What is at stake for Brazilian Amazonia in the climate negotiations

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Abstract:

Issues left undecided at COP-18 in Doha in December 2012 are critical to containing the two greatest threats to Brazil's Amazon forest: direct deforestation and forest loss through drought and fire provoked by climate change. Brazil's diplomatic positions on the role of tropical forests in mitigating global warming currently call for receiving donations through a voluntary fund, but without generating carbon credit valid against emissions-reduction commitments by countries that accept limits on their national emissions (i.e., Annex I countries). Brazil has long rejected accepting a target (assigned amount), and has instead presented a non-binding "voluntary objective." In 2011 at COP-17 in Durban, Brazil expressed willingness to accept a commitment after 2020, but only if all of the rest of the world agreed to do the same. This author argues that Brazil's national interests would be better served by accepting a target now and by supporting fully marketable carbon credit from Reducing Emissions from Deforestation and Degradation (REDD). The global goal of preventing mean temperature from increasing beyond 2°C above pre-industrial levels would be much more likely to be achieved in practice with tropical forests fully included in a carbon market as part of an agreement for the period after 2012.

Keywords: Avoided deforestation, Carbon, Greenhouse effect, Global warming, Mitigation, REDD, Tropical forest

1 Prologue

The question of what is at stake for Brazilian Amazonia in negotiations involves scientific information, such as expected climatic impacts in Brazil if greenhouse-gas emissions continue unchecked. This question also involves factors that are inherently not scientific, such as one's view of what is in the national interests of Brazil. One must be clear about underlying assumptions and opinions without shying away from drawing the conclusions that follow from them. Here it is assumed that avoiding loss of Amazon forest either to deforestation or to climate change is in Brazil's national interest. Readers should be aware that this is an opinion piece.

The proper place of Reducing Emissions from Deforestation and Degradation (REDD) is one of the most controversial topics in climate discussions today. Different governments, non-governmental organizations (NGOs) and academicians have radically different positions on the topic. REDD holds both promise and risk. The promise stems from the large amounts of carbon emission that could be avoided at comparatively low cost and on a time scale compatible with the need for rapid response to climate change. The risk comes from the existence of a variety of ways through which REDD could be used to justify carbon credits that allow fossil-fuel emissions to be authorized without a real offset from reduced forest emissions. Participants in the debate are divided into those who favor fixing REDD and those who want to throw it out. It is a matter of attitude whether REDD should simply be eliminated or whether it should be and implanted with appropriate provisions such that its mitigation potential can be tapped without incurring either greater net emissions or a variety of environmental and social impacts that can accompany some types of proposed REDD activities. As one of the originators of the concept of "avoided deforestation," now subsumed under "REDD", I am in the "fix it" camp.

The present paper is not a review of REDD and will not engage with the arguments in the pro- versus anti-REDD debate. For both sides, readers are referred to reviews in Fearnside (2012a,b). Anti-REDD arguments include questions of whether the carbon credits adequately reflect the true climatic benefits considering the effects of leakage (e.g., the displacement of deforestation activity to locations outside of the project boundaries), permanence (the time that carbon remains out of the atmosphere) and uncertainty (the effect of the true values of carbon stocks and other parameters, including baseline scenarios, being different from those used in computing project benefits), as well as various possible environmental and social impacts depending on the types of project implemented. Pro-REDD arguments include the climatic benefits of maintaining forest after adjustment for leakage, permanence and uncertainty (plus an additional margin to ensure that benefit estimates are conservative), and the many non-carbon co-benefits of retaining forests, such as maintaining biodiversity, hydrological functions, water cycling and the human cultures that depend on forest presence.

It should be noted that the carbon benefits of reduction in emissions from deforestation and degradation are inherently different from those of carbon sequestration in forms with fast turnover, such as silvicultural plantations for paper pulp. The differences lie in the permanence of the carbon removal from the atmosphere, in the value of the time needed for the sequestration to take place (for example in waiting for planted trees to grow), and in the levels of certainty (Fearnside 1995, 2000, 2002). It was unfortunate that plantations and avoided deforestation were lumped as "sinks" in debates over the Kyoto Protocol's Clean Development Mechanism (CDM).

Readers should not expect opinions to be referenced in the literature. The author has a long history of participation in these debates, including prolonged contact with an extraordinarily wide range of actors, such as government officials, diplomats, and NGOs of diverse persuasions and national origins (including grassroots and indigenous groups), as well as academics on all sides of these issues. To a certain extent, the reader will have to take it on faith that the author knows what he is writing about.

2 History and controversies

Among the many issues not settled at the Climate Convention's 18th Conference of the Parties (COP-18), held in Doha in December 2012, are decisions regarding the place of tropical forests in mitigating global warming. These decisions could offer key opportunities for Amazonia, Brazil and the world to switch course instead of following the current path, which many see as inexorably leading to a climatic disaster. Inclusion of some form of REDD is now accepted in principle, but much remains to be negotiated that could result in REDD playing only in a severely limited role in the overall mitigation effort.

Over the years that climate negotiations have been in progress, various aspects of Brazil's diplomatic position have evolved, while others have not. From before the 1992 "Earth Summit" in Rio de Janeiro that produced the United Nations Framework Convention on Climate Change (UN-FCCC) until COP-13 in Bali in 2007, Brazil's Ministry of External Affairs resolutely resisted any suggestion of linking reductions in deforestation to mitigation of global warming (Fearnside 2006). This is best explained as a reflection of the common perception in Brazil, and especially inside the "bubble" of the diplomatic community, that the rest of the world is engaged in a long-standing conspiracy to take Amazonia away from Brazil and declare it an "internationalized" zone similar to Antarctica (Council on Foreign Relations Independent Task Force 2001, Fearnside 2001a). Any sort of payment for carbon

was seen as opening the door to pressure in this direction. This blanket resistance began to change in late 2007 after Amazon deforestation rates had dropped by about half since their peak in 2004. The opportunity to gain financial returns from reducing deforestation was apparent, and this had stimulated the governors of Brazil's nine Amazonian states to mount increasing pressure on the federal government to alter the country's negotiating positions (e.g., Ecodebate 2009). The shift in position that began in 2007 applied to receiving international funds based on reduced deforestation, not to the questions of Brazil accepting an emissions cap (assigned amount) under the Kyoto Protocol or to allowing reduced deforestation to generate carbon credit (Certified Emissions Reductions, or CERs) that could be sold to fulfill emissions-reduction commitments in the countries that have accepted assigned amounts (Annex I countries) (e.g., FSP 2007).

In 2008, Brazil established the Amazon Fund to receive international donations for the purpose of slowing deforestation to avoid greenhouse-gas emissions (Brazil, Fundo Amazônia 2011). This fund is administered by Brazil's National Bank for Economic and Social Development (BNDES) and is overseen by a commission from government agencies and environmental NGOs. The major donor has been Norway, which has contracted contributions totaling US$418 million and transferred US$112 million out of a promised US$1 billion to be paid in installments by 2015, subject to progress in reducing deforestation; Germany has contracted US$27.2 million and transferred US$$4.7 million (Amigos da Terra-Amazônia Brasileira 2012; Brazil, Fundo Amazônia 2013).

At COP-15 in Copenhagen in December 2009, Brazil presented a refinement of its Amazon Fund proposal (Brazil, MMA 2009) and of the country's National Plan for Climate Change (Brazil, CIMC 2008). The proposal taken to Copenhagen was for forests to enter mitigation plans only if "limited" (Munhoz 2009), meaning that most of the funds would be donated to a voluntary fund (the Amazon Fund) and would not be valid for carbon credit that can be sold to compensate for fossil-fuel emissions. This author has long argued that Brazil's representatives should take a more courageous stance (Fearnside 1999, 2001b). For Amazonia and Brazil, it is essential both to control global warming at a level that assures survival of the Amazon forest and to include Amazon forest maintenance as a mitigation option on a scale that effectively halts further expansion of deforestation in the region. Brazil's current plan for slowing deforestation falls short of this, leaving Amazonia still at risk (Fearnside 2009a).

The decline in Brazil's deforestation rates from 2004 through 2011 does not mean that the process is under control: while improvements in enforcement of environmental legislation played a role in this decline, falling commodity prices and increasingly unfavorable currency exchange rates for Brazilian exports were key factors (Fearnside 2010). Econometric analyses indicate that through 2007 there was close agreement between deforestation rates and commodity prices (expressed in Brazilian reais, therefore including the effect of changing exchange rates); only beginning in 2008 did deforestation rates diverge from this pattern, indicating an important contribution from governance policies (Assunção et al. 2012; see also Hargrave and Kis-Katos 2011). Brazil's massive plans for building highways and dams in Amazonia imply future deforestation increases, rather than decreases (e.g., Fearnside and Graça 2006). Moreover, the powerful "ruralist block" (representatives of large landholders) in the National Congress has succeeded in dismantling Brazil's Forest Code and other key pieces of environmental legislation (e.g., Metzger et al. 2010). The law finally passed on 25 September 2012 (Law No. 12.651/12 with partial vetoes, alterations in law 12.727/12 and accompanying provisional administrative measures) greatly reduces protection of forests on

private land; the still-unsettled "regulamentation" of the law, and the extent to which it is enforced and obeyed in practice, will determine how great these losses will be.

At the COPs in Cancun (2010), Durban (2011) and Doha (2012) some progress was made on negotiating the details of REDD, which became "REDD+" to include enhancement of per-hectare forest carbon stocks and the consideration of social benefits and benefits for other environmental services, such as maintaining watershed functions and biodiversity (Angelson 2008; Moutinho et al. 2011a,b). A wide range of issues remain to be resolved both of a political nature and on theoretical questions regarding carbon accounting (Fearnside 2012a,b).

Important as they are, the shifts to date in the positions of Brazil's Ministry of External Relations represent only a first step along the path of change that is needed to tap the potential of Amazonia in climate mitigation and the potential of mitigation to contribute to a more sustainable future economy in Amazonia. The arguments that have led to resisting any connection between deforestation and climate are still present, and, of course, many of the same individual actors are also still present. Neither Brazilian civil society nor the Brazilian government has a monolithic view on any of these issues. An internal struggle over climate policy between the Ministry of External Affairs and the Ministry of the Environment has been longstanding, with the more-powerful Ministry of External Affairs always having the upper hand. This became most public in 1999 in an incident over the inclusion of avoided deforestation in the CDM (see Fearnside 2001b, 2005). In the lead-up to Copenhagen in 2009, a similar struggle became public over Brazil's taking on an assigned amount under the Kyoto Protocol (Telles 2009).

While support for REDD is the most common view in Brazil's civil society, this is not universal. Divisions over the question of whether REDD is good or bad are the result of long debates within Brazil. Pro-REDD arguments are reviewed in Moutinho et al. (2011a,b); anti-REDD arguments are reviewed in Barr (2011). It would be remiss not to mention that some of these divisions reflect influences from NGOs on either side of this issue in other parts of the world, several of which have invested considerable effort in organizing events in Brazil to promote their views among Brazilian NGOs and/or funding foreign visits by key NGO leaders. Of course, self-interest is also a factor, with those groups that plan to make money from REDD projects strongly supporting this approach. Another factor is electoral politics, with REDD projects promoted by state governments (as in Acre and Amazonas) being resisted by those in opposition parties or groups. Amid this cacophony, there is ample room for different opinions as to where Brazil's best interests lie.

The best guide in this debate in Brazil is the impact that different proposals would have on the Amazon forest. This is illustrated by an incident from the earlier debate over inclusion of tropical forests in the CDM, which split the world's environmental NGOs along geographical lines during the 3½ years between the Kyoto Protocol in December 1997 and the Bonn agreement in June 2001 (see Fearnside 2001a, c). In Brazil only one locally based NGO supported the European position opposing all "sinks" in the CDM (see Fearnside 2001a). In an event in São Paulo, the head of the NGO in question made the statement that the issue of forests in the CDM was so complicated that each morning when he got out of bed he never knew which side to support. The contrast couldn't have been greater with the statement at the same event by Marina Silva, a rubber tapper from the forests of Acre who later went on to become a senator and then Minister of the Environment. There was no question where she stood. The difference lies in Marina Silva having an anchor from which

to judge different issues: if something helps to maintain the Amazon forest and the traditional peoples who inhabit it, then she is for it, if something contributes to destroying the forest then she is against it.

3 Why a voluntary fund is not enough

A "voluntary fund" would condemn forests to a decidedly secondary role as compared to their role if reductions were linked to mandatory targets through credit that is valid under the Kyoto Protocol or its successor. If the principal industrial emitters become more serious in facing the challenge of containing global warming, then these countries will have to take on much larger reduction commitments, and meeting these commitments will absorb all of the money they have for fighting global warming. There would be little or no money left over for contributions to voluntary funds that are essentially for public relations (Fearnside 2012a).

The argument used to relegate REDD to a separate fund, instead of being included in carbon trading as part of the effort to meet the emissions-reduction targets of countries with national commitments (Annex I countries), is that the potential decrease in tropical forest loss represents so much carbon that offering it on the market would depress carbon prices to the point where no one would invest in clean technologies in the rich countries. This argument is defective because it assumes that the commitments of the countries are fixed, but the reality is that no country has any binding commitment to a specific reduction in emissions from 2013 onwards. The price of any commodity, be it soybeans or carbon, depends on an equilibrium between supply and demand. This means that the price can be maintained or increased either by reducing supply or by increasing demand. The low price of carbon foreseen by defenders of a separate fund, and also by defenders of allowing only a very limited offering of forest carbon on the market, presumes that the demand for purchasing carbon credit will remain constant (e.g., KEA 3 2009, p. 18). But it is exactly this demand that cannot be allowed to remain constant: the main battle is to convince countries to take on much larger commitments to reduce their net emissions, which means greatly increasing their demand for purchasing carbon. With sufficient commitments, the price of carbon can be maintained at a level where the world gets both more clean energy (as from wind and solar power in Europe) and real elimination of tropical deforestation. It is foolish to surrender on increasing these commitments before the battle has even begun.

One of the ways often used to counter fear of forest carbon "flooding" the market is to suggest a limitation, where only a small percentage of mitigation can be done through claiming carbon credit from this source. This is similar to the limit agreed for in Marrakech in 2001, where a maximum of 1% of each Annex I (developed) country's 1990 emissions could be offset by credit from CDM projects for afforestation and reforestation (i.e., silvicultural plantations) (see Schlamadinger et al. 2007). Fear of allowing full volume of trading in forest carbon stems from the mistaken belief that there is so much forest carbon that might be sold that buyers would be lacking. However, the emissions reductions needed to contain global warming are much greater than the amount emitted by deforestation each year. Much of the reduction will therefore still have to come from other sources with greater expense per ton of carbon, ensuring that the carbon price will be bid up to a reasonable level and a "collapse" avoided – provided the large commitments to reduction are made.

4 Why forest carbon credit should be traded

There is a world of difference between payments through a fund that generates no carbon credit and selling credit in an open market. The main difference is in the volume of money, which, as mentioned earlier, is bound to be very limited in the case of a fund because mitigation that counts towards fulfilling negotiated targets will absorb the vast majority of available money. Another reason for a fund condemning countries like Brazil to much smaller levels of financial return from forest carbon is that the amount paid through the fund is not based on the value of the carbon in the market. A market price would be the result of competing against expensive alternatives in the industrialized countries. In contrast, the price paid by the fund would only compensate for the "opportunity costs" of not deforesting (e.g., Greenpeace 2008, p. 19). The "opportunity cost" refers to paying for what would have been earned had the forest been cut and converted to the land use that would normally replace forest, which is low-productivity cattle pasture in most of Amazonia today (Nepstad et al. 2007, 2009). But would accepting this as the basis of payment be in Brazil's best interests? The opportunity cost represents the lowest possible return that would be accepted in a market system, but there is no upper limit as to how much can be earned if supply and demand cause the price to rise above this low level.

The idea that a market mechanism will result in the price of any commodity falling until it approaches the opportunity cost is based on the assumption that producers will produce more and more of the commodity until supply satisfies demand, and that the identities and locations of the producers will shift until the market is being supplied in the cheapest way. If a single class of producer (such as those forgoing deforestation for Amazonian cattle pastures) were able to supply the entire market, then the equilibrium between supply and demand that determines the price would settle near the opportunity cost of these actors. But in the context of bringing global warming under control, this special case (with potential ranchers being the only actors) does not apply. If human society is to cut its emissions by, say, 80% to avoid "dangerous" climate change, then the contribution of avoiding tropical deforestation and degradation will be grossly inadequate. Even if all forest carbon loss were completely halted, an enormous amount of emissions reduction would still have to come from using less fossil fuel. There is no getting around this fact. What this means for carbon price is that markets will adjust such that the price is at the opportunity cost, not of Amazon ranching, but rather of the most expensive fossil-fuel replacement option that needs to be tapped in order to reach the goal of 80% total reduction in total emissions. This will be substantially higher than the opportunity cost of avoided deforestation.

The possibility of getting additional payments for each hectare of avoided deforestation on the basis of other environmental services, such as water cycling and biodiversity maintenance, can be added on top of the pure carbon market value. These additional financial flows might well come from a fund rather than a market arrangement, since, unlike carbon, the environmental services involved are not interchangeable with offset measures elsewhere. There is no need to throw out the logic underlying the carbon value in order to gain the financial benefit of the other environmental services.

Throwing away the potential for much greater returns by having forest carbon sold in a market system is not a rational negotiating strategy for Brazil. As an illustration, imagine if in the 1940s, before oil exploitation began in the Middle East, an offer had been made to Saudi Arabia to buy development rights on the basis of opportunity cost. It could have been argued that Bedouins with a few camels in the desert produce a cash value of, say, less than ten US cents per hectare per year, and so they would be happy to accept US$10/ha for use of the area for the next hundred years. Would it be wise, or fair, to accept such a deal? Should

Brazil sell its Amazon carbon for the per-hectare price of a poor-quality pasture? This only makes sense as a negotiating position if seen through the lens of the belief among Brazilian diplomats that the world is in a constant conspiracy to take Amazonia away from the country, and that the value of Amazon carbon could provide the motive (e.g., Fearnside 2009b).

5 Why Brazil's interests are inherently different from those of Europe

It has become fashionable in Europe to oppose allowing tropical forest maintenance to earn carbon credit that can be traded against the commitments that industrialized countries make to reduce their national emissions. Both European governments and European-dominated NGOs like Greenpeace International take this position. They justify this with a moral discourse, claiming that the countries that caused the current climate crisis have a responsibility to mitigate it "at home" (e.g., Greenpeace 2008, p. 14). This confuses two very different questions. One is who should pay the bulk of the cost, and few would disagree that this should be the developed countries. However, it is an entirely different question as to whether this should all be done "at home," where the cost for each ton of carbon kept out of the atmosphere can easily be double or triple the cost of achieving the same climate benefit by applying the funds abroad.

Climate responsibility is not the key factor here. Putting oneself in the shoes of a politician in a European country, such as Germany, one can easily imagine a group of environmentalists presenting a demand that Germany spend X% of its gross domestic product (GDP) on fighting global warming. The politician might say, "Sure, we will build a wind turbine factory, a solar panel factory, retool the Opel automobile factory to make ecological cars, etc." All of this creates employment and income in Germany. On the other hand, if the politician says "OK, let's send the money to Brazil to stop deforestation" it would do nothing for the economy of Germany. Europeans will therefore oppose major money flows for avoiding tropical deforestation even if the climate benefit is several times greater for the same expenditure. What this means is that restricting all or almost all of the mitigation to expensive investments "at home" will result in these countries not agreeing to the much greater commitments to emissions reductions that are needed to really keep global temperature from rising beyond 2°C above pre-industrial levels. As a result, Brazil would lose not only the financial inputs from selling carbon but could also lose its Amazon forest. Brazil's interests are inherently different from those of Europe.

6 Why 450 ppmv is not enough

The countries of the world have now reached a consensus that an increase of mean global temperature of 2°C above the pre-industrial average represents "dangerous" climate change. Although the Ministry of Foreign Affairs claims in virtually every public statement on climate that Brazil is a "leader" in climate negotiations, Brazil was one of the last countries to get on the 2°C bandwagon, only accepting this goal in July 2009 after over 100 other countries had already endorsed this objective. Now the critical question to be negotiated is what concentration of greenhouse gases should be allowed to accumulate in the atmosphere in light of this goal, and Brazil's leadership would be welcome on this crucial decision. A frequently mentioned number is 450 parts per million by volume (ppmv) of carbon dioxide equivalent (CO_2e). The problem with this is that this concentration corresponds to a 50% chance of average temperature staying within the 2°C bound, but it also implies a 50% chance that the temperature will rise beyond this level (Hare and Meinshausen 2006). Since a 2°C average global temperature rise corresponds to a rise of at least 4°C in

Amazonia, this is approximately the limit for maintaining the Amazon forest (Nobre and Borma 2009). Brazil must therefore throw its diplomatic weight behind a definition well below 450 ppmv CO_2e.

A dramatic reminder of this came in 2005, when a devastating drought struck Amazonia, practically drying up tributaries on the southern side of the Amazon and causing forest fires in Acre. The year 2005 was not an El Niño year, when warm water in the Pacific Ocean causes drought in northern Amazonia, as during the 1997-1998 Great Roraima Fire. Instead, the drought was caused by a patch of warm water in the Atlantic Ocean (Marengo et al. 2008), and global climate simulations indicate this type of drought becoming a very frequent occurrence if CO_2 concentrations in the atmosphere rise above 400 ppmv (Cox et al. 2008). A CO_2 concentration of 400 ppmv is approximately equal to 450 ppmv CO_2e because the total effect on global warming is raised by the CH_4, N_2O and other trace gases included in CO_2e, but not counted in the pure "CO_2 concentration" figure. With continuation of present emission patterns, a drought as severe as that of 2005 was a one-in-twenty-year event in 2005 but would increase in frequency to be one in every two years by 2025 and nine in every ten years in 2060 (Cox et al. 2008). Clearly, this is far beyond the capacity of the Amazon forest to withstand drought and fire. In 2010 another record drought struck, this time combining a strong Atlantic dipole with a modest El Niño event (Lewis et al. 2011; Marengo et al. 2011).

The Stern Review represents the most comprehensive effort to date to estimate the cost of achieving different stabilization targets. The review focuses on stabilizing the atmosphere at 450-550 ppmv CO_2e, and dismisses the 450 ppmv lower end of this range as "almost out of reach" (Stern 2007, p. xv). The 550 ppmv CO_2e target emphasized in the review corresponds to a most-probable warming of 3ºC, rather than 2ºC (p. 294). Targets below 450 ppmv CO_2e were not considered, partly because "cost modelling exercises rarely consider stabilisation below 500 ppm CO_2e" and partly because "it would be unwise to assume that any overshoot could be clawed back" (p. 299). The cost of stabilizing at 500-550 ppmv CO_2e (450-500 ppmv CO_2) is estimated at 1% of global GDP in 2050, assuming that global GDP at that time will be four times larger than it was in 2005 (p. xv). Stabilizing at 450-500 ppmv CO_2e would cost approximately three times more (p. 247). The cost of stabilizing at levels lower than this is evidently too frightening for economists to even consider. This outlook of the "dismal science," as economists call their discipline, appears to be approaching the problem from the wrong direction. The starting point is the cost that is considered politically feasible to bear, and the stabilization level is then the lowest concentration of greenhouse gases that will fit within that constraint. A better approach for guaranteeing the future welfare of humanity would be to start with the environmental limits (such as 400 ppmv CO_2 or 450 ppmv CO_2e as an approximate limit for maintaining Amazonian forest) and then adjust the economic system to pay the corresponding costs, even if painful.

7 Why Brazil should take on a real target

The voluntary objective for reducing Brazil's emissions by 36-39% by 2020 (as compared to what is projected to be emitted in that year with no mitigation) is very different from a target (assigned amount). An assigned amount implies that there are consequences if the target is not met, whereas an "objective" has no such consequences attached. In the case of a binding international agreement like the Kyoto Protocol, this means that a country that exceeds its assigned amount would have to buy carbon credit from somewhere else at the going price at that time until the target is met. Under a binding agreement, the commitment

remains in effect regardless of who is governing the country. By contrast, between now and 2020 Brazil will have several presidential administrations, any of which will be free to disavow the voluntary objective announced by the government in 2009. Making the "voluntary objective" into a federal law does not greatly change this, as a simple vote of the National Congress could reverse it if emissions turn out to be greater than hoped.

Taking on a real target under a binding agreement would be advantageous for Brazil for several reasons. First, such a target would allow much more carbon credit to be sold based on national total emissions, not just the results of specific mitigation projects, and even within these limits only the portion that can be shown to be "additional" to a no-project scenario. Second, Brazil's taking on a target would be a key step both in inducing industrialized countries that had commitments under the Kyoto Protocol to commit to larger cuts now and to induce developing countries to also take on commitments under the post-Kyoto agreement. Brazil is one of the countries that is most at risk from global warming, and so achieving this greater global reduction in emissions is essential to Brazil's national interest. Otherwise, the country risks losing much of its Amazon forest to climate change (e.g., Fearnside 2009c; Malhi et al. 2008; Nepstad et al. 2008; Salazar et al. 2007).

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