

Chapter 11

Climate Change Science and Politics in Brazil

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Introduction

Almost since the issue emerged on the political scene in the late 1980s, Brazil has been a prominent, if not always willing, player in the climate change debates.

In the late '80s and early '90s Brazil achieved international notoriety for the extensive destruction of the largest rainforest in the world, most prominently in the 1990 World Resources Institute (WRI) report which (erroneously, as it turned out) ranked Brazil among the top greenhouse villains in the world. On the other hand, it has one of the best energy matrices in terms of greenhouse gases of the major countries of the world, largely due to its almost exclusive reliance on hydro power for electricity, and its large-scale alcohol from sugarcane program, which substitutes alcohol for gasoline and diesel as a transportation fuel. In addition, large areas of Brazil are highly vulnerable to the effects of climate change, especially in the already arid northeast and central Brazil. Yet the issue of climate change has rarely achieved more than a marginal status in Brazil in terms of the priorities of the political and policy spheres, the general public, the scientific community, and even environmentalists. Climate change has only rarely entered the realm of high policy in Brazil, and when it has, this was largely a reaction to external events and pressures, rather than to the efforts of groups within Brazil.

Climate change has been of direct concern to only a handful of officials, scientists, academics and environmentalists. Although there is research underway on subjects related to climate change, there is no scientific institution or even permanent research program devoted exclusively to long-term climate change or anthropogenic influences. Nor do any of Brazil's environmental, natural resource, and economic departments have staff committed exclusively to the issue. However, certain key organizations such as INPE (National Institute for Space Research) and INPA (National Institute for Research in the Amazon) exist more for historical reasons than to pursue a clearly defined mandate, so some relevant research can and does take place even in the absence of a formal mandate. On the policy side, the only staff in any government agency in Brazil exclusively devoted to the climate change issue is a small group in the Ministry of Science and Technology, which is primarily responsible for Brazil's National Communication, as required by the UN Framework Convention on Climate Change (UNFCCC).

There has not been a great demand for science advice from within the policy community in Brazil, partly because there have been few controversial policy decisions in which climate science has been central. Brazil, like all non-Annex I countries, does not have obligations to reduce emissions under the Convention, and there is little controversy about the reality of climate change among those involved in the issue.¹ The existing research programs related to climate change have been advanced because of the interests of individual scientists and groups of researchers, or because of other priorities, such as weather prediction, understanding interannual variability, or biodiversity protection and resource management in the Amazon. Often they have only been possible through the collaboration and support of U.S. and European research institutions. Only rarely has scientific research in Brazil been the result of an exclusive response to a domestic institutional interest in climate change per se.

¹ Among scientists in Brazil, only one "skeptic" (Molion) has achieved any degree of prominence, and he has found little resonance outside the scientific community.

In this context, the interface between science and policy in Brazil is very different from the situation which exists in the industrialized countries. Many of the latter have extensive scientific research programs focussed exclusively on anthropogenic global climate change, with well-developed GCMs and integrated modeling capabilities. In addition, as the previous chapters have amply shown, the industrialized nations may have several policy units exclusively devoted to climate change, continuous or at least regular attention to the issue at all levels of government and in all relevant sectors, a range of NGOs with active campaigns on the issue, and a public that is reasonably aware of and concerned about the issue.

On Brazilian political, public and scientific agendas, by contrast, climate change invariably comes out the loser, since it competes for space with issues of widespread poverty, the struggle for economic improvements, perpetual political scandals, crime and police brutality, urban air and water pollution, short term climatic disruptions from the El Niño/Southern Oscillation, and efforts to achieve some stability in Brazil's turbulent economic and political situation.

Development of the Climate Issue

Several factors conditioned how the issue of climate change was received in Brazil in the last half of the 1980s, when it was making the transition from a scientific issue to a political and policy one. The country was emerging from a two-decade long military dictatorship and in 1989 had its first democratically elected president since the 1960s. The country was still recovering from a severe economic crisis, with very high inflation rates and heavy foreign debt. Since the crisis had resulted in part from the oil price shocks of the 1970s, the country had been taking drastic measures to reduce oil imports. Most dramatically, it developed a domestic fuel alcohol industry from sugar cane to replace gasoline in cars and light trucks.

The most important factor affecting the reception of the climate change issue, however, was the question of the Amazon rainforest. Throughout the 1980s tropical forest destruction, particularly in the Brazilian Amazon, had been receiving more attention internationally, particularly

in Europe and North America. The international media increasingly focussed on the Brazilian Amazon as an endangered eco-system of global significance. Metaphorical descriptions of the Amazon as the “lungs of the earth” became commonplace.

Brazil’s scientific and policy reaction to the climate change issue was heavily influenced by the fact that the majority of Brazil’s greenhouse gas emissions come from land use changes and deforestation in the Amazon rainforest and the semi-arid cerrado. Prior to 1992, much of the scientific effort related to climate change involved monitoring deforestation rates. In the late ‘80s and early ‘90s, there were wide disparities in the estimates of deforestation rates in the Brazilian Amazon, ranging from the 17,000 km²/year average estimated by Tardin and Cunha (1990) for the years 1978-88, to the 80,000 km²/year figure given by the World Resource Institute for the period 1979-89 in its widely cited 1990 report. (See Martinelli et al. 1996 for a survey of various estimates.) Since around 1993, a broad consensus has emerged around INPE’s original figure of 21,810 km²/year for the decade between 1978 and 1988. After 1988, the rate dropped to a low of 11,200 km²/year in 1991, according to INPE (See Table 1). This drop has been attributed to a variety of factors, including the phasing out of tax incentives that favored large-scale land clearing in the Amazon for cattle ranching, an economic recession, and an increase in monitoring and enforcement of existing laws governing land use in the Amazon. After 1991, however, the rates began rising again.

Time Period	Policy	Science
Phase 1: 1970-1989 Discovery and Resistance	Very little direct attention to climate change. Growing international concern about destruction of the Amazon rainforest in the mid-1990s is met with resistance and accusations of attempting to “internationalize” the Amazon. Energy policy developments include massive hydro-electric and sugar-cane alcohol development, the latter as a transportation fuel to offset oil imports. Although both ensured low CO2 emissions in the energy sector, no attempt is made to link these to the climate change issue.	Sporadic assessments of deforestation rates in Amazon. Widely varying assessments of rates of deforestation methods, with the use of different satellite data sources. Beyond this, there is virtually no climate research in Brazil and minimal involvement in the international climate research agenda.
Phase 2: 1990-1992 Constructive Engagement	Climate change becomes an acceptable issue for discussion at the political level, with some Ministers sympathetic to the issue. The end of tax incentives that encouraged deforestation and resulting reduction in deforestation rates, as well as INPE findings that actual deforestation rates were considerably below previous estimates, allowed Brazil space for a less defensive posture internationally. With the international spotlight on Brazil during the preparations for the Rio Earth Summit, Brazil's leaders anxious to appear proactive.	Primary scientific issue is debate over rates of deforestation, with INPE producing research that argues that rates were overestimated by some sources. Agreement to allow importation of supercomputers to Brazil, and beginning of cooperative research projects (IAI, ABLE).
Phase 3: 1992-1995 Withdrawal	After ECO-92 and the impeachment of President Collor for corruption shortly thereafter, little attention is paid to issue at senior levels. The only concern is to avoid commitments for Brazil in negotiations for COP-1 and to avoid credits for Joint Implementation between Annex I and non-Annex I nations. Deforestation rate begins to rise again. Weakening of political support and strictly economic rationale for subsidies to alcohol program, in the context of continuing low international oil prices, but little attempt in policy circles to link this to climate change.	Scientific research broadens to include carbon cycling, with considerably more resources available, primarily from international sources. Still little concerted attention within the meteorology community to long-term climate change, since weather prediction and interannual variability the clear national priority. Some two-dimensional modeling at INPE.
Phase 4: 1996 to Present Implementation and Scientific consolidation	COP-1 Berlin Mandate ensures that there would be no near-term emissions reductions commitments for Brazil. Policy efforts shift to meeting the FCCC reporting requirements and preparing a draft protocol for the Kyoto conference. Deforestation rates continue to rise. Climate change is used by President as justification for alcohol program.	Several research centers have supercomputing capacity, almost exclusively devoted to weather prediction and interannual variability, but with INPE (CPTEC) and USP having some interest in long-term climate change. LBA Project brings together an interdisciplinary network which covers many areas related to climate change.

Table 1. History of Climate Science and Policy in Brazil, 1970-1998.

In determining the emissions of greenhouse gases (GHGs) resulting from changing land use patterns in Brazil, however, the rate of deforestation is only one source of uncertainty. Other factors are the biomass density and the efficiency of carbon release from burning, both of which involve complex factors and have wide disparities in their estimated values. Biomass density varies dramatically throughout the region. It can only be measured directly by physically cutting the trees in a sample plot, excavating the roots, and weighing the dried plant matter to calculate the carbon content. A less labor-intensive, but also less accurate, method involves using measurements of height and diameter of trees, and a conversion factor to arrive at the biomass. Assessing the efficiency of burning is even more complex. It involves calculating the percentage of carbon released into the atmosphere from combustion and from biological breakdown of the residues, versus the (possibly very high) percentage that is carried as organic matter into the water table, river systems and ultimately to the ocean. Finally, it must take into account the amount of carbon re-absorbed from re-growth of vegetation, which depends on local soil and ecological conditions as well as the type of land use. Large-scale cattle ranching, for example, results in very little regrowth, often over a period of decades, while small-scale shifting agriculture often results in significant regrowth over a period of a few years.

The late 1980s and early 1990s brought a dramatic shift in Brazilian perceptions of the growing international attention to environmental issue. Beginning with the 1972 Stockholm environmental conference, environmental issues had been seen in some quarters — especially by the military government — as, alternatively, (a) an attempt by industrialized countries to freeze development in the South and preserve the privileges of the industrialized countries; (b) an attempt to “internationalize” the Amazon region and undermine Brazil’s sovereignty over it; or (c) a subversive movement linked to unsavory political goals. By the late 1980s, however, there was a growing acceptance of the economic and ecological criticisms of Brazil’s policies in the Amazon, and especially of the generous government subsidies for expansion of cattle ranching. Along with this came a growing awareness, both in Brazil and elsewhere in the South, that international

attention to environmental issues could be used to obtain financial support and technology for more environmentally sound development strategies.

Most importantly, the issue of the Amazon was coming to dominate Brazil's international agenda, with negative economic consequences. By 1990,

negotiations over far more important economic issues were increasingly being obstructed and overshadowed by the wave of foreign criticism of Brazil's Amazon policy. Thus it was not simply the direct political and economic costs of external pressure, but rather their impact on Brazil's broader foreign policy objectives that was decisive in helping to shift Brazilian policy. The Collor government came into office determined to reorient Brazilian foreign policy away from what it perceived to be an outdated and counter-productive 'third worldism' and to improve relations with the industrialized countries, especially the United States (Hurrell 1992, 417).

Thus, even though the environmental arguments themselves carried little weight in the dominant political and economic circles, circumstances were forcing some response.

But even before these had a serious impact on the political process, the idea that so-called "sustainable development" might offer opportunities for Brazil was being proposed from outside governments, and largely from the academic community. In the area of energy, the idea was being advanced that the developing world could "leapfrog" over the dirty and inefficient technologies historically employed by the industrialized countries. Through ensuring early implementation of advanced and clean technologies, the industrialized countries could help the developing countries avoid pollution and waste of resources that would otherwise occur, thus benefiting North and South alike (see Goldemberg et al. 1988).

In the area of forestry, one proposal that emerged in Brazil was in fact stimulated directly by the growing concern about climate change: the Floram Project.² The idea for the project developed from a proposal by Wilfred Bach, of Munster University, at the November 1988 “Climate and Development” conference in Hamburg, Germany. In the midst of a debate about whether nuclear power could be a solution to global warming, Bach challenged the Brazilian delegates to seek a major reforestation effort. Werner Zulauf, who was part of the Brazilian delegation at the conference, returned to Brazil with the idea and wrote about it in his column for the Folha de São Paulo. In May 1989, after discussions with Zulauf, José Goldemberg, then Rector of the University of São Paulo (USP), asked the Director of the Institute for Advanced Studies (IEA) at USP to develop a detailed proposal, which called for reforesting 20 million hectares — 2.3 percent of the Brazil’s land area — over a 20-30 year period. The project would involve many different types of reforestation and serve different purposes, from restoring biodiversity to providing feedstock for industry. Its main goal, however, was to absorb a projected 115 million metric tons of carbon from the atmosphere.

The Floram project was seen by its proponents as a way to move Brazil out of its defensive international posture on environmental issues through a proactive forestry project (Marcovitch 1995,10). Because this objective was to serve the global interest, it was expected that much of the financial support would be raised from outside Brazil. One proposal called for a \$1 per barrel international levy on oil to raise the \$20 billion anticipated cost. But in order to make a credible case for international funding, it would be necessary first to reduce deforestation rates, responsible for the majority of Brazil’s GHG emissions. Otherwise the Floram Project would offset only domestic emissions from deforestation, and would fail to make a larger contribution to

² The name Floram comes from the Portuguese words *Floresta* and *Meio-Ambiente*, meaning “forest” and “environment.”

greenhouse gas removal. In 1990 and 1991 deforestation was reduced considerably (see Table 1), thus removing a major impediment to international funding.

Despite initial optimism, however, the project never gained the necessary support either within or outside Brazil. It was criticized by many environmentalists, and even by the Minister of Environment José Lutzenberger, as a technocratic solution based on the model of monoculture plantations.³ Some sectors of government, especially the Ministry of Foreign Affairs, did not see climate change as a significant national concern, and were reluctant to support anything resembling joint implementation, or which might be interpreted as removing the burden of emissions reductions from industrialized countries. Thus almost none of the proposal has been implemented to date. The Floram Project is still a subject of discussion in Brazil, however, and received a boost in 1996 when it received an international environmental prize. It remains one of the only significant policy initiatives in Brazil that has climate change as its primary rationale.

Brazil's energy matrix, on the other hand is in many respects ideally suited to minimizing CO₂ emissions, albeit for historical and geographic reasons having nothing to do with the climate change issue. First, the country has immense hydroelectric potential, much of it unexploited. Indeed, the vast majority (over 95 percent) of Brazil's electricity is produced from hydro. Second, Brazil has very limited fossil fuel resources, with some offshore oil and very limited deposits of low-quality, high-sulfur coal concentrated in the south of the country. Because of the lack of coal, much of the smelting of ore in Brazil's large mining industry is fueled by charcoal from nearby forests, a renewable resource if harvested sustainably. Third, Brazil has developed a large fuel alcohol program based on sugarcane plantations, which has offset petroleum imports with a renewable energy source.

³ The Floram proposal actually involved a variety of reforestation techniques beyond monoculture plantations, and Lutzenberger admitted that he hadn't read the proposal.

This program (Proálcool) was established in 1976, primarily in response to the 1970s oil price shock, a severe balance of payments crisis resulting from the steeply rising costs of imported oil. In past centuries, Brazil's economy had been heavily dependent on sugar cane, but throughout the 20th century, it was a struggling industry buffeted by the instabilities in international sugar prices. The use of alcohol as a substitute for gasoline prompted a massive expansion of the industry. Technical difficulties in the large-scale production of alcohol, and in adapting car engines to use it, were quickly dealt with. The program was soon producing 200,000 barrels per day of fuel alcohol, and at its peak was offsetting about half the gasoline that would otherwise have been used in Brazil.

However, the future of this program is currently very much in question. The price of alcohol was directly subsidized by a gasoline tax. Presently there is strong pressure to eliminate this subsidy, since the currently low international petroleum prices considerably weaken the program's dominant rationale. For some years in the 1980s, almost all automobiles made in Brazil used alcohol, but now almost no alcohol-fuel cars are produced, and the existing stock of alcohol-fuel cars is rapidly aging. Although all gasoline in Brazil contains 22 percent alcohol, even this would be threatened if the subsidies were removed. But despite the program's precarious status, it and other programs and favorable aspects of Brazil's energy matrix have been increasingly used in international discussions related to the FCCC to argue that Brazil is already doing more than the industrialized countries to reduce greenhouse emissions (Reid and Goldemberg 1997, 18; Figueiredo 1997)

Growth of a Climate Research Agenda: From deforestation rates to LBA

Research related to climate change in Brazil has been largely focussed on the Amazon region, and to a lesser extent on the semi-arid cerrado to the south. Since 1990, satellite monitoring and calculation of deforestation rates has been carried out on an almost yearly basis.

But beyond this, the emphasis is shifting towards integrated modeling of the carbon cycle and various other ecological, chemical and hydrological processes of the Amazon region. These investigations began in 1989, but after 1992 considerably more resources became available to support this research, as well as greater modeling capacity. Also in the 1990s came a strong growth in interdisciplinary research and coupled modeling of the interactions between atmospheric thermodynamics and chemistry, and of these with hydrological, nutrient and carbon cycles. But interdisciplinarity also created its own set of problems, chief among them how to evaluate interdisciplinary proposals and research.

Until 1991, Brazil had a very limited capacity to carry out modeling, in part because of restrictions imposed on the export of supercomputers by manufacturing countries for security reasons. Some researchers at INPE had worked with small, 2-dimensional models. But they had no access to supercomputers and GCMs until the Center for Weather Forecasts and Climate Studies (CPTEC) was established in 1994, specifically to house INPE's new supercomputer (NEC SX-3/12R). Since then, several centers have installed or are in the process of installing supercomputers. However, most of these will be used almost exclusively for weather prediction and study of interannual climate variability (including El Niño/Southern Oscillation), reflecting the research priorities in Brazilian meteorology. Only two institutions, the National Institute for Space Research (INPE) and the University of São Paulo, are developing general circulation models (GCMs) with the capacity to model long-term changes of the global climate, and even in these centers the study of long-term climate change is a much lower priority than more regional and short-term weather and climate phenomenon. In the early 1990s, INPE was the Brazilian partner of a research project with the UK, called ABRACOS (Anglo-Brazilian Amazonian Climate Observation Study), which was intended to monitor climate variables in Amazonia, in order to provide data for the calibration and validation of GCMs.

CPTEC became the center for coordination of international projects related to climate and Amazonia. CPTEC and its Director, Carlos Nobre, currently provide the coordination for the

Large-Scale Biosphere-Atmosphere Experiment in Amazonia (LBA), which has become the principal focus for most of the climate change related research in Brazil. LBA is an extensive network of researchers and institutions with a budget and administration based in CPTEC. It has a total budget of \$80 million, and maintains close links to international institutions for funding and other support. For example, NASA is providing aerial surveys involving extensive overflights of the Amazon forest, at a cost of \$10 million. Climate change plays a large part in the motivation for this funding, and in the rationale for the project.

Only recently has research put us in a position to speculate about the role of Amazonia in the global carbon balance. Some results indicate that Amazonian forests may take up carbon at a low rate, but given the size of Amazonia even small rates of uptake will be significant in terms of the global carbon budget. The rate of uptake may be highly sensitive to temperature, and the forest may change from being a sink to being a source of carbon for an average temperature rise of a degree or less. Quantifying the carbon balance of Amazonia and finding out how it may respond to future climate and ambient carbon dioxide concentrations is a high priority for the international effort to predict future climate. Moreover, information on carbon stocks and fluxes is required by all countries under the terms of the Climate Convention. LBA will contribute, through measurements and improved models, to make these assessments and to explore scenarios of future change.

The two fundamental scientific questions of LBA are: (1) How does Amazonia currently function as a regional entity? (2) How will changes in land use and climate affect the biological, chemical and physical functions of Amazonia, including the sustainability of development in the region and the influence of Amazonia on global climate. (LBA 1996 LBA website)

The primary activities of LBA are data collection and processing, and integrated modeling of atmospheric dynamics and chemistry, and carbon, nutrient and hydrological cycles.

The Numeric Modeling component deals with global, regional and local atmospheric models, hydrologic models, models of the carbon cycle and that of other trace gases and models of transport of gases and aerosols. These models constitute the principal tools for extending our understanding obtained through accurate observations in all the Basin. Models for assimilation of data will be perfected and developed. (Nobre undated:7, ML translation)

Although much of the focus is on regional dynamics and its response to immediate national needs, it is also justified in terms of global dynamics, inasmuch as its goal is “to furnish qualitative and quantitative information to support politics of sustainable development and protection of the ecosystems of Amazonia, in the context of their regional and global functions” (Nobre undated, 7; ML translation).

Government Responses to Climate Change

Historically, the development of the current Brazilian state structure has been influenced by two contradictory trends.

The dominant tradition in Brazilian government was that of clientelista relations between government officials and the dominant economic actors in the relevant sectors (Tojal and Carvalho 1997). This involved a sectoral corporatism, in which powerful political and economic actors could implement programs and dispense patronage to benefit their sector, with considerable autonomy from other sectors. This system led to a lack of centralized control and a weak state that was largely incapable of implementing coherent policies.⁴ The modern Brazilian state began to

⁴ One consequence of the weak central state and the sectoral autonomy is the creation of taxes targeted to specific ends. One of these is the direct subsidy to the fuel alcohol program with money from a tax on gasoline, where the revenue does not pass through the central treasury.

take form in the late 1930s, in the Estado Novo, and expanded rapidly from the 1950s to the 1970s, during the 15 years of democratic rule prior to 1964, and especially during the period of military dictatorship that followed. During this period the number and size of state-owned corporations, and thus the state's direct involvement in the economy, expanded dramatically.

However, these state activities were either created at the instigation of, or became strongly linked to, powerful private sector interests. Thus even during the dictatorship the state had little real autonomy, and only the relative prosperity and the influx of foreign capital allowed the government to buy off the various private interests through its large-scale development projects such as. Public sectors without powerful private sector partners, such as health care, the public school system, and environmental protection, received little support even during the years of economic expansion. With the economic crisis of the 1980s, and the deterioration of infrastructure and social indicators, the situation reverted to a state of what Tojal and Carvalho (1997, 65) call "chronic ungovernability." The result was a transition to civilian rule starting in 1985, followed by a decade of political and economic turmoil. In this atmosphere of almost constant crisis, the state had even less freedom to pursue policies and strategies that did not directly respond to economic interests and immediate concerns. It was during this decade that the issue of climate change emerged and international attention to Brazilian rainforest destruction reached its peak.

Along with pervasive clientalism, however, or perhaps as a reaction to it, there also exists in Brazilian politics a subordinate tradition of faith in comprehensive rational planning and management. This tendency had its most powerful expression in the Positivist movement of the early 20th century, and left its slogan, "ordem e progresso" (order and progress) on the Brazilian flag. Part of the rationale for the creation of the new capital, Brasilia, was to create a haven for rational planners to guide the development and modernization of the Brazilian nation. A respect for education and intellectual achievement is deeply ingrained in Brazil's highly stratified society, and although the public school system has been allowed to deteriorate, Brazil has maintained many high quality post-secondary institutions, most funded directly by State and federal governments.

Thus the bureaucracies have excellent access to highly trained personnel for managerial and technical positions.

The practical effect of the combination of these two trends is the occasional development of rational, systematic proposals and organizational structures, which then either are not implemented because of a lack of resources and political support, or are subverted by particular interests in the course of tough political negotiations.

Until the early 1990s, responsibilities for environmental issues were scattered among various ministries, with no clear logic or coordinating structure. Since no policy measures were required or expected as a result of climate change, there was little need for formal processes or bodies. However, in 1994 a Presidential Decree (under Itamar Franco) formally created the Interministerial Committee for Sustainable Development (CIDES), consisting of various Ministers and chaired by the Minister of Planning and Budget. The primary task identified for CIDES was to implement Agenda 21, as well as the Rio Declaration and international conventions and accords dealing with environmental issues.

CIDES was intended to coordinate activities both between various environmental issues, and government-wide policies related to sustainable development. As a Ministry-level committee, with representation from some of the most powerful Ministries, it could have brought some order to Brazil's chaotic policies. However, CIDES turned out to be a complete failure. The structure of CIDES was widely criticized as ineffectual, with a complete lack of resources for its implementation, and no participation of civil society. A few months after CIDES was created, there was a national election and a change of government, and CIDES was almost completely abandoned. Although CIDES existed on paper for almost three years, it never held a formal meeting.

In February, 1997, another Presidential Decree — this time under Pres. Fernando Cardoso — replaced the defunct CIDES with the Sustainable Development and National Agenda 21

Policies Commission. The new body differed significantly from the 1994 proposal. Whereas CIDES was to be a very high-level committee composed only of Ministers, the new Commission would include representatives of certain ministries (rather than Ministers), as well as five representatives from civil society and the Coordination Secretary of the Social Policies Chamber. The other major change is that the Ministry of Environment, Water Resources and Legal Amazon will preside over the new structure, rather than the Minister of Planning and Budget, as in the old structure. These changes will likely have little effect on the course of climate change policy, since the new structure shows few signs of being taken any more seriously than the previous one. Like its predecessor, this Commission is widely perceived to be a grand rhetorical gesture designed to hide the lack of any coherent policy.

Although CIDES was never implemented, the Presidential Decree that created it also defined responsibilities for various government agencies vis-à-vis the climate change issue. CIDES was to have three Secretariats (Coordenadorias) responsible for different areas related to international environmental agreements: External Relations, Climate Change, and Biological Diversity. The Secretariat for Climate Change, located in the Ministry of Science and Technology, would have been responsible for coordinating the implementation of commitments resulting from the FCCC. In Brazil the issues of climate change and biodiversity both primarily involve the Amazon region, which is Brazil's (and the world's) largest stock of biodiversity, and also Brazil's largest source of GHG emissions. However, the Secretariat for Biological Diversity, responsible for the Biodiversity Convention, is the responsibility of the Ministry of Environment, Water Resources and the Legal Amazon, because it largely involves parks and conservation areas, while the Secretariat for Climate Change the responsibility of the Ministry of Science and Technology.

The Secretariat for External Relations, located within Ministry of External Relations, has responsibility

to coordinate the work of preparation and definition of Brazilian positions in international negotiations about sustainable development; administer the

international implications resulting from decisions taken about national strategies and policies required for sustainable development, and monitor the activities of other countries in carrying out the international commitments resulting from the Rio Conference (CIDES website; ML translation)

Thus officially, the Ministry of External Relations (commonly called Itamaraty) is responsible for the international negotiations, while the Ministry of Science and Technology is responsible for “implementation.” The latter is generally understood here in the narrow sense of implementing Brazil’s commitments under the FCCC. Since the FCCC requires only Annex I countries (OECD and East Bloc countries) to reduce emissions, Brazil’s obligations consist primarily of creating emissions inventories and reporting on activities and trends within Brazil (the National Communication).

Given the extent to which most Brazilian initiatives are driven by international events and processes, this gives the Ministry of External Relations considerable power over the climate change issue in Brazil. Many in the scientific and academic community interested in climate change argue that the Ministry has not used this power constructively or creatively. Rather, they say, in its self-proclaimed role as the defender of Brazil’s narrow political and economic interests the Ministry has served to block, or at least dilute support for, some potentially promising Brazilian initiatives such as the Floram Project. Itamaraty tends to regard any foreign interest in the Amazon as an attack on national sovereignty.

The Working Group on Climate Change specified in the Decree was created in 1994, at the time with one staff person, José D. G. Miguez. Fulfilling Brazil’s FCCC commitments to the preparation of inventories and the National Communication became the Working Group’s primary official responsibility. This in itself was a large task, since there was little centralized data and much of the required information had to be assembled from widely dispersed sources, involving a broad network of industries, universities and research institutions, state and municipal governments, and federal ministries to generate data and write the various sections of the report.

The work was funded through a grant from the Global Environmental Facility and an agreement with the U.S. Country Studies program, with some in-kind contributions from Brazil.

The group's work was not restricted to preparing the National Communication. Two other important activities are worth noting: the creation of an extensive World Wide Web site, and the preparation of a proposal for the protocol of the third Conference of Parties to the FCCC (COP-3) in Kyoto in December 1997. The climate change Home Page was created in late 1995, when the World Wide Web was at a very early stage in Brazil. At this time, the Ministry of Science and Technology (MCT) was developing a National Research Network (RNP) to link educational and scientific research institutions using the Internet. Since the Working Group on Climate Change was located within the MCT, it had ready access to facilities and expertise for its Web site. The site's initial purpose was to facilitate communication among all the actors involved in preparing Brazil's National Communication. It has since evolved into a huge repository of more than 600 Web pages, including official statements and government positions, links to other relevant government departments, international agencies, scientific research centers, Brazil's recommendations for the Kyoto protocol, and institutions involved in the preparation of the National Communication, with drafts of the various sections as they appear. Most documents are translated into English, Portuguese, and Spanish, which serves to facilitate international communication and complements Brazil's strategy to build international support for its positions.

Brazil in the International Arena

At the 7th meeting of the Ad Hoc Group on the Berlin Mandate (AGBM7)⁵, in July 1997, Brazil formally submitted its Proposed Elements of a Protocol to the UNFCCC for the Kyoto COP-3 meetings. Brazil's Protocol recommendations were largely the product of Luiz Gylvan Meira Filho, one of Brazil's best-known scientists and head of the Brazilian Space Agency, and who also served as Co-Chair of IPCC Working Group I, and a Lead Author of Chapter 1 of the Second Assessment Report (Houghton et al, 1995). Although the Space Agency has little formal responsibility for the climate change issue, Dr. Meira Filho had been extensively involved in the issue since the early 1990s, when he was in charge of satellite surveys at the National Institute for Space Research (INPE), which were used to monitor deforestation rates. In 1991, INPE had been instructed by the Minister of Science and Technology to update estimates of deforestation in the Brazilian Amazon on a yearly basis, partly to reinforce Brazil's position in anticipation of the upcoming United Nations Conference on Environment and Development (UNCED), to be held in Rio de Janeiro in June, 1992. These measurements were used to challenge the World Resources Institute figures, which had listed Brazil among the leading contributors to carbon dioxide emissions. More recently, in addition to his contribution to the IPCC, Meira Filho has also represented Brazil in the international negotiations under the FCCC, often as the head of the delegation. Following the AGBM4 meeting in 1996, he began to develop a quantitative formula to allocate responsibility for climate change, and worked with José Miguez to develop this idea into the submission to the negotiations for the Kyoto Protocol.

⁵ The *Ad Hoc* Group on the Berlin Mandate was created during the First Conference of the Parties to the FCCC in 1995 to provide the forum for negotiations of legally binding emissions reductions targets for industrialized countries.

The Proposed Elements of a Protocol to the UNFCCC has two primary components. First is a detailed and mathematically sophisticated method for allocating responsibilities and emissions targets for limiting climate change, linked to the global average warming produced by those emissions. The rate of net anthropogenic emissions for each country or group of countries, measured in gigatons of carbon per year (GtCy) is translated by means of a relatively simple mathematical model into the increase in global average temperature caused by those emissions. The second component is a proposal to create a “clean development fund” with revenue from a per-metric-ton charge on GHG emissions from Annex I countries in excess of their emission targets.

The stated goal of the protocol proposal was to produce an “objective” and quantitative methodology for the difficult problem of allocating responsibility and emission limits among the Annex I parties for the Kyoto Protocol. The proposed solution involves a sophisticated methodology for tying national responsibilities and obligations directly to the increase in global average temperature that results from those emissions. According to the proposal,

... the two central questions to be discussed by the AGBM in preparing a Protocol to the Convention are:

- a) the decision on the future level of Annex I Parties emissions in the time horizon of the Berlin Mandate (2000 to 2030), and
- b) the criterion for the sharing of the burden of mitigation among those Annex I Parties.

In order to introduce objectivity in the treatment of both questions, it is necessary to establish the relationship between the anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol (the cause of climate change), and the quantitative resulting change of climate (the effect of human action). (Brazil 1997, Part 3.1)

The protocol documents repeatedly emphasize the “objectivity” of the proposal, attempting to ground national obligations and policy decisions in climate science and mathematical models, in contrast to the commonly discussed methods for allocating emission reductions based on economic or population considerations. The criteria for emissions limitations in the protocol submission are linked to the impacts of these emissions on climate, rather than to the economic and social factors involved in these emissions — i.e. to the effects rather than the causes.

At the heart of the proposal was a relatively simple formula that uses two equations to model the links between emissions and atmosphere concentrations, and between concentrations and temperature increase. The simplified formula, according to its designers, incorporates all relevant variables, but does not depend on supercomputers or on ‘global warming potentials’ — only a constant C that allows the formula to be calibrated with an agreed climate model. Thus,

(i)t is demonstrated that a very simple calculation scheme can be used in lieu of the complex climate models, while still maintaining the correct functional dependence of the increase in mean surface temperature upon the emissions over a period of time. (Brazil 1997, Part 3.1)

The only debatable input, according to the authors, is the choice of IPCC Scenario A as the source of the emissions scenarios used to calculate the impact of emissions on global temperature.

A principal goal of the submission is to shift the emphasis from consideration of annual emissions to the impact of net emissions on global temperature over a period of time.

Whereas it is recognized that the change of climate is predicted to have a complex geographical distribution, it important to have a unique measurement of the global climate change. The obvious choice of a unique variable to measure climate change is the change in global mean surface temperature, because other global variables such as the time rate of change of the global mean surface temperature and the rise

in mean sea level are derived from the change in global mean surface temperature.
(Brazil 1997, Part 3.3)

Thus, in climate science the global mean surface temperature has acted as an “obligatory passage point,” to use Latour’s (1988) term, mediating between causes and effects. To arrive at any conclusions about the impacts of climate change, one needs to pass through this variable, and use it as the basis for any subsequent work. In the realm of climate policy and international negotiations, however, this variable has remained on the periphery; it was at most used as a rationale for action. By always calculating the effects of emissions on global mean surface temperature, Brazil’s protocol submission attempts to move the latter from background assumption to the central and indispensable basis for policy decisions.

Brazil’s proposal establishes a basis for calculating the relative responsibilities of the Annex I parties and non-Annex I parties, as well as for the allocation of reduction targets for each individual Annex I country. Beyond this, it would establish a charge for countries that exceed their emissions ceilings. These proceeds would go to a “clean development fund” for activities in non-Annex I countries which would reduce emissions in those countries. As for the criteria for allocation of these funds to developing country recipients, Brazil proposed that the allocation be made in proportion to their ‘effective emissions’ – i.e., the greater a country’s emissions, the more funds they are entitled to receive. This is potentially controversial, since it would ensure that a large part of the fund goes to large emitters such as India and China, Indonesia and Brazil.

Another significant implication of Brazil’s proposed methodology is that it provides a basis for taking into account historical emissions, and thus for comparing the total contribution of industrialized and developing countries to the global temperature increase. The documents note that

whereas the annual emissions of non-Annex I countries are estimated to grow to be equal to those of Annex I countries by 2037, according to the IPCC IS92a

scenario, the resulting change in temperature as measured by the effective emissions from non-Annex I countries are estimated to equal that of Annex I countries in 2147. (Brazil 1997)

This statistic has obvious benefits for Brazil and other countries of the South in the context of international negotiations, since it provides support for the agreement reached at COP-1 in Berlin that only industrialized countries need commit to reductions prior to 2020. Since opponents of climate treaties, particularly in the USA, have made the lack of emissions-reduction commitments by developing countries a prominent bone of contention, this is a powerful argument.

Brazil's recommendations for the protocol received some support and acceptance in the international negotiations. Most of the support and attention, however, centered around the proposal for the creation of the Clean Development Fund. Part of the reason was that the proposal was written in dense technical language, not very accessible for the policy communities that were expected to digest it. The Kyoto COP-3 meeting decided to send this proposal to the Subsidiary Body on Scientific and Technological Advice (SBSTA) for examination, where it faces an uncertain future. However, the proposal for the Clean Development Fund was accepted (included as Article 12 of the Kyoto Protocol to the FCCC), although it will not be formally established until COP-4 in Buenos Aires in 1998. There were some significant modifications to Brazil's proposal, most notably that it will not be funded through charges on emissions of Annex I countries in excess of their commitments, but through voluntary contributions, and in exchange for credits against the commitments of the donor countries. It is thus much closer to a multilateral agency for Joint Implementation (JI) projects than to Brazil's original intentions. This is ironic, given Brazil's opposition to JI, described below.

Compared to other G77 countries, Brazil has taken a conciliatory tone on two crucial North-South conflicts in the international negotiations: whether developing countries should accept restrictions on their national emissions, and whether climate change should be used to leverage

more development assistance from the industrialized countries. On the first issue, the need for dramatic growth in domestic emissions as part of the process of industrialization, the large Asian countries (notably China, India and Indonesia) have been much more resistant than Brazil to the possibility of future commitments to restrictions under the FCCC. Although they are clear that industrialized countries have to move first, Brazilian negotiators have acknowledged the need for commitments by southern countries at some point in the future. Brazil's openness on this point could be attributed to its lack of significant fossil fuel reserves, which means that industrial development will inevitably depend largely on renewable sources of energy, such as hydroelectric power and biomass fuels, which do not result in net emissions of carbon dioxide.⁶

The issue of increased development assistance has faded somewhat since the 1992 Rio Conference, where some hoped to use environmental issues to leverage more aid money from developed countries. African countries have been the most insistent on increased aid untethered to specific measures to reduce emissions. Brazil's proposal for a Clean Development Fund would involve considerable transfers of funds from Annex I to non-Annex I countries. However, the source of the funds would be a charge on greenhouse gas emissions in excess of allowances for Annex I countries, and the funds would be used only for projects that would directly reduce emissions, rather than for more general development objectives.

On the fundamental issue of Joint Implementation (JI), Brazil has taken a strong position. It opposes any JI regime that would involve a transfer of credits to Annex I countries for emissions reductions or sinks in countries of the South. Brazil's position is that JI "should be an

⁶ The reservoirs from hydro-electric facilities emit methane and carbon dioxide from decomposing biomass, but these emissions are, in most cases, much less than emissions from an equivalent coal-fired generation. See Rosa (1996b) and Fearnside (1995) for a comparison of hydroelectric and fossil fuel generating stations.

additional and complementary means for the fulfillment of the obligations under the Convention, and not an expedient way for developed countries to register credits as a compensation for the non-fulfillment of their commitments” (Filho 1997, 1). Among the arguments used by Brazil to justify its opposition to credits for JI between Annex I and non-Annex I countries are:

- it would place an obligation on countries of the South to help solve a problem that is largely caused by the industrialized countries;
- it would allow the industrialized countries to continue to increase their emissions and reap the benefits from those emissions, at the expense of the rest of the world;
- it is a re-interpretation of the original understanding of the Convention, which only envisaged JI involving Annex I countries;
- JI could imply the long-term immobilization of the environmental assets of developing countries, especially forested areas.
- JI would allow industrialized countries to exploit the cheapest opportunities for GHG reductions, leaving higher-cost ones for the host countries in the event that they assume reductions commitments at some point in the future;
- JI could replace the requirement in the FCCC for additional assistance to developing countries in the form of financial resources and technology (Lima 1997; Filho 1997; Miguez 1997).⁷

⁷ There is also resistance in the Department of External Affairs to the idea that Brazil could be providing free “environmental services” to the rest of the world through its maintenance of the

Domestically, Brazil's opposition to JI has been widely criticized by sectors of the academic and scientific communities involved in the issue. The latter are more likely to see JI as a realistic way to channel some resources towards solutions to the climate change issue, and to support worthwhile initiatives in Brazil. Internationally, at the first Conference of the Parties in Berlin in 1995, Brazil and China were almost alone in this position, but by COP-2 almost all of the G77 supported it, with the exception of a few countries in Central America (Miguez 1997, 37).

Analysis and Conclusions

A striking feature of climate science and policy in Brazil is the extent to which both areas, and the coordination between them, are driven by international events, institutions, and concerns. Virtually all Brazilian groups involved in the issue have as their chief audience either international or other external organizations, or other national programs. Much of the scientific research is carried out in partnership with US and European research agencies, although there is some effort to frame it in terms of national policies. The two instances where science and policy were arguably integrated — the efforts to monitor and reduce deforestation in the early 1990s, and the Brazilian submission for the Kyoto protocol — were both mediated by international events. In the first case, the monitoring was stepped up in order to counter what turned out to be dramatic overestimates of deforestation rates by a variety of mainly external agencies and researchers, the political support for efforts to reduce deforestation derived from efforts to improve Brazil's international

Amazon rainforest, as expounded for example by Fearnside (1996), and that there is an opportunity to generate income from this. The fear is, according to a senior Itamarati official, that if Brazil can charge for its environmental services, that perhaps in the future it will have to pay for its 'disservices', such as cutting or burning the rainforest. An important issue here in relation to climate change is whether the natural Amazon forest is a sink for CO₂, which is as yet is being treated by the scientific community as a fairly tentative hypothesis.

environmental reputation. In the second case, the protocol submission was obviously motivated by the international negotiations, but also resulted from its key author's extensive involvement in the IPCC. The most comprehensive effort to gather information from various sectors related to climate change is a direct result of Brazil's commitment under the FCCC to produce a National Report.

The lack of coordination and communication between the various ministries, agencies and sectors relevant to climate change is another prominent, although perhaps predictable, aspect of the issue. Brazil has no commitments that could imply costs for industry, and therefore the private sector has largely ignored the issue, even where there might be business opportunities involved. Given the almost complete lack of any formal structure for an ongoing policy dialogue on the issue, the academic community has played a strong role in filling this vacuum. Universities, principally the University of São Paulo (USP) and the Federal University of Rio de Janeiro (UFRJ) have held a series of forums to bring together key players from the scientific and policy communities. This, and the fact that the only concrete policy proposal motivated solely by the climate change issue was the university-initiated Floram Project, reflect the prominent role of universities in broader social and political affairs in Brazil. Also, with the exception of Itamaraty, science and scientists have played a dominant role in the issue. This also results from the absence of emissions reductions commitments, which would otherwise have drawn the economic and social policy communities into the issue. (This pattern is in fact characteristic of the early stages of development of the climate issue in other countries.) It was thus easier, for example, for the protocol proposal to be conceived largely in scientific, rather than economic or political terms.

Many of the key scientific and policy initiatives emerged from the personal or professional interests of individuals, rather than from their institutional duties (again reflecting the general lack of effective coordination of the issue). The most striking example of this is Brazil's protocol submission, whose key author, in his role as Director of the Brazilian Space Agency, has no

institutional link to the climate change issue. Yet he is a lead author in the IPCC and often head of the Brazilian IPCC delegation.

Overall, Brazil's political response to the climate change issue has largely been restricted to rhetoric and positioning in the international negotiations, with virtually no impact at the level of domestic policies and programs. The Brazilian political system seems to have a predilection for large, comprehensive programs and policy measures — “package deals” such as CIDES, Agenda 21, Floram, and the Protocol Proposal, which may be intellectually satisfying but often are not implemented. Yet the existence of Brazil's huge fuel alcohol program, the reduction of deforestation rates in the early 1990s, the extensive use of renewable energy, and municipal programs such as São Paulo's Rodizio (day without a car) show that Brazil has the ability to implement programs that could greatly affect its emissions of GHGs. Still, the fact that these all occurred for reasons largely or entirely unrelated to climate change bear out the following comment, made in the context of the European Community:

If you want to implement a climate policy, it is wise not to call it that. Call it an economic policy, a fiscal policy, an employment policy, a social policy, or an international relations policy. Climate policy on its own does not command either widespread public support or effective political weight. But a climate policy that resonates with or reinforces other arenas of policy, where there is higher public and political profile, can help give it strength and durability. (O'Riordan and Jäger 1996, 353)

Indeed, the precarious status of the fuel alcohol program and the currently rising rates of deforestation indicates how little sway the issue has over important policy decisions. Environmental issues in general, and climate change in particular, are still largely seen in key Brazilian political and business circles as at best marginal, and at worst a threat to economic growth and national development. The view of climate change as a legitimate threat to the national

well-being, with implications for concrete policy measures in Brazil, still remains restricted largely to the academic and scientific communities.

Notes