



Environmental policy in Brazilian Amazonia: lessons from recent history

A política ambiental na Amazônia brasileira: lições da história recente

Philip M. Fearnside – Instituto Nacional de Pesquisas da Amazônia (INPA).
E-mail: pmfearn@inpa.gov.br

Resumo

Tropical forest in Brazil, as in other countries, faces threats stemming from decision making that favors destructive development and gives only token consideration to lost environmental services and other impacts. History, particularly the most relevant period covering the recent years of rapid development in Amazonia, is a source of useful lessons for changing the decision-making process to favor outcomes that are less destructive and more sustainable. Development decisions set processes in motion with consequences extending far into the future, adding urgency to the task of assimilating these lessons. Decisions in the coming decade will determine the fate of Brazil's Amazon forest, as is also the case for other countries that could benefit from the lessons of recent history in Brazil.

Abstract

A floresta tropical no Brasil enfrenta ameaças decorrentes de uma tomada de decisão que favorece o desenvolvimento destrutivo e só considera simbolicamente os serviços ambientais perdidos e outros impactos. A história, particularmente o período mais relevante que abrange os últimos anos de rápido desenvolvimento na Amazônia, é uma fonte de lições úteis para mudar o processo de tomada de decisão para favorecer resultados que são menos destrutivos e mais sustentáveis. As decisões sobre desenvolvimento deslançam processos com consequências que se estendem longe no futuro, acrescentando urgência à tarefa de assimilar essas lições. As decisões na próxima década determinarão o destino da floresta amazônica brasileira, assim como é o caso para outros países, que poderiam se beneficiar com as lições da história recente do Brasil.

Palavras-chave

Deforestation. Development policy. Ecosystem services. Environmental services. Global warming. Tropical forest.

Keywords

Desmatamento. Política de desenvolvimento. Serviços ambientais. Serviços ecossistêmicos. Aquecimento global. Floresta tropical.

1 THE RELEVANCE OF THE PAST

“Those who cannot remember the past are condemned to repeat it.”

Nowhere is this notable statement of George Santayana (1905) more relevant, yet ignored in practice, than in the case of public policies in Brazilian Amazonia.

Many of the major infrastructure projects that today shape the course of events in Amazonia (Figure 1) were started during Brazil's military dictatorship (1964-1985). These include the Transamazon Highway and its associated colonization projects (MORAN, 1981; SMITH, 1982; FEARNSIDE, 1986a), the BR-364 (Cuiabá-Porto Velho) Highway and its POLONOROESTE Program (Fearnside, 1987, 1989a), the BR-163 (Santarém-Cuiabá) Highway (TORRES, 2005; FEARNSIDE, 2007), the BR-319 (Manaus-Porto Velho) Highway (FEARNSIDE; GRAÇA, 2009), and a series of large dams such as Tucuruí, Balbina and Samuel (FEARNSIDE, 1989b, 1999, 2001, 2005a). These projects were decided by a handful of generals in Brasília who had them built immediately either through private contractors or, as in the cases of the BR-163 and BR-319 Highways, by sending the army itself to build the infrastructure. Not only were no environmental impact studies done, but decisions were made without economic viability studies that calculate the costs and benefits purely in terms of monetary flows. Whenever examples of environmental and social impacts of these projects are brought up in discussions of current infrastructure plans, the usual government response is that Brazil is entirely different today, and that past disasters are the fault of the dictatorship and will never be repeated again due to the requirement of an environmental impact study and report (EIA-RIMA) and associated public hearings. But how much has really changed for establishing public policies in Amazonia since the dictatorship? The currently unfolding history of major projects suggests that not much has changed. Major projects that would set in motion chains of events with enormous environmental and human consequences are still decided by a handful of high officials and are announced and treated as “irreversible” before any environmental or economic viability study is done. Examples include reconstruction of the BR-319 Highway (a road that has been abandoned since 1988) and damming the Xingu River at Belo Monte. This paper reviews recent history in Brazilian Amazonia in an effort to extract lessons that could change decision making in favor of a less destructive course over the coming decade. Decisions in the coming decade will be critical

in determining the fate of Amazonian forest in the remainder of the century, as is also the case in other tropical countries that could learn from history in Brazil.

Figure 1. Brazil's Legal Amazon region with locations mentioned in the text.



2 GOVERNMENT PLANS

2.1 FEDERAL PLURIANNUAL PLANS

Brazil's federal government has been operating under a series of “pluriannual plans” such as *Brasil em Ação* (Brazil in Action) (1996 to 1999), *Avança Brasil* (Forward Brazil) (2000 to 2003) *Plano Plurianual*, or “PPA” (Pluriannual Plan) (2004 to 2007), the *Programa de Aceleração do Crescimento*, better known as the “PAC” (Program for the Acceleration of Growth”) (2008 to 2011) and PAC-2 (2012-2015). Note that the object of the current plan is “growth,” not “development,” much less “sustainable development.” The term “growth” implies simply an increase in size, whereas “development” implies an improvement, whether or not size increases. The plans have, indeed, been focused on size rather than quality, each plan being essentially a long list of highways, dams and other infrastructure projects that the government regards as of high priority. In fact, many of the projects, such as the BR-163 (Santarém-Cuiabá) Highway and the Belo Monte Dam, have remained the

same through this sequence of plans, with expensive projects being successively postponed due to lack of funds or for bureaucratic reasons.

2.2 PUBLIC POLICY INITIATIVES

2.2.1 *Policy plans*

Public policy in Amazonia has been influenced by a wide variety of initiatives. These include projects financed by multilateral development banks such as the World Bank and the Interamerican Development Bank, including the POLONOROESTE and subsequent PLANAFLORO projects in Rondônia, the PMACI project in Acre and the PRODEAGRO project in Mato Grosso (see FEARNSIDE, 1987). These attempted to influence policies in various ways, including ecological-economic zoning (ZEE). These multilateral development bank projects began in the 1980s, and the 1990-2009 period saw a reduction in the direct role of Bank projects for public policies. However, the World Bank, together with the Brazilian government—especially the Ministry of the Environment, was co-administrator of the PPG7 Pilot Program to Conserve the Brazilian Rainforest (1992-2008). The PPG7 sponsored a wide variety of initiatives throughout Brazilian Amazonia, and a smaller number in the Atlantic Forest region (see <http://www.mma.gov.br/ppg7/>). Projects included the “Type-A Demonstration Projects” (PDA) for financing small-scale sustainable development projects run by grassroots non-governmental organizations (NGOs), support for extractive reserves (RESEX) – an activity that started before the PPG7 and continues after it, environmental management support for selected areas in Amazonian states, forestry management, *várzea* (floodplain) management, ecological-economic zoning by state-level agencies, demarcation of indigenous land, fire prevention and control, support for science and technology related to Amazonia, and protected area planning and creation in “ecological corridors.” These projects had varying degrees of success, the most notable contributions to the environment being demarcating indigenous lands and stimulating the formation of grassroots NGOs in order to qualify for funding PDA demonstration projects.

2.2.2 *Payment for environmental services*

One form of intervention with considerable potential is payment for environmental services (PES). Unfortunately, the main initiative in this area to

date, the PROAMBIENTE Program under the Ministry of the Environment (MMA), has had little influence because the payments depend on the MMA's budget. This budget is always inadequate and uncertain, leading the project to lose credibility with participating farmers when the payments are not made as promised.

Another initiative under the MMA is the Protected Areas in Amazonia (ARPA) program (e.g., SOARES-FILHO et al., 2009, 2010). This program works to achieve Brazil's announced goal of protecting 10% of each ecosystem in the country. Reserve creation in Amazonia is central because opportunities to create new reserves are rapidly disappearing as the advancing frontier makes reserve establishment politically impractical, especially for the large areas needed to maintain Amazonian biodiversity and climate (e.g., PERES, 2005).

2.2.3 Forestry management

Forestry management is an area where public policies potentially affect large areas of standing forest. In 2006, the Ministry of the Environment proposed and obtained passage of a law creating "public forests" in Amazonia that would be offered for bidding by companies for forestry management. A new agency, the Brazilian Forest Service (SFB), was created in the Ministry of the Environment to supervise these and other projects for forest management. The main rationale for creating the public forests was that it would quickly establish an official presence in areas of federal government land where use is undefined, these being the areas under greatest threat of invasion by landgrabbers (*grileiros*).

Forestry management in private properties requires approval of forest management plans by state-level environmental agencies. This can represent a major barrier in practice. For example, in the state of Amazonas in 2008 there were 2000 management plans proposed, of which only nine were approved. Most of the denied requests were based on lack of valid land title documents. By contrast, forest management in Acre is much more active. It should be noted that inherent contradictions in forestry management often make this practice illusory as a conservation measure (FEARNSIDE, 1989c, 2003a).

2.2.4 Hydroelectric dams

In practice, much of the environmental policy in Amazonia is not made by the Ministry of the Environment but by the ministries that build major public works such as highways and dams. The Ministry of Mines and Energy, which

is responsible for hydroelectric dams, is therefore a major actor. Its subsidiary, ELETROBRÁS, is one of the few government agencies that engages in long-range planning. Unfortunately, this planning is almost entirely devoted to maximizing generating capacity to accompany an expected exponential increase in demand, which is often erroneously portrayed as “need” for electricity. Virtually never is there any questioning of what the electricity is to be used for. The exponential projections of demand incorporate all of the inefficiency and waste in current energy use and also implicitly ratify plans for an expansion of electro-intensive export industries, especially primary aluminum (*e.g.*, BERMANN, 2012).

After the energy shortage (*apagão*) of 2001, then-president Fernando Henrique Cardoso created the National Council for Energy Policy (CNPE). This council might have undertaken the sort of rethinking that is so sorely needed for Brazil’s energy sector, and could have taken the lead in weaning the country from the unending expansion of generating capacity to supply the world with cheap aluminum. If Brazil continues down the path of trying to supply international markets with whatever volume of electro-intensive commodities that the world wants to buy, then there is no limit to the number of hydroelectric dams and other forms of generation that the country “needs.” Unfortunately, the CNPE is almost a “ghost” agency, having rarely met since its creation.

The only time that the electrical sector has ever revealed the full extent of dam-building plans in Amazonia was in December 1987 when ELETROBRÁS released its 2010 Plan (BRAZIL, ELETROBRÁS, 1987). The total, irrespective of the expected date of completion, was 79 dams with a combined area of 10 million hectares, or 2% of the Brazilian Legal Amazon (see FEARNSIDE, 1995). Following intense criticism of the plan, subsequent public releases of information have been restricted to dams planned for limited periods, such as the 2015 and 2030 plans and the ten-year “decennial” plans. The 2012-2021 decennial plan (BRAZIL, MME, 2012) contains no discussion of what to do with the electricity generated, and furthers the impression that what is at stake are the light bulbs in people’s houses rather than increasing export of products like aluminum.

2.2.5 *Oil and gas*

Petrobrás is also an actor that creates structural changes through its infrastructure projects. The logic for several of the current plans is unclear. A gas pipeline from Coarí to Manaus was completed in 2009 and a smaller one from Silves to Manaus is nearing completion. The Coarí gas pipeline connects with the already completed Urucu-Coarí “polyduct,” which transports both oil

and gas. The gas deposit at Urucu is believed to be sufficient to supply Manaus for approximately 40 years. It is therefore not clear why Petrobrás has placed a priority on a gas pipeline to link Urucu with the much larger gas field at Juruá, further to the west. If the gas is really for Manaus, it would make much more sense to wait a few decades until the Urucu gas is nearing an end before investing in the second pipeline. The Juruá-Urucu pipeline raises the suspicion that the gas is really destined for transport via another much more controversial pipeline planned from Urucu to Porto Velho. This pipeline is ostensibly to supply gas for a thermoelectric plant in Porto Velho. However, the lack of logic for this pipeline is apparent, given that two large hydroelectric dams on the Madeira River are under construction; one (Santo Antônio) began generation in December 2011 and the other (Jirau) is scheduled for June 2013. These dams will make Rondônia a major exporter of electricity to Brazil's southeast region. The Urucu-PortoVelho pipeline would have much greater potential environmental impact than the other pipelines because Rondônia is overflowing with people looking for land and is the principal source of migrants to deforestation hotspots in the neighboring states of Amazonas and Acre and the north-western portion of Mato Grosso. A pipeline from Porto Velho would open a route for invasion of the large block of intact forest in western Amazonas.

2.2.6 Deforestation control

Deforestation control efforts have included an annual repression campaign by the Ministry of the Environment's Brazilian Institute for Environment and Renewable Natural Resources (IBAMA). For policy formulation, a potentially important event was the creation in 2003 of the Permanent Interministerial Working Group on Deforestation (GT-Desmatamento). However, the measures announced in the plan drafted by this interministerial working group (BRAZIL, GT-DESMATAMENTO, 2004) have largely remained on paper, with little concrete action resulting from them (GREENPEACE, 2005). Nevertheless, deforestation rates declined dramatically from 2004 through 2012. Part of this can be attributed to government control efforts (BARRETO et al., 2011) and to a complex interaction of different government and civil-society actors (HECHT, 2012). About half of it is a reflection of economic trends such as the crash in soybean prices from 2003 to 2007 and the decline in international beef prices over the same period, followed by the world-wide fall in demand for commodities in 2008 with the onset of economic recession in much of the world (ASSUNÇÃO et al., 2012). At the same time the exchange rate of the Brazilian real against

other currencies worsened dramatically from the point of view of exporters of soybeans or beef: the US\$ was worth almost R\$4 in 2002, falling to R\$1.5 in 2011 and rising to around R\$2 in 2013. For the first portion of the decline in deforestation, from 2004 to 2008, the deforestation rates track international commodity prices, but after 2008 deforestation continued to decline despite a recuperation of prices (HARGRAVE; KIS-KATOS, 2011; ASSUNÇÃO et al., 2012). The decline in deforestation rates has produced a climate of confidence (one might say hubris) among planners in Brasília, who believe that highways and dams can be built throughout Amazonia without provoking deforestation. Unfortunately, they are likely to be proved wrong when economic forces realign to drive clearing rates up (FEARNSIDE, 2010a).

There has been a trend towards transferring increasing amounts of authority from the federal government to the state governments in environmental matters. Much of the licensing responsibility has passed to the state environmental agencies, IBAMA retaining responsibility for projects that affect more than one state. Other state-level initiatives include the “*Zona Franca Verde*” (“Green Free-Trade Zone) program in Amazonas, which includes the creation of state “sustainable development reserves” (RDS). In Acre the “*Governo da Floresta*” (“Government of the Forest”) has stressed extractive reserves and forestry management. In Mato Grosso, the state’s environmental licensing program over the 1999-2001 period had a discernible effect on deforestation rates (Fearnside, 2003b), but various problems have caused it to have counterproductive effects because of “institutional subversion” (RAJÃO et al., 2012). Nevertheless, Mato Grosso has had the greatest reduction in deforestation rate among Amazonian states over the 2004-2012 period (BRAZIL, INPE, 2013). There is an inherent risk in the trend to decentralization, as lower levels of government such as states and municipalities are more easily influenced by the economic power of those who would rather not be fettered by environmental regulations. The nine Amazonian states are also quite varied in their attention to the environment: the World Bank informally classifies them into three groups -- three “green” states (Acre, Amazonas and Amapá), three “red” states (Roraima, Rondônia and Maranhão), and three intermediate “yellow” states (Mato Grosso, Tocantins and Pará).

Threats to the forest came to a head in discussions over revising (or essentially abandoning) Brazil’s “Forest Code,” the 1965 law that requires that a percentage of each private property be maintained in forest as a “legal reserve,” in addition to protecting riparian areas and steep slopes (the area of permanent protection, or APP). Although it was possible to avoid most of the requirements under the legislation in force before the 2012 reform of the Forest Code (LIMA;

CAPOBIANCO, 2009). The requirements nevertheless had an important role in allowing the government's executive branch to repress deforestation when motivated to do so.

On 24 May 2011 the Chamber of Deputies (lower house) of Brazil's National Congress approved a revision of the Forestry Code (REBELO, 2010). The proposal would reduce both the legal reserve and the area of permanent protection, as well as forgive past violations of the code (*e.g.*, METZGER *et al.*, 2010). These changes would have grave consequences for the environment, including fostering the general expectation of impunity for future environmental violations (FEARNSIDE, 2010b; VIEIRA; BECKER, 2010). The vote, which approved the changes by a margin of seven to one, represented a defeat for the environment with implications far beyond the regulations in question. Brazil's population is now 85% urban, meaning that the vast majority has no direct financial interest in being allowed to deforest more. On the contrary, the protection from flooding offered by riparian vegetation and the avoidance of landslides provoked by clearing steep hills are roles of the Forest Code that are clearly in the interest of all except rural landholders. Given the destruction and death that was caused by rivers flooding in north-eastern Brazil and by landslides on steep hillsides in the state of Rio de Janeiro during the very period when the congressional debate was underway, a seven-to-one vote against the interests of most of the population is hard to explain by normal political logic. During the course of the debate five rural leaders were assassinated, including a well-known husband-and-wife team of environmentalists living near Marabá, Pará. When one of the representatives of Pará tried to speak of the murders in the plenary, he was booed and prevented from speaking by the other deputies. In other words, the anti-environmental wave has reached proportions far beyond the substantial numerical power of the "ruralist block" (representatives of large landholders). On 6 December 2011 the Senate approved the gutted Forestry Code by a vote of 59 to 7 after some modest modifications. The modified bill then returned to the Chamber of Deputies, where the completely outnumbered environmentalist block decided to "throw in the towel" and boycott the vote on ratifying the changes. After a partial presidential veto the bill returned to the Chamber of Deputies, where amendments were added to weaken environmental protections even further. The Senate approved the final version in May 2012, and, after a presidential veto of selected paragraphs, the law entered into effect together with a set of "provisional measures" from the executive branch (BRAZIL, PR, 2012).

2.5.7 Climate Negotiations

State government positions on climate negotiations have been a positive force since 2008. Similar to the situation in the United States, where the state of California has been significantly more proactive on climate issues than the federal government, the Amazonian states have been much more active than the federal government in working to obtain international payments for maintaining Amazonian forest.

In 2008 the federal government created the Amazon Fund (*Fundo Amazônia*) to receive funds from other countries that want to help Brazil slow deforestation. The fund is administered by Brazil's National Bank for Economic and Social Development (BNDES). BNDES is the primary voice in deciding how the money will be used, despite the fund having an advisory board that includes scientists and NGOs. Norway has promised US\$1 billion, and contributed approximately one-fourth of this so far. Germany has promised a much more modest amount of US\$28 million, of which US\$4 million was contributed by 2012. The donations do not generate any form of carbon credit that can be used to offset emissions in the countries that contribute to the fund. Brazil has been promoting the fund as the mechanism by which it would like to receive any funds intended to slow Amazonian deforestation as a means of reducing global warming. This author believes it unwise to expect this model to serve as the basis for financing Amazonian forest maintenance in the future because there will not be funds available for voluntary contributions outside of the crediting system of the Climate Convention once countries make serious commitments to reducing their national emissions (FEARNSIDE, 2009, 2012a,b).

3 HISTORY DOESN'T FOLLOW THE PLAN

One of the most obvious lessons of the history of public policy in Amazonia is that events on the ground often do not transpire the way they are planned. The classic examples are the BR-364 (Cuiabá-Porto Velho) Highway and the Carajás Iron Project, both of which the World Bank, which funded the projects, believed would be “model” projects for environmental sustainability (GOODLAND, 1985). In fact, both created major impacts (FEARNSIDE, 1986b, 1987, 1989a,d; ANDERSON, 1990). In the case of the BR-364, public concern in the United States over these impacts led directly to creation of an environment department within the World Bank in 1987. There is a strong parallel between the history of these projects and official discourse concerning

the proposed reconstruction of the BR-319 (Manaus-Porto Velho) Highway (BRAZIL, SCS-PR, 2009).

Part of the reason for the discrepancy between plans and real developments is the large role of actors who have little reason to follow the plan, or who often have strong reasons for not following the plan. These include *grileiros* (large illegal landgrabbers who obtain title to public land by fraudulent means), organized landless peasant movements (*sem terras*), drug traffickers and money launderers, individual squatters (*posseiros*), and the “ruralist block” of large ranchers and agribusiness interests (e.g., FEARNSSIDE, 2008). This is especially critical for lawless areas like the Terra do Meio, an area the size of Switzerland that has basically been outside of the control of the Brazilian government (GREENPEACE, 2001, 2003; FEARNSSIDE, 2005b). The Terra do Meio has been controlled by drug traffickers, *grileiros* and other illegal actors (SCHÖNENBERG, 2002; TARAVELLA, 2008).

An example of the gulf between plans and practice is provided by the Sustainable BR-163 Program. This program involves 32 NGOs plus the Brazilian government in an effort to turn the BR-163 Highway into a “corridor of sustainable development.” The program proposes a variety of actions to favor agroforestry and other activities by small farmers in an area that has seen rapid advance of land grabbing and forest loss for low-grade cattle pastures (ALENCAR et al., 2005; IPAM, 2005). However, MODIS satellite imagery interpreted by INPE’s DETER program indicates this area as one of the main hotspots of deforestation since 2009, suggesting that deforestation activity is shifting out of the traditional Arc of Deforestation and into this supposed sustainable development area (e.g., BRAZIL, INPE, 2009: 7). In addition, deforestation has entered the Jamanxim National Forest on the BR-163, and in January 2012 an executive “provisional measure” decreed reduction of this national forest by 91,308 ha (ISA, 2012).

The case of the BR-163 Highway illustrates the danger of governance being viewed as something that can simply be taken off the shelf, and that can justify any kind of infrastructure (FEARNSSIDE, 2007). One can’t simply choose a “governance” scenario and expect to have history follow this more desirable course as compared to a “business-as-usual” scenario: see exchange between Nepstad *et al.* (2002a,b) and Laurance and Fearnside (2002). Simulations of the BR-163 Highway’s impact indicate much less deforestation in a hypothetical governance scenario than in a business-as-usual scenario that is based on past trends (SOARES-FILHO et al., 2004). In the case of the BR-163 Highway, what has taken place in fact is a more rapid spread of deforestation than what was expected in the business-as-usual scenarios, despite supposedly being an area of sustainable development.

The current example is the EIA for the BR-319 Highway, where one of the most unlikely scenarios imaginable is presented as the basis for the report endorsing the highway. This is one of “strong environmental governance,” for which the example given is Yellowstone National Park, where the park includes roads and no one deforests (UFAM, 2009: Vol. 1, p. 185; see FEARNSIDE; GRAÇA, 2009).

Recently the possibility of cattle being displaced to Amazonia as a result of biofuel expansion in other parts of Brazil is based on the simple assumption that the government will be able to implant a level of governance in Amazonia that curtails any expansion of deforestation (MELILLO et al., 2009). This assumption is critical to a calculated benefit for climate from biofuels. History would suggest the imprudence of assuming such governance would be effective when pressures increase. This would have major implications for future monetary flows and land-use changes, which could produce substantial emissions through displacement of cattle to Amazonia (*e.g.*, FARGIONE et al., 2008; GIBBS et al., 2008). Soy expansion in Mato Grosso has now been statistically linked to displacement of cattle to forest areas in the state of Pará (ARIMA et al., 2011).

4 WHAT IS THE ‘REAL’ PLAN?: THE ROLE OF DECEPTION

The question of what the ‘real’ plan is relates to one of the recurrent tricks-of-the-trade for infrastructure promotion: “deny, then do.” Well-documented cases include the filling of the Balbina reservoir and a sequence of false promises in the case of the Tucuruí-II hydroelectric project (see FEARNSIDE, 2006). Current attention in this regard is focused on what is known by Belo Monte Dam opponents as the “institutionalized lie” regarding planned dams on the Xingu River upstream of Belo Monte, namely the official scenario since 2008 that there will be only one dam built on the Xingu River (NADER, 2008). The question of side roads associated with the BR-319 Highway (BRAZIL, DNIT, 2002) also appears to fit this pattern. Another case is the Chacorão Dam on the Tapajós River, which would flood 18,700 ha of the Munduruku Indigenous Land (MILLIKAN, 2011). This dam would be needed to complete the high-priority Tapajós waterway (BRAZIL, PR, 2011a), but it is conspicuously missing from announced hydroelectric plans (BRAZIL, PR, 2011b; BRAZIL, MME, 2012).

Unfortunately, the EIA/RIMA is still viewed as a token exercise for bureaucratic approval of the projects, rather than as an input to decision-making. It is a bureaucratic hurdle that infrastructure promoters consider to be an obstacle and opponents view as an opportunity to delay projects on procedural grounds. Unfortunately, the EIA/RIMA does not play its desired role as a

serious discussion of the pros and cons of each project and of the development strategies of which the project is a part. While Brazil's licensing system needs to be reformed to take on this role as an input to decision making, the current political climate would be likely to turn any effort to enact legislation for this purpose into an opportunity to gut the system even further. The May 2011 vote in the house of deputies by a margin of 7 to 1 to demolish many of the environmental protections in the Forest Code shows the tenuous nature of the country's environmental protection.

Despite the severe limitations, the legislative climate in Brazil imposes, the lessons of the history of environmental decision making in recent decades indicate many pitfalls and a few advances that provide useful lessons for continued efforts to improve, or at least maintain, environmental policy. Many of the problems and lessons in Brazilian Amazonia are relevant to other parts of the world.

CONCLUSIONS

We have learned surprisingly little from history in terms of environmental policy in Amazonia despite advances in institution building and great strides in the organization and capacity of civil society. Environmental threats are increasing faster than the strengthening of environmental policies and institutions.

Destructive projects advance through such mechanisms as government pluriannual plans, weak environmental institutions as compared to those promoting infrastructure, regulatory weakening through agri-business interests in the legislature and through decentralization of licensing and enforcement to levels of government that are more responsive to local entrepreneurial interests than to environmental concerns, use of unrealistic "governance scenarios" to justify projects and sometimes outright deception as to the real plans of development authorities. Progress continues in key areas such as environmental services and, to some extent, international negotiations. However, the current anti-environmental political climate in the Brazilian legislature severely restricts many avenues for improving environmental policy in Brazilian Amazonia. Many of these problems also apply to other tropical countries.

ACKNOWLEDGMENTS

The Conselho Nacional do Desenvolvimento Científico e Tecnológico (CNPq; Proc. 305880/2007-1; 304020/2010-9; 573810/2008-7; 575853/2008-5) and Instituto Nacional de Pesquisas da Amazônia (INPA: PRJ13.03) provided financial support. This discussion is updated from a part of a presentation at the

Conference on Environmental Policy, Social Movements, and Science for the Brazilian Amazon, University of Chicago. 5-6 November 2009, Chicago, Illinois, U.S.A. (<http://amazonia.uchicago.edu/>). P.M.L.A. Graça made useful comments.

REFERENCES

ALENCAR, A.; MICOL, L.; REID, J.; AMEND, M.; OLIVEIRA, M.; ZEIDEMANN, V.; DE SOUSA, W. C. **A pavimentação da BR-163 e os desafios à sustentabilidade: uma análise econômica, social e ambiental**. Cuiabá, Mato Grosso, Brazil: Instituto Centro de Vida (ICV). 25 pp. 2005. Available at: <<http://www.estacaovida.org.br/pdf/pavimentacaobr163.pdf>>.

ANDERSON, A. B. Smokestacks in the rainforest: Industrial development and deforestation in the Amazon Basin. **World Development**, v. 18, pp. 1556-1570. 1990.

ARIMA, E. Y.; RICHARDS, P.; WALKER, R.; CALDAS, M. M. Statistical confirmation of indirect land use change in the Brazilian Amazon. **Environmental Research Letters**, v. 6, paper 024010. doi:10.1088/1748-9326/6/2/024010. 2011.

ASSUNÇÃO, J.; GANDOUR, C. C.; ROCHA, R. **Deforestation Slowdown in the Legal Amazon: Prices or Policies?** Climate Policy Initiative (CPI) Working Paper, Rio de Janeiro, RJ, Brazil: Pontífica Universidade Católica (PUC), 37 pp. 2012. Available at: <<http://climatepolicyinitiative.org/publication/deforestation-slowdown-in-the-legal-amazon-prices-or-policie/>>.

BARRETO, P.; BRANDÃO Jr., A.; MARTINS, H.; SILVA, D.; SOUZA Jr., C.; SALES, M.; FEITOSA, T. **Risco de Desmatamento Associado à Hidrelétrica de Belo Monte**. Belém, Pará, Brazil: Instituto do Homem e Meio Ambiente da Amazônia (IMAZON). 98 pp. 2011. Available at: <http://www.imazon.org.br/publicacoes/livros/risco-de-desmatamento-associado-a-hidreletrica-de-belo-monte/at_download/file>.

BERMANN, C. O setor de eletro-intensivos. In P. F. Moreira (Ed.), **Setor Elétrico Brasileiro e a Sustentabilidade no Século 21: Oportunidades e Desafios**. Brasília, DF, Brazil: Rios Internacionais. pp. 29-34. 2012.

BRAZIL, DNIT (Departamento Nacional de Infraestrutura de Transportes). **Mapa Rodoviário Amazonas**. Scale: 1:2,250,000. Brasília, DF, Brazil: DNIT, Ministério dos Transportes. 2002. Available at: <<http://www.dnit.gov.br/menu/rodovias/mapas>>.

BRAZIL, ELETROBRÁS (Centrais Elétricas Brasileiras). **Plano 2010: Relatório Geral, Plano Nacional de Energia Elétrica 1987/2010 (Dezembro de 1987)**. Rio de Janeiro, RJ, Brazil: ELETROBRÁS. 269 pp. 1987.

BRAZIL, GT-DESMATAMENTO (Grupo Permanente de Trabalho Interministerial para a Redução dos Índices de Desmatamento da Amazônia Legal). **Plano de Ação para a Prevenção e Controle do Desmatamento da Amazônia Legal**. Brasília, DF, Brazil: Presidência da República, Casa Civil. 156 pp. 2004.

BRAZIL, INPE (Instituto Nacional de Pesquisas Espaciais). **Monitoramento da Cobertura Florestal da Amazônia por Satélites: Avaliação DETER-Agosto de 2009**. São José dos Campos, SP, Brazil: Instituto Nacional de Pesquisas Espaciais (INPE). 11 pp. 2009. Available at: <<http://www.amazonia.org.br/arquivos/329230.pdf>>.

BRAZIL, INPE (Instituto Nacional de Pesquisas Espaciais). **Projeto PRODES: Monitoramento da floresta amazônica brasileira por satélite**. <<http://www.obt.inpe.br/prodes/index.php>>. 2013. Accessed 10 Jun. 2013.

BRAZIL, MME (Ministério de Minas e Energia). **Plano Decenal de Expansão de Energia 2021**. Brasília, DF, Brazil: MME, Empresa de Pesquisa Energética (EPE). 386 pp. 2012. Available at: <http://www.epe.gov.br/PDEE/20120924_1.pdf>.

BRAZIL, PR (Presidência da República). **Eixo transportes**. <<http://www.brasil.gov.br/pac/relatorios/2011-pac-2/2o-balanco/2o-balanco-hidrovia/view>>. 2011a.

BRAZIL, PR (Presidência da República). **Eixo energia**. <<http://www.brasil.gov.br/pac/relatorios/2011-pac-2/2o-balanco/2o-balanco-geracao-de-energia-eletrica/view>>. 2011b.

BRAZIL, PR (Presidência da República). Lei Nº 12.651, de 25 de maio de 2012. **Diário Oficial da União** 28 May 2012. 2012. Available at: <http://www.planalto.gov.br/ccivil_03/_Ato2011-2014/2012/Lei/L12651.htm>.

BRAZIL, SCS-PR (Secretaria de Comunicação Social da Presidência da República). BR-319 é modelo de rodovia sustentável na Amazônia. **Em Questão** n.786, 1 April 2009. Brasília, DF, Brazil: SCS-PR. 2009. Available at: <http://www.brasil.gov.br/noticias/em_questao/.questao/EQ786a/>.

FARGIONE, J., HILL, J., TILMAN, D., POLASKY, S; HAWTHORNE, P. Land clearing and the biofuel carbon debt. **Science**, v. 319. pp. 1235-1238. 2008.

FEARNSIDE, P. M. *Human Carrying Capacity of the Brazilian Rainforest*. New York, NY, U.S.A.: Columbia University Press. 293 pp. 1986a.

FEARNSIDE, P. M. Agricultural plans for Brazil's Grande Carajás Program: Lost opportunity for sustainable development? **World Development**, v.14, n. 3, pp. 385-409. doi:10.1016/0305-750X(86)90076-8. 1986b.

FEARNSIDE, P. M. Deforestation and international economic development projects in Brazilian Amazonia. **Conservation Biology**, v. 1, n. 3, pp. 214-221. 1987.

FEARNSIDE, P. M. **Ocupação Humana de Rondônia: Impactos, Limites e Planejamento**. Brasília, DF, Brazil: Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq). 76 pp. 1989a.

FEARNSIDE, P. M. Brazil's Balbina Dam: Environment versus the legacy of the pharaohs in Amazonia. **Environmental Management**, v. 13, n. 4, pp. 401-423. 1989b.

FEARNSIDE, P. M. Forest management in Amazonia: The need for new criteria in evaluating development options. **Forest Ecology and Management**, v. 27, n. 1, pp. 61-79. doi:10.1016/0378-1127(89)90083-2. 1989c.

FEARNSIDE, P. M. The charcoal of Carajás: Pigiron smelting threatens the forests of Brazil's Eastern Amazon Region. **Ambio**, v. 18, n. 2, pp. 141-143. 1989d.

FEARNSIDE, P. M. Hydroelectric dams in the Brazilian Amazon as sources of 'greenhouse' gases. **Environmental Conservation**, v. 22, n. 1, pp. 7-19. 1995.

FEARNSIDE, P. M. Social impacts of Brazil's Tucuruí Dam. **Environmental Management**, v. 24, 4, pp. 483-495. 1999.

FEARNSIDE, P. M. Environmental impacts of Brazil's Tucuruí Dam: Unlearned lessons for hydroelectric development in Amazonia. **Environmental Management**, v. 27, n. 3, pp. 377-396. 2001.

FEARNSIDE, P. M. Conservation policy in Brazilian Amazonia: understanding the dilemmas. **World Development**, v. 31, n. 5, 757-779. doi:10.1016/S0305-750X(03)00011-1. 2003a.

FEARNSIDE, P. M. Deforestation control in Mato Grosso: A new model for slowing the loss of Brazil's Amazon forest. **Ambio**, n. 32, n. 5, pp. 343-345. 2003b.

FEARNSIDE, P. M. Brazil's Samuel Dam: Lessons for hydroelectric development policy and the environment in Amazonia. **Environmental Management**, v. 35, n. 1, pp. 1-19. 2005a.

FEARNSIDE, P. M. Deforestation in Brazilian Amazonia: History, rates and consequences. **Conservation Biology**, v. 19, n. 3, pp. 680-688. 2005b.

FEARNSIDE, P. M. Dams in the Amazon: Belo Monte and Brazil's hydroelectric development of the Xingu River Basin. **Environmental Management**, v. 38, n. 1, pp. 16-27. 2006.

FEARNSIDE, P. M. Brazil's Cuiabá-Santarém (BR-163) Highway: The environmental cost of paving a soybean corridor through the Amazon. **Environmental Management**, v. 39, n. 5, pp. 601-614. 2007.

FEARNSIDE, P. M. The roles and movements of actors in the deforestation of Brazilian Amazonia. **Ecology and Society**, v. 13, n. 1, paper 23. [online] <<http://www.ecologyandsociety.org/vol13/iss1/art23/>>. 2008.

FEARNSIDE, P. M. Brazil's evolving proposal to control deforestation: Amazon still at risk. **Environmental Conservation**, v. 36, n. 3, pp. 176-179. 2009.

FEARNSIDE, P. M. Consequências do desmatamento da Amazônia. **Scientific American Brasil**, Especial Biodiversidade, pp. 54-59. 2010a.

FEARNSIDE, P. M. Código Florestal: As perdas invisíveis. **Ciência Hoje** v. 46, n. 273, pp. 66-67. 2010b.

FEARNSIDE, P. M. Brazil's Amazon Forest in mitigating global warming: unresolved controversies. **Climate Policy**, v. 12, n. 1, pp. 70-81. doi:10.1080/14693062.2011.581571. 2012a.

FEARNSIDE, P. M. The theoretical battlefield: Accounting for the climate benefits of maintaining Brazil's Amazon forest. **Carbon Management**, v. 3, n. 2, pp. 145-148. doi:10.4155/CMT.12.9. 2012b.

FEARNSIDE, P. M. The evolving context of Brazil's environmental policies in Amazonia. Belém, **Novos Cadernos NAEA**. Vol. 16, n. 2 p. 9-25, jul-dez 2013.

FEARNSIDE, P. M.; GRAÇA, P. M. L. A. BR-319: A rodovia Manaus-Porto Velho e o impacto potencial de conectar o arco de desmatamento à Amazônia central. **Novos Cadernos NAEA**, v. 12, n. 1, pp. 19-50. 2009.

GIBBS, H. K., JOHNSTON, M., FOLEY, J. A., HOLLOWAY, T., MONFREDA, C., RAMANKUTTY, N.; ZAKS, D. Carbon payback times for crop-based biofuel expansion in the tropics: the effects of changing yield and technology. **Environmental Research Letters**, v. 3, paper 034001. doi:10.1088/1748-9326/3/3/034001. 2008.

GOODLAND, R. J. A. Brazil's environmental progress in Amazonian development. In: HEMMING, J. (Ed.). **Change in the Amazon Basin: Man's Impact on Forests and Rivers**. Manchester, U.K.: Manchester University Press. pp. 535. 1985.

GREENPEACE. **Terra do Meio: Lar para onças, paraíso para foras da lei. Viva Amazônia 2001**. Manaus, Amazonas, Brazil: Greenpeace. 2 pp. 2001. Available at: <http://www.greenpeace.org.br/amazonia/pdf/briefing_terradomeio.pdf>.

GREENPEACE. **State of Conflict: An Investigation into the Landgrabbers, Loggers and Lawless Frontiers in Pará State, Amazon**. Amsterdam, The Netherlands: Greenpeace International. 53 pp. 2003. Available at: <<http://www.greenpeace.org/international/press/reports/state-of-conflict>>.

GREENPEACE. **Faltou Ação ao Plano de Ação: Relatório sobre as Ações de Governo para Combater o Desmatamento na Amazônia no Período março de 2004 a maio de 2005.** Manaus, Amazonas, Brazil: Greenpeace. 29 pp. 2005. Available at: http://www.greenpeace.org.br/amazonia/pdf/Fata_acao_web3.pdf

HARGRAVE, J.; KIS-KATOS, K. Economic causes of deforestation in the Brazilian Amazon: A panel data analysis for the 2000s. **Discussion Paper Series**, n. 17, Freiburg, Germany: University of Freiburg, 30 pp. 2011. Available at: http://www.vwl.uni-freiburg.de/iwipol/discussion_papers/DP17_Hargrave_Kis-Katos%20-%20Economic%20Causes%20of%20Deforestation%20in%20the%20Brazilian%20Amazon.pdf.

HECHT, S. B. From eco-catastrophe to zero-deforestation? Interdisciplinarity, politics, environmentalisms and reduced clearing in Amazonia. **Environmental Conservation**, v. 39, n. 1, pp. 4-19. 2012.

IPAM (Instituto de Pesquisas Ambientais da Amazônia). **Os caminhos da Cuiabá-Santarém: Oportunidade para o desenvolvimento regional sustentável.** Belém, Pará, Brazil: IPAM. 2005. Available at: http://www.ipam.org.br/programas/cenarios/br163/planejamento.php?session_id=7447fabd6c6d356cf7cedf0280584e16.

ISA (Instituto Socioambiental). Dilma reduz Unidades de Conservação na Amazônia para viabilizar hidrelétricas. **Notícias Socioambientais**, 16 January 2012. <http://www.socioambiental.org/noticias/nsa/detalhe?id=3490>. 2012

LAURANCE, W. F.; FEARNSIDE, P. M. Issues in Amazonian development. **Science**, v. 295, p. 1643. doi:10.1126/science.295.5560.1643b. 2002.

LIMA, A.; CAPOBIANCO, J. P. R. **Alcance territorial da legislação ambiental e a consolidação do uso agropecuário de terras no Brasil.** Belém, Pará, Brazil: Instituto de Pesquisas Ambientais da Amazônia (IPAM). 5 pp. 2009. Available at: <http://www.climaedesmatamento.org.br/uploads/livros/18135df03aa6143c3b22eeeb101a42fa2678374e.pdf>.

MELILLO, J. M.; REILLY, J. M.; KICKLIGHTER, D. W.; GURGEL, A. C.; CRONIN, T. W.; PALTSEV, S.; FELZER, B. S.; WANG, X.; SOKOLOV, A. P.; SCHLOSSER, C. A. Indirect emissions from biofuels: How important? **Science**, v. 326, pp. 1397-1399. 2009.

METZGER, J. -P.; LEWINSOHN, T.; JOLY, C. A.; VERDADE, L. M.; RODRIGUES, R. R. Brazilian law: Full speed in reverse. **Science**, v. 329, pp. 276-277. 2010.

MILLIKAN, B. **Dams and Hidrovias in the Tapajos Basin of Brazilian Amazonia: Dilemmas and Challenges for Netherlands-Brazil relations.** International Rivers Technical Report. International Rivers, Berkeley, California, U.S.A. 36 pp. 2011.

MORAN, E. F. **Developing the Amazon: The Social and Ecological Consequences of Government-Directed Colonization along Brazil's Transamazon Highway**. Bloomington, Indiana, U.S.A.: Indiana University Press. 292 pp. 1981.

NADER, V. Mentira institucionalizada justifica Hidrelétrica de Belo Monte. **Correio Cidadania**, 17 June 2008. <<http://www.correiocidadania.com.br/content/view/1955/>>. 2008.

NEPSTAD, D. C.; MCGRATH, D.; ALENCAR, A.; BARROS, A. C.; CARVALHO, G.; SANTILLI, M.; VERA-DIAZ, M. del C. Frontier governance in Amazonia. **Science**, v. 295, p. 629. 2002a.

NEPSTAD, D. C.; MCGRATH, D.; ALENCAR, A.; BARROS, A. C.; CARVALHO, G.; SANTILLI, M.; VERA-DIAZ, M. del C. Response. **Science**, v. 295, pp. 1643-1644. 2002b.

PERES, C. A. Why we need megareserves in Amazonia. **Conservation Biology**, v. 19, n. 3, pp. 728-733. doi:10.1111/j.1523-1739.2005.00691.x. 2005.

RAJÃO, R.; AZEVEDO, A.; STABILE, M. C. C. Institutional subversion and deforestation: Learning lessons from the system for the environmental licencing of rural properties in Mato Grosso. **Public Administration and Development**, v. 32, pp. 229-244. doi:10.1002/pad.1620. 2012.

REBELO, A. Parecer do relator deputado Aldo Rebelo (PC do B-SP) ao Projeto de Lei No. 1876/99 e apensados. Brasília, DF, Brazil: Câmara dos Deputados. 270 pp. 2010.

SANTAYANA, G. Reason in Common Sense. Vol. 1, In: **The Life of Reason: The Phases of Human Progress**. New York, NY, U.S.A.: Dover Publications, Inc. 5 vols. 1905.

SCHÖNENBERG, R. Drug trafficking in the Brazilian Amazon. In: GEFFRAY, C.; FABRE, G.; SHIRAY, M. (Eds.). **Globalisation, Drugs and Criminalisation: Final Research Report from Brazil, China, India and Mexico**. Paris, France: United Nations Educational and Scientific Organization (UNESCO). pp. 172-207. 2002.

SMITH, N. J. H. **Rainforest Corridors: The Transamazon Colonization Scheme**. Berkeley, California, U.S.A.: University of California Press. 248 pp. 1982.

SOARES-FILHO, B. S.; DIETZSCH, L.; MOUTINHO, P.; FALIERI, A.; RODRIGUES, H.; PINTO, E.; MARETTI, C. C.; SUASSUNA, K.; SCARAMUZZA, C. A. M.; de ARAÚJO, F. V. **Reduction of Carbon Emissions Associated**

with Deforestation in Brazil: The Role of the Amazon Region Protected Areas Program (ARPA). Belém, Pará, Brazil: Instituto de Pesquisa Ambiental da Amazônia (IPAM). 32 pp. 2009. Available at: <<http://www.ipam.org.br/download/livro/Reduction-of-Carbon-Emissions-Associated-With-Deforestation-in-Brazil-The-Role-of-The-Amazon-Region-Protected-Areas-Program-ARPA-/184>>.

SOARES-FILHO, B. S.; ALENCAR, A.; NEPSTAD, D. C.; CERQUEIRA, G.; VERA-DIAZ, M. del C.; RIVERO, S.; SOLÓRZANO, L.; VOLL, E. Simulating the response of land-cover changes to road paving and governance along a major Amazon highway: The Santarém-Cuiabá corridor. **Global Change Biology**, v. 10, n. 5, pp. 745-764. 2004.

SOARES-FILHO, B.; MOUTINHO, P.; NEPSTAD, D.; ANDERSON, A.; RODRIGUES, H.; GARCIA, R.; DIETZSCH, L.; MERRY, F.; BOWMAN, M.; HISSA, L.; SILVESTRINI, R.; MARETTI, C. Role of Brazilian Amazon protected areas in climate change mitigation. **Proceedings of the National Academy of Sciences USA**, v. 107, n. 24, pp. 10821-10826. doi:10.1073/pnas.0913048107. 2010.

TARAVELLA, R. **La frontière pionnière amazonienne aujourd'hui : projet socio-environnemental de conservation forestière contre dynamique pastorale de déforestation. Une analyse stratégique 2000-2006 de l'action collective en "Terra do Meio" (Pará, Brésil).** Doctoral thesis in environmental sciences, Paris, France: AgroParisTech. 636 pp. 2008.

TORRES, M. (Ed.). **Amazônia Revelada: Os Descaminhos ao longo da BR-163.** Brasília, DF, Brazil: Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq). 496 pp. 2005.

UFAM (Universidade Federal do Amazonas). **Estudo de Impacto Ambiental – EIA: Obras de Reconstrução/Pavimentação da Rodovia BR-319/AM, no Segmento entre os km 250,0 e km 655,7.** Manaus, Amazonas, Brazil: UFAM. 6 Vols. + Annexes. 2009.

VIEIRA, I. C. G.; BECKER, B. K. A revisão do Código Florestal e o desenvolvimento do país. **Ciência Hoje**, v. 46, n. 274, pp. 64-67. 2010.

Texto submetido à Revista em 11.11.2014
Aceito para publicação em 23.06.2015