POLICY BRIEF

RESEARCH AND FINANCIAL INNOVATIONS IN SUPPORT OF BRAZIL'S INDC PROCESS

With less than five months to go before the UN climate summit in Paris, Brazil is poised to lead. A 90% reduction in deforestation nation-wide is within reach. Combined with the country's recent pledge to reforest 12M hectares of land, this reduction would allow the world's most forest-rich tropical nation to achieve zero net deforestation and zero net forest carbon emissions. These pledges would represent a 40% reduction in nation-wide emissions, and could be achieved while expanding the production of food, fiber and biofuel. They could also help grow Brazil's economy by opening markets, attracting investment, and delivering technical assistance to the nation's small-scale farmers. Brazil's important advances in governing vast forest frontiers through command-and-control measures create the enabling conditions for a bold, national agenda of positive incentives for sustainable, inclusive rural development. National green forest bonds could help finance this INDC agenda, delivered to farmers and local governments through a "territorial performance" bonus fund.

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MAIN FINDINGS

1 | **Brazil can achieve zero net deforestation and zero net forest carbon emissions[v] nationally through:**

- A steep decline in gross deforestation—the clearing of mature forest
- A steep increase in reforestation, as already pledged, with a strong role for forest regeneration and plantations that generate commercial returns
- A steep decline in emissions from Amazon forest fire and selective logging

2 | **These commitments are compatible with—and supportive of—other core national interests. They could be achieved while:**

- Expanding the production of food, fiber and biofuel
- Increasing the productivity and market access of small-scale farmers who currently depend upon forest clearing to grow subsistence crops, and are at risk in a scenario of rapidly declining deforestation
- Reducing illegal deforestation, another Brazilian commitment
- Increasing market access for Brazilian agricultural and forestry products more generally
- Attracting private investment in Brazil's agricultural, livestock and forestry sectors that helps to achieve the INDC targets

3 | **Progress towards INDC targets will require new sources of private and international public finance.**

- Substantial finance is needed to restore forests to comply with the Forest Code, expand the area of commercial planted forests, increase the provision of rural extension services, compensate farmers for foregoing their legal right to clear forests, and create a system of positive incentives to encourage farmers and local governments to make the transition to more productive, low-deforestation farming, among other needs.
- A Green Forest Bond could significantly increase availability of low-cost finance for the Brazilian Government to implement its INDC agenda.
- A Territorial Performance Bonus Fund could provide an efficient mechanism to deliver finance to farmers and communities to implement the INDC targets, as well as attract additional private funds through a "matching" program for companies that benefit from increases in "territorial performance."

BRAZIL'S INDC CHALLENGE

Six years ago during the Copenhagen climate summit, President-elect Dilma Rousseff announced a bold commitment to lower Brazil's greenhouse gas emissions. The announcement was a beacon of hope in an otherwise disappointing summit. The biggest piece of that commitment—to reduce Amazon deforestation 80% by 2020—has nearly been achieved already, far ahead of schedule. As of 2014, the annual rate of forest clearing in the Amazon had fallen by 76%. This story of success has kept nearly 5 billion tons of CO_2 in Amazon forest trees and outside of the atmosphere as agricultural production has continued to climb[1]. It has made Brazil a global leader in climate change mitigation. The costs of this feat were borne almost entirely by Brazil alone, and markets for Brazilian agricultural products have been slow to recognize the scale and significance of this achievement.

As Brazil prepares its "Intended Nationally-Determined Commitments" (INDC) ahead of the Paris climate summit, it is poised to lead again. Key questions must be answered:

- **Could Brazil achieve zero net deforestation and zero net forest carbon emissions nationally?**
- **Would the decline in deforestation necessary to achieve these targets allow for continued growth of agricultural production?**
- **Would striving for this goal place additional burden on smallholders, who have largely been omitted from the low-deforestation agenda?**
- **If Brazil succeeds in ending illegal deforestation, as promised, will that also slow deforestation?**
- **Could an ambitious INDC help increase market access of Brazil's agricultural and forestry products?**
- **Could the INDC help Brazil attract the private investment that will be needed to achieve this ambitious agenda?**
- **How could these finance innovations and other interventions help drive Brazil's transition to an equitable, sustainable, low-emission development model?**

THE STUDY

This Policy Brief provides some initial responses to these questions based upon a synthesis of current scientific understanding of Brazil's land-use systems and greenhouse gas emission profile, an unpublished study on future agricultural expansion needs, and new work on financial instruments. The methods and literature used are described at the end of this document.

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v *Zero net deforestation* means that the area of native, mature forest cleared each year is less than or equal to the area of new, species-rich forest that is either restored or regenerated. *Zero net forest carbon emissions* means that the emissions of CO_2 from clearing of mature forests or forest degradation through logging and understory fire is less than or equal to the net uptake of CO_2 by restored or regenerating forests. *Gross Deforestation* refers to the clearing of mature, native forests.

RESULTS

QUESTION 1

Brazil's commitment to reforest 12M hectares is very ambitious, and positions the country to achieve zero net deforestation and perhaps zero net forest carbon emissions nationally. By how much must forest carbon emissions decline to achieve these goals? What are the most appropriate target sources of emissions for achieving these reductions?

RESPONSE

Brazil will need to reforest 0.9 M hectares per year on average to achieve 12 M hectares by 2030. Zero net deforestation could be reached with 0.6 M hectares per year of reforestation and a 90% decline in gross deforestation. Zero net forest carbon emissions could be achieved nationally through a 90% decline in deforestation, 12 million ha of new forests, and steep reductions in emissions from Amazon forest fires and selective logging (Table 1, Figure 1). Strategies for reducing emissions from Amazon forest fires and selective logging are field-tested and cost-effective[2,3].

MAJOR FOREST CARBON EMISSION FLUXES AND POSSIBLE PATHWAY TO ZERO-NET EMISSIONS

SOURCE OF EMISSION/REMOVAL	HISTORICAL EMISSIONS (MTCO$_2$/YEAR)	RECENT EMISSIONS (MTCO$_2$/YEAR)	ZERO-NET EMISSIONS (MTCO$_2$/YEAR)	KEY CONSIDERATIONS
GROSS DEFORESTATATION - AMAZON	719	176	68	Risks for smallholders; finance
GROSS DEFORESTATION - CERRADO	184	82	18	Restrictions on Agriculture growth; finance
GROSS CLEARING OF OTHER NATIVE VEGETATION *(exclude Caatinga & Pampas)*	18	11	2	
REFORESTATION	-10[4,5]	-10[6]	-88	Finance requirements
SELECTIVE LOGGING - AMAZON	100 - 300[7,8]	5 - 75[9,10]	0[vi]	Mainstreaming Reduced-Impact Logging
FOREST FIRE - AMAZON	10 - 300[11]	10 - 300[12]	0[vi]	Improved Fire Management, fire brigades
TOTAL NET FOREST CO$_2$ EMISSIONS	1020-1220	280-560	0	

Table 1.

Possible emissions reductions and accelerated carbon accumulation that could result in nation-wide "zero net forest carbon emissions", and key concerns for achieving these goals. These are preliminary assessments that will require further refinement. They do not include agricultural emissions, such as changes in soil carbon and enteric fermentation emissions of methane. See Methods for references on emissions from deforestation.
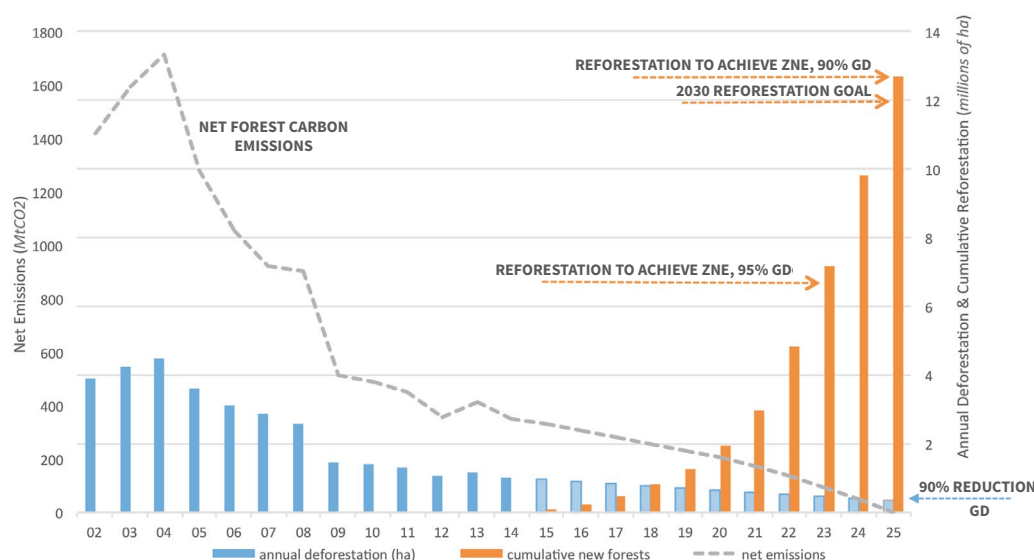

Figure 1.

Possible pathway to achieve zero net emissions from forest carbon in Brazil. In this scenario, gross deforestation (GD) declines 90% and its emissions are counter-balanced through carbon accumulation with reforestation of 12 million hectares. Both zero net deforestation and zero net emission could be attained by 2025 if the proper incentives are in place. This graph does not show the steep decline in emissions from forest fire and selective logging that are a necessary component of a national, "zero net forest carbon emissions" scenario.

vi Assumes net emissions from forest fire and logging are zero through steep reductions in new emissions and uptake of CO$_2$ by recovering, previously burnt and logged forests.

QUESTION 2

What rate of gross deforestation—the clearing of mature forest—is necessary to maintain Brazil's growth in agricultural production?

RESPONSE

Under a business-as-usual scenario, with 3% annual growth in crop and livestock production, approximately 5,000 km^2 of new cropland will be needed each year through 2020[13]. This land area is equivalent to approximately 10% of historical annual deforestation rates (Figure 2) and is therefore compatible with a 90% decline in gross deforestation. Continued agricultural expansion and steep declines in deforestation will be most difficult to achieve in the Northern Cerrado region, which includes "MAPITOBA"[vii], Brazil's main area of agricultural expansion today (Figure 3). Cattle production increases are currently achieved mainly through productivity gains on existing pastureland through integrated livestock-crop systems and other approaches. With greater investment in cattle yield improvement, beef production could grow for many years on a shrinking area of pastureland, opening up room for crop expansion onto former pastures, reducing the demand for new land and new deforestation (Figure 2). Deforestation driven by land speculation will continue to pose an important threat to forests, and will require expansion of Brazil's current systems of governance, law enforcement and compatible incentives.
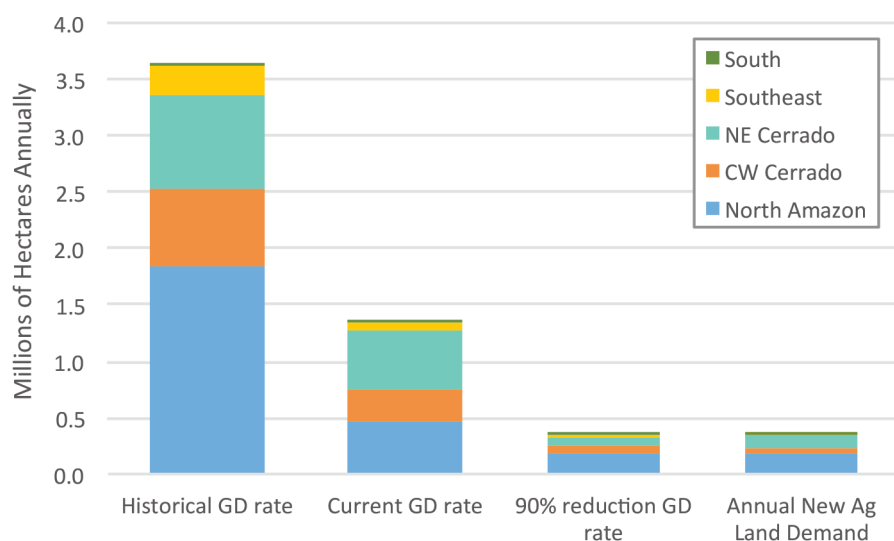

Figure 2.

The annual demand for new cropland and pasture under a business-as-usual scenario is roughly equivalent to the amount of new land that would be available under a scenario of 90% reduction in gross deforestation nationally in Brazil. Preliminary analysis.
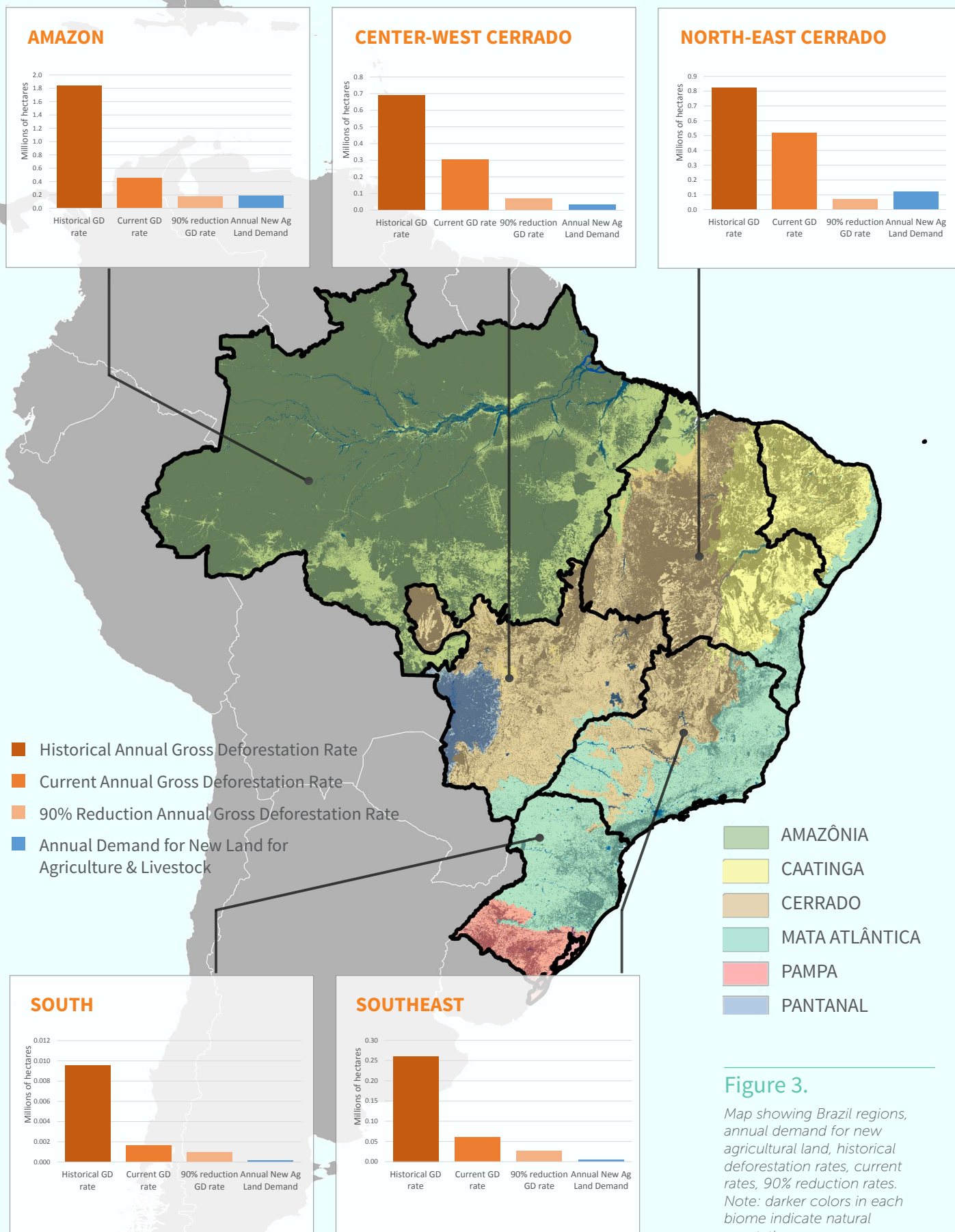
vii MAPITOBA includes Maranhão, Piauí, Tocantins and Bahia states

AMAZON

Millions of hectares

2.0	
1.8	
1.6	
1.4	
1.2	
1.0	
0.8	
0.6	
0.4	
0.2	
0.0	

Historical GD rate | Current GD rate | 90% reduction GD rate | Annual New Ag Land Demand

CENTER-WEST CERRADO

Millions of hectares

0.8	
0.7	
0.6	
0.5	
0.4	
0.3	
0.2	
0.1	
0.0	

Historical GD rate | Current GD rate | 90% reduction GD rate | Annual New Ag Land Demand

NORTH-EAST CERRADO

Millions of hectares

0.9	
0.8	
0.7	
0.6	
0.5	
0.4	
0.3	
0.2	
0.1	
0.0	

Historical GD rate | Current GD rate | 90% reduction GD rate | Annual New Ag Land Demand

■ Historical Annual Gross Deforestation Rate

■ Current Annual Gross Deforestation Rate

■ 90% Reduction Annual Gross Deforestation Rate

■ Annual Demand for New Land for Agriculture & Livestock

AMAZÔNIA

CAATINGA

CERRADO

MATA ATLÂNTICA

PAMPA

PANTANAL

SOUTH

Millions of hectares

0.012	
0.010	
0.008	
0.006	
0.004	
0.002	
0.000	

Historical GD rate | Current GD rate | 90% reduction GD rate | Annual New Ag Land Demand

SOUTHEAST

Millions of hectares

0.30	
0.25	
0.20	
0.15	
0.10	
0.05	
0.00	

Historical GD rate | Current GD rate | 90% reduction GD rate | Annual New Ag Land Demand

Figure 3.

Map showing Brazil regions, annual demand for new agricultural land, historical deforestation rates, current rates, 90% reduction rates. Note: darker colors in each biome indicate natural vegetation.

QUESTION 3

Could a steep decline in deforestation be achieved without imposing additional burdens or restrictions on smallholder farmers?

RESPONSE

Many smallholder farmers, such as those in the Amazon region's agrarian reform settlements, called *assentamentos*, depend upon extensive, low-productivity cattle production and slash-and-burn agriculture for their livelihoods. Their dependence on some forest clearing and a dearth of economic alternatives places them at risk in a scenario of steeply declining deforestation. Smallholder farmers have largely been excluded from the programs designed to slow deforestation in the Amazon region of Brazil. As a result, their percent contribution to Amazon deforestation has grown in recent years.[27] Through improved access to markets, technical assistance and finance, the productivity and incomes of smallholders could improve, increasing the likelihood that Brazil could achieve a 90% reduction in deforestation without imposing hardship on these producers. Currently, the trend is in the opposite direction as technical assistance is not regularly available and the agrarian reform agency's budget restrictions continue. Strategies to make more funding available for these important interventions are discussed in Question 6.

Both smallholders and larger-scale producers can increase the value of their landholdings through forest clearing. A steep decline in deforestation could force many landholders to forego the value of land clearing. Both increases in productivity to reduce the demand for new land and incentives or compensation to forego forest development rights may be needed to address the challenge of foregone land appreciation (discussed further in Question 6).
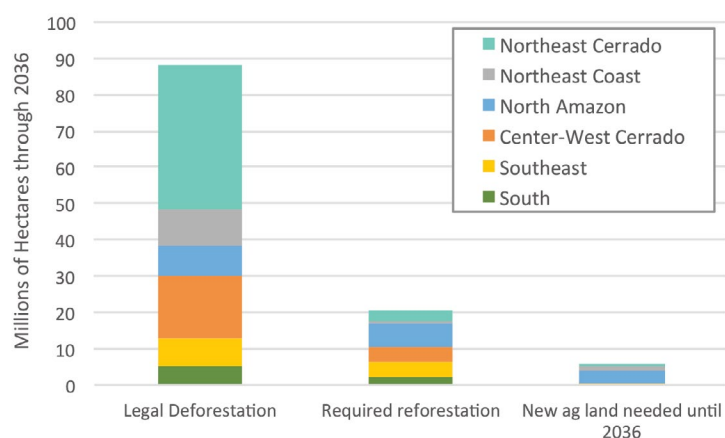
QUESTION 4

Would successful implementation of Brazil's pledge to end illegal deforestation lead to a national reduction in deforestation?

RESPONSE

Brazil's pledge to end illegal deforestation is very important, and could contribute to a slowing of deforestation rates. However, in the absence of a broader forest strategy the end of illegal deforestation could be accompanied by an increase in forest clearing. Full compliance with Brazil's revised Forest Code could be achieved while legally clearing 85 million hectares of forests[14] (Figure 4). This means that the current rate of deforestation could double for four decades before running out of 'legally convertible' forest.

QUESTION 5

How might Brazil's INDC be used to increase market access for Brazil's agricultural and forestry products?

RESPONSE

One of the major barriers to market access for Brazilian products is the perceived corporate risk of association with Amazon deforestation and illegal activities[viii]. The 76% decline in Amazon deforestation, including an 86% decline in the state of Mato Grosso, Brazil's agricultural powerhouse, has not yet translated into greater market acceptance of products grown in the Brazilian Amazon. One of the causes of this market failure is the mismatch among definitions of success. Many companies demand "zero deforestation" and "zero illegality" sources[ix] of soy and other agricultural commodities measured at the level of individual farms as they seek to distance themselves from reputational risks. Other companies are embracing the idea of solving the problem of tropical deforestation regionally, and are focused on managing their risk by supporting regional progress in achieving steep reductions in gross deforestation and, eventually, zero net deforestation. Brazil's INDC could be framed to recognize and empower those market players that are interested in partnering with the government and farm sectors to address deforestation regionally and nationally. An ambitious Brazilian INDC could become the basis for a broadly-shared definition of success in addressing deforestation, illegality and carbon emissions that markets adopt.

Figure 4.

Total area of potential legal deforestation, mandatory reforestation, and new agricultural land needed through 2036.

viii   This perception is one reason that the Consumer Goods Forum companies committed in 2010 to restrict their sourcing of soy, beef, palm oil, pulp and timber to "zero net deforestation" suppliers by 2020.

ix   *Zero deforestation* means absolutely no deforestation. *Zero illegality sources* means commodities produced in areas that comply fully with the Brazilian Forest Code and other Brazilian laws.

QUESTION 6

How might Brazil's INDC drive investment at the scale needed to achieve its commitments?

RESPONSE

Achieving the ambitious INDC targets described above will require tens of US$ billions in investment and financing over the next fifteen years and efficient mechanisms for delivering this finance where it is needed. Most of the necessary interventions to reach these targets will require finance above and beyond current levels. Some examples of these interventions include expansion of rural extension services for smallholders, forest fire prevention, improvements in crop and livestock productivity, reforestation and compensation of landholders who forego their legal right to clear forest[x]. Given the scale of financing requirements, current macroeconomic conditions and fiscal constraints, it is unlikely that Brazil's public sector will be able to fund these programs alone. Financial structures are needed that attract significant private finance without significantly adding to Brazil's debt burden.

A Green Forest Bond (GFB) is a very promising financial structure for playing this role. We propose that GFBs could use international climate finance to overcome the main obstacle to increasing Brazilian public funding—the cost of capital. This national/international "superstructure" could then support a "substructure" of regional and local public-private financing mechanisms that attract investment from agribusiness, commodity buyers, banks, commercial forestry investors and other private actors while efficiently delivering this finance to farmers, communities and local governments.

THE PUBLIC-PRIVATE FINANCE "SUPERSTRUCTURE"
BRAZIL GREEN FOREST BONDS[xi]

Brazil could accumulate upfront funds for investment in the INDC agenda by **explicitly** linking green bonds to *international pay-for-performance climate finance*.[xii] This linkage could potentially lower the implied net cost of capital for Brazil to 0% or even a negative rate, meaning that the pay-for-performance commitment would allow Brazil to raise finance upfront to implement its INDC agenda. Building on the Brazilian/Norwegian partnership in the Amazon Fund and devoting proceeds from green forest bonds to INDC goals (instead of the general Treasury), there is an opportunity for Brazil to develop an ambitious

financing mechanism that could harness significant pay-for-performance (PFP) commitments from governments other than Norway, such as under the Warsaw Framework and UN Green Climate Fund.

Capital market interest in green bonds is growing globally. However, investors are primarily seeking high returns on their investments and high credit ratings. Green forest bonds could be structured to provide investors who would not normally invest in agriculture and forests with the same return on investment and risk characteristics as normal "investment grade" bonds (i.e. bonds where governments guarantee to pay back investors and where capital markets consider the guarantee to be strong).

To illustrate how this might work, we use an example of a US$600 million GFB issue (Table 2). We assume an annual yield or "coupon" of 5% on a Brazilian GFB with a maturity of 10 years. We assume that this $600M GFB would enable emissions reductions of 60 million metric tons of CO_2e over 10 years that would generate pay-for-performance (PFP) payments (US$300 million) sufficient to subsidize all the interest costs. This finance would be available upfront through the bond purchases, unlike traditional pay-for-performance structures that provide finance only as performance is demonstrated.

The $600M raised through this initial bond issuance could be used as necessary to fund the INDC strategy[xiii]. One frequent question that is raised about the GFB is: how would the Brazilian Government pay the bond investors back? Firstly, the Brazilian government would contractually guarantee to pay back investors as they do with normal government bonds. The question then becomes: how might the bond be paid back without increasing the national debt? Some of the funds raised might be spent on irrecoverable costs like extension services or fire prevention. But other funds would earn a return for the government via loans to farmers or co-investment in commercial forestry. In the example below in Table 2, as long as the total return to the government was above zero %, there would not be an increase in the national debt after 10 years. With declining deforestation, increasing legal compliance, and increasing productivity and inclusion of smallholders and communities, Brazil's INDC could translate into reduced risk, greater market access and greater investment that should grow the agricultural and forestry economies, with corresponding benefits to the Treasury over time.

CREDIT ENHANCEMENT

As a secondary step to enhance the structure, we also propose that Brazil, Norway and the Multilateral Development Finance Institutions (DFIs) explore the potential to create further synergy and efficiency through credit enhancement.

In the illustrative case described above (Table 2), Green

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x   Rural extension services are particularly important for small-scale farmers; the total costs to cover all smallholders would be about R$10B[28]. An effective plan for financing reforestation, which alone could cost US$30B or more, is particularly important since 21M hectares land must be reforested to achieve full compliance with the Forest Code[14, 15].

xi See also: R. Edwards, D. Tepper and S. Lowery. Forest Trends (Feb 2014): *Jurisdictional REDD+ Bonds: Leveraging Private Finance for Forest Protection, Development, and Sustainable Agriculture Supply Chains*

xii "Pay-for-performance" climate finance compensates nations or subnational regions through post facto payments. Norway's performance-based pledge to the Amazon Fund, for example, has committed up to $1B in finance if Amazon deforestation rates continue to slow.

xiii A regular program of bond issuance would be required to support INDC goals out to 2030. Bonds could be issued as US$ sovereign bonds or in Brazil R$.

Table 2.

EXAMPLE OF POTENTIAL BRAZIL GREEN FOREST BOND (10 YEAR) FOR $600M

	YEAR 1 2016	YEAR 2 2017	YEAR 3 2018	YEAR 4… 2019	…YEAR 10 2025	TOTAL
COUPON (INTEREST) COST (5%/YR), US$MILLION	30	30	30	30	30	**300**
EMISSION REDUCTIONS (MTCO$_2$)	6	6	6	6	6	**60**
PAYMENTS-FOR-PERFORMANCE (PFP) ($5/TCO$_2$), US$M	30	30	30	30	30	**300**
POST-PFP COUPON (INTEREST) COST, US$M	0	0	0	0	0	**0**
POST CARBON COUPON COSTS, %	0	0	0	0	0	**0**
IMPLIED NET PRINCIPAL TO BE REPAID, US$M						**600**

Forest Bond investors would have the usual security of Brazil's "investment grade" credit rating, which is currently at the weaker end of the "investment grade" spectrum (around a BBB bond rating). Provision of partial risk guarantees by DFIs to enhance the credit rating would significantly broaden the pool of potential investors, leveraging the global interest in Green Bonds and further lowering the cost of capital for Brazil[xiv].

INCENTIVES FOR REGIONAL INNOVATIONS
A TERRITORIAL PERFORMANCE BONUS FUND

Green Forest Bonds could provide several billion dollars of low cost capital in support of Brazil's INDC strategy. To maximize its positive impact, efficient mechanisms are needed to deliver this finance on the ground in a way that drives land-use change towards the INDC targets. One of the important lessons from Brazil's experience in slowing Amazon deforestation is the effectiveness of jurisdictional or "territorial" approaches to deforestation, in which performance targets for slowing deforestation and complying with the law are established at the level of the *municipio*, not the farm[1]. What has generally been missing in territorial approaches, such as the *Municípios Críticos* program and the *Programa Municipios Verdes*, are *positive* incentives for farmers and local governments to reach the performance targets[1]. We illustrate here one possible mechanism for delivering these "missing carrots".

Example: The Territorial Performance Bonus Fund

The Territorial Performance Bonus Fund (Figure 5), still under development, is designed to create the enabling conditions for a "race-to-the-top" among *municipio*s as they strive to slow deforestation, increase agricultural productivity, and move farmers into legal compliance. It is designed specifically to strengthen jurisdictional

programs such as *Programa Municípios Verdes* (Pará) and *Programa Municípios Sustentáveis* (Mato Grosso) by providing positive incentives for successful collaboration in achieving performance targets. The central idea is to establish a matching fund of public and private finance that is periodically opened up for competitive bids. Competing proposals will include a consortium of partners from local government, farm organizations and/or communities, and a lead organization specialized in agricultural innovation. Private sector finance can come into the Fund indirectly from Green Forest Bonds, or directly from companies working in target jurisdictions, philanthropic investors, and others. The winning municipios will use their grant monies to provide technical assistance and rural extension services that help small- and medium-scale farmers access credit programs or implement agricultural innovations on their land. These proposals can feature strategies for reforestation and legal compliance, and support for forest fire brigades. Indigenous communities might receive support for their community enterprises. If the municipio—or municipios—reach performance targets for key sustainability indicators, then an additional bonus is provided to participating farmers and the local government—a "carrot" that rewards performance at the local level. The bonus could potentially come from agribusinesses who stand to gain from the matching technical assistance provided to producers in their supply chains.

OTHER OPPORTUNITIES

Attracting investment from commodity markets

Progress in achieving INDC targets would validate Brazil as the leading supplier of sustainable commodities, catalyzing further investment over the medium term from private actors through increased long-term supply contracts for agriculture or timber products and related trade finance, in which commodity buyers help to finance investments (e.g., seeds, fertilizer, or infrastructure) that increase production.

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xiv Traditionally, such guarantees create risks and liabilities for the DFIs, and the fees that DFIs may charge as an insurance premium to provide guarantees can offset any economic benefit in terms of reduced borrowing costs. However, the explicit link of the REDD+PFP could reduce such risks by using the REDD+ PFP payments as financial "collateral" (e.g., by withholding a proportion of PFP payments until maturity of the Green Forest Bond or utilizing a small upfront "grant" element of donor finance as an "insurance premium").

THE TERRITORIAL BONUS MATCHING FUND
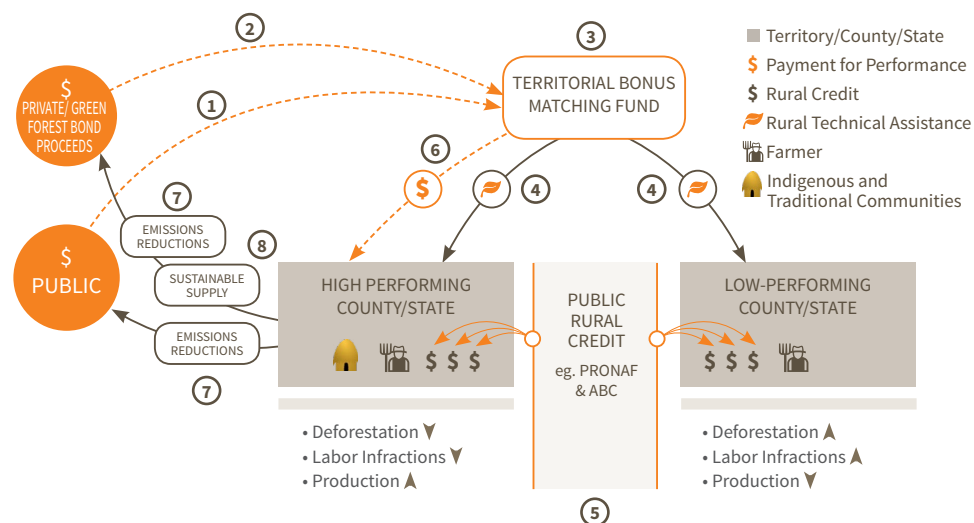
HOW THE FUND WOULD WORK:

1. Amazon Fund pledges $30m? match to Fund
2. Businesses and donors pledge matching contribution
3. "Territorial Bonus Fund" launched
4. Technical support provided to farmers and communities in target municipios
5. Public agricultural credit accessed by farmers
6. Territorial "bonus" to farmers, communities and local governments in high performing municipios
7. Non-tradeable emission reductions flow to contributing companies and donors
8. Sustainable soy and beef bought by companies

Figure 5.

Example of a private-public matching fund that would help to unlock the potential of Brazil's existing agricultural credit lines. Competitive grants would go to winning consortia that are led by "agricultural innovation" organizations, and that include local government, farm organizations and communities. This fund mechanism is under development with the Amazon Fund, led by Earth Innovation Institute, and would be piloted in Mato Grosso.

Attracting investment for commercial forestry

Although the large majority of investments in commercial plantations are in North America, Brazil has an opportunity to attract substantial investment from traditional forest investors. There is strong demand from institutional funds to increase these investments given the long-term, stable returns that forestry can deliver. The INDC therefore provides an opportunity to significantly scale up this growing global investment class. In Brazil some additional financial incentives are likely to be required to attract the major dollar-based investors. Public-private finance mechanisms could be used to lower the risks of investing in sustainable tropical forestry. Public funds could take a subordinate position in the capital structure via concessional debt and a willingness of the government to be repaid after other private investors are repaid.

INITIATING A RACE-TO-THE-TOP

Brazil's agricultural and forestry sectors can generate stable, long-term returns for investors. The INDC process presents an opportunity to take these sectors to a higher level of sustainability, catalyzing a larger flow of investments to help farmers become legally compliant, to meet—and help to define—global sustainability standards, and to invest in new low-carbon production models. To achieve this higher level of performance will require an initial set of relatively risky

investments both at the farm- and local- level. Once these investments have been made, risk should decline triggering more investment. This is the strategic opportunity that the Territorial Performance Bonus Fund is a response to. With strong collaboration across entire territories or jurisdictions to achieve ambitious performance goals and targets, the Bonus Fund can use low-cost funding to support these initial investments and private capital to support the longer term infrastructure investment needs of the territory. Once these investments have been made, the territory will be poised to continue to attract lower cost capital from a larger pool of investors and businesses.

Up front, low- to potentially no-cost funding through a Green Forest Bond provides the Brazilian Government with the resources to significantly scale up public investment to catalyze regional territorial performance systems. High performing "territories" that are delivering positive outcomes generate more public and private investment to support more competitive, productive and compliant agricultural and forestry industries. These regions become increasingly more attractive to global investors looking for stable investment opportunities in growing markets, fueling further economic growth while supporting the zero net deforestation targets.

QUESTION 7

How can these funding mechanisms and other strategic interventions help to drive Brazil's transition to an equitable and sustainable low emission rural development trajectory that is continually reinforced by the region's competitiveness, resilience and adaptability in a dynamic and globalizing biosphere?

RESPONSE

The two financial instruments presented here and others like them, optimization of existing agricultural credit lines, and a unified Brazilian definition of success in addressing the major risks of relevance to markets and investors could drive this national transition. The main opportunities uncovered in this analysis, including recommendations for Brazil's INDC, are summarized below.

RECOMMENDATIONS

BRAZIL'S INDC

1 **Include in the INDC a commitment to (a) lower nation-wide deforestation 90% and (b) lower emissions from forest fire and logging 90% by 2025.** Together with Brazil's recent commitment to reforest 12 million hectares, these two commitments would mean that the nation achieves zero net deforestation and zero net forest carbon emissions by 2030.

A PARADIGM SHIFT

2 **From "Command-and-Control" to "Race-to-the-Top":** Brazil has reached the limits of command-and-control approaches to deforestation. A new, more positive paradigm is needed that continues to enforce the law as it establishes positive incentives for entire counties and states, and the farmers who reside in these jurisdictions, to improve their "performance" in slowing deforestation, reforesting, achieving legal compliance, improving agricultural productivity and integrating smallholders and communities. Territories and regions will "race to the top" through collective action as they strive to attract industries and investors, open markets, and reduce bureaucratic burdens.

STRATEGIC INTERVENTIONS TO ACHIEVE THESE INDC COMMITMENTS

3 **Launch a national reforestation task force.** A multi-sector team is needed to design and implement a national reforestation plan to achieve the 12M hectare target—more than half the area of reforestation needed to comply with the Forest Code. The task force might develop cost-effective approaches, with a special emphasis on forest regeneration and commercial tree plantations, provide technical support, design finance mechanisms, and foster public-private partnerships.

4 **Design a national program to prevent forest degradation.** This program would support and expand innovative, field-tested approaches for preventing and controlling forest fires in closed-canopy forests and for encouraging reduced-impact logging techniques.

5 **Accelerate investment in beef yield improvements.** Increasing yields allow growth in beef production to continue to expand on a shrinking area of pasture, reducing demand for newly cleared land, and reducing the risks that declining deforestation rates restrict growth of agricultural production.

6 **Expand and improve rural technical support to small-scale farmers and communities** to focus on reducing deforestation, intensifying production systems, improving forest management and silviculture, and holistic approaches to farm management. Develop programs, similar to Colombia's Projecto de Apoio a Alianças Productivas (PAAP), to support the development of equitable contracts between producer and community organizations and companies buying and/or processing agricultural commodities ; facilitate smallholder integration into sustainable supply chains.

7 **Create a program for fairly compensating landholders who forego their legal right to clear forests on their land.** A national drive to reduce deforestation will eventually restrict landholders' rights to legally clear land on their properties. (See Question 4). This restriction could impose billions of dollars of opportunity costs on landholders, and will require a fair program of compensation.

8 **Establish a unified Brazilian definition of success for the pathway to sustainable rural development that features the INDC targets and is recognized by markets, investors and international donors.** This definition could overcome the fragmentation— the profusion of metrics—that impedes progress today. Brazil's historic success in slowing Amazon deforestation can be deepened and diffused to the nation if markets, investors and donors are aligned around the same performance targets and milestones.

FINANCING THE STRATEGIC INTERVENTIONS

9 **Attract private sector finance by issuing green forest bonds.** Issue an initial green forest bond in which a portion of Norway's next pay-for-performance pledge to the Amazon Fund is used to pay down the coupon of the bond (Table 2). Funds raised through the green forest bond could be used to finance the recommendations presented here. The decline in deforestation and increased legal compliance and productivity that are embedded in this INDC should accelerate economic growth by reducing risk to investors and markets.

10 | **Develop a national territorial innovation fund.** The *Municipios Criticos* program and *Programa Municipios Verdes* have demonstrated the power of collective action when farmers are faced with losing their access to credit because of regional deforestation rates. These programs' effectiveness has been constrained by a lack of positive incentives and private sector engagement. A territorial innovation fund could overcome this limitation (see Figure 5)

11 | **Optimize existing agricultural credit programs.** Credit programs such as the Agricultura de Baixo Carbono (ABC) and PRONAF make several US$billion available to small and medium scale farmers each year. Many smallholder farmers need to renegotiate their PRONAF loans because they are in default and little of ABC credit has gone for reforestation. Neither of these credit programs provide better terms for farmers in municipios that are succeeding in slowing deforestation. Finance from green forest bonds could be used to make these credit programs responsive to territorial performance through the bonus fund (Figure 5).

12 | **Attract new sources of finance.** The global significance of Brazil's potential INDC commitments could attract considerable bilateral and philanthropic donations. With a unified definition of success, national progress towards reducing risks, efficient mechanisms for delivering benefits on the ground (Figure 5), and an effective system for monitoring progress, funds could flow into Brazil's national low-emission rural development agenda more rapidly.

CONCLUSION

Brazil's INDC presents an opportunity to speed this nation's transition from a decade of major advances in command-and-control governance of vast tropical forest frontiers to a new phase of rural development in which agricultural and forestry innovation thrives under clear, streamlined rules for doing business. The INDC could initiate a national "virtuous circle", in which Brazil's success in lowering emissions, slowing deforestation, increasing agricultural productivity and moving landholders into full compliance with the law reduces risks and attracts greater investment while opening up new markets for agricultural and forestry products, further accelerating this transition. To seize this opportunity, Brazil could attract new investment from both private and public spheres with the help of pay-for-performance international climate finance.

METHODS

CALCULATING ZERO-NET DEFORESTATION AND ZERO-NET EMISSIONS

Baseline deforestation rates per region are historic annual averages as defined in the National Climate Change Program (PNMC)[16] for the Amazon (1996-2005; PRODES)[17] and Cerrado (1998-2009; PMDBBS & 2nd GHG Inventory).[18,19] Baseline deforestation rates for the Atlantic Forest and Pantanal biomes are the 2001-2010 historical annual average (SOS Mata Atlantica)[20] and 2002-2009 historical annual average (PMDBBS), respectively. A 90% and 95% reduction from baseline by 2025 is projected assuming a linear reduction from most recent reported year (Amazon-2014, Atlantic Forest-2013, Cerrado-2010, Pantanal-2009). The Pampa and Caatinga biomes are excluded from the analysis. Annual emissions from deforestation are estimated using an emission factor of 132.5 tC/ha in the Amazon and Atlantic Forest, and 56.1 tC/ha in the Cerrado and Pantanal biomes.[21]

Area of regeneration/reforestation required to achieve zero-net emissions by 2025 by region is calculated by assuming a ramp-up of regeneration in each biome, in which annual regeneration rate equals annual deforestation rate in 2020, and increases until sequestration from the growing pool of re-growing forests equals emissions from deforestation in 2025. Carbon accumulation rate is assumed to be 3.5tC/ha/year in the Amazon and Atlantic Forest[22], and 0.92tC/ha/year in the Cerrado and Pantanal.[23,24,25]

Historical, current and zero-net emissions from deforestation in the Amazon, Cerrado, and other vegetation in Table 1 are calculated using the above methodology.[26] This is a preliminary analysis, and further research, especially related to fire and logging carbon fluxes, is needed.

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