Integrating Brazilian National Priorities and Policies in Global Environmental Issues*

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Introduction

Brazil has been very active in environmental policies and played an important role in several global environmental conventions created from the the 1992 UNCED Conference held in Rio.

However, the country still face problems with prioritization and effectiveness mechanisms to apply these policy initiatives. Although the environmental reasoning adopted in the design of these policies is very clear and sound, the conflict between growth, intra-temporal equality and environmental costs are still commanding implementation issues. In addition to that, constrains on human and capital resources become relevant, particularly in a scenario of constant fiscal crisis.

Can a country still facing serious barriers to apply its local policies conciliate them with global environmental concerns and response actions?

This study is an attempt to answer this question by first reviewing current national and policy initiatives in Brazil and, secondly, analyzing their framing into recent mechanisms under debate on global environmental issues.

The next section presents an overview of national priorities reflected in public opinion polls, sectoral surveys and governmental investment programs. The three following sections deal with biodiversity, forest and climate change indicators for Brazil and their relevant policy initiatives. The next section discusses specifically the new clean development mechanism (CDM) which has emerged from the Climate Change Convention as an integrating device for local and global issues. Finally, based on a recent study by Seroa da Motta, Young and Ferraz (1998), it is analyzed how far can CDM go in this integration challenge for the case of Brazil[1], raising issues of possible governmental approaches to deal with these integration matters.

National Priorities in Brazil[2]

[1] This study of Seroa da Motta, Young and Ferraz (1998) was sponsored by the World Resources Institute.
[2] Part of this section is presented in Seroa da Motta, Young and Ferraz (1998).

Brazil has been one of the fastest growing economies in the world during the last fifty years. Despite this continuous growth, Brazil has not been able to reduce social inequalities at the same pace. In fact, during the eighties and the beginning of this decade, very high inflationary pressures jeopardized Brazil's opportunities for growth, and increased social conflicts.

Until very recently, the Brazilian model of development was based on import substitution. Protectionism, creation of state companies and ambitious fiscal and credit programmes incentives transformed the previous agrarian economy into a highly industrialized society within a time span of 30 years. During the most dynamic period, the seventies, Brazil grew at an average annual rate of economic growth of 8.7% and the urban population share of total population increased from 30% to 70%.

During the late seventies, the oil and debt crisis generated fiscal imbalances slowing investment capacity which led to almost nil growth in the following decade. Inefficient and autarchic industrial and agricultural structures, highly unequal distribution of income, increasing unemployment and an unbalanced spatial distribution of production and consumption were exacerbated during this recession period. This period was followed by an acute fiscal crisis and, consequently, a permanent threat of hyperinflation. Moreover, during 1990 the annual inflation rate reached 2,380%.

Since 1994 Brazil has applied monetary stabilization policies which have reduced the monthly inflation rate from 80% to 1% . Success with the social agenda has not been so impressive. Growth has not resumed at high rates, currently at less than 3% per year, and the perspective in the short run is not very promising, specially with the current global economic crisis. Furthermore, unemployment rate is increasing and consequently, the exposure to social problems.

Structural problems are also restricting. Personal income is still highly concentrated with 66.1% of the total income accruing to the 20% richest families while just 2.3% accrues to the poorest 20%. A similar degree of high concentration is indicated for land tenure where small farms (with less than 10 ha) cover less than 3% of the total farming area while the share of big farms (with more than 10,000 ha) is above 40%. Social movements towards agrarian reform have graced the whole country together with people affected by drought in the Northeast region and the homeless in big cities.

Market-oriented policies for trade liberalization, privatization and deregulation have been carried out and more are to come for the fiscal system and retirement schemes. Social care programs for the poor in urban and rural areas have been continuously extended. Land taxation has recently been modified, increasing dramatically the tax brackets for idle land, although in the case of forestland, the tax level has actually been reduced. Agrarian reform programs have received a large share of the budget and ambitious targets have been set. The balance between market reliance and social safety net strategies sustains the current political debate.

The current political agenda, without doubt, is to resume growth and reduce social gaps. These are national priorities widely recognized by all political parties and totally grasped by public opinion.

Public Opinion Perception

A recent public opinion poll[3] carried out by the Ministry of the Environment has shown that only 47% of Brazilians agree with the idea that the environment should take priority over economic growth. Moreover, acceptance of lowering environmental quality in exchange for growth increases among the lower income-classes.

International cooperation for the solution to global environmental problems also divides public opinion where only 43% of the those interviewed agree with it. Again, acceptance on cooperation decreases among lower income-classes.

Tree cutting and burning was singled out as the main national environmental problem with 45% of indication among those interviewed. Water pollution, sanitation and solid waste all together take 34% of indications while air pollution only 12%.

On the other hand, the understanding about the connection between deforestation and climate change and greenhouse effects were not perceived. These global issues appeared as the least important global environmental problems. Specie extinction, however, is taken as highly relevant in this global context.

Results from another survey[4] directed at 90 opinion makers (experts, public officials, congressman and businessman) places global issues as the lowest priority in environmental problems (3%), although forest issues (36%) are in second place after urban problems (59%). Social questions are the fourth priority (26%) and water resources the third (33%).

As it can be seen, in general public opinion in Brazil, trade-offs between growth and preservation and balance of global and local issues are not uniformly perceived by Brazilians. Urban issues are as dominant as rural ones, although climate change issues are not understood as an externality of deforestation. Since international cooperation is welcome by almost half of the sample, it could certainly increase if local issues are addressed.

In summary, for the decision-makers, global issues are still less relevant when compared to other urban and social problems, however, there is room for international cooperation if local issues are also considered.

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[3] See MMA (1997).
[4] See Crespo *et al*.(1998)

Business Perception

A recent survey carried out by the National Association of Industries in Brazil (CNI) has revealed some interesting features of the industrial sector knowledge towards global environmental issues. The survey has questioned 265 medium and large industrial firms about their level of knowledge of these issues. Table 1 summarizes the main results.

Table 1
Knowledge Level of the Brazilian Industrial Sector on Global Environmental Issues

Issues/Level of Knowledge	They are well informed	It is considered relevant to their business
Climate Convention	14%	85%
Biodiversity Convention and the Forest Comission	9%	71%
Agenda 21	22%	89%

Source: Pesquisa Gestão Ambiental na Indústria Brasileira, CNI, 1998

As can be seen, knowledge levels about the main initiatives on global environmental issues is still very low among industrial firms. In the other hand, a great majority recognizes that they are relevant to their business activities. The lower percentage of relevance for biodiversity and forest issues appearing in Table 1 can be explained by the lower direct importance of these issues in industrial processing.

Governmental Actions and Prioritization

The federal government of today has an ambitious program denominated "Brazil in Action" which comprises numerous investments and programs directed at social, regional and development aims. Table 2 summarizes the most important ones. As can be seen, social and regional actions are those with a higher allocation and cover basically health, irrigation and sanitation whereas development ones are mostly aimed at agrarian reform, transport (roads, waterways and ports) and energy distribution (transmission lines and natural gas pipelines).

Gas pipelines are planned to explore sources in the Amazon to local needs for thermal plants in the region major cities and imports from Bolivia to meet industrial demand in the South and Southeast regions. Hidroways and ports are planned for every region while irrigation programmes are concentrated in the semi-arid areas of the Northeast region.

Table 2

Main Projects of the Plan of Action Programme in Brazil

Project	*Total Costs (1994 US$ 10^6)*
Urucu Project (gas pipeline in the Amazon State, NO)	788
Madeira Waterway (The Amazon, NO)	24
São Francisco Waterway (NE)	11
New Irrigation Pattern (ne)	2,043
PROAGUA (increase of water supply in the NE)	300
PRODETUR (tourism investments in the NE)	201
Suape Harbor (NE)	172
Pecém Harbor (NE)	218
Tocantins-Araguaia Waterway (NO)	158
FERRONORTE (4778 km of railway, CE,NO)	443
Sepetiba Harbor Expansion (Rio de Janeiro State, SE)	350
Santos Port Expansion (São Paulo State, SE)	1,896
Tietê-Paraná Waterway (SE)	60
Gas Pipeline Brasil-Bolívia (SO,SE)	1,500
Electric Transmission Line (1.000 km/500 KW)	738
Mercosul Road (SO,SE)	600
Agrarian Reform Programme (160,000 families)	5,350
Agricultural Credit for the Agrarian Reform Families	2,650
Reduction in Infant Mortality (basic sanitation programme for 1,279,000 families, NE)	916
PRO-SANEAMENTO (Sanitation Programmes for Municipalities and States)	1,725

Notes: NO = North Region; NE = Northeast Region; CE = Central region; SE = Southeast Region; SO = South Region. When region location is not stated, programme action is aimed at a country as whole.
Source: Programa Brasil em Ação,1994

On the energy production side, although projects are still more atomized, their main aim is to cope with the high continuous increase in energy demand which may be exacerbated in a scenario where national growth resumes at higher rates. With the reductions in cheap (including forest and water costs) hydropower generation opportunities, Brazil's energy supply will rely mostly on fossil fuel. While gas may play an important role, fuel oil will be dominant.

Alternative and biomass electricity are part of the agenda but still at an experimental phase. Ethanol fuel for vehicles was once a priority with an ambitious National Alcohol Programme (PROALCOOL) which, at that time, created one of the largest biomass programmes in the world. PROALCOOL has been, however, phased out due to its high production costs compared to the persistently low oil market prices.

Energy conservation has been somehow already advanced by major users due to the increases in energy costs in recent years as required by macroeconomic stabilization programmes .

In summary, energy priorities are certainly detached from any environmental concerns since stable and reliable supply is the driving force and a paramount to the resumption of growth.

These development projects undoubtedly have significant environmental impacts. Agrarian reform is already facing the dilema of converting forestland. Waterway, ports and irrigation projects and will create hidrological changes with several ecological disturbances. Energy distribution projects can also be environmentally harmful, although environmental gains may arise through the use of natural gas. Although the federal government is undertaking, through the use of private consultants, a detailed analysis of the ecological impact of these projects, it can not be expected that planners will be able to reach a compromise between development and environmental aims.

Recently, a compromise in the project design of the Paraná Waterway, crossing the Pantanal (3 million ha of wetland in the Central region), was not reached to prevent ecological damages and the government decided to cancel the projects.

In Brazil, as elsewhere in the world, environmental concerns are not introduced into planning by economic analysis. Insertion of an environmental variable in planning is a matter of *ad hoc* adjustments at project level from its design until its full operation. Moreover, disputes on environmental grounds still confront radical positions based on the assumption of no decoupling possibility between growth and preservation.

Environmental legislation and its instruments are fully based on mandatory norms and standards which are not flexible to recognize opportunities for balance. Consequently, environmental licensing and supervision are often informally relaxed to take into account these needs for compromise when political pressure is high. Such a pattern creates uncertainty, litigation and enforcement failures.

At the same time, environment-related projects are carried out by the federal government, states and municipalities and reveal some policy priorities regarding environmental issues. The major ones are aimed at water and forest resource management, as shown in Table 3.

At the federal level, some projects are responses to the planned development projects. If development projects are fairly integrated into government planning, environment-related ones are, however, not unified into a single agenda and are, in fact, not articulated even within the same government level.

Table 3
Environment-Related Projects at the Federal Level

Project	*Value (1997 US$ 10^3)*
Brazilian Semi-arid Region Water Programme	330,000
Brazilian Water Programme (in negotiation with World Bank)	670,000
Environmental studies for the Sao Francisco river course deviation (in negotiation with WB)	10
Upper Paraguay River Basin Project (TORs and basic data)	380
Upper Paraguay River Basin Project (investments - in negotiation with Global Environmental Fund-GEF)	3,000 to 4,000
Hydrological GIS for the hole country (starting in 1998)	Not available
Pilot Project to Conserve the Brazilian Rain Forest - PPG7	250,000
PROECOTUR - Eco-tourism for the Amazonian Region (in negotiations with Inter-American Development Bank - IDB)	300,000
External Markets for Forestry Products	Project not totally designed yet
Data Base Building on Biodiversity	Project not totally designed yet
Timber Consumption Pattern Changes	Project not totally designed yet
Improvement in the Ornamental Fishing Market	Project not totally designed yet
Planted Forests (policy definition) and Revision of the National Forest System (policy definition)	240
Coastal Management National Programme	Not available
MONITORE - Quality Management National Programme	Not available
PRONABIO - Biodiversity National Programme	40

Source: Figures obtained from document and conversations at the Ministry of the Environment (MMA).

The World Bank (WB) and the Inter-American Development Bank (IDB), together with the Japanese Overseas Economic Cooperation Fund (OECF) and the KFW (a German bank), are the main multilateral financing institutions for environmental projects in Brazil. The lack of an explicit and compromised national agenda for the environment has make environmental officials easily captured by the generous funding from these multilateral agencies and, in fact, it set up a shadow environment agenda in Brazil with projects benefiting from this external sympathy.

These programmes and projects somehow reveal environmental priorities, such as, water and forest resources, which are in accordance with results indicated in public opinion surveys.

The Programme “Brasil em Ação” has a commitment by the current administration and will be part of the campaign seeking its re-election in next November. However, any other administration will not fall far short of a similar set of investments since they represent recognized priorities, although budget allocation, region and timing may change.

Nevertheless, Brazil’s perception of climate change priority is high but it is still overshadowed by the increasing and continuous need to frame local environmental problems, particularly in the urban context. Although social and growth aims are not totally opposed to environmental ones, there is still a perception that they present higher priorities. Consequently, one has to devise initiatives in this area with mechanisms which attach real and concrete benefits easily perceived by decision makers and the public opinion in order to count on them to indicate priority and facilitate enforceability.

Biodiversity Initiatives in Brazil

This section presents first some indicators of the Brazilian biodiversity and overview recent policy initiatives.

Biodiversity Indicators

With a total area of 8,511,996 km^2 and located between 5°16’N and 33°44’S, Brazil has a broad climatic and geomorphologic variety. This variety is responsible for the presence of several important biomes and ecosystems, which lodge about 10% to 20% of world’s known living species. Among them, a large number is unique world-wide and probably many of them remain unknown yet. There is an estimate that about 2 million plant, animal and micro-organism species exist in Brazil.

The Brazilian most important biomes are the Amazonian rainforest and deciduous forests in the north, the eastern coast moist forest (known as Mata Atlântica), the savannah areas (Cerrado) in the Central region the thorn forest (Caatinga scrubs) in the Northeast and North, the Pantanal wetlands in mid-west and the pine forests and the Pampa fields in the South. It also deserves attention the wet riparian forest in North-Western of the Amazon (Campinarana), the coastal mangroves, sand dunes and salt marshes, all transition zones and many small areas where special combinations of climate, altitude and soil background singular ecosystems.

Some of these great biomes were heavily damaged by human activities, such as the Mata Atlântica and the southern pine forests. Nowadays, the agriculture frontier advances over large cerrado areas in central Brazil and over some areas in the Amazon, specially in Rondônia and Pará states.

According to FUNBIO (1995), Brazilian flora sums about 55,000 described species, a number that represents 22% of world’s total. For example, Brazil has the richest palm (c. 390 species) and orchid (c. 2,300 species) flora.

Brazilian fauna is also very diverse, totalling more than 5,800 vertebrate species. Among them, over 3,000 fish, 1,573 bird, 502 amphibian, 468 reptile and 394 mammal species were already described. These figures correspond to about 17% of total bird species and to 10% of all known amphibians and mammals. Brazilian invertebrate fauna is also one of the world's most diverse, and the identification process is still in course.

Some native Brazilian species already have economic significance, such as many hardwood trees, rubber tree, brazilian nuts, manioc and cashew. Pharmacological use of Brazilian species, some of them traditionally used by people is growing steadily, and its economic potential is invaluable.

About 40% of Brazilian GNP come from agroindustries, 4% from forestry and 1% from fisheries. Biodiversity activities, as fishing and forest extractivism employ more than 3 million people, and 17% of the energy production countrywide come from sugarcane alcohol and fuelwood.

However, Brazilian agriculture relies mostly in exotic species, as coffee, soybean, orange and sugarcane. About 31% of Brazilian exports come from these products. Almost all cattle bred in the country consist in bovine cattle and poultry that are not native species and feed, in the case of cattle, on African grasses. Even silviculture rely mostly on foreign eucalyptus and pines.

The potential of Brazilian biodiversity remains almost unscathed due to the lack of basic research and the prevailing productive system that hampers alternative species use. Currently, a great effort is being carried on research to unveil new uses of biodiversity products in the country. There are more than 300 M.Sc. and 150 Ph.D. level courses on biological-related issues in the country. The world's greatest tropical conservation units are also located in Brazil, including the most complete tropical germoplasm bank.

Policies on Biodiversity Protection

Biodiversity issues have been subject of very important governmental actions which can be seen as necessary steps to more comprehensive policies where economic incentives may be introduced. Their successful implementation will depend, however, on political will and institutional capability. The most recent ones are:

- UNCED Biodiversity Convention was approved by the Brazilian Congress in February 1994. Recently the Ministry of the Environment has released the Brazilian National Report on Biological Diversity. The Ministry of the Environment in a joint initiative with the Research Institute of Applied Economics (IPEA) and the University Santa Úrsula in Rio de Janeiro, have launched a training programme on economic valuation for several governmental agencies related to environmental issues[5].

[5] This programmes will also undertake several case studies and create a network for this purpose among the participant institutions.

- In December 1994, a Presidential Decree set the Brazilian Biological Diversity Programme (PRONABIO) which aims to promote joint actions between governmental agencies and civil society in order to stimulate research(including inventories), international co-operation and dissemination(including a national network) activities on biodiversity issues and problems. In the Programme's Steering Committee, half of the twelve seats are due to non-governmental representatives. So far, PRONABIO has two funding mechanisms. FUNBIO (The Brazilian Fund for Biodiversity), mainly devoted to private actions, funded with US$ 20 million from GEF and run by a committee composed of businessmen, scientists, NGO`s and environmental agencies. The other fund is PROBIO (Pro-Biodiversity) which has also US$ 20 million and is co-ordinated by CNPq (The National Research Council) focusing primarily on research activities. Although they do not represent an expressive amount of resources, these actions were consolidating several initiatives, particularly those related to joint actions with NGO and business community and policy design and implementation. The current fiscal crisis has, however, reduced any possibility of carry in more resources for these programmes.

- Economic and ecological diagnosis of the Amazon was recently released from which indicators could be used as a zoning tool for activity licensing and policy orientation. However, this instrument has not been successfully implemented in this direction. The lack of institutional capacity to set clear policy aims and priorities, particularly in the Amazon states, has been pointed out as the main reason for such failure.

- The Conservation Unit System of Brazil is significant in term of area. As can be seen in Table 4, the share of land area for conservation, Indian reserves and private forests is reasonable high and almost as big as the land devote to cropping and livestock activities. Currently, there is an attempt to pass a new law for the system trying to introduce planning and financing mechanisms. Apart from that, several actions have been made to create biological corridors and expanding the area of National, particularly in the Amazon. It is also already in course a project to create more National Forests at the impressive area of 40 million ha in the Amazon to introduce sustainable logging activities to compete with the current non-sustainable practices[6]. However, this impressive system is still lacking planning and priorization to manage the scarce resources allocated to it. The recent efforts to raise revenues from its parks will not increase significantly the resource availability. It is estimated that around US$ 500 million are needed to solve land tenure problems in conservation units[7]. IBAMA and other state forest services lack institutional capacity to carry on monitoring while unit demarcation is still to be done in several units.

Table 4
Land Use Patterns in Brazil

Uses	Brazil	North	Northeast	Central	Southeast	South

[6] See Seroa da Motta (1997) and Ferraz and Seroa da Motta (1998).
[7] See Funatura (1992).

			Region		Region		Region		Region		Region	
	km²	%	Km²	%	km²	%	km²	%	km²	%	km²	%
Cropping	873 296	17.22	93 531	4.99	327 227	35.59	120 735	11.03	161 762	22.63	170 041	36.30
Livestock	1 791 884	35.34	208 764	11.15	351 481	38.23	592 441	54.12	424 874	59.43	214 323	45.75
Conservation Units	484 570	9.56	404 026	21.57	20 707	2.25	26 087	2.38	21 346	2.99	12 405	2.65
Indian Reserves	1 030 634	20.33	869 153	46.41	20 648	2.25	138 143	12.62	793	0.11	1 897	0.41
Private Forests	889 836	17.55	297 303	15.87	199 254	21.67	217 350	19.85	106 173	14.85	69 756	14.89
Total	5 070 221	100.00	1 872 777	100.00	919 318	100.00	1 094 756	100.00	714 948	100.00	468 422	100.00

Source: Seroa da Motta (1997)

Forest Policies in Brazil

This section presents some indicators of deforestation in the Brazilian ecosystems and analyse policy initiatives designed to curb this process.

Deforestation Indicators[8]

Considering the country as a whole, the remaining area covered by Atlantic Forest vegetation is only about 8% of the total original area. Atlantic Forests are, by far, the most threaten ecosystem in Brazil. Such alarming situation brought about a 1990 law forbidding any kind of activity in areas covered with this vegetation which may lead to deforestation. Also major efforts are taken to create and implement conservation units in the remaining areas to preserve the biodiversity values from this ecosystem.

In the last twenty years, the expansion of the agricultural frontier also took place, following the same development model adopted in the southern regions, in the Central and North regions of the country where are located, respectively, the Cerrados and Amazonian Forests.

That expansion resulted in large areas of forest conversion. This was possible firstly due to the highly concentrated income and land tenure distribution existing in the country acting as push migration factors. Secondly, and not less important, these regions' occupation was determined by ambitious regional development programmes.

The occupation of Cerrados by agricultural activities is very expressive. According to data from the latest Agricultural Census for 1985 , an area of 50.7 million ha was converted to cropping and livestock . Projections from WWF (1994) indicate that almost 40 % of Cerrados original area is today already converted representing approximately 70 million ha or an annual deforestation rate of 0.77% in the period 1985-94.

To give a more precise dimension of this occupation, the 1985 converted area in Cerrados is bigger than the territory of Spain. This massive conversion in such short period can be explained mainly due to the favourable credit system offered to the agricultural sector in the

[8] See, for more details, Seroa da Motta (1996).

region where rural southern families migrated to avoid the increasing land prices in their original regions due to land tenure concentration.

Since transport costs was high in this remote area, the region has intensified its activities to cash crops and cattle raising. The quality of soil in this region has demanded highly intense chemical input practices with obvious threats to biodiversity.

Deforestation in the Amazon cannot be measured in remaining area basis because it is a recent frontier region with an area four times bigger than the original Atlantic Forests. In fact, the actual Amazonian Region covers almost 50% of the country area.

In 1978-79 when recent occupation was at the peak, annual deforestation was of 0.54% or an equivalent area of 21,000 ha. The forest would be totally deforested in 130 years if this rate was kept. During the eighties, economic recession and the consequent lack of public and private resources to maintain the costly and ambitious development programmes, associated with increasing monitoring forced by external pressure, can explain the decreasing deforestation rates estimated for the following years. In 1991, deforestation rate fell to 0.30% or less than 11,000 ha[9].

However, in the following years, macroeconomic factors, such as, currency overvaluation and high unemployment, may explain the return of high deforestation rates.

Although total deforested area is still no more than 10% of total original area, the recent increasing of deforestation rates in inner regions may indicate that new frontier advance fronts are being opened.

Therefore, the future trend of deforestation in this region will depend basically on the political and economic conditions which assure a constant reversion of the inducing deforestation factors. A radical change in land property rights assignment and the introduction of economic incentives for sustainable activities, as will be later discussed, can play an important role in this process.

Forest Policy Initiatives

Brazil has a Forest Code since 1930 which sets norms and rules for forestland uses. One of the most important rule was the obligation to land-owners set aside part of their land area for preservation. This preservation area is denominated as " legal reserve".

Also the current legislation presents other regulatory mechanisms for land-use in forests and fragile areas of water catchment, estuaries, dunes and so on. Also strict control on hunting and fishing and capture of endangered species are in place. A ban on further clearing of the remaining of Atlantic Forest, the most altered forest ecosystem, was recently established.

[9] See Seroa da Motta (1996).

Moreover, logging activities or other wood based activities can only be licensed based on reforestation plans supplying wood consumption equivalents.

As shown in Table 4, conservation units correspond today to almost 9% of national territory. Recently, other conservation units were created and there is a plan to create an area of 60 million ha in the Amazon solely devoted to National Forests which are due to sustainable logging activities.

In order to deal with the deforestation process taking place in the Amazon, recent policy measures were taken, such as: (i) a temporary ban on the export of noble tree species, such as, for example the mahogany and (ii) the " legal reserve" in the Amazon for farming area over 10 ha was increased to 80% from the previous share of 50%.

Another major step was made to consider preservation areas, which are registered by owners as such, as productive land for the basis of the calculation of land tax levels. Until then preservation as regarded as an non-productive use and thereby contributing to land-conversion. This change was included in the recent revision of the rural land tax (ITR) which is intended to finance the agrarian reform in course in Brazil and this new tax is intended to be fiercely implemented. If this implementation is successful, one may expect that farmers will have a great incentive to consider a economic value in preservation.

One important economic instrument has been applied in some states of Brazil to create preservation incentives for municipalities facing land-use restrictions. In these cases a new legislation has set aside part of the value added tax revenue[10] to be distributed among municipalities according to their land-use restriction levels. Thus a municipality has its share of this tax revenue increased proportionally to the size of its area devoted to preservation.

Despite of these several initiatives, deforestation in Brazil is far from being reduced to desirable levels. Apart from institutional fragility to enforce norms and rules, deforestation of important ecosystems is also a result of several economic factors, such as, high concentration of land and income distribution.

These factors cannot be easily reverted since it would require long-term structural adjustments to alleviate social inequalities, to accomplish a satisfactory land reform and even to solve remuneration issues inhibiting the capacity of enhancing human resources in governmental agencies.

Climate Change Issues

This section present some indicators of the Brazilian contribution to climate change and discuss the governmental approach to this issue.

[10] See Seroa da Motta (1997) for more details over this instrument and others in Brazil.

Contributions to Climate Change

Brazil's carbon emissions from energy sources in Brazil is, according to MCT (1997), about 80.1 Mt. C (including biomass net emissions) which represent around 1.2% of total global emissions. However, energy consumption is very low in Brazil and show significant differences when confronted with consumption levels in OECD countries, particularly by comparing per capita carbon emission. In the case of Brazil, this per capita intensity is of only 0.52 tC/inhab while, for example, in the USA is of 5.31 tC/inhab.

The Brazilian carbon intensity in the total energy supply in Brazil is of 0.39 tC/tep which is also much lower than in many OECD countries. This is mostly due to the current energy mix in Brazil which has been developed with hydropower and biomass sources. Such mix pattern is, however, in change due to the exhaustion of economically viable sources of hydropower and biomass. Gradually energy consumption in Brazil will be more reliant on fossil fuel sources[11].

Carbon release from deforestation in Brazil is, however, more impressive. According to Reis and Andersen (1998), around 168 Mt. C is the net effect arising from carbon release from the destroyed original vegetation (198 Mt. C) and carbon sequestration in secondary vegetation (30 Mt. C). This emission level represents about 2.4 % of total global carbon emissions.

As can be seen, Brazil's contributions to climate change in equity terms is very favorable when compared to rich countries. In the other hand, contributions from land-use changes is significant and increases the country's challenge to create response actions to global warming.

Climate Change Initiatives

The Brazilian initiatives in climate change combating have been almost none regarding response options. The government has always made clear that Brazil's growth cannot be jeopardized with restrictions associated to carbon emission issues. The country's contribution to this global problem is not significant in terms of energy source since Brazil's energy mix relies mostly on hydropower. Although the deforestation sources are as much big as the energy ones, the Brazilian government seen them as a development rigth which has been used by the rich countries in the past when they initiated their growth path by reducing their forestland area.

Based on these reasonable equity assumptions, Brazil has been a key player in the Climate Change Convention. Brazil has, in fact, made clear that its willingness to participate in a global efforts to combat greenhouse gases emissions is dependent on the commitment the rich countries will have on GHG control and the financing mechanisms available to finance

[11] See other indicators in MCT (1997).

such similar initiatives in developing countries. That, in fact, has been a commom strategy shared by the G77 group[12].

For that reason, Brazil has been very active to pass the Annex 1 caps in the 1997 COP3 in Kyoto[13]and also have proposed non-compliance charges or penalties to Annex 1[14] countries (A1C) which do not fulfil their emission caps. This mechanism was denominated as the Clean Development Fund (CDF) which would use the charge revenue to finance sustainable development initiatives in non-Annex 1 countries (NA1C).

Strong opposition from some developed countries, particularly USA, arose against on the grounds of flexibility. As a charge fund CDF could not create the appropriate incentives to reduce global costs of carbon emission control and promote carbon control actions in developing countries. A new version of CDF was proposed as the Clean Development Mechanism which allows A1C to buy carbon credits from NA1C which have implemented carbon saving investments. Such tradable credit scheme would then minimize global control costs and assure the implementation of carbon saving options in developing countries.

The Protocol resulting from Kyoto COP finally set emission caps for several developed countries and introduced the possibility of market creation mechanisms based on emission trading. It established a legally binding obligation on Annex B countries to reduce emissions for six GHGs in total by about 5.0% below 1990 levels by the years 2008-12. There are no similar emission reductions for developing countries under this Protocol. Annex 1 countries agreed to differentiated reductions: 8% for the European Union, 7% for the United States, 6% for Canada, Japan, Hungary and Poland, and 5% for Croatia. Russia and Ukraine promised to stabilize at 1990 levels, while Norway, Australia and Iceland were allowed increases of 1, 8, and 10%, respectively.

Apart from CDM, emission trading and joint-implementation mechanisms were also allowed for transactions among countries with caps. While trade and joint-implementation among A1C result in carbon credit and debit against caps, CDM only works as a credit to A1C without resulting into any debit to non-Annex 1 countries. That is, CDM is only valid credit to the Kyoto caps and will not be carried over afterwards.

Many of the procedures needed to allow the trade in emissions to carry on under the CDM, however, such as, baseline, additionallity, certification and so on, are still to be defined. Even tough, CDM is certainly the big star born from the Kyoto Protocol since it grasps all the required incentives to spur on cooperation and increase cost-effectiveness in global GHG control.

[12]The group formed of 77 developing countries which tries to follow commom and co-ordinated policies in global issues, such as, climate change.
[13]Conference of the Parties of the Climate Convention.
[14]Countries which are obliged to reduce first their GHG emissions as set by the Convention.

In the last COP 4 in Buenos Aires, the Brazilian government has emphasized its determination to introduce cumulative carbon emission criteria by proposing each country responsibility through estimate of their emission to temperature increase rather than by simple emission inventories. Climate Brazilian scientists from the Brazilian Space Agency has developed a very simple model which can be easily run in in standards PC computers.

CDM as a Funding Device

Away from subsidized funds and carbon tax, CDM is a typical market creation instrument. Market forces are now expected to come into place and create the necessary incentives to make co-operation worthwhile for every nation in the global warming combat. Private investors, rather than governments, may take a lead in making co-operation possible using the market as the arena to create economic incentives.

Although the CDM market can be very efficient in implementing cost-effective investments to control GHG, it can not capture, alone, the external benefits (externalities) arising from projects on global warming response options. These benefits usually improve people's welfare in the country taking response actions. These benefits emerge externally to markets and, consequently, do not get a price. Therefore they do not affect private capital returns, i.e., financial profitability.

Additionally, there are clearly response options which are very cost-effective to global GHG control, but result in negative benefits, that is, impose social costs as spillover effects worsening country's welfare.

We will here denominate these externalities as secondary benefits (SB) and our concept will go beyond the current concept adopted elsewhere in the global warming literature which is strongly associated with positive local environmental externalities. Our concept covers distributive and development aspects and, above all, recognize some as negative benefits. Instead of treating them as benefits and costs separately, we take the denomination of secondary benefits but differentiating them as positive and negative when necessary.

The GHG control has an important feature, and necessary condition, for the application of economic instruments: marginal control costs vary largely among polluters. Additionally, since GHG emissions are uniformly mixed (i.e., spatially independent) in the atmosphere, emission trading appears to be a good candidate to maximize efficiency gains. That is, emissions from one place can be traded at par with emissions from other places without deteriorating those place's environmental quality[15]. In this case, transaction costs are largely reduced.

[15] Although non-uniform mixing emissions could also rely on tradable devices, transaction costs (including administrative costs) would be high.

Under the CDM, any country from the non-annex B group can take up on projects to reduce GHG and get credited for that, being able to sell this credit on the market. Consequently, CDM transactions will take place as long as A1C' caps are not met and NA1C' marginal abatement costs are lower than the Annex 1's .

Nevertheless, the previous characteristics are not sufficient conditions to make the CDM market work on a cost-effective basis to create GHG abatement efforts. Market creation mechanisms require competitive market conditions to fulfill efficiency aims. Considering the diversity of GHG emission sources and control options, a pure private basis CDM market would confront many sellers and buyers allowing for a highly competitive market.

The question is whether such a competitive feature may emerge in a CDM market. The answer to that is dependent on the discretionary power that governments will bring to bear on CDM transactions. The major source of GHG cuts will come from few NA1Cs and, furthermore, buyers will be concentrated in the few A1Cs. If governments act in order to exercise their discretionary power in the CDM market controlling market decisions according to each country's strategy, we will see a market with few buyers and sellers playing strategically to maximize individual country benefits. Such imperfections will certainly reduce efficiency gains from the CDM outcome.

On the other hand, looking at an individual economy, a competitive market alone may lead to other imperfections since benefits from GHG control are global but costs are born locally. Consequently, a market with many individual firms seeking maximization of profits will enhance competition, but will not capture secondary benefits from GHG control.

Secondary Benefits

So far funding for global warming response options, such as GEF, has discriminated against secondary benefits in their project analysis. Projects in this way were ranked taking into account secondary benefits. Much of the discussion was on how many of these benefits should be deducted from funds of global warming control efforts since recipient countries would gain other benefits while reducing incremental costs[16]. In other words, it became a matter of how to apply cost-benefit analysis to rank and select projects for funding.

On the other hand, these considerable benefits did not lead developing countries to an active investment program. They were not willing to undertake these global warming response options even in the presence of such high secondary benefits. In summary, response option projects fell considerably short of the opportunities for win-win investments widely indicated in the joint implementation literature.

[16] See, for example, Heintz and Toll (1996).

Apart from the lack of GHG credible and equitable abatement commitments until the Kyoto Conference, capital constraints, scale effect and learning costs were the usual explanations for this contradiction.

Furthermore, even if a country perceives high social return from global warming response projects, it cannot leverage the required capital for these additional investments. Moreover, technological barriers and lack of experience prevent these countries from accurately identifying costs and benefits associated with scale and learning.

Will CDM revert this situation, making these investment opportunities financially viable?

The most important feature of CDM is its reliance on market forces. Allowing for the trading in emissions, CDM can bring private investors into the GHG control business. An investor now may generate revenue selling GHG savings and, therefore, improve a project's returns. Such a market will overcome capital constraints since the opportunities of this market-oriented approach will attract international business. In other words, CDM diverts funding from governments to private investors who will seek profits and bear the costs. Governments will intervene to reduce transaction costs through monitoring.

GHG savings will then be regarded as a typical commodity traded on a market in a way to maximize private profits. In this way, scale effects will be recognized and learning costs reduced since technology will be needed and promoted to guarantee private returns .

Economies where CDM is applied in order to create GHG savings for trade will receive large investments with benefits ranging from employment opportunities to balance of trade improvements creating reasonable equity gains for developing countries.

Government Intervention

Although this pure market-oriented approach makes, under some special conditions[17], most of efficiency and equity gains on GHG control all over the globe, it will not guarantee that a country is making most of its resources. While investors will be fully satisfied with trade outcomes from the CDM market, governments should be not willing to go too far.

Although government dominance, as said before, may lead to a rather imperfect market, a purely private CDM market brings about welfare issues related to local externalities associated to GHG abatement. In other words, a pure market-basis approach of CDM will set aside any chance of integrating any secondary benefits associated with GHG projects into project selection. Note that secondary benefits will accrue to countries undertaking GHG emission savings but, theoretically speaking, one can only guarantee that market selection investments will minimize GHG abatement costs. The maximization of other potential external benefits is not assured.

[17] Symmetry of information between countries and perfect competition in the tradable market are two necessary conditions.

There is no straightforward way to help a country identifying every social cost and benefit from all its investment options and try to rank global warming response investments among them in order to motivate a country to rationally select the best opportunities. Economists cannot easily deliver such output in this overall dimension and government does not behave rationally like that anyway.

Summing up, CDM market does not take into account any other benefit which cannot be captured by the market. And as it was pointed out previously, these benefits seem to be very impressive.

Literature on this subject differs on value estimation but agrees on their importance[18]. For example, energy-oriented projects reducing reliance on fossil fuels also reduce other air pollutants associated with health safety, additionally they can be more labor intensive and regionally tailored. Forestry projects may, above all, restrict deforestation thus protecting biodiversity. Moreover, it needs to be recognized that these secondary benefits may be generated at different levels for the same GHG abatement result. That is, not only can secondary benefits be great but they may also differ across projects.

As previously mentioned, market-oriented CDM will not capture these external benefits into their investment decision since they will not be cashed by investors. However, these benefits can represent a great change in efficiency and equity gains of each investment emerging from market forces.

Summing up, CDM market-oriented will rely only on financial costs and benefits. In doing so, the market will certainly do a better job than global warming funds to increase investment in GHG control in the most effective way. On the other hand, that does not necessarily lead to social welfare maximization in a specific country undertaking the investments, particularly in the presence of significant environmental externalities associated with global warming cautionary investments. Internalizing these externalities, using the social cost-benefit approach may change the rank of investment options compared to what market alone would indicate.

CDM Options in Brazil

A recent study by Seroa da Motta, Young and Ferraz (1998) has estimated carbon saving costs in several climate change combat response options in Brazil. It has also identified the level of secondary benefits of each of these options. In doing so, the study was able to point out the expected balance between private profitability which will spur up the CDM market and expected welfare gains arising from them whih will acrrue to the Brazilian people.

This study, however, did not attempt to make any monetary valuation. The assessment was be based on qualitative indicators from some non-monetary quantitative indicators which

[18]See, for example, Ekins (1996) for a survey.

reveal their importance *vis-a-vis* the current state of welfare affected by them. Analysis will be limited to point out SB related to each option against its private returns.

It is certainly complex and controversial to evaluate secondary benefits, even when one assign monetary values in order to make them comparable. Therefore, the results of this study have to be taken as an attempt to clarify the need to balance private returns to secondary benefits which cannot be captured by pure market-based mechanisms.

Private profitability as indicated by the carbon break-even prices measured as the carbon price required to make the option's net present value equal to zero at an annual 12% discounted rate.

Carbon saving, i.e., option's carbon reduction, was estimated in three assumptions:

(i) Energy options considered that energy supply in Brazil is coming from fossil fuel sources since economically feasible hydropower options have been almost exhausted.
(Ii) Planted forests accounted for different uses of the wood output.
(Iii) Sustainable native forest management was analyzed into two types: one which is undertake on private forestland and other in public land in National Forests. In both cases, only carbon sequestration from tree growth was accounted.

Secondary benefits were classified into three categories:

Environmental quality benefits covering issues, such as, water resources availability; water resources quality; urban air pollution; soil erosion control; and biodiversity protection.

Development benefits covering issues, such as, effects on aggregate demand; effects on trade balance; effects on regional economies; and opportunity cost of the output foregone.
Equity benefits covering issues, such as, effects on income distribution arising from the project output and costs.

Table 5 summarizes this study estimates.

Table 5
Generalized Indicators of Benefits from Response Options in Brazil

	Industrial plantations and biomass electricity	***Sustainable native forest management***	***Ethanol with electricity cogeneration***	***Industrial cogeneration of electricity***	***Wind energy***
Carbon Break-Even Price	medium	low	Very low	high	medium
Environmental Benefits	low	high	Medium	low	high
Development	high	medium	High	high	low

Benefits					
Equity Benefits	low	high	High	low	low

Source: Seroa da Motta, Young and Ferraz (1998)

As previously pointed out, private investors seeking CDM rents will be more willing to undertake plantations rather than native forest management since the former option offer higher profitability against lower learning costs, reasonable scale effects and, above all, lower C break-even prices. CDM buyers would also go for plantation due to low leakage rates.

Industrial cogeneration of electricity is by far the option with the highest private return. Biomass electricity and wind energy options are at the same profitability level than plantation. Ethanol production is, however, not private profitable at all and it would only be a CDM option if is undertaken with government intervention.

However, when secondary benefits are taken into account a different picture may arise from our analysis.

In terms of environmental benefits, native forest management options, particularly, concession forests, offer a great deal of secondary benefits with great relevance for biodiversity protection. Biomass electricity as charcoal substitution can also assure air pollution benefits.

For development impacts, plantations are more important for the activity level of the economy as a whole but less for the regional economy, although they can negatively affect the trade balance deficit. In terms of regional benefits, private sustainable logging in native forests is more relevant. Ethanol and biomass electricity, on the other hand, capture most of all development gains.

Equity issues are in favor of native forest management when they affect low income classes at the project's output, costs and ecological benefits, although they generate more negative impacts from displacement activities than plantations.

Ethanol and biomass electricity combine development gains with equity ones. In the case of ecological impacts, wind energy offers more air pollution benefits while biomass is more prone for biodiversity protection.

For further details on estimation procedures and option description, readers should refer to Seroa da Motta, Young and Ferraz (1998).

This partial qualitative analysis summarized in Table 5 presents generalized indicators of secondary benefits for the previously analyzed options. As can be seen, private profitability, by itself, has no definitive link pattern to secondary benefits. That is, market forces alone will not be able to select CDM options which have, at the same time, high private cost-effective and high positive linkages to ecological and social benefits.

If the CDM market offers a carbon price which makes attractive several options, including the ones with high secondary benefits without driving the price downwards, there is no reason to be concerned about the country's welfare maximization since all benefits will be captured.

However, demand for CDM is limited by current caps and Brazil has so many opportunities in the potential CDM market that such price taker assumption will certainly not prevail. As a result, a high private return option may displace a high social return option. In this case, a country may be willing to act in the CDM market as a single unique agent with a portfolio of socially desirable projects.

For this purpose, government may try to regulate private agent access to CDM market to orient them to select socially desirable CDM options. Although this can be justified on welfare grounds, as Table 5 indicates, it will certainly downgrading the country's portfolio of cost-effective options and introduce increasing transactions costs, including reducing agents agility to compete in the CDM market.

Therefore, such regulation approach is not easy to carry out and there is no guarantee that government intervention will assure welfare maximization due to high transaction costs which may emerge from policy failures.

That can be more realistic in the Brazilian case. Austin et al. (1998) has undertaken a survey of recent prospective studies on CDM market. The CDM flows could be of US$ 5-17 billion per year by 2010, implying a range of US$ 25-85 billion for the full budget period of 2008-2012. Those figures are relatively small when compared to current ODA expenditures and some countries´ GDP as the cases of Brazil, India and China. These studies also show that China may take the largest share of CDM funds - up to 70% - because of its large number of low cost opportunities. Therefore, one can expect that CDM market will be a very competitive market to Brazil.

Moreover, additionallity criteria can discard current profitable options of Brazil, such as, forest plantations. Baselines procedures may also not consider Brazil's future supply expansion on fossil fuels. All these still unsolved issues may reduce still more the country's opportunities in the CDM market.

Based on that, one can say that Brazil cannot increase the transaction costs of its CDM opportunities when they go to business in the CDM market.

As can be seen, the conflict between country's cost-effectiveness and welfare gains arising from CDM opportunities is clear, but there is no simple approach which can solve it.

If an attempt has to be made to grasp welfare gains, that can be tried at the expenses of cost-effectiveness of CDM buyers by the introduction of market shares for each non-Annex 1

country. With market shares previously set to each country, then countries can set mechanisms to maximize welfare gains since its demand is already assured.

Such CDM country caps may, however, be constrained for two reasons:

1 - Annex 1 countries will regard that as an unacceptable reduction of flexibility in CDM which increase their abatement costs. To overcame that, only political persuasion can be applied on the basis of the welfare gains accruing to NA1C.

2 - Even if A1C accept these market shares, NA1C may not find an acceptable criteria to fix these shares. The Brazilian proposal of estimating each country responsibility to the green-house effects by country's emission correlation to global temperature rise may, however, be a good starting-point to set up basis for this sharing criteria.

Apart from other CDM technicalities still to be resolved to make possible the launching of a CDM market, the conciliation of CDM with country's welfare maximization is far from being entangled. The merging of global and local issues will need much more than diplomatic efforts. That is, apart from our already effective diplomatic performance, we should also increase our knowledge on economic matters affecting CDM and other climate change related issues. Brazil has to increase critic mass among CDM stakeholders, such as, private sector, academia, NGO and other governmental sectors, to help in the design of effective strategies in which climate change issues can generate opportunities to the the Brazilian society wellbeing. The first step towards this aim is to make CDM regulations which reduce transactions cost rather than increasing them.

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