover loss, and emissions data. Section II delves deeper, examining trends in the subnational allocation of funding within these ten countries. Section III provides our conclusions, based on the observations laid out in Sections I and II, including policy implications and recommendations for future study. Finally, four case studies for Brazil, Colombia, the Democratic Republic of the Congo (DRC), and Ethiopia are presented within the Annex. These further tease out individual country-level and subnational trends and provide examples of varying distribution patterns, as well as the dependence of REDD+ finance on factors other than forest statistics.

It is our hope that such analysis—by providing a deeper layer of granularity and transparency—will spark new insights needed to attract additional finance and mobilize increased engagement by donors and government actors toward areas most in need of forest conservation support.⁵

² For relevant analyses see: Lee and Pistorius 2015; Silva-Chávez et al. 2015; Nepstad et al. 2013; Fishbein and Lee 2015.

³ We use GFW tree cover loss data from the University of Maryland's Hansen Lab as a proxy for "deforestation," recognizing both the strengths and weaknesses of this approach.

⁴ See next section for more details about the methodology of this study.

⁵ Of course, public sector and donor finance are not the only source of investments that are needed to achieve reduced deforestation. For example, the large number of voluntary private sector deforestation-free supply chain commitments will ultimately need to be matched by private sector investments in intensification where there is progress and evidence of success on reducing deforestation.

Approach and Methodology

Launched in 2011, REDDX attempts to provide greater transparency around the financial flows that have been committed to support REDD+ and to aid countries in identifying national climate and forest conservation priorities. The initiative works in partnership with local civil society organizations and REDD+ Focal Points in thirteen countries collectively representing 65% of the world's tropical forest cover. This report focuses specifically on ten⁶ of these countries, across three regions:

- **Latin America:** Brazil, Colombia, Mexico, and Peru
- **Africa:** Democratic Republic of the Congo (DRC), Ethiopia, Ghana, Liberia, and Tanzania
- **Asia–Pacific:** Indonesia

The REDDX model is based on annual cycles of primary data collection through surveys and in–person interviews, as well as national validation and consultation processes to confirm the results in each of the REDDX participant countries. During the 2015 data collection cycle, in–country civil society partners utilized an updated survey to capture geo–referencing data, so that funding could be located spatially. This data was then coded, first on a national versus subnational basis, and then for subnational flows further coded according to specific political jurisdictions⁷ or groupings of provinces referred to in the report as “regions” (e.g., the Brazilian Amazon). Because significant finance was earmarked for multiple jurisdictions, we analyzed these flows in two different ways. In one view all funding was allocated to individual provinces (see below). In a second view we included these multi–province regions as data points themselves. The core analyses presented below use the province–level data. However, the regional approach was used to confirm key results and for a few of the case studies.

Tree cover, tree cover loss, and gross tree cover loss emissions data at both the national and subnational scale were obtained from World Resource Institute's Global Forest Watch and GFW–Climate for the years 2001 through 2014.⁸ Utilizing tree cover thresholds that most closely match each country's own definition of “forest,” as revealed in relevant REDD+ policy documents, GFW data was compiled for each of the identified REDDX provinces and regions receiving funding, as well as the remaining unfunded jurisdictions within each country. Financial data was then modeled as a function of tree cover and emissions data with linear and log regression analyses to assess both the statistical and explanatory power of the forest variables.

Given the data collection and compilation processes, both the REDDX and GFW datasets contain certain limitations. Of the \$5.9 billion⁹ originally tracked by the REDDX partner network, approximately 13%, or \$744 million, was allocated across multiple provinces without specific data regarding the amount going to each province. In order to divide these financial flows out and assign specific dollar amounts flowing to individual provinces, we utilized a deforestation–area weighting technique, under the assumption that this is likely a more accurate way of dividing up this funding than simply splitting the funding equally between all provinces in the grouping. While this may not represent the actual amount of funding flowing to each individual province, it represents a best–available approximation and provides what is likely a more accurate estimate of the distribution of funding, rather than arbitrarily dividing funds across multiple provinces collectively receiving a specific tranche of funding. This method suggests some caution in interpreting the regression statistics, but is less problematic than including multi–jurisdiction regions.¹⁰ Additionally in countries with large datasets, particularly Indonesia, where more detailed geographic information was difficult to obtain, greater proportions of funding are likely to have been *de facto* categorized as “national” due to an inability by our partners in some instances to pinpoint the final destination of certain finance flows; in some cases this may have caused subnational finance flows to appear artificially low.

⁶ For the additional three REDDX countries (Ecuador, Papua New Guinea, and Vietnam) we were unable to code enough of the financial flows to the subnational scale with sufficient confidence to include them.

⁷ For the purposes of this study, our units were the political subdivision just below “national” in each country. These are variously referred to as States, Provinces, Counties, or Departments by each of the ten different countries included in the study.

⁸ See <http://www.globalforestwatch.org/> and <http://climate.globalforestwatch.org/>.

⁹ All financial values throughout the report are reported as U.S. Dollars, unless otherwise noted.

¹⁰ The province–level results presented below were robust to removing this 13% of REDD+ finance from the analysis.

It should also be noted that in general, REDD+ financial data is based on commitment and disbursement information, rather than pledges. However, in order to provide a more comprehensive and up-to-date picture, we have elected to include all recent and pending major pledges of which we are aware, including those announced at and since the UNFCCC Paris COP in December of 2015. These are mainly in the form of bilateral agreements between Norway and various countries; the REDD+ Early Movers Programme (REM); the BioCarbon Fund's Initiative for Sustainable Forest Landscapes; and the Forest Carbon Partnership Facility's Carbon Fund. In many cases, a portion of this pledged funding has been earmarked for national-level readiness activities, while the rest will be provided as results-based payments for verified emission reductions either at the national or subnational level. When specific information regarding the planned geographical allocation of these large amounts of funding was not available, these flows were coded within the national category. Additional information regarding individual pledges can be found in Annex II.

While GFW is the only globally consistent source of tree cover and emissions data at the subnational level, it is important to note that its methodology also has drawbacks.¹¹ Firstly, a measure of total tree cover area is available only for one year: 2000. Additionally, independent estimates of gross tree cover loss in the years 2001 through 2014 and total tree cover gain from 2001 through 2012 make it impossible to estimate net forest loss. Climate data includes only gross tree cover loss—not forest degradation or peat emissions, which are important in some geographies, and excluding any offsetting sinks from tree cover gain. For both area and emissions data, it is important to note that GFW tree cover information is not equivalent to a land use definition of deforestation, which is more common in country reporting. For example, harvesting a timber plantation would appear as tree cover loss within GFW data, even though this would not be considered a deforestation event from the land use perspective assuming such areas are replanted. Lastly, forest cover percentages may be underestimated for those few states and provinces with large bodies of water within their borders, as we only had access to total province area information, rather than land areas (excluding water) for each province.

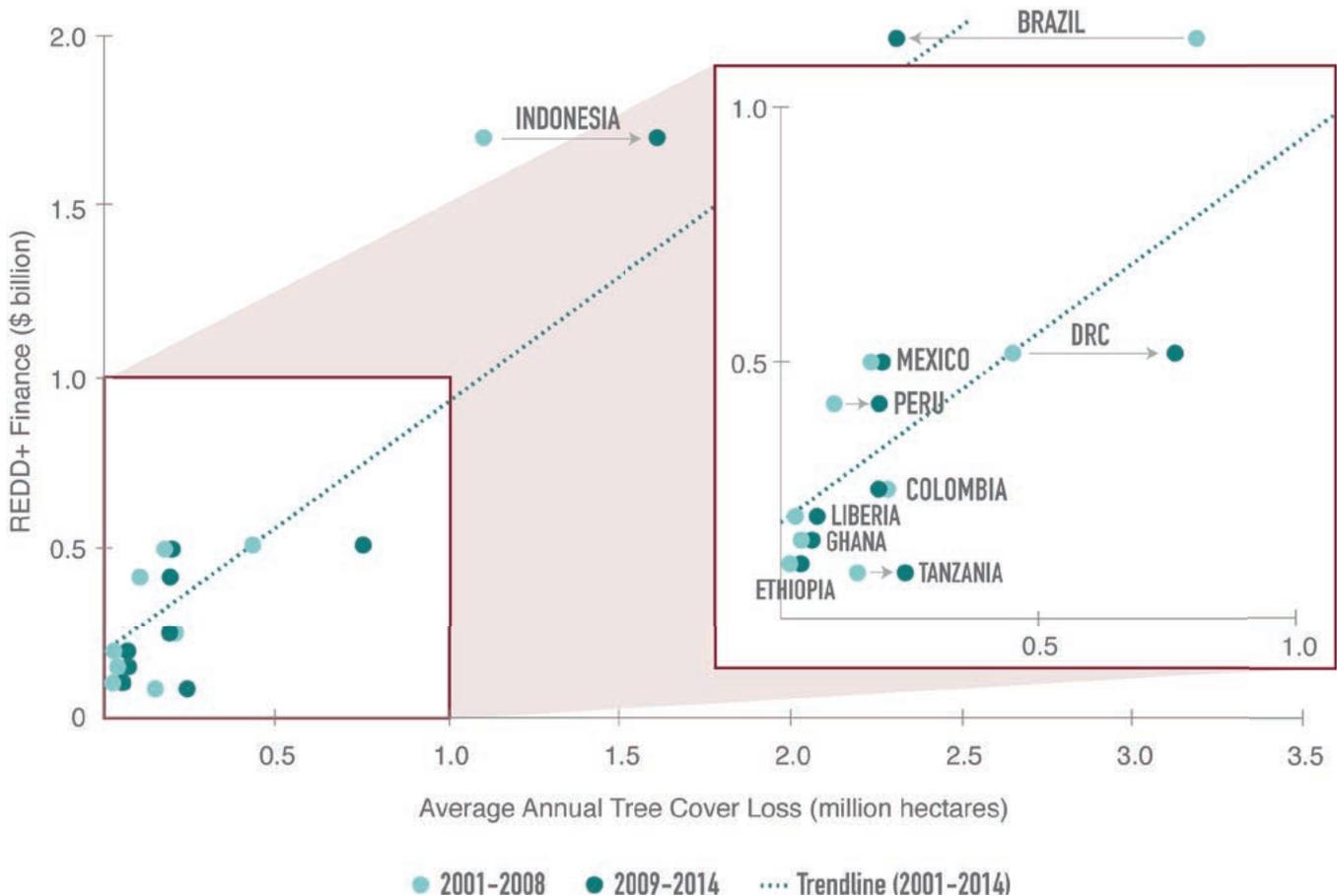
¹¹ See [Elias, Ellis, and Griscom \(nd\)](#) for a very useful overview of the strengths and weaknesses of the GFW and Hansen data.

I. Where Is REDD+ Finance Going Globally? And Is It Well-Targeted to Country-Level Forest Cover, Deforestation, and Emissions Trends?

Decisions regarding allocation of REDD+ finance from donors to recipient countries are dependent on a wide range of factors. Geopolitical interests and nation-state relationships undoubtedly play a major role in shaping donor decisions regarding which countries they will direct finance toward. Prior experiences in implementing programs (climate and other) and risk are also important. However, we might expect donor decisions to primarily take into account total forest cover, the rate and amount of forest cover loss (deforestation), and the resulting CO₂ emissions from these processes, as well as cost per unit of reduction. In order to maximize the effectiveness of REDD+ finance—in terms of reduced emissions resulting from avoided deforestation—donors could be expected to have a strategic interest in targeting countries with large forest areas, high levels of deforestation, and high levels of CO₂ emissions from deforestation.

Not surprisingly, overall trends in REDD+ finance across the ten countries generally follow these expected patterns. Countries with larger total forest areas tended to receive greater levels of REDD+ finance. A simple linear regression model indicates a significant relationship ($p = 0.002$) between REDD+ funding and tree cover, with 70% of the variation in total finance committed to each country explained by forest area.

Figure 1: REDD+ Finance vs. Average Annual Tree Cover Loss



Significant relationships also exist between forest cover loss, CO₂ emissions, and total finance provided ($p < 0.001$). Countries with greater forest loss between the years 2001 and 2014 received more REDD+ funding than those with less forest loss, as shown in Figure 1. Forest cover loss over the period 2001–2014 explained 88% of the variation in total finance, and forest loss from 2009 through 2014 explained 94% of the variation in total finance. The fact that forest cover loss in the more recent period from 2009 through 2014 explains more variation in REDD+ finance is due in large part to reduced deforestation in Brazil and increased deforestation in Indonesia since 2009. As the total area of forest cover loss for the two countries became more similar, the fact that each also received similar levels of REDD+ finance increases the overall fit of the regression across the ten countries.

When comparing the distribution of REDD+ funding across the countries to differences in CO₂ emissions from deforestation, the relationship is again strong. Countries with greater forest CO₂ emissions received higher levels of REDD+ finance. Once more, the power of emissions to explain finance is slightly stronger for emissions during the more recent period from 2009 through 2014 ($R^2 = 0.93$) than for the earlier period from 2001–2008 ($R^2 = 0.87$) for the same reason as above.¹²

Indonesia's land use change emissions profile is unique among our sample countries in that it is being dominated by a source other than gross deforestation: emissions from peat fires and degradation account for as much as 55% of Indonesia's land use emissions from 2001 through 2014.¹³ When these peatland emissions are factored into the analysis, Indonesia's average annual emissions more than double to 1.11 million metric tons of CO₂ per year over the 2009–2014 period, pushing Indonesia ahead of Brazil's annual deforestation emissions of 0.578 million metric tons during the same time to become the largest source of CO₂ emissions among the ten countries (Figure 2). This weakens the power of emissions by itself to explain REDD+ funding over the period 2009–2014. However, we expect that donors are considering both gross forest emissions and peat emissions in their REDD+ finance decisions for Indonesia, so this may be a more appropriate model.

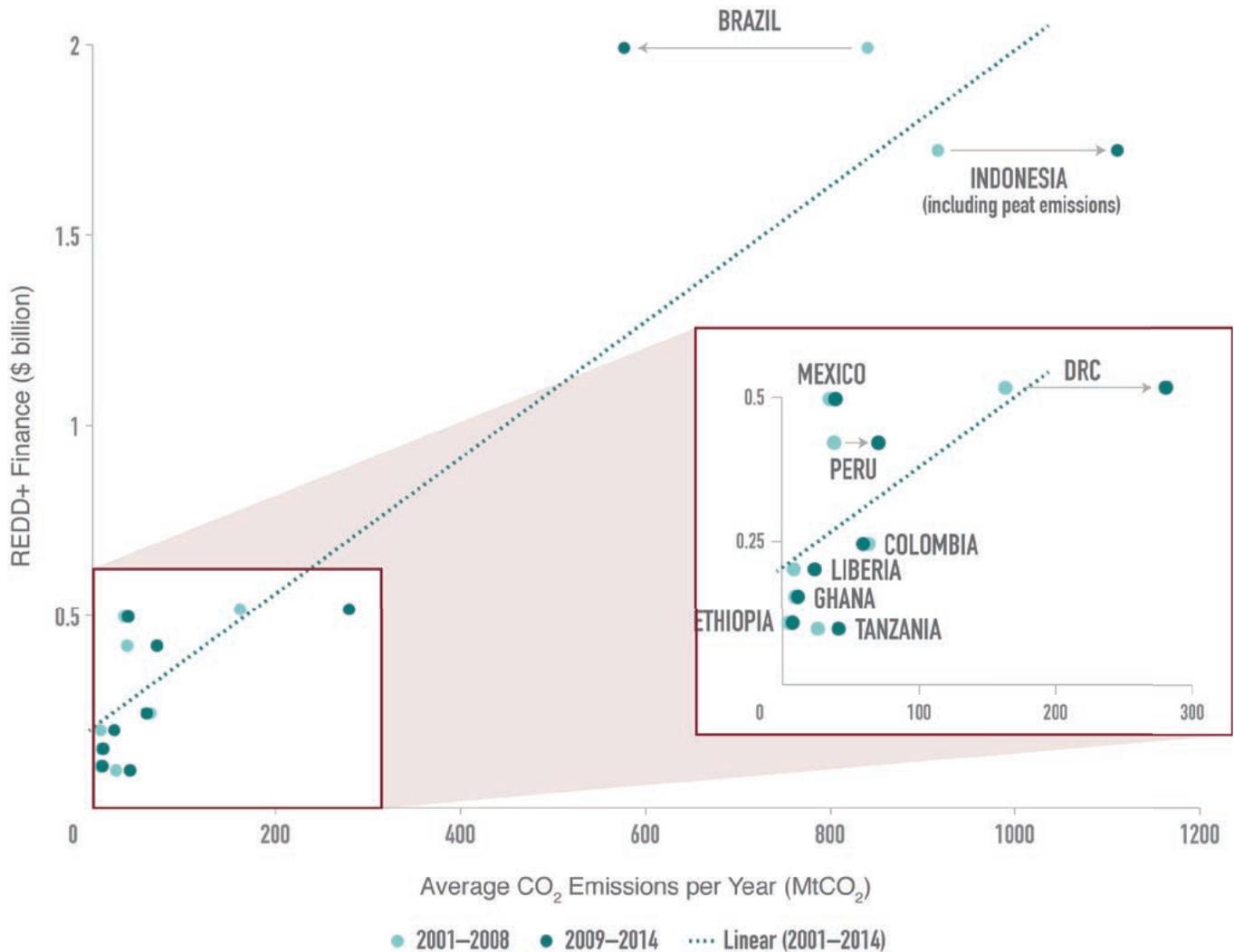
In this model, expected REDD+ finance allocated to a REDD+ country with zero emissions would be about \$193 million from 2009–2014, or about \$32 million per year. This predicted baseline amount of finance, which is independent of emissions, might be indicative of the fixed costs of participating in REDD+. More notable is the slope of the regression line, which indicates that for every additional million tons of average annual emissions, we expect an increase in REDD+ finance of \$308,000 per year (\$1.8 million for the full period). This suggests that annual REDD+ finance per ton of emissions decreases as emissions increase—a country with higher emissions should not expect the same level of REDD+ finance on a per-ton basis as a country with lower emissions. It is important to note that other variables not included in the regression may be highly correlated with emissions—such as the overall size of the country or its relative economy strength—and that these hidden variables, if included, may reduce the explanatory power of emissions.

In each of the observed relationships—between REDD+ finance and forest cover, forest cover loss, and emissions—Brazil and Indonesia are to a large extent driving the strength of the trends, given their high forest cover, high forest cover loss, corresponding high levels of CO₂ emissions from forest loss, and large REDD+ finance commitments and pledges. Yet, the general trends remain even when removing Brazil and Indonesia from the analysis, although in each case the explanatory power of the regression and statistical significance of the predictor are reduced ($0.4 < R^2 < 0.5$ and $p < 0.075$ respectively, noting the small sample size of 8 countries).

¹² This is when excluding peat emissions from Indonesia. Also, the graph of this finding is not included in the report for the sake of brevity.

¹³ The estimate of Indonesia's annual peat emissions from 2001 to 2014 in this analysis is the sum of peat decomposition from deforestation and forest degradation, and emissions from peat fires. The former is taken from Indonesia's Second National Communication (SNC) to the UNFCCC for years 2001–2012; 2013 and 2014 are interpolated. The SNC also provides the Indonesian government's estimates of peat fire emissions from 1997 to 2007, which are used directly for available years. For years 2008 to 2014, we predict peat fire emissions using the strong linear relationship between the SNC data and FAOStat's total area burned series based on GFED4 ($R^2 = 0.938$ for the 8 years of overlapping data). Peat emissions from deforestation and decomposition average 119 MtCO₂/year, while peat fire emissions average 434 MtCO₂/year, for a total of 553 MtCO₂/year over the period 2001–2014.

Figure 2: REDD+ Finance vs. CO₂ Emissions from Deforestation (including Indonesian peat emissions)



Despite the general trends across the ten countries linking REDD+ funding with total forest area, deforestation, and associated emissions, considerable variation exists at the individual country level. A useful way to compare these relationships across the countries is to calculate and compare the amount of funding donors have allocated to each country per hectare of forest cover, per hectare of forest cover loss, and per metric ton of CO₂ emissions (Table 1).

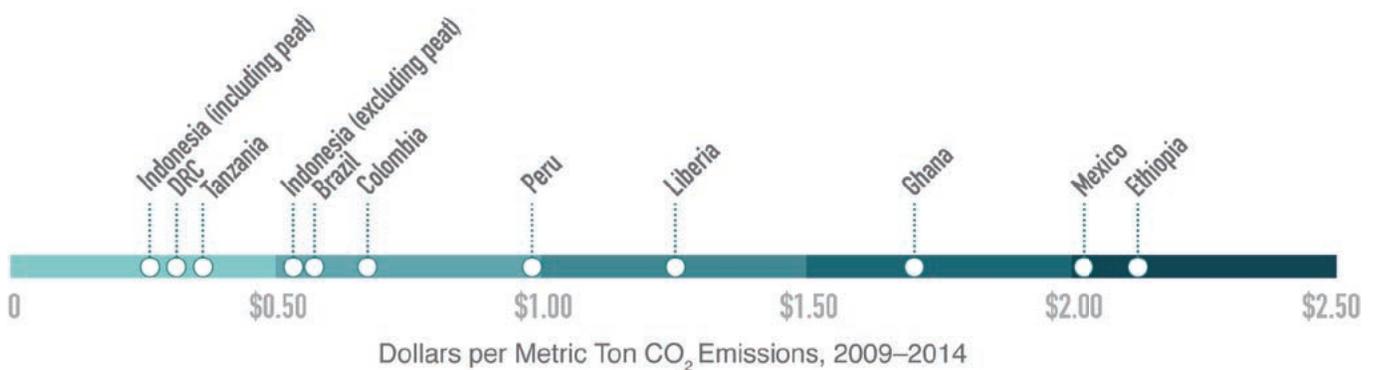
When comparing funding based on emissions, Ethiopia comes out ahead, having received more funding per metric ton of CO₂ emissions than any of the other countries. Mexico received the next-largest amount, followed by Ghana, Liberia, and Peru. These same countries also received proportionally more finance per hectare of forest cover loss, with Ethiopia again leading the way. On the other end of the spectrum, the DRC, Indonesia, Tanzania, Brazil, and Colombia received less funding per metric ton of emissions and per hectare of forest cover loss than the trend line average across the ten countries.

While a number of factors are undoubtedly at play in determining differential levels of REDD+ finance flowing to the ten countries included in this study, a few emerging trends offer partial explanations as to why some countries received more funding than others per hectare of deforestation and per ton of emissions. Perhaps the most straightforward observation is that countries with the largest areas of forest cover, deforestation, and emissions tended to receive less funding per hectare of forest cover, per hectare of deforestation and per ton of emissions, while countries with smaller total forest areas received greater relative levels of REDD+ finance. In other words,

despite the huge differences in forest cover area, deforestation, and emissions across the countries, donors have opted to distribute proportionally more funding to countries with less forest cover/loss/emissions and proportionally less funding to countries with more forest cover/loss/emissions.

Table 1: Available REDD+ Finance in Ten REDD+ Countries

Country	Dollars per Metric Ton CO ₂ Emissions, 2009–2014	Dollars per Hectare of Forest Cover Loss, 2009–2014	Dollars per Hectare of Forest Cover
Brazil	\$0.57	\$143	\$3.65
Colombia	\$0.67	\$212	\$3.00
Democratic Republic of Congo	\$0.31	\$114	\$2.58
Ethiopia	\$2.12	\$567	\$6.35
Ghana	\$1.70	\$376	\$11.15
Indonesia (excluding peat emissions)	\$0.53	\$178	\$10.73
Indonesia (including peat emissions)	\$0.26		
Liberia	\$1.25	\$420	\$21.01
Mexico	\$2.02	\$421	\$7.90
Peru	\$0.98	\$377	\$5.33
Tanzania	\$0.36	\$67	\$1.44
Median	\$0.67	\$293.85	\$5.84



There are a variety of reasonable explanations for this trend, with the most obvious being differences in economies of scale. REDD–readiness finance aims in large part to catalyze policy changes at the national level and to develop systems and institutions necessary for future REDD+ implementation. To a large degree, these investments represent a fixed set of costs that donors must commit to fund, regardless of the size of a country or its forests. Both large countries with sizable forest areas and smaller countries with more limited forest areas all face a complex set of challenges in preparing to implement REDD+. Virtually every sector, ministry, or office of a national government exercises decision–making authority that in some way impacts forests, and therefore REDD–readiness initiatives must initiate change across a wide range of actors and institutions, in both large countries and small. Monitoring, Reporting, and Verification (MRV) systems to establish baselines for forest cover and forest cover change are also necessary and expensive to establish in any country, regardless of its size. However, the impacts of these relatively fixed, up–front costs in larger countries such as Brazil, DRC, or Indonesia will by definition affect larger areas of

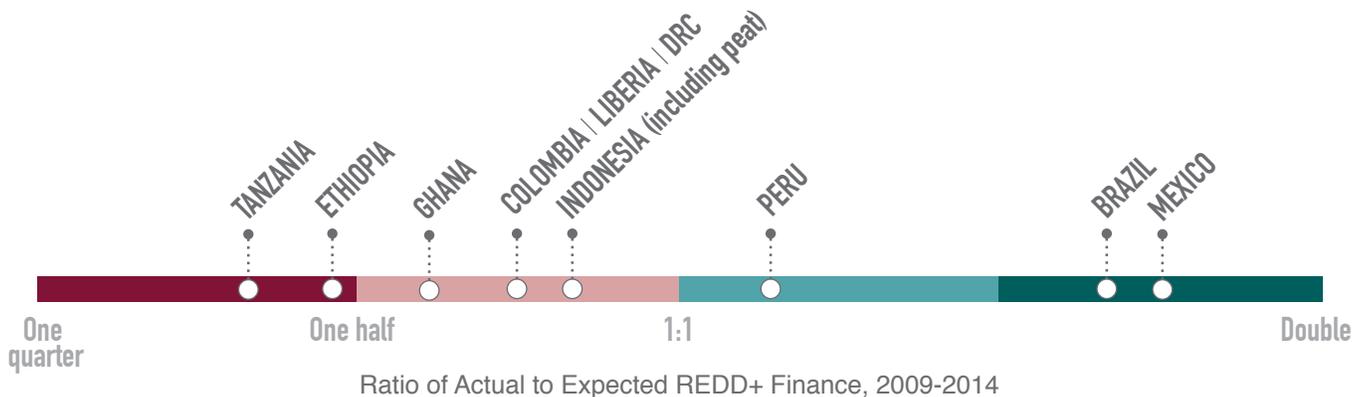
forest cover than in countries such as Liberia, Ghana, and Ethiopia where total national forest cover is relatively small. As such, the similar levels of funding allocated across the countries for Phase-I readiness activities will translate to larger per-hectare and per-ton contributions in countries with smaller forest areas than in countries with large forest areas. While this is certainly true for Phase-I activities, as REDD+ countries and donors increasingly move toward Phase-III payments for verified emissions reductions we should expect to see funding allocated to countries more proportionately to forest area, forest area loss, and forest emissions.

Ethiopia’s high apparent allocation of REDD+ finance could be explained in part by the country’s emphasis on reforestation in its REDD+ plans. To the extent REDD+ finance is supporting reforestation or other forest stock enhancement activities rather than avoided deforestation, estimates of dollars per ton of forest emissions would not accurately represent dollars per ton of emissions abatement opportunity (i.e., including from reforestation)—which is the more important but unobservable variable. Ethiopia’s forest area is a small percentage of its total land area, and while forests are still being lost at a significant pace, the country seeks to not only stop the loss but to flip forests from an emissions source to a significant sink by 2030.

Perceived differences in capacity and national commitment to reduce deforestation may also account for the disparities observed across the countries. Ethiopia and Mexico submitted particularly ambitious plans to reduce emissions from forest loss and agriculture, which may partially explain why both countries received more than \$2/ton in REDD+ finance for the period 2009–2014. Ostensibly, donors can be more confident that both countries have a firm national commitment to aggressively reduce deforestation emissions and plans in place to effectively utilize funding toward these goals. Similarly, Liberia’s post-2006 election achievements to reform its logging concession system under its new president Johnson-Sirleaf may also explain why donors—sensing a serious commitment by the national government to conserve the country’s forests—have allocated proportionally high levels of REDD+ finance to the country in the ensuing decade.

In contrast, capacity and commitment may also account for the relatively low levels of funding per metric ton of CO₂ emissions received by the DRC and Indonesia. In the case of Indonesia, Norway’s commitment of \$1 billion in finance has been on the table since 2010, but the country’s failure to reduce its deforestation and its resulting emissions has precluded any significant additional investments by Norway or other donors. The situation in the DRC is somewhat different. Despite its vast forest area, the country’s deforestation rate has been relatively low and stable until recently. Additionally, the DRC has the highest corruption risk and arguably lower government capacity than of any of the other nine countries, potentially contributing to hesitancy among donors to allocate REDD+ funding to the country.¹⁴ Norway’s recent pledge of \$200 million to the DRC through the Central African Forest Initiative is structured to ensure that funding is only paid out as explicit milestones are reached—an effort to both provide a clear REDD+ road map for the country and to ensure accountability.

Figure 3: Ratio of Observed to Predicted REDD+ Finance per Ton CO₂ Emissions, 2009–2014



¹⁴ The DRC has a Corruption Perception Index rating of 22 (out of 100) according to Transparency International, <http://www.transparency.org/cpi2015#results-table>.

Another way to compare differences in funding is in relation to the average trend line estimating the relationship between REDD+ finance and CO₂ emissions across all ten countries (Figure 3). By calculating the difference between the observed (actual) and predicted (trend line) level of REDD+ finance for each country and dividing this by the trend–line–predicted value for each country, we derive a ratio expressing the extent to which a given country’s observed REDD+ finance is larger or smaller than the trend line of all ten countries would predict, given each country’s particular annual average emissions over the period 2009–2014.

This analysis reveals that Mexico is receiving 1.74 times more funding per ton of emissions than the model would predict, while Brazil received 1.67 times more than the average, and Peru 1.25 times more. The other seven countries received less funding than the ten–country trend line average would predict, with Tanzania’s funding representing the largest departure from the predicted average (ratio of 0.33), followed by Ethiopia (0.46), Ghana (0.62), DRC (0.75), Liberia (0.76), Colombia (0.77), and Indonesia (0.82). Differences in capacity (perceived or real) may be driving this trend, with donors opting to direct proportionally more funding to high–capacity countries with advanced REDD+ programs such as Mexico and Brazil, and demonstrating greater reticence to commit commensurate funding (per ton of emissions abatement opportunity) to many African countries.

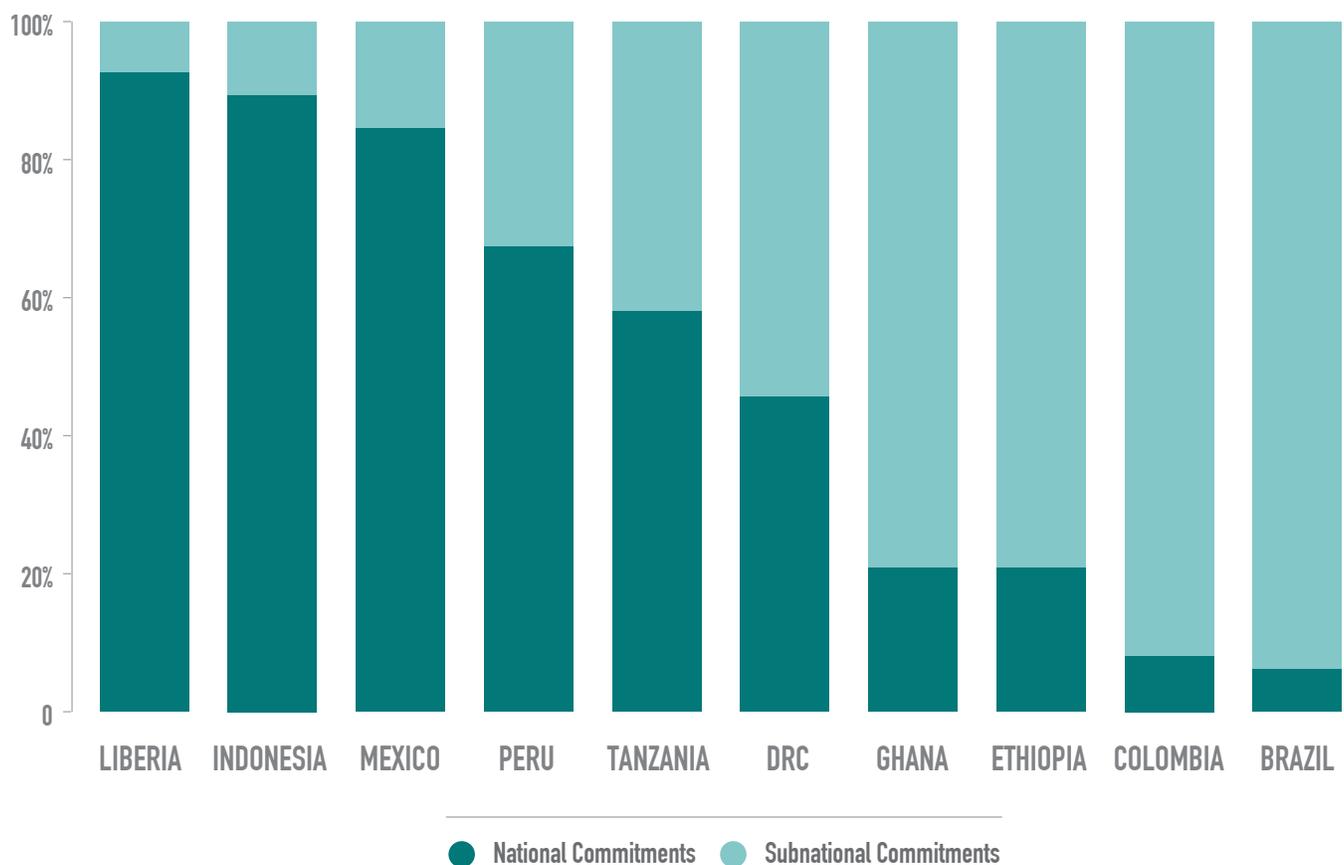
II. Where Is REDD+ Finance Going within These Ten Countries?

National vs. Subnational Pledges, Commitments, and Disbursements

Of the \$5.9 billion in total finance tracked to the ten countries, REDD+ was able to identify \$2.9 billion in funding directed towards national-level REDD-readiness initiatives, and \$3 billion in funding earmarked for subnational initiatives targeting specific geographic regions or provinces within a country. Countries receiving (or that have already allocated) a majority of funding for initiatives operating at the subnational rather than the national level include Brazil, Colombia, Ethiopia, and Ghana. If not for Brazil, the balance between national and subnational funding across the ten countries would not be nearly so even. Nearly two-thirds of the total subnational funding tracked was directed to provinces within Brazil alone (\$1.87 billion), suggesting that the other nine countries are either not as far along on the REDD+ implementation pathway as Brazil, or are choosing to implement REDD+ at the national scale—as the majority of their funding was either allocated to, or remains at, the national level. A greater national allocation for countries earlier in the REDD+ implementation pathway is to be expected, given that initial REDD-readiness activities tend to focus on national-level initiatives such as the establishment of MRV systems and governmental policy reform, capacity building, and strategic planning. In contrast, later-stage REDD+ payments for performance have tended thus far to target the subnational level, focusing on the most heavily forested areas through jurisdictional REDD+ programs.

Countries with higher institutional capacity and stronger national policy frameworks already in place ostensibly do not require quite as much national-level readiness funding. This may have enabled them to more easily develop

Figure 4: Proportion of National vs. Subnational REDD+ Finance by Country



jurisdictional approaches and direct greater finance to the subnational level. In addition to perceived differences in national capacity across the countries, geography is also likely playing a role. Focusing on subnational investments makes sense in countries for which most forest cover and forest loss are concentrated in just a few regions—and where land use policies are likely to be a high political priority. This is the case in a country like Ethiopia, for example, in which the province of Oromia contains nearly half of the country's forest area—and much of its restoration opportunity—and has received more than 70% of all REDD+ funding pledged to the country. More than two-thirds of the country's forests are located in only two of the country's eleven political regions, so allocating REDD+ funding to the national level makes less strategic sense than simply targeting these two heavily-forested regions, as donors have in fact done (see Annex I).

Liberia, Indonesia, and Mexico have received high levels of international REDD+ finance at the national scale, together accounting for nearly 74% of the overall \$2.9 billion in national funding. Yet, both Mexico and Indonesia are in the process of building out their own jurisdictional programs. It is likely that greater amounts of funding are flowing at the national scale due to their REDD+ management and institutional arrangements. For example, Mexico's National REDD strategy (EN-REDD) places the National Forestry Commission (CONAFOR) as the sole entity charged with overseeing the implementation of subnational projects within classified Early Action Areas. In Indonesia, the federal government has taken a strong lead in developing REDD+, formerly through the National REDD+ Agency—and while the federal government is closely involving subnational jurisdictions and has a mechanism to deliver REDD+ funding to local areas (FREDDI), significant proportions of finance and pledges to the national planning and REDD+ programs have not yet been allocated to specific geographies.

Disbursement rates differ across national and subnational allocations. Approximately one-half (\$1.5 billion) of total subnational finance tracked across all ten countries was disbursed by the end of 2014. The proportion of nationally targeted funds disbursed was somewhat lower, at 25%. It is possible that this higher disbursement rate at the subnational level may be due to efficiency—there may be fewer steps for funding to pass through if it skips the national government, therefore taking less time to distribute. But this might also be a question of timing and methodology. If significant proportions of national funds may eventually be distributed or used for subnational implementation but have not yet been allocated, the REDDX methodology is not likely to identify the subnational destination of REDD+ pledges or commitments. Geographic data is more common for funds that have actually been disbursed, suggesting some caution in interpreting the observed patterns of national versus subnational allocation of REDD+ finance.

Subnational Relationships between Finance and Forest–Climate Data

The same line of reasoning guiding expectations for REDD+ finance going to various countries—that it would likely be a function of factors such as forest cover, deforestation, and emissions—could also be expected to apply at the subnational level. That is, one might expect that not only would more funding be going to countries with more forest area, more forest loss, and greater emissions, but also that greater levels of funding would be directed to subnational regions within these countries that have particularly large forest areas, high levels of forest loss, and high levels of associated CO₂ emissions. For both international donors and national governments implementing REDD+, it would seem that targeting money to reach regions most in need of forest conservation assistance and incentives is a prerequisite for REDD+ interventions to maximize their potential impact and odds of success.

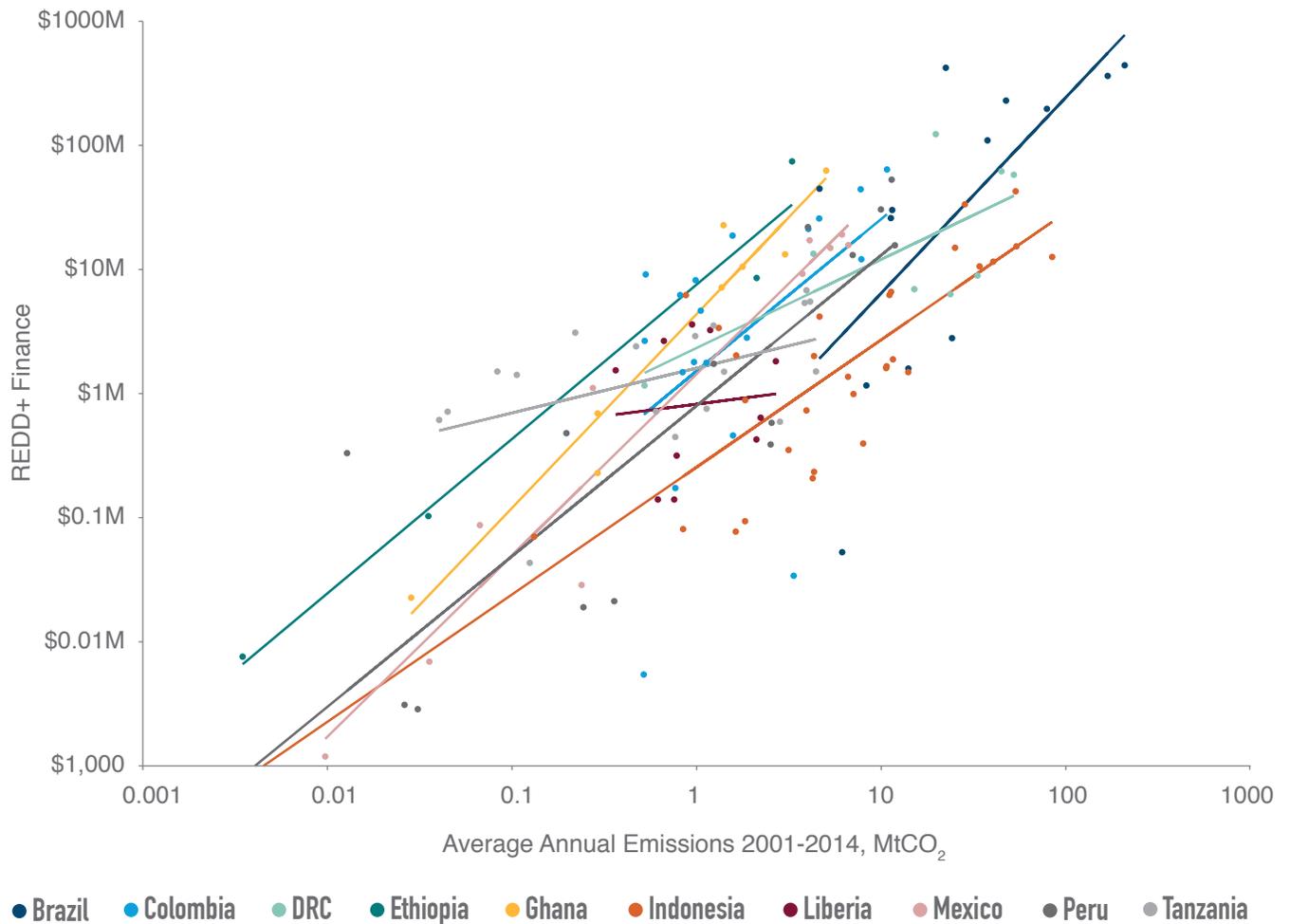
Of the \$3 billion in REDD+ funding identified to subnational initiatives across the ten countries, more than half (\$1.87 billion) has been allocated to Brazilian provinces. Other provinces, for example Bandundu in Democratic Republic of Congo, Caquetá in Colombia, Oromia in Ethiopia, and Western Region in Ghana, are also scheduled to receive large proportions of the overall subnational finance tracked. The average funding going to the 10 provinces receiving the most subnational REDD+ finance exceeds \$200 million, while the median province is receiving just over \$2 million.¹⁵ The forest statistics exhibit similarly skewed distributions. We therefore log-transformed these variables prior to modeling relationships between them, after visually confirming normally distributed errors (e.g., Figure 5).¹⁶ While several of the Brazilian provinces were of course still the highest, they were no longer outliers.

¹⁵ This median measure includes all 136 provinces to which REDDX was able to track subnational pledges, commitments, or disbursements, but does not include the 85 provinces to which REDDX did not track any REDD+ finance.

¹⁶ Note that this transformation requires removal of provinces with zero REDD+ finance; no provinces receiving REDD+ finance had zero values for any of the forest statistics.

The relationships observed across countries at the national scale also hold across subnational jurisdictions globally. In simple linear regressions of log-transformed values, tree cover explained 53% of the variability in REDD+ finance; tree cover loss 61%; emissions from 2001 to 2008 62%; and emissions from 2001 to 2014 and from 2009 to 2014 both 63%.¹⁷ We also examined whether the relationships held after controlling for country differences. When fitting a common slope across countries, but allowing independent intercepts for each country—in other words, assuming a common scaling relationship between the forest variables and REDD+ finance for all jurisdictions, but with different starting points for each country—the fit improved somewhat (explaining between 58% and 72% of the variability), with statistically significant differences across many of the countries. The best model allowed for differences across countries in both the slope and intercept—essentially fitting a distinct line for each country while assuming a common error distribution.¹⁸

Figure 5: Province-level REDD+ Finance vs. CO₂ Emissions from Deforestation by Country



Several differences emerge between countries in the relationship between forest variables and province-level REDD+ finance; we focus here on average annual CO₂ emissions from 2001 to 2014 as the core explanatory variable. In countries with a steeper slope, such as Brazil (dark blue) and Ghana (gold), REDD+ finance increases more quickly as a function of emissions across respective jurisdictions. For example, a tenfold increase in average

¹⁷ This result is robust to alternative multivariate regressions that included all three independent variables after transformations to reduce their correlations, e.g., modeling REDD+ funding as a function of forest area, percent area loss, and emissions per hectare.

¹⁸ We did not group countries without statistically significant differences in slope or intercept.

annual emissions from one province to another results in an expected 38-fold increase in REDD+ finance in Brazil and a 37-fold increase in Ghana. Liberia's jurisdictions, followed by those in Tanzania and then DRC, have the lowest proportional differences in REDD+ finance compared to emissions, indicating province-scale REDD+ finance is much more evenly distributed across participating provinces regardless of emissions. For example, a province in Liberia with 10 times more emissions than its neighbor could expect to receive less than twice as much REDD+ funding. The analogous multiple is just over 2 in Tanzania and about 5 in DRC. Indonesia's provinces have a nearly 1:1 relationship between differences in emissions and differences in REDD+ dollars—a province with twice the emissions likely received twice as much REDD+ finance.

The overall conclusion of these regression analyses is clear: not only is a large proportion of the differences in national-scale REDD+ finance explained by differences in national emissions, a large proportion of the differences in province-scale REDD+ finance *within* countries is similarly explained by emissions, even though the details of that relationship may differ across countries. While not surprising, this research is the first to verify such a relationship across a broad swath of REDD+ finance.

Beyond this overall conclusion, there are also some interesting outliers within the dataset, representing provinces with high forest cover and/or deforestation that are receiving little to no funding. In these instances a multitude of other political factors such as institutional capacity, weak governance, and differing approaches to conservation influence donor and REDD-country governments' decision on where to direct finance and investment within a country.

Provinces for which REDDX was not able to identify any targeted subnational funding, but with high forest cover and/or deforestation rates include: Bombi and Maryland within Liberia and Guerrero, Mexico. Those receiving minimal funding include Volta, Ghana and Mbeya, Tanzania, as well as several additional states within Liberia. In the case of Liberia, the country as a whole has simply not received very much subnational REDD+ finance; therefore it is not surprising that certain provinces within Liberia are outliers within the dataset. While provinces like these may appear to be underfunded, it should be noted that in many cases these countries have recently received large national-level pledges, at least some of which will likely be distributed to provinces in the coming years. Again, Liberia is one such example as the country recently signed a bilateral agreement with Norway for \$150 million, suggesting that donors are in fact aware of funding shortfalls to certain forest countries and provinces and are working to rectify them.

On the other hand, conditions of weak governance or the presence of civil conflict can be a primary factor in explaining why certain provinces have received less funding, despite the presence of high forest cover and deforestation rates. For example, certain regions within both Mexico and Colombia¹⁹ are associated with high levels of illegality and illicit drug trade which are contributing to increased levels of deforestation.²⁰ Yet REDDX data verify that provinces within these areas are not receiving high levels of subnational funding. Explanations for this phenomenon are fairly clear, given that REDD+ investments and interventions require a basic degree of political stability and coherent governance in order to be effective.

Jurisdictional REDD+ Programs

Another factor influencing the levels of subnational REDD+ finance received by various provinces and regions is whether or not these subnational jurisdictions are formally participating in jurisdictional REDD+ (J-REDD) programs and partnerships. Individual provinces participating in J-REDD programs such as the Governor's Climate and Forest Task Force (GCF), the FCPF Carbon Fund, and the BioCarbon Fund's Initiative for Sustainable Forest Landscapes (ISFL) tend to receive significantly more funding per hectare of forest cover, forest cover loss, and ton of emissions than provinces not in these J-REDD pipelines. The scale of potential REDD+ emissions reductions from these J-REDD programs is massive. For example, should sufficient financial resources be made available to support the twenty-six states participating within the GCF who have committed to the Rio Branco Declaration target of 80% reduction in annual deforestation by 2020, they would generate more than 500 million tons of CO₂

¹⁹ Refer to Fergusson et al. (2014) for additional analysis regarding the trends between deforestation and conflict in Colombia.

²⁰ McSweeney et al. 2014.

emissions reductions per year—an order of magnitude greater than the 34.4 million tons in market-based forest offsets transacted in 2014.²¹ Given the scale of emission reductions at stake, donors have allocated billions of dollars in pledged support to jurisdictions volunteering to participate in J-REDD programs.

Collectively, the 32 J-REDD provinces within this study's ten countries have received nearly \$2.4 billion, while the other 189 non-participating provinces together have obtained \$631 million. The majority, or 64% (\$1.5 billion), of J-REDD funding is being targeted to initiatives within 7 of the Amazonian states in Brazil. Thus, Brazilian provinces are substantially driving the relationships between subnational J-REDD finance and forest cover, forest loss, and emissions.

When Brazilian provinces are removed, the twenty-five provinces in the J-REDD pipelines receive on average three times more funding per ton of emissions and per hectare of forest cover loss and forest cover than provinces not participating in J-REDD initiatives (Table 2). When Brazilian provinces are included, the pattern becomes even more skewed: provinces within the J-REDD pipeline receive five times more finance per ton of emissions and per hectare of forest loss and more than four times more finance per hectare of forest cover area.

Table 2: Available Finance to J-REDD and Non-J-REDD Provinces

Type of Province	Dollars per Metric Ton of CO ₂ Emissions, 2009–2014	Dollars per Hectare of Forest Cover Loss, 2009–2014	Dollars per Hectare of Forest Cover
J-REDD Provinces	\$0.55	\$166.23	\$4.09
J-REDD Provinces, excluding Brazil	\$0.32	\$99.60	\$3.23
Non J-REDD Provinces	\$0.11	\$32.19	\$0.98

What differentiates these 32 provinces from the non J-REDD provinces? While individual provinces participating within the J-REDD pipeline tend to have greater forest cover and suffer from higher deforestation, what seems to set these locations apart is their strong political commitment to forest conservation and low-carbon development via jurisdictional approaches to REDD+ implementation. In fact, this is in many ways a prerequisite for participating in J-REDD programs.

Strong national commitment also plays a role and is necessary to authorize, facilitate, and support involvement by subnational provinces in J-REDD programs. The theory-of-change underpinning jurisdictional REDD+ is the belief that piloting REDD+ at the subnational level is a necessary precursor to the future nation-wide expansion of REDD+ interventions, accounting, and financial transfers. This theory guides the planning and investment decisions of the donors and REDD+ country governments funding and participating in J-REDD programs, and while in the short-term this approach may appear to allocate funding disproportionately to those provinces participating in J-REDD initiatives, the long-term aim is to operationalize REDD+ at the national scale.

Additional J-REDD and outlier patterns are explored in more depth in Annex I, which contains individual country case studies for Brazil, Colombia, DRC, and Ethiopia.

²¹ Goldstein 2015.

III. Conclusions & Recommendations

What Have We Learned?

We have shown that at the national scale, and at the subnational scale both within countries and across countries, REDD+ finance differences can largely be explained by the expected relationships with forest loss, emissions, and cover. That is to say, REDD+ finance is going to countries that are facing deforestation and the amounts received are what we would expect given their deforestation and forest profile. Higher REDD+ finance is better predicted by higher emissions and higher forest cover loss than by forest cover alone, suggesting that donors may be prioritizing REDD+ finance toward areas facing higher deforestation pressures, rather than equally targeting (or equally valuing) conservation of forest carbon stocks in all areas with high forest cover. This is true both at national and subnational scales and makes sense from a climate perspective that aims to reduce emissions as quickly as possible.

At the national scale, we also observe a strong negative relationship between absolute emissions (or forest area loss) and REDD+ funding per ton of emissions (or per hectare of loss). Countries with high levels of total emissions from deforestation receive lower levels of finance on a per-ton basis. For example, Indonesia's REDD+ finance of \$1.7 billion equates to only \$0.26/ton, compared to Liberia's \$200 million, which is significantly lower in absolute terms but five times higher than Indonesia on a per-ton basis at \$1.25/ton. Part of this difference can be explained by fixed costs associated with readiness. We observe an average REDD+ funding stream that is independent of emissions of about \$32 million per country per year.²² Other factors could also be coming into play, however. For example, countries with larger economies might be expected to cover a higher proportion of REDD+ costs, and there is certainly a correlation in our small sample between emissions and economy size. A similar pattern could result from fragmentation and edge effects, if larger countries are more likely to have large contiguous blocks of forest or a greater proportion of intact forest landscape and REDD+ finance is directed to forest frontier areas. While our sample size is too small to fully distinguish between these explanations, the pattern is clear.

There are also indications that more national-scale finance is allocated to countries with higher capacity and/or lower corruption. High-capacity countries are allocated more REDD+ finance than would be expected based on their emissions or forest loss data alone, and lower-capacity countries are receiving less. This result would be expected if REDD-readiness costs are higher in relatively high-capacity countries, perhaps because there are already well-developed systems in place that require shifting or because the costs of labor and operations are higher. It would also be expected if donors were allocating results-based finance commitments primarily to high-capacity countries.

At the subnational scale, we observe similar broad relationships between REDD+ finance and emissions and forest loss both globally and within each country, but there also appear to be significant differences in how much impact these forest variables have on subnational distribution of REDD+ finance. It appears that subnational REDD+ finance may be more concentrated in high-emissions provinces in higher-capacity countries (e.g., Brazil, Mexico, and Ghana), although again the sample of 10 countries is too small to be certain. The temporal resolution of our REDD+ finance data was not sufficient to identify trends—for example a shift from national finance in earlier periods to subnational finance in later years in a particular country or jurisdiction. However, we did observe a higher proportion of subnational-scale finance in countries that are more advanced in their REDD+ process, which suggests that such a shift does in fact take place.

Finally, our analysis indicates that REDD+ finance is being targeted to those countries and provinces demonstrating strong political commitment to tropical forest protection as indicated by their Intended Nationally Determined Contributions (INDCs), national REDD+ strategies, other policies such as low-carbon development plans, and participation in jurisdictional REDD+ programs. For example, jurisdictions that have displayed high levels of commitment and capacity are more often selected to participate in J-REDD pipeline programs, and therefore tend to receive significantly more funding per hectare of forest cover, forest cover loss, and ton of emissions than provinces

²² The confidence interval of this estimate is \$3.6 million to \$60.7 million per year.

not in these J-REDD pipelines. Our analysis also identifies some outliers in the other direction—provinces with high deforestation and emissions but very low or no REDD+ finance. In many of these cases, conflict or other socio-political factors explain the discrepancy (see case studies below for examples).

Recommendations for Future Analysis

The various factors influencing the distribution of REDD+ finance at the jurisdictional level are multifaceted and inextricably linked and therefore must be considered on a country-by-country basis, taking into account not only trends in climate and forest data but also geopolitical variables. As such, future analyses should combine financial and forest and climate data with in-depth institutional and policy analysis to help pinpoint areas of conflict, weak governance, and potential risk. Additionally, future analyses should take into consideration other variables such as ecological and economic co-benefits based on biome, as well as forest composition data to provide a more holistic picture of those areas that may require additional finance. We also suggest that we need a better understanding of the relationship between finance received and decreased deforestation, particularly over time. In other words, whether finance is being used effectively to achieve the REDD+ goal to slow, halt and reverse forest cover loss.

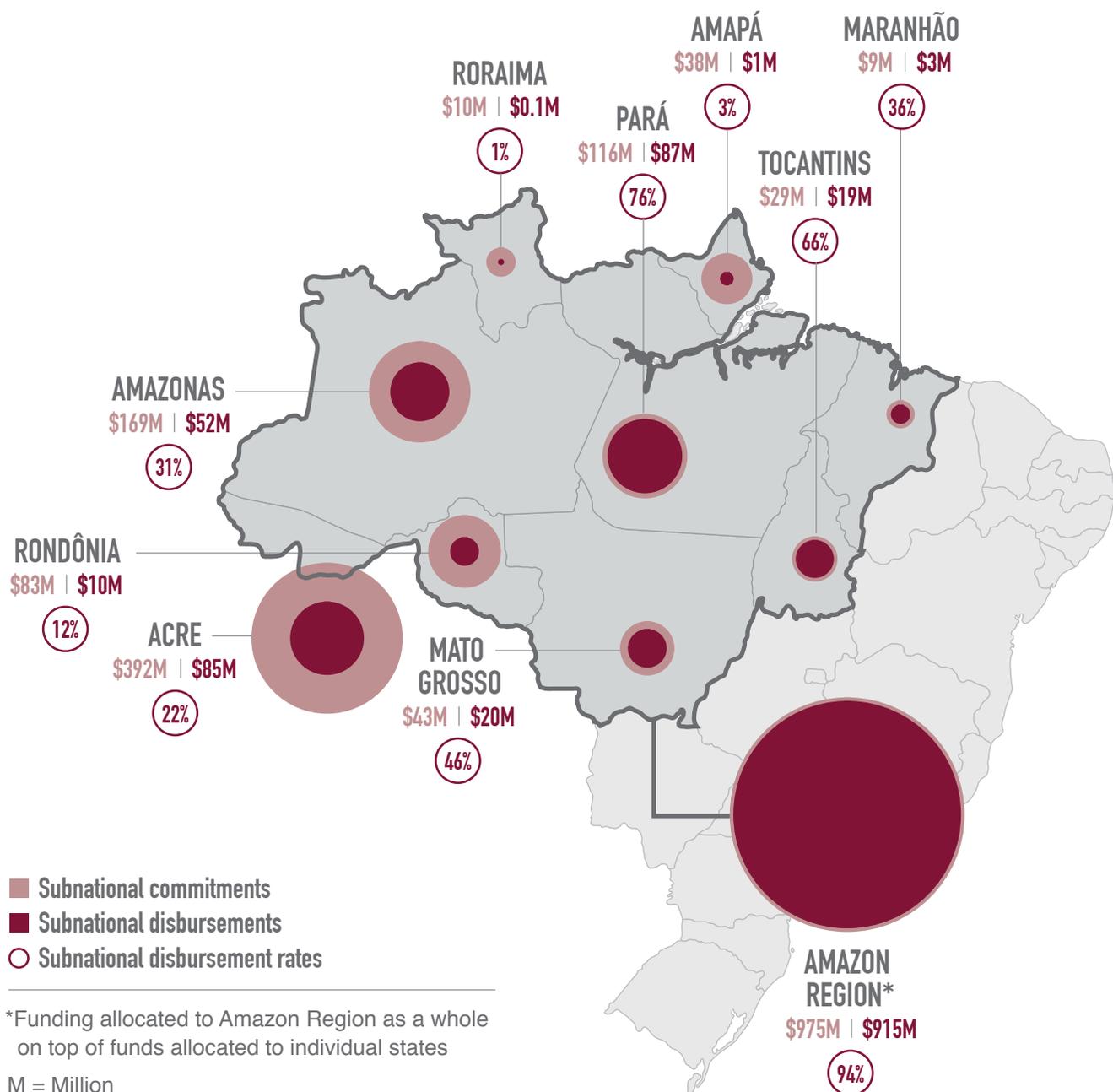
Finally, donor and REDD+ countries would benefit from a better system to track REDD+ and related land use finance in order to generate a more accurate picture of how this finance flows within a country. REDD+ has been best able to track public finance and, to the extent relevant, private sector finance from voluntary carbon markets. As the Paris Agreement makes clear, both domestic public sector investment (e.g., to meet Intended Nationally Determined Contributions) and private sector investment are likely to play increasingly large roles in climate finance in the years ahead. As forest country governments put in place “carrots and sticks” to drive private sector investment towards lower-carbon actions, understanding and mapping global investments in REDD+ will become more difficult but no less critical.

ANNEX I – Country Case Studies

Brazil

Brazil is home to approximately one-third of the world's remaining tropical rainforests, with the Amazon alone covering nearly half of the country's land mass. In recent years, the country has been heralded as an international success story in the environmental world. As an early adopter of REDD+, Brazil has received extensive amounts of funding for drastically reducing deforestation rates and emission within the country. It is currently on track to meet its original 2008 target of reducing deforestation by 80% by 2020.

Annex I–Figure 1: Subnational REDD+ Commitments and Disbursements within the Brazilian Amazon



During the 2009–2016 period, the REDD_X initiative tracked a total of \$1.99 billion in finance to Brazil. Only \$123 million, or 6.5%, was targeted to national-level readiness initiatives. The overwhelming majority (\$1.87 billion) of REDD+ finance was instead channeled to the subnational level where it is strongly correlated with forest cover, deforestation, and associated emissions ($0.44 < R^2 < 0.65$). It stands to reason that Brazil would likely be receiving more subnational funding, as the country has high institutional capacity and governance mechanisms. Additionally, Brazil has one of the most advanced jurisdictional programs in the world, as seven of the nine Amazonian states reacted to early delays in the development of the national REDD+ strategy by establishing state-level programs to achieve regionally defined targets.

Geographically speaking, REDD+ efforts within the country have long focused on the Amazon region, which historically has high forest cover, forest cover loss, and emissions from deforestation. Therefore, it is no surprise that over 49% (approximately \$974 million) of subnational finance has been allocated to the Amazon region, with individual Amazonian states receiving an additional \$889 million. Of this funding, approximately 47% had been channeled through the state-run Amazon Fund via large commitments from both Germany and Norway.

High allocations of funding to the Amazon are likely warranted based on the region's forest cover, deforestation, and emission profile—the region accounts for approximately two-thirds of both the country's total tree cover and deforestation area. As a whole, the region has significantly reduced both deforestation rates and gross forest loss emissions. However, it should be noted that four of the nine Amazonian states experienced slight increases in deforestation rates during the 2001–2014 period. Only Maranhão's increased deforestation rate and subsequent emissions were statistically significant.

Brazil's Atlantic Forest

The Mata Atlântica, or Atlantic Forest, encompasses several forest types including both dry and moist broadleaf forests, as well as tropical mangroves. The entire forest complex spans four countries: Brazil, Paraguay, Argentina, and Uruguay. In Brazil, the region extends across portions of thirteen states along the country's eastern coast. Historically, the area has experienced high deforestation due to rapid land conversion and increased urbanization. Today, despite a comparatively lower rate of deforestation than that of the Amazon, the relative impact of deforestation within the region is considerable given that 7% of original forest remains.*

The REDD_X initiative tracked limited REDD+ finance to states within the Mata Atlântica region during the 2009–2014 period, despite them having some of the highest deforestation rates in the country. One possible explanation for this is that forest fragmentation and edge effects have severely limited the remaining forests' ability to sequester carbon. A 2011 study released in journal of *Tropical Conservation Science* found “that only 8% of the forest is currently capable of achieving its full carbon sequestration potential.”** Donors therefore may be wary to provide finance.

Additionally, until relatively recently, landscape restoration and afforestation efforts were not a large component within Brazil's conservation and climate change agenda. As such, these activities have been relatively underfunded by REDD+ financial streams; however, this is beginning to change. In 2009, the Atlantic Forest Restoration Pact, led by the International Union for Conservation of Nature (IUCN) and The Nature Conservancy (TNC), was forged to restore 15 million hectares of the forest by 2050. The program currently has two hundred and sixty members, working toward restoring more than 1 million hectares of land by 2020. Also, in early 2016, Brazil submitted its INDC; among other goals the country has set a target of restoring 12 million hectares of forests by 2030.

All this indicates that actions to support forest recovery and preservation of the remaining forest will likely become increasingly important within the context of REDD+ in the Mata Atlântica states and points to an opportunity for international donors and the national government alike to more thoroughly integrate these efforts and associated finance into the broader National Strategy.

* World Wildlife Fund (n.d.).

** de Paula et al. 2011.

With the overwhelming majority of subnational REDD+ finance earmarked for projects and programs within the Amazon, other Brazilian states have yet to receive significant amounts of funding. Both the Cerrado—particularly within the states of Goiás, Mato Grosso Sul, and Minas Gerais—as well as the Mata Atlântica region (see box below) appear to be somewhat underfunded. The REDDX initiative identified only 1% (19.5 million) of overall subnational finance is being channeled to the Cerrado. Yet, the region was able to make considerable gains; it witnessed a fall in deforestation rates and a statistically significant ($p = 0.004$) decrease in gross forest loss emissions in the Cerrado region from 2001 to 2014, at an average rate of decline of about 17 million tons per year.

Colombia

Colombia is the second-most biologically diverse country in the world, with unique ecoregions including the Northwestern Andean montane forests and the Amazon rainforest, which covers approximately 10%, or about 60.5 million hectares of the country's land area. With the fourth-largest economy in Latin America, Colombia's economic growth is based largely on mining, agriculture, and industrial exports. As drivers of deforestation, these economic sectors have contributed to an estimated 310,000 hectares of forest cover loss per year over the past two decades. According to the Colombian government's Institute of Hydrology, Meteorology and Environmental Studies (Instituto de Hidrología, Meteorología y Estudios Ambientales; IDEAM), the majority of the country's forest loss is occurring in the Amazon and Andean regions; however relatively speaking, the Caribbean region has suffered the greatest impact, having lost nearly a quarter of its forest between 2000 and 2010.²³

As the country is characterized by distinct ecoregions, which dictate both forest cover and drivers of deforestation, Colombia has elected to take a subnational step-wise approach to the development of its REDD+ strategy. Thus far, the country has identified nine subnational regions, or Regional Climate Change Nodes (*Nodos Regionales de Cambio Climático; NRCC*), demarcating boundaries by aligning ecoregions and jurisdictions of the regional environmental management institutions known as the Autonomous Regional Corporations (*Corporaciones Autónomas Regionales; CARs*). The data utilized within this analysis, however, is coded by department, as some provinces are present within multiple nodes, making it difficult to accurately calculate deforestation data and allocate financial flows.

From 2009 to mid-2016, REDDX tracked a total of \$245 million in REDD+ finance provided to the country as a whole. A relatively small portion (8%, or \$19.8 million) was targeted at the national level for readiness activities including stakeholder engagement, policy and law analysis, and institutional strengthening. Approximately \$225 million was directed to the subnational level, aimed at similar capacity-building activities, as well as addressing land rights and tenure issues, and aiding in forest carbon project design. Such an allocation between the national and subnational scale would make sense given the country's strong commitment to sustainable, low-carbon development and its stated jurisdictional approach.

To date, at least 52% (\$127 million) of subnationally directed funding has been earmarked for states within the Amazon region. At the recent Conference of the Parties in Paris (COP 21), it was announced that the country would receive up to \$113 million—\$12 million from Germany, \$53 million from Norway, and \$48 from the UK via the REDD+ Early Movers (REM) program to support the implementation of the Colombian government's Amazon Vision Programme, which seeks to achieve zero-net deforestation in the region by 2020.²⁴

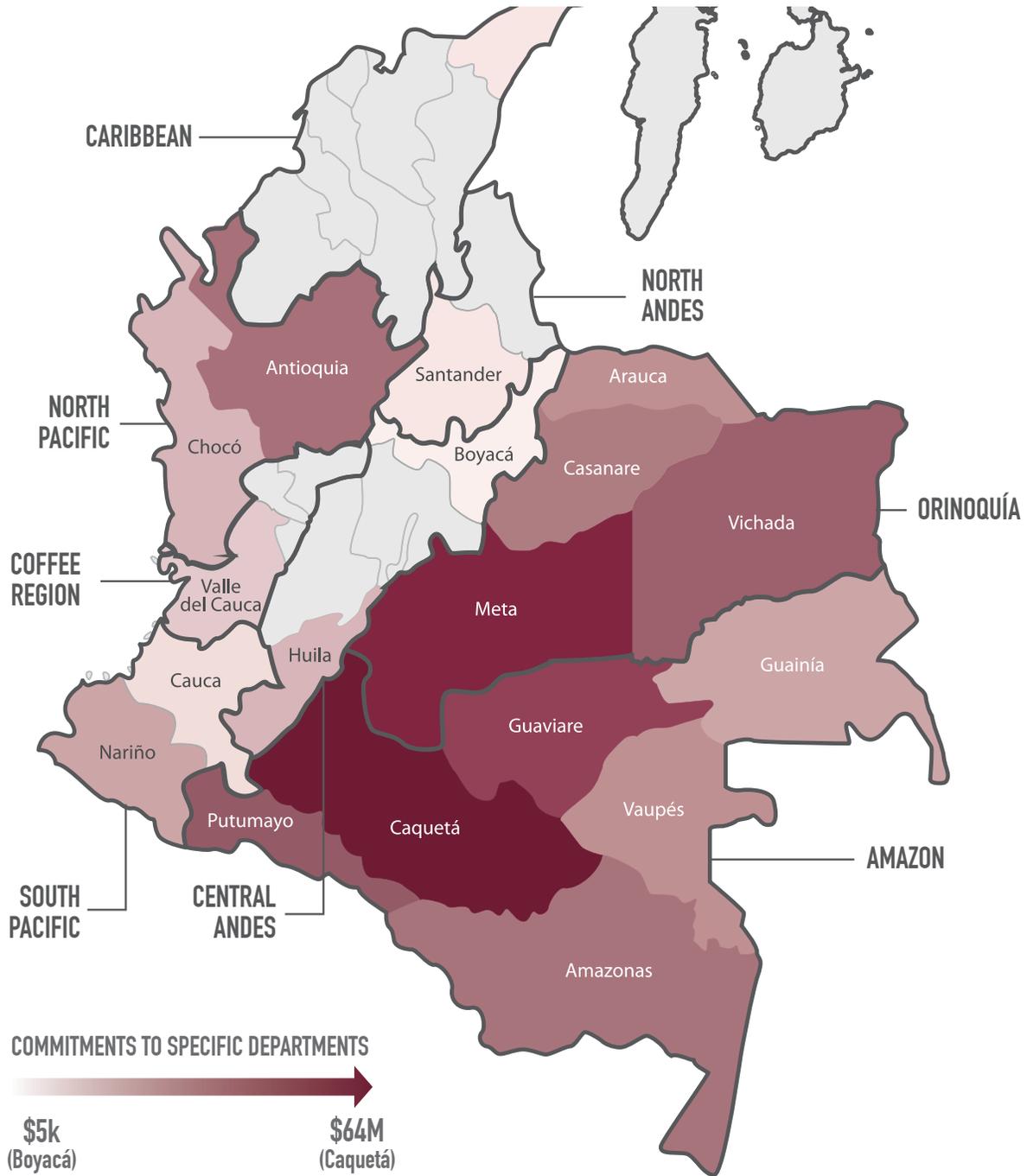
Historically, provinces within the adjacent Orinoquía region have attracted relatively limited finance, despite having some of the highest deforestation rates in the country. This was likely due to the difficult realities of implementing REDD+ in areas plagued by weak governance and conflict. However, within the context of the peace-building agenda, rural development within the region has become a high priority for the Colombian government. Recognizing the need to provide incentives to protect these areas, international donors have begun to pledge large sums of money, including \$65 million scheduled to be delivered under the World Bank's BioCarbon Fund ISFL over the next nine years. Together, the ISFL and the Colombian government will create a low-emissions development plan for

²³ Montenegro et al. 2011.

²⁴ Goldstein 2015.

Orinoquía, in order to harmonize land–use planning and low-emissions development investments, in an attempt to mitigate the unintended consequences of large–scale agro–development. Payments will occur in two separate phases, with \$15 million disbursed during the first technical assistance phase (2016–2018) and up to \$50 million in payments for verified emissions reductions during the secondary implementation stage (2016–2025).²⁵

Annex I–Figure 2: Geography of Jurisdictional REDD+ Finance within Colombia



²⁵ BioCarbon Fund Initiative for Sustainable Forest Landscapes (ISFL) 2015.

Annex I–Table 1: Estimated Subnational REDD+ Finance to Colombian EcoRegions

EcoRegion	Percent of Colombia's Forest Cover	Average Rate of Deforestation, 2001–2014	Estimated Subnational REDD+ Finance (\$)
Caribbean	2.7%	0.47%	\$173,269
Andes	17.1%	0.33%	\$1,833,702
Pacific	9.4%	0.24%	\$18,627,377
Orinoquía	3.5%	0.39%	\$77,398,919
Amazon	67.3%	0.19%	\$127,326,162

The data also indicates that provinces within both the Caribbean and Andean regions have attracted relatively little finance (see table above). This was substantiated by recent REDD+ national validation workshop findings, which highlighted that both Caribbean tropical dry forests (bosques secos tropicales) and Andean forests remain underfunded.

The production and distribution of illicit crops has greatly affected primary Andean forests. Continued cultivation and drug-related conflict may also explain the lack of subnational REDD+ finance being targeted to the region. The French Facility for Global Environment (FFEM) has contributed the majority (\$1.7 million) of funding in order to promote connectivity between the Amazon and pilot projects within the Andes. An additional \$0.1 million was provided to the provinces of Boyacá and Santander to preserve the last remnants of oak in the Eastern Andes Cordillera and to reduce deforestation in the Guantiva–La Rusia–Iguaque Conservation Corridor via sustainable production and forest management activities.

In the coming years, the federal government along with international donors must continue to identify areas for intervention, targeting finance to provinces and ecoregions that most align with national conservation and development strategies.

Democratic Republic of Congo

The Democratic Republic of the Congo (DRC) is home to the largest extent of tropical rainforests in Africa, and second-largest on earth, covering over 100 million hectares. The country's historical deforestation rate has fluctuated between 0.2% and 0.3% over the past 20 years, which is relatively low compared to the world average (0.6%) over the same period. However, due to large-scale and illegal forest exploitation and the sheer size of its forests, the DRC is also one of the top ten countries in terms of annual forest loss, making it a good candidate for REDD+ implementation.

The REDD+ initiative tracked a total of \$514.3 million in REDD+ finance provided to the DRC from 2009 through mid-2016. Just less than half of this funding (\$234.7 million) was targeted at national-level REDD+ readiness initiatives intended to have an impact across the entire country—primarily through policy reform and capacity building for government institutions.²⁶ Slightly more than half of the country's total REDD+ funding (\$279.6 million) was allocated toward subnational initiatives aimed at reducing emissions from deforestation in specific geographic regions of the country.²⁷ This subnational finance was distributed in a highly uneven manner across the country, with the province of Bandundu at the high end receiving \$123 million in funding, and the province of Katanga at the low end not receiving any funding.

²⁶ The vast majority of this national-level funding (\$200 million) falls under the Government of Norway's recent pledge of support for REDD+ in the DRC through the Central African Forest Initiative (CAFI).

²⁷ In July of 2015, DRC implemented its longstanding plans for political decentralization, breaking up its former 11 total provinces into 26. Given the recent nature of this restructuring, the REDD+ and GFW data are coded to align with the former provincial subdivisions of the country. This unfortunately makes for a less-granular analysis of subnational REDD+ finance and deforestation trends than would have been possible if the data were coded to align with the country's new system of 26 provinces, but nonetheless important trends concerning the alignment of REDD+ finance with deforestation and emissions patterns can still be identified.

Deforestation, Emissions, and the Targeting of Forest Conservation Finance

Across all nine provinces²⁸, the spatial targeting of subnational REDD+ finance to DRC is not strongly related with forest cover, deforestation, and associated emissions ($R^2 = 0.15$ for each relationship and not statistically significant). However, this lack of correlation is largely due to the two outliers mentioned above. When the provinces of Bandundu and Katanga are removed from the dataset, the correlations become much stronger ($0.65 < R^2 > 0.8$ for all three comparisons, $p < 0.05$), indicating that aside from Bandundu and Katanga, the three metrics of forest cover area, forest cover loss, and deforestation emissions are reasonably strong predictors of the level of finance received by the various provinces (noting the small sample size of seven provinces).

Bandundu is receiving nearly half (44%) of all REDD+ funding earmarked for subnational initiatives in the DRC, yet it contains approximately 11% of the country's forest cover and was responsible for 11% of the country's forest loss and 9% of its deforestation emissions from 2001 through 2014. Clearly, the province is receiving a proportionally much greater amount of REDD+ finance than one might expect it to receive, based on its forest cover, deforestation, and emissions profile in respect to the rest of the country. Much of this discrepancy is a result of the \$50 million pledged to Bandundu through the Forest Carbon Partnership Facility (FCPF) Carbon Fund, via the Mai-Ndombe Emissions Reduction program, which is currently under development and nearing final approval.

While, in theory, REDD+ finance would be tightly linked to forest cover loss and emissions, in reality limited donor funding and high up-front costs for the development of jurisdictional REDD+ programs require donors and REDD+ country governments to make difficult decisions, choosing to allocate large sums of funding to one or some provinces over others, even when deforestation trends across provinces may be similar. The likely justification donors and REDD+ country governments would provide for this seemingly lopsided allocation of funding to one specific province is the argument that development of jurisdictional pilot programs, such as Mai-Ndombe, require both greater levels of financing to initiate because they are first-of-a-kind, but are also expected to produce knowledge, structures, and systems that can be later applied beyond the boundaries of the jurisdiction to further the goals of REDD+ throughout the whole country. Under this line of reasoning, disproportionate donor investments in specific jurisdictions such as Mai-Ndombe can be justified as essential test-cases with potentially high-value outcomes for other provinces throughout the country.

Annex I–Table 2: DRC Provinces: REDD+ Finance, Forest Cover, Deforestation, and Emissions Trends

Province	Estimated Subnational REDD+ Finance (\$)	Proportion of Total Subnational REDD+ Finance Pledged to DRC	Proportion of Total National Forest Cover	Proportion of Total National Deforestation Area	Proportion of Total National Deforestation Emissions	Growth in Deforestation Rate from 2001–08 to 2009–14
Bandundu	\$123,134,267	44%	11%	11%	9%	0.17%
Équateur	\$61,827,892	22%	19%	19%	21%	0.23%
Orientale	\$57,911,696	21%	24%	21%	25%	0.16%
Bas-Congo	\$13,409,808	5%	2%	3%	2%	0.54%
Kivu	\$8,923,256	3%	11%	14%	16%	0.17%
Kasai-Oriental	\$6,938,834	2%	6%	7%	7%	0.15%
Kasai-Occidental	\$6,320,524	2%	7%	11%	11%	0.21%
Kinshasa City	\$1,161,067	0%	0%	0%	0%	0.13%
Katanga	\$–	0%	19%	13%	9%	0.10%

* Provinces receiving proportionally greater or lesser REDD+ finance than would be commensurate with their forest cover, deforestation, and emissions trends are shown in bolded text.

²⁸ The GFW dataset combines three of the eleven provinces into one, resulting in a total of nine provinces. In order to allow for a valid comparison, the corresponding REDD+ financial data for these provinces was also combined into one.

However, given finite donor funding available for REDD+, disproportionately large investments in one region necessitate disproportionately small investments in other regions, and the data reveal the existence of these trends in certain DRC provinces. The province of Katanga, for example, has not received any REDD+ finance according to REDDX tracking, yet it contains nearly 20% of the entire forest area of the country, 13% of the country's forest cover loss from 2001–2014, and 9% of deforestation emissions over the same period. Its deforestation rate is admittedly lower and growing more slowly than the other provinces of the country, but is growing nonetheless. The provinces of Kivu, Kasai–Oriental, and Kasai–Occidental are also receiving proportionally less finance than their forest cover, deforestation, and emissions would predict. These examples point to the opportunity for the full roll-out of national REDD+ programs to eventually smooth-out REDD+ finance flows and distribute them more evenly across countries, in line with deforestation trends and national development priorities.

The ongoing presence of civil conflict in DRC may also help to explain, in part, observed REDD+ finance distribution patterns in the country. As shown in the table (Annex I–Table 2), the provinces which have been the primary locus of civil conflict over the past two decades, namely Kivu and Katanga, are also the provinces which have received far less REDD+ finance than their deforestation and emissions trends would predict them to receive. Conversely, the province receiving the most funding, Bandundu, is in the western region of the country, farthest from the fighting. While multiple factors are undoubtedly at play in determining the geography of REDD+ finance distribution within DRC, it stands to reason that the presence of civil conflict would make it considerably more difficult for REDD+ programs to achieve their intended results in these regions, and that REDD+ investments would therefore be directed to more politically stable areas of the country.

Ethiopia

Ethiopia's natural resources are the foundation of Ethiopian economic development, ensuring food security and providing basic necessities to its growing population. Over the past three decades, however, Ethiopia has lost a significant amount of forest cover due to deforestation. With expansion of agriculture, settlements, and wild fires, the rate of deforestation remains quite high.

Therefore, the Ethiopian government has signaled bold intentions to anchor forest conservation and restoration within its larger national agenda for green growth and economic development. In 2011, Ethiopia launched its Climate Resilient Green Economy (CRGE) strategy, which aims to significantly boost per capita GDP in the country without increasing greenhouse gas emission levels, with an ultimate goal of moving Ethiopia from a Least Developed Country (LDC) to a middle income country by 2025. REDD+ is a core component of the CRGE and has been identified as one of four pillars of the strategy to be prioritized for fast-track implementation.

More recently, Ethiopia's national climate pledge put forth as part of the Paris Climate Agreement aims for the country to double its economy by 2030 while slightly reducing emissions from 2010 levels, which would represent an estimated 64% reduction against its projected business-as-usual emissions by 2030. More than half of these reductions (51%) are projected to come from the forest sector through conservation of existing forest stocks and reforestation. Agriculture and forestry account for 88% of Ethiopia's global warming emissions, making REDD+ an attractive option for Ethiopia to pursue in its quest for carbon-neutral growth.

In total, REDDX tracked \$104.8 million in REDD+ finance pledged or committed to Ethiopia from 2009 through mid-2016. The majority of this funding (79%) was allocated toward subnational REDD+ initiatives targeting reduced deforestation and reforestation efforts at the regional level. The Ethiopian government, in partnership with key international donor support, has targeted the Oromia Region as the primary site of early REDD+ interventions. Due in large part to the country's strong commitment to pursuing REDD+, as demonstrated both through the CRGE strategy and its Paris climate pledge (INDC), Ethiopia was selected among a competitive pool of candidate countries to participate in the BioCarbon Fund's Initiative for Sustainable Forest Landscapes (ISFL). The ISFL is supported by Germany, Norway, the United Kingdom, and the United States and aims to pioneer a new jurisdictional-scale approach to reducing emissions from the land-use sector by partnering with the private sector, providing both readiness funding and payments for verified emissions reductions, and supporting streamlined governance at the subnational scale.

The Ethiopian government selected the regional state of Oromia as the site of implementation for the ISFL program. This was a natural choice for a variety of reasons, including the fact that it is the most forested region in the country and was the location of the most advanced Ethiopian REDD+ pilot project—the Bale Mountains Eco–Region REDD+ project, implemented by the Oromia Forest and Wildlife Enterprise (regional government) and partnering NGOs. The government and ISFL donors aim to build on the early REDD+ efforts already present in Oromia to expand the scope of REDD+ throughout the region, with the ultimate aim of scaling up to the national level.

Annex I–Table 3: Ethiopian Regional States: REDD+ Finance, Forest Cover, Deforestation, and Emissions Trends

Regional State	Estimated Subnational REDD+ Finance (\$)	Proportion of Total Subnational REDD+ Finance Pledged to Ethiopia	Proportion of Total National Forest Cover	Proportion of Total National Deforestation Area	Proportion of Total National Deforestation Emissions
Oromia	74,297,460	90%	43%	49%	51%
Southern Nations, Nationalities, and Peoples' Region	8,544,025	10%	26%	29%	33%
Amhara	102,987	–	8%	4%	4%
Tigray	7,588	–	19%	16%	11%
Afar	–	–	3%	1%	1%

* This table does not include the remaining six Ethiopian Provinces which together contain less than 1% of the country's forest area, and for which REDD+ has not tracked any subnational REDD+ finance.

Due to the Ethiopian government's prioritization of Oromia as the country's main REDD+ pilot region, more than 70% of total REDD+ funding to the country has targeted REDD+ efforts in the region. The lion's share of this funding is the \$65 million pledged through the ISFL. The Oromia region is the largest in the country, equivalent in size to Italy, so the country's strategy to concentrate funding here in order to pilot REDD+ activities rather than more evenly distributing funding throughout the country is understandable. However, other regions of the country also contain significant forest areas and face similar deforestation pressures—particularly the Southern Nations, Nationalities, and Peoples' Region; and Tigray—and future REDD+ efforts in Ethiopia will need to incorporate these regions as well, if the country is to fully achieve its commitment to pursue aggressive emission reductions through avoided deforestation.

ANNEX II

Annex II–Table 1: Major REDD+ Pledges (\$M)²⁹

Country	National Pledges	Subnational Pledges	J-REDD Initiative/ Program	Area Targeted
Colombia		\$113M	REM	Amazon Region
		\$65M	ISFL	Orinoquía Region (Meta; Vichada; Aruaca; Casanare)
Democratic Republic of Congo	\$200M		CAFI	
		\$50M	Carbon Fund	Mai-Ndombe, Bandundu
Ethiopia		\$65M	ISFL	Oromia
Ghana		\$50M	Carbon Fund	Cocoa Forest Mosaic
Indonesia	\$950M		Norway Bilateral	
		\$50M	Carbon Fund	Jambi; Central Kalimantan; East Kalimantan; Sulawesi
Liberia	\$150M		Norway Bilateral	
Mexico		\$50M	Carbon Fund	REDD+ Early Action Areas
Peru	\$240M		Norway Bilateral	
		\$50M	Carbon Fund	Ucayli; San Martín
TOTAL	\$1,540M	\$493M		

²⁹ These pledges represent provisional funding promises put forth by donors that have not yet been formally committed or disbursed, and which are subject to change or modification. However, this paper's entire analysis has included each of these funding pledges, to provide a more up-to-date and accurate picture of global REDD+ finance and to allow for a more meaningful comparison of this finance with trends in forest cover, loss, and emissions.

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